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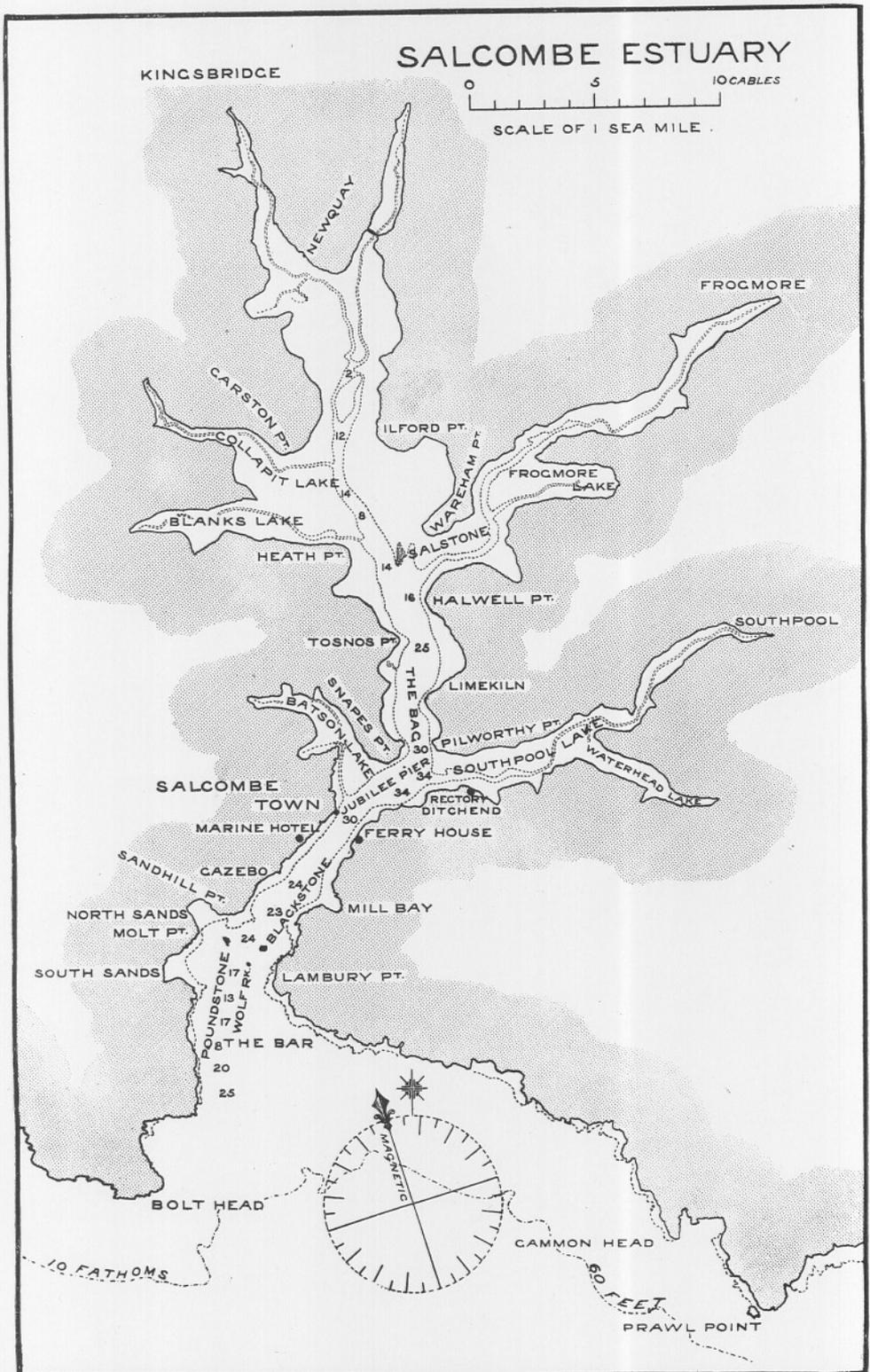
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The Fauna of the Salcombe Estuary.

By

E. J. Allen, D.Sc., and R. A. Todd, B.Sc.

With the assistance of W. Garstang, M.A., W. I. Beaumont, B.A.,
T. V. Hodgson, and R. H. Worth.

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I. Introduction.

IN connection with the work of the Plymouth Laboratory it has been the custom of the Marine Biological Association for several years past to extend its operations during the summer months to the various harbours on the coast of Devon and Cornwall, with a view to making a comparative study of the faunas found in the different localities and of correlating, so far as that may be possible, differences in the character of the fauna with differences in the physical conditions prevailing in each. In former years this has been done by making occasional visits, lasting generally for a few days only, in our small steamer, the *Busy Bee*. It was found, however, that if investigations of this character were to be satisfactorily carried out some arrangement would have to be made for remaining in one locality for longer periods, and working each harbour in turn in more detail. Mr. J. W. Woodall kindly came to our assistance and purchased the hull of an old cruising yacht, which he caused to be fitted as a small floating laboratory and house-boat, and placed at our disposal for use in connection with the researches. This vessel, the *Dawn*, which can be towed by our own steamer, has been stationed at Salcombe during the present summer and has proved herself to be very well adapted to the work for which she was intended. We have also to thank Mr. Woodall for defraying the expenses of keeping the *Dawn* at Salcombe.

The harbour of Salcombe is of special interest to zoologists from the fact that it was the hunting ground of George Montagu, in the early years of the century, and it was from specimens collected in this locality that many of our marine animals were first made known to science and accurately described. It was partly for this reason, and also because on previous short visits very promising results had been obtained, that we decided to make Salcombe the first of the harbours to investigate in detail. The present report consists almost entirely of a record of facts with regard to the nature and distribution of the fauna as we have found it during the present summer, consideration and discussion of these facts and comparison with the conditions prevailing in other localities being held over until further investigations on a similar plan have been carried out elsewhere.

It is only by a large number of detailed records of this kind, where all possible information is given as to the exact localities and conditions in which each species is found, that we can hope to ascertain the general principles which underlie the distribution of the animals which live in the sea.

In the compilation of the present record a number of naturalists

have taken part, and to all these our thanks are due. In the collecting work we had the assistance of Mr. Garstang for several days, as well as Messrs. A. D. Darbishire and W. M. Aders. In the determination of the species there has been considerable division of labour. With the exception of the Polynoida, which were identified by Mr. Hodgson, Mr. Allen is responsible for the Polychæta, which have proved, perhaps, the most interesting group of all, quite a number of Montagu's species being rediscovered, and several new additions being made to British records. The Mollusca were identified by Mr. Todd, as well as the Decapoda, Amphipoda, and Isopoda amongst the Crustacea. Mr. W. I. Beaumont has named the Mysidae, Mr. Garstang and Mr. L. W. Byrne the Fishes, Mr. A. E. Shipley the Gephyrea, Mr. R. C. Punnett and Mr. Beaumont the majority of the Nemertina, and Mr. R. H. Worth the Foraminifera. For the other groups Mr. Allen and Mr. Todd are jointly responsible.

An account of the plankton is not included in the present report, but collections were regularly made and sent to Mr. E. T. Browne, who has undertaken to report upon them.

We are also greatly indebted to Mr. J. Luskey Coad, of Salcombe, a gentleman who during the summer months makes seine and trammel fishing a recreation which he pursues with great diligence, for the account of the fishes which have frequented the harbour during the present summer and of the general character of the fishing.

II. The Physical Conditions Prevailing in the Salcombe Estuary.

For the purposes of this report the whole Salcombe estuary may be conveniently divided into three principal portions, which will be readily recognised on the accompanying chart, and will be referred to as (1) the Kingsbridge estuary, extending from Kingsbridge to Snape's Point; (2) Salcombe Harbour, from Snape's Point to Sandhill Point; and (3) the region between the latter point and the bar, which is generally referred to as "outside the harbour."

In its general geographical features the Salcombe estuary resembles many of the other estuaries on the south coast of Devon and Cornwall, more especially Dartmouth, Fowey, and Falmouth. Outside the harbour proper there is a large area more or less sheltered on the east and west by high land, but fully exposed to the south. This area is bounded on the seaward side by a bar of sand, stretching from the eastern to the western land and covered only by a few feet of water at low tide, and on the harbour side converges to a narrow mouth, which forms the entrance to Salcombe Harbour proper. Inside the mouth, the harbour widens considerably, and its general direction turns somewhat to the

eastward, so that its waters become more sheltered from the southerly weather. At its north-eastern end are two large but shallow creeks, which at low tide become large mud-flats, with only a small stream running through each—Batson Lake and Southpool Lake—as well as the narrow entrance to the Kingsbridge estuary between Pilworthy Point and Snape's Point.

The Kingsbridge estuary, as is usual in these cases, has a deep winding channel, which is bounded on either side by large mud-banks covered with water only at high tide. A number of creeks with similar extensive mud-banks run into the main estuary, and there is situated at some distance from its mouth an island known as the Salstone, which at high tide is quite submerged.

The Nature of the Water.—Compared with the size of the whole estuary and the volume of sea-water which enters with the tide, the various streams which run into it are small, and the amount of fresh water which enters the estuary is not sufficient to seriously reduce the density. In Salcombe Harbour proper, and probably in the Kingsbridge estuary as far up as the Salstone, the density of the water, excepting in times of flood, is very nearly that of Channel water. The following observations of density were made by Mr. Garstang from the *Dawn*, which was moored off Ditch End, at the north-east end of Salcombe Harbour:—

Aug. 7th, 1900 (low water 8.30 p.m., 12 ft. 7 in. tide), 7.45 p.m.; temperature of water, 17° C.; density at that temperature, 1.026.
 Aug. 8th, 1900 (high water at 3.12 p.m.), 2.30 p.m.; temperature of water, 15.6° C.; density, 1.0267 at 16° C.

A third determination was made by Mr. Todd between Garston Point and the Salstone in the upper part of the Kingsbridge estuary, and gave the following:—

Oct. 10th, 1900 (low water 12.49 p.m., 16 ft. 8 in. tide), 12.45 p.m.; temperature of water, 15.7° C.; density at that temperature, 1.0266.

Temperature.—Owing to the extensive area of the mud-flats, which are covered by the rising tide with a shallow layer of water, the water in the estuary must necessarily be subjected to considerable changes in temperature, which will vary in direction and magnitude according to the season of the year. To these changes of temperature, which will often be very sudden, the animals living in the estuary must of necessity be adapted.

The Movements of the Water. 1. *The Tides.*—The tidal current in Salcombe Harbour is exceedingly strong, and the scour, especially at spring tides, is very considerable in the centre of the stream. The maximum rise and fall is about 17 ft.

2. *Wave-Action*.—This is only of importance in the lower part of the harbour near the mouth, and in the area between the mouth and the bar. In the latter region it is of course a very powerful factor, and, as will be seen when the fauna of this part is treated, renders it very barren. Inside the harbour itself there is very good shelter, the effect of which upon the fauna is very marked. There is reason to suppose that the eastern shore is less disturbed than the western in this part.

Nature of the Bottom-Deposits.—The bottom-deposits will be described in detail when the separate parts of the estuary are considered. Making a general statement, we may say that in the Kingsbridge estuary the soil on the banks consists of fine, sticky mud, over by far the greater part of the area exposed at low tide. On certain parts of the shore, which are exposed to the action of specially strong tidal currents, the mud is not able to deposit to such an extent as it does on the ordinary mud-banks, and we then find a harder deposit, consisting of gravel, mixed with a considerable quantity of mud, but lying often very close to the bed-rock. At the north end of Salcombe Harbour the mud of the banks becomes mixed with considerable quantities of sand, and has a much firmer consistency, the firmness of its surface being increased by the fact that it is overgrown with *zostera*, the roots of which help to keep it compact. In the lower parts of Salcombe Harbour the shore consists chiefly of fine sand, excepting at the upper tidal levels where gravel and muddy gravel are found.

The nature of the deposit in the channel is only known to us from the results obtained by dredging with an ordinary dredge with net bag, no actual samples of the deposit having been taken. In the Kingsbridge estuary the dredge brought up a mass of decaying seaweeds, with a good many stones, some gravel, and a quantity of black, sticky mud. Around Snape's Point, where the Kingsbridge estuary narrows and joins Salcombe Harbour, the bottom-deposit consists of clean, fine shell-gravel, and this shell-gravel extends into the first bight on the west shore of the Kingsbridge estuary, which is known as "The Bag."

In the channel in Salcombe Harbour the dredge material consisted of stones and shells, accompanied by very little mud such as was found in the Kingsbridge estuary. In the lower part of the harbour, between Salcombe town and the mouth, a patch of *Melobesia* ground was found. Outside the mouth of the harbour the deposit is all fine, clean sand.

III. Description of the Fauna found in different parts of the Salcombe Estuary.

1. THE SALSTONE.

[Shore collecting : July 13th, 1900, tide 15 ft. ; July 30th, 1900, tide 14 ft. 5 in. ; August 12th, 1900, tide 16 ft. ; October 10th, 1900, tide 16 ft. 8 in.]

The Salstone (see Chart) lies some distance up the Kingsbridge estuary, at the mouth of Frogmore Creek, and is distant about 2 miles from the Blackstone, which guards the entrance to Salcombe Harbour proper. It is completely covered for a short time at high tide, but is generally to be seen as an island standing almost in the middle of the estuary. The main channel of the Kingsbridge river passes close to its western side, whilst the water from Frogmore Creek passes down the south-east shore. These two shores, the western and south-eastern, from half-tide mark to low water, have a soil composed of hard muddy gravel, which only covers the underlying shale with a layer a foot or eighteen inches deep. At the southern end of the Salstone there is a small stretch of clean, coarse sand uncovered at extreme low water (16 ft. 8 in. tide).

The north-east shore, which is sheltered from the main tidal streams, is on the other hand covered with soft, sticky mud, so soft that one can only walk on it with very considerable difficulty.

On the muddy gravel of the western and south-eastern shores the common and characteristic animals are :—

(1) FIXED SPECIES. *Morchellium argus*, which is present on the muddy gravel in exceptional abundance; the orange-coloured sponge, *Hymeniacidon sanguineum*, also very common; *Sagartia bellis*, numerous in patches where a layer of mud lies on the top of a layer of gravel; *Myxicola infundibulum*, whose gelatinous tubes are very frequent, especially at the lowest tidal levels; *Branchiomma vesiculosum*, the tubes of which occur fixed often in clusters in the muddy gravel, but are confined almost entirely to the tidal level which is only just uncovered at a 15 ft. tide; *Sabella pavonina*, which on the south-east shore is found in bunches of twenty or thirty together at a lower tidal level than the *Branchiomma*, namely that just exposed at a 16 ft. tide; *Clavelina lepadiformis*, frequently attached to some of the larger stones, especially on the western shore; and *Melinna adriatica*, which is often met with in muddy patches, though it cannot be called plentiful and must be regarded as an immigrant from the adjoining fine mud.

(2) BURROWING SPECIES. *Nephtys Hombergii* is perhaps the most commonly taken; *Amphitrite Johnstoni* is generally distributed, but is especially abundant on the south-east shore; *Nereis cultrifera* is common at the higher tidal levels; *Nereis longissima* is occasionally found in patches of finer mud. *Carinella annulata*, a few small *Notomastus latericius*, and the mollusc *Tapes pullastra* are all met with.

(3) WANDERING SPECIES. Small *Carcinus maenas* and small *Eupagurus Bernhardus* are numerous, whilst *Cardium edule* and *Prosthecereus vittatus* are also found.

Comparing the two shores the most striking differences are the special abundance of *Branchiomma vesiculosum*, *Sabella pavonina*, and *Amphitrite Johnstoni* on the south-east, and of *Clavelina lepadiformis*, *Asciidiella aspersa*, and *Phallusia mammillata* on the west. On the western shore, also, the following species were taken which did not occur on the south-eastern: *Chaetopterus variopedatus*, *Modiola modiolus*, *Maclovioia gigantea*, and *Lumbriconereis Latreillii*.

Three specimens of the common octopus, *O. vulgaris*, were found nested on the shore near low-tide mark (16 ft. tide), at the southern corner of the island (see Garstang, "The Plague of Octopus on the South Coast, and its Effect on the Crab and Lobster Fisheries," in the present number of this Journal, p. 260).

The fauna of the soft mud on the north-east shore of the Salstone resembles that found on this kind of mud in other parts of the estuary. Where the mud is finest the common and characteristic species is the small Sabellid *Melinna adriatica*, the tubes of which are seen protruding thickly from the whole surface of the mud-flat. The only other species which is at all frequent is the Capitellid, *Notomastus latericeus*, the specimens of which here attain a large size. These worms live in vertical, spiral burrows in the mud, which are lined with mucus. On the intermediate ground, between the finest mud and the harder muddy gravel, a number of other species occur in addition to those just mentioned, the most important of which are *Morchellum argus*, *Sagartia bellis*, *Myxicola infundibulum*, *Tapes pullastra*, and *Cardium edule*. At the higher tidal levels *Audouinia tentaculata* is common.

Salstone, West Shore. List of Species.

PORIFERA.

Hymeniacidon sanguineum. Common in patches of considerable size.

Suberites domuncula. Not uncommon, occupied by *Eupagurus cuanensis*.

ACTINOZOA.

Sagartia bellis. Very common in places, attached to stones generally some inches beneath the surface of the mud.

ECHINODERMA.

- Asterias glacialis*. One very large one on the south end of the island.
Ophrothrix fragilis. One.

TURBELLARIA.

- Prostheceraeus vittatus*. Two found near low-water mark (16 ft. tide), in neighbourhood of *Morchellium*.

NEMERTINA.

- Carinella superba*. Several in the muddy gravel.
 „ *polymorpha*. One found in similar ground.

GEPHYREA.

- Phascolosoma pellucidum*. Not uncommon in muddy gravel.

POLYCHÆTA.

- Gattyana cirrosa*. In the tubes of *Amphitrite Johnstoni*.
Sthenelais boa. Several. Elytra brown.
Maclovina iricolor. One only taken, about 18 inches long.
Lumbriconereis Latreillii. Two.
Nereis cultrifera. Plentiful.
 „ *longissima*. In the finest mud or sand.
Nephtys Hombergii.
Audouinia tentaculata. Common in muddy gravel, especially at the higher tidal levels.
Notomastus latericeus. Several.
Arenicola marina. Common in places.
 „ *Grubii*. One only taken.
Chaetopterus variopedatus. Two or three at dead low water (16 ft. tide).
Amphitrite Johnstoni. Several.
Sabella pavonina. Not very common.
Branchiomma vesiculosum. Several.
Myxicola infundibulum. Common near low-water mark.

CRUSTACEA.

- Inachus dorynchus*. A few.
Gebia stellata. One specimen.
Eupagurus Bernhardus. Young ones common near and below low-water mark, generally in *Littorina* shells.

MOLLUSCA.

- Solen ensis*. Shells only.
Lutraria elliptica. Shells only.
Tapes pullastra. Very common; found on or close under the surface, or buried to a depth of several inches.
Cardium edule. Common, near to or upon the surface.
Modiola modiolus. One living animal taken attached to a stone.
Pinna pectinata. Shells only taken.
Fissurella reticulata. One only taken.
Trochus zizyphinus. Common at lower tidal levels.
 „ *cinerarius*. Common.
 „ *umbilicaris*.

- Littorina littoralis*. } Common at higher levels, on Fucus.
 „ *littorea*. }
Scalaria communis. One on the gravel at the south end.
Bulla hydatis. Five were found on the surface of the muddy gravel on the west shore, and seven or eight on a patch of coarse sand at the extreme south.
Octopus vulgaris. Three found in holes between rocks covered with stones and shells.

TUNICATA.

- Botryllus violaceus*. Only a few small pieces seen.
Ascidia aspersa. Very common and large, either attached to stones or lying free upon the surface.
Phallusia mammillata. Several found.
Clavelina lepadiformis. Very common, attached to stones.
Didemnum sp. Not uncommon.
Amaroucium Nordmanni. Found along with *Morchellium argus*, but much less numerous.
Morchellium argus. Very common.

PISCES.

- Centronotus gunnellus*. One found on the south end, inside an empty *Buccinum* shell.

Salstone, South-East Shore. List of Species.

FORAMINIFERA.

A sample of sand taken on the south-east shore, just above low water (16 ft. tide), was found to contain 78 Foraminifera in 13 c.grms. All were identified.

<i>Rotalia beccarii</i>	.	.	.	.	.	.	77 per cent.
<i>Polystomella crispa</i> (a few specimens of <i>P. striato-punctata</i> included)	.	.	.	.	.	.	18 „
<i>Miliolina seminulum</i>	.	.	.	.	.	.	3 „
<i>Truncatulina lobatula</i>	.	.	.	.	.	.	1 „
<i>Bolivina dilatata</i>	.	.	.	.	.	.	1 „

Miliolina bicornis, *M. agglutinans*, *Nonionina depressula*, *Textularia gramen*, and *T. agglutinans* were also present. Some of the specimens of *Rotalia beccarii* are of very considerable dimensions. Nearly all are large. [R. H. WORTH.]

PORIFERA.

- Hymeniacidon sanguineum*. Very abundant.
Suberites domuncula.

HYDROZOA.

- Hydractinia echinata*. On shell inhabited by *Eupagurus Bernhardus*.

ACTINOZOA.

- Sagartia bellis*. Extremely abundant in places.
 „ *parasitica*. On shell inhabited by *Eupagurus Bernhardus*.

ECHINODERMA.

- Amphiura elegans*. One or two.
Ophiothrix fragilis. One or two.

NEMERTINA.

Carinella superba. Two large specimens in muddy gravel.

TURBELLARIA.

Prostheceraeus vittatus. Three at low-water level (16 ft. tide) in the neighbourhood of *Morchellium*.

GEPHYREA.

Phascolosoma pellucidum. One in very soft shale, almost clay.

POLYCHÆTA.

Gattyana cirrosa. In tubes of *Amphitrite Johnstoni*.

Sthenelais boa. Brown elytra.

Marphysa Bellii. One or two.

Nereis cultrifera. Numerous at same level as *Branchiomma*, occasionally lower down.

„ *longissima*. Two in muddy sand.

Nephtys Homborgii. Moderately common.

Andouinia tentaculata. Common at higher tidal levels.

Magelona papillicornis. One specimen.

Notomastus latericeus. Not very large, but moderately common.

Clymene sp. Occasional specimens.

Amphitrite Johnstoni. Fairly common.

Melinna adriatica: Occasionally found everywhere.

Sabella pavonina. Very abundant in places, at a lower tidal level than *Branchiomma*. Sometimes twenty to thirty tubes in a cluster at low-water mark, 16 ft. tide.

Branchiomma vesiculosum. Common in patches, often in clusters of six to twelve tubes, chiefly at low-water mark, 15 ft. tide.

Myxicola infundibulum. Common.

CRUSTACEA.

Inachus dorynchus.

Carcinus mænas. Fairly common.

Eupagurus Bernhardus. Young ones were very common, chiefly in *Littorina* shells. One large one at low-water level (16 ft. tide) with *Sagartia parasitica*.

MOLLUSCA.

Lutraria elliptica. One, eight or nine inches below the surface, in gravel.

Tapes pullastra. Several near or at the surface or several inches below.

Cardium edule. Occasionally found near or on the surface.

Pecten opercularis. One or two lying on the surface of the gravel.

Scalaria communis. Four found at low-water level, 16 ft. tide.

Bulla hydatis. One.

Archidoris tuberculata. Two large ones near low-water level (16 ft. tide) in the neighbourhood of *Morchellium* and *Hymeniacion*.

TUNICATA.

Asciidiella aspersa. A few.

Phallusia mammillata. One.

Clavelina lepadiformis. A few colonies on stones.

Morchellium argus. Very common, attached to the gravel.

Salstone, North-East Mud (harder parts). List of Species.

PORIFERA.

Hymeniacidon sanguineum. Common where suitable stones for its attachment are found.

ACTINOZOA.

Sagartia bellis. Common in places where stones suitable for its attachment lie at some distance (from one to four or five inches) below the surface of the mud.

POLYCHÆTA.

Nereis longissima. A few in fine mud.

Audouinia tentaculata. Common at higher tidal levels.

Notomastus latericeus. Very common and large.

Clymene sp. A number of specimens.

Chætopterus variopedatus. One.

Melinna adriatica. Common; exceedingly abundant in the finest mud.

Myxicola infundibulum. Common.

CRUSTACEA.

Carcinus mænas.

MOLLUSCA.

Lutraria elliptica. One.

Tapes pullastra. Common.

Cardium edule. Common at or near the surface of the mud.

Aplysia punctata. Only one seen.

TUNICATA.

Ascidia aspersa. Only one or two seen.

Morchellium argus. Common where stones are present.

Salstone, North-East Mud (finest parts). List of Species.

POLYCHÆTA.

Myrianida maculata. One, budding. In the finest mud.

Notomastus latericeus. Large and numerous.

Melinna adriatica. Extremely numerous.

2. MUD-FLAT BETWEEN GARSTON POINT AND THE SALSTONE, ON THE WESTERN SIDE OF THE KINGSBRIDGE ESTUARY.

[Shore collecting: August 29th, 1900, tide 14 ft. 5 in.]

Near low-water mark the sloping edge of the bank was composed of stiff clayey mud, in which a characteristic fauna was found, consisting of a small number of species, most of which, however, were present in considerable abundance.

POLYCHÆTA.

Nereis cultrifera. By no means so plentiful as *N. longissima*.

„ *longissima*. Six specimens.

Nephtys Hombergii. Common.

Notomastus latericeus. Common.

Clymene sp. A species of *Clymene*, at present undetermined, was plentiful.

Melinna adriatica. Extremely abundant.

Sabella pavonina. Common in clusters.

Branchiomma vesiculosum. Several.

MOLLUSCA.

Pholas dactylus. A number of large recent dead shells, together with lumps of bored chalk, were found just under the surface of the mud.

Tapes pullastra. Two or three living specimens.

3. HALWELL POINT TO PILWORTHY POINT.

A large flat of very fine, sticky mud occupies the greater part of the bay on the eastern side of the Kingsbridge estuary, immediately south of Halwell Point, excepting on the southern shore, under the lime kiln (see Chart), where the ground becomes harder, a good deal of gravel being mixed with the mud. The mud-flat was examined at its southern end only, and those species which are usually found in the softest mud were discovered. The tubes of *Melinna adriatica* were extremely abundant, and the Capitellid *Notomastus latericeus* was not uncommon, large specimens being obtained occupying their usual spiral burrows.

The fauna on the southern shore of the bay, where the ground consisted of very muddy gravel, resembled that found on those parts of the Salstone where the ground was of a similar nature. The most noteworthy feature is perhaps the abundance of *Nereis longissima* in the more muddy parts.

Shoreunder Limekiln opposite Tosnos Point. List of Species.

[Shore collecting: August 15th, 1900, tide 15 ft. 7 in. Gravel with a large amount of mud.]

PORIFERA.

Hymeniacidon sanguineum.

ACTINOZOA.

Sagartia bellis. Common in patches.

POLYCHÆTA.

Gattyana cirrosa. In tubes of *Amphitrite Johnstoni*.

Lumbriconereis Latreillii. Two specimens.

Nereis cultrifera. Plentiful.

„ *longissima*. Eight specimens.

Nereis irrorata. One only.

„ *diversicolor*. One only.

Nephtys Hombergii. Several.

Audouinia tentaculata. At higher tidal levels.

Notomastus latericeus. Common.

Amphitrite Johnstoni. With <i>Gattyana cirrosa</i> .	Branchiomma vesiculosum. Common in patches.
Lanice conchilega. A few.	Myxicola infundibulum. Fairly common.
Melinna adriatica. Common.	

MOLLUSCA.

Tapes pullastra. Several.	Cypræa europæa. Several.
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TUNICATA.

Morchellium argus. Common.

Melinna adriatica was extremely abundant in the fine mud to the north of the gravel, and *Notomastus latericeus* was also found living there.

North of Pilworthy Point.

The shores of the bay immediately north of Pilworthy Point were only examined at a 13 ft. 4 in. tide, so that the results refer to a somewhat high tidal level.

Immediately north of the Point very fine mud was found, in which, as usual, *Melinna adriatica* was very abundant. There were also a few *Arenicola marina*, and young *Crangon vulgaris* were extremely numerous in the shallow pools left in hollows of the mud.

In the more gravelly portions at a higher tidal level the following species were found:—

List of Species.

ACTINOZOA.

Sagartia bellis. Fairly common everywhere, in places very numerous.

POLYCHÆTA.

Harmothoë lunulata.

Nereis cultrifera. Common.

„ *diversicolor*. Several.

Nephtys Hombergii. Common.

Audouinia tentaculata. Common in patches of black muddy gravel, accompanied only by *Nereis cultrifera*.

Notomastus latericeus.

Arenicola marina. Common.

CRUSTACEA.

Carcinus mænas. Small, abundant.

MOLLUSCA.

Scrobicularia piperata. Eight, in gravel.

Tapes decussata.

Cardium edule. One or two lying on the surface.

At the north end of the bay, 40-50 yards south of the first reef of rocks, where the shore consisted of stiff clay gravel, lying on hard clay, underneath which was soft rock, the following were found, the note-

worthy feature being the abundance of very large specimens of *Phascolosoma* :—

GEPHYREA.

Phascolosoma vulgare. Large specimens very abundant in a patch of gravel measuring 10 yards by 3 yards.

POLYCHAETA.

Nereis cultrifera. Several. | *Arenicola marina*. Occasional.

POLYZOA.

Loxosoma phascolosomatum. Common, attached to the hinder end of nearly all the specimens of *Phascolosoma*.

4. ZOSTERA BANKS AT THE NORTH-EASTERN END OF SALCOMBE HARBOUR.

The shores exposed at low water at the north-eastern end of Salcombe Harbour consist chiefly of banks of fairly hard muddy sand covered with zosteræ. Near low-water mark there are generally patches of finer and softer mud from which the zosteræ is absent. Three of these banks were examined carefully, but the fauna on all three is so similar that they may be treated together. These banks are (1) the zosteræ bank between Snape's Point and Salcombe town; (2) the zosteræ bank south of Pilworthy Point at the junction of the Kingsbridge estuary and Southpool Lake; (3) the zosteræ bank between Ditch End and Southpool Lake, on the south-east shore.

In the following list the comparative abundance of each species on the different banks is indicated.

List of Species obtained by Shore Collecting.

1. August 1st, 1900, tide 13 ft. 6 in.
2. June 19th, 1900, tide 13 ft. 9 in.
3. June 16th, 1900, tide 14 ft. 10 in.; July 15th, 1900, tide 15 ft. 6 in.

FORAMINIFERA.

A sample from the surface of the zosteræ bed south of Pilworthy Point consisted of a very fine sand with extremely small particles mixed with it. Thirty-five Foraminifera were found in 13 c.grms. Of these seven were not identified, but all were probably species as under. Of those identified :—

<i>Rotalia beccarii</i>	.	.	.	.	.	42 per cent.
<i>Polystomella crispa</i>	.	.	.	.	.	28 "
<i>Textularia agglutinans</i>	.	.	.	.	.	14 "
<i>Nonionina depressula</i>	.	.	.	.	.	4 "
<i>Lagena striata</i>	.	.	.	.	.	4 "
<i>Truncatulina lobatula</i>	.	.	.	.	.	4 "
<i>Miliolina seminulum</i>	.	.	.	.	.	4 "

The following species, in addition to the above, were also identified: *Miliolina bicornis*, *Haplophragmium canariense*, *Textularia saggitula*, *Bulimina pupoides*, *Bolivina punctata*, *Lagena sulcata*, *Lagena orbignyana*, *Planorbulina mediterraneensis*.

[R. H. W.]

ACTINOZOA.

Sagartia bellis. Common on banks (1) and (2).

GEPHYREA.

Phascolosoma pellucidum. One (3).

NEMERTINA.

Carinella superba. One large specimen (3).

POLYCHÆTA.

Marphysa sanguinea. One specimen (3).

Lumbriconereis Latreillii (3).

Nereis cultrifera. Eight (1); several (2); common (3).

„ *longissima*. Two small ones (1); one (2); two (3).

„ *diversicolor*. Three (1).

Nephtys Hombergii. Several (1); several young ones in muddy gravel inshore (2).

Glycera convoluta (1).

Audouinia tentaculata. Common in patches of black mud (1); common in patches (3).

Notomastus latericeus. A few (1); several in muddy gravel (2); several (3).

Arenicola marina. Common (1); common in muddy gravel (2); common in muddy gravel (3).

Clymene sp. Occasional specimens in (1).

Amphitrite Johnstoni. Two from gravel (3).

Lanice conchilega. Small one (3).

Melinna adriatica. Very common in mud free from *zostera* (1); common in mud free from *zostera* (2); occasionally on *zostera* bank (3).

Pectinaria belgica. One on gravel at higher tidal level (3).

Sabella pavonina. Several (3).

Branchiomma vesiculosum. Several (1), (2), and (3).

Myxicola infundibulum. Several (1) and (2); very common, especially at dead low water (3).

CRUSTACEA.

Carcinus mænas. Common, living in holes (1) (2) (3); most common in (3).

Gebia stellata. Two (1), one with ova.

Corophium grossipes. Very common in mud free from *zostera*, living in vertical burrows 4-5 inches long (3).

MOLLUSCA.

Tellina solidula. One in gravel near shore (3).

Scrobicularia piperata. Six in *zostera*-free mud (1).

Tapes pullastra. Several (1).

Cardium edule. Several (2); one (3).

Mytilus edulis. One attached to a stone (1).

Nassa reticulata. Spawn on *zostera* (3).

Æolis papillosa. One (3).

TUNICATA.

Asciidiella aspersa. A few (3).

Morchellium argus. A few specimens attached to stones in the mud (3).

List of Specimens obtained with Cheese-cloth Trawl.

[The cheese-cloth trawl was worked on the same three banks at high tide, viz.:-

- (1) Between Snape's Point and Salcombe town (August 2nd, 1900);
- (2) South of Pilworthy Point (July 6th, 1900); and
- (3) Between Ditch End and Southpool Lake (July 7th, 1900).]

ECHINODERMA.

Amphiura elegans. One (3).

CRUSTACEA.

- | | |
|---|--|
| <p><i>Carcinus mænas</i>. Common (2) and (3); one or two (1).</p> <p><i>Crangon vulgaris</i>. A few (1) and (3); common but small (2).</p> <p><i>Hippolyte varians</i>. A few (3).</p> <p><i>Palæmon serratus</i>. A few (2) and (3); one small one (1).</p> <p><i>Macromysis flexuosa</i>. (1); very common on (2); two dozen (3).</p> <p><i>Macromysis neglecta</i> (?). (2) and (3).</p> | <p><i>Idothea balthica</i>. Several (2) and (3); one (1).</p> <p><i>Arcturus gracilis</i>. One (3).</p> <p><i>Jæra marina</i>. One or two (3).</p> <p><i>Ampelisca typica</i>. One (3).</p> <p><i>Dexamine spinosa</i>. A few (3).</p> <p><i>Gammarus locusta</i>. Common (1), (2), and (3).</p> <p><i>Corophium grossipes</i>. Two (1); several (3).</p> <p><i>Phthisica marina</i>. Several (3).</p> |
|---|--|

MOLLUSCA.

- | | |
|---|--|
| <p><i>Venus ovata</i>. One (1).</p> <p><i>Littorina littorea</i>. Several small (2).</p> <p><i>Rissoa labiosa</i>. Very common (1); a few (2) and (3).</p> <p><i>Rissoa ulvæ</i>. Several (1); common (2); one (3).</p> | <p><i>Cerithium reticulatum</i>. One (2).</p> <p><i>Chemnitzia elegantissima</i>. Shell only (1); very common (2).</p> <p><i>Nassa reticulata</i>. One (1).</p> <p><i>Elysia viridis</i>. One (3).</p> |
|---|--|

PISCES.

- Cottus* sp. One (2).
- Gobius Ruthensparri*. One young (3); numerous young at all stages and adults (2).
- Callionymus lyra*. One, $\frac{3}{4}$ inch long (3).
- Gasterosteus spinachius*. (2) and (3).

5. SOUTHPOOL LAKE.

[Shore collecting: July 15th, 1900, tide 15 ft. 6 in.]

The large mud-flats laid bare at low tide in Southpool Lake are composed of the finest sticky mud, so soft that one sinks nearly to the knees when walking upon it. The mud is very barren, the small Sabellid *Melinna adriatica* being the only abundant animal living in it. In the inlet just below the Rectory, on the southern shore, down which a stream of fresh water runs, there is some slightly harder ground, in which a number of species were found, as listed below.

List of Species.**ACTINOZOA.**

- Sagartia bellis*. Fairly common where the mud contains suitable stones for its attachment.

POLYCHÆTA.

- Marphysa sanguinea*. Occasional specimens.
Nereis cultrifera. Occasional specimens.
 „ *diversicolor*. The commonest Nereid on this shore.
Nephtys Hombergii. Occasional specimens.
Audouinia tentaculata. Common in places.
Arenicola marina. Common.
Melinna adriatica. Very common in the finest mud.

CRUSTACEA.

- Carcinus mænas*. Small, common.
Crangon vulgaris. Young common in pools in the mud.
Schistomysis Helleri. In the pools on the mud, not uncommon.

MOLLUSCA.

- Scrobicularia piperata*. One found in muddy gravel.
Tapes decussata. One or two in muddy gravel.

6. EAST SIDE OF SALCOMBE HARBOUR (DITCH END TO FERRY HOUSE).

[Shore collecting : August 14th, 1900, tide 16 ft.]

This shore was examined on one occasion only, and then not very thoroughly. The northern half of it is composed of gravel and stones mixed with a little mud, in which digging is difficult. In this hard ground the following species were taken :—

GEPHYREA.

- Phascolosoma vulgare*. Common in a patch of gravel at a high tidal level.
 „ *pellucidum*. A few.

POLYCHÆTA.

- Nereis irrorata*. One.
Branchiomma vesiculosum. Common in patches at same level as *Phascolosoma vulgare*.

Further south sandy mud, covered in patches with *zostera*, was found. Species taken here were :—

ACTINOZOA.

- Sagartia bellis*. Not uncommon in places.

POLYCHÆTA.

- | | | |
|---|--|---|
| <i>Harmothoë setosissima</i> . One. | \| | <i>Notomastus latericeus</i> . Fairly common. |
| <i>Nephtys Hombergii</i> . | | <i>Melinna adriatica</i> . A few. |
| <i>Glycera convoluta</i> . | | <i>Myxicola infundibulum</i> . One or two. |
| <i>Goniada maculata</i> . One specimen. | | |

CRUSTACEA.

- Gebia stellata*. Burrows of *Gebia* are common in patches of muddy sand free from *zostera*.

7. SAND BANKS AND ZOSTERA BEDS NEAR THE MOUTH OF SALCOMBE HARBOUR.

The conditions prevailing on the shores on either side of Salcombe Harbour, between Salcombe town and the harbour mouth, are very similar. The deposits exposed at spring tides consist chiefly of fine sand and sandy mud, which is covered with large patches of zosteræ. On the west (town side) there is a band of muddy gravel at a higher tidal level than the zosteræ, and this gravel possesses a somewhat different fauna from that found on the sandbanks.

Comparing the animals found on the two sides of this part of the harbour, we notice that the eastern side has, on the whole, a richer fauna than the western. *Echinocardium cordatum*, which is very common on zosteræ-free patches on the eastern side, is altogether absent on the western. *Solen marginatus*, common on the eastern side, is practically absent on the western, as are also *Ophiocnida brachiata* and *Gebia stellata*, both of which are common on the eastern zosteræ banks near low-water mark. The following species also, found on the eastern shore, are much less plentiful or altogether wanting on the western: *Myxicola infundibulum*, *Sthenelais boa*, *Lucina flexuosa*, *Lucina borealis*, *Lutraria elliptica*, *Cardium edule*, and *Montacuta ferruginosa*, which is commensal with *Echinocardium cordatum*.

On the other hand, the following occur much more frequently on the western than on the eastern side: *Cerianthus*, *Nereis irrorata* (on the coarser gravel at the higher tidal levels), *Amphitrite Edwardsi* and *Amphitrite Johnstonei* (with their respective commensal polynoids *Lepidasthenia argus* and *Gattyana cirrosa*), *Pecten maximus* and *Aplysia punctata*. The difference in distribution in the case of the two latter, which are wandering species, may be due to the fact that whereas on the eastern shore the edges of the banks are steep and the deep channel is close to them, on the western side the banks slope more gradually into the deep water.

The greater prevalence of burrowing species on the eastern than on the western shore may in a measure be due to the fact that the former is somewhat more sheltered from the effects of southerly gales than the latter.

COMPARISON OF THE FAUNA FOUND ON THE SHORE AT THE SALSTONE WITH THAT FOUND NEAR THE MOUTH OF SALCOMBE HARBOUR.—The following species are abundant on the shore between Salcombe town

and the mouth of the harbour on the eastern or western side, but are either not found or are much less numerous on the Salstone:—

Ophiocnida brachiata.	Lanice conchilega.
Echinocardium cordatum, with	Gebia stellata.
Montacuta ferruginosa.	Solen marginatus.
Synapta inhærens.	Pecten maximus.
Nephtys cæca.	Venus striatula.
Goniada maculata.	Lucina borealis.
Amphitrite Edwardsi, with Lepi-	Aplysia punctata.
dasthenia argus.	

On the other hand, certain species are abundant on the shore at the Salstone which are absent or are much less numerous on the banks near the mouth of Salcombe Harbour. Amongst these are:—

Hymeniacion sanguineum.	Melinna adriatica.
Sagartia bellis.	Inachus dorynchus.
Prosthecereus vittatus.	Tapes pullastra.
Nereis longissima.	Scalaria communis.
Notomastus latericeus.	Bulla hydatis.
Branchiomma vesiculosum.	Phallusia mammillata.
Myxicola infundibulum.	Asciadiella aspersa.
Sabella pavonina.	Morchellium argus.

Amongst the Foraminifera *Rotalia beccarii* is the prevailing species on the Salstone, whilst its place seems to be taken by *Polystomella crispa* and *Truncatulina lobatula* on the zostera banks and sand near the mouth of the harbour.*

On comparing the two lists just given, it will be seen that the majority of the species are animals which adopt either the fixed or burrowing habit, and the nature of the soil or bottom-deposit will in many cases be the determining factor in the difference of distribution observed. In the lower parts of the harbour this is almost entirely fine sand, whilst on the Salstone it is either muddy gravel or fine mud. The increased amount of wave-action near the mouth of the harbour is also a factor which must be taken into consideration, though its action is doubtless principally indirect in preventing the deposition of mud.

As has been pointed out elsewhere, it seems probable that the difference in the density of the water in the two localities is not very great, and that even at the Salstone we are still dealing with a marine rather than with a brackish-water fauna. The amount of suspended mud in the water, on the other hand, will be very much greater in the higher part of the estuary.

* *Polystomella crispa* is very abundant on the zostera in Cawsand Bay, near Plymouth, and can be obtained in quantity by rubbing the zostera on a sieve, a mode of obtaining it which is due to Mr. J. J. Lister. [E. J. A.]

Western Shore. Salcombe Town to Gazebo (under Marine Hotel).

[Shore collecting: June 15th, 1900, tide 14 ft. 10 in.; August 11th, 1900, tide 15 ft. 4 in.; August 25th, 1900, tide 14 ft. 6 in.; August 27th, 1900, tide 14 ft. 11 in.; October 9th, 1900, tide 16 ft. 6 in.; October 11th, 1900, tide 16 ft. 4 in.]

List of Species.**ACTINOZOA.**

Sagartia bellis. Not uncommon, but not in the profusion found in the Kings-bridge estuary.

Cerianthus sp. General in the zosteria banks.

ECHINODERMA.

Synapta inhærens. Not uncommon in the zosteria banks.

Ophiocnida brachiata. One in the zosteria banks.

NEMERTINA.

Lineus bilineatus. One.

GEPHYREA.

Phascolosoma pellucidum. Fairly common in the zosteria banks.

POLYCHÆTA.

Lepidonotus squamatus. One on zosteria bank.

Gattyana cirrosa. Common; commensal in tubes of *Amphitrite Johnstoni*.

Lepidasthenia argus. Not uncommon; commensal in the tubes of *Amphitrite Edwardsi*.

Marphysa Bellii. One specimen found.

Maclovina iricolor. One.

Lumbriconereis Latreillii. Common in zosteria banks.

Nereis cultrifera. Very common; several in *Heteronereis* condition, June 15th and August 11th.

„ *longissima*. One or two each day.

„ *irrorata*. Moderately common in the gravel above the zosteria beds. *Heteronereis* stage, October 11th.

Nephtys Hombergii.

„ *cæca*.

Glycera convoluta. One small one only found.

Goniada maculata. Three specimens.

Audouinia tentaculata. Plentiful in muddy sand and gravel at higher tidal levels.

Spio seticornis. Very common in the gravel at higher tidal levels.

Nerine cirratulus. One.

Scoloplos armiger. One or two.

Notomastus latericeus. Moderately plentiful in zosteria banks.

Arenicola marina. Common.

Clymene sp. Two species, at present undetermined, were not uncommon.

Chætopterus variopedatus. One in zosteria bank.

Amphitrite Edwardsi. Not uncommon at a slightly higher tidal level than *A. Johnstoni*.

„ *Johnstoni*. Moderately common.

Janice conchilega. Abundant on sand below Gazebo.

Melinna adriatica. Not uncommon in zosteria banks.

CRUSTACEA.

Carcinus mænas. A few. | *Gebia stellata*. Two in zosteræ bank.

MOLLUSCA.

<p><i>Solen marginatus</i>. One small one in zosteræ bank.</p> <p><i>Tellina fabula</i>. One in zosteræ bank.</p> <p><i>Scrobicularia piperata</i>. One in gravel at higher tidal level.</p> <p><i>Lutraria elliptica</i>. Two or three in sand free from zosteræ.</p> <p><i>Venus striatula</i>. Two or three on surface of sand free from zosteræ.</p> <p><i>Lucina borealis</i>. Several in zosteræ bank, 5 to 6 inches below the surface.</p>	<p><i>Pecten maximus</i>. Not uncommon, lying on the zosteræ.</p> <p><i>Trochus striatus</i>. Very common on the zosteræ.</p> <p><i>Rissoa labiosa</i>. Very common on the zosteræ.</p> <p><i>Aplysia punctata</i>. Extremely abundant with spawn on June 15th, 1900, lying on the zosteræ. Much less common on our later visits.</p>
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TUNICATA.

Morchellium argus. An occasional piece among the zosteræ.

Zosteræ under the Marine Hotel. Cheese-cloth Trawl.

[July 14th, 1900.]

CRUSTACEA.

<p><i>Crangon vulgaris</i>. A few.</p> <p><i>Palæmon serratus</i>. Several.</p> <p><i>Macromysis neglecta</i> (?). Eight.</p>	<p><i>Macromysis inermis</i>. Three.</p> <p><i>Idothea balthica</i>. One small.</p>
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PYCNOGONIDA.

Phoxichilus spinosus. One male.

MOLLUSCA.

Aplysia punctata. One.

PISCES.

<p><i>Cottus</i> sp. Several.</p> <p><i>Gobius Ruthensparri</i>. Abundant from 18-20 mm. long.</p> <p><i>Aphia pellucida</i>. One.</p>	<p><i>Gasterosteus spinachia</i>. Several.</p> <p><i>Labrus maculatus</i>. Several small.</p> <p><i>Crenilabrus melops</i>. Many small ones.</p> <p><i>Nerophis æquoreus</i>.</p>
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Eastern Shore. Sand and Zosteræ Banks between the Ferry House and Millbay.

[Shore collecting: June 14th, 1900, tide 14 ft. 10 in.; July 12th, tide 14 ft. 6 in.; July 16th, tide 15 ft. 5 in.; August 10th, tide 14 ft. 7 in.; August 13th, tide 16 ft. 2 in.; August 14th, tide 16 ft.; August 25th, tide 14 ft. 6 in.; August 28th, tide 14 ft. 9 in.; October 9th, tide 16 ft. 6 in.; October 11th, tide 16 ft. 4 in.]

FORAMINIFERA.

In 13 c.grms. of a sample of the surface sand at Millbay 62 Foraminifera were counted, and all identified. These belonged to the following species:—

<i>Nonionina depressula</i>	29 per cent.
<i>Truncatulina lobatula</i>	24 „
<i>Rotalia beccarii</i>	16 „

CRUSTACEA.

<p><i>Carcinus mænas</i>. A few.</p> <p><i>Gebia stellata</i>. Common in zosteræ banks and in muddy sand to the north of them.</p> <p><i>Eupagurus Bernhardus</i>. Small ones frequent below low-water mark.</p>	<p><i>Crangon vulgaris</i>. Common below low-water mark.</p> <p><i>Palæmon serratus</i>. Common amongst zosteræ below low-water mark.</p>
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Miliolina seminulum	11.5 per cent.
Polystomella crispa	6.5 "
Textularia gramen	5 "
Polystomella striato-punctata	3 "
Discorbina rosacea	2 "
Planorbulina mediterraneensis	1.5 "
Bulimina pupoides (? Bulimina elegans)	1.5 "

The specimens of *Miliolina seminulum* were generally much smaller than those found in the next sample. One large specimen of *Polymorphina compressa* was found; compared with the individuals from the 30-fathom line off this coast the size is striking.

On floating, the following additional species were obtained: *Lagena sulcata*, *Lagena orbignyana*.

A sample of the fine surface sand taken between the Ferry House and Millbay was found to contain 50 Foraminifera in 13 c.grms.

Of these eleven were not identified, but all were probably species as under:—

Nonionina depressula	26 per cent.	Textularia agglutinans	5 per cent.
Polystomella crispa	18 "	Bulimina pupoides	2.5 "
Miliolina seminulum	13 "	Planorbulina mediterraneensis	2.5 "
Rotalia beccarii	13 "	Lagena orbignyana	2.5 "
Polystomella striato-punctata	7.5 "	Discorbina rosacea	2.5 "
Textularia gramen	5 "	Truncatulina lobatula	2.5 "

Many of the individuals of *Miliolina seminulum* are of exceptional size.

There were also present occasional individuals of *Biloculina ringens*, *Miliolina bicornis*, and *Lagena apiculata*.

The following small species, in addition to those given above, were obtained by floating them from another portion of the dried sample: *Bolivina punctata*, *Lagena striata*, *L. sulcata*, and *L. hexagona*.

Another sample of very fine sand or mud from near the Ferry House contained 53 Foraminifera in 13 c.grms.

Of these sixteen were not identified, but all were probably species as under.

Of those identified—

Polystomella crispa	24 per cent.	Truncatulina lobatula	5.5 per cent.
Nonionina depressula	19 "	Textularia agglutinans	5.5 "
Miliolina seminulum	16.5 "	Discorbina rosacea	2.5 "
Rotalia beccarii	16.5 "	Lagena orbignyana	2.5 "
Polystomella striato-punctata	5.5 "	Planorbulina mediterraneensis	2.5 "

The following species were identified in addition to those given above: *Bulimina pupoides*, *Bolivina punctata*, *Lagena sulcata*, *L. lævis*, *L. hexagona*, *Polymorphina lactea*, *Nonionina stelligera*. [R. H. W.]

ACTINOZOA.

Sagartia bellis. Occasional specimens.

Actinia mesembryanthemum. A few scattered, generally attached to stones.

Halcampa chrysanthellum. Only one found, buried in *zostera* bank.

ECHINODERMA.

- Synapta inhærens*. Not uncommon in the zosteræ banks.
Ophioechna brachiata. Common in zosteræ banks near low-water mark. None found in free sand.
Echinocardium cordatum. Very common in the sand between Millbay and the zosteræ banks. Only two or three small ones were taken in the zosteræ banks themselves.

NEMERTINA.

- Lineus bilineatus*. Common in sand with a little zosteræ.
Carinella superba. Not uncommon in the zosteræ banks.

GEPHYREA.

- Phascolosoma vulgare*. One specimen only.
 „ *pellucidum*. Very common in zosteræ banks.

POLYCHÆTA.

- | | |
|--|--|
| <p><i>Aphrodite aculeata</i>. One only, about 1 inch long.
 <i>Lepidasthenia argus</i>. One in Amphitrite burrow.
 <i>Sthenelais boa</i>. Several.
 <i>Marphysa sanguinea</i>.
 <i>Maclovia iricolor</i>. Two or three only.
 <i>Nereis cultrifera</i>. Not uncommon in zosteræ banks.
 „ <i>longissima</i>. One or two only.
 „ <i>irrorata</i>. One only, exact locality not recorded.
 „ <i>diversicolor</i>. Not frequent.
 „ <i>fucata</i>. One, probably from shell inhabited by hermit crab.
 <i>Nephtys Hombergii</i>. Small specimens common in the fine sand free from zosteræ, large ones in the zosteræ banks.
 „ <i>cæca</i>. A number of large specimens found.
 <i>Glycera convoluta</i>. A few only.</p> | <p><i>Goniada maculata</i>. Two specimens.
 <i>Magelona papillicornis</i>. Several from Millbay sand.
 <i>Nerine conicocephala</i>. One only found.
 <i>Scoloplos armiger</i>. In the fine sand.
 <i>Notomastus latericeus</i>. In the zosteræ bank; moderately frequent, but generally small.
 <i>Arenicola marina</i>. Common; very large at low-water mark.
 <i>Clymene</i> sp. Three different species were found, two of them being common.
 <i>Owenia fusiformis</i>. Three specimens in clean, fine sand at Millbay.
 <i>Amphitrite Edwardsi</i>. One.
 <i>Lanice conchilega</i>. Common in sand at Millbay.
 <i>Melinna adriatica</i>. A few in muddy sand at north end of zosteræ banks.
 <i>Myxicola infundibulum</i>. A few specimens seen on the zosteræ bank.</p> |
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CRUSTACEA.

- | | |
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| <p><i>Carcinus mænas</i>. A few.
 <i>Gebia stellata</i>. Common in zosteræ banks and in muddy sand to the north of them.
 <i>Eupagurus Bernhardus</i>. Small ones frequent below low-water mark.</p> | <p><i>Crangon vulgaris</i>. Common below low-water mark.
 <i>Palæmon serratus</i>. Common amongst zosteræ below low-water mark.</p> |
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MOLLUSCA.

Thracia phascolina. Three buried in sand at Millbay.	Lucina borealis. Common in sand and zosteræ banks.
Solen marginatus. Very common in Millbay sands, less common in zosteræ banks.	„ flexuosa. Not uncommon in sand and zosteræ banks.
„ siliqua. Several in Millbay sand.	Montacuta ferruginosa. Very common; commensal with <i>Echinocardium cordatum</i> .
„ pellucidus. Not uncommon in sand.	Trochus zizyphinus. Several.
Tellina incarnata. Shells only.	„ magus. Three on sand at Millbay.
„ fabula. Shells only.	Littorina littoralis. Several on zosteræ.
Syndosmya sp. One living in clean sand.	„ littorea. Several on zosteræ.
Tapes pullastra. One only.	Natica monilifera. Shell only.
Lutraria elliptica. Common in sand and zosteræ banks, especially off Millbay.	Purpura lapillus. Two or three living ones on sand.
Venus striatula. Two or three found lying on the clean sand at Millbay.	Buccinum undatum. Shell.
„ fasciata. Two found under same conditions.	Cypræa europæa. One or two.
Cardium edule. Not uncommon on Millbay sand.	Philine aperta. On zosteræ, with spawn.
	Aplysia punctata. Two or three only, with spawn.
	Æolis papillosa. Spawn only found.

TUNICATA.

Morchellium argus. Small pieces only.

Zosteræ between the Ferry House and Millbay. Cheese-cloth Trawl.

[July 12th, 1900.]

ECHINODERMA.

Amphiura elegans. One.

CRUSTACEA.

Crangon vulgaris. Few, two with ova.	Dexamine spinosus. Two or three.
Hippolyte varians. Very common.	Gammarus locusta. Common.
Macromysis flexuosa. One or two only.	„ campylops. Common.
Idothea balthica. One.	Phthisica marina.
Ampelisca typica. Two.	

PYCNOGONIDA.

Phoxichilus spinosus. Two.

MOLLUSCA.

Trochus striatus. Two.	Rissoa labiosa. Several.
„ cinerarius. One.	„ ulvæ. A few.
Littorina littoralis. One.	Cerithium reticulatum. One.

PISCES.

Gobius Ruthensparri. Two or three.	Centrolabrus exoletus. One.
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8. BAYS OUTSIDE SALCOMBE HARBOUR.

[July 14th, 1900.]

The following records, representing the results of only one day's collecting outside the harbour, may be added, although by no means complete.

Rocks between Gazebo and North Sands Bay.

PORIFERA.

Sycon compressum. | *Halichondria panicea.*

HYDROZOA.

Sertularia pumila. With gonophores; on *Laminaria.*

ACTINOZOA.

Anthea cereus. | *Tealia crassicornis.*
Actinia mesembryanthemum. |

ECHINODERMA.

Cucumaria pentactes. One under stone. | *Ophiothrix fragilis.* Under stones.

POLYCHÆTA.

Marphysa sanguinea. One in gravel between stones.
Audouinia tentaculata. Several in gravel.

CRUSTACEA.

Porcellana platycheles. Under stones. | *Palæmon serratus.* In rock pools.
Hippolyte varians. In rock pools. |

MOLLUSCA.

Aplysia punctata. One only. | *Pleurobranchus plumula.* One.

POLYZOA.

Umbonula verrucosa. On rocks and stones.

TUNICATA.

Botryllus violaceus. On rocks and stones.
Clavelina lepadiformis. On rocks and stones.
Morchellium argus. On rocks and stones.

North Sands Bay.

The clean sand of this bay, which in stormy weather is washed by a heavy sea, was found to be very barren.

POLYCHÆTA.

Arenicola marina. | *Melinna adriatica.*
Lanice conchilega. |

South Sands Bay.

Very similar to the North Sands Bay. There is a zosteria bed on the south side of the bay in which a few Polychætes were found.

POLYCHÆTA.

- Nereis cultrifera*. In zosteria bank.
Nephtys Hombergii. In zosteria bank.
Notomastus latericeus. One in zosteria bank.
Arenicola marina. Very common.
Lanice conchilega. Very common.

Cheese-cloth Trawl on the Bar, Salcombe.

[August 21st, 1900.]

CRUSTACEA.

- | | |
|--|---|
| <i>Diogenes varians</i> . One in <i>Littorina</i> shell. | <i>Urothoë</i> sp. Several. |
| <i>Crangon vulgaris</i> . A few large ones. | <i>Pontocrates altamarinus</i> . Three. |
| „ <i>trispinosus</i> . Several. | <i>Paratylus falcatus</i> . One. |
| <i>Schistomysis arenosa</i> . One. | <i>Idothea balthica</i> . One. |
| <i>Bathyporeia pelagica</i> . Three. | |

MOLLUSCA.

- Maetra solida*. One.

9. CHANNEL WEST OF SALSTONE.

[Dredging, August 16th, 1900.]

FORAMINIFERA.

A sample of the mud was found to contain 105 Foraminifera in 13 c.grms. Of these fourteen were not identified, but all were probably species as under.

Of those identified—

<i>Nonionina depressula</i>	.	.	.	.	.	29 per cent.
<i>Rotalia beccarii</i>	.	.	.	.	.	22 „
<i>Polystomella crispa</i>	.	.	.	.	.	18 „
„ <i>striato-punctata</i>	.	.	.	.	.	7 „
<i>Bolivina dilalata</i>	.	.	.	.	.	5.5 „
<i>Truncatulina lobatula</i>	.	.	.	.	.	4.5 „
<i>Bulimina pupoides</i>	.	.	.	.	.	3.5 „
<i>Lagena orbignyana</i>	.	.	.	.	.	3.5 „
<i>Miliolina seminulum</i>	.	.	.	.	.	2 „
<i>Lagena sulcata</i>	.	.	.	.	.	1 „
<i>Textularia agglutinans</i>	.	.	.	.	.	1 „
<i>Bolivina punctata</i>	.	.	.	.	.	1 „
<i>Globigerina bulloides</i>	.	.	.	.	.	1 „

Only one specimen of *Globigerina bulloides* in the 13 c.grms. It seems out of place so far up the estuary.

All Foraminifera of larger species are represented by small specimens.

As many of the smaller Foraminifera would be overlooked in taking the census, the figures already given are not complete. Comparatively, as between sample and sample, the numbers hold good, but absolutely they should be increased to an extent not clearly ascertainable. The following small forms or small specimens were floated from another sample of the mud: *Lagena sulcata*, common; *L. orbignyana*, fairly common; *Globigerina bulloides*, fairly common. All other species mentioned in the census are present, and the following not so mentioned: *Miliolina agglutinans*, *Haplophragmium canariense*, *Textularia saggitula*, *Lagena lævis*, *L. hexagona*, *L. lagenoides*, *L. semistriata*, *Spirillina vivipara*, common, *Planorbulina mediterraneensis*. [R. H. W.]

HYDROZOA.

<i>Sertularia argentea</i> . Small piece.	|	<i>Plumularia setacea</i> . Common on
<i>Aglaophenia tubulifera</i> . One colony.		<i>Ascidiella</i> .

ECHINODERMA.

<i>Asterias rubens</i> . One.		<i>Ophrothrix fragilis</i> . One or two.
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NEMERTINA.

Carinella sp. One.

POLYCHÆTA.

<i>Lagisca</i> sp.		<i>Nereis</i> sp. Young Nereids of at least
<i>Harmothoë spinifera</i>.	|	two species.
<i>Syllis</i> sp.	|	<i>Phyllodoce</i> sp.
<i>Myrianida maculata</i> . One.	|	<i>Polymnia nebulosa</i> .
<i>Amblyosyllis spectabilis</i> . One.	|	<i>Potamoceros triquetter</i> .
<i>Nereis cultrifera</i> . Many small specimens.	|	<i>Spirorbis borealis</i> . Common.

CRUSTACEA.

<i>Inachus dorsettensis</i> . A few.	|	<i>Janira maculosa</i> . One.
<i>Eupagurus Bernhardus</i> . A few, small.	|	<i>Leucothoe spinicarpa</i> . One.
„ <i>cuanensis</i> . One or two.	|	<i>Gammarus locusta</i> . Two.
<i>Anapagurus lævis</i> . One.	|	<i>Amphithoe rubricata</i> . One.
<i>Hippolyte varians</i> . One, with ova.	|	<i>Protella phasma</i> . Common.
<i>Arcturus damnoniensis</i> . One.	|	

MOLLUSCA.

<i>Crenella marmorata</i> . Several.	|	<i>Cerithiopsis tuberculare</i> . One.
<i>Anomia ephippium</i> . Common.	|	<i>Odostomia eulimoides</i> .
<i>Chiton asellus</i> . One.	|	<i>Aplysia punctata</i> . One, with spawn.
<i>Calyptraea sinensis</i> . Common.	|	

POLYZOA.

<i>Crisia ramosa</i> . One colony, with ovicells.	|	<i>Amathia lendigera</i> . One colony.
<i>Mimosella gracilis</i> . One colony.	|	<i>Bowerbankia pustulosa</i> (?).

TUNICATA.

<i>Styelopsis grossularia</i> . A few small ones on stones and shells.	|	<i>Ascidiella aspersa</i> . Abundant.
<i>Perophora Listeri</i> . Several, growing on <i>Ascidiella</i>.	|	<i>Didemnum</i> sp. Common, growing on <i>Ascidiella</i> .
	|	<i>Morchellium argus</i> . Abundant.

10. CHANNEL BETWEEN SALSTONE AND SNAPE'S POINT.

[Dredging: August 3rd, 7th, 16th, and 25th, 1900.]

The dredge brought up a mass of decaying seaweed, with stones, gravel, and a quantity of black, sticky mud.

List of Species.

PORIFERA.

Suberites domuncula. With *Eupagurus cuanensis*.

HYDROZOA.

Hydractinia echinata. One colony.	<i>Sertularia argentea</i> . Several colonies, attached to stones, etc.
<i>Eudendrium ramosum</i> . Dead stalk.	<i>Antennularia antennina</i> . One colony.
<i>Clytia Johnstoni</i> . Fairly common.	<i>Plumularia setacea</i> . Several colonies, attached to <i>Ascidella</i> , etc.
<i>Halecium Beanii</i> . Small colony, with gonophores.	
<i>Sertularella polyzonias</i> . Small colony.	

ACTINOZOA.

Sagartia parasitica. One on *Buccinum* shell, inhabited by *Eupagurus Bernhardus*.

ECHINODERMA.

<i>Amphiura elegans</i> . Not uncommon.	<i>Echinus miliaris</i> . Fairly common.
<i>Ophrothrix fragilis</i> . Not uncommon.	

NEMERTINA.

<i>Carinella superba</i> . One.	<i>Lineus longissimus</i> . Several.
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TURBELLARIA.

Prosthiostomum sp. One.

POLYCHÆTA.

<i>Euprosyne foliosa</i> . Three.	<i>Phyllococe</i> sp.
<i>Evarne impar</i> .	<i>Eulalia punctifera</i> .
<i>Lepidonotus squamatus</i> .	„ <i>viridis</i> .
<i>Harmothoë spinifera</i> .	<i>Glycera capitata</i> . One small specimen.
<i>Sthenelais boa</i> . Two.	<i>Nerine vulgaris</i> . One small.
<i>Syllis</i> (<i>Haplosyllis</i>) <i>hamata</i> .	<i>Thelepus setosus</i> .
<i>Nereis cultrifera</i> . Many small specimens from 15-55 mm. long.	<i>Polycirrus caliendrum</i> .
„ sp. juv. Young of two species undetermined.	„ <i>aurantiacus</i> .

CRUSTACEA.

<i>Stenorhynchus phalangium</i> .	<i>Porcellana longicornis</i> . Common.
<i>Inachus dorsettensis</i> . Several.	<i>Galathea squamifera</i> . One or two.
<i>Eurynome aspera</i> . Common.	„ <i>intermedia</i> . Common.
<i>Pilumnus hirtellus</i> . One.	<i>Athanas nitescens</i> . One.
<i>Portunus corrugatus</i> . One.	<i>Apeudes talpa</i> . Several.
„ <i>pusillus</i> . Common.	<i>Arcturus intermedius</i> . One or two.
<i>Ebalia tuberosa</i> . Several.	„ <i>damnoniensis</i> . Two.
<i>Eupagurus Bernhardus</i> . A few, small.	<i>Munna Krøyeri</i> . A few.
„ <i>cuanensis</i> . Several, with <i>Suberites</i> .	<i>Dexamine spinosa</i> . Two.
„ <i>Prideauxii</i> .	<i>Gammarus locusta</i> . Several.
<i>Anapagurus lævis</i> . A few.	<i>Amphithoë rubricata</i> . Several.
	<i>Protella phasma</i> . Common.

MOLLUSCA.

Solen ensis. Shell only.	Trochus cinerarius. Common.
Saxicava rugosa. One.	Rissoa ulvæ. Common.
Syndosmya alba. Several.	Phasianella pullus. One.
Tapes pullastra. Young.	Turritella communis. Shells only, common.
Cardium edule. A few, young.	Cerithiopsis tuberculare. Several.
Kellia suborbicularis. Several.	Scalaria communis. Shell only.
Modiola modiolus. Young, not un- common.	Lamellaria perspicua. One or two.
Crenella marmorata. Common.	Murex erinaceus. One.
Nucula nucleus. Several.	Nassa incrassata. Several.
Pecten varius. Two.	Buccinum undatum. Several young ones.
„ maximus. One or two small.	Mangelia septangularis. One shell.
„ opercularis. Several.	„ costata. One.
Anomia ephippium. Common.	Cypræa europæa. Common.
Chiton fascicularis. One or two.	Philine aperta. A few.
„ asellus. One or two.	Aplysia punctata. One or two.
Calyptræa sinensis. Very common.	Goniodoris nodosa. One or two.
Fissurella reticulata. Not uncommon.	Lomanotus sp. Three.
Trochus zizyphinus. Several.	Elysia viridis. A few.
„ magus. Common.	

POLYZOA.

Aetea truncata. A few very small colonies on shells.	Bugula turbinata. Abundant on shells. <i>Ascidiella</i> , etc.
Eucratea chelata. A few bits on shells and Hydroids.	Crisia ramosa. Several small colonies.
	Bowerbankia pustulosa (?). Common.
	Pedicellina cernua. On <i>Turritella</i> shell.

TUNICATA.

Molgula sp. Several.	Ascidiella scabra. Common.
Ascidiella aspersa. Common.	Morchellium argus. Several specimens.

PISCES.

Callionymus lyra. One, $\frac{3}{4}$ inch long.

11. SHELL-GRAVEL AROUND SNAPE'S POINT AND IN THE "BAG."

[Dredging: August 25th, 1900.]

The bottom-deposit consists of clean, fine shell-gravel.

List of Specimens.

PORIFERA.

Suberites domuncula.

HYDROZOA.

Sertularella Gayi.

ECHINODERMA.

Ophiura ciliaris. One.	Ophrothrix fragilis. One small one.
Amphiura elegans. One or two.	Echinus miliaris. One.

CRUSTACEA.

Anthura gracilis. One. | Gnathia maxillaris. A few.

MOLLUSCA.

Mactra solida. A dozen. | Trochus magus. Shell.
 Pecten opercularis. | Philine aperta. One.
 Emarginula reticulata. One on *Pecten*
 shell.

POLYZOA.

Bugula flabellata. Small colony.
 „ turbinata. Several colonies with ovicells.
 Crisia ramosa. Small colony.

TUNICATA.

Ascidella scabra. | Molgula sp.

12. CHANNEL BETWEEN SNAPE'S POINT AND THE MOUTH OF THE HARBOUR.

[Dredging : August 2nd, 17th, and 31st, 1900.]

The dredge brought up stones and shells, with very little mud such as was found in the channel in the Kingsbridge estuary. A patch of *Melobesia* ground was met with near the mouth of the harbour.

List of Species.

PORIFERA.

Sycon sp. | Suberites domuncula. On living *Nassa*
 Clione celata. Boring shells, etc. | *reticulata*.

ACTINOZOA.

Anthea cereus. One or two.

HYDROZOA.

Clytia Johnstoni. On Hydroids, etc. | Sertularella polyzonias. Small colony
 Obelia geniculata. Small colony on | with gonophores.
Trochus magus. | Sertularia argentea. One small piece
 Halecium sp. On stone. | on *Trochus magus*.
 Plumularia setacea. Small colonies.

ECHINODERMA.

Amphiura elegans. Several. | Echinus miliaris. Several.

NEMERTINA.

Micrura fasciolata. Several.

GEPHYREA.

Phascolion strombi. One in *Turritella communis* shell.

POLYCHAETA.

Evarne impar. | Thelepus setosus.
 Lepidonotus squamatus. | Sabellaria alveolata. On shells.
 Nereis sp. Young only, species not | Potamoceros triqueter. On shells.
 determined. | Spirorbis borealis.
 Lanice conchilega.

CRUSTACEA.

Stenorhynchus phalangium. Several.	Hippolyte varians. A few.
" tenuiostris. A few.	" Cranchii. One.
Inachus dorsettensis. Several.	Gnathia maxillaris. Very common.
Maia squinado. One.	Sphæroma curtum. One.
Portunus pusillus. A few.	Idothea balthica. One or two.
" depurator. One.	Arcturus damnoniensis. Three.
Ebalia tuberosa. A few.	" gracilis.
Eupagurus Bernhardus. Several.	Janira maculosa. A few.
" Prideauxii. One.	Dexamine spinosa. One.
" cuanensis. Several.	Melita gladiosa. One.
Anapagurus lævis. One.	Amphithoe rubricata. One or two.
Galathea intermedia. Several.	Protella phasma. Not uncommon.
Crangon vulgaris. A few.	

PYCNOGONIDA.

Nymphon gracilis. One or two.	Ammothea echinata. Several.
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MOLLUSCA.

Solen ensis. Shell only.	Trochus magus. Common.
Saxicava rugosa. One.	" cinerarius. Common.
Syndosmya alba. Shell only.	" striatus. A few.
Lutraria elliptica. One, in process of being eaten by the <i>Octopus</i> .	Rissoa parva. One.
Venus fasciata. One.	" ulvæ. Several.
" ovata. One.	Cerithium reticulatum. One.
Cardium norvegicum. Shell only.	Murex erinaceus. Several large ones.
Diplodonta rotundata. Shell.	Nassa reticulata. One or two.
Lepton squamosum. Shell only.	" incrassata. A few.
Modiola modiolus. Young, not un- common.	Buccinum undatum. A few young ones.
Crenella marmorata. Several.	Mangelia purpurea. Shell only.
Pectunculus glycimeris. Shells only.	Cypræa europæa. Several.
Pecten opercularis. A few small ones.	Bulla hydatis. Shell only.
Anomia ephippium. Common.	Philine aperta. Several.
Chiton fascicularis. One.	Aplysia punctata. Several.
" asellus. A few.	Lamellidoris bilamellata. One.
Acmaea virginea. Several.	Goniodoris nodosa. One.
Calyptrea sinensis. Several.	Æolis papillosa. One.
Fissurella reticulata. Several.	Elysia viridis. One.
Trochus zizyphinus. A few.	Cratena amæna. One.
	Octopus vulgaris. One.

POLYZOA.

Eucratea chelata. On <i>Plumularia</i> .	Crisia ramosa.
Scrupocellaria scruposa. Small colony on <i>Trochus magus</i> .	Bowerbankia pustulosa (?).
Bugula flabellata. Several colonies.	Lichenopora hispida. A few colonies.
" turbinata. Common.	Pedicellina cernua. On <i>Sertularella</i> .

TUNICATA.

Asciidiella aspersa. A few.	Asciidiella scabra. A few.
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IV. A Complete List of the Species Identified, with an Account of their Local Distribution.

FORAMINIFERA.*

[Nomenclature: BRADY, *Challenger Report*, ix.]

The Foraminifera were identified from samples of sand and mud taken for that purpose from the surface of the shore close to low-water mark. These samples were obtained in the following localities:— (1) The south-east shore of the Salstone; (2) the zostera bank south of Pilworthy Point, at the north-east end of Salcombe Harbour; (3) from the clean, fine sand at Millbay; (4) from some clean sand between Ferry House and Millbay, near the mouth of Salcombe Harbour; (5) from some more muddy sand near the Ferry House; (6) A sample of the mud dredged in the channel west of the Salstone was also examined.

BILOCULINA RINGENS (*Lamarck*). A few in the sand from between Ferry House and Millbay.

MILIOLINA SEMINULUM (*Linn.*). Abundant in samples of sand and mud taken between Ferry House and Millbay, near the mouth of Salcombe Harbour. The specimens here were exceptionally large. Present, but less numerous, at the Salstone, both on the shore and in mud from the channel, and also in sand from the north-east end of Salcombe Harbour.

MILIOLINA BICORNIS (*Walker and Jacob*). A few specimens only in sand from between Ferry House and Millbay, from the north-east end of Salcombe Harbour, and from the Salstone.

MILIOLINA AGGLUTINANS (*d'Orbigny*). Occasional specimens from the Salstone, and from the mud dredged in the channel immediately to the west of it.

HAPLOPHRAGMIUM CANARIENSE (*d'Orbigny*). Occasional specimens in sand from the north-east end of Salcombe Harbour and from the channel west of the Salstone.

TEXTULARIA GRAMEN, *d'Orbigny*. A few from the sand between Ferry House and Millbay, and a few from the Salstone.

TEXTULARIA AGGLUTINANS, *d'Orbigny*. Found in all the samples examined, being most plentiful at the north-east end of Salcombe Harbour.

* By R. H. WORTH.

TEXTULARIA SAGGITULA, *DeFrance*. Occasional specimens from the north-east end of Salcombe Harbour and from the channel to the west of the Salstone.

BULIMINA PUPOIDES, *d'Orbigny*. A few specimens from all grounds.

BOLIVINA DILATATA, *Reuss*. A few specimens from the shore on the Salstone and from the channel to the west of it.

BOLIVINA PUNCTATA, *d'Orbigny*. A few from all localities except the Salstone.

LAGENA STRIATA, *Williamson*. A few from north-east end of Salcombe Harbour and from the sand between Ferry House and Millbay.

LAGENA SULCATA (*Walker and Jacob*). Common in the channel to the west of Salstone and in the sand between Ferry House and Millbay. A few from the north-east end of Salcombe Harbour, and from mud between Ferry House and Millbay.

LAGENA LÆVIS (*Montagu*). A few from the mud near the Ferry House, and a few from the channel to the west of the Salstone.

LAGENA HEXAGONA (*Williamson*). A few between Ferry House and Millbay, and a few from channel west of the Salstone.

LAGENA ORBIGNYANA (*Sequenza*). A few recorded from all samples, excepting that from the shore at the Salstone.

LAGENA LAGENOIDES (*Williamson*). A few seen in the mud from the channel west of Salstone only.

LAGENA APICULATA, *Reuss*. A few from the sand between Ferry House and Millbay only.

LAGENA SEMISTRIATA, *Williamson*. A few from the channel west of the Salstone only.

POLYMORPHINA LACTEA (*Walker and Jacob*). A few from the mud between Ferry House and Millbay only.

SPIRILLINA VIVIPARA, *Ehrenbaum*. A few from the channel west of Salstone.

GLOBIGERINA BULLOIDES, *d'Orbigny*. Small specimens were fairly common in the mud from the channel west of the Salstone.

DISCORBINA ROSACEA (*d'Orbigny*). In both sand and mud from between Ferry House and Millbay.

PLANORBULINA MEDITERRANENSIS, *d'Orbigny*. A few specimens from all samples, excepting that from Salstone.

TRUNCATULINA LOBATULA (*Walker and Jacob*). Moderately common in all samples. Most numerous (24 per cent.) in the sand from Millbay.

ROTALIA BECCARII (*Linn.*). One of the commonest foraminifera in all parts of the estuary. In the sample from the shore on the Salstone 77 per cent. of the specimens counted belonged to this species; in that from the channel west of Salstone 22 per cent.; in that from the north-

east end of Salcombe Harbour 42 per cent.; in those from between Ferry House and Millbay 13 per cent. on the sand, 16.5 per cent. on the mud; and in that from Millbay sand 16 per cent.

NONIONINA DEPRESSULA (*Walker and Jacob*). The most abundant species in the samples from the Ferry House to Millbay, where it formed 26 and 29 per cent. of the specimens counted from the sand, 19 per cent. of those from the mud. It was less common in the sample from north-east end of Salcombe Harbour (4 per cent.). It was not found in the first sample from the shore at Salstone, but a few specimens were seen in a later one taken at the same place. In the sample of mud dredged from the channel to the west of the Salstone this species formed 29 per cent. of the foraminifera counted.

NONIONINA STELLIGERA, *d'Orbigny*. A few from the sample of muddy sand taken between Ferry House and Millbay.

POLYSTOMELLA CRISPA (*Linn.*). One of the foraminifera most frequently met with in the Salcombe estuary. It was present in numbers in all the samples examined, and formed a considerable percentage of the whole number of specimens in all cases in which they were counted. The figures are: Salstone, 18 per cent.; channel west of Salstone, 18 per cent.; north-east of Salcombe Harbour, 28 per cent.; sand between Ferry House and Millbay, 18 per cent.; mud near the Ferry House, 18 per cent.; sand from Millbay, 6.5 per cent.

POLYSTOMELLA STRIATO-PUNCTATA (*Fichtel and Moll.*). This was found in both the samples from between the Ferry House and Millbay, and in that from the channel west of the Salstone. The specimens from the latter sample make it very doubtful whether the specific difference between *Polystomella crispa* and *Polystomella striato-punctata* can be maintained. Every variety occurs from the typical *P. crispa*, with well developed markings, hyaline test and carinate margin, to equally typical specimens of *P. striato-punctata*, with short and almost insignificant markings, semi-porcellanous test, and margin well rounded. At least twenty intermediate forms were obtained from a small sample.

PORIFERA.

[Nomenclature: R. HANITSCH, "Revision of Generic Nomenclature and Classification in Bowerbank's British Spongiadæ," *Trans. Liverpool Biol. Soc.* vol. viii. 1894.]

SYCON COMPRESSUM, *Auctt.* On the rocks at mouth of Salcombe Harbour.

SYCON CORONATUM, *Ellis and Solander*. Dredged in Salcombe Harbour.

HALICHONDRIA PANICEA, *Pallas*. On the rocks at mouth of Salcombe Harbour.

HYMENIACIDON SANGUINEUM, *Grant*. Very abundant on the Salstone and other parts of the Kingsbridge estuary, forming large clusters on the muddy gravel of the shore.

SUBERITES DOMUNCULA, *Olivi*. On the shore at the Salstone; also common in dredgings in the channel, both in Kingsbridge estuary and in Salcombe Harbour. Inhabited by hermit-crab (*Eupagurus cuanensis*).

CLIONA CELATA, *Grant*. Boring in shells dredged in Salcombe Harbour.

HYDROZOA.

[Nomenclature: HINCKS, *British Marine Hydroids*.]

HYDRACTINIA ECHINATA (*Fleming*). On shells inhabited by *Eupagurus Bernhardus* from the Salstone, and from the channel between the Salstone and Snape's Point.

CLYTIA JOHNSTONI (*Alder*). Abundant on shells and weeds dredged in all parts of the channel from the Salstone to the mouth of Salcombe Harbour.

OBELIA GENICULATA (*Linn.*). Dredged in Salcombe Harbour: a small colony growing on *Trochus magus* shell.

HALECIUM BEANII, *Johnston*. Dredged between Salstone and Snape's Point.

SERTULARELLA GAYI, *Lamouroux*. Dredged in the "Bag" off Snape's Point, a clean shell-gravel ground.

SERTULARELLA POLYZONIAS (*Linn.*). A few small pieces only, dredged in the channel between Salstone and the mouth of Salcombe Harbour.

SERTULARIA ARGENTEA, *Ellis and Solander*. Common in dredgings from the channel west of the Salstone to the mouth of Salcombe Harbour.

SERTULARIA PUMILA, *Linn.* Growing on *Laminaria*, etc., on the rocks at the mouth of Salcombe Harbour.

ANTENNULARIA ANTENNINA (*Linn.*). Dredged in the channel between Salstone and Snape's Point.

AGLAOPHENIA TUBULIFERA, *Hincks*. Small colony dredged in the channel west of Salstone.

PLUMULARIA SETACEA (*Ellis*). Abundant, growing on *Asciidiella* from the channel west of the Salstone. Several colonies were dredged also between Salstone and Snape's Point, and one or two small ones from Salcombe Harbour.

ACTINOZOA.

[Nomenclature: GOSSE, *British Sea Anemones and Corals*.]

SAGARTIA BELLIS (*Ellis and Solander*). This anemone occurred in extraordinary profusion in certain parts of the estuary. The conditions under which it can best flourish are found where stones or gravel lie

from an inch to three or four inches beneath the surface of fine mud. The anemone attaches itself to the stones or gravel, the body becomes often much elongated, and the disc is protruded and expanded above the surface of the mud. In some places the mud-banks are carpeted with these expanded discs, which may be seen before the tide has quite left the bank. When the bank is dry the discs of the anemone are contracted, and what appear to be a number of holes are seen in the mud. This condition of things is found especially in the Kingsbridge estuary—on the Salstone and on the shore between Halwell Point and Pilworthy Point large patches of ground suitable for the species exist—and is also frequent at the north-east end of Salcombe Harbour. In the parts of the harbour nearer the mouth the anemone often occurs on the banks, but is never met with in such abundance as in the upper parts of the estuary. Gosse (*British Anemones*, p. 33) describes what appears to be a similar condition of things to that found on the mud-banks at Salcombe, in the Fleet and the Backwater at Weymouth, though he says that the anemone simply rests on the mud with its broad, flat base. This is certainly not the case in the Salcombe estuary, nor is it so in the River Yealm, near Plymouth, where we also meet with the same phenomenon. Further, Gosse speaks of the Weymouth specimens as a "breed of the species" which deviates from the "normal habit." It would, we think, be more correct to say that the "normal habit" of the species is to live in the estuarine mud-flats. This is where its centre of distribution is to be found, whilst individuals of the species extend to suitable and sheltered situations in the rock-pools along the more open coast. As has already been pointed out by one of us,* it is of primary importance, when considering the adaptation of species to their environment, that the true centre of distribution of the species should be known, for it is to the conditions there prevailing that the species is best adapted, and it is there that the species is kept true.

SAGARTIA PARASITICA (Couch). Found in the usual position, namely, on the shell inhabited by *Eupagurus bernhardus*. On the shore at Salstone, and dredged from the channel between Salstone and Snape's Point.

ADAMSIA PALLIATA (Bohadsch). Dredged in the channel between Salstone and the mouth of Salcombe Harbour. Commensal with *Eupagurus Prideauxii*.

ANTHEA CEREUS, Ellis and Solander. Living on the rocks at the mouth of Salcombe Harbour and also in the channel of the harbour itself, where it was dredged.

* *Journ. Mar. Biol. Assoc.* vol. v. 1899, pp. 367 and 473.

ACTINIA MESEMBRYANTHEMUM, *Ellis and Solander*. On the rocks at the mouth of the harbour. One or two attached to stones at Millbay.

TEALIA CRASSICORNIS (*Müller*). On the rocks at the mouth of the harbour.

HALCAMPA CHRYSANTHELLUM (*Peach*). One specimen of this species was found buried in the sand of the zosteria bed near Millbay, on the eastern side of Salcombe Harbour.

CERIANTHUS, sp. A number of specimens were obtained in the zosteria banks on the western shore near the mouth of Salcombe Harbour (under Marine Hotel). Not met with elsewhere in the estuary.

ECHINODERMA.

[Nomenclature: JEFFREY BELL, *Catalogue of the British Echinoderms in the British Museum.*]

SYNAPTA INHÆRENS (*O. F. Müller*). Not uncommon in the sand of the zosteria banks near the mouth of Salcombe Harbour on both the east and west sides. The soil is a moderately clean sand with a small admixture of mud.

CUCUMARIA PENTACTES (*Montagu*). Found under a stone amongst the rocks at the mouth of Salcombe Harbour.

ASTERIAS RUBENS, *Linn.* Only one specimen of this common species was found. This was dredged in the channel west of the Salstone, in the Kingsbridge estuary.

ASTERIAS GLACIALIS, *Linn.* One very large specimen on the shore at the south end of the Salstone. This is the first record we have seen of this species being found east of Bolt Head (cf. *Journ. Mar. Biol. Assoc.* v. 1899, p. 467).

OPHIURA CILIARIS (*Linn.*). One specimen dredged on the clean shell gravel of the "Bag," at the entrance to the Kingsbridge estuary.

OPHIOCNIDA BRACHIATA (*Montagu*). This is one of the many species first described by Montagu from specimens obtained at Salcombe. (*Trans. Linn. Soc.* vii. 1804, p. 84). It was rediscovered in the same locality by Norman (*Annals and Mag. Nat. Hist.* S. VII. vol. iv. p. 289). It occurs on the eastern side of the harbour close to low-water mark at spring tides, and is most common at the edge of the zosteria beds north of Millbay Sands. When placed upon sand in a vessel of sea-water these starfish burrow rapidly, sinking vertically into the sand, but generally leaving the ends of the arms above the surface.

OPHIOTHRIX FRAGILIS (*O. F. Müller*). Never met with in numbers, but occasional specimens were found on the shore, generally under stones, on the Salstone and amongst the rocks at the mouth of Salcombe Harbour. A few were also dredged in the Kingsbridge estuary.

AMPHIURA ELEGANS (*Leach*). Found in all dredgings, and also on the shore at Salstone.

ECHINUS MILIARIS, *Gmelin*. Not uncommon in dredge material obtained in the channel from the Salstone to the mouth of Salcombe Harbour. Not found on the shore.

ECHINOCARDIUM CORDATUM (*Pennant*). Very common in the clean sand between the zosteria beds to the north of Millbay, on the east side of Salcombe Harbour. Specimens are seldom found actually in the zosteria banks themselves. When the sand is uncovered by the tide, the presence of the *Echinocardium* is indicated by the holes in the sand through which the tube feet of the urchin are protruded. The mollusc *Montacuta ferruginosa* is often found commensal with the *Echinocardium*.

NEMERTINA.*

[Nomenclature: BÜRGER, *Nemertinen des Golfes von Nepeal*, 1895, Naples Monograph, No. 22.]

CARINELLA ANNULATA (*Montagu*). Mr. Beaumont obtained this species in the zosteria banks between Ferry House and Millbay, in September, 1898.

CARINELLA SUPERBA, *Kölliker*. This species was frequently found on the shore both in the Kingsbridge estuary and in Salcombe Harbour. It occurred on both sides of the Salstone, on the shores at the north-east end of Salcombe Harbour, as well as on the banks near the mouth, immediately to the north of Millbay. A specimen was also obtained in dredge material from the channel between Salstone and Snape's Point.

CARINELLA POLYMORPHA (*Renier*) was found on the shore on the west side of the Salstone.

LINEUS LONGISSIMUS (*Gunnerus*). Several specimens were dredged in the channel between Salstone and Snape's Point.

LINEUS BILINEATUS, *McIntosh*. Obtained on the shore near the mouth of Salcombe Harbour. It was common in clean sand (with a little zosteria) between the Ferry House and Millbay, on the eastern side; one was obtained on the western side under the Marine Hotel, and one in the fine mud to the north-east of the Salstone.

MICRURA FASCIOLATA, *Ehrenberg*. Several specimens were dredged in the channel in Salcombe Harbour. None were recorded from higher up the estuary.

* The list of species in this group is probably incomplete. We are indebted to Messrs. R. C. PUNNETT and W. I. BEAUMONT for assistance in the identification of those specimens which are recorded.

TURBELLARIA.

PROSTHECERÆUS VITTATUS (*Montagu*). Another species first described by Montagu from this locality. We found several specimens on the shore at a 16-ft. tide at the Salstone. Montagu's specimens were also obtained from the shore at Salstone (*Trans. Linn. Soc.* vol. xi., 1807).

PROSTHIOSTOMUM, sp. Dredged in the channel between Salstone and Snape's Point. Agrees closely with one previously taken at Plymouth by Mr. Garstang. Both are remarkably narrow and elongated, and are referable almost certainly to *P. siphunculus*, Delle Chiaje; but further observations on the living animal are needed to remove all doubt. This is the first record of the genus in British waters. [W. G.]

GEPHYREA.*

PHASCOLOSOMA VULGARE, *Blainville*. Large specimens of this species were numerous in the Kingsbridge estuary, in the bay immediately to the north of Pilworthy Point. At the north end of this bay, 40 to 50 yards south of the first reef of rocks, a patch of ground was found, measuring about 10 yards by 3 yards, where two or three of these large specimens were found in each spadeful of the soil. The ground was composed of stiff clay-gravel, lying on hard clay which passed quickly into soft rock. The species was also abundant, but the specimens were of smaller size, on the eastern shore of Salcombe Harbour, a little to the south of Ditch End, where the ground is composed of hard muddy gravel. One specimen was obtained on the same side of the harbour near Millbay.

PHASCOLOSOMA PELLUCIDUM, *Keferstein*. This species was much more widely distributed than the preceding. It was very common in the zosteria banks on the east side of Salcombe Harbour between Millbay and Ferry House, as well as on the western side under the Marine Hotel. It was also taken on the eastern shore from the Ferry House to Ditch End, but was here less common than *P. vulgare*. Single specimens were taken on the zosteria banks at the north-east end of Salcombe Harbour, and it was not uncommon on both the western and south-eastern shores of the Salstone, where the ground is hard.

PHASCOLION STROMBI (*Montagu*). One specimen in a shell of *Turritella communis*, from the channel between Snape's Point and the mouth of the harbour. The specimen was identified by Mr. Todd.

* The two species of *Phascolosoma* were identified by Mr. A. E. SHIPLEY.

POLYCHAETA.*

[Nomenclature: DE SAINT-JOSEPH, "Les Annélides Polychètes des Côtes de Dinard," *Ann. Sci. Nat. Zoologie*, 1887-95; "Les Annélides Polychètes des Côtes de France (Manche et Océan)," ditto, 1898.]

SYLLIS HAMATA, *Claparède*. Dredged in the channel between Salstone and Snape's Point.

Other Syllids, the species of which have not been determined, were dredged in all parts of the estuary.

AMBLYOSYLLIS (GATTIOLA) SPECTABILIS, *Johnston*, was dredged in the channel west of the Salstone.

MYRIANIDA MACULATA, *Claparède*. One specimen, with a chain of six or seven buds, found on the fine mud on the north-east side of the Salstone. A second quite young example also came from the same locality, and the species was dredged in the channel west of the Salstone.

This is almost certainly the *Nereis pinnigera* of Montagu (*Trans. Linn. Soc.* ix. 1808, p. 111, Pl. VI. Fig. 3), although de Saint-Joseph (*Ann. Sci. Nat.* xx. 1895, p. 195) does not adopt Montagu's specific name, giving it only as a doubtful synonym. The Salstone, where our specimens were taken, was one of Montagu's favourite hunting grounds.

EUPHROSYNE FOLIOSA, *Aud. et Edw.* Three specimens, dredged in the channel between Salstone and Snape's Point.

APHRODITE ACULEATA, *Linn.* One small specimen only of this sand-burrowing species was obtained. It was 28 mm. long, and came from Millbay Sands.

† LEPIDONOTUS SQUAMATUS (*Linn.*). Dredged in the channel between the Salstone and Snape's Point, as well as in the channel in Salcombe Harbour. It was also obtained on the shore under the Marine Hotel.

GATTYANA CIRROSA (*Pallas*). Found on the shore living in the tubes of *Amphitrite Johnstoni* on the Salstone, south of Halwell Point and near the mouth of Salcombe Harbour (under Marine Hotel).

LAGISCA, sp. Dredged in the channel west of the Salstone.

HARMOTHÖE SPINIFERA (*Ehlers*). Dredged in the channel west of the Salstone, and between the Salstone and Snape's Point.

HARMOTHÖE SETOSISSIMA (*Savigny*). On the eastern shore of Salcombe Harbour.

HARMOTHÖE LUNULATA (*Delle Chiaje*). On the shore of the bay north of Pilworthy Point.

EVARNE IMPAR (*Johnston*). Dredged in the channel between the Salstone and the mouth of Salcombe Harbour.

* By E. J. ALLEN, with the exception of the *Polymoidæ*, by T. V. HODGSON.

† For the *Polymoidæ* the terminology adopted is that of McINTOSH, *Monograph of British Annelids*, part ii., Ray Society, London, 1900.

LEPIDASTHENIA ARGUS, *Hodgson*. Found in the tubes of *Amphitrite Edwardsi*, on the shore between Salcombe town and Sandhill Point (under Marine Hotel). For details of this new species see p. 250 of the present number of this Journal.

STHENELAIS BOA (*Johnston*). All the specimens had brown elytra. The species was met with on the Salstone and near the mouth of the harbour, between the Ferry House and Millbay. It was never numerous. Specimens were also dredged in the channel between the Salstone and Snape's Point.

MARPHYSA SANGUINEA (*Montagu*). A specimen was met with on the south-east shore of the Salstone; a few specimens were found at the north-east end of Salcombe Harbour, on the eastern shore, and it was also taken on the same side of the harbour between the Ferry House and Millbay.

MARPHYSA BELLII (*Aud. et Edw.*). Three specimens from the north-east side of the Salstone, one from the south-east side, and one from near the mouth of Salcombe Harbour (under Marine Hotel). The gills begin on the seventeenth segment and occur on 23 segments in the specimens from the Salstone. In the one from under the Marine Hotel they begin on the eighteenth and occur on 29 segments. The species has previously been found on the north coast of France and in the Mediterranean (Audouin et Edwards, Marenzeller, de Saint-Joseph).

ARABELLA (MACLOVIA) IRICOLOR (*Montagu*). (For the synonymy of this species see Willey, *Journ. Mar. Biol. Assoc.* vol. vi. p. 98.) Obtained by digging in the muddy gravel on the west side of the Salstone and in the sand near the mouth of the harbour. One or two specimens only were found in each locality.

LUMBRICONEREIS LATREILLI, *Aud. et Edw.* (This is the name adopted by de Saint-Joseph. It seems likely, however, that *L. fragilis* (Müll) is the same species.) A number of specimens were found on the west side of Salcombe Harbour, under the Marine Hotel. The species was also met with on the zostera banks at the north-east end of Salcombe Harbour, in the Kingsbridge estuary opposite Halwell Point, and on the west side of the Salstone.

NEREIS (PRAXITHEA) IRRORATA (*Malmgren*). (For the synonymy of this species see Saint-Joseph, *Ann. Pol. Dinard. Ann. Sci. Nat.* S. VII. v. p. 263).

At Salcombe *N. irrorata* was most plentiful in the muddy gravel on the west side of the harbour, near the mouth (under Marine Hotel), where a number of specimens were found. Two specimens were also taken on the east side of the harbour, and a single one in the Kingsbridge estuary, south of Halwell Point. In all cases but one the ground was muddy gravel. The animals were always found in-

habiting a membranous tube, formed of hardened mucus, with a few particles of sand and mud attached, as described by Saint-Joseph (*Ann. Sci. Nat.* S. VII. xx. p. 216). When the worms of this species were removed from their tubes and placed upon clean sand in a vessel of sea-water, they remained on the surface of the sand for some time, moving about, but making little attempt to burrow. After several hours, however, they were found buried in the sand, inclosed in a new tube made of secreted mucus, which was doubtless produced by the numerous glands which are found on the parapodia and on the sides of the body. The great development of these glands is one of the characteristic features of the species.

NEREIS (PERINEREIS) CULTRIFERA, *Grube*. Of the five species of *Nereis* found on the shore in the Salcombe estuary, by far the most common is *Nereis cultrifera*. It is found practically everywhere, from Garston Point to the mouth of the harbour, excepting on the very fine mud in the upper parts of the estuary. It is most common, however, where the soil is composed of gravel mixed with more or less sand and mud. In this respect its distribution resembles that of *N. irrorata*, though on the whole it is a much more ubiquitous species than the latter. Young specimens were numerous in dredge material.

NEREIS (EUNEREIS) LONGISSIMA, *Johnston*. (See Saint-Joseph, *Ann. Sci. Nat.* S. VIII. vol. v. 1898.) This is a well-marked species with a restricted distribution, which is well shown by the localities in which it is found in the Salcombe estuary. It is most at home in fine muddy sand, the soil most suitable for it being generally found around the margins of the large banks of the finest sticky mud, which occupy considerable areas in the upper parts of the estuary. In these mud-banks themselves it does not appear to flourish. It was found most abundantly in the mud to the south of Garston Point and on the southern side of the bay immediately below Halwell Point (under the limekiln). It was not uncommon in soil of the proper kind on the Salstone. Near the mouth of Salcombe Harbour occasional specimens only were met with. *Nereis longissima* burrows very rapidly in fine sand, and I agree with Saint-Joseph in saying that it does not appear to form a tube like *N. irrorata*. When placed upon fine sand in a vessel of clean sea-water it generally commences to burrow immediately, and rapidly disappears beneath the surface of the sand. The proboscis seems to play an important part in the burrowing process, being constantly protruded and withdrawn as the head becomes buried.

It is interesting to note that *Nereis longissima* was obtained by the *Porcupine* off the west of Ireland at a depth of 1,366 fathoms, on a bottom of fine clayey mud (*Ehlers, Beiträge zur Kenntniss der Ver-*

ticalverbreitung der Borstenwürmer im Meere. Zeitschr. wiss. Zool. xxv. 1875 p. 20).

The specimens of *N. longissima* obtained at Salcombe were generally of a perfectly uniform light shade, which was nearly flesh colour. One specimen, however, from the western side of the Salstone was very brilliantly coloured. The general ground tint was a purple-grey, and this was covered in patches with a bright chrome-yellow pigment. At the anterior end of the dorsal surface the yellow patches were found covering each side of every segment, leaving a central patch of the purple-grey ground colour between. Behind the first 50 or 60 segments the yellow patches were scattered irregularly. On the ventral surface the anterior segments were almost covered with the yellow, and behind this a median line of yellow extended backwards for some distance.

NEREIS DIVERSICOLOR, *O. F. Müller*. This worm was numerous only in a small gully traversed by a stream of fresh water, which runs into Southpool Lake just below the Rectory (see Chart). Occasional specimens were found in other parts of the harbour. The distribution of this species at Plymouth shows it to be an essentially brackish-water animal, which is in agreement with what we found at Salcombe.

NEREIS FUCATA, *Savigny*. The normal habit of the worm is to live in the upper coils of a shell inhabited by a hermit-crab. We did not specially seek for it when at Salcombe, and the single specimen recorded was given me by some children who were catching hermit-crabs when we were collecting on Millbay Sands.

PHYLLODOCE. Two or three undetermined species of Phyllodoce were common in dredge material, especially in that from the Kingsbridge estuary.

EULALIA PUNCTIFERA, *Grube*, was identified from material dredged in the channel between Salstone and Snape's Point.

EULALIA VIRIDIS (*Müller*) was also found in dredge material obtained between Salstone and Snape's Point.

NEPHTHYS HOMBERGII, *Audouin et Edwards*, must be regarded as one of the commonest, if not the commonest, shore Polychaete in Salcombe estuary. It is met with on grounds of all kinds, excepting possibly the very finest mud, and seems about equally distributed from Garston Point to the mouth of the harbour. On the clean sand at Millbay numerous very small specimens were found, which in some places were almost the only living creatures in the sand.

NEPHTHYS CAECA (*Fabricius*) was found only on the banks near the mouth of the harbour, being most numerous on the eastern side. The specimens were generally of large size. The habit of the species seems to resemble that of *N. Hombergii*, although in this case the local distribution is very different. The two species (*N. caeca* and *N. Hom-*

bergii) differ in geographical distribution, *N. caeca* being an Arctic species not found in the Mediterranean, whilst *N. Hombergii* is a Mediterranean form not extending to northern seas.

GLYCERA CONVOLUTA, *Keferstein*, was nowhere abundant. None were found in the Kingsbridge estuary, the two or three specimens taken being all from the shore in Salcombe Harbour.

GLYCERA CAPITATA, *Oersted*. One small specimen was dredged between the Salstone and Snape's Point.

GONIADA MACULATA (*Oersted*). Three specimens of this species were obtained from the shore near the mouth of Salcombe Harbour on the western side, and three from the eastern side. The exact nature of the soil in which most of the specimens were obtained was unfortunately not noted at the time, but two from Millbay certainly came from fine sand. *Goniada maculata* is a northern species. It was found on muddy ground by the *Pommerania* expedition, and on ooze by the *Porcupine* in 767 and 1,215 fathoms (*Ehlers Zeitschr. wiss. zool.* XXV. 1875, p. 22).

AUDOUINIA TENTACULATA (*Montagu*). Very common all over the estuary above half-tide mark, wherever the soil contains much mud mixed either with gravel or sand.

MAGELONA PAPILLICORNIS, *F. Müller*. One specimen was found on the south-east side of the Salstone, and two on Millbay Sands near the mouth of Salcombe Harbour.

SPIO SETICORNIS, *Fabricius*. This species was obtained in abundance on the shore under the Marine Hotel, on the western side of Salcombe Harbour. It was found by Mr. Hodgson in the muddy gravel above the zosteria banks. It forms long, slender tubes or galleries of mucus covered with sand grains.

NERINE CIR RATULUS (*Delle Chiaje*). (See Saint-Joseph, *Ann. Sci. Nat.* S. VIII. v. 1898, p. 349.) One specimen was obtained on the shore under the Marine Hotel, on the west side of Salcombe Harbour.

NERINE CONICOCEPHALA, *Johnston*. One specimen on the east side of Salcombe Harbour.

NERINE VULGARIS, *Johnston*. One small one dredged between the Salstone and Snape's Point.

SCOLOPLOS ARMIGER, *O. F. Müller*. A few specimens found in the zosteria banks near the mouth of Salcombe Harbour, on both the east and west sides. None are recorded from higher up the estuary.

NOTOMASTUS LATERICEUS, *Sars*, is one of the commonest worms found on the shore in the Salcombe estuary. It is most abundant, and the specimens are of largest size in the fine mud in the upper parts of the estuary (Kingsbridge estuary). In the muddy parts of the shore round the Salstone it was especially abundant and large. Specimens from the latter locality were found which, when killed with spirit and

extended, measured up to 14 inches (35.5 cm.). The species extended to the banks in the lower parts of Salcombe Harbour, though the specimens here were not so large as those found in the mud in the upper parts of the estuary. The worm was seldom met with in gravel unless the latter contained a large quantity of mud. It was found living in a spiral burrow in the mud or sand, which was lined by a mucous secretion from the body of the worm.

Genital pores were counted in specimens in which they were swollen and distinct, and gave the following results:—*Specimen 1*: Pores on abdominal segment 2 to segment 14. *Specimen 2*: Abdominal segments 2 to 10. *Specimen 3*: Abd. segts. 2–11. *Specimen 4*: Abd. segts. 2–14. *Specimen 5*: Abd. segts. 2–14. *Specimen 6*: Abd. segts. 2–15.

ARENICOLA MARINA, *Linn.*, was common on the shores in all parts of Salcombe Harbour proper, in sand or muddy sand. In the Kingsbridge estuary, although not uncommon, it was far less frequent. In the sandbanks near the mouth of Salcombe Harbour very large specimens were met with near low-water mark belonging to the second variety of this species described by Gamble and Ashworth (*Quart. Journ. Micr. Sci.* xli. 1898). The largest specimens were from 13 to 14 inches (33 to 35 cm.) long.

ARENICOLA GRUBII, *Claparède*. (For detailed description of this species see Gamble and Ashworth, *Quart. Journ. Micr. Sci.* xliii. 1900.) One specimen only was obtained, from the muddy gravel on the west side of the Salstone.

CLYMENIDS. Three species of *Clymene* (*Praxilla*) were obtained, which are being reserved for detailed description. One species was common on the mud in the upper parts of the Kingsbridge estuary, and extended to the sandbanks near the mouth of Salcombe Harbour. On these latter banks two other species were also found.

OWENIA FUSIFORMIS, *Delle Chiaje*. Three specimens of this species were found in the clean, fine sand at Millbay.

CHÆTOPTERUS VARIOPEDATUS (*Renier*) was found on the shore at extreme low water in two places—on the west side of the Salstone and on the *zostera* bank near the mouth of Salcombe Harbour on the western side. In each locality two or three specimens only were obtained.

AMPHITRITE JOHNSTONI, *Malmgren*, was very abundant on the Salstone, especially on the north-east and south-east sides. It was occasionally met with on the shore in all parts of Kingsbridge estuary and Salcombe Harbour, being abundant on the western shore near the mouth of the harbour (under Marine Hotel). In the mud of the Salstone the ends of the tubes were often covered with pieces of shell and gravel, and projected from $\frac{1}{2}$ to 1 inch above the surface.

The main portion of the tube or burrow in which the worm lives is lined by a moderately hard, claylike substance of a brownish yellow colour, which seems to be formed by the action upon the mud of the mucus secreted by the animal. There is here no sign of a definitely built tube, such as that constructed, for instance, by *Lanice*, excepting at the external opening, which projected above the surface of the mud. The burrows were very frequently inhabited by the Polynoid *Gattyana cirrosa*.

AMPHITRITE EDWARDSI, *Quatrefages*, resembles *A. Johnstoni* very closely in appearance and habit, but can be readily distinguished by the fact that it possesses only 17 setigerous segments in the thorax instead of 24. In the Salcombe estuary it was found only in the zosteria banks near the mouth of Salcombe Harbour, and was met with in some numbers on the western side (under Marine Hotel). On the eastern side one specimen only was taken. In the former situation (zosteria bank under Marine Hotel) both *A. Johnstoni* and *A. Edwardsi* live in close proximity; but it was noted by Mr. Hodgson, who recently paid special attention, at my request, to the exact situations in which specimens of these two species could be found, that whilst *A. Johnstoni* was more common at extreme low-water mark, *A. Edwardsi* was most frequent higher up on the zosteria bank. The areas of distribution of the two species overlapped to some extent, and where this occurred specimens of both might be turned up in one spadeful of muddy sand.

It has already been noted that *A. Edwardsi* was never found in the Kingsbridge estuary, in which respect its distribution again differs from that of *A. Johnstoni*, for this species was especially common on the Salstone.

The burrow of *A. Edwardsi* is very similar to that of *A. Johnstoni*. Although no projecting ends to the tubes were noted, it is quite possible that they may sometimes be made. They were by no means always found in the case of *A. Johnstoni*.

The handsome Polynoid *Lepidasthenia argus*, which is described by Mr. Hodgson for the first time in this number of the Journal (see p. 250), was found living in the burrows of *A. Edwardsi*.

LANICE CONCHILEGA (*Pallas*). Extremely abundant in patches of clean sand near the mouth of Salcombe Harbour on both sides, as well as in the sand of the bays outside the harbour, especially in the more sheltered parts of them. One or two specimens only were found at the north-eastern end of the harbour, and one or two in the Kingsbridge estuary (under limekiln). Evidently clean sand without much admixture of mud is necessary for this species to flourish.

Small specimens were obtained in dredge material from Salcombe Harbour.

THELEPUS SETOSUS (*Quatrefages*). Specimens found in dredge material obtained between the Salstone and Snape's Point, and also from Salcombe Harbour.

POLYMNIA NEBULOSA (*Montagu*) was dredged in the channel west of the Salstone.

POLYCIRRUS CALIENDRUM, *Claparède*. Obtained from dredge material between Salstone and Snape's Point.

POLYCIRRUS AURANTIACUS, *Grube*. Obtained from dredge material between Salstone and Snape's Point.

MELINNA ADRIATICA, *von Marenzeller*. (*Adriat. Annel. I. Sitzb. d. k. Akad. Wiss. zu Wien. lxxix. p. 472.*) In the very finest mud, which forms large banks in the upper parts of the Salcombe estuary, a species of *Melinna* occurs in extraordinary abundance, the whole surface of the mud being studded with the tubes of the worm. In other parts of the estuary, even in the parts of the harbour nearest the sea, the same species is found in the mud and sand banks, though the number of specimens met with in any one spot is here not large. The centre of distribution lies undoubtedly in the mud-flats already mentioned, and the specimens found in other parts must be regarded as immigrants.

The examination of a considerable number of specimens of the species found at Salcombe leads me to conclude that it is the *Melinna adriatica* of von Marenzeller, although in some respects there are slight differences from the description given by that author. The most important of these are the number of segments in relation to the body length, and the structure of the membranous comb on the dorsal side of the fourth segment. Von Marenzeller gives the length of his specimens at 15.30 mm., and the total number of segments 78-90. The largest of the Salcombe specimens was 60 mm. long, but a portion of the tail was missing. Other Salcombe specimens gave:—Length 40 mm., segments 70; length 40 mm., segments 72; length 39 mm., segments 85; length 35 mm., segments 70; length 33 mm., segments 81; length 32 mm., segments 85; length 29 mm., segments 81; length 28 mm., segments 73. This character is clearly too variable for any weight to be attached to it.

The membranous comb of *M. adriatica* is described by von Marenzeller as having 4-8 completely rounded denticulations on its anterior border, differing in this respect from that of *M. cristata*, which Sars describes as having 12-16 very small triangular points or lobes. In the Salcombe specimens this character is subject to very considerable variations. In a few specimens there were 6-8 rounded denticulations; in one specimen I counted 8 rounded denticulations, but each of these had a very slight notch in the centre, so that it was approaching the condition of 16 denticulations. In the majority of specimens the

number of denticulations is more than 12, in this respect resembling *M. cristata*; but again the amount of variation renders the character of little use as a specific distinction.

In other characters the Salcombe specimens agree with those described by von Marenzeller. The isolated dorsal hooks behind the gills as well as the ventral uncini are both well represented by von Marenzeller's figures. The uncini have generally five large teeth, one rudimentary tooth and rounded ends, with the exception of those at the end of each row, which have often four large teeth only, one rudimentary tooth and rounded ends. There is, however, a certain amount of variation in this character, as in some specimens I have found only uncini with four large teeth, like those generally found at the end of the rows; or there may be a very small and rudimentary outer tooth, representing the first of the typical five large teeth.

M. adriatica is described as having 36-47 uncini in one row. I have found in the Salcombe specimens 34, 35, 42, 43, 46; 38, 39, 42, the last three figures being obtained from different segments of the same worm.

The colour of the Salcombe specimens is not subject to much variation, and agrees with von Marenzeller's description. The red patches on the dorsal surface spoken of by the author vary in size, shape, and position, since they are due to blood showing through the skin. I need only add further that when the gills are contracted they have a distinctly greenish tinge.

It is practically certain that this species is the *Sabella curta* of Montagu (*Testacea Britannica*, p. 554; quoted in Johnston, *British Museum Catalogue*, p. 263), although some points in his description of the worm do not seem quite to agree. Montagu, however, says: "This *Sabella* is gregarious, covering the whole surface of the shore in the inlet near Kingsbridge, appearing like bits of straw covered with mud, and as close and numerous as stubble in a field," which exactly expresses what we saw in the same estuary during the present summer.

PECTINARIA BELGICA (*Pallas*). One specimen was obtained on the eastern shore at the north-east end of Salcombe Harbour, from a patch of sandy ground, and a second specimen from the north-east side of the Salstone.

SABELLA PAVONINA, *Savigny*. On the south-east shore of the Salstone this species was extremely abundant at dead low water with a 16-ft. tide, being often found in clusters of twenty or thirty together. It was also abundant on the mud on the west side of the Kingsbridge estuary, south of Garston Point. Other localities, where a few specimens were obtained, were the west side of the Salstone and the zosteria banks

at the north-east end of Salcombe Harbour. The species was entirely absent from the banks near the mouth of the harbour.

BRANCHIOMMA VESICULOSUM (*Montagu*) is another species which was first described from specimens obtained in this estuary. It occurs at a higher tidal level than *Sabella pavonina* and *Myxicola infundibulum*, and is most abundant where the soil is composed largely of gravel. It was never met with on clean sand or mud. It was most numerous on the gravel at the Salstone and in the upper parts of Salcombe Harbour.

MYXICOLA INFUNDIBULUM (*Renier*) is also a very common species in the estuary, and was well described by Montagu, who found it on the Salstone. It is very frequent on all parts of the Salstone, and in some places at the north-east end of Salcombe Harbour. It occurred in extraordinary numbers near low-water mark, on the zostera flat immediately to the south of Pilworthy Point. In the lower parts of Salcombe Harbour it was met with only occasionally, and must there be regarded as an immigrant from the upper parts of the estuary.

POTAMOCEROS TRIQUETER (*Linnaeus*). Common in dredge material from Salcombe Harbour and the Kingsbridge estuary.

SPIROBIS BOREALIS, *Daudin*. Common in dredge material from Salcombe Harbour and the Kingsbridge estuary.

CRUSTACEA.*

DECAPODA.

STENORHYNCHUS PHALANGIUM (*Pennant*). This species was present in most hauls of the dredge taken between the Salstone and the mouth of the harbour, excepting those taken in the "Bag."

STENORHYNCHUS TENUIROSTRIS (*Leach*). A few were dredged between Snape's Point and the mouth of the harbour.

INACHUS DORSETTENSIS (*Penn.*). Taken in all hauls of the dredge, excepting those in the "Bag."

INACHUS DORYNCHUS, *Leach*. Was only found on the west and south-east shores of the Salstone, between tidemarks.

MAIA SQUINADO (*Herbst*). One only was taken in the dredge between Snape's Point and the mouth of the harbour. It is, however, very commonly taken when working the tuck-net on the zostera banks and mud-flats.

EURYNOME ASPERA, *Leach*. This crab was common in dredgings taken between Snape's Point and the Salstone.

PILUMNUS HIRTELLUS (*Linn.*). One only was taken in dredging from between Snape's Point and the Salstone.

* By R. A. TODD.

CARCINUS MÆNAS (*Penn.*). This species is moderately common on all the sand, mud, and zosteria banks in Salcombe Harbour. In some localities, notably the zosteria bank off Ditch End, it is abundant, although usually of a small size. In the latter place it makes burrows in the patches of mud free from zosteria, each burrow being one to two feet long, and of a diameter corresponding to the size of the crab inhabiting it. The burrow starts as a more or less vertical hole three or four inches in length, runs horizontally for a foot or so and then upwards, opening on the surface. The crabs also make holes in the edges of the zosteria banks, which are generally some inches above the surface of the surrounding mud, and as these holes are fairly numerous the zosteria bed gradually becomes undermined at its edges, the overhanging portion ultimately breaking away.

PORTUNUS CORRUGATUS (*Penn.*). Was only taken once, in the dredge between Snape's Point and the Salstone. In the Plymouth district it is taken chiefly on the New Grounds, between the Breakwater light and Drake's Island.

PORTUNUS PUSILLUS (*Leach*). This species was commonest in dredge material from between Snape's Point and the Salstone, a few only being taken between Snape's Point and the mouth of the harbour.

PORTUNUS DEPURATOR (*Leach*). One only recorded, from dredgings between Snape's Point and the mouth of the harbour.

EBALIA TUBEROSA (*Penn.*). Present in all hauls of the dredge taken between Snape's Point and the Salstone. A few only were taken between Snape's Point and the mouth of the harbour.

EUPAGURUS BERNHARDUS (*Linn.*). Young specimens of this species were very common on the Salstone and opposite the Marine Hotel, running about between tidemarks. It was present in all the dredgings (excepting in the "Bag") in varying numbers. A few large ones were taken inhabiting *Buccinum* shells to which were attached the anemone *Sagartia parasitica*.

EUPAGURUS PRIDEAUXII (*Leach*). Several specimens of this hermit-crab were present in dredgings taken between Salstone and the mouth of the harbour, sometimes with *Adamsia palliata*.

EUPAGURUS CUANENSIS (*Thompson*). This species was taken most commonly between Snape's Point and the Salstone, a few being taken west of the Salstone and between Snape's Point and the mouth, all in the dredge. It generally inhabited a shell which was covered with the sponge *Suberites domuncula*, the shell in many cases, however, having been almost completely eaten away by the sponge.

ANAPAGURUS LÆVIS (*Thompson*). Was taken frequently in the dredge, in all parts of the channel between the mouth of the harbour and the Salstone, generally inhabiting *Turritella* shells.

DIOGENES VARIANS (*Costa*). One specimen only of this hermit-crab was taken, in the cheese-cloth trawl, on the bar, outside Salcombe Harbour.

PORCELLANA LONGICORNIS (*Penn.*). Recorded only from dredgings taken between Snape's Point and the Salstone. It was most probably, however, taken elsewhere.

PORCELLANA PLATYCHELES (*Penn.*). Recorded only from under rocks, etc., between Sandhill Point and South Sands Bay.

GALATHEA SQUAMIFERA, *Leach*. A few were taken in the dredge, between Salstone and Snape's Point, and one in a prawn-pot in 4 to 5 fathoms off Ditch End.

GALATHEA INTERMEDIA, *Lilljeborg*. This Galathea was taken very commonly in the dredge between Salstone and Snape's Point, and also, but not so commonly, between Snape's Point and the mouth of the harbour.

PALINURUS VULGARIS (*Latr.*). The "crayfish," according to the Salcombe fishermen, was sometimes taken when tuck-netting, and was occasionally found in holes at the edge of the zosteria banks.

GEBIA STELLATA (*Montagu*). This interesting crustacean, first described by Montagu from specimens obtained at Salcombe, was found most commonly on the zosteria bank opposite the Marine Hotel, and in the muddy sand below the Ferry House, a few being taken in other localities, *i.e.* one on the west shore of the Salstone, two in the zosteria between Snape's Point and Salcombe town, and two under the Marine Hotel. The burrows do not appear to be of very great length; they are nearly always branched, some of the branches being vertical, at their ends at least. Two or more of these branches open at the surface, whilst others are blind. Leach records burrows of a hundred feet or more in length on the shores of Plymouth Sound, but none of those we followed were more than two or three feet long.

Norman found *Gebia* at Salcombe in the locality where we have now found it to be abundant (eastern side of harbour). [*Ann. Mag. Nat. Hist.* 1899, p. 289.]

HOMARUS VULGARIS (*Milne-Edwards*). Occasionally taken in shovels, and also when tuck-netting.

CRANGON VULGARIS, *Fabricius*. On all the mud-flats in the Kingsbridge estuary, and in the upper parts of Salcombe Harbour, during the time we were at Salcombe (June to September), large numbers of young of the common shrimp (*Crangon vulgaris*) were found, wherever pools of water were left on the surface of the mud. Full-grown specimens, or specimens of a marketable size, on the other hand, we only took on the bar outside the harbour, never in the estuary itself, and from information we received from local fishermen it appears that there is no

fishery for them, although small shrimp-trawls and shove-nets are often worked for the capture of prawns (*Palæmon serratus*).

CRANGON TRISPINOSUS (*Hailstone*). Eight specimens were taken on the clean sand of the bar, with the cheese-cloth trawl.

ATHANAS NITESCENS (*Mont. MSS.*). One specimen only was taken in the dredge between the Salstone and Snape's Point.

HIPPOLYTE (VIRBIUS) VARIANS (*Leach*). This species was generally taken when using the cheese-cloth trawl on the zosteria banks, especially opposite the Marine Hotel, being often of a bright green colour. It was also found in rock pools between Sandhill Point and South Sands Bay.

HIPPOLYTE CRANCHII, *Leach*. One only was taken in the dredge between Snape's Point and the mouth of the harbour.

PALÆMON SERRATUS (*Penn.*). The common prawn was present on all the zosteria, mud, and sand banks when they were covered with water, but was not often left on them when uncovered, as it always retires to deeper water when the tide starts to ebb.

*MACROMYSIS FLEXUOSA (*Müller*). Very common on the zosteria bank south of Pilworthy Point, common on the zosteria off Ditch End, a few only from zosteria bank between Snape's Point and Salcombe, and two from the zosteria on the eastern side of Salcombe Harbour between Ferry House and Millbay.

MACROMYSIS INERMIS (*Rathke*). A few were taken in the cheese-cloth trawl on the zosteria bank off Ditch End, and three on the zosteria under the Marine Hotel.

MACROMYSIS NEGLECTA (*G. O. Sars*) (?). In cheese-cloth trawl south of Pilworthy Point, on zosteria off Ditch End, and under the Marine Hotel (west side of Salcombe Harbour).

SCHISTOMYSIS ARENOSA (*G. O. Sars*). One only was taken, in the cheese-cloth trawl on the bar outside Salcombe Harbour.

SCHISTOMYSIS HELLERI (*G. O. Sars*). Not uncommon in pools on mud-flat north of the Rectory, on east side of Southpool Lake. I am indebted to Mr. Beaumont for the following note: "Not quite typical; more slender, telson narrower and less curved in outline, and with fewer spines (14-16), inner uropod with 12-13 spines, outer uropod hardly $\frac{1}{3}$ longer than the inner."

AMPHIPODA.

[Nomenclature in general that of G. O. SARS, *Crustacea of Norway*, vol. i.]

BATHYPOREIA PELAGICA, *Spence Bate*. One specimen only was taken, in the cheese-cloth trawl on the bar.

* The Mysidæ were identified by Mr. W. I. BEAUMONT. The nomenclature is that of SARS, *Middelhavets Mysider*.

UROTHOE, sp. Several specimens were taken in the cheese-cloth trawl on the bar.

LEUCOTHOE SPINICARPA (*Abild*). One was taken in the dredge, west of Salstone.

PONTOCRATES ALTAMARINUS (*Spence Bate*). Two specimens were taken on the bar.

PARATYLUS FALCATUS (*Metzger*). One specimen was taken on the bar, in the cheese-cloth trawl. It is, I believe, new to Britain. Sars (*Crust. of Norway*, vol. i. p. 466) records it from the south-east coast of Norway, Karmo, and the west coast of Finmark. Other records are: East Frisian coast (*Metzger*), French coast (*Chevreur*), Dutch coast (*Hoek*).

DEXAMINE SPINOSA (*Montagu*). A few were taken in the cheese-cloth trawl on the zosteria off Ditch End, three on the zosteria under the Marine Hotel, and three in the dredge, between the Salstone and the mouth of the harbour.

GAMMARUS LOCUSTA (*Linn*). Taken in nearly all hauls of the dredge and cheese-cloth trawl; commonest on the zosteria south of Pilworthy Point.

GAMMARUS CAMPYLOPS, *Leach*. Taken commonly in the cheese-cloth trawl on the zosteria banks on the east side of Salcombe Harbour, between Ferry House and Millbay Sands.

MELITA GLADIOSA, *Spence Bate*. One or two specimens were dredged in the channel in Salcombe Harbour.

AMPHITHOE RUBRICATA (*Montagu*). Present in most hauls of the dredge, excepting those taken in the "Bag."

COROPHIUM GROSSIPES (*Linn*). Found very commonly in the mud-flat off Ditch End, living in vertical burrows 4 to 5 inches long. A few were also taken in the cheese-cloth trawl on the zosteria bank between Snape's Point and Salcombe town.

PHTHISICA MARINA, *Slabber*. A few were taken on the zosteria bank off Ditch End, and two on the zosteria bank on the east side of Salcombe Harbour, between Ferry House and Millbay Sands.

PROTELLA PHASMA (*Montagu*). Common in dredge material.

ISOPODA.

[Nomenclature that of G. O. SARS, *Crustacea of Norway*, vol. ii.]

APSEUDES TALPA (*Montagu*). Not uncommon in dredgings taken between the Salstone and Snape's Point.

ANTHURA GRACILIS (*Montagu*). One specimen only was taken when dredging in the "Bag."

GNATHIA MAXILLARIS (*Montagu*). Very common in dredgings from the harbour, and two from the "Bag."

SPHAEROMA CURTUM, *Leach*. One dredged in the channel between Snape's Point and the mouth of Salcombe Harbour.

IDOTHEA BALTHICA, *Pallas*. Present in most hauls of the cheese-cloth trawl.

ARCTURUS GRACILIS (*Goodsir*). Taken on the zosteria off Ditch End, and also in dredgings from the channel in Salcombe Harbour.

ARCTURUS INTERMEDIUS (*Goodsir*). Two were taken in the dredge between Snape's Point and the Salstone.

ARCTURUS DAMNONIENSIS, *Stebbing*. Not uncommon in dredge material.

JANIRA MACULOSA, *Leach*. A few were taken with the dredge in the channel of Salcombe Harbour.

JÆRA MARINA (*Fabr.*). Two were taken with the cheese-cloth trawl on the zosteria bank off Ditch End.

MUNNA KRÖYERI, *Goodsir*. Not uncommon in the dredge material taken between the Salstone and Snape's Point.

PYCNOGONIDA.*

[Nomenclature: P. P. C. HOEK, *Études sur les Pycnogonides* (Arch. Zoo. Exp. et Gen. ix. 1881).]

NYMPHON GRACILIS, *Leach*. Two dredged in Salcombe Harbour.

AMMOTHEA ECHINATA (*Hodge*). Not uncommon in dredgings from the harbour.

PHOXICHILUS SPINOSUS (*Montagu*). One taken in the cheese-cloth trawl on the zosteria under the Marine Hotel, and two between Ferry House and Millbay.

POLYZOA.

[Nomenclature: HINCKS, *British Marine Polyzoa.*]

AETEA TRUNCATA, *Landsborough*. Dredged in the channel between Salstone and Snape's Point.

EUCRATEA CHELATA (*Linn.*). Dredged in the channel from the Salstone to the mouth of Salcombe Harbour.

SCRUPOCELLARIA SCRUPOSA (*Linn.*). Small pieces dredged in Salcombe Harbour, attached to *Trochus magus*.

BUGULA TURBINATA, *Alder*. Dredged in quantity in the channel from the Salstone to the mouth of Salcombe Harbour.

BUGULA FLABELLATA, *Thompson*. Dredged in the "Bag," at the mouth of Kingsbridge estuary, and in the channel in Salcombe Harbour.

UMBONULA VERRUCOSA (*Esper*). Common on the rocks at the mouth of Salcombe Harbour.

CRISIA RAMOSA, *Harmer*. Dredged in all parts of the channel from Salstone to mouth of Salcombe Harbour.

* By R. A. TODD.

LICHENOPORA HISPIDA (*Fleming*). On shells dredged in Salcombe Harbour.

AMATHIA LENDIGERA (*Linn.*). On dredge material from channel west of Salstone.

BOWERBANKIA PUSTULOSA (*Ellis and Solander*) (?). A species of Bowerbankia was common on dredge material from all parts of the channel, from the Salstone to the mouth of Salcombe Harbour. It is probably *B. pustulosa*, although the contracted zoëcia show forms similar to those figured by Hincks for *B. imbricata*, as well as those figured for *B. pustulosa*, and many intermediate stages. Hincks records *B. pustulosa* as plentiful in Salcombe Bay.

MIMOSELLA GRACILIS, *Hincks*. One piece dredged in channel west of the Salstone.

PEDICELLINA CERNUA (*Pallas*). On *Turritella* shell from the channel between Salstone and Snape's Point; on *Sertularella* from channel in Salcombe Harbour.

LOXOSOMA PHASCOLOSOMATUM, *Vogt*. On the posterior end of *Phascolosoma vulgare* from the shore north of Pilworthy Point.

[NOTE.—The incrusting Polyzoa, attached to shells, were not identified.]

MOLLUSCA.*

[Nomenclature: FORBES AND HANLEY, *British Mollusca*, 1853.]

PHOLAS DACTYLUS, *Linn.* Recent shells of this species, some of which were over five inches in length, were found in mud between Garston Point and the Salstone, accompanied by lumps of bored chalk, which were probably the remains of some cargo. One of the borings showed very distinctly that the action of the spines of the shell had played an important part in producing it. The sides of the hole were marked with a number of transverse furrows of varying length and depth, which were, as a rule, deep (perhaps $\frac{1}{10}$ inch) at one end and shelved off to nothing at the other. The furrows were only visible in the newer part of the boring, the old part being quite smooth. The shells themselves were in very good condition, the spines being prominent and sharp. This was probably due to the fact that they were boring in soft chalk, as those we get at Plymouth in the shale of Rum Bay are always much smaller (three inches long), the spines having been worn short and stumpy. It was found that only very slight pressure was necessary to make furrows in the chalk with the *Pholas* shells, similar to those seen in the borings themselves.

SAXICAVA RUGOSA (*Linn.*). Two specimens, attached to stones, etc., were taken in the dredge between the Salstone and the mouth of the harbour.

* By R. A. TODD.

THRACIA PHASEOLINA, *Lamarck*. One living specimen was found lying on the sand at Millbay.

SOLEN MARGINATUS, *Pulteney*. This species is characteristic of the sand and zosteria banks between Millbay and the Ferry House, being most abundant at the Millbay end in the sand. It burrows to a depth of eighteen inches or so, the hole being easily recognised by the shape of its aperture, which is oblong with a slight constriction in the middle. The animal is able to disappear down its hole much more quickly than *S. ensis*, owing probably to its shell being straight and not curved. When annoyed it frequently throws off its siphon in rings, the siphon splitting along the dark transverse bands which mark its surface.

SOLEN SILIQUA, *Linnaeus*. A few specimens only of this species were found in the sand at Millbay. The aperture of the hole is oval in shape.

SOLENS ENNIS, *Linnaeus*. A few shells only of this species were found. It seems to prefer a much coarser sand than *S. marginatus*, as the only place near Plymouth in which it occurs in abundance is a bank in the River Yealm, which consists of much coarser sand than that at Millbay, Salcombe. Although we have collected in the Yealm many times, so far we have only found one *S. marginatus*.

SOLENS PELLUCIDUS, *Pennant*. Several specimens of this small *Solen* were found lying on the surface of the sand at Millbay just after the tide had turned, having come out of their holes. One large one was obtained from the mud on the north-east of the Salstone. When placed in a dish of sea-water the small specimens became active at times, swimming or shooting about in search of a suitable place in which to burrow. The swimming was effected by means of the foot, which was protruded at the end of the shell, bent back over one of the valves to its fullest extent, and then suddenly straightened. The impetus received from the action was frequently sufficient to propel the *Solen* two or three inches. This movement was often repeated several times, after which the animal would attempt to burrow, again making use of its foot, which it straightened out, keeping it at the same time as thin as possible and forcing it into the sand. After entering the sand the end of the foot was first of all expanded, and then the whole foot contracted, the shell being thus drawn a little way beneath the surface. This action was repeated until the *Solen* had buried itself. When lying in sea-water on the bare glass it still tried to burrow in the same way, often making several attempts at one spot.

TELLINA INCARNATA, *Linnaeus*. Shells only were found.

TELLINA FABULA, *Gronovius*. A living specimen was found in the zosteria bank under the Marine Hotel, buried six or eight inches below the surface.

TELLINA SOLIDULA, *Pulteney*. Shells of this species were common on the mud near Kingsbridge. One or two living ones were found in the muddy gravel between the zosteria and shore, near Ditch End, buried three or four inches below the surface.

SYNDOSMYA ALBA (*Wood*). Several living specimens were dredged in the channel off Tosnos Point.

SCROBICULARIA PIPERATA (*Gmelin*). This species was not uncommon in the mud just to the south of Snape's Point, and also in the gravel to the north of Pilworthy Point. They appear to be gregarious in habit, four or five occurring together in a small patch of suitable gravel or mud. Single ones were found in the creek below the Rectory (Southpool Lake) in gravel, south-east of Pilworthy Point, and in the gravel under the Marine Hotel. At Plymouth I have found them only in the fine mud in St. John's Lake, a branch of the Hamoaze, where they are common, occurring a dozen or so in a patch of ground a yard square.

MACIRA SOLIDA, *Linnaeus*. Fairly common in the clean shell-gravel in the "Bag" off Snape's Point. Shells were very common in North and South Sand Bays. One or two specimens were obtained on the Bar. When dredging in the latter locality on October 2nd, 1896, large numbers of this species were obtained. [E. J. A.]

LUTRARIA ELLIPTICA, *Lamarck*. This bivalve was found most commonly on a sand and zosteria bank off Millbay, which was only uncovered at low water. It was also not uncommon on the sand and zosteria banks between Millbay and the Ferry House. Single specimens were found in the sand below Gazebo, in gravel on the south-east and in mud on the north-east shore of the Salstone. They were generally found buried a foot or more below the surface, their siphons being visible before the tide left them. When first uncovered by the tide the siphons were contracted, and the holes left by them generally filled up with sand, and it was not till nearly low-water that they were again extended to the surface. After making the aperture afresh the siphons were withdrawn two or three inches. The hole at the surface is usually oval in shape, although one was found almost exactly like that of *Solen marginatus* (see above).

One *Lutraria*, which we dredged in the channel of Salcombe Harbour, was being eaten by an *Octopus*, one valve of the shell being broken (? by the dredge). A *Lutraria* and an *Octopus* were trawled under similar circumstances in Cawsand Bay, Plymouth, on October 1st, 1900, but in this case both valves of the *Lutraria* were intact.

TAPES DECUSSATA (*Linnaeus*). Several living specimens were found in muddy gravel to the north of Pilworthy Point, and also in the bight below the Rectory (Southpool Lake). They were generally buried a few inches deep in the gravel.

TAPES PULLASTRA, *Wood*. This was by far the commonest bivalve on the Salstone, especially on the western shore. It was found lying on the surface of the muddy gravel, or buried to a depth of three or four inches. A few were found on the other grounds, but it was nowhere so common as on the Salstone.

VENUS STRIATULA, *Donovan*. Living specimens of this mollusc were found lying on the surface of the clean sand at Gazebo and Millbay.

VENUS FASCIATA, *Donovan*. One or two were found lying on the clean sand in Millbay. It is most commonly found on gravelly ground, such as one finds near Plymouth, one mile west of Stoke Point.

VENUS OVATA, *Pennant*. Only two specimens were taken—one with the cheese-cloth trawl on the zosteria of Salcombe estuary, and the other with the dredge between Snape's Point and the mouth of the harbour.

CARDIUM EDULE, *Linnaeus*. Was commonest on the Salstone, lying on or near the surface of the muddy gravel on the west and south-east shores, and of the fine mud on the north-east. It also occurred on several other grounds, especially in the Kingsbridge estuary.

CARDIUM NORVEGICUM, *Spengler*. Shell dredged in Salcombe Harbour.

LUCINA BOREALIS (*Linnaeus*). This species was found chiefly in the zosteria banks on the east side of the harbour between Millbay and the Ferry House, one or two only being found in the zosteria bank under the Marine Hotel. It was always buried six or eight inches deep.

LUCINA FLEXUOSA (*Montagu*). Not uncommon in the sand and zosteria banks between Millbay and Ferry House, buried several inches below the surface.

MONTACUTA FERRUGINOSA (*Montagu*). This species was always found commensal with *Echinocardium cordatum* in the clean sand at Millbay, and always in the same position, *i.e.* in a burrow opposite the post-anal impression of the *Echinocardium*. Each burrow contained from one to six *Montacuta* of all sizes, generally the latter number or thereabouts. The shells, especially near the umbonal regions, were coloured red by an incrusting reddish deposit, consisting of organic débris, which Gwyn Jeffreys thinks may be due to the fæces of the animal itself. It might also be due to the fæces of the *Echinocardium*. In the case of some specimens of *Echinocardium* which were obtained from the Yealm, one *Montacuta* was found adhering to one of the post-anal spines, in the same way as *M. substriata* attaches itself to the spines of *Spatangus purpureus*.

DIPLODONTA ROTUNDATA (*Montagu*). Shell dredged in Salcombe Harbour.

KELLIA SUBORBICULARIS (*Montagu*). Was often present in dredge material, generally in dead bivalve shells in which there was a deposit of mud.

LEPTON SQUAMOSUM (*Montagu*). Only shells of this species were found. Canon Norman records it from Salcombe as a commensal with *Gebia stellata* (*Ann. and Mag. Nat. Hist.*, March, 1891).

MODIOLA MODIOLUS (*Linnæus*). One living specimen was found on the western shore of the Salstone, half buried in the muddy gravel and attached to a stone by its byssus. Small *Modiolæ*, probably the young of this species, were not uncommon in dredge material, generally attached to stones and shells.

CRENELLA MARMORATA (*Forbes*). This species was common in dredge material, attached to or boring in the tests of Ascidiæ (*Ascidella*).

NUCULA NUCLEUS (*Linnæus*). Not uncommon in dredge material from the channel off Tosnos Point.

PINNA PECTINATA, *Linnæus*. One or two valves of this fine mollusc were found on the west shore of Salstone.

Montagu (*Testacea Britannica*, part. i. p. 181) speaks of the occurrence of this species at Salcombe as follows:—

“They lie on a gravelly bottom covered with mud and long seaweeds, and are only to be got at particular times when the sea recedes farther than usual.

“They stand upright, with the large end about an inch above the surface; the lower end fixed by a very large, strong byssus, so firmly attached to the gravel that much force is required to draw them up; and most commonly the byssus is left behind. This beard is composed of numerous, fine, silk-like fibres of a dark purplish brown, two or three inches in length. The larger end of the shell is naturally a little open, and cannot be closed by art, but the animal is capable of effecting it. The beaks of the valves rarely cover each other exactly.

“Some of these shells have been taken annually for many years, the animal having been accounted very good food, but they require at least five or six hours’ stewing to render them eatable. If this is properly attended to they are nearly as good as *Scallops*, but never so tender.

“The bank on which these shells are found probably increases, so that the water leaves a greater part bare, at every spring tide, than formerly; and in consequence they become an easy prey to crows and gulls. Few are now to be obtained but at some unusual low tide.

“We have taken them of all sizes, from one inch to one foot in length, and from their general habits cannot liken them to any of the Linnæan species. One of the largest, after the animal was taken out, weighed seventeen ounces. The animal is very disproportionate to the shell, not occupying one-half of it.”

PECTEN OPERCULARIS (*Linnæus*). A few living specimens were found on the Salstone. Common in dredge material.

PECTEN MAXIMUS (*Linnæus*). A few were taken in the dredge, but only half-grown. It was found not uncommonly at low tide on the zostera bank under the Marine Hotel, lying on the surface, and covered by the zostera. Scallop dredging is practised to a considerable extent in Salcombe Harbour during the winter months.

PECTEN VARIUS (*Linnæus*). Two dredged in the channel between Salstone and Snape's Point.

ANOMIA EPHIPIUM, *Linnæus*. Was found everywhere, especially in dredge material.

CHITON FASCICULARIS, *Linnæus*. Taken in the dredge between Salstone and Snape's Point.

CHITON ASELLUS, *Chemn.* Common in dredge material.

ACMÆA VIRGINEA (*Müll.*). Not uncommon in dredge material.

CALYPTRÆA SINENSIS (*Linn.*). This species was very common in dredge material, especially that from between Snape's Point and the Salstone, attached to stones, shells, etc.

FISSURELLA RETICULATA (*Donovan*). Fairly common in dredge stuff, especially off Tosnos Point, feeding on Ascidians, sponges, etc. One was taken on the Salstone feeding on an Ascidian.

EMARGINULA RETICULATA, *Sowerby*. One only was taken attached to a shell from the "Bag."

TROCHUS ZIZYPHINUS, *Linn.* Occasional specimens were met with everywhere. The shore records of this species, and also of *T. cinerarius* and *T. umbilicatus*, are rather incomplete.

TROCHUS MAGUS, *Linn.* Common in dredgings from between Salstone and the mouth of the harbour, excepting the shell-gravel in the "Bag." A few were found on the sand at Millbay. All the shells, excepting the young ones, were covered with Polyzoa, nullipore and algæ.

TROCHUS UMBILICATUS, *Montagu*. Not recorded from dredgings; probably ubiquitous at higher tidal levels as far as the shore was concerned, excepting on the fine mud, although not recorded.

TROCHUS CINERARIUS, *Linn.* Common in dredge material, and most probably at higher tidal levels everywhere on the shore, although only recorded from west shore of Salstone.

TROCHUS STRIATUS, *Linn.* Not uncommon in dredging from between Snape's Point and mouth of harbour, very common on the zostera under Marine Hotel.

LITTORINA LITTORALIS (*Linn.*) and *L. LITTOREA* (*Linn.*). The records of these two species are very incomplete. They are probably common everywhere on the shore, at higher tidal levels where there is any weed or stones.

RISSEA LABIOSA (*Montagu*). Was generally taken when working the cheese-cloth trawl on the zostera banks.

RISSOA ULVÆ (*Penn.*). This species was generally found in dredgings from the channel, and when working the cheese-cloth trawl on the *zostera* banks.

RISSOA PARVA (*Da Costa*). One specimen only was taken in the dredge, between Snape's Point and the mouth of the harbour.

PHASIANELLA PULLUS (*Linnaeus*). One dredged in channel between Snape's Point and Salstone.

TURRITELLA COMMUNIS, *Risso*. Shells of this species were common, especially in dredge material. The shells were almost always occupied by a Pagurid, and covered with sponges.

CERITHIUM RETICULATUM (*Da Costa*). One or two generally taken in the cheese-cloth trawl on the *zostera* banks.

SCALARIA COMMUNIS, *Lamarck*. Five specimens of this mollusc were taken on the Salstone, four from the south-east shore, and the other from the south-west.

CHEMNITZIA ELEGANTISSIMA (*Montagu*). This species was very common on the *zostera* south of Pilworthy Point.

ODOSTOMIA EULIMOIDES, *Hanley*. One taken in the dredge west of the Salstone.

LAMELLARIA PERSPICUA (*Linnaeus*). A few specimens were dredged between the Salstone and Snape's Point.

CERITHIOPSIS TUBERCULARE (*Montagu*). One in the dredgings from west of Salstone, and several from between Salstone and Snape's Point.

MUREX ERINACEUS, *Linn.* Several large specimens were dredged between Snape's Point and the mouth of the harbour, and one above Snape's Point.

PURPURA LAPILLUS (*Linn.*). The records of this species are very incomplete.

NASSA INCRASSATA (*Müll.*). Several specimens were taken by the dredge between the Salstone and Snape's Point, and a few between Snape's Point and the mouth.

NASSA RETICULATA (*Linn.*). This gasteropod was very commonly taken in a prawn-pot baited with fish, crab, octopus, etc., in four to five fathoms of water off Ditch End. It was also fairly common on the various shores, especially Salstone, although not recorded in the lists. A few were taken in the dredge.

BUCCINUM UNDATUM, *Linn.* One large whelk was found on the west shore of the Salstone. Young specimens were not uncommon in dredgings.

MANGELIA PURPUREA (*Montagu*). Shell only, taken between Snape's Point and the mouth of the harbour.

MANGELIA COSTATA (*Penn.*). A living specimen was dredged between Salstone and Snape's Point.

MANGELIA SEPTANGULARIS (*Montagu*). Shell only taken.

CYPRÆA EUROPÆA (*Montagu*). Fairly common in dredge material and on rough ground between tidemarks, *e.g.* Salstone, under the limekiln, etc.

BULLA HYDATIS, *Linn.* Fifteen living specimens of this mollusc were found on the muddy gravel on the western shore and on the clean gravel on the southern shore of the Salstone.

PHILINE APERTA (*Linn.*). Several specimens occurred in the dredgings between the Salstone and the mouth of the harbour, and some in dredging from the "Bag" off Snape's Point. On the shore it was taken with spawn on the zosteria bank between Millbay and the Ferry House.

APLYSIA PUNCTATA, *Cuvier*. This species, together with quantities of spawn, was found in great abundance on the zosteria banks between the Marine Hotel and Gazebo on our first visit to that locality (June 15th, 1900). On our subsequent visits, however, there were very few to be seen. A few were also found on other grounds, *i.e.* one on north-east mud, Salstone, and a few on the zosteria between Millbay and the Ferry House, and one on the rocks between Sandhill Point and South Sands Bay. It occurred fairly frequently in dredge material.

PLEUROBRANCHUS PLUMULA (*Montagu*). One specimen from the rocks between Gazebo and North Sands Bay.

ARCHIDORIS TUBERCULATA (*Cuvier*). Two specimens only were found on the south-east shore of Salstone.

LAMELLIDORIS BILAMELLATA (*Linn.*). One only was taken, in the dredge between Snape's Point and the mouth of the harbour.

GONIODORIS NODOSA (*Montagu*). A few only were taken, in the dredge between Salstone and the mouth of the harbour, excepting on the shell-gravel in the "Bag."

LOMANOTUS, *sp.* Three specimens were dredged between the Salstone and Snape's Point.

ÆOLIS PAPILOSA (*Linn.*). One was dredged between Snape's Point and the mouth of the harbour, and spawn found on the zosteria between Millbay and the Ferry House.

CRATENA AMÆNA (*A. and H.*) One dredged between Snape's Point and the mouth of the harbour.

ELYSIA VIRIDIS (*Montagu*). A few were dredged between Salstone and the mouth of the harbour, and one was taken with the cheese-cloth trawl on the zosteria between the Rectory and Ditch End.

OCTOPUS VULGARIS, *Lamarck*. Three specimens were found nested on the southern end of the Salstone (August 12th). They were also taken in the dredge, and with seine nets (tuck net) in Salcombe Harbour. For details as to the special abundance of octopus in the English Channel during the present summer, see Mr. Garstang's article on the subject in this number of the Journal, p. 260.

TUNICATA.

[Nomenclature: HERDMAN, *A Revised Classification of the Tunicata*, Journ. Linnean Soc. Zoology, xxiii.]

MOLGULA, sp. A few specimens were dredged between the Salstone and Snape's Point, and also on the shell-gravel of the "Bag" at the mouth of the Kingsbridge estuary.

STYELOPSIS GROSSULARIA (*van Beneden*). A few small specimens attached to shells, etc., were dredged in the channel west of the Salstone.

PHALLUSIA MAMMILLATA (*Cuvier*). A few specimens were found on the shore on both sides of the Salstone.

ASCIDIELLA ASPERSA (*O. F. Müller*). One of the commonest ascidians in the Salcombe estuary. It was found on the shore on the Salstone and on the zosteria banks at the north-east end of Salcombe Harbour. At the end of September, 1898, *A. aspersa* were extremely abundant on these banks, whereas during the present summer (1900) they were found only occasionally. On the zosteria banks the specimens were met with in clusters of two or three together lying on the surface of the bank, but not attached to it in any way. Many specimens were obtained by dredging in the Kingsbridge estuary, and it was also dredged, though in less abundance, in Salcombe Harbour.

ASCIDIELLA SCABRA (*O. F. Müller*). Common in dredge material from the Kingsbridge estuary, especially in the channel between Salstone and Snape's Point. Dredged also in Salcombe Harbour.

PEROPHORA LISTERI, *Wieg.* Growing on shells dredged from the channel west of the Salstone.

CLAVELINA LEPADIFORMIS, *O. F. Müller*. Very common on the shore on the west side of the Salstone, attached to stones, less common on the south-east side. It was also found on the rocks at the mouth of Salcombe Harbour.

BOTRYLLUS VIOLACEUS, *H. M.-Edw.* On stones and rocks at the mouth of Salcombe Harbour. It was scarce on the shore at Salstone, and was not found elsewhere in the estuary.

AMAROUCIUM NORDMANNI, *M.-Edw.* On the shore at the Salstone in company with *Morchellium argus*, but not plentiful. The specimens were recognised and identified by Mr. Garstang.

MORCHELLIUM ARGUS, *M.-Edw.* Very abundant on the harder parts of the shore in the Kingsbridge estuary, attached to stones and gravel. It was a striking feature of the fauna on the muddy gravel forming the south-east shore of the Salstone, and was plentiful on the western side also. In Salcombe Harbour it was occasionally met with on the zosteria banks, but became less frequent as the mouth of the harbour was

approached. It was abundant in dredgings from the channel in the Kingsbridge estuary, especially immediately west of the Salstone.

DIDEMNIDS. Specimens were dredged in the channel west of the Salstone, and also obtained on the western shore of the same island.

PISCES.*

[Nomenclature: DAY, *British Fishes.*]

COTTUS, sp. A specimen is recorded by Mr. Todd from the zosteræ south of Pilworthy Point. The specimen was not kept, so that the species is uncertain. Several were also obtained under the Marine Hotel.

GOBIUS PAGANELLUS, *Gmel. Linn.* Taken in zosteræ under the Marine Hotel and on the eastern side of Kingsbridge estuary.

GOBIUS RUTHENSFARRI, *Euphr.* Abundant in the zosteræ and along the shore at all points (under the Marine Hotel, Snape's Point, mouth of Southpool Lake, Salstone).

Goby larvæ, from 2.5 to 5.5 mm. in length, probably referable to this species, were taken abundantly in tow-nets between Snape's Point and Ditch End, August 7th to 12th.

APHIA PELLUCIDA, *Nardo.* One young specimen, 12 mm. in length, was taken in zosteræ under the Marine Hotel on July 14th. It resembles the adult female in general features, but is slightly more slender in form and still scaleless. For observations on the habits of this species in Plymouth Sound see this Journal, v. pp. 89 and 338.

CENTRONOTUS GUNNELLUS (*Linn.*). Mr. Todd found one specimen on the south end of the Salstone, in an empty *Buccinum* shell.

CALLIONYMUS LYRA, *Linn.* A young specimen, 12 mm. long, was taken on the zosteræ bed opposite Snape's Point on June 16th.

LABRUS MACULATUS, *Bl.* Four young specimens were taken in zosteræ under the Marine Hotel on July 14th. Three are about one inch in length (23 to 28 mm.); the fourth is much smaller, measuring only 11.3 mm. Even at this stage the species is readily distinguishable from its congeners by the fin-ray formula of the dorsal and anal fins, which for all four specimens was as follows:—

D. XX.—XXI; 10–11. A. III; 9–10.

The last two soft rays of each fin have been counted as one, in accordance with Günther's method. From *C. melops* of the same size the youngest specimen is also distinguishable by the uniform distribution of the chromatophores on the sides of its body, as far back as the hinder margin of the dorsal and anal fins, where they cease (cf. *Ct. rupestris*, Holt, Ann. Mus. Marseille, v., 1899, pl. 5, fig. 49).

CRENILABRUS MELOPS, *Linn.* Very young specimens, from 7.7 to 11.5 mm. in length, were taken in large numbers in the zosteræ under

* By W. GARSTANG and L. W. BYRNE.

the Marine Hotel on July 14th. A larger specimen, measuring 20 mm., was taken in zosteria at the mouth of Southpool Lake on August 8th. The species is distinguishable at all these stages from its allies, not only by its fin-ray formula, but also by the vertical stripes produced by the grouping of the chromatophores. The latter, in specimens below 12 mm. in length, do not extend behind the hinder margin of the dorsal and anal fins (cf. *Ct. rupestris*, Holt, Ann. Mus. Marseille, v., 1899, pl. 5, fig. 49), but are already grouped into four or five vertical bands, separated by intervals devoid of chromatophores. In the smaller specimens (8 to 10 mm.) the bands are less distinct than in the larger ones, but their incipient formation is indicated by the gaps visible here and there among the chromatophores. At first the gaps appear somewhat irregular, owing to their independent development along the uppermost and middle regions of the side; but at about 10 mm. the dorsal and mid-lateral gaps begin to coalesce in a vertical direction, and thus produce more definite interspaces between the bands. The latter are best defined, as a rule, near their dorsal ends. Each band, in specimens 8 to 11 mm. long, contains about four to five chromatophores in a line drawn across its breadth; but this number increases considerably as growth proceeds, since the bands in the largest specimen (20 mm.) contain from 12 to 20 chromatophores across. The number of fin-rays in the ten specimens counted fell within the formula—

D. XVI; 8-9. A. III; 9-10.

Only in the smallest specimen (below 8 mm.) was it impossible to determine the number of dorsal rays.

It should be added that these young wrasses below 12 mm. in length (whether *C. melops* or *L. maculatus*) still retain remnants of the larval fin membrane in the preanal region ventrally, and in front of the caudal fin both dorsally and ventrally.

CENTROLABRUS EXOLETUS, *Linn.* One young specimen, 36 mm. in length, was found in zosteria opposite the Marine Hotel, August 19th.

GASTEROSTEUS SPINACHIA, *Linn.* One specimen, south of Pilworthy Point.

SYNGNATHUS, sp. A young, recently liberated specimen was taken in a tow-net off Snape's Point, on August 13th.

NEROPHIS ÆQUOREUS, *Linn.* Under Marine Hotel.

ATHERINA PRESBYTER, *Jenyns.* Abundant along the wharves.

CLUPEA SPRATTUS, *Linn.* Four sprat larvæ, varying between 14.5 and 18.25 mm. in length, were taken in tow-nets at night between Snape's Point and Ditch End, August 7th to 13th.

Six young sprats, 29.5 to 34.8 mm. in length, were taken at the surface on July 16th in the harbour. They formed part of a shoal which was being pursued, according to the fisherman, by atherines.

APPENDIX.

NOTES ON THE SEINE AND TRAMMEL FISHING IN
SALCOMBE HARBOUR DURING 1900.

THE following tables have been compiled from information kindly placed at our disposal by Mr. J. Luskey Coad, of Salcombe. They provide a record of the results of each day's fishing during the season with a seine and a trammel-net inside the harbour. The seine hauls were made at various points in the estuary; the trammel net, on the other hand, was always shot just inside the harbour bar.

The season, as may be inferred from the tables, was not a very good one, the most notable catch being that of twenty bass, averaging $1\frac{1}{2}$ lb. weight, in the trammel on September 17th. Mr. Coad remarks that the trammels shot by other boats outside the harbour did well with red mullet. Later in the year (October) mackerel became exceptionally plentiful, many boats averaging one hundred each on the morning of October 17th. The first mackerel taken by Mr. Coad during the season was caught while whiffing off Gammon Head on the 9th of May.

Although the seine yielded a moderate number of plaice and flounders during August and September, we met with no evidence that the estuary is to any extent a nursery for young flatfish, the absence of which from the muddy foreshores was a marked feature.

In explanation of the term "Hud," which is once used in the first table, Mr. Coad adds that the creature is "an ink fish, similar to the squid, of a brownish green colour." He identifies it with the genus *Ommastrephes*, and states that the specimens caught this year averaged from about 6 to 12 inches in length. The squid (*Loligo*) caught this year varied between 3 and 14 inches in total length.

W. G.

I. SEINE-NET.

	JUNE 29	JULY			AUGUST				SEPTEMBER			Total.
		16,	27,	30	10,	13,	25,	28	7,	25,	28	
Bass	3	4	1	3	—	1	2	—	1	—	—	15
Red Mullet	—	—	2	—	—	—	8	1	—	—	6	17
Gurnards	—	—	—	—	—	—	—	—	2	—	2	4
Mackerel	—	—	—	—	—	—	—	—	—	—	1	1
Dory	—	—	1	3	8	3	6	—	4	3	1	29
Sand Smelt	Many	—	Many	—	—	—	—	—	25	—	25	Many
Grey Mullet	—	—	—	2	—	—	—	—	—	—	—	2
Conners and Wrasse* .	—	6	Many	—	Many	—	—	—	—	—	—	Many
Pollack	2	—	6	—	12	12	12	160	6	12	10	232
Plaice	—	3	4	5	10	18	12	3	1	3	4	63
Flounder	—	4	—	—	12	12	14	12	2	12	—	68
Sole	—	—	—	—	—	1	—	—	—	2	1	4
Lobster	—	—	2	—	—	—	1	1	—	—	—	4
Spider Crabs	—	—	—	—	—	—	—	—	2	—	—	2
Squid	—	—	—	—	—	—	—	—	2	—	—	2
Hud	—	—	—	—	—	—	—	—	1	—	—	1
Octopus	—	1	—	—	5	—	—	—	12	—	—	18
Total Fishes	5+?	17	14+	13	42+	47	54	176	41	32	50	

* *Crenilabrus melops* and *Labrus maculatus*.

II. TRAMMEL-NET.

	JULY				AUGUST								SEPTEMBER							Total.				
	4,	6,	7,	19, 20	7,	8,	9,	18,	19,	20,	21,	30,	31	1,	4,	5,	6,	17,	18,		19,	20,	21	
Bass	—	—	—	—	—	—	—	1	—	—	—	7	1	4	—	2	—	20	1	1	—	—	37	
Red Mullet	—	—	—	—	—	—	—	—	3	—	—	—	1	1	—	3	—	1	2	—	—	—	11	
Gurnard	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	
Mackerel	—	—	1	1	—	—	—	1	1	—	—	—	—	—	3	—	—	—	—	—	—	—	7	
Dory	—	—	1	2	—	—	4	7	1	3	1	—	2	2	1	5	—	—	2	—	—	—	31	
Grey Mullet	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	2	1	—	—	—	—	—	5	
Wrasse*	2	1	2	1	—	—	—	—	1	—	—	—	—	—	1	—	—	—	1	—	—	—	9	
Cod	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	
Pollack	1	1	1	2	—	—	2	1	1	—	2	—	—	—	2	1	—	—	—	—	—	—	14	
Pouting	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	
Rockling	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	
Brill	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	
Plaice	4	—	—	—	2	2	—	—	—	1	—	—	—	—	—	—	2	—	—	4	2	—	17	
Flounder	1	—	—	—	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	
Sole	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	2	1	3	1	9	
Peal	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	
Ray	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	2	5	
Lobster	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	
Crab	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	
Spider Crab	M	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	Many	
Total Fishes	9	5	5	4	4	2	7	6	10	4	8	3	7	4	5	6	15	7	23	5	5	9	6	

* *Labrus maculatus* alone.

**The Amphinomidæ, Aphroditidæ, Polynoidæ, and
Sigalionidæ of Plymouth and the
English Channel.**

By

T. V. Hodgson.

HAVING attempted to investigate the Polychæte fauna of the Plymouth district during those favourable opportunities which have occurred during the past three years, I now put upon record some few notes respecting a small section of this interesting but extremely perplexing group.

The section under consideration is that treated of by McIntosh in his recently published Monograph (20). I have taken advantage of that work to compile a synoptical table of the British species belonging to those genera which are represented in the English Channel.

The attention that I have been able to give to these Polychætes has not been what I could have wished, nor has it been anything like adequate to exhaust the local species. I might therefore publish a very incomplete list, or, by bringing into a compact form the records of those species known to occur in the Channel in addition to a synoptical table, I might be able to assist some future worker. I have adopted the latter alternative. The synopsis has been difficult to prepare, and that difficulty has not been diminished by a complete ignorance of many of the species included. Many are known only from single or even mutilated specimens which have been obtained from the stomachs of fishes.

One is rarely satisfied with definitions, generic or specific, and this dissatisfaction becomes the more pronounced when comparisons have to be made. In adopting the classification of McIntosh an awkward situation presents itself. The genus Polynoë, after undergoing numerous fluctuations, has, for the time at least, been divided into a number of small but closely related genera. There are nine of these included in the British fauna, distinguished by the possession of fifteen elytra. De St. Joseph, in his *Annélides Polychètes des côtes de Dinard*, unites four of these genera with others; thus Harmothoë, Eunoa, Evarne, and Antinoë are included in the single genus Harmothoë. I have allowed the four new species described by that author to remain in the genus Harmothoë without attempting to reduce them to the smaller genera of McIntosh, it being, in a paper of this kind, a matter of small

importance. In dividing the genus *Harmothoe* into three sections, I have relied largely upon the accuracy of McIntosh's drawings.

In the following synopsis the family and generic descriptions are copied from McIntosh (20), with a slight alteration of terminology and omission of all points relating to internal anatomy.

The local area included in the scope of this paper is the entire south coast of Devon and Cornwall. The field thus defined is a large one, and has not by any means been exhaustively worked. The central area in the immediate vicinity of Plymouth is best known, and as the operations of the Marine Biological Association extend east and west, so the more likely and productive spots will be first visited, and the intervening areas will receive attention in due course. The varied character of the shores round Plymouth renders it a particularly rich spot for Polychætes. Extensive mud-flats occur in all the rivers, and the shore in the Sound possesses numerous areas strewn with fucoid-covered boulders and stones, with or without muddy sand, in large patches. These form productive grounds for numerous species, the richest and best of which are Drake's Island, Rum Bay, the Bridge, and Bovisand Bay.

Below tidal water Millbay Channel is, perhaps, the richest field. The bottom there is covered with stones of varied character, rough and smooth, usually bored by *Saxicava* and other boring animals. These form the home of numerous hydroids, sponges, etc.

Queen's Ground and Duke Rock are cleaner and yield irregular clinkers from the ocean steamers, with shell detritus, all of which are more or less covered with hydroids, polyzoa, and algæ, etc.

Outside the Sound, Wembury Bay is a favourite ground, and exhibits every phase, from huge fucoid-covered boulders, stones, to muddy sand and fine sand; and though its area is not particularly large, its varied character renders it exceptionally productive.

The varied character of the bottom offshore has been indicated in a remarkably precise manner by Allen, in his paper "On the Fauna and Bottom-Deposits near the Thirty-Fathom Line from the Eddystone Grounds to Start Point."

The fauna of Salcombe Harbour has recently been investigated by Mr. Allen and Mr. Todd with interesting results as regards Polychætes, and I am indebted to them for the opportunity of including those species here, and further to the latter gentleman for giving me other notes, which are distinguished by his initials.

Throughout the paper I have marked with an asterisk (*) all those species which are known to occur in the local area as already defined. All those forms occurring elsewhere in the Channel are distinguished by a dagger (†).

FAMILIES.

AMPHINOMIDÆ.

Body elongate, or more or less ovoid.

Parapodia much modified, the neuro and notopodia widely separated, the latter merged in the dorsum and provided with chætæ, branchiæ, and cirri.

APHRODITIDÆ.

Body comparatively large, ovate or oblong.

Chætæ very strong. Parapodia bearing fifteen elytra, which are sometimes concealed by a dense felt.

POLYNOIDÆ.

Body more or less elongate, usually comparatively broad, more or less concealed by a variable number of elytra.

Prostomium, with four sessile eyes and three tentacles.

ACOETIDÆ.

Body elongate, partially concealed by numerous elytra.

Prostomium, with pedunculate eyes and three tentacles.

SIGALIONIDÆ.

Body elongate, concealed by numerous elytra, which are accompanied by a cirriform gill. Ctenidia on all parapodia.

FAMILY **AMPHINOMIDÆ.**

Prostomium rounded or compressed. A median and two lateral tentacles, though the latter may be absent, an elongated dorsal caruncle, and four eyes.

Body elongate, oblong or ovate oblong, feet with the noto and neuropodia widely separated and furnished with cirri.

Mouth removed from the tip of the snout ventrally, with modified segments laterally; protrusible proboscis devoid of jaws.

Parapodia peculiarly modified, the notopodium being extended and merged into the dorsum, but with chætæ, branchiæ, and cirri.

Chætæ brittle, calcareous, and tubular, with gelatinous contents; rarely hook-like spines.

Buccal apparatus and proboscis large and complex.

Anus dorsal, with two posterior appendages.

SUB-FAMILY I. AMPHINOMINA.

Body elongate. A median and two lateral tentacles. Noto and neuropodia widely separated.

GENUS PARAMPHINOME.

Prostomium small. No caruncle, no eyes. Five tentacles.

Branchiæ on anterior segments only.

GENUS EURYTHOË.

Prostomium large. A caruncle, four eyes, dorsal. A median and two lateral tentacles.

Branchiæ from the third segment backward.

SUB-FAMILY II. EUPHROSYNINA.

Body oblong or ovate oblong: A median tentacle, a trilobed caruncle.

GENUS SPINTHER.

Prostomium merged into general contour of body. Eyes four, at base of tentacle.

No branchiæ.

GENUS EUPHROSYNE.

Prostomium narrow. Eyes four, two dorsal and two ventral.

Notopodium merged into the dorsum and provided with several arborescent branchiæ, and two or three dorsal cirri on each side.

GENUS EURYTHOË, *Kinberg*.

Body elongated, with flattened rectangular segments.

Prostomium large, rounded or pentagonal. Eyes four, dorsal.

A median and two lateral tentacles. Caruncle trilobed.

Palpi forming two adnate lobes inferiorly in front of the mouth, each with a tentacular process or stylode.

Dorsal cirrus single. Chætæ of the notopodium linear, sub-articulate; others sub-bifid, with a serrate limb and a short process. Neuropodial chætæ bifid.

Branchiæ from the third segment backward.

†EURYTHOË BOREALIS, *Sars*.

GENUS EUPHROSYNE, *Savigny*.

Body generally short, oblong, equally narrowed at either end.

Segments not numerous, two thick styles posteriorly.

Prostomium narrow, frontal part narrowest, a band passing downward to the inferior ridge. Eyes both on the dorsal and ventral surfaces. One median tentacle situated in front of eyes. Lateral tentacles two, very short, springing in front of the inferior eyes.

Fascicles of chætæ arranged on each side of the segments. Notopodial chætæ forming a transverse row, no barbs. Neuropodial chætæ grouped in a broad pencil. Capillary chætæ unequally bifurcate. Dorsal cirri two (or three, Ehlers) on each side, one at the inner border of the fascicle, the other at the outer margin. Ventral cirri single.

Branchiæ dorsal, in rows, and more or less ramose.

Palpi forming fixed lobes on each side of the mouth.

Mouth opening on the ventral surface and extending over several segments.

Buccal apparatus complex.

* *E. FOLIOSA*, *Aud. et Edw.* Size nearly 1 inch.

Branchiæ with ovate expansions at the tips.

E. ARMADILLO, *Sars.* Size $\frac{1}{3}$ inch.

Branchiæ with lanceolate tips.

E. ROBERTSONI, *McIntosh.* Size $\frac{1}{2}$ inch.

Branchiæ with digitate tips, only a trace of a swelling.

† *E. INTERMEDIA*, *St. Joseph.*

As *E. foliosa*, with a bundle of chætæ between noto and neuropodia.

FAMILY APHRODITIDÆ.

Annelids of an ovate or oblong form, convex dorsally, with a distinct prostomium, on which are a pair of eyes and a median tentacle, and under which is a papillose facial tubercle.

No lateral tentacles, two palpi. Tentacular cirri long, buccal cirri (ventral cirri of the second foot) moderately long.

Proboscis long and powerful, with four muscular ridges representing teeth, and a tough internal lining.

Dorsal fimbriæ small, alternating with the elytra, or absent.

First foot bearing three dense tufts of bristles.

Elytra, fifteen pairs occurring on segments 2, 4, 5, 7, 9, . . . 25, 28, 31.

Segmental organs (nephridia) opening by well-marked papillæ pointing upwards between the feet.

APHRODITA, *Linn.*

Elytra concealed by a close felt of simple hairs.

Eyes sessile. All chætæ simple.

LÆTMATONICE, *Kinberg.*

Elytra concealed by a close felt of simple hairs.

Eyes on short peduncles.

Chætæ of the elytra-bearing feet glochidiate.

HERMIONE, *Blainville.*

No dorsal felt. Eyes pedunculate.

Elytra alternating with dorsal cirri.

Chætæ simple, glochidiate, and bidentate.

GENUS APHRODITA, *Linnaeus*.

Eyes sessile.

Dorsum covered with a thick, close felt of massive, simple hair.

Chætæ of the neuropodium long, silky, and iridescent, and like all other chætæ, simple, not barbed or toothed.

*APHRODITA ACULEATA, *Linn.*

GENUS †LÆTMATONICE, *Kinberg*.

Eyes on short peduncles placed near the anterior border of the head.

Dorsum covered with felt.

Spines of the elytra-bearing feet glochidiate, other segments with lateral bundles of stout bristles and a tuft of hair-like chætæ.

Chætæ of the neuropodium semi-pinnate.

Segmental organs (nephridia) opening externally by papillæ directed upwards between the parapodia.

†L. FILICORNIS, *Kinberg*.

Prostomium tripartite.

Glochidiate chætæ with three or four teeth.

L. PRODUCTA, *var. Britannica, McIntosh*.

Prostomium triangular. Ocular peduncles present, but no eyes.

No dorsal felt. ‡

Glochidiate chætæ with four recurved fangs, besides the process at the base of the terminal spear-tip.

GENUS HERMIONE, *Blainville*.

Prostomium, with a single tentacle and two palps.

Peristomium bears chætæ and two long cirri.

Pedunculated eyes fixed to the margin of the prostomium.

Maxillæ absent or small.

No dorsal felt. Elytra alternating with dorsal cirri.

Neuro and notopodial divisions of the feet distinct.

Elytra-bearing feet with glochidiate dorsal spines and a tuft of strong chætæ over the elytra. Neuropodial chætæ bidentate.

Segmental papillæ from the eighth to the twenty-ninth foot.

*HERMIONE HYSTRIX, *Savigny*. Size to 2¼ inches.

FAMILY POLYNOIDÆ.

Body more or less elongate.

No facial tubercle, convex prostomium; the base of the tentacle arising from the middle anteriorly. Two lateral tentacles, four eyes, palpi elongate.

‡ This is a divergence from the generic distinction.

Peristomium bearing the first foot with long dorsal and ventral cirri, and the ventral cirrus of the next segment long.

Pharynx exsertile, muscular, cylindrical, with papillæ round the margin; horny jaws.

Parapodia, first foot bearing only a few minute chætæ, conforming to the dorsal type.

Elytra, twelve to thirty-five or more; segments carrying these devoid of cirri.

Segmental organs opening ventrally on papillæ near the bases of the feet. Dorsal chætæ with more or less tapered simple tips, ventral chætæ with simple or bifid hooked tips.

Development by trochophores.

SYNOPSIS OF GENERA.

Twelve elytra.

LEPIDONOTUS, *Leach.*

Prostomium produced into the bases of the tentacles.

Fifteen elytra, covering the body entirely.

Prostomium produced into the bases of the tentacles.

MALMGRENIA, *McIntosh.*

Tentacles, palps, and cirri smooth.

Eyes large, lateral, nearly forming a square.

Lateral tentacles arise underneath the base of the median.

GATTYANA, *McIntosh.*

Tentacles and cirri densely covered with long cilia.

Elytra smooth to the naked eye, posterior and external margin with long cilia, segmental papillæ long.

HARMOTHOE, *Kinberg, char. em.*

Posterior, pair of eyes, dorsal, anterior ventral, or on the extreme margin. Not always visible from the dorsum.

Segmental papillæ long.

Dorsal chætæ, well-marked spinous rows, smooth tips.

Ventral chætæ, simple-hooked tips, superiorly and inferiorly, median bifid.

ANTINOË, *Kinberg.*

Eyes as in Harmothoë.

Elytra, surface spinous, margin with short cilia.

Dorsal chætæ, long and tapering, well-marked spinous rows.

Ventral chætæ, long and slender, with elongated spinous regions and hair-like tips.

EUNOA, *Malmgren*.

Eyes postero-lateral or lateral.

Elytra, surface tuberculate, margin ciliate.

Dorsal chætæ, minutely spinulous, tip pointed and bare.

Ventral chætæ somewhat longer, tip smooth, hooked, spinous rows large.

EVARNE, *Malmgren*.

Eyes large, close together, postero-lateral in position.

Dorsal chætæ shorter than ventral, spinous rows large.

Ventral chætæ very long, with minutely bifid tips.

PHYLLANTINOË.

Cephalic appendages and elytra unknown.

Prostomium short and broad, median tentacle arising far backwards between the lobes. Eyes postero-lateral.

Fifteen elytra, not completely covering the body. About 40 segments.

LAGISCA, *Malmgren*.

Body narrow and attenuate posteriorly.

Last 9-12 segments not covered by elytra.

SCALISETOSUS, *McIntosh*.

Elytra cover dorsum in front, but leave it uncovered posteriorly.

Translucent.

Fifteen elytra, on anterior part of body only. About 100 segments.

POLYNOË, *Savigny*.

Palps, with dense rows of clavate papillæ.

Elytra, with broad belt of papillæ on anterior surface.

ENIPO, *Malmgren*.

Palps and tentacles smooth.

Elytra smooth, subcircular.

Eighteen elytra.

ACANTHICOLEPIS, *Norman MS*.

Elytra coarsely spinous, covering dorsum entirely.

Prostomium cleft to form two pointed lobes.

Tentacles and cirri ciliate.

HALOSYDNA.

Elytra large, soft, with frilled outer border.

Prostomium continuous, with tentacles; these and palps smooth.

Nuchal collar with prominent flaps.

Numerous elytra. On segments 1, 3, 4, 6, . . . 25, 28 *et seq.* to end of body.

ACHOLOË, *Claparède*.

Elytra entirely covering the body.

A T-shaped branchial process on the cirriferous parapodia.

LEPIDASTHENIA, *Malmgren*.

Elytra not covering the body, except in very young specimens.

Notopodium rudimentary.

GENUS *LEPIDONOTUS*, *Leach*.

Body short, more or less linear. Anterior part of prostomium produced into the bases of the median and lateral tentacles. Palpi smooth or with papillæ in five longitudinal rows. Elytra, twelve pairs, covering the dorsum entirely and occurring on segments 1, 3, 4, 6, 8 *et seq.* alternately.

**L. SQUAMATUS*, *Linn.* Size about 1 inch or more.

Elytra entirely covering the body, conspicuously ciliate on outer and posterior margin.

**L. CLAVA*, *Mont.* Size 2 inches or more.

Elytra not covering the body, except in young specimens; to the unassisted eye not ciliate.

GENUS *MALMGRENIA*, *McIntosh*.

Head somewhat pyriform, with the narrow end in front, † the median and lateral tentacles springing from the front, as in *Lepidonotus*. Eyes large, nearly forming a square.

Palpi, tentacles, and cirri smooth.

Segmental eminences fairly developed, but without papillæ.

Elytra, fifteen pairs, smooth, with the exception of a small group of papillæ at the anterior curve.

Dorsal chætæ translucent, short, and with faint spinous rows.

Ventral chætæ translucent, with rather short distal regions, and five rows of spines. The tip hooked, and a secondary process beneath.

**M. CASTANEA*, *McIntosh*. Size $\frac{3}{4}$ inch.

Elytra smooth. Reniform examples, with a small and somewhat triangular group of papillæ near anterior curve.

Variably bordered with madder-brown.

M. ANDREAPOLIS, *McIntosh*. Size 1 inch or more.

Elytra smooth. Reniform examples, with a belt of microscopic papillæ along anterior border. A brown ring, more or less complete, on the anterior, and after the sixth and seventh becoming a V-shaped mark with a spot.

† *McIntosh's* figures do not indicate this.

GENUS GATTYANA, *McIntosh*.

Lateral tentacles arising below the base of the median, they and the cirri densely covered with long cilia. Palpi, with numerous short clavate papillæ truncate at the tip.

Elytra, fifteen pairs, minutely spinous, covering all the dorsum and attached to segments 1, 3, 4, 6, 22-5 *et seq.*

This genus has only recently been instituted by McIntosh on the ground of priority, the better-known name of *Nychia* being already appropriated.

*GATTYANA CIRROSA, *Pallas*. Size nearly 2 inches.

GENUS HARMOTHOË.

Body not much elongated.

Lateral tentacles fixed below the median.

Palpi, with rows of minute truncate papillæ.

Eyes four, two on the lobes in front, the two posterior on the dorsum in front of the collar.

Elytra, fifteen pair, covering the whole of the dorsum.

Segmental papillæ long. Papillæ of proboscis $\frac{9}{8}$.

1. Lateral tentacles distinctly shorter than the prostomium.

(a) Posterior eyes not in contact with nuchal border.

Four eyes, visible from the dorsum.

*H. MARPHYSÆ, *McIntosh*. Size about $\frac{3}{4}$ inch.

Prostomium deeply cleft, lobes somewhat rounded. Eyes small.

Elytra rather thin, smooth, and pellucid. A belt of small papillæ (spines) in front of scar.

†H. MAXILLOSPINOSA, *St. Joseph*. Size nearly $\frac{3}{4}$ inch.

Prostomium, with small, narrow cleft.

Median tentacle on a very broad base.

Jaws bristling with chitinous spines.

Two eyes, visible from the dorsum.

H. ANTILOPIS, *McIntosh*. Size nearly 1 inch.

Prostomium somewhat deeply cleft, lobes subconical.

Elytra having long cilia on the outer border.

†H. PICTA, *St. Joseph*. Size 1 inch.

Prostomial cleft widely V-shaped.

Three tentacles, papillose, subulate, on stout dark brown bases.

(b) Posterior eyes in contact with nuchal border.

H. ZETLANDICA, *McIntosh*. Size about $\frac{1}{2}$ inch.

Prostomial cleft broad, not very deep.

Elytra, with a few minute papillæ, though apparently smooth.

†H. LJUNGMANI, *Malmgren*. Size $\frac{1}{2}$ inch or little more.

Prostomial cleft deep, not very broad.

Elytra fairly uniformly papillose, a very few minute cilia on margin.

2. Lateral tentacles about the length of the prostomium.

Four eyes, visible from the dorsum.

*H. LUNULATA, *Delle Chiaje*. Size about $\frac{3}{4}$ inch.

Prostomium deeply cleft, lobes somewhat rounded.

Elytra finely veined, margin smooth, a cluster of fine spines in front of scar.

*H. SPINIFERA. Size nearly 1 inch.

Prostomium elongate, deeply cleft, lobes subconical.

Elytra, the first light-coloured, the second nearly black, the remainder becoming lighter. Spinose near the outer border, where a few clavate cilia exist.

*H. SETOSISSIMA, *Savigny*. Size to $1\frac{3}{4}$ inches.

Prostomium broad, somewhat deeply cleft, lobes rounded.

Elytra densely covered with minute papillæ, a few clavate cilia on outer border.

*H. AREOLATA, *Grube*. Size $\frac{3}{4}$ inch.

Prostomial cleft somewhat deep, wide, a slightly curved V-shape.

Elytra leathery, marked in irregular polygonal areas.

Posterior and outer margin with long cilia.

†H. CÆLIACA, *St. Joseph*. Nearly $\frac{3}{4}$ inch.

Prostomium broad. Tentacles and cirri with long tapering papillæ.

Eyes postero-lateral.

†H. ARENICOLÆ, *St. Joseph*. Size 1 inch.

Prostomium nearly quadrangular, the anterior border with small semicircular depression in the centre.

Three tentacles finely papillose, subulate.

3. Lateral tentacles distinctly longer than the prostomium.

H. FRAZER-THOMSONI, *McIntosh*.

Four eyes, visible from the dorsum.

Elytra, margin smooth.

*H. IMBRICATA, *Linn*. Size to 2 inches.

Posterior eyes, only visible from the dorsum.

Elytra, margin with small clavate cilia.

† *H. RETICULATA*, *Claparède*. Size nearly 1 inch.
Elytra marked with black spots, margin richly ciliate.
Median tentacle $2\frac{1}{2}$ times the length of the lateral.

H. HALIAËTI, *McIntosh*.
No perfect specimen known.

† *H. TORQUATA*, *Claparède*. Size $\frac{1}{2}$ inch.
Sixteen elytra. Margin smooth, except the first four.

† *H. SARNIENSIS*, *Lankester*. Size to 2 inches.
Twenty elytra. Lateral tentacles as long as prostomium, median tentacle three times as long.

GENUS *EUNOA*, *Malmgren*.

Lateral tentacles arising under the median, below and slightly internal to the peaks of the head. Palpi, with six rows of short cilia. Eyes large, visible from the dorsum.

Elytra, fifteen pairs, occurring on segments 1, 3, 4, 6, . . . 22, 25, etc.
External aperture of the segmental organs indicated by blackish pigment. No papillæ. †

* *E. NODOSA*, *Malmgren*. Size $2\frac{1}{4}$ inches.
Prostomium cleft to half its length.
Eyes four, large, lateral, the anterior about the level of a median transverse line.

E. TRITONI, *McIntosh*. Size nearly $1\frac{1}{2}$ inches.
Prostomium cleft to form two minute lobes.
Eyes four, moderate size, equal, the four median as regards length.

GENUS *EVARNE*, *Malmgren*.

Body rather small, ovate oblong, attenuate posteriorly.
Lateral tentacles fixed under the median, prostomium deeply incised in front, and with prominent lateral peaks.
Eyes four, generally large, the anterior pair on the projecting lateral region, the posterior in front of the nuchal collar and widely separated.

Palpi densely covered with minute papillæ.
Elytra, fifteen pair, spinulose, ciliated or smooth at the edge.
Dorsal bristles shorter than the ventral, and with wide rows of spines; ventral bristles very long, with minutely bifid tips.
Segmental papillæ well marked, but not long.

* *E. IMPAR*, *Johnston*. Size 1 inch.
Elytra, with densely ciliated margin. More posterior portion papillose, often increasing to spines, and on the border large pyriform or globular papillæ.

† Segmental papillæ are described by McIntosh for both the species assigned to this genus.

- E. JOHNSTONI, *McIntosh*. Size nearly $\frac{1}{2}$ inch.
 Elytra, margin with few long and somewhat fusiform cilia.
 Surface, with rather large conical horny papillæ, often with blunt spinous tips.
- E. HUBRECHTI, *McIntosh*. Size $\frac{1}{2}$ inch and over.
 Elytra thin but tough, margin smooth, surface minutely granular under a lens.
- E. ATLANTICA, *McIntosh*.
 Elytra unknown.
 Specimen imperfect, resembling *E. impar*.
- E. PENTACTÆ, *Giard*.
 Elytra resembling *E. impar*. Median tentacle only half as long again as lateral. Two dark bands on tentacular cirri.

GENUS LAGISCA.

- Body rather narrow, attenuate posteriorly.
 Prostomium cleft. Lateral tentacles attached below the median.
 Eyes four, lateral, two just in front of a median transverse line, two in front of the nuchal border.
 Elytra fifteen, covering the dorsum except the last few.
 Notopodial chætæ, with acute tips and finely serrated.
 Neuropodial chætæ, simple superiorly and inferiorly, rest bidentate, the rest with long spinous rows.
 Papillæ of proboscis $\frac{3}{4}$. ‡
 Nephridial papillæ beginning as a minute process on the fifth foot and extending nearly to the last. Much smaller than in *Harmothoë*.
- *L. FLOCCOSA, *Savigny*. Size about $1\frac{1}{2}$ inches.
 Prostomium deeply cleft.
 Elytra, most of the surface minutely and densely spinulose, and soft globular papillæ near posterior margin. Outer margin with a few short slender cilia.
- L. ELIZABETHÆ, *McIntosh*. Size $\frac{1}{2}$ inch, or rather more.
 Prostomium, with shallow crescentic depression separating lobes.
 Elytra resembling those of *L. floccosa*, but with external margin richly provided with long clavate cilia, which become reduced posteriorly.
- L. JEFFREYSII, *McIntosh*. Size nearly $\frac{3}{4}$ inch.
 Prostomium somewhat deeply but narrowly cleft.
 Elytra, most of the surface minutely and densely spinulose.
 External margin with long filiform cilia.

‡ *McIntosh* figures $\frac{3}{4}$ papillæ for the proboscis of *L. floccosa*.

- **L. EXTENUATA*, *Grube*. Size $1\frac{1}{4}$ inches.
 Prostomium somewhat deeply cleft.
 Elytra, most of the surface minutely and densely spinulose.
 External margin richly provided with long pellucid cilia.
- **L. RARISPINA*, *Malmgren*. Size $1\frac{1}{2}$ inches.
 Closely resembling *L. floccosa*. Spines on elytra larger.
 Two curved chætæ arise dorsally from the base of the tentacular cirri.

GENUS SCALISETOSUS, *McIntosh*.

- Anterior border of the head smoothly rounded.
 Eyes placed close together on each side, while the right and left pairs are widely separated and placed far back.
 Palpi smooth. Proboscis somewhat thin.
 Body of moderate length. Scales cover the dorsum in front, but leave the centre bare posteriorly.
 Segmental eminence distinct, but papillæ small.
 Chætæ transparent as crystal; dorsal slightly curved, and with from five to eight very distinct rows of spines. Ventral bristles slender, elongate, with close spinous rows, and hooked and bifid tip.
- †*S. COMMUNIS*, *Delle Chiaje*. Size $\frac{3}{4}$ inch.
 Median and lateral tentacles long, with numerous short clavate cilia.
- **S. ASSIMILIS*, *McIntosh*. Size $\frac{3}{4}$ inch.
 Median tentacle long, lateral short; all smooth.
 A blackish brown median band down the back.
- †*S. ECHINI*, *Giard*. Size $1\frac{1}{4}$ inch.
 Resembling *S. assimilis*. An irregular band of green down the back.

GENUS POLYNOË, *Savigny*.

- Head elongated antero-posteriorly, with a somewhat indistinct peak on each side, beneath which is the lateral tentacle.
 Anterior and posterior eyes widely separated.
 Palpi, with dense rows of clavate papillæ.
 Body linear elongate, with many segments.
 Segmental papillæ long.
 Elytra, fifteen pairs, with a broad belt of papillæ on the surface anteriorly.
 Notopodium minute, with small spinous chætæ truncated at the tip.
 Neuropodium has a single, strong, hastate chæta superiorly, and below, strong bifid chætæ with short spinous regions.
- **POLYNOË SCOLOPENDRINA*, *Savigny*. Size to 5 inches.

GENUS HALOSYDNA, *Kinberg.*

Body linear oblong; head continuous anteriorly with the bases of the median and lateral tentacles.

Eyes large. Palpi smooth. Nuchal collar with a prominent flap.

Segmental eminences distinct and the papillæ long.

Proboscis, with twenty-two frilled papillæ along each border.

Elytra, eighteen pairs, large, soft, and with a frilled outer border, not covering the dorsum.

Notopodium minute, with slender, simple, and finely spinous chætæ.

Neuropodium rather long, with numerous somewhat slender chætæ with tips of varying breadths.

*HALOSYDNA GELATINOSA, *M. Sars.* Size to 3½ inches.

GENUS ACHOLOË, *Delle Chiaje.*

Head elongated from before backward and running into the bases of the tentacles.

No peaks. Four large, equidistant eyes. Palpi smooth and short.

Body sublinear, flattened; segments numerous.

A segmental eminence, but no distinct papilla.

Cirri on every foot, and a T-shaped branchial process.

Elytra numerous.

Parapodia short, notopodium minute, chætæ few and small, with a minute hook at the tip. Neuropodium bearing chætæ with long and strong shafts and short spinous regions having a sharp hook at the tip.

*ACHOLOË ASTERICOLA, *Delle Chiaje.* Size to 2 inches or more.

GENUS LEPIDASTHENIA, *Malmgren.*

Corpus elongatum, sublineare depressum.

Oculi 4, utrinque bini approximati, laterales, par anterius in vel pone medium lobi cephalici.

Antennæ una cum tentaculo e parte anteriore lobi cephalici productæ.

Elytra minuta posteriora versus magnitudine decrescentia, maximam partem dorsi nudam relinquuntia, in segmentis pedibus instructis 1, 3, 4, 6, 8, . . . 20, 22, 25, 28, . . . 79-82 obvia.

Ramus superior pedis perminutus acicula sola præditus, setis omnino carens. Setæ rami inferioris infra apicem subrectum bidentatum, dentibus subrectis, paullo dilatatæ serrulatæ; 1 l. 2 superiorum ceteris plerumque duplo validiores et crassiores apice integro, margine altero vero dentibus paucis serrato.

Cirri anales 2 breves pone anam dorsualem. [*Malmgren.*]

*LEPIDASTHENIA ARGUS, *sp. nov.* Size to 8 inches (see p. 250).

FAMILY SIGALIONIDÆ.

Prostomium rounded, often with a nuchal collar posteriorly.

No facial tubercle. Median tentacle, when present, generally long, produced from the median part of the prostomium and with ctenidia at the sides of the base (ceratophore).

Lateral tentacles fused with the base of the tentacular cirri, the tips only emerging.

Eyes four, occasionally only two, or absent.

Palpi long, attenuate, and smooth, with buccal ctenidia at the bases.

Body long and narrow.

Pharynx, with $\frac{9}{11}$, $\frac{11}{11}$, $\frac{13}{13}$ papillæ and teeth.

First pair of feet carried in front of the head.

Notopodial chætæ spinous and tapering.

Neuropodial chætæ compound, the terminal region being often long, multiarticulate, and bifid.

Ctenidia on all the feet.

Elytra and cirriform gills alternate in the anterior segments up to the twenty-sixth; those of the middle and posterior part furnished with both elytra and cirriform gills.

STHENELAIS, *Kinberg.*

Elytra partly fringed with a variable number of minute papillæ, entirely covering the dorsum.

EUSTHENELAIS, *McIntosh.*

Elytra unknown. Known only from a fragment.

SIGALION, *Aud. et Edw.*

Elytra partly fringed with pinnate processes, or with long papillæ arising from an axis; entirely covering the dorsum.

LEANIRA, *Kinberg.*

Elytra not covering the dorsum anteriorly, smooth in outline and surface.

A median and two lateral tentacles.

PHOLOË, *Johnston.*

Elytra partly fringed with long cilia with moniliform tips. Median portion of dorsum exposed.

A median tentacle only. Two pair of eyes.

GENUS STHENELAIS.

Prostomium rounded anteriorly, with a nuchal collar posteriorly in the preparations.

A pair of ctenidia at the base (ceratophore) of the median tentacles. Lateral tentacles fused with the first foot; tentacular cirri more or less separate.

Palpi long, subulate and smooth, springing from the ventral surface of the prostomium, but fusing with the first foot.

A pair of scoop-shaped ctenidia at the base.

Elytra covering the dorsum, fringed.

Noto and neuropodia of equal lengths.

Segmental eminence at the base of each foot, and a ciliated funnel-shaped process on the foot.

A well-developed branchial process on every foot, and on the dorsal ridge beneath it three T-shaped ciliated organs.

Notopodial chætæ long, stiff, finely tapered, and spinous.

Neuropodial chætæ, upper ones with simple tips, boldly spinous; next come compound bristles at first, with a terminal region of three segments, then with one joint, and at the ventral edge with one to four joints, all with bidentate tips. They are arranged in the foot after the outline of a horseshoe, in transverse section.

*S. BOA, *Johnston*. Size to 8 inches.

Prostomium, with broad, crescentic depression on the anterior border. Eyes four, antero-lateral in position; the anterior, the largest, are almost hidden by the ctenidia.

S. ZETLANDICA, *McIntosh*. Size 2 inches and more (?).

Specimen fragmentary. Head unknown.

†S. ATLANTICA, *McIntosh*. Size unknown.

Prostomium divided into two lobes by a slight median depression. Median tentacle subulate and with a terminal joint. Eyes four, one behind the other in the middle of the anterior border of each lobe.

*S. LIMICOLA, *Ehlers*. Size 2 inches and more.

Prostomium ovoid laterally, base of median tentacle large and cylindrical (conical in spirit), eyes four, posterior just behind base of median tentacle, the anterior usually concealed by the ctenidia.

S. JEFFREYSII, *McIntosh*. Size 2 inches (?).

Prostomium broadly ovate, bearing a long median tentacle on a short base. No eyes visible (in a preparation).

†S. MINOR, *Pruvot and Racovitza*. Size 2 inches (?).

Prostomium resembling that of *S. limicola*, but with small processes on the inner border of the ventral tentacular cirrus. In *S. limicola* they are large.

GENUS SIGALION, *Audouin and Milne Edwards.*

Prostomium elongate from before backwards.

Median tentacle absent, lateral tentacles short and papilliform, fixed to the anterior part of the prostomium.

Elytra covering the dorsum; marginal processes pinnate, or with long papillæ from the axis.

The parapodia resemble those of *Sthenelais*, notopodium clavate and furnished with a papilla. Chætæ as in *Sthenelais*. Neuro-podium somewhat truncate and with a papilla internal to the chætæ, which are all bifid.

Branchiæ on every foot (*S. Matildæ*).

Segmental eminence placed ventrally at the base of each foot.

† *S. MATILDÆ*, *Aud. & Edw.* Size to 5 inches.

Four eyes, near the centre of the prostomium.

S. BUSKII, *McIntosh.* Eyes unknown.

GENUS PSAMMOLYCE, *Kinberg.*

Caput antenna singula et 2 aut 4 oculis; proboscis armata; primi pedes antice ultra caput porrecti, cirrus tentacularibus instructi; pedes ceteri quasi uniremes; elytra medium dorsi haud tegentia, margine fimbriato, papillis obsita. [*Carus.*]

PSAMMOLYCE HERMINIÆ, *Aud. & Ed.*

GENUS PHOLOË, *Johnston.*

Prostomium furnished with a short median tentacle.

Eyes, two pairs, more or less connate.

Body linear oblong; elytra on alternate segments in the anterior part of the body; posteriorly a pair on each segment.

First foot with two tentacular cirri, without chætæ.

Notopodium with slender, tapering, spinous chætæ.

Neuropodium with stout, falcate, compound chætæ.

P. MINUTA, *O. Fabricius.*

Tentacle and cirri somewhat papillose. Size $\frac{3}{4}$ inch.

† *P. SYNOPHTHALMICA*, *Claparède.*

Tentacle and cirri swollen at the base; two of the cirri papillose.

LIST OF BRITISH SPECIES, INCLUDING THOSE RECORDED
FROM THE ENGLISH CHANNEL.

* Found on the coast of Devon and Cornwall.

† Found in the Channel, but not on the British Coasts.

AMPHINOMIDÆ.**AMPHINOMINA.**PARAMPHINOME, *Sars.*

P. pulchella.

EURYTHOË, *Kinberg.*

† E. borealis.

EUPHROSYNINA.SPINTHER, *Johnston.*

S. oniscoides.

S. miniaceus.

EUPHROSYNE, *Savigny.*

* E. foliosa.

E. armadillo.

E. Robertsoni.

† E. intermedia.

APHRODITIDÆ.APHRODITA, *Linnaeus.*

* A. aculeata.

LÆTMATONICE, *Kinberg.*

† L. filicornis.

L. producta.

HERMIONE, *Blainville.*

* H. hystrix.

POLYNOIDÆ.LEPIDONOTUS, *Leach.*

* L. squamatus.

* L. clava.

† L. pleiolepis.

GATTYANA, *McIntosh.*

* G. cirrosa.

EUNOA, *Malmgren.*

* E. nodosa.

E. tritoni.

POLYNOIDÆ.LAGISCA, *Malmgren.*

* L. floccosa.

L. Elizabethæ.

L. Jeffreyssii.

* L. extenuata.

* L. rarispina.

ACANTHICOLEPIS, *Norman MS.*

A. asperirma.

HARMOTHOË, *Kinberg.*

* H. imbricata.

* H. spinifera.

H. zetlandica.

† H. Ljungmani.

H. antilopis.

H. Haliaëti.

H. Frazer-Thomsoni.

* H. marphysæ.

* H. lunulata.

* H. setosissima.

* H. areolata.

† H. cæliaca.

† H. maxillospinosa.

† H. picta.

† H. arenicolæ.

† H. reticulata.

† H. torquata.

† H. Sarniensis.

EVARNE, *Malmgren.*

* E. impar.

E. Johnstoni.

E. Hubrechtii.

E. atlantica.

† E. pentactæ.

LIST OF BRITISH SPECIES, ETC.—*continued.*

POLYNOIDÆ.

- ANTINOË, *Kinberg.*
 A. Sarsi.
 A. finmarchica.
 A. mollis.
- PHYLLANTINOË, *McIntosh.*
 P. mollis.
- SCALISSETOSUS, *McIntosh.*
 †S. communis.
 *S. assimilis.
 †S. echini.
- MALMGRENIA, *McIntosh.*
 *M. castanea.
 M. andreapolis.
- HALOSYDNA, *Kinberg.*
 *H. gelatinosa.
- POLYNOË, *Savigny.*
 *P. scolopendrina.
- ENIPO, *Malmgren.*
 E. Kinbergi.
- ACHOLOË, *Claparède.*
 *A. astericola.
- LEPIDASTHENIA.
 *L. argus.

ACOETIDÆ.

- PANTHALIS, *Kinberg.*
 P. ørstedii.

SIGALIONIDÆ.

- STHENELAIS, *Kinberg.*
 *S. boa.
 S. zetlandica.
 †S. atlantica.
 *S. limicola.
 S. Jeffreysii.
 †S. minor.
 S. sp.
- EUSTHENELAIS, *McIntosh.*
 E. hibernica.
- SIGALION, *Audouin & M. Ed.*
 †S. Mathildæ.
 S. Buskii.
- PSAMMOLYCE, *Kinberg.*
 †P. Herminia.
- LEANIRA, *Kinberg.*
 L. hystericis.
- PHOLOË, *Johnston.*
 P. minuta.
 †P. synophthalmica.

The following species are recorded on the French coast, but I have not sufficient information to assign to them their right position:—

- Polynoë lævis, *Audouin and M. Edwards.*
 Lænilla alba, *Malmgren.*
 Hermadion variegatum, *Gr. et Kr.*

DISTRIBUTION OF SPECIES.

†EURYTHOE BOREALIS, *Sars.*

This species has been recorded by McIntosh from under a stone in a tide pool at Herm. This author regards it as rare in British waters, but Benham (3) remarks that specimens six inches long occur all round the British area. Taking the size of the animal into consideration, it is doubtful if the two authors refer to the same species.

LOCALITY.

Herm Tide pool McIntosh (16).

*EUPHROSYNE FOLIOSA, *Audouin and Edwards.*

A species which is by no means uncommon. Its colour is some shade of orange-red, but this has something of a greyish character in many specimens. Those taken from Plymouth Sound are often partially concealed by a covering of flocculent detrital matter. The animal occurs in the holes of rocks and stones brought up by the dredge; it has also been found on the fine gravel of Ground XIV (1) in the neighbourhood of the Eddystone.

Of the numerous species of *Polychætes* described by McIntosh in his recent Monograph (20) a large number are noted as being deep-water forms in the north, but as their range of distribution passes to the south, so they make their home in shallower or even tidal waters. This species is a case in point, but I have never met with it in tidal waters.

Pruvot‡ (29) records it from the *Fucus* zone, the *Himantalia* zone to the gravel of the base of his littoral zone.

LOCALITIES.

Plymouth: Millbay Channel, Duke Rock, Mewstone Grounds, Stoke Point.

Eddystone Ground XIV. Fine gravel Allen (1).

Herm Under stones near low-water
mark (Lankester, Hornell, Mc-
Intosh) McIntosh (20).

Weymouth Gosse, *vide* McIntosh (20).

Dinard Dredgings and at extreme low
tide, under large stones de St.-Joseph (31).

Between Granville and
Iles Chausey . . Bed of oysters and *Anomia* . . Audouin and Milne-
Edwards (2).

St. Malo Grube (12).

Côtes de Bretagne Pruvot (29).

St. Vaast Grube (14).

‡ See p. 257.

†EUPHROSYNE INTERMEDIA, *St.-Joseph*.

Recorded once only from a dredging near la Conchée, Dinard, by de St.-Joseph.

McIntosh is inclined to regard this as only a variety of *E. foliosa*.

LOCALITY.

Dinard (la Conchée) . Dredging . . . de St.-Joseph (31).

*APHRODITA ACULEATA, *Linn.*

This, the common sea-mouse, is a well-known and widely distributed species. Though so common, it is not often taken by the Association in their dredging and trawling operations, but considerable numbers are brought into the port by the local fishermen, and some of these are of very large size.

Möbius (27), dealing with the North Sea, states that it frequents a soft bottom of mud, muddy sand, or sand and shells, shells, sand, and small stones, to a depth of 100 fathoms and over.

Pruvot (29) records it from the Himanthalia zone among seaweeds, where the bottom is sandy, on the coast of Brittany, and from coastal mud or sand of the open sea in the Golfe du Lion.

LOCALITIES.

Plymouth: Penlee, 3-6 miles S.W. (R. A. T.), Rame Head, 2-5 miles S.W. (R. A. T.), Stoke Point, Mewstone Grounds.

Eddystone Grounds III.,

IV., V.	Fine sand	Allen (1).
Devon	Common all along the coast, and cast up by storms	Parfitt (28).
Folkestone and Sandgate	Beach after storms	T. V. H.
Scarriaux, Côtes du Boulonnais		A. Malaquin (21).
Wimereux		Darboux (8).
Dinard	Only among algæ brought up by the trawl	de St.-Joseph (31).
Baie de Cancale	Principally on sheltered bottoms and oyster beds. Only by accident it occurs at low tide or on the beach	Audouin and M.-Edwards (2).
St. Malo, Roscoff		Grube (12).
St. Vaast		Grube (14).

†LETMATONICE FILICORNIS, *Kinberg*.

As regards the Channel this species has only been taken on the oyster ground off St. Peter Port, Guernsey, along with Hermione (McIntosh, 20). It appears to be a northern species, and is found at considerable depths, chiefly on muddy sand.

Möbius (27) records it on mud in the North Sea.

LOCALITY.

St. Peter Port, Guernsey . . . McIntosh (16).

* *HERMIONE HYSTRIX*, *Savigny*.

Rather common. It occurs chiefly on the gravel grounds in the neighbourhood of the Eddystone at a depth of about 30 fathoms.

McIntosh (20) records it as partial to shell débris, gravel, and similar regions, while Pruvot (29) finds it on the coast of Brittany in the littoral zone. In the middle (*Himanthalia*) region of this zone it occurs among seaweed on a sandy bottom, and lower down it lives on a coarse sand, passing to fine sand at greater depths.

LOCALITIES.

Plymouth : Stoke Point ; Mewstone Ledge ; Rame Head, 3 miles S.W. ; 3-6 miles S.W. (R. A. T.) ; Penlee, 5 miles S.W. (R. A. T.).		
Eddystone IX., X.	Coarse gravel with sand or mud.	Allen (1).
St. Peter Port, Guernsey	Shell-gravel, etc.	McIntosh (20).
Côtes du Boulonnais	Dredgings	A. Malaquin (21).
Dinard	Common enough on the shore and at extreme low tide, and in dredgings at all depths	de St.-Joseph (31).
Baie de Cancale	On oyster beds	Audouin and Milne-Edwards (2).
Iles Chausey	Among seaweeds on a muddy bottom, exposed only at the very lowest tides	Audouin and Milne-Edwards (2).
Côtes de Bretagne		Pruvot (29).

* *LEPIDONOTUS SQUAMATUS*, *Linn.*

This is one of the most abundant species, and occurs everywhere and in all situations from between tidemarks to deep water.

It is not infrequent on the shore under stones, and occurs in the holes and crevices of stones brought up by the dredge, as well as in the miscellaneous collection of material which includes *Chaetopterus* tubes and a varied assortment of Hydroids and Polyzoa from all parts visited by the Association.

Möbius, writing with reference to the North Sea, gives as its habitat stones, sand, and shells; sandy mud; sand with small stones and shells; dead *zostera* (27); red algæ; stones, sand, and red algæ (Baltic) (26).

Pruvot (29) confines it to tidal waters at all levels, and the laminarian zone on stony ground of various kinds.

LOCALITIES.

Plymouth : Area general.		
Eddystone Grounds	Fine sand; coarse gravel with sand or mud; fine gravel; shell-gravel; stones	Allen (1).
Salcombe	Coralline region	Parfitt (28).
Falmouth, South Devon, Weymouth		Johnston (16).

Côtes du Boulonnais	Very abundant	A. Malaquin (21).
Wimereux, Plymouth		Darboux (8).
Dinard	Very common on shore and in dredgings	St.-Joseph (31).
Havre, Villerville, Villers, Lui-sur-Mer		St.-Joseph (32).
St. Vaast, Concarneau, Croisic	All along the coast under stones	de St.-Joseph (33).
Côtes de Bretagne		Pruvot (29).
St. Vaast		Grube (14).

* *LEPIDONOTUS CLAVA*, *Montagu*.

This species is very common, but by no means so abundant as the last, and is more restricted in its distribution. It occurs below tide-marks, but between them it is most numerous at extreme low water under stones. All authors seem to agree in limiting the size of this species to something like an inch and a half, but local specimens of such a size would be regarded as small. They frequently occur up to $2\frac{1}{4}$ inches, and sometimes even more. Under these circumstances the elytra are widely separated, and a very good figure of the worm in this condition is given by Bourne (4). Pruvot (29) records it from the higher strata of tidal waters among fucus-covered rocks in the Channel, and from the same zone in the Golfe du Lion in the Mediterranean.

LOCALITIES.

Plymouth: Breakwater, Cattewater, Rum Bay, Wembury Bay, the Bridge.	Johnston (16).
South Devon, Falmouth	Darboux (8).
Wimereux	St.-Joseph (32).
Concarneau, St. Jean de Luz, Croisic	Pruvot (29).
Côtes de Bretagne	

† *LEPIDONOTUS PLEIOLEPIS*, *v. Marenzeller*.

The species described under this name is recorded from the Japanese seas, and is characterised by the possession of 15 elytra, a fact which should lead to a modification of the genus. St.-Joseph describes a specimen from Cézembre, which he assigns to this species. As it only possesses 12 elytra and is very small, he somewhat apologetically explains that it is only a young one.

LOCALITY.

Dinard (Cézembre)	Dredging 20 m.	de St.-Joseph (31).
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* *MALMGRENIA CASTANEA*, *McIntosh*.

By no means uncommon. This species has, in this locality at least, only been found as a commensal on the under surface near the mouth of *Spatangus purpureus*, and is therefore found on the same kind of ground as that frequented by the echinoderm.

†HARMOTHOË MAXILLOSPINOSA, *de St.-Joseph.*

Recorded from Dinard by de St.-Joseph, who found it several times in dredgings. Pruvot's laminarian (gravel) region.

†HARMOTHOË PICTA, *de St.-Joseph.*

First recorded from Dinard, where de St.-Joseph found a single specimen on the shore in an empty tube of *Lanice conchilega*, and subsequently it was found in greater numbers, and from other localities on the French coast, where it occurred as a tidal form.

LOCALITIES.

Dinard	Tubes of <i>Lanice</i>	de St.-Joseph (31).
St. Jeande Luz, Hendaye	Under stones	de St.-Joseph (32).

†HARMOTHOË LJUNGMANI, *Malmgren.*

Not yet recorded from the neighbourhood of Plymouth. McIntosh records it as a tidal and a deep-water form, but Pruvot only includes it in his laminarian zone.

LOCALITIES.

Dinard	Dredgings	de St.-Joseph (31).
Côtes de Bretagne	Laminarian (gravel) zone	Pruvot (29).

*HARMOTHOË LUNULATA, *Delle Chiaje.*

A not uncommon tidal form. It may be found among the laminarian roots on the Plymouth Breakwater, and occasionally hidden under stones near low water.

Hornell (15) states that this species may be found in the ambulacral grooves of *Astropecten irregularis*.

LOCALITIES.

Plymouth: Breakwater, the Bridge, Rum Bay.	
Salcombe.	
Channel Islands	McIntosh (20).

*HARMOTHOË SPINIFERA, *Ehlers.*

This is a very common species at Plymouth, and one in which the colouration, always presenting a wide range in the Polynoids, is sufficiently constant to make it readily recognisable. It is found in all parts of the Sound where rocks and stones occur, in the crevices of which it appears to dwell.

Pruvot (29) notes it from the laminarian region only, which corresponds with my experience, though McIntosh (20) gives a locality which is apparently within tidal limits.

LOCALITIES.

Plymouth: Millbay Channel, Duke Rock, Queen's Ground.			
Polperro	. Chinks in rocks	.	McIntosh (20).
Côtes du Boulonnais	.	.	Malaquin (21).
Dinard	. Common in dredgings	.	de St.-Joseph (31).
Côtes de Bretagne	. Laminarian (gravel)	.	Pruvot (29).

*HARMOTHOË SETOSISSIMA, *Savigny*.

McIntosh (20) records it both as a tidal and deep-water species, in the latter case also as an inhabitant of *Chaetopterus* tubes. It is occasionally found among the Polyzoa (*Cellaria*) and *Chaetopterus* tubes from the Eddystone Grounds. I have only seen a few examples.

LOCALITIES.

Plymouth: Eddystone Grounds.			
Plymouth (E. M.)	.	.	McIntosh (20).
Salcombe.			
Herm, Channel Islands	.	.	McIntosh (20).
Herm	. <i>Chaetopterus</i> tubes	.	Lankester (19).
Côtes du Boulonnais	. <i>Chaetopterus</i> tubes	.	Malaquin (21).
St. Vaast	. Dredgings	.	de St.-Joseph (32).
Roscoff	.	.	Grube (21).
St. Vaast	.	.	Grube (14).

*HARMOTHOË AREOLATA, *Grube*.

Not uncommon on the Eddystone Grounds, where the dredge or trawl brings up masses of Polyzoa, Hydroids, and *Chaetopterus* tubes.

LOCALITIES.

Plymouth: Eddystone Grounds.			
Herm, Channel Islands	Tubes of <i>Chaetopterus</i> (Cooper), and under stones	.	McIntosh (20).
Herm	. Under stones and in or near tubes of <i>Terebella nebulosa</i>	.	E. Ray Lankester (17).
Côtes du Boulonnais	. Dredgings, <i>Chaetopterus</i> tubes, rarely on shore	.	Malaquin (21).
Dinard	. Rare in dredgings; young only	.	de St.-Joseph (31).
Côtes de Bretagne	. Fucus zone	.	Pruvot (29).

†HARMOTHOË CÆLIACA, *de St.-Joseph*.

Recorded only from Dinard by de St.-Joseph, who found it on several occasions in dredgings. Pruvot's laminarian (gravel) region.

†HARMOTHOË ARENICOLÆ, *de St.-Joseph*.

Recorded only from Dinard by de St.-Joseph, who found it on the shore attached to a specimen of *Arenicola*.

*HARMOTHOË IMBRICATA, *Linn.*

Not an abundant species, but at the same time fairly common. McIntosh regards the Channel as very near its limit of distribution, its place being taken in the south by *Lagisca floccosa*. In the neighbourhood of Plymouth it occurs between tidemarks and in deeper water. It is found among broken shells or stones covered with sponges, hydroids, polyzoa, and *Chaetopterus* tubes on the Eddystone Grounds, and also under laminarian roots and suchlike crevices on the Breakwater.

McIntosh (20) gives similar localities, and adds the tubes of *Terebella* and *Chaetopterus*, and also old shells with *Polycirrus*.

Pruvot (29) finds it on the coasts of Brittany, in the *Fucus* as well as the *Cystoseira* zones of tidal waters, but he does not notice it in the laminarian zone.

Möbius (26), referring to the Baltic, finds it among *zostera* and red algæ, also on sand, mud, and muddy sand of various qualities, to a depth of nearly 100 fathoms. Again in the North Sea (27) he adds 10 fathoms to the depth, and as habitat, stones, shells, etc., variously combined with sand, mud, or both.

LOCALITIES.

Plymouth: Breakwater, Rum Bay.		
Eddystone Grounds III. and VII. fine sand; XVI. shell gravel, [T.V.H.]	Allen (1).	
Torbay	Gosse (10).	
South Devon	Johnston (16).	
Channel Is., Guernsey . Rare	McIntosh (20).	
Côtes du Boulonnais . Under stones and in dredgings .	Malaquin (21).	
Dinard	de St.-Joseph (31).	
Granville, Noir-moutier, and coasts of Brittany	Andouin and M.-Edwards (2).	
Côtes de Bretagne . Littoral zone	Pruvot (29).	
St. Vaast	Grube (14).	

†HARMOTHOË RETICULATA, *Claparède.*

de St.-Joseph doubtfully refers a mutilated specimen taken near Dinard to this species.

Pruvot (29) records it from the *Fucus* zone of tidal waters, the *zostera* banks on a sandy bottom, stones covered with *Cystoseira* to the sandy gravel of his laminarian zone.

McIntosh (19) considers that this species is in all probability identical with *Evadne impar*.

LOCALITIES.

Dinard (Cézembre) . Dredging	de St.-Joseph (31).
Côtes de Bretagne	Pruvot (29).

†HARMOTHÖE TORQUATA, *Claparède*.

This species, which closely resembles *H. spinifera* of Ehlers, is an inhabitant of the Fucus zone of tidal waters, and is recorded by Pruvot (25) from the coasts of Brittany. It is introduced here on his authority.

†HARMOTHÖE SARNIENSIS, *Lankester*.

This species is recorded by Prof. Ray Lankester from Guernsey and Herm, where it appears to have been very abundant under stones near low-water mark.

According to Lankester it appears to replace *H. imbricata*, which it resembles very closely in other respects than the number of the elytra.

It is not noticed by McIntosh in his recent Monograph (20).

LOCALITIES.

Guernsey and Herm Lankester (17).

*EUNOA NODOSA, *M. Sars*.

This fine species is only occasionally found, and the only locality in the neighbourhood of Plymouth is the Eddystone Grounds.

LOCALITIES.

Eddystone Grounds . XVIII. Stones . [Weldon]. Allen (1).

*EVARNE IMPAR, *Johnston*.

A very common tidal and deep-water species. McIntosh (20) states that it occurs under stones between tidemarks, in the crevices of tangle roots, and in the cavities of shells, both univalve and bivalve. This accords completely with my own experience in this neighbourhood, throughout which it appears to be pretty generally distributed. de St.-Joseph (32) describes the variety *Pagenstecheri* from St. Lunaire.

Pruvot (29) records it from his laminarian zone with a gravelly bottom, and also from the fine sand of the coastal region.

LOCALITIES.

Plymouth: Area general.

Eddystone Grounds VII. fine sand. XIV. fine gravel. XVIII. stones, Allen (1), T. V. H.

Salcombe Coralline zone Parfitt (28).

Salcombe T. V. H.

Torbay, Anstey's Cove Gosse (10).

Herm, Channel Islands Between tidemarks McIntosh (20).

Wimereux Darboux (8).

Dinard (rare), Isle de Rochefort, Saint Jacut de St.-Joseph (31).

Portel, Côtes du

Boulonnais Under stones between tidemarks A. Malaquin (21).

Baas, Côtes du

Boulonnais Sand bank, dredgings A. Malaquin (21).

St. Lunaire, Côtes de France de St.-Joseph (32).

St. Malo Grube (12).

Côtes de Bretagne Laminarian and coastal zones . Pruvot (29).

†*EVARNE PENTACTÆ*, *Giard*.

Lives on the body of *Cucumaria pentactes*, with which holothurian it is commensal. It has not been recorded from this side the Channel.

LOCALITY.

Grisnez, Wimereux Giard (9).

**LAGISCA FLOCCOSA*, *Savigny*.

This is one of the commonest of the local species, and may best be described as having a general distribution throughout the local area. It occurs between tidemarks to deep water, and under the synonym of *L. propinqua* it is recorded from the sand and gravel of the Eddystone Grounds.

LOCALITIES.

Plymouth: Area general.

Eddystone Grounds . Fine sand, coarse gravel with
sand or mud, fine gravel, shell-
gravel, stones Allen (1).

South Devon Johnston (16).

Wimereux Darboux (8).

**LAGISCA EXTENUATA*, *Grube*.

Not uncommon. It occurs most frequently under the laminarian roots on the Breakwater, and more rarely on the Eddystone Grounds, among the Polyzoa and *Chaetopterus* tubes.

McIntosh (20) records it from the tube of a *Eunice*, and free on muddy sand; while Pruvot (29) gives its habitat as the *Fucus* zone down to the base of the rocks covered with *Laminaria*, and with a somewhat variable bottom.

LOCALITIES.

Plymouth: Breakwater, Eddystone Grounds.

Roche Bernard, Roche
de Lineur, Côtes du

Boulonnais . . . Dredgings, especially at Platriers Malaquin (21).

Wimereux Darboux (8).

Dinard . . . Dredgings de St.-Joseph (31).

St. Vaast, St. Guénolé, Croisic, St. Jean de Luz . . . de St.-Joseph (32).

Côtes de Bretagne . Littoral zone . . . Pruvot (29).

**LAGISCA RARISPINA*, *Sars*.

This species is not admitted by McIntosh in his "Monograph of the British Annelids," nor is it included amongst the synonyms.

It appears to me to be very closely related to *L. floccosa*, with which species I should probably have identified it, had not Prof. Weldon drawn my attention to it in dealing with the Polychætes from the

Eddystone Grounds (1). Since then I have found it in some numbers from that area and from the adjacent Mewstone Grounds.

LOCALITIES.

Plymouth: Eddystone Grounds, Mewstone Grounds.		
Eddystone Grounds (1) VII. Fine sand	.	[Weldon]. Allen (1).
Wimereux	.	Darboux (8).
Between Ridens and Vergoyer, Pierrettes,	}	{ M. Sauvage,
Côtes du Boulonnais			A. Malaquin (21).

†SCALISSETOSUS COMMUNIS, *Delle Chiaje*.

Not yet recorded from the neighbourhood of Plymouth.

Hornell (15) states that this species has been found commensally on three different kinds of starfishes.

LOCALITIES.

Channel Islands	.	McIntosh (20).
Côtes du Boulonnais	Dredgings	Malaquin (21).
Dinard	Dredgings	de St.-Joseph (31).
Lanvéoc, Brest	.	de St.-Joseph (33).
Côtes de Bretagne	Laminarian (gravel)	Pruvot (29).

*SCALISSETOSUS ASSIMILIS, *McIntosh*.

This species has recently been found upon the oral region of *Echinus esculentus*, Mr. R. A. Todd bringing it to my notice. I think I am justified in saying that it is not uncommon.

LOCALITIES.

Plymouth: Penlee, 3-5 miles S.W. (R. A. T.), Mewstone Grounds.		
Lanvéoc, Brest	.	de St.-Joseph (33).
Côtes de Bretagne	Laminarian (gravel)	Pruvot (29).

†SCALISSETOSUS ECHINI, *Giard*.

Found by Giard as a commensal on the sea urchins *Echinus sphaera* and *E. esculentus*, in 30 fathoms.

LOCALITY.

Concarneau	.	Giard (9).
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POLYNOE SCOLOPENDRINA, *Savigny*.

McIntosh (20) gives the habitat of this species as the tubes of *Polymnia (Terebella) nebulosa*, between tidemarks, Herm, and between the chinks of rocks (gneiss), in muddy sand in the burrows of *Lysidice*. Other authors confirm the residence of this species more or less closely with *Polymnia nebulosa*, while de St.-Joseph (31) states that it is found on the shore under stones, where it constructs a tube of sand and bits of shell.

Here at Plymouth it has only been found in two localities, viz. Millbay Channel and the Eddystone Grounds.

Specimens from the former locality make their appearance at rather long intervals, so that it cannot be called common, and it seems to frequent the chinks and crevices of the rocks which are found there, the depth being about 25 fathoms. Only a single specimen has been found on the Eddystone Grounds. This is considerably larger than the Millbay forms. It measures some $3\frac{1}{2}$ inches in length, and the dorsum in the hinder part of the body bears three longitudinal rows of well-developed tubercles.

The Millbay specimens are small, barely two inches in length, and give one the idea of being disproportionately narrower. The dorsum is not tuberculated. In colour the specimens are approximately alike.

LOCALITIES.

Plymouth : Millbay Channel.		
Eddystone Grounds	.	Allen (1).
Falmouth	.	Johnston (16).
Channel Islands	.	McIntosh (20).
Dinard	Dredgings and on shore .	de St.-Joseph (31).
St. Malo	With terebellids .	Audouin et M.-Edwards (2).
St. Malo, Roscoff	.	Grube (12).
Côtes de Bretagne	Himantalia and laminarian zones .	Pruvot (29).

* HALOSYDNA GELATINOSA, *M. Sars.*

Not infrequently found on the shore under stones which rest on a basis, sometimes very scanty, of sandy mud, and occasionally in deep water. It cannot be called an abundant species. McIntosh (20) gives it its habitat under stones and in crevices, laminarian roots between tidemarks, and in the valves of old shells in deeper water.

Pruvot (29) gives the habitat of this worm on the coast of Brittany as the middle (Himantalia) zone of tidal waters, and also his laminarian zone among the Laminaria, which accords with its distribution in the neighbourhood of Plymouth.

LOCALITIES.

Plymouth : Rocks below Laboratory, Rum Bay, Mewstone Grounds, off Stoke Point (R. A. T.), Wembury Bay (R. A. T.), Drake's Island (R. A. T.).		
Eddystone Grounds IX.	Coarse gravel, with sand or mud	Allen (1).
Channel Islands	.	McIntosh (20), Lankester (17).
Dinard	At lowest tides in the holes bored in the mud by <i>Nerine</i> .	de St.-Joseph (31).
Roscoff .	.	Grube (12).
Côtes de Bretagne	Himantalia and laminarian zones .	Pruvot (29).

* ACHOLOË ASTERICOLA, *Delle Chiaje*.

Commensal in the ambulacral groove of *Astropecten irregularis*, this species is decidedly common, a very fair percentage of these echinoderms being accompanied by the worm. It is comparatively easy to find them; their colour betrays them, and they can be readily turned out of the ambulacral groove of the starfish, though it has hitherto proved impossible to preserve specimens entire.

Within an hour or two of capture the worm will voluntarily leave its host, and may be found wandering over the various animals with which it may be temporarily associated. This leads one to suppose that it is free during some portion of its existence, though I can find no evidence of its having been obtained in such a condition.

It occurs on several species of the genus *Astropecten*, Carus (5).

LOCALITIES.

Plymouth: Mewstone Grounds, off Stoke Point, S.W.; Penlee Point, 5 miles S.E.; Rame Head, 5 miles S.E. (R. A. T.).

Eddystone Grounds I.,

II., III. Fine sand [T. V. H.] Allen (1).

LEPIDASTHENIA ARGUS, *sp. nov.* Size to $8\frac{1}{2}$ inches.

GENERAL APPEARANCE. An elongated worm of upwards of 200 segments, coloured a warm buff, with a transverse band of dark brown between each segment. A red longitudinal line on ventral surface.

Elytra numerous, not very large comparatively, completely covering the sides of the body, but leaving a conspicuous median portion exposed; translucent, with a dark-coloured, more or less fan-shaped patch posterior to the centre; behind this a narrow crescentic band of opaque white.

SPECIFIC CHARACTERS.

PROSTOMIUM. Broad, red, with an antero-median depression dividing it into two lobes. Tentacles three, sub-equal, produced from the anterior margin of the prostomium. Median tentacle long, comparatively stout, distinctly swollen near the filiform tip, lateral tentacles more slender, the swelling indistinct. Tentacular cirri similar to the lateral tentacles. All these organs are smooth and possess a deeply pigmented band at the distal portion of the swelling, which is marked by a band of opaque white.

Eyes four, anterior pair wider apart and slightly larger than the posterior. Proboscis with $\frac{11}{11}$ papillæ and a small additional one on each side, a short distance from the extremity.

ELYTRA. On segments 1, 3, 4, 6, 8, . . . 22, 25, 28, *et seq.*, to the end of the body. The first is subcircular, some few are uniform, but most

are an irregular circle. Surface and margin quite smooth. Translucent, with faint granular pigment. Immediately behind the point of attachment is a brown-coloured patch with a sharp anterior border, fading gradually inwards and backwards. In the posterior elytra this pigmented area occupies most of the hinder portion of the elytron, and is fan-shaped. Near the posterior margin is a more or less conspicuous crescentic band of opaque white.

PARAPODIA. Notopodium reduced to a mere stump with a very few slender chætæ or none. Dorsal cirrus resembling tentacular cirri, and extending nearly to the extremity of the chætæ, except in a few of the anterior segments where it projects far beyond. Neuropodium well developed with numerous chætæ of a tolerably uniform character; the upper ones are longer and more slender. The spinulose rows are well developed; there are about forty of these on the more slender chætæ, and they become reduced to about twelve on the ventral side, the chætæ becoming shorter and stouter and finally more curved. The chætæ are bifid.

This remarkably fine species has recently been discovered at Salcombe by Mr. Todd, existing as a commensal in the tubes of *Amphitrite Edwardsi*.

It is one of the most brilliantly coloured of the Polynoids, and I am indebted to Mr. W. Garstang for the following description of the colour when alive:—

“General colour a warm buff, occasionally inclining to pink in some specimens. The intervals between the segments are marked by a conspicuous transverse bar of dark brown. In the anterior half of the body the bases of the cirrus-bearing parapodia are also coloured dorsally with a diffuse patch of the same pigment, which is scarcely perceptible on the elytron-bearing segments.

“In the posterior half of the body the pigment on the bases of the cirriferous parapodia fades completely away.

“Each elytron bears a dark brown patch immediately behind its point of attachment and spreading inwards towards the posterior border. The anterior margin of this pigmented area is sharp and well defined, but fades away distally. These pigmented areas lie on the lower surface of the elytra, but are clearly visible through their translucent integuments. In the anterior segments the spots are smaller and more strongly pronounced than in the posterior segments, where they gradually assume a broader and more fan-shaped outline. A more or less crescentic streak of opaque white near the posterior border of the elytra adds to the conspicuous character of these markings.”

While this description was being prepared I was enabled to visit Salcombe during the spring tides of October, when I secured a dozen

specimens of the species. The colour varies a good deal while retaining all its essential characteristics, and in some individuals the dark brown appears to be more of a purple. I am inclined to believe that the natural colour is a purple rendered a rich brown by virtue of its intensity. Some of the individuals taken showed this very clearly, and in one case one half of the body was conspicuously lighter than the other.

The ventral surface is practically colourless except for a very strongly marked longitudinal line of bright red.

ELYTRA. In shape they are sub-circular, and some few reniform. From a certain variation in size it may be assumed that they are lost and replaced with comparative ease, though this is hardly borne out by the circumstances connected with their capture and preservation. The surface and margin are both smooth. Under the microscope a light brown pigment is visible over the entire surface of the elytron, and differs only in density from the visibly pigmented area. This pigment is deposited in small circular patches, each having a lighter spot in the centre. From the area of attachment the nerve runs in an arborescent manner over the entire elytron, the branching being very close and delicate.

PROSTOMIUM. Broad; the posterior portion is pigmented brown (in spirit). It consists of two ovoid lobes separated anteriorly by a median depression, which loses itself about half-way back. The tentacles are continuations forward of the prostomium, and their proportionate lengths seem to vary somewhat. The four eyes are postero-lateral in position, but not in contact with the margin; the anterior are slightly larger than the posterior.

PARAPODIA. Elongate, with the notopodium rudimentary.

First foot. The notopodium consists of a mere papilla, with a slender and tapering chæta. The neuropodium is well developed and sub-conical. It is provided with some thirty or more slender chætæ. The spinulose region of these is bent backwards and long. The apex is apparently truncate, but there are evidences of a minute cleft. The more ventral chætæ are shorter; the spinulose border is turned ventralwards. The ventral cirrus is very long.

The second foot is very similar; the ventral cirrus reaches beyond the neuropodium, and the dorsal cirrus extends very considerably further. The chætæ do not present any striking differences.

In the typical feet the notopodium increases in size for the stout part of the animal's body, and may carry four or five long, slender chætæ with no serrulations. In the neuropodium three groups of chætæ may be made out: an upper group, where the chætæ are few in number, long and slender, and with the spinulose region pro-

portionally long; a median group, where the chætæ are by far the most numerous, and are stout, the spinulose region being distinctly shorter, and shortening as the chætæ pass to the ventral region, where it is shortest. The shafts of the most ventral chætæ are distinctly more slender, and form the third group, which is not always so sharply defined as the others.

The ventral cirrus is scarcely half the length of the neuropodium measured from the point of insertion of the cirrus.

With the doubtful exception of the first two feet, all the chætæ are bifid at the extremity, the only difference being the depth of the cleft.

The presence of chætæ in the notopodium is not a constant character. No definite statement can be made either as to the number of the segments or of the elytra, as these appear to be directly related to the size of the animal. The largest specimen I have seen measures $8\frac{1}{2}$ inches in length with 67 elytra and 190 segments, and the smallest is $1\frac{1}{2}$ inches long with 22 elytra. This last specimen, having been a month or so in spirit, is almost colourless. Another specimen, 2 inches long with 30 elytra, possesses the characteristic colour, but very feebly developed. In these two cases the elytra completely cover the body. A specimen, $5\frac{3}{8}$ inches long with 54 elytra and 150 segments, has assumed the character and proportions described for the species. Specimens of intermediate size are necessary to trace the change in the proportions and colouration of the elytra.

The segmental papillæ are very prominent, more especially in the posterior part of the body, and the anus is provided with two short cirri.

The generic definition of *Lepidasthenia* given in the synopsis (p. 232) is a verbatim copy of Malmgren's original. This author appears to have had one or more specimens. Neither here nor in the original description of Grube's *Polynoe elegans* are any figures given, and nothing is said as to its habits. A figure, however, is given by Benham (3) in the *Cambridge Natural History*, and this unquestionably proves that the Salcombe species is distinct. This species does not accord with Malmgren's definition in the matter of the parapodia, but the difference does not justify the creation of a new genus, and the existing one must be amended in that particular.

*STHENELAIS BOA, *Johnston*.

This is a common species, and occurs between tidemarks on a more or less sandy bottom, burrowing in the sand or under stones. It is also tolerably frequent in dredgings, especially where the bottom consists of stones and broken shells.

Pruvot (29) records it from sandy beaches near low tide, and from the zone of *zostera* banks.

Möbius (27), referring to the North Sea, reports it generally on sandy ground, of varied character, frequently also with shells and shell fragments, sometimes on mud or on sand more or less mixed with mud.

LOCALITIES.

Plymouth : Drake's Island, Rum Bay, Bovisand Bay, off Rame Head, Mewstone Ground.			
Salcombe	Zostera banks, and near low tide.		
Exmouth	Tidemarks		Parfitt (28).
South Devon			Johnston (16).
Channel Islands, Herm			McIntosh (20).
Wimereux, Plymouth			Darboux (8).
Dinard	In muddy sand all along the coast		de St.-Joseph (31).
St. Malo, Roscoff			Grube (12).
Côtes de Bretagne			Pruvot (29).
St. Vaast			Grube (14).

*STHENELAIS LIMICOLA, *Ehlers*.

The record of McIntosh cited below is all that I know of this species occurring in the neighbourhood of Plymouth. He notes it as an inhabitant of sandy ground in water of some depth, never between tidemarks.

LOCALITIES.

Cornwall, Polperro			McIntosh (20).
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†STHENELAIS MINOR, *Pruvot and Racovitza*.

Taken once in a dredging between Ile Ronde and Lanvéoc Point, near Brest by de St.-Joseph. He expresses some doubt as to the identity of the species.

Pruvot (29) records it from the gravel at the base of his littoral zone.

LOCALITIES.

Lanvéoc	Dredging		de St.-Joseph (33).
Côtes de Bretagne	Littoral		Pruvot (29).

†SIGALION MATHILDÆ, *Aud. et Edw.*

Recorded by McIntosh as a tidal form occurring under stones, and extending to deeper water on a more or less sandy ground. Pruvot (29) says sandy beach near low tide. Möbius (27) reports it from the North Sea on fine sand with shells.

LOCALITIES.

Channel Islands			McIntosh (20).
Boulogne-sur-Mer			Darboux (8).
Isles Chausey			Audouin et M.-Edwards (2).
Dinard	On sand on the shore		de St.-Joseph (31).
Poulingen, St. Vaast, Villers	On sand		de St.-Joseph (32).
Côtes de Bretagne	Littoral		Pruvot (29).

†PSAMMOLYCE HERMINIÆ, *Aud. et Edw.*

Pruvot (29) includes this species in his list of Polychaetes from the coast of Brittany. He records it from the sandy beaches near low tide, and from the fine sand of the coastal region.

LOCALITIES.

Côtes de Bretagne Pruvot (29).

†PHOLOË MINUTA, *Fabricius.*

This is a tidal as well as a deeper water species, and is found commonly under stones between tidemarks, and especially in pools (20). I have not seen it in the Plymouth neighbourhood.

LOCALITIES.

Channel Islands McIntosh (20).
Wimereux Darboux (8).
St. Malo Grube (12).
St. Vaast Grube (14).

†PHOLOË SYNOPHTHALMICA, *Claparède.*

A variety of this species, to which de St.-Joseph gives the qualification *var. Dinardensis*, is recorded as common in dredgings at all depths off Dinard.

Pruvot (29) records it from the base of his littoral zone with a gravelly bottom, to the fine sand of the coastal region.

LOCALITIES.

Dinard de St.-Joseph (31).
Côtes de Bretagne . Littoral and coastal . . . Pruvot (29).

I have not sufficient information to assign to the following species their correct position.

POLYNOE LÆVIS, *Aud. et Edw.*

This species, according to Pruvot (29), is found on the sandy zostera banks of tidal waters, but may also be found in deeper water.

Audouin and Milne-Edwards, who first described this species, give no information as to the conditions under which it was found. The description has not that precision which is demanded by modern specialisation.

LOCALITIES.

Isles Chausey Audouin and Edwards (2).
Litora Francogalliæ Carus (5).
Côtes de Bretagne . Zostera beds . . . Pruvot (29).

LÆNILLA ALBA, *Malmgren.*

Recorded by Grube from the French coast, but details of its capture are not given. The genus *Lænilla* of Malmgren has been modified and broken up, and this species would probably be included in the genus *Malmgrenia* of McIntosh.

LOCALITY.

St. Malo, Roscoff Grube (12).

SCALISSETOSUS VARIEGATUM, *Gr. et Kr.*

Included here on the authority of Pruvot (29), who includes it in his list of species occurring on the coast of Brittany. I have not met with any other allusion to the species.

LOCALITY.

Côtes de Bretagne . *Cystoscira* region . . . Pruvot (29).

NOTE ON PRUVOT'S BIOLOGICAL REGIONS.

Pruvot (29) has dealt at some length with the fauna of the coast of Brittany and that of the Golfe du Lion in the Mediterranean.

In comparing the faunas of these two regions he shows how the life of the various species is intimately related to the conditions to which they are exposed, and the character of the surface on which they live.

I have here incorporated a summary of his observations in so far as they apply to the group under consideration and as regards the Channel fauna only.

It will be seen that his observations very accurately describe the distribution of Polychætes in the neighbourhood of Plymouth, but reference must be made to his work for one to realise its importance.

As his terminology differs from that in general use in this country it needs some explanation. He divides the depths of the sea into three regions: (1) Littoral, (2) Coastal, and (3) Abyssal, the last of which is not, of course, found in the Channel.

The littoral region is that in which the bottom is subjected to the influence of waves and superficial currents, and extends so far as to include the laminarian and a considerable portion of Forbes' coralline zone. The coastal region occupies the whole of the Channel below a depth of about 21 fathoms.

The following table will show better than mere description the subdivision and character of these regions and the three "facies" ascribed to each zone:—

	ROCKY.	SANDY.	ESTUARINE.	
Subterrestrial zone . . .	Rocks covered with <i>Balanus</i> . Rocks covered with <i>Pelvetia</i> .	Pure sand with <i>Talitrus</i> .	Mud-banks, ordinarily exposed.	
1. LITTORAL REGION.	Upper	Upper beach with <i>Cardium edule</i> .	River mud. <i>Fucus</i> . Sandy mud with <i>Arenicola</i> . Muddy gravel of ports.	
	Littoral zone, Middle	Stones with <i>Cystoseira</i> . Rocks with <i>Himantalia</i> . Large overhanging rocks and caves.	Banks of zosteræ. Lower beach with <i>Solen</i> & <i>Dentalium</i> .	Muddy seaweed banks. Estuarine sandy mud.
	Lower	Rocks with <i>Laminaria</i> .	Stones with <i>Polyzoa</i> , etc.	Marl.
2. COASTAL REGION.	Zone of coastal mud	Missing in the Channel.		
	Zone of sand	Sand, gravel, and stones at the bottom of	the Channel.	

REFERENCES.

1. Allen.—On the Fauna and Bottom-deposits near the Thirty-fathom Line from the Eddystone Grounds to Start Point. *Journ. Mar. Biol. Assoc.*, vol. v. 1899.
2. Audouin et Milne-Edwards.—Memoir pour servir à l'Histoire Naturelle de la France. Vol. ii. *Annélides*. Paris. 1834.
3. Benham, W. B.—Archiannelida, Polychæta, and Myzostomaria. *Camb. Nat. Hist.* vol. ii. 1896.
4. Bourne, A. G.—On certain points in the Anatomy of the Polynoina and on the Polynoë (Lepidonotus, Leach) clava of Montagu. *Trans. Linn. Soc. Lond.*, ser. 2, Zool., vol. ii. 1883.
5. Carus, V.—Prodromus Faunæ Mediterraneæ. Stuttgart. 1885.
6. Claparède, E.—Les Annelides Chétopodes du Golfe du Naples. Genève et Bale. 1868.
7. Committee for the Exploration of the Marine Fauna of South Devon, Reports. *Reports Brit. Assoc.* 1865, 1867, 1869, 1872. Committee for Exploring the Marine Zoology of South Devon, Reports. *Reports Brit. Assoc.* 1879-80.
8. Darboux, J. G.—Recherches sur les Aphroditiens. *Memoire 6. Trav. Inst. Zool. Univ. Montpellier et de la Stat. Marit de Cette*. Lille. 1899.
9. Giard, A.—Sur quelques Polynoidiens. *Bull. Scient. du Dep. du Nord*, ser. 2, vol. ix. 1886.
10. Gosse, P. H.—A Naturalist's Rambles on the Devonshire Coast. London. 1853.
11. Grube, E.—Actinien Echinodermen und Wurmer des Mittelmeeres. Königsberg. 1840.
12. Grube, E.—Mittheilungen über St. Malo and Roscoff und die dortige Meeres-, besonders die Annelidenfauna. *Jahresb. schles. Gesellschaft für Vat. Cult.* Breslau.
13. Grube, E.—Bemerkungen über die familie der Aphroditeen. *Jahresb. der Schles. gesells.* Breslau. 1875.
14. Grube, E.—Mittheilungen über St. Vaast-la-Hougue und seine Meeres-, besonders seine Annelidenfauna. *Jahresb. schles. Gesellschaft für Vat. Cult.* Breslau. 1869-72.
15. Hornell, J.—Report on the Polychætous Annelids of the L.M.B.C. District. *Proc. & Trans. L'pool. Biol. Soc.*, vol. v. 1890-1.
16. Johnston, G.—A Catalogue of the British Non-parasitical Worms in the Collection of the British Museum. London. 1865.
17. Lankester, E. Ray.—On some New British Polynoina. *Trans. Linn. Soc. Lond.*, vol. xxv. 1866.
18. McIntosh, W. C.—On the Annelida of the *Porcupine* Expeditions of 1869 and 1870. Part I. Euphrosynidæ to Sigalionidæ. *Trans. Zool. Soc. Lond.*, vol. ix.
19. McIntosh, W. C.—On British Annelida. Part I. Euphrosynidæ to Sigalionidæ. *Trans. Zool. Soc. Lond.*, vol. ix.
20. McIntosh, W. C.—A Monograph of the British Annelids. Part II. Polychæta, Amphinomidæ to Sigalionidæ. Ray Society, London. 1900.
21. Malaquin, A.—Annélides Polychètes des côtes du Boulonnais. *Revue Biol. du Nord de la France*. Tome ii. 1889-90.
22. Malmgren, A. J.—Nordiska Hafs Annulater. *Öfvers. K. vet. Akad. Forhand.* Stockholm. 1865.

23. Malmgren, A. J.—Annulata Polychæta Spitsbergiæ, Grönlandiæ, Islandiæ et Scandinaviæ hactenus cognita. *Öfvers. K. vet. Akad. Forhand.* Stockholm. 1867.
24. Marenzeller, E. von.—Sudjapanische Anneliden. *Math. Naturwiss Akad. Wien.* 1879.
25. Marenzeller, E. von.—Zur Kenntniss der Adriatischen Anneliden. *Sitzb. der K. K. Akad. zu wiss. zu Wien.* 1874.
26. Möbius, K.—Die wirbellosen Thiere der Ostsee. *Jahresbericht der Comm. z. wiss. Untersuchung der deutschen Meere, für 1871.* Berlin. 1873.
27. Möbius, K.—Vermes. *Jahresbericht der Comm. z. wiss. Untersuch. der deutschen Meere.* Berlin. 1875.
28. Parfitt, E.—A Catalogue of the Annelides of Devonshire, with Notes and Observations. *Trans. Devon Assoc.*, vol. ii. 1867.
29. Pruvot, G.—Essai sur les Fonds et la Faune de la Manche Occidentale (Côtes de Bretagne) comparés a ceux du Golfe du Lion. *Arch. Zool. Expér et Gen.*, ser. 3, vol. v. 1897.
30. Pruvot, G., and E. G. Racovitza.—Materiaux pour la Faune des Annélides de Banyuls. *Arch. Zool. Expér et Gen.*, ser. 3, vol. iii. 1895.
31. St.-Joseph, de.—Annélides Polychètes des côtes de Dinard. Parts II. and IV. *Ann. des Sci. Nat.*, ser. 7, vols. v. and xx. 1888, 1895.
32. St.-Joseph.—Les Annélides Polychètes des côtes de France. *Ann. Sci. Nat.*, ser. 8, vol. v. 1898.
33. St.-Joseph.—Les Annelides Polychètes de la Rade de Brest et de Paimpol. *Ann. Sci. Nat.*, ser. 8, vol. x. 1899.

The Plague of Octopus on the South Coast, and its effect on the Crab and Lobster Fisheries.

By

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UNTIL the spring of 1899 the true or common octopus (*Octopus vulgaris*, L.) had been comparatively rare in the neighbourhood of Plymouth during the past ten or twelve years—*i.e.* since the opening of the Plymouth Laboratory in 1888. Specimens could only be obtained for the aquarium at long intervals, in spite of the tempting inducements offered to fishermen. As much as ten shillings has more than once been given to fishermen for a specimen of this voracious mollusk. On the other hand, the smaller and less powerful octopod known as *Eledone cirrosa* was almost always obtainable, and the octopus tank in the aquarium was rarely devoid of several specimens.

In the early part of last year (1899) the situation began to change, and we were for the first time able to keep the tank supplied with a number of true octopus, since which date there has been no difficulty in procuring an unlimited number of specimens, either from the professional fishermen or in the ordinary course of our own fishing operations.

We noticed this increase in the abundance of octopus before there was any means of judging whether it was a purely local phenomenon, or was observable over a wider area. The first specimens were brought to us in January, and from May onwards they were obtained in increasing abundance. Early in the same year, however (though I have no exact record of the date), a visitor from the Channel Islands informed me that the increase of octopus in those islands was so great as to have already caused much damage to the shell fisheries there, since the octopus entered the pots of the fishermen, and destroyed the crabs and lobsters which had been caught.

Later in the year paragraphs began to appear in the newspapers upon the subject, and during the present year (1900) have revealed that the

increase in octopus on both shores of the English Channel has not only been of a phenomenal character, but has caused widespread disaster to the shell fisheries on the French and English coasts alike. Three of these paragraphs are sufficiently detailed to deserve quotation.

1. From the *Western Evening Herald*, Plymouth, December 18th, 1899.

“A DEVIL-FISH PLAGUE.

“A correspondent writes as follows from Rivage de Questichou, a small watering-place on the coast of the Cherbourg promontory: ‘For the last two or three months this coast has been visited by a perfect octopus plague. They have quite ruined the fisheries, and many men have laid up their boats in despair. They devour everything, even crabs, and lobsters, and oysters, and all shell fish. The other day a man employed at the large oyster-beds near here told me he had that day found one that had eaten eighteen oysters that tide. The shore is strewn with octopus, and the other morning along high-water mark I counted sixty-eight in a distance of two hundred yards. A friend here measured one, and it was 5 feet 7 inches across the tentacles, but there are far larger ones than that. Some of the suckers are as large as a two-shilling piece. They are most loathsome beasts. Unless the cold winter destroys them, there will be no bathing next summer along this coast.’”

2. From the *Western Morning News*, Plymouth, September 18th, 1900.

“Budleigh Salterton crab and lobster fishery has been a very poor one this season. The failure is attributed by the fishermen in a great measure to octopi. The men say that eight or ten years since it was quite an event to take one of these creatures in their crab or lobster pots, but of late, more especially in the past two summers, their number has increased at an alarming rate, and they are now constantly being taken. The presence of the octopi is believed to be due to the excessive heat of recent summers. Not long since an octopus measuring at least 6 feet, with its tentacles fully extended, was captured off the coast, and they have often been seen close in shore, showing a preference for a pebbly or rocky bottom, and seldom seen where there is much sand.”

3. From the *Fishing Gazette*, London, October 27th, 1900.

“Last year and this year the coasts of Brittany have been infested by the cuttlefish (*Octopus vulgaris*), which had been deserted by them for fifteen years previously. In the Department of Finistère they are so abundant that it is almost impossible to turn over a stone on the beach without finding one or more of the pests. In some places they have been thrown up by the sea after a storm in such quantities that their dead bodies threatened to be a danger to the inhabitants, and hundreds of cartloads had to be carted away and sold as manure.

“In the lobster and crab fishing districts of the coast they have proved so destructive of these fish that the fishermen have been obliged to look to other means of making their living.”

In the Fourteenth Annual Report (for 1899) of the Inspectors of Sea Fisheries (England and Wales), an exceptional abundance of octopus is recorded by the collectors of fishery statistics for Babbacombe, Torquay, Brixham, Yealm, Mevagissey, Cadgwith, and Mousehole, all of which are fishing ports on the south-east coast of Devon and Cornwall. The collector of statistics at Plymouth reports a lack of evidence as to any exceptional prevalence of octopoda off this port, but the information obtained by ourselves leaves no doubt upon the matter.

I have attempted below to throw light upon the three practical aspects of this plague of octopus: (1) its cause, (2) its effects on the shell fisheries, and (3) the possibility of arresting its continuance by remedial measures.

I. CAUSE OF THE PLAGUE.

There can be no doubt from its widespread character that the plague is due in the first place to an exceptional multiplication of octopus in recent years. There is some evidence, as will be shown below, that the octopus move about in marauding bands; but this is probably a local phenomenon, that cannot account for the exceptional abundance of these creatures on both shores of the Channel.

The suggestion made in the paragraph from the *Western Morning News*, above cited, is, in my opinion, nearer the truth, viz. that the cause of their prevalence is connected with the heat of recent summers.

We unfortunately know nothing directly concerning the rate of growth of this large octopod. Many small mollusks attain their full size and maturity in their second year, as I have myself shown,* but there is abundant evidence that the larger mollusks require a number of years to attain the same condition. This is well seen in those shell-bearing mollusks which form fringes † (*varices*) on their whorls. The rate of growth in littoral, as well as most land animals, is not even, but is subject to alternating periods of active growth and quiescence, in accordance with the seasons. Consequently the larger fringes on the spiral shells of many mollusks, as well as the "shoots" of an oyster's shell, afford satisfactory indication of the age of these creatures. An oyster ‡ continues to enlarge his shell by annual "shoots" for four or five years, and then ceases to grow except in thickness. The number of spiny varices on the shells of the various species of *Murex* is never

* *Jour. M.B.A.* i., 1890, pp. 447-50.

† WOODWARD'S *Manual of Mollusca*, 1880, pp. 12, 13, 213.

‡ Oysters may produce spat when two years old, but are most prolific in their fourth and fifth years (*vide* HOEK. See this *Journal*, N.S. i. p. 277).

less than three, and may mount up to seven or eight in certain species (e.g. *M. radix*, Fischer's *Conchyliologie*, p. 641, fig. 399). The value, from this point of view, which should be given to the ridges on the shells of ammonites (extinct cuttlefishes) is doubtful. Woodward (*loc. cit.*) suggests that they may indicate the age of the shell in years (20 to 100); but there is no more ground for this conclusion than there would be for the opinion that the septa in the shell of a *Nautilus* or a *Spirula* were of annual formation. Both structures are intimately connected with the growth and support of the body, but their formation cannot be dependent on any annual periodicity of growth, since *Spirula* at any rate lives in the abysses of the ocean (350 to 950 fms.) far below the influence of seasonal changes. On the other hand it is not impossible that the larger and thicker varices which occur at intervals along the shells of certain ammonites may indicate the extent of one year's growth (Fischer and Woodward, *loc. cit.*, pl. iii., figs. 9 and 12). On this basis the age of the specimens figured could be estimated at five or six years.

From the facts recorded above concerning the rate of growth of oysters and the larger gastropods, it seems clear that the larger mollusks require at least three or four years to attain their full normal size. The octopus which have infested our coasts this year have been of various dimensions, but great numbers of them have been of phenomenal size, the arms in many cases attaining a length of 3 feet, and in some a length of 3½ feet from the mouth to the tip of the arm.

As specimens exceeding these in size are of very rare occurrence, we may assume provisionally that the age of the oldest specimens is at least three or four years, and, upon Woodward's theory of cephalopod growth, may far exceed that limit. The case of *Spirula* seems to me to be alone sufficient to discredit the accuracy of Woodward's theory; and a maximum age of seven or eight years for the largest specimens of octopus caught this year is the utmost that I should be prepared to assign from the analogy of other mollusks.

These estimates are probably sufficiently accurate to support the view that the plague of octopus may be traced to the influence on the reproduction of this species of the exceptionally favourable conditions which prevailed in 1893. If reference be made to the third volume of this Journal (pp. 210, 211) it will be seen that the conditions which prevailed in that year on our southern shores, as well as on the coasts of France, were extraordinarily favourable* for the reproduction of marine animals, and resulted in a great increase of the smaller mollusks, hydroids, and

* The spring quarter was the warmest recorded in our islands for at least thirty-three years, and was succeeded by a hot, calm summer (see this Journal, vi. p. 68, Table G).

Duke Rock	" "	10	—	—	1	2	4
Batten Bay	" "	10	—	—	1	1	2
Mallard	Friday, 19th	10	—	—	2	3	3
Promenade Pier	" "	10	—	12	1	2	2
Opposite Mt. Edgcombe House	" "	10	—	4	—	4	2
South of Drake's Island	Saturday, 20th	10	—	—	—	1	2
Queen's Ground Buoy	" "	10	—	—	—	2	4
Bovisand Bay	" "	10	—	—	—	—	2
Total	6 days	180	3	44	15	41	64
Average per diem		30	0·5	7·3	2·5	7	10·7

It will be seen that in Plymouth Sound, inside the Breakwater, the fisherman set thirty baited crab pots daily on an average during this experiment. His average daily catch consisted of less than one live crab and three live lobsters, and of nearly eleven octopus; while he removed daily the corpses or mutilated remains of as many as seven crabs and seven lobsters. Of eight crabs caught daily in his pots, at least seven, on an average, fell victims to the attacks of octopus; and of every ten lobsters caught only three escaped. The number of octopus caught in the pots is not an accurate measure of their actual abundance, because, unlike the crabs and lobsters, they can make their escape from the pots after entering them. In the Bovisand pots the bait was found to have disappeared, although no crabs or lobsters were caught. The capture of one or two octopus, however, in each string of pots shows that the creatures had entered the pots to devour the bait, and then taken

other forms on the south coast, as well as in an usually heavy fall of oyster spat.

The same conditions must have also affected the octopus, and the abundance of full-grown specimens which was first noticed off our coasts in January, 1899, appears to me to be attributable to that original cause. The warm summers and mild winters which we have experienced during the past few years have also provided the conditions most suitable to a warm-water animal, and have favoured its residence in our inshore waters. In Mr. Allen's paper on the fauna of Salcombe it will be seen that we found the grotto-like nests of the octopus, together with their inmates, in considerable numbers on the shore of Salcombe estuary this year, and others have come across these unpleasant intruders when bathing inshore in Whitsand Bay and elsewhere. I myself found a minute octopus, scarcely larger than a grain of rice (3.5 mm.), when fishing with a muslin net in Salcombe Harbour in August. This shows that the creature is already established, and reproducing its kind, in our inshore waters, and augurs ill for the shell fisheries during the next few years unless, as we may reasonably expect, a severe winter during the coming season may drive the octopus off shore to deeper water,* or, again, unless remedial measures can be devised for exterminating the animal.

II. EFFECTS ON THE SHELL FISHERIES.

The extent of the injury caused by the hordes of octopus now infesting our shores may be gathered from the subjoined table. It represents the actual catch of an experienced Plymouth fisherman (Mr. Wm. Roach) during a single week of October, and shows the total number of baited pots put down daily on the grounds, and the catch of crabs, lobsters and octopus. The number of crabs and lobsters killed in the pots by intruding octopus is distinguished from the number of uninjured shell fish. It should be borne in mind that until the last two years the entrance of an octopus into a fisherman's pots was a most exceptional occurrence, and did not happen, as I am credibly informed, more than once or twice a year. Several years might pass before the individual crab fisherman would take a single specimen in his pots.

* Postscript, Nov. 15th. The trawling smacks are now catching large numbers of octopus both off Plymouth (5 miles from shore) and in Start Bay (20 miles S.S.E. of Berry Head). As many as 100 have been taken in one haul in the latter locality.

TABLE I., showing the Actual Catch of Crabs, Lobsters, and Octopus by a Plymouth fisherman, in Plymouth Sound, during one week in October, 1900, distinguishing the living shell fish from those which had been killed (and often eaten) by Octopus.

	DATE.	NO. OF POTS.	CRABS.		LOBSTERS.		OCTOPUS.
			Live.	Dead.	Live.	Dead.	
Duke Rock	Monday, 15th	10	—	6	2	4	6
Inside Breakwater	„ „	10	—	—	1	3	4
Queen's Ground Buoy	„ „	10	1	3	1	2	5
Bovisand	„ „	10	—	—	—	—	1
East End of Breakwater	Tuesday, 16th	10	2	3	1	4	4
Drake's Island	„ „	10	—	—	1	2	3
Picklecombe Fort	Wednesday, 17th	10	—	—	—	2	6
Queen's Ground Buoy	„ „	10	—	7	1	2	3
Inside Breakwater Fort	„ „	10	—	4	2	2	4
White Patch (Ram's Cliff)	Thursday, 18th	10	—	5	1	5	7
Duke Rock	„ „	10	—	—	1	2	4
Batten Bay	„ „	10	—	—	1	1	2
Mallard	Friday, 19th	10	—	—	2	3	3
Promenade Pier	„ „	10	—	12	1	2	2
Opposite Mt. Edgecombe House	„ „	10	—	4	—	4	2
South of Drake's Island	Saturday, 20th	10	—	—	—	1	2
Queen's Ground Buoy	„ „	10	—	—	—	2	4
Bovisand Bay	„ „	10	—	—	—	—	2
Total	6 days	180	3	44	15	41	64
Average per diem	-	30	0·5	7·3	2·5	7	10·7

It will be seen that in Plymouth Sound, inside the Breakwater, the fisherman set thirty baited crab pots daily on an average during this experiment. His average daily catch consisted of less than one live crab and three live lobsters, and of nearly eleven octopus; while he removed daily the corpses or mutilated remains of as many as seven crabs and seven lobsters. Of eight crabs caught daily in his pots, at least seven, on an average, fell victims to the attacks of octopus; and of every ten lobsters caught only three escaped. The number of octopus caught in the pots is not an accurate measure of their actual abundance, because, unlike the crabs and lobsters, they can make their escape from the pots after entering them. In the Bovisand pots the bait was found to have disappeared, although no crabs or lobsters were caught. The capture of one or two octopus, however, in each string of pots shows that the creatures had entered the pots to devour the bait, and then taken their departure. It is, on the other hand, not improbable that the octopus actually caught in one or other of these pots were the same which had eaten the bait in the empty pots.

Be this as it may, the figures in the preceding table reveal in a striking

manner the enormity of the damage which has been inflicted on the shell fisheries of the Devon and Cornish coasts during the past summer. Although they mark probably the climax of the plague so far as Plymouth is concerned, yet destruction on a similar scale took place for at least six weeks or two months previously, and on a scale not much less serious during the earlier months of the year.

One of the most remarkable phenomena connected with the plague of octopus at Plymouth took place early in September, and appears to indicate that the octopus were moving about in large marauding bands. On Sunday, September 8th, it became known that crabs of unusual size were to be found between tidemarks at Batten and other parts of the eastern side of the harbour, and more than a hundred crabs, 5 to 7 inches in breadth, were picked up in that locality in the single day, as well as larger numbers of the smaller size which normally frequent the tidal zone.*

During the next few days crabs of 4-6 inches breadth were also exceptionally abundant on the shore below the Hoe, near the bathing-place at Tinside, and were gathered by boys who took them away by dozens at a time.

On the western shore, under Mount Edgumbe, near the "Bridge," we found no specimens exceeding 4 inches in breadth.

The explanation of the appearance between tidemarks of such exceptional numbers of fair-sized crabs is probably that the hordes of octopus had driven the crabs inshore to the shallowest margins as the only avenue of escape. The suddenness of the phenomenon, and its limitation to the eastern and northern sides of the harbour, was possibly due to an incursion into the Sound, through the eastern channel, of roving bands of octopus in search of food, though it is not improbable that the shallower declivity of the bottom and the greater extent of the tidal zone in this region may have facilitated the escape of a larger number of crabs in this part than elsewhere in the Sound.

In order to measure the general damage done to the shell-fish industry on the South Coast during the year, I have had recourse to the Board of Trade's monthly statistics of fish landed. As the practical problems presented are of an immediate character, I have thought it better not to wait until the whole year's returns have been completed, but to base comparisons on the statistics for the six summer months alone during the present and preceding years.

* Mr. W. Demelwick, water bailiff, informs me that from the above-mentioned date to the end of October at least 600 crabs and lobsters were picked up in this locality, viz. about 200 male crabs, 4-7 inches broad; 300 female crabs, 3½-6½ inches broad; and 100 lobsters, 9-11 inches in length. He adds, "The occurrence was most unusual, and no one remembers such a thing before."

In the first place, however, it is desirable to review the annual statistics of crabs and lobsters landed on the English coasts since the commencement of the Board's returns, in order to follow the general course of the English shell fisheries during recent years.

The following table shows the numbers of crabs and lobsters returned as landed on the South Coast and on All Coasts of England and Wales annually since 1886:—

TABLE II., showing the Number of Crabs and Lobsters annually landed (1) on the South Coast, and (2) on All Coasts of England and Wales, from 1886 to 1899, together with the Percentage Ratio in each year of the former to the latter (compiled from the Board of Trade's Returns).

YEAR.	CRABS (thousands).			LOBSTERS (thousands).		
	S. Coast.	All Coasts.	Per cent.	S. Coast.	All Coasts.	Per cent.
1886 . . .	528	2,863	18	325	452	72
1887 . . .	630	4,081	15	399	518	77
1888 . . .	635	4,750	13	338	469	72
1889 . . .	676	5,082	13	468	720	65
1890 . . .	744	4,808	15	596	922	65
1891 . . .	632	4,612	14	531	790	73
1892 . . .	766	4,521	17	624	858	73
1893 . . .	813	5,008	16	509	747	68
1894 . . .	828	4,339	19	467	728	64
1895 . . .	893	4,501	20	442	677	65
1896 . . .	1,028	5,030	20·4	499	932	53·5
1897 . . .	911	4,048	22·5	442	700	63·1
1898 . . .	1,078	5,628	19·2	486	826	58·9
1899 . . .	1,044	4,918	21·2	449	790	56·8

Summary of the preceding Table in Averages for Successive Periods of Four Years.

YEAR.	CRABS (thousands).			LOBSTERS (thousands).		
	S. Coast.	All Coasts.	Per cent.	S. Coast.	All Coasts.	Per cent.
1886-87 . . .	579	3,472	16	362	485	75
1888-91 . . .	672	4,813	14	483	710	68
1892-95 . . .	825	4,592	18	510	752	68
1896-99 . . .	1,015	4,906	21	469	812	58

It will be seen, from the summary provided, that on the South Coast the number of crabs annually landed has increased very steadily during the entire period covered by the returns, while the quantities landed on all coasts generally have remained fairly stationary since 1887. Consequently the percentage of crabs landed on the South Coast has increased during the same period, viz. from 14 per cent. in the quadrennial period 1888-91 to 21 per cent. in the period 1896-9.

On the other hand, the quantity of lobsters annually landed on the South Coast shows no such steady increase, the maximum having been attained in the years 1890-2, while the total quantity landed on all coasts shows a progressive aggrandisement. Consequently the per-

centage of lobsters landed on the South Coast has declined from 75 per cent. in 1886-7 to 58 per cent. in 1896-9.

Unfortunately we have no satisfactory information as to the changes in catching power devoted to this branch of the fishing industry during the period covered by the returns of fish landed. The information contained in column 5 of the collectors' returns in the Annual Reports of the Inspectors of Sea Fisheries (E. and W.) gives a rough indication of the number of boats engaged in crab and lobster fishing since 1892, and I have tabulated the data there given for the two years 1892 and 1899 for the South Coast ports, with the following results:—

	TOTAL NO. OF BOATS ENGAGED.					
	Class.					
	1st.	2nd.	3rd.			
1892*	14	206	299			
1899†	10	209	349			

These figures, if reliable, indicate that there has been no appreciable increase in the number of 1st and 2nd class boats specially engaged in crab and lobster fishing ‡ on the South Coast during the past eight years. The increase in the number of 3rd class (rowing) boats is probably more apparent than real, as shown by the extraordinary numbers assigned in the returns for Folkestone in 1899, and for Plymouth both in 1892 and 1899.

Consequently the increase in the returns of crabs landed during the past fourteen years may be taken as indicating an actual increase in their abundance, though this conclusion does not accord with the opinion of Plymouth fishermen whom I have questioned on the point.

The next table (Table III.) shows the average number of crabs and lobsters landed on the South Coast in each month of the year. It is compiled from the monthly returns of the Board of Trade for the entire term of fourteen years, 1886-99. It shows that the catch of shell fish varies regularly with the seasons, being low in the cold months, and high in the warm months. The six most productive months for both crabs and lobsters are seen to be those from April to September.

* Certain obvious errors in the official published figures have been corrected as follows:—
Kingsdown.—3rd class boats assigned, 3.
Plymouth.—For "150 3rd class boats" read "25 2nd class boats."
Helford.—For "3rd class" read "2nd class."

† Corrected as follows:—

Folkestone.—Six 1st class boats and 42 2nd class boats have been eliminated, these being trawlers and line vessels.

Plymouth.—For "100 3rd class boats" read "20 2nd class boats."

‡ The number of South Coast trawling smacks (which catch a certain quantity of crabs) has not increased 5 per cent. since 1889 (see this Journal, vi. p. 67, Table E), whereas the increase in the annual returns of crabs exceeds 50 per cent. during the same period.

TABLE III., showing the Average Number of Crabs and Lobsters landed on the South Coast of England in each month of the year (compiled from the Board of Trade's Returns for the fourteen years 1886-99); together with the Percentage of each monthly average to the average annual catch for the same series of years.

	CRABS.		LOBSTERS.	
	Monthly Average (in thousands).	Per cent.	Monthly Average (in thousands).	Per cent.
January	9.6	1.2	6.4	1.4
February	17.6	2.2	16.1	3.4
March	29.4	3.7	25.8	5.5
April	49.7	6.2	33.5	7.1
May	85.3	10.7	45.2	9.6
June	147.3	18.4	74.4	15.8
July	166.6	20.8	98.5	21.0
August	129.8	16.2	78.2	16.7
September	80.7	10.0	54.7	11.6
October	45.8	5.7	27.7	5.9
November	27.0	3.4	7.6	1.6
December	11.7	1.5	2.0	0.4
YEAR	800.6	100.0	469.6	100.0

The percentage of crabs landed in the six summer months (April to September) amounts to 82.3 per cent. of the whole, and that of lobsters to 81.8 per cent. of the whole. It follows therefore that statistics based on the returns for the six summer months alone in successive years provide a sufficiently accurate basis from which to compare the productiveness of these fisheries in successive years. Indeed, it is probable that greater accuracy is ensured by this method than by taking the figures for the entire year, since the catches in the winter months depend less on the abundance of shell fish in the vicinity of the coast than on the prevalence or scarcity of stormy weather.

The next table shows the number of crabs and lobsters annually landed during the six summer months on the South Coast from 1886 to 1900.

TABLE IV., showing the Number of Crabs and Lobsters landed on the South Coast during the six summer months (April to September) in each year from 1886 to 1900 (compiled from the Board of Trade's Returns).

	CRABS (thousands).	LOBSTERS (thousands).
1886	471	281
1887	504	335
1888	514	279
1889	544	398
1890	571	499
1891	538	431
1892	603	478
1893	666	395
1894	679	367
1895	779	349
1896	869	416
1897	734	354
1898	880	405
1899	877	388
1900	596	319

It will be seen from the table that the yearly fluctuations in the returns for these months are almost identical in character with the fluctuations in the returns for the entire year given in Table II. The returns for the six summer months, however, in 1900 are seen to fall far below the returns for many years previously, both for crabs and lobsters, but especially for crabs. The number of crabs landed in 1900 is returned as 596 thousands, and that of lobsters 319 thousands. The returns for the previous year are, for crabs, 877 thousands, and for lobsters 388 thousands. The returns for 1900 accordingly show a diminution of 32 per cent. on the returns of the previous year as regards crabs, and of 18 per cent. as regards lobsters. These decreases are without parallel in the whole period of fifteen years covered by the Board of Trade's statistics, the nearest approach being afforded in the stormy year 1897, when the returns both for crabs and lobsters fell by 15 per cent. below those of the previous year. The number of crabs returned as landed on the South Coast in the summer months of the present year is actually lower than the number returned for any of the previous eight years, and of lobsters for any of the previous eleven years.

These figures therefore show in a marked manner the disastrous effect of the octopus plague on the shell fisheries of the South Coast during the present year. Unfortunately, it is not improbable that the ill effects may continue to be felt for several years to come, since a great destruction of shell fish, both mature and immature, must have taken place without directly affecting the statistics for the present year, though it may be expected to exert a depressing influence on the number of shell fish available for capture in succeeding years.

A feature of considerable interest in these statistics is the suddenness of the fall in 1900, although the first signs of the increase in the number of octopus on our coasts were manifested early in the preceding year. Bearing in mind the fact that the full effects of the plague were already experienced in the Channel Islands and on the French coast during the preceding year, and that there were no indications of any local increase in the numbers of octopus on our coasts prior to 1899, it seems exceedingly probable that the plague on our own coast is due to an actual invasion of octopus from the opposite shores of the Channel. This invasion began in 1899, but did not reach its height until the present year. The probable cause of the invasion, if this interpretation of the facts be accepted, is not far to seek. Enough is known about plagues in general to justify the statement that while they are in most cases attributable in the first instance to the effects of exceptionally favourable conditions for reproduction and survival, the migrations which subsequently take place are caused by the overcrowding and dearth of food which necessarily ensue in the original locality. I need

only point to the well-ascertained facts concerning the plagues and migrations of lemmings* and locusts† in support of this statement.‡

The information we possess concerning the present plague of octopus points to a precisely similar conclusion—viz. an abnormal multiplication of these creatures on the French shores of the Channel and in the Channel Islands, dating back with some degree of probability to the year 1893, and followed in 1899, when the plague on the French coast had reached its height, by migrations outwards from the overcrowded centres of multiplication.

I have no detailed information as to the devastation effected by these creatures on the French coast (beyond the statement that they have done enormous damage to the shell fisheries in general), but the changes they have already wrought in our own waters are sufficient to show their probable character. In Plymouth Sound they have not only attacked the edible crabs (*Cancer pagurus*) and lobsters (*Homarus vulgaris*), but have temporarily exterminated the larger swimming crabs (*Portunus puber* and *depurator*) which in previous years have always been found in great abundance in the harbour. During the last few months it has been impossible to obtain more than isolated specimens in the shrimp trawl, although in previous years scores, and even hundreds, at a time could be obtained. In the Laboratory aquarium the octopus attacked and devoured all the specimens of the commoner British octopod, *Eledone cirrhosa*, which were living in the same tank.

III. REMEDIAL MEASURES.

There is no reason to believe that the present plague of octopus will continue for more than one or two seasons, since the creature would long ago have established itself on our shores if the conditions had been suitable for its permanent residence. The species is a warm-water animal, and belongs, like many other occasional visitants of our south-western shores, to an assemblage of types which are distributed from the Mediterranean to the southern shore of the English Channel. The extension of these types to the north and east is usually limited by a line drawn from Start Point to the Cherbourg peninsula. As types of this fauna may be mentioned the ormer or ear-shell (*Haliotis tuberculata*), the crayfish (*Palinurus vulgaris*), the cotton-spinner (*Holothuria nigra*), and the pilchard or sardine (*Clupea pilchardus*). The barrier to the north-east, constituted roughly by the Start-to-Cherbourg line, is largely one of temperature. Eastward of that line the mean yearly temperature

* COLLETT, *Myodes lemmus, its Habits and Migrations in Norway*. Christiania Videnskabs-Selskabs Forhandling, 1885, No. 3.

† MUNRO, *The Locust Plague and its Suppression*, London, 1900.

‡ Cf. LATTEB, *The Recent Plague of Wasps*, Natural Science, iii., Oct., 1893, p. 273; also cf. vi., 1895, p. 178.

of the sea along the whole English coast from Start Point to the Straits of Dover is very slightly in excess of 52° Fahr., as recently determined by Dickson;* whereas west of that line the mean annual temperature of the coastal waters on the English coast rises from $52^{\circ}\cdot 1$ at the Start to $53^{\circ}\cdot 9$ in the Scilly Isles.

On the French coast the mean temperature is naturally somewhat higher than the temperature even of Devonshire and Cornish waters, and is not usually subject to so much depression during the winter months. It is probably this difference which, more than any other, renders impossible the permanent acclimatisation on the Devonshire and Cornish coasts of animals which are common on the opposite shores and rarely found on our own. The warm summers and mild winters which we have recently experienced have enabled the octopus temporarily to maintain themselves on our shores under pressure of the exceptional circumstances prevailing on the French coast; but the normal conditions of temperature will, in all probability, reassert themselves during the next year or two, in which case the disappearance of the octopus will almost certainly ensue.

Great damage to the shell fisheries may unfortunately take place in the meantime, and it is very desirable that the situation should be carefully considered. If the figures given in Table I., p. 265, afford any indication of the injury done to the fisheries in other localities as well as Plymouth, the question arises whether it would not be better for the fishermen to suspend all fishing for crabs and lobsters during the continuance of the plague, and to turn their attention temporarily to other kinds of fishing. By continuing to set their baited pots for shell fish they will obtain very meagre catches of uninjured crabs and lobsters so long as the octopus abound, and will at the same time place a far larger number at the mercy of the octopus without any chance of escape. As shown in Table I., fourteen out of every seventeen crabs and lobsters caught in October fell victims to the octopus, whereas if they had not been imprisoned in the fishermen's pots they would have been free to avail themselves of their natural methods of concealment and protection. Many of those which are now killed in the fishermen's pots would doubtless survive under natural conditions until the octopus disappear again, and would thus add to the breeding stock next year. It is to be feared that this stock, as well as the abundance of young crabs, must have been seriously reduced during the past summer. It is consequently to the fishermen's own interests to avoid all unnecessary waste of those which remain, since it is on them that the fisheries depend for their replenishment during the coming years.

* H. N. DICKSON, *Q. J. R. Met. Soc.*, xxv., Oct., 1899.

The one advantage which results from a continuance of the fishing is that the fishermen are thereby enabled to catch and destroy large numbers of octopus which are taken in their pots, and this in itself is of much importance. If a single fisherman, in the ordinary course of his work, as shown in Table I., can catch sixty-four octopus in a week, an appreciable reduction can be made in their numbers by the labours of ten or a dozen fishermen similarly employed.

On the Continent, however, and especially in the Mediterranean, where these octopods are regularly fished and sold for food, it is found that they can be caught in unbaited earthenware pots or vases, provided these are of a shape and size suitable for the octopus to enter and take shelter in. The pots appear usually to be pitcher-shaped, with a globular body about 12 inches and a neck about 3 or 4 inches in diameter. These are attached by cords to a line at fixed intervals, and the whole is then lowered to the bottom and buoyed for subsequent recognition. The line is hauled up every few days, and a certain number of octopus are found to have taken up their residence in the empty pots. They can thus be removed and killed without involving any sacrifice of valuable shell fish in the process.

In places where the octopus abound, *e.g.* at Marseilles, three or four men are permanently employed at a small subsidy in the sole work of catching them by the above and similar devices.

The question therefore arises whether similar means could not be used with advantage during the present crisis on the Devonshire and Cornish coasts; and, if so, whether the Sea Fisheries Committees of the two counties might not obtain authority to temporarily subsidise those *bonâ fide* crab fishermen who would give up their ordinary mode of fishing to devote themselves for a time to the work of exterminating the octopus by such means.

I hope that by the time these remarks are published I may be in a position to state the results of experiments on these lines which are now in progress in Plymouth Sound.

Notes and Memoranda.

Gadus esmarkii (*Nilss.*) in shallow water. A living specimen of this fish was taken on August 27th, 1900, in a tuck-net worked by Mr. T. Curtis on the shore of the Hamoaze, off Coombe Lake, between Saltash and the mouth of the River Lynher. Associated with it were numbers of mackerel, garfish, and young gadoids. Owing to its "bastard" characters, which struck the eye of the fisherman when handling it, the specimen was brought to the Laboratory for examination. Its capture is interesting for several reasons. It is the first specimen of Esmark's Pout recorded from the English Channel, and the only specimen hitherto obtained in littoral water, at any rate in the British area. The previous British records are enumerated in Holt's papers in *Trans. Roy. Dublin Soc.* v. 1895, p. 431, and this Journal, vol. v. 1897, p. 79. The dimensions and fin-ray formula of this specimen are given below, together with those of the less mutilated specimen from the Bristol Channel referred to by Holt in the second of his papers.

	—SPECIMEN FROM—	
	HAMOAZE. mm.	BRISTOL CHANNEL. mm.
Length, without caudal rays	168	167
„ with „	181	180
Depth, maximum	35	Shrunken
„ min. (caudal peduncle)	8	8
Length of head	39.5	37
Diameter of eye	13	12
Length of snout (preorbital)	10	9
Interorbital breadth	9	7
Fin-rays— $D_1 + D_2 + D_3$	15 + 24 + 24	15 + 28 + 27
„ $A_1 + A_2$	26 + 25	29 + ?

It will be observed that in the proportions of the eye and head ($=\frac{1}{3}$) these southern specimens agree with the Norwegian type (Smitt, *Scandinavian Fishes*, 1892, p. 502), but that the ratio of length to depth of body falls below the minimum ratio assigned to this character for Scandinavian specimens by Smitt. The figures given by this authority show that the total length varies between 5.1 and 5.9 times the depth. In the Plymouth specimen the length is only 4.8 times the depth, thus approximating to the proportions of most of the Scottish and Irish specimens described by Günther and Holt ($4\frac{1}{2}$ times). It

would therefore appear that in spite of occasional exceptions, such as those recorded by Holt, there is a general tendency in the British samples of *Gadus esmarkii* to the assumption of a stouter and less slender shape of body than in the Scandinavian type. So far as the Plymouth specimen is concerned this relation is also confirmed by the relatively greater depth of the caudal peduncle. The body length is only 21 times the depth of the peduncle, whereas in Scandinavian specimens, according to Smitt, the body is so attenuated that the length varies between 22.2 and 25 times the minimum depth of the body. Günther's figure of a Scottish specimen, on the other hand, yields a ratio of 24.5 times the caudal peduncle (*Proc. Roy. Soc. Edin.* xv. 1889, Plate III.).

The fin-ray formulæ present no distinctive features, since they happen to coincide closely in the two fishes examined with the minimum and maximum limits of variation assigned to Scandinavian specimens by Smitt. The maximum number of rays (38) attributed by Smitt to the second anal fin is clearly a misprint for 28.

It follows from the above that the only difference between the British and Norwegian samples of *Gadus esmarkii* that is revealed by the available data is a greater range of variation in the relative size of the eye and depth of the body in British than in Scandinavian specimens, a difference that may possibly be reduced upon examination of these points in a larger number of Scandinavian specimens.

WALTER GARSTANG.

An albino Hake (*Merluccius merluccius*). During the first week of October, 1900, Mr. J. C. Ward, Director of the Milford Docks Company, sent me, at the request of the captain of one of the steam trawlers, a specimen of a fish which came up in the trawl amongst a catch of hake, and was presumed to belong to some different and unfamiliar species. It was hakelike in form and structure, but much leaner in appearance, and entirely destitute of the usual skin pigmentation, both on the external surface of the body and on the inner linings of the buccal cavity and gill covers.

As a white-mouthed hake (*Merluccius argentatus*) has been recorded from the Icelandic coast by Faber (*vide* Günther, *Catalogue of Fishes*, iv. p. 346), I examined this specimen in some detail, half expecting it to throw light on the somewhat dubious Icelandic form. In all structural respects, however, the specimen agreed with the common hake, the teeth being normal, the scales forming about 135 rows, and the fin-ray formula being D. 10 + 39; A. 38. The pigmentation of the retina and peritoneum was also normal. The specimen was clearly, therefore, a white-skinned abnormality of the common hake, and offered

no approach either to the Icelandic or New England hake, as regards an exceptionally large number of fin-rays.

The lean and emaciated condition of the specimen was, however, very striking, especially in the head region, where not only the bony ridges of the skull and cheeks projected sharply beneath the thin layer of skin, but even the lines of sculpture of the superficial bones were plainly recognisable. In a normal hake, with which I compared the specimen, these details were quite invisible, and the bony ridges were rounded off or hidden by the plumpness of the integument. In girth and weight the albino was far inferior to the normally pigmented hake of approximately equal length, as the following figures reveal:—

	Albino.	Normal (dusky) hake.
Length, to base of caudal fin	26 $\frac{1}{4}$ ins.	27 $\frac{1}{2}$ ins.
Length of head (snout to opercular spine).	6 $\frac{1}{4}$ „	6 $\frac{1}{4}$ „
Interorbital breadth	1 $\frac{5}{8}$ „	1 $\frac{3}{4}$ „
Girth round head, just in front of pelvic fins	9 „	10 $\frac{1}{8}$ „
Girth just behind the tenth anal fin-ray	9 $\frac{1}{8}$ „	10 $\frac{1}{4}$ „
Weight (guttled)	4 lb. 5 oz.	5 lb. 9 $\frac{1}{2}$ oz.

These data show that, although the length of the albino was only 4 $\frac{1}{2}$ per cent. less than that of the normal hake, the deficiency in girth amounted to 11 per cent. and the deficiency in weight to 23 per cent.

As the fish showed no signs of disease, I believe its lean condition may be attributed with some confidence to the check placed upon its catching powers by its conspicuous white colouration. Being a predacious and nocturnal fish, the hake must depend largely for its success in catching mackerel and other active prey upon its dusky inconspicuous appearance. A white hake, on the other hand, would be more easily avoided, especially at night, and would therefore catch fewer fish. Hence the emaciated condition of this albino is particularly interesting from the evidence it seems to afford of the operation of natural selection as regards the colouration of fishes.

In drawing this conclusion I have not overlooked the possibility that the deficiency in skin pigment may have involved a thinning of the skin, either as a physiological or congenital correlate, especially as in the New England hake (*M. bilinearis*), which appears to be less darkly pigmented than the European species, the ridges on the head are described as being very conspicuous (Jordan and Evermann, *Fishes of North America*, 1898, p. 2,530). The relative deficiency in the weight of this albino fish appears to be far too great to admit of this interpretation.

WALTER GARSTANG.

Marine Biological Association of the United Kingdom.

Report of the Council, 1899-1900.

The Council and Officers.

The four usual quarterly meetings of the Council have been held during the year, at which the average attendance has been eight. Three meetings have been held at the rooms of the Royal Society, and one at the rooms of the Zoological Society. The Council desires to express its thanks to both Societies for the hospitality shown.

The Council has to record with deep regret the death of two of its Vice-Presidents, both of whom took an active part in the foundation of the Association in 1884, and have since that time taken great interest in its welfare—His Grace the Duke of Argyll and Sir William Flower, K.C.B.

The Plymouth Laboratory.

The buildings, fittings, and machinery at Plymouth are in good order, with the exception of the small gas engine, the condition of which is receiving the attention of the Council. The Laboratory is adequately provided with the necessary apparatus for advanced research.

Arrangements have been made for supplying sea-water, obtained from the open sea beyond the Plymouth Breakwater, for special experiments on the rearing of sea-fishes and other marine animals. A tank-boat, having a carrying capacity of about 1,200 gallons, has been purchased, and a Tangye's pump fixed near the shore, by means of which the water is pumped from the boat to tanks placed on the upper story of the west wing of the Laboratory building. From these tanks the water is run through glass tubes to the main laboratory. The woodwork of the tanks is not yet seasoned, and a practical trial of the system has up to the present not been attempted.

The Boats.

The steamboat *Busy Bee* is in good order, and has not caused much expense for repairs during the year. Owing to the great increase in the price of coal it was found necessary to lay her up for a period during the winter, and the collecting work was then done by the sailing boat *Anton Dohrn*.

Through the kindness of Mr. J. W. Woodall the Association has had placed at its disposal for the present summer the hull of a small sailing yacht, the *Dawn*, which is being fitted up as a floating laboratory, for the purpose of investigating the fauna of the different harbours in the neighbourhood. This boat is at present stationed at Salcombe.

The Staff.

No change has taken place in the salaried staff during the year, which now consists of the Director (Mr. E. J. Allen), the Naturalist in charge of Fishery Investigations (Mr. W. Garstang), and the Director's Assistant (Mr. R. A. Todd). The Council considers that further development of the work of the Association must depend chiefly upon the provision of funds for a substantial increase in the number of naturalists permanently engaged in carrying out investigations. With the staff at its present numerical strength it is impossible to make full use of the facilities for research provided by the Laboratory and its equipment; for although the number of voluntary workers is not inconsiderable, the periods for which they remain at the Laboratory are generally short. Several additional naturalists might be permanently employed at Plymouth without any great additional expense beyond that of their salaries.

Occupation of Tables.

In addition to the Officers employed by the Association, the following naturalists have been engaged in research work at the Plymouth Laboratory during the year:—

- W. M. ADERS, Marburg (Hydrozoa).
- W. I. BEAUMONT, B.A., Cambridge (Nemertina and Mysidæ).
- G. P. BIDDER, B.A., Cambridge (Sponges).
- E. T. BROWNE, B.A., University College, London (Medusæ).
- C. FORSTER COOPER, Cambridge (General Zoology).
- W. F. COOPER, Cambridge (General Zoology).
- H. FAGAN, Cambridge (General Zoology).
- N. B. HARMAN, B.A., M.B., Cambridge (Fishes).
- M. D. HILL, M.A., Oxford (Alcyonium).
- J. KIMUS, Ph.D., Louvain (Crustacea).
- W. SAVILLE KENT, London (Fishes).
- W. F. LANCHESTER, B.A., Cambridge (Phoronis).
- Prof. E. W. MACBRIDE, M.A., Montreal (Echinoderma).
- Prof. E. A. MINCHIN, M.A., University College, London (Sponges).
- Miss E. G. PHILIPPS, Newnham, Cambridge (Polyzoa).
- R. C. PUNNETT, B.A., Cambridge (Elasmobranchs).
- A. WILLEY, D.Sc., London (Polychæta).
- R. N. WOLFENDEN, M.D., Cambridge (Plankton).
- H. M. WOODCOCK, University College, London (Hydrozoa).

Twelve students from Oxford, Cambridge, and Eton attended Mr. Garstang's vacation class in Marine Biology.

The Library.

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

- Transactions and Proceedings of the Royal Society of London.*
Transactions and Proceedings of the Zoological Society of London.
Zoological Record.
Report of the British Association for the Advancement of Science. (Dover, 1899.)
Journal of the Royal Microscopical Society.
Quarterly Journal of Microscopical Science. (Presented by Messrs. J. and A. Churchill.)
Proceedings of the Fourth International Congress of Zoology. (Cambridge, 1898.)
Report of H.M. Inspectors of Fisheries. (England and Wales.)
Catalogue of the Radcliffe Library, Oxford.
Zoological Results based on Material from New Britain, New Guinea, Loyalty Islands, and elsewhere. Dr. A. Willey.
The Cambridge Natural History. (Presented by the Editors.)
Transactions of the Scottish Natural History Society.
Proceedings of the Scottish Microscopical Society.
Report of the Millport Marine Biological Station.
Annual Report of the Fishery Board for Scotland.
Studies from the Marine Laboratory of the Royal Dublin Society.
Proceedings of the Royal Irish Academy.
Proceedings and Transactions of the Liverpool Biological Society.
Report of the Port Erin Biological Station.
Lancashire Sea Fisheries Committee. *Superintendent's Report.*
Studies in Biology from Owens College, Manchester.
Northumberland Sea Fisheries Committee. *Report on Trawling Excursions.*
Proceedings of the Bristol Naturalists' Society.
Cornwall County Council. *Report of the Lecturer on Fishery Subjects.*
Rousdon Observatory. *Meteorological Observations.*
Annual Reports of the Department of Marine and Fisheries, Canada.
Bulletin of the Natural History Society of New Brunswick.
Annals of the South African Museum.
Cape of Good Hope Department of Agriculture. *Report of the Marine Biologist.*
Illustrations of the Zoology of the Royal Indian Marine Survey Ship "Investigator."
Administration Report of the Madras Government Museum.
Memoirs of the Bernice Panahi Bishop Museum.
Proceedings of the Linnean Society of New South Wales.
Australian Museum, Sydney. *Report of Trustees.*
Australian Museum, Sydney. *Memoir IV.; Catalogue XVII., Tunicata.*
Records of the Australian Museum.
Proceedings of the Royal Society of Victoria.
Fauna Hawiienensis.
Bulletin du Museum d'Histoire Naturelle, Paris.
Statistique des Pêches Maritimes.
Bulletin de la Marine Marchande.

- Bulletin Scientifique de la France et de la Belgique.*
Mémoires de la Société Zoologique de France. Bulletin de la Société Zoologique de France.
Congrès International de Pêches. Maritimes. (Dieppe, 1898.)
Bulletin de la Société Centrale d'Aquiculture et de Pêche.
La Feuille des Jeunes Naturalistes.
La Pisciculture Pratique.
Le Mois Scientifique.
Wissenschaftliche Meeresuntersuchungen. Aus der Biologischen Anstalt auf Helgoland.
Mittheilungen des Deutschen Seefischerei-Vereins.
Allgemeine Fischerei-Zeitung.
Mittheilungen aus dem Naturhistorischen Museum in Hamburg.
Bulletin de l'Académie Impériale des Sciences de St. Petersbourg.
Bulletin du Laboratoire Biologique de St. Petersbourg.
Russian Fishery Journal.
Mittheilungen des Kaukasischen Museums.
Revue Internationale de Pêche et de Pisciculture.
Acta Societatis pro Fauna et Flora Fennica.
Norwegian North Atlantic Expedition Reports.
Archiv for Mathematik og Naturvidenskab.
Bergens Museums Aarbog.
An Account of the Crustacea of Norway. By G. O. Sars. (Bergens Museum.)
Norsk Fiskeritidende.
Svensk Fiskeri Tidskrift.
Det Kongelige Norske Videnskabers Selskabs Skrifter.
Bihang till Kongl. Svenska Vetenskaps Akademiens Handlingar.
Selskabet for de Norske Fiskeriers Fremme.
Mittheilungen aus der Zoologischen Station zu Neapel.
La Nuova Notarisia.
Mémoires de l'Académie Royal des Sciences et des Lettres de Danemark.
Bulletin de l'Académie Royale des Sciences et des Lettres de Danemark.
The Danish Ingolf Expeditions. Zoological Museum, Copenhagen.
Report of the Danish Biological Station to the Board of Agriculture. Dr. C. G. J. Petersen.
Beretning fra Kommissionen for Videnskabelig Undersøgelse af de danske Fravande.
Verslag van den Staat der Nederlandsche Zee Visscherijen.
Mededeelingen over Visscherij.
Tijdschrift der Nederlandsche Dierkundige Vereeniging.
Het Zoologisch Station der Nederlandsche Dierkundige Vereeniging. Dr. P. P. C. Hoek.
La Cellule.
Bulletin de la Société Belge de Géologie.
Annales du Musée du Congo.
Estatica das Pescas Maritimas. Portugal.
Revista de Pesca Maritima.
Bulletin and Report of the United States Commission of Fish and Fisheries.
Bulletin and Memoirs of the Museum of Comparative Zoology at Harvard College.
Annual Report of the Smithsonian Institution. United States National Museum.
Bulletin of the United States National Museum.
Proceedings of the United States National Museum.
Bulletin and Annual Report of the American Museum of Natural History.

- Annals of the New York Academy of Sciences.*
Memoirs from the Biological Laboratory of the Johns Hopkins University.
Bulletin of the Laboratories of Natural History, State University of Iowa.
Bulletin of the Illinois State Laboratory.
Publications of the Field Columbian Museum.
Contributions to Biology from the Hopkins Seaside Laboratory of the Leland Stanford Junior University.
Proceedings of the Boston Society of Natural History.
Bulletin of the Buffalo Society of Natural Sciences.
Comunicaciones del Museo Nacional de Buenos Aires.
Annales del Museo Nacional de Montevideo.
Revista Chilena de Historia Natural.
Journal of the College of Science, University of Tokyo.
Annotationes Zoologicae Japonenses.
Journal of the Fisheries Society of Japan.
Report of Fisheries Institute. Department of Commerce and Agriculture. Japan.

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:—

- Report on the Xeniidæ collected by Dr. Willey.* J. H. Ashworth.
The Epidermis of Tubifex rivulorum, Lamarck, with Especial Reference to its Nervous Structures. L. Atheston.
A Contribution to the Anatomy of the Digestive Tract in Salmo salar. J. K. Barton.
On the Formation of Coral Reefs on the N.W. Coast of Australia. P. W. Bassett-Smith.
Record of Echinoderma. F. A. Bather.
The Fauna of the Sound. From the Swedish of Dr. E. Lönnberg, by F. A. Bather.
A Book of Whales. F. E. Beddard. Presented by Dr. Russel Rendle.
On the Occurrence of Gobius capito on the Coast of Brittany. G. A. Boulenger.
The Elimination of the Unfit as illustrated by the introduced Sparrow. H. C. Bumpus.
The Breeding of Animals at Woods Holl. H. C. Bumpus.
On the Reappearance of the Tile-fish. H. C. Bumpus.
Résultats Scientifiques de la Campagne du "Caudan." Copépodes. E. Canu.
Note sur les Copépodes et les Ostracodes Marins des Cotes de Normandie. E. Canu.
Le Tarif des Douanes et la Conservation des harengs congelés au moyen du Mélange de Sel et de Glace. E. Canu.
La Pêche a Boulogne. E. Canu.
Plankton Researches in 1897. P. T. Cleve.
On the Seasonal Distribution of some Atlantic Plankton Organisms. P. T. Cleve.
On the Origin of Gulf-stream Water. P. T. Cleve.
Some Atlantic Tintinnodea. P. T. Cleve.
Recherches sur les Aphroditiens. J. G. Darboux.
The Mean Temperature of the Surface Waters of the Sea round the British Coasts and its Relation to the Mean Temperature of the Air. H. N. Dickson.
Von der Allgemeingiltigkeit Wissenschaftlicher Aussagen. H. Driesch.
Resultate und Probleme der Entwicklungsphysiologie der Thiere. H. Driesch.
Studien über das Regulationsvermögen der Organismen. H. Driesch.
Haben die Fische ein Gedächtniss. L. Edinger.
Notes on Tectibranchs and Naked Molluscs from Samoa. C. Eliot.

- The Power of Colour-change in Animals.* F. W. Gamble.
- Directions to Fishermen for Increasing the Stock of Fish on the Fishing Grounds.* W. Garstang.
- Miscellanées Biologiques dédiées au Professeur A. Giard a l'occasion du XXV^e Anniversaire de la Foundation de la Station Zoologique de Wimereux.*
- Coup d'œil sur la Faune et note sur la Flore du Boulonnais.* A. Giard.
- La Station Zoologique de Wimereux.* A. Giard.
- The Palpebral and Oculomotor Apparatus in Fishes.* N. Bishop Harman.
- Zur Kenntniss der Gattungen Margelopsis and Nemopsis.* C. Hartlaub.
- Beiträge zur Fauna der Südöstlichen und Ostlichen Nordsee.* Dr. Fr. Heincke.
- Oysters and Disease.* Lancashire Sea Fisheries Memoirs. W. A. Herdman and R. Boyce.
- The Medusæ of Millepora.* S. J. Hickson.
- Zoophytes. Presidential Address, Manchester Microscopical Society.* S. J. Hickson.
- The Stolonifera and Alcyonacea collected by Dr. Willey.* S. J. Hickson and I. Hiles.
- Neuere Lachs-und Maifisch-Studien.* P. P. C. Hoek.
- Recherches sur la Reproduction des Poissons osseux.* E. W. L. Holt.
- On the Nephridium of Nephthys cæca.* F. H. Hughes.
- The True Nature of Mobiusispongia parasitica, Duncan.* A. V. Jennings.
- On a new Genus of Foraminifera of the Family Astrorhizidæ.* A. V. Jennings.
- On the Structure of the Isopod Genus Ourozeuktes.* A. V. Jennings.
- The Structure of the Forest of Wyre Coal-Field.* D. Jones.
- On the Nauplius stage of Penæus.* K. Kishinouye.
- Contributions to the Natural History of the Commander Islands.* K. Kishinouye.
- The Sense-organs of Nereis virens, Sars.* F. E. Langdon.
- The Development of Echinoids.* E. W. MacBride.
- The Movements of Copepods.* E. W. MacBride.
- Dictionary of the Lepcha language.* Gen. G. B. Mainwaring.
- Description d'une espèce nouvelle du genre Potamon, Sav., provenant du pays des Somalis.* J. G. de Man.
- Note sur quelques Thelphusidés recueillis par M. Parie dans l'Indo-Chine.* J. G. de Man.
- Note sur quelques espèces des genres Parathelphusa, H.M.E. et Potamon, Sav., recueillis par M. Leonardo Fea pendant son voyage en Bermanie.* J. G. de Man.
- Note sur quelques espèces du genre Alpheus, Fabr. appartenant a la section dont l'Alpheus Edwardsi, Aud., est le représentant.* J. G. de Man.
- The Maturation, Fertilization, and Early Development of the Planarians.* W. G. van Name.
- Manual de Ictiologia Marina.* D. A. Navarrete.
- On British Species of Siphonostoma.* M. J. Newbigin.
- 2-den beretning om de ved den biologiske station i Bergen foretagne udklaekningsforsög med lakserogn i saltvand.* O. Nordgaard.
- Notes on Montagu's Hunting Ground, Salcombe Bay.* A. M. Norman.
- Revision of British Mollusca.* A. M. Norman.
- Cucumaria Montaguï (Fleming) and its Synonymy.* A. M. Norman.
- A Month on the Trondhjem Fiord.* A. M. Norman.
- Holothuria nigra, Gray, and its Synonymy.* A. M. Norman.
- La Riduzione Progressiva della Variabilita e i suoi Rapporti coll' Estinzione e coll' Origine delle Species.* D. Rosa.
- Les Cutleriécées et leur Alternance de Générations.* M. C. Sauvageau.
- Note Preliminaire sur les Algues Marines du Golfe de Gascoyne.* C. Sauvageau.

- Les Acinetospora.* C. Sauvageau.
A List of Irish Cetacea. R. F. Scharff.
The History of the European Fauna. R. F. Scharff.
Address to the Zoological Section, British Association, Dover, 1899. A. Sedgwick.
On a collection of Echiurids from the Loyalty Islands, New Britain and China Straits. A. E. Shipley.
Notes on the Species of Echinorhynchus parasitic in the Cetacea. A. E. Shipley.
The Death Temperature of Certain Marine Organisms. H. M. Vernon.
Heat Rigor in Cold-blooded Animals. H. M. Vernon.
The Effect of Staleness of the Sexual Cells on the Development of Echinoids. H. M. Vernon.
The Marine Biological Stations of the World. H. B. Ward.
Protoplasmic Contractility and Phosphorescence. S. Watasé.

Amongst a large number of pamphlets from the library of the late Rev. Thomas Hincks, presented to the Association by Mrs. Hincks, and forming a valuable addition to those purchased last year from the same source, are :—

- A notice of some new genera and species of British Hydroid Zoophytes.* J. Alder.
Descriptions of three new and rare British Zoophytes on the Coast of Northumberland. J. Alder.
Descriptions of two new species of Sertularian Zoophytes. J. Alder.
Reports on Deep Sea Dredgings on the Coasts of Northumberland and Durham. H. B. Brady.
A monograph of the recent British Ostracoda. H. B. Brady.
On the development of decapod Crustacea. Spence Bate.
The General History of the Cephalopoda, Recent and Fossil. A. Crane.
Description of Peachia hastata; a new genus and species of the class Zoophyta. P. H. Gosse.
On the diacious character of the Rotifera. P. H. Gosse.
On the Anatomy and Physiology of the Tunicata. A. Hancock.
 Reprints of many papers by Rev. T. Hincks.
Études sur les Éponges de la mer Blanche. C. Mereschkowsky.
 Reprints of many papers by Rev. A. M. Norman.
Monograph of the Genus Isocardia. L. Reeve.
 Reprints of several papers by Rev. T. R. R. Stebbing.
Some remarkable forms of Animal Life from great depths off Norway. G. O. Sars.
Middelhavets Mysider. G. O. Sars.
Catalogue of the Land and Freshwater Mollusca of Ireland. W. Thompson.
Preliminary Check-list of the Marine Invertebrata of the Atlantic Coast from Cape Cod to the Gulf of St. Lawrence. A. E. Verrill.
On the Urticating filaments of the Aeolidae. T. S. Wright.

General Report.

The periodical surveys of the physical and biological conditions prevailing at the mouth of the English Channel, which were undertaken last year by Mr. Garstang in order to throw light on the migrations of the mackerel and other fishes, have been continued, at quarterly intervals, for an entire year. Five surveys altogether were made, from February, 1899, to March, 1900. The same route was taken

on each voyage, viz. from Plymouth to Ushant, with a station in mid-Channel; from Ushant to the westward about fifty miles (near Parson's Bank); from the latter station northwards to Mount's Bay; and from the Mount's Bay station back to Plymouth. At each station systematic observations were made for comparative purposes by identical methods and instruments. They included serial temperature determinations at all depths, filtration of a definite column of water from bottom to surface with a "vertical net" (for estimating the varying abundance of minute plant and animal life), and collections of the floating life at surface, midwater, and bottom by means of a specially devised "closing net," which worked with great precision. The collections brought home on the different voyages are now under examination, and will be reported upon in due course. The expense of steamboat hire (£140) in connection with these experiments has been met by special grants from the British Association at the Bristol and Dover meetings.

Mr. Garstang has also carried out a series of preliminary experiments on the rearing of sea-fish larvæ under different conditions, with a view to a solution of the difficulties hitherto encountered in regard to the practical work of sea-fish culture. His experiments led to definite and satisfactory conclusions, proving the necessity of agitated water to the larvæ in their early stages, and resulting in the healthy metamorphosis and survival of an unprecedented proportion of the fry (above 50 per cent.). Structural alterations, already described, have been made in the Plymouth Laboratory, with a view to a repetition of these experiments on a larger scale with the larvæ of food-fishes.

An independent examination of the experimental and statistical evidence which bears on the alleged depletion of the trawling grounds has also been made by Mr. Garstang, which leaves little, if any, room for doubt that the fisheries for the more valuable flat-fish at any rate (prime fish and plaice) are undergoing a process of exhaustion in consequence of over-fishing. Mr. Garstang's report on this subject includes the first elaborate attempt to measure the growth of catching power in the English deep-sea trawl and line fisheries since the introduction of steam in the fishing industry. A detailed report will shortly appear in the Journal of the Association.

The investigation of the fauna and bottom-deposits of the shallow-water grounds in the neighbourhood of Plymouth, upon a plan similar to that followed in the investigation of the grounds near the thirty-fathom line between the Eddystone and Start Point, has made considerable progress during the year. A large number of hauls of the trawl and dredge have been taken upon the area under examination, and the results have been systematically recorded. In these shallower waters the conditions are more complicated and variable than those met with

at thirty fathoms, and some little time must elapse before the results of the research are sufficiently complete for publication.

The Laboratory has continued to supply preserved specimens of marine animals and plants to the Universities and other teaching institutions, as well as to a number of museums in different parts of the world. Many private workers have also been provided with specially-prepared material for their own researches. This specimen trade pays its own expenses, and is of considerable advantage to biological science in general, as well as to the Association.

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:—

BARNARD, J. E.—*Photogenic Bacteria*. Trans. Jenner Instit., 1899, ser. 2, p. 81.

GARSTANG, W.—*Plankton and Physical Conditions of the English Channel*. Report Brit. Assoc., 1899.

GARSTANG, W.—*Experiments on the Artificial Rearing of Sea-Fish*. Brit. Assoc. Rep., 1899.

HARMAN, N. B.—*The Palpebral and Oculomotor Apparatus in Fishes: observations on Morphology and Development*. Journ. Anat. and Phys., vol. xxxiv., 1899.

HOLT, E. W. L.—*Recherches sur la Reproduction des Poissons osseux*. Ann. Mus. Hist. Nat. Marseille, v. 1899.

HOLT, E. W. L., and BEAUMONT, W. I.—*Report on the Schizopoda of Ireland*. Sci. Trans. Roy. Dublin Soc. (Series II.), vol. vii., pt. vii., 1900.

TAYLOR, T. H.—*The Embryology of the Polyzoa*. Brit. Assoc. Rep., 1899.

MACBRIDE, E. W.—*The Development of Echinoids. Part I. The Larvæ Echinus miliaris and Echinus esculentus*. Quart. Journ. Micr. Sci., vol. xlii., 1899, p. 335.

MACBRIDE, E. W.—*The Rearing of Larvæ of Echinidæ*. Report Brit. Assoc., 1899.

MACBRIDE, E. W.—*The Movements of Copepoda*. Quart. Journ. Micr. Sci., vol. xlii., 1899, p. 505.

Donations and Receipts.

The Receipts for the year include the grants from H.M. Treasury (£1,000) and the Worshipful Company of Fishmongers (£400), Founder's Subscription (£100), Composition Fees (£15), Annual Subscriptions (£138), Rent of Tables in the Laboratory (£54), Sale of Specimens (£238), Admission to the Tank Room (£76). The total income for the year amounts to £2,059 19s. 4d. The Council desires to call attention to the statement made by Mr. Hanbury (*Times*, June 16th, 1900), and to observe that it is not the case that the Association is not in need of increased funds. The balance shown in the yearly accounts of the Association is no surplus, but merely the usual working balance of a current account.

Vice-Presidents, Officers, and Council.

The following is the list of gentlemen proposed by the Council for election for the year 1900-1901:—

President.

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

Vice-Presidents.

The Duke of ABERCORN, K.G., C.B.

The Earl of ST. GERMANS.

The Earl of MORLEY.

The Earl of DUCIE, F.R.S.

Lord AVEBURY, F.R.S.

Lord TWEEDMOUTH.

Lord WALSINGHAM, F.R.S.

The Right Hon. A. J. BALFOUR, M.P.,
F.R.S.

Sir EDWARD BIRKBECK, Bart.

The Right Hon. JOSEPH CHAMBERLAIN, M.P.

Sir MICHAEL FOSTER, M.P., F.R.S.

A. C. L. GÜNTHER, Esq., F.R.S.

Sir JOHN MURRAY, F.R.S.

Prof. ALFRED NEWTON, F.R.S.

Rev. Canon NORMAN, D.C.L., F.R.S.

Sir HENRY THOMPSON, Bart.

Rear-Admiral Sir W. J. L. WHARTON,
K.C.B., F.R.S.

Members of Council.

F. E. BEDDARD, Esq., F.R.S.

Prof. F. JEFFREY BELL.

G. P. BIDDER, Esq.

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G. HERBERT FOWLER, Esq.

S. F. HARMER, Esq., F.R.S.

Prof. W. A. HERDMAN, F.R.S.

Prof. G. B. HOWES, F.R.S.

J. J. LISTER, Esq., F.R.S.

Prof. E. A. MINCHIN.

D. H. SCOTT, Esq., F.R.S.

Prof. CHARLES STEWART, F.R.S.

Prof. D'ARCY W. THOMPSON, C.B.

Prof. W. F. R. WELDON, F.R.S.

Hon. Treasurer.

J. A. TRAVERS, Esq.

Hon. Secretary.

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

The following Governors are also members of the Council:—

ROBERT BAYLY, Esq.

J. P. THOMASSON, Esq.

THE PRIME WARDEN OF THE FISH-
MONGERS' COMPANY.

A. E. SHIPLEY, Esq. (Cambridge University).

E. L. BECKWITH, Esq. (Fishmongers'
Company).

Prof. Sir J. BURDON SANDERSON, Bart.,
F.R.S. (Oxford University).

Dr.

Statement of Receipts and Expenditure for the Year ending 31st May, 1900.

Cr.

Receipts.		£	s.	d.	Expenditure.		£	s.	d.
To Balance from last year, being Cash at Bank and in hand			153	4	8	By Salaries and Wages—			
„ H. M. Treasury		1000	0	0	Director	200	0	0	
„ Fishmongers' Company		400	0	0	Naturalist	250	0	0	
„ Founder's Subscription—G. P. Bidder, Esq.		100	0	0	Director's Assistant	80	0	0	
„ Life Member's Composition Fee—					Wages	536	11	2	
The Hon. R. Guinness		15	15	0					1066
„ Donation—J. W. Woodall, Esq.		5	5	0	„ Stationery, Office Printing, Postages, &c.				103
„ Annual Subscriptions		137	9	0	„ Printing and Illustrating Journal				120
„ Rent of Tables	54	9	0		„ Outside Sea-water Plant—				
„ Sale of Specimens	237	16	3		Purchase of and fixing Pumping Apparatus, Tanks, and Tank-boat				143
„ Sale of Journal, &c.	13	14	8		„ Sundry Expenses—				
„ Admissions to Tank Room	76	3	9		Gas, Water, Coal, &c. £103	7	0		
					Coal for Steam Yacht	50	4	10	
„ Interest on Investment	19	6	8						153
									11
									10
					Insurance of Steam Yacht, including boiler	12	7	6	
					Stocking Tanks, Feeding, &c.	59	5	1	
					Glass, Chemicals, Apparatus, &c.	£73	3	10	
					Less Sales of Glass, &c.	9	6	5	
									63
									17
					Maintenance and Renewal of Buildings. Maintenance and Renewal of Boats and Nets	£163	17	4	
					Less Sale of Nets and Gear ...	55	6	3	
									108
									11
					Rates, Taxes, and Insurance	13	2	10	
					Boat Hire	8	6	0	
					Travelling Expenses	25	0	6	
					Library	60	18	4	
									600
					„ Balance forward, being Cash at Bank and in hand, 31st May, 1900				178
									15
									11
									£2213
									4
									0

Examined and found correct,

EDWIN WATERHOUSE, }
 FRANK E. BEDDARD, } Auditors.
 G. HERBERT FOWLER, }

£2213 4 0

Investment held 31st May, 1900, £500 Forth Bridge Railway 4% Guaranteed Stock.

£2213 4 0

Marine Biological Association of the United Kingdom.

LIST
OF
Governors, Founders, and Members.

1ST NOVEMBER, 1900.

I.—Governors.

The British Association for the Advancement of Science, <i>Burlington House, W.</i>	£500
The University of Cambridge.....	£500
The Worshipful Company of Clothworkers, 41, <i>Mincing Lane, E.C.</i>	£500
The Worshipful Company of Fishmongers, <i>London Bridge</i>	£4705
The University of Oxford	£500
Bayly, Robert, <i>Torr, Plymouth</i>	£1000
Bayly, John (the late)	£600
Thomasson, J. P., <i>Woodside, near Bolton</i>	£970

II.—Founders.

* Member of Council. † Vice-President. ‡ President.

1884 The Corporation of the City of London	£210
1884 The Worshipful Company of Mercers, <i>Mercers' Hall, Cheapside</i>	£341 5s.
1884 The Worshipful Company of Goldsmiths, <i>Goldsmiths' Hall, E.C.</i>	£100
1884 The Royal Microscopical Society, 20, <i>Hanover Square, W.</i>	£100
1884 The Royal Society, <i>Burlington House, Piccadilly, W.</i>	£350
1884 The Zoological Society, 3, <i>Hanover Square, W.</i>	£100
1884 Bulteel, Thos., <i>Radford, Plymouth</i>	£100
1884 Burdett-Coutts, W. L. A. Bartlett, 1, <i>Stratton Street, Piccadilly, W.</i>	£100
1884 Crisp, Frank, LL.B., B.A., Treas. Linn. Soc., 17, <i>Throgmorton Avenue, E.C.</i>	£100
1884 Daubeny, Captain Giles A., <i>Les Colondalles, Montreux, Switzerland</i> ...	£100
1884 Eddy, J. Ray, <i>The Grange, Carleton, Shipton, Yorkshire</i>	£100
1884 Gassiott, John P., <i>The Culvers, Carshalton, Surrey</i>	£100
*1884 Lankester, Prof. E. Ray, F.R.S., <i>British Museum (Natural History), South Kensington, S.W.</i>	£100
1884 Lister, S. Cunliffe, <i>Swinton Park, Masham, Yorkshire</i>	£100

+1884	Lord Avebury, F.R.S., <i>High Elms, Bromley, Kent</i>	£100
1884	Poulton, Prof. Edward B., M.A., F.R.S., <i>Wykeham House, Oxford</i> ...	£100
1884	Romanes, G. J., LL.D., F.R.S. (the late)	£100
1884	Worthington, James (the late)	£100
1885	Derby, the Rt. Hon. the late Earl of	£100
*1887	Weldon, Prof. W. F. R., F.R.S., <i>Merton Lea, Oxford</i>	£100
1888	Bury, Henry, M.A., <i>Trinity College, Cambridge</i>	£100
1888	The Worshipful Company of Drapers, <i>Drapers' Hall, E.C.</i>	£315
1889	The Worshipful Company of Grocers, <i>Poultry, E.C.</i>	£120
+1889	Thompson, Sir Henry, Bart., 35, <i>Wimpole Street, W.</i>	£110
1889	Revelstoke, The late Lord	£100
1890	Riches, T. H., B.A., <i>Kitwells, Shenley, Herts.</i>	£130
*1900	Bidder, G. P., 9, <i>Windsor Terrace, Plymouth</i>	£100

III.—Members.

ann. signifies that the Member is liable to an Annual Subscription of One Guinea.

C. signifies that he has paid a Composition Fee of Fifteen Guineas in lieu of Annual Subscription.

1897	Adams, W. R., 57, <i>Wood Vale, Lordship Lane, London, S.E.</i>	<i>ann.</i>
1900	Aders, W. M., 28, <i>St. John's Wood Road, London, N.W.</i>	<i>ann.</i>
1884	Alger, W. H., <i>Manor House, Stoke, Devonport</i>	<i>C.</i>
*1895	Allen, E. J., D.Sc., <i>The Laboratory, Plymouth</i>	<i>ann.</i>
1885	Armstrong, Lord, C.B., F.R.S., <i>Crag Side, Rothbury</i>	<i>C.</i>
1893	Ascroft, R. L., 11, <i>Park Street, Lytham, Lancs.</i>	<i>ann.</i>
1892	Assheton, R., <i>Granchester, Cambridge</i>	£20
1899	Auckland Lord, <i>Kitley, Plymouth</i>	<i>ann.</i>
1884	Bailey, Charles, F.L.S., <i>Ashfield, College Road, Whalley Range, Manchester</i>	<i>ann.</i>
1893	Bailey, W. E., <i>Porth Enys Museum, Penzance</i>	<i>C.</i>
1884	Balfour, Prof. Bayley, F.R.S., <i>Royal Botanic Gardens, Edinburgh</i>	<i>C.</i>
1893	Bassett-Smith, P. W., Staff-Surgeon, R.N., <i>R.N. Hospital, Haslar, Portsmouth</i>	<i>ann.</i>
1884	Bateson, Wm., F.R.S., <i>St. John's College, Cambridge</i>	<i>ann.</i>
1897	Baxter, G. H., <i>Hutton Road, Brentwood, Essex</i>	<i>ann.</i>
1884	Bayliss, W. Maddock, B.Sc., <i>St. Cuthberts, West Heath Road, Hampstead.</i>	<i>ann.</i>
1884	Bayly, Miss, <i>Seven Trees, Plymouth</i>	£50
1884	Bayly, Miss Anna, <i>Seven Trees, Plymouth</i>	£50
1897	Baynes, R. W., 4, <i>Saltram Place, Plymouth</i>	<i>ann.</i>
1884	Beaumont, W. I., B.A., <i>The Laboratory, Plymouth</i>	<i>ann.</i>
1885	Beck, Conrad, 68, <i>Cornhill, E.C.</i>	<i>C.</i>
*1889	Beckwith, E. L., <i>The Knoll, Eastbourne</i>	<i>ann.</i>
*1887	Beddard, F. E., F.R.S., <i>Zoological Society's Gardens, Regent's Park, N.W.</i>	<i>ann.</i>
1884	Beddington, Alfred H., 8, <i>Cornwall Terrace, Regent's Park, N.W.</i>	<i>C.</i>
1897	Bedford, Mrs., 326, <i>Camden Road, London, N.</i>	<i>ann.</i>
*1884	Bell, Prof. F. Jeffrey, 35, <i>Cambridge Street, Hyde Park, W.</i>	<i>ann.</i>
+1885	Birkbeck, Sir Edward, Bart., 10, <i>Charles Street, Berkeley Square, W.</i> ...	<i>ann.</i>
1893	Bles, A. J. S., <i>Palm House, Higher Broughton, Manchester</i>	<i>ann.</i>
1889	Bolitho, T. B., <i>Chyandour, Penzance</i>	<i>ann.</i>
1884	Bompas, G. C., 121, <i>Westbourne Terrace, Hyde Park, London, W.</i>	<i>ann.</i>

- 1884 Bossey, Francis, M.D., *Mayfield, Redhill, Surrey* ann.
 1884 Bostock, E., *Stone, Staffordshire* ann.
 1890 Bourne, Prof. A. G., F.R.S., *The Presidency College, Madras* ann.
 *1884 Bourne, Gilbert C., M.A., *Savile House, Mansfield Road, Oxford* ann.
 1898 Bowles, Col. Henry, M.P., *Forty Hall, Enfield* ann.
 1895 Bridge, Prof. T. W., D.Sc., *University of Birmingham* ann.
 1890 Brindley, H. H., M.A., 6, *Richmond Road, Cambridge* ann.
 1886 Brooksbank, Mrs. M., *Leigh Place, Godstone, Surrey* C.
 1884 Brown, Arthur W. W., 37, *Evelyn Mansions, Carlisle Place, Victoria Street, S.W.* C.
 1893 Browne, Edward T., B.A., 141, *Uxbridge Road, W.* ann.
 1893 Buchanan, Miss Florence, B.Sc., *The Museum, Oxford* ann.
 1884 Buckton, G. B., *Weycombe, Haslemere* ann.
 1896 Bulstrode, H. P., M.D., 4, *The Mansions, Earl's Court, S.W.* ann.
 1887 Burd, J. S., *Cresswell, Higher Compton, Plymouth* ann.
 1889 Burnard, Robert, 3, *Hillsborough, Plymouth* ann.
 1897 Byrne, L. W., B.A., 33, *Lancaster Gate, London* ann.
- 1884 Caine, H. T., 5, *Upper Wimpole Street, London, W.* C.
 1884 Caine, W. S., *The Terrace, Clapham Common, S.W.* £21
 1887 Caldwell, W. H. C.
 1884 Canterbury, His Grace the Archbishop of, *Lambeth Palace, S.W.* ann.
 †1884 Chamberlain, Rt. Hon. J., M.P., 40, *Prince's Gardens, S.W.* ann.
 1884 Christy, Thomas Howard ann.
 1887 Clarke, Rt. Hon. Sir E., Q.C., 5, *Essex Court, Temple, E.C.* £25
 1884 Clay, Dr. R. H., *Windsor Villas, Plymouth* ann.
 1885 Clerk, Major-General H., F.R.S., "Mountfield," 5, *Upper Maze Hill, St. Leonards-on-Sea, Sussex* £21
 1886 Coates and Co., *Southside Street, Plymouth* C.
 1885 Collier Bros., *Old Town Street, Plymouth* C.
 1900 Cooper, W. F., B.A., *Ashlyns Hall, Berkhamsted* ann.
 1889 Crossman, Major-General Sir William, K.C.M.G., *Cheswick, Beal, R.S.O., Northumberland* ann.
- 1885 Darwin, Francis, F.R.S., *Botanical Laboratory, Cambridge* C.
 1885 Darwin, W. E., *Ridgemount, Bassett, Southampton* £20
 1889 Davies, H. R., *Treborth, Bangor* ann.
 1884 Dewick, Rev. E. S., M.A., F.G.S., 26, *Oxford Square, Hyde Park, W.* ... C.
 1885 Dixey, F. A., M.A., Oxon., *Wadham College, Oxford* £26 5s. and ann.
 1890 Driesch, Hans, Ph.D., *Philosophenweg 5, Heidelberg, Germany* C.
 †1889 Ducie, The Rt. Hon. the Earl of, F.R.S., *Tortworth Court, Falfield, R.S.O.* £50 15s.
 1884 Dunning, J. W., 4, *Talbot Square, W.* £26 5s.
 1884 Dyer, Sir W. T. Thiselton, M.A., K.C.M.G., F.R.S., *Director of the Royal Gardens, Kew* C.
- 1893 Edward, S. Stanley, F.Z.S., *Kidbrook Lodge, Blackheath, S.E.* ann.
 1898 Eliot, Sir C. N. E., K.C.M.G., C.B., *British Agency, Zanzibar* ann.
 1891 Ellis, Hon. Evelyn, *Rosenais, Datchet, Windsor* C.
 1893 Enys, John Davies, *Enys, Penryn, Cornwall* ann.
 1884 Evans, Sir John, D.C.L., F.R.S., *Nash Mills, Hemel Hempstead* £20
 1885 Ewart, Prof. J. Cossar, M.D., *University, Edinburgh* £25

- 1894 Ferrier, David, M.A., M.D., F.R.S., 34, *Cavendish Square, W.* ann.
 1884 Fison, Frederick W., *Greenholme, Burley-in-Wharfedale, Leeds* C.
 1897 Foster, Richard, *Windsorworth, Looe, R.S.O.* ann.
 *1885 Fowler, G. Herbert, B.A., Ph.D., 5, *Pyrland Road, Richmond, London, S.W.* ann.
 1884 Fox, George H., *Wodehouse Place, Falmouth* ann.
 1886 Freeman, F. F., *Abbotsfield, Tavistock, S. Devon* C.
 1884 Fry, George, F.L.S., *Carlin Brae, Berwick-on-Tweed* £21
 1884 Fryer, Charles E., *Board of Trade, S.W.* ann.
- 1898 Ganz, C., 5, *Kildare Terrace, Bayswater, London* ann.
 1892 Galton, F., F.R.S., 42, *Rutland Gate, S.W.* ann.
 1885 Gaskell, W. H., F.R.S., *The Uplands, Shelford, Cambridge* C.
 1885 Gaskell, E. H. C.
 1899 Gardiner, Dr. Edw. G., *Woods Hole, Mass., U.S.A.* C.
 1893 Gatty, Charles Henry, LL.D., F.L.S., *Felbridge Place, East Grinstead* ... C.
 1897 Gibbs, Hon. Henry, 10, *Lennox Gardens, S.W.* ann.
 1884 Gibson, Ernest, F.Z.S., c/o Fraser, Stoddart, and Ballingall, 16, *Castle Street, Edinburgh* ann.
 1885 Gordon, Rev. J. M., *St. John's Vicarage, Redhill, Surrey* ann.
 1885 Gotch, Prof. F., F.R.S., *University Museum, Oxford* ann.
 1884 Grove, E., *Norlington, Preston, Brighton* ann.
 1884 Groves, J. W., *Wargrave Lodge, Wargrave-on-Thames* ann.
 1900 Groves, C.E., F.R.S., *Guy's Hospital, London, S.E.* ann.
 1899 Guinness, Hon. Rupert, *Elweden, Thetford* C
 †1884 Günther, Dr. Albert, F.R.S., 2, *Lichfield Road, Kew Gardens* ann.
 1900 Gurney, E., 28, *Grosvenor Place, S.W.* ann.
- 1884 Haddon, Prof. Alfred C., M.A., F.R.S., *Innisfail, Hills Road, Cambridge* ann.
 1884 Halliburton, Prof. W. D., M.D., F.R.S., *Church Cottage, 17, Marylebone Road, London, W.* ann.
 1884 Hannah, Robert, 82, *Addison Road, Kensington, W.* C.
 1897 Hargreaves, P., *The Fishery, North Hayling, Hants.* ann.
 *1885 Harmer, S. F., D.Sc., F.R.S., *King's College, Cambridge* C.
 1889 Harvey, T. H., *Cattedown, Plymouth* ann.
 1888 Haselwood, J. E., 3, *Lennox Place, Brighton* C.
 1884 Haslam, Miss E. Rosa, *Ravenswood, Bolton* £20
 1884 Hayne, The Rt. Hon. C. Seale, M.P., 6, *Upper Belgrave Street, S.W.* ... ann.
 1884 Head, J. Merrick, F.R.G.S., J.P., *Ardverness, Reigate* ann.
 1884 Heape, Walter, *Heyroun, Chaucer Road, Cambridge* C.
 *1884 Herdman, Prof. W. A., F.R.S., *University College, Liverpool* ann.
 1884 Herschel, J., Col., R.E., F.R.S., *Observatory House, Slough, Berks.* C.
 1884 Heywood, James, F.R.S. C.
 1889 Heywood, Mrs. E. S., *Light Oaks, Manchester* C.
 1884 Hickson, Prof. Sydney J., M.A., D.Sc., F.R.S., *Ellesmere House, Wilenslow Road, Withington, Manchester* ann.
 1897 Hodgson, T. V., c/o L. E. Sexton, Esq., 17, *Collinge Park, Higher Compton, Plymouth* ann.
 1884 Holdsworth, E. W. H., F.L.S., F.Z.S., *Lucerne House, Dartmouth* ann.
 1893 Holt, Mrs. Vesey W., 104, *Elm Park Gardens, S.W.* ann.
 *1887 Howes, Prof. G. Bond, F.R.S., F.L.S., *Science and Art Department, South Kensington* ann.
 1884 Hudleston, W. H., M.A., F.R.S., 8, *Stanhope Gardens, South Kensington, S.W.* ann.

- 1891 Indian Museum, *Calcutta* ann.
 1888 Inskip, Capt. G. H., R.N., 22, *Torrington Place, Plymouth* ann.
- 1885 Jackson, W. Hatchett, M.A., F.L.S., *Pen Wartha, Weston-super-Mare* ann.
 1893 Jago, Edward, *Coldrenick, Liskeard, Cornwall* ann.
 1887 Jago-Trelawny, Major-Gen., F.R.G.S., *Coldrenick, Liskeard* C.
 1890 Johnson, Prof. T., D.Sc., F.L.S., *Royal College of Science, Dublin*..... ann.
 1894 Justen, F. W., F.G.S., F.Z.S., 120, *Alexandra Road, South Hampstead, London, N.W.*..... ann.
- 1884 Kellock, W. B., F.L.S., F.R.C.S., 94, *Stamford Hill, N.*..... ann.
 1899 Kent, W. Saville, F.L.S., *The Elms, Elmswood Rd., Croydon* ann.
- 1897 Lanchester, W. F., B.A., "*Shirley*," *Croydon, Surrey* C.
 1885 Langley, J. N., F.R.S., *Trinity College, Cambridge* C.
 *1895 Lister, J. J., M.A., F.R.S., *St. John's College, Cambridge*..... ann.
 1888 Lopes, The Rt. Hon. Sir Massey, Bart., *Maristow, Roborough, South Devon* ann.
- 1885 Macalister, Prof. A., F.R.S., *St. John's College, Cambridge* ann.
 1900 Macfie, J. W. Scott, *Rowton Hall, Chester* C.
 1884 Mackrell, John, *High Trees, Clapham Common, S.W.* C.
 1886 MacMunn, Charles A., M.D., *Oak Leigh, Wolverhampton* ann.
 1889 Makovski, Stanislaus, *Fairlawn, Redhill* ann.
 1885 Marr, J. E., M.A., *St. John's College, Cambridge* C.
 1884 McAndrew, James J., *Lukesland, Ivybridge, South Devon* ann.
 1884 McIntosh, Prof. W. C., F.R.S., 2, *Abbotsford Crescent, St. Andrews, N.B.* C.
 1884 Michael, Albert D., *Cadogan Mansions, Sloane Square, S.W.*..... C.
 *1899 Minchin, Prof. E. A., *University College, London* ann.
 1885 Mocatta, F. H., 9, *Connaught Place, W.* C.
 1886 Mond, Ludwig, F.R.S., 20, *Avenue Road, Regent's Park, N.W.*..... C.
 1884 Morgan, Prof. C. Lloyd, F.R.S., *University College, Bristol*..... ann.
 1891 Morgans, Thomas, 60, *Queen Square, Bristol*..... ann.
 †1889 Morley, The Rt. Hon. the Earl of, 31, *Prince's Gardens, S.W.* ann.
 1885 Morrison, Alfred, 16, *Carlton House Terrace, London, W.* £52 10s.
 †1896 Murray, Sir John, K.C.B., F.R.S., *Challenger Lodge, Wardie, Edinburgh* ann.
- †1884 Newton, Prof. Alfred, M.A., F.R.S., *Magdalen College, Cambridge* £20
 †1884 Norman, Rev. Canon, M.A., D.C.L., F.R.S., *The Red House, Berkhamsted, Herts*..... ann.
- 1884 Ommanney, Admiral Sir Erasmus, K.C.B., F.R.S., 29, *Connaught Square, W.* ann.
- 1898 Parkinson, J., 251, *Camden Road, London, N.*..... ann.
 1884 Parsons, Chas. T., *Norfolk Road, Edgbaston, Birmingham* ann.
 1900 Peek, Sir Cuthbert, Bart., 22, *Belgrave Square, London, S.W.* ann.
 1885 Phillips, Chas. D. F., M.D., 10, *Henrietta Street, Cavendish Square, W.* C.
 1887 Phipson, Mrs., *Dasak Bungalow, Naisk Road, Bombay, India* ann.
 1886 Power, Henry, F.R.C.S., 37A, *Great Cumberland Place, W.* ann.
 1885 Pritchard, Prof. Urban, 26, *Wimpole Street, W.* ann.
 1884 Pye-Smith, P. H., M.D., 48, *Brook Street, W.* C.

- 1897 Quentin, C., *Milland, Liphook, Hants.* ann.
 1893 Quintin, St. W. H., *Scampstone Hall, Rillington, Yorks* ann.
- 1884 Ralli, Mrs. Stephen, 32, *Park Lane, W.* £30
 1885 Ransom, W. B., *The Pavement, Nottingham* C.
 1893 Rashleigh, E. W., *Kilmarth, Par Station, Cornwall* ann.
 1888 Rawlings, Edward, *Richmond House, Wimbledon Common* ann.
 1892 Robinson, Miss M., *University College, London, W.C.* ann.
 1892 Rüffer, M.A., M.D., *Conseil Sanitaire, Maritime et Quarentenaire, Alexandria, Egypt* ann.
- 1897 Sandeman, H. D., 4, *Elliot Terrace, Plymouth* ann.
 1888 Scharff, Robert F., Ph.D., *Science and Art Museum, Dublin* ann.
 1884 Selater, P. L., F.R.S., Sec. Zool. Soc., 3, *Hanover Square, W.* ann.
 1884 Selater, W. L., *The Museum, Cape Town* ann.
 *1885 Scott, D. H., M.A., Ph.D., F.R.S., *Old Palace, Richmond, Surrey* C.
 1884 Sedgwick, A., M.A., F.R.S., *Trinity College, Cambridge* C.
 1888 Serpell, E. W., 19, *Hill Park Crescent, Plymouth* £50
 1900 Sexton, L. E., 17, *Collinge Park, Higher Compton, Plymouth* ann.
 1898 Seyd, Ernest, 38, *Lombard Street, London, E.C.* ann.
 1885 Sheldon, Miss Lilian, *The Murmurs, Eemouth* ann.
 1884 Shipley, Arthur E., M.A., *Christ's College, Cambridge* C.
 1886 Shore, T. W., M.D., *Heathfield, Allegn Park, Dulwich, London, S.E.* ... ann.
 1894 Simpson, F. C., J.P., *Maypool, Churston Ferrers, R.S.O.* ann.
 1885 Sinclair, F. G., *Friday Hill, Chingford, Essex* C.
 1891 Sinclair, William F., 102, *Cheyne Walk, Chelsea, S.W.* C.
 1884 Skinners, the Worshipful Company of, *Skinners' Hall, E.C.* £42
 1889 Slade, Commander E. J. Warre, *Milton Heath, Dorking* C.
 1893 Sorby, H. C., LL.D., F.R.S., *Broomfield, Sheffield* ann.
 1888 Spencer, Prof. W. Baldwin, M.A., *University of Victoria, Melbourne* ... ann.
 1884 Spring-Rice, S. E., C.B., 1, *Bryanston Place, Bryanston Square, W.* ... C.
 *1884 Stewart, Prof. Chas., F.R.S., *Royal College of Surgeons, Lincoln's Inn Fields, W.C.* ann.
 1897 Straker, J., LL.M., F.Z.S., *Oxford and Cambridge Club, S.W.* C.
 1884 Sutherland, The Duke of, *Stafford House, St. James', S.W.* C.
- 1894 Thomas, W. F., *Bishopshalt, Hillingdon, Middlesex* ann.
 *1899 Thompson, Prof. D'Arcy W., C.B., *University College, Dundee* ann.
 1890 Thompson, H. F., B.A., 35, *Wimpole Street, W.* ann.
 1884 Thornycroft, John I., *Eyot Villa, Chiswick Mall* ann.
 1888 Thurston, Edgar, *Government Central Museum, Egmore, Madras* ann.
 1899 Tims, H. W. Maret, M.D., F.L.S., 19, *Lyndewode Road, Cambridge* ... ann.
 *1897 Travers, J. A., *Dorney House, Weybridge* ann.
 1888 Tripe, Major-General, 3, *Osborne Villas, Stoke, Devonport* ann.
- 1888 Vallentin, Rupert, 1, *Melville Road, Falmouth* ann.
 1891 Vaughan, Henry, 28, *Cumberland Terrace, N.W.* ann.
 1884 Venning, Mrs., 3, *Wingfield Villas, Stoke, Devonport* £50
 1884 Vines, Professor Sydney H., M.A., D.Sc., F.R.S., *Botanical Gardens, Oxford* ann.

1884	Walker, Alfred O., <i>Ulcombe Place, Maidstone</i>	ann.
1884	Walker, P. F., 36, <i>Prince's Gardens, S.W.</i>	ann.
†1884	Walsingham, Lord, F.R.S., <i>Merton Hall, Thetford</i>	£20
1890	Waterhouse, Edwin, <i>Feldmore, near Dorking</i>	ann.
1891	Wildy, A. G., 14, <i>Buckingham Street, Adelphi, London, W.C.</i>	ann.
1900	Wiley, A., D.Sc., <i>Guy's Hospital, London, E.C.</i>	ann.
1884	Wilson, Scott B., <i>Heather Bank, Weybridge Heath</i>	C.
1900	Wolfenden, R. N., M.D., <i>Rougemont, Seaford, Sussex</i>	ann.
1884	Woodall, John W., M.A., F.G.S., 5, <i>Queen's Mansions, Victoria Street, London, S.W.</i>	ann.
1898	Worth, R. H., 42, <i>George Street, Plymouth</i>	ann.

IV.—Associate Members.

1889	Alward, George, 11, <i>Hainton Street, Great Grimsby.</i>
1900	Bignell, G. C., F.E.S., <i>The Fens, Home Park Road, Saltash, Cornwall.</i>
1889	Caux, J. W. de, <i>Great Yarmouth.</i>
1889	Dannevig, Capt. G. M., <i>Arendal, Norway.</i>
1889	Dunn, Matthias, <i>Mevagissey.</i>
1889	Olsen, O. T., F.L.S., F.R.G.S., <i>Fish Dock Road, Great Grimsby.</i>
1889	Ridge, B. J., <i>Newlyn, Penzance.</i>
1890	Roach, W., 4, <i>Gascoyne Place, Plymouth.</i>
1889	Shrubsole, W. H., 62, <i>High Street, Sheerness-on-Sea.</i>
1889	Sinel, Joseph, 2, <i>Peel Villas, Cleveland Road, Jersey.</i>
1890	Spencer, R. L., <i>L. and N.W. Depot, Guernsey.</i>
1890	Wells, W., <i>The Aquarium, Brighton.</i>
1890	Wiseman, Fred., <i>Buckland House, Paglesham, Rochford, Essex.</i>

PAPERS ON THE FAUNA AND FLORA OF PLYMOUTH.

PUBLISHED IN THE JOURNAL OF THE ASSOCIATION.

- "Preliminary Report upon the Fauna and Flora of Plymouth Sound," by Walter Heape . . . O.S. Vol. i. pp. 153-193.
 "Director's Report," by G. C. Bourne . . . N.S. Vol. i. p. 5.
 "Notes on the Marine Oligochæta of Plymouth," by F. E. Beddard . . . N.S. Vol. i. p. 69.
 "Report on the Pelagic Copepoda collected at Plymouth in 1888-89," by G. C. Bourne . . . N.S. Vol. i. p. 144.
 "Report on the Nudibranchiate Mollusca of Plymouth Sound," by W. Garstang . . . N.S. Vol. i. p. 173.
 "Flora of Plymouth Sound and Adjacent Waters," Preliminary Paper, by Prof. T. Johnson . . . N.S. Vol. i. p. 286.
 "Notes on the Hydroids of Plymouth," by G. C. Bourne . . . N.S. Vol. i. p. 391.
 "A Complete List of the Opisthobranchiate Mollusca found at Plymouth," by W. Garstang . . . N.S. Vol. i. p. 399.
 "Report on the Tunicata of Plymouth," by W. Garstang . . . N.S. Vol. ii. p. 47.
 "Notes on the Marine Invertebrate Fauna of Plymouth for 1892," by W. Garstang . . . N.S. Vol. ii. p. 333.
 "Notes on the Plankton observed at Plymouth during June-September, 1892," by E. J. Bles . . . N.S. Vol. ii. p. 340.
 "List of Nemertines of Plymouth Sound," by T. H. Riches . . . N.S. Vol. iii. p. 1.
 "The Turbellaria of Plymouth Sound and its Neighbourhood," by F. W. Gamble . . . N.S. Vol. iii. p. 30.
 "Faunistic Notes at Plymouth during 1893-4," by W. Garstang . . . N.S. Vol. iii. p. 212.
 "Faunistic Notes," by E. J. Allen . . . N.S. Vol. iv. p. 48.
 "Notes on Plymouth Hydroids," by Prof. C. C. Nutting . . . N.S. Vol. iv. p. 146.
 "A List of the Parasitic Copepoda of Fish obtained at Plymouth," by Staff-Surgeon P. W. Basset-Smith, R.N. . . . N.S. Vol. iv. p. 155.
 "Notes on Dredging and Trawling Work during the latter half of 1895," by E. J. Allen . . . N.S. Vol. iv. p. 164.
 "On *Doris maculata*, a new species of Nudibranchiate Mollusc found at Plymouth," by W. Garstang . . . N.S. Vol. iv. p. 167.
 "On the changes in the Pelagic Fauna of Plymouth during September, 1893 and 1895," by E. T. Browne . . . N.S. Vol. iv. p. 168.
 "Notes on the Pelagic Fauna at Plymouth, August to December, 1895," by T. V. Hodgson . . . N.S. Vol. iv. p. 173.
 "Algological Notes," by G. Brebner . . . N.S. Vol. iv. pp. 179 & 286.
 "Notes on New or Rare British Marine Polyzoa," by S. F. Harmer . . . N.S. Vol. v. p. 51.
 "On the Pelagic Fauna of Plymouth for September, 1897," by E. T. Browne . . . N.S. Vol. v. p. 186.
 "On the Fauna and Bottom Deposits near the thirty-fathom line from the Eddystone Grounds to Start Point," by E. J. Allen . . . N.S. Vol. v. p. 365.

Marine Biological Association of the United Kingdom.

PRICE LIST OF MARINE SPECIMENS.

THE following list contains a selection of the more common forms of marine animals and plants which occur in the neighbourhood of Plymouth, and are suitable for laboratory work and for museums.

Preserved specimens are usually in stock, and can then be forwarded immediately on receipt of order; the prices quoted are for such specimens. Living specimens will generally be charged at the same rate as preserved specimens, but when delivery is required on a particular day an extra charge may be made, according to the additional labour involved.

All orders are attended to as promptly as possible; but when fresh specimens are required a delay is often unavoidable, owing to uncertainty of weather, or to scarcity of animals at the particular season.

It should be stated, in ordering, whether the specimens are required for museums, dissection, or histological work. The prices include spirit in the case of preserved specimens, and glass tubes for all small ones. Hampers, barrels, packing-cases, bottles, jars and tins will be charged for. Hampers and barrels may be returned, and will be allowed for in full, if not damaged. Small parcels are forwarded by Parcel Post; large packages by goods train in the case of preserved specimens, by passenger train for living ones.

Special attention will be paid to orders for rare animals and plants, and stages in their development.

The list of Algæ contains specimens most suitable for laboratory work, preserved to show their various reproductive stages and other special features.

A list of papers dealing with special groups, and supplying the information on the fauna and flora hitherto published by the Association, is given below.

Cheques should be made payable to the Marine Biological Association, and all communications addressed to THE DIRECTOR, THE LABORATORY, CITADEL HILL, PLYMOUTH.

October, 1900.

PRICE LIST OF MARINE SPECIMENS.

PROTOZOA.

FORAMINIFERA

	s.	d.
Polystomella . . . per tube*	1	6
Haliphysema "	2	6
Various other species "	2	0

HELIOZOA

Actinosphærium "	1	0
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RADIOLARIA

Acanthometra "	2	0
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INFUSORIA

Ceratium "	1	6
Peridinium "	1	6
Noctiluca miliaris "	1	0
Zoothamnium "	1	0

PORIFERA.

Terminology is that of R. Hanitsch, "Revision of Generic Nomenclature and Classification in Bowerbank's *British Spongiadae*." *Trans. Liverpool Biol. Soc.*, vol. 8, 1894.

Leucosolenia botryoides each	2	0
Sycon compressum per doz.	2	0
coronatum "	2	6
Oscarella lobularis each	1	0
Spongelia fragilis "	3	6
Halichondria panicea "	2	0
Reniera sp. "	2	6
Chalina oculata "	3	0
Desmacidon fruticosum "	2/6	to 7/6
Raspailia hispida "	3	0
Hymeniacidon sanguineum per crust	2	0
Suberites domuncula each	1	6
Cliona celata "	2	0
Polymastia mammillaris "	2	6
Pachymatisma Johnstonia "	2	6
Tethya lynceurium "	2	6

HYDROZOA.

Terminology is that of Hincks' *British Marine Hydroids*.

GYMNOLASTEAE

	s.	d.
Clava squamata . . . per tube	1	6
Tubiclava lucerna "	3	6
cornucopiae "	2	6
Hydractinia echinata "	2	0
Podocoryne carnea "	2	0
Lar sabellarum "	3	0
Coryne vaginata "	1	6
Syncoryne eximia "	1	6
Sarsii "	1	6
Myriothele phrygia each	0	6
Eudendrium ramosum per tube	1	6
capillare "	1	6
album "	1	6
Perigonimus repens "	1	6
Garveia nutans "	1	6
Heterocordyle Conybeari "	1	6
Bougainvillia ramosa "	2	0
Tubularia indivisa "	1	6
larynx "	1	6
humilis "	2	0
bellis "	2	0
crocea "	1	6

CALYPTOBLASTEAE

Clytia Johnstoni "	1	6
Obelia geniculata "	1	6
gelatinosa "	1	6
dichotoma "	1	6
Campanularia flexuosa "	1	6
Hincksii "	1	6
verticillata "	1	6
Gonothyræa Loveni "	1	6
Lafoëa dumosa "	1	6
Coppinia arcta per tube	1	6
Calycella syringa "	1	6
Halecium halecinum "	1	6
Beanii "	1	6

* The prices quoted are for ordinary preserved specimens. Living specimens, when obtainable, are generally charged at the same prices; museum specimens at a slightly increased rate.

	s.	d.		s.	d.
Sertularella polyzonias per tube	1	6	Depastrum cyathiforme each	1	0
Gayi	1	6	Haliclystus octoradiatus per doz.	3	0
Diphasia rosacea	2	0			
pinaster	2	0	SIPHONOPHORA		
Sertularia pumila	1	6	Muggiæa atlantica		
abietina	1	6	(Cunningham)	per doz.	1 6
argentea	2	6			
cupressina	2	6	CTENOPHORA.		
Hydrallmania falcata	2	0	Pleurobrachia pileus per doz.	3	6
Thuiaria articulata	2	0			
Antennularia antennina	2	0	ACTINOZOA.		
ramosa	2	6	HEXACTINIE		
Aglaophenia pluma	1	6	Terminology that of P. H. Gosse, <i>British</i>		
tubulifera	2	0	<i>Sea Anemones.</i>		
myriophyllum	2	0	Actinoloba dianthus each	2	6
Plumularia pinnata	1	6	Sagartia bellis	2	0
setacea	1	6	miniata	2	6
Catharina	1	6	viduata	2	6
similis	1	6	parasitica	1	6
			Adamsia palliata	1	6
MEDUSAE			Anthea cereus	1	0
Terminology that of E. Haeckel, <i>System</i>			Actinia mesembryanthemum	6d.	to 1/-
<i>der Medusen</i> ; and E. T. Browne,			Bunodes gemmacea	each	1 0
"British Hydroids and Medusæ,"			Tealia crassicornis	6d.	to 1/-
<i>Proc. Zool. Soc., 1896.</i> Names of the			Halcapa chrysanthellum	2	0
latter author are in italics.			Arachnactis sp.	1	0
Sarsia tubulifera	per doz.	3 0	Corynactis viridis	1	0
Codonium pulchellum each	0 6		Gephyra Dohrnii	2	0
Perigonimus repens	0 6		Zoanthus Couchii	1	6
Podocoryne carnea	0 6		Caryophyllia Smithii	1	6
Corymorpha nutans	0 3				
Hybocodon prolifer	0 4		Living specimens of Hexactiniae may be had		
Lar sabellarum	0 6		at one-half the above prices.		
Dipurena halterata	0 6		OCTACTINIE		
Amphinema dinema	0 6		Aleyonium digitatum per col.	2	0
Tiara pileata	0 6		Eunicella (Gorgonia)		
Lizzia blondina	0 4		verrucosa	2	6
Margelis principis	0 4		Sarcodictyon catenata	2	6
ramosa	0 4				
Margellium octopunctatum per doz.	3 0		ECHINODERMA.		
Obelia gelatinosa	1 0		Terminology is that of Prof. F. Jeffrey		
geniculata	1 0		Bell, <i>Catalogue of British Echinoderms,</i>		
lucifera	1 0		British Museum.		
Tiaropsis diademata	each	0 4	Cucumaria pentactes each	1	0
Euchilota pilosella	0 6		lactea	per doz.	2 6
Phialidium <i>Buskianum</i> per doz.	2 0		planci	each	1 6
<i>temporarium</i>	2 0		Thyone fusus	1	6
<i>cymbaloideum</i>	2 0		Holothuria nigra	each	1 6
Saphenia mirabilis	each	0 6	Synapta inhaerens	1	0
Irene pellucida	0 6		Antedon rosacea	per doz.	4 6
Liriantha appendiculata	0 6		Pentacrinoid larvæ per tube	2	0
Chrysaora isosceles	1 6		Astropecten irregularis each	0	9
Cyanea Lamarckii	1 6		Luidia Sarsi	2	6
Aurelia aurita	0 9				
Ephyrae per doz.	2 0				

PRICE LIST OF MARINE SPECIMENS.

5

		s.	d.
Porania pulvillus .	each	1	6
Asterina gibbosa .	per doz.	2	0
Palmipes placenta .	each	1	6
Solaster papposus .	"	1	0
Henricia sanguinolenta	"	1	6
Asterias glacialis .	per doz.	6	0
rubens .	"	6	0
Ophiura ciliaris .	"	4	6
Amphiura elegans .	"	1	6
Ophiactis Balli .	"	2	6
Ophiocoma nigra .	"	4	6
Ophiothrix fragilis .	"	4	0
Ophiocnida brachiata	each	0	6
Echinus acutus .	"	2	0
miliaris .	"	0	9
esculentus .	"	0	9
Echinocyamus pusillus	"	1	0
Spatangus purpureus	"	1	0
Echinocardium cordatum	"	1	0
pennatifidum "	"	2	6
Segmenting ova and larvæ—			
Plutei, Bipinnariæ and Auriculariæ	per doz.	2	0

TURBELLARIA.

Terminology that of F. W. Gamble, *Turbellaria of Plymouth Sound and Neighbourhood*, (*Jour. M. B. A.* vol. iii. p. 30.)

Convoluta paradoxa .	per doz.	3	6
Plagiostoma vittatum	"	2	0
Enterostoma Austriacum	each	0	4
Cylindrostoma quadrioculatum	per doz.	2	6
Stylochoplana maculata	"	4	0
Leptoplana tremellaris	"	3	0
Prostheceræus vittatus	each	0	6
Cycloporus papillosus	"	0	4
Eurylepta cornuta .	"	0	6
Oligocladus sanguinolentus	"	0	4
Stylostomum variabile	"	0	3

NEMERTINA.

Terminology that of T. H. Riches, *List of the Nemertines of Plymouth Sound*, (*Jour. M. B. A.* vol. iii. p. 1.)

Carinella annulata (McIntoshii)	each	0	6
superba	"	1	0
Cephalothrix linearis	"	1	0
bioculata	per doz.	2	0
Amphiporus lactifloreus	"	1	6
dissimulans	each	0	9
Drepanophorus spectabilis	"	2	6

		s.	d.
Tetrastemma flavidum	per doz.	2	6
dorsale	"	1	6
candidum	"	2	6
vermiculatum	per doz.	2	0
melanocephalum	per doz.	2	0
Nemertes gracilis .	each	1	0
Neesii .	"	1	0
Eupolia curta .	"	2	0
Lineus marinus .	"	1	6
obscurus .	per doz.	1	6
bilineatus .	"	3	0
Micrura purpurea .	"	2	6
fasciolata .	"	2	6

CHÆTOGNATHA.

Spadella bipunctata	per doz.	1	0
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GEPHYREA.

Thalassema neptuni .	each	1	0
Petalostoma minutum	per doz.	2	6
Phascolion strombi .	each	1	6
Phascolosoma .	"	1	0
Phoronis hippocrepia	each	0	3

ARCHIANNELIDA.

Histriodrilus homari	per doz.	3	6
Polygordius sp.	each	1	0
Dinophilus tæniatus	per doz.	2	6

OLIGOCHÆTA.

Clitellio arenarius .	per doz.	2	0
ater .	"	2	0

POLYCHÆTA.

Terminology generally that of de Saint-Joseph, *Les Annélides Polychètes des Côtes de Dinard*, *Ann. Sci. Nat.* 1887-1895.

Aphrodite aculeata .	each	1	0
Hermione hystrix .	"	2	0
Halosydna gelatinosa	"	0	4
Lepidonotus clava .	per doz.	1	6
squamatus	"	1	6
Sthenelais boa .	each	0	9
Euphrosyne foliosa .	"	0	6
Hyalinœcia tubicola .	"	0	6

		s.	d.			s.	d.
Eunice Harrassii	each*	1	0	Nicolea venustula	each	1	6
Marphysa sanguinea	"	1	3	Thelepus cinnatus	"	1	0
Lysidice Ninetta	"	1	0	Polycirrus aurantiacus	"	0	6
Maclovina iricolor	"	1	0	Sabella pavonina	"	0	6
Lumbriconereis Latreillii	"	0	9	Branchiomma vesiculosum	"	0	6
Ophryotrocha puerilis	per doz.	2	6	Dasychone bombyx	"	0	6
Nereis cultrifera	"	2	0	Bispira volutacornis	"	1	6
pelagica	"	2	6	Myxicola infundibulum	"	1	0
fucata	each	0	6	Serpula vermicularis	"	0	6
diversicolor	per doz.	1	6	Hydroides norvegica	"	0	2
Dumerillii	each	0	6	Protula tubularia	"	1	0
irrorata	"	0	6	Filograna implexa	per tube	1	6
longissima	"	0	6	Spirorbis borealis	"	1	0
procera	"	0	6	Trochospheres and post-larval stages			
Nephtys cœca	"	0	9		per tube	2	0
Hombergii	"	0	9	Myzostomum glabrum	per doz.	1	0
longisetosa (Johnston)							
	each	0	9				
Glycera capitata	"	0	9				
convoluta	"	0	9				
dubia (Johnston)	"	1	0				
Syllis prolifera	per doz.	3	0				
armillaris	"	3	0				
Amblyosyllis (Gattiola) spectabilis							
	each	0	4				
Autolytus prolifer (Müll)	"	0	4				
Myrianida maculata	"	0	6				
Phyllodoce lamelligera	"	1	0				
maculata	per doz.	1	6				
Pancerina	each	1	0				
Eulalia viridis	per doz.	3	6				
Tomopteris onisciformis	each	1	6				
Cirratulus tentaculatus	per doz.	6	0				
cirratus	each	1	0				
Notomastus latericeus	"	1	0				
Spio sp.	"	0	4				
Nerine vulgaris	"	0	4				
coniocephala	"	0	4				
Scoloplos armiger	"	0	6				
Arenicola marina	"	0	6				
ecaudata	"	0	6				
Grubii	"	1	0				
Clymene sp.	"	1	0				
Chætopteris variopedatus	"	0	9				
Siphonostoma affinis	"	0	9				
Trochonia plumosa	"	1	0				
Sabellaria alveolata	per doz.	2	6				
Pectinaria auricoma	each	1	0				
Amphitrite Johnstonei	"	0	9				
Terebella lapidaria	"	0	6				
Lanice conchilega	"	0	9				

HIRUDINEA.

Pontobdella muricata each 1 6

CRUSTACEA.**CLADOCERA**

Evadne Nordmanni per tube 1 6

Podon intermedius " 1 6

OSTRACODA

Cypris, Cythere, etc. " 1 6

COPEPODA

Terminology in general that of Giesbrecht, *Pelagische Copepoden* (Naples monograph), 1892, and *Das Tierreich*, 1898; supplemented by Brady, *British Copepoda*, 1878-80.

Calanus finmarchicus per tube 1 6

Pseudocalanus elongatus " 1 6

Paracalanus parvus " 1 6

Candace pectinata " 2 6

Temora longicornis " 1 6

Eurytemora affinis " 1 6

Centropages typicus " 1 6

Anomalocera Patersoni " 1 6

Acartia clausi " 1 6

bifilosa " 1 6

Oithona spirostris " 1 6

Notodelphyidæ var sp. " 2 0

Corycaeus anglicus " 1 6

Monstrilla Danæ each 1 0

Euterge acutifrons per tube 1 6

* The prices quoted are for ordinary preserved specimens. Living specimens, when obtainable, are generally charged at the same prices; museum specimens at a slightly increased rate.

		s.	d.
Dactylopus strömii .	per tube	1	6
Idya furcata .	"	1	6
Longipedia coronata .	"	1	6
Thalestris rufocincta .	"	1	6
Harpacticus chelifer .	"	1	6
Peltidium depressum .	"	1	6
Chondracanthus lophii .	each	0	6
Nicotoë astaci .	per doz.	2	6
Caligus rapax .	"	2	6
Pandarus bicolor .	each	0	4
Anchorella triglæ .	"	0	3
Numerous other species	each from	0	3
CIRRIPEdia			
Conchoderma auritum .	each	0	6
Lepas anatifera .	"	0	3
Scalpellum vulgare .	"	0	3
Pyrgoma anglicum .	per col.	1	0
Balanus tintinnabulum .	"	0	6
amphitrite .	"	0	6
crenatus .	"	0	6
Chthamalus stellatus .	"	0	6
RHIZOCEPHALA			
Sacculina carcini .	each	0	6
LEPTOSTRACA			
Nebalia bipes .	per doz.	1	0
AMPHIPODA			
Terminology that of G. O. Sars. <i>Crustacea of Norway</i> , vol. i.			
Hyperia galba .	each	0	3
Talitrus locusta .	per doz.	1	6
Orchestia littorea .	"	1	6
Orchomene Batei .	each	0	2
Ampelisca lævigata .	per doz.	2	0
Leucothoë spinicarpa .	"	2	0
Paratylus Swammerdami .	"	2	6
Dexamine spinosa .	"	2	6
Gammarus marinus .	"	0	3
locusta .	"	1	6
Melita obtusata .	"	2	0
Amphithoë rubricata .	"	2	0
Podocerus falcatus .	"	1	6
Erichthonius abditus .	"	2	0
Corophium crassicorne .	"	2	0
Bonelli .	"	1	6
Chelura terebrans .	"	1	0
Phtisica marina .	"	2	6
Protella phasma .	"	1	0
Caprella linearis .	"	2	0
æquilibra .	"	2	0
acanthifera .	"	2	0
tuberculata .	"	2	0

ISOPODA			
Terminology that of V. Carus, <i>Prodromus Faune Mediterraneæ</i> .			
Apeudes talpa .	each	0	3
Latreillii .	"	0	3
Anceus maxillaris .	per doz.	1	6
Conilera cylindracea .	each	0	3
Sphaeroma serratum .	"	0	3
Idotea tricuspidata .	per doz.	1	6
linearis .	"	2	6
emarginata .	"	1	6
Jæra albifrons .	each	0	3
Munna Kroyeri (Goodsir) .	"	0	3
Janira maculosa (Leach) .	"	0	3
Arcturus intermedius (Goodsir) .	"	0	3
Limnoria lignorum .	per doz.	2	6
Bopyrus squillarum .	each	1	0
Cryptophtiria balani .	"	0	4
Microniscus sp. .	per doz.	3	6
Ligia oceanica .	"	1	6
CUMACEA			
Iphinoë trispinosa .	per doz.	2	6
Pseudocuma longicornis .	"	2	6
Diastylis Rathkii .	"	2	6
MYSIDÆ			
Terminology that of Canon Norman, "On British Mysidæ." <i>Ann. Mag.</i> N.H. 1892.			
Siriella armata .	per doz.	1	6
Gastrosaccus sanctus .	"	2	0
Anchialus agilis .	"	2	0
Leptomysis mediterranea .	"	2	0
Macropsis Slabberii .	"	2	0
Schistomysis spiritus .	"	1	6
Parkeri .	"	2	6
arenosa .	"	1	6
Macromysis flexuosa .	"	1	6
Neomysis vulgaris .	"	1	6
DECAPODA			
Terminology that of V. Carus, <i>Prodromus Faune Mediterraneæ</i> .			
Palæmon serratus .	per doz.	4	0
squilla .	"	5	0
Palæmonetes varians .	"	1	6
Pandalus annulicornis (Leach) .	per doz.	1	6
brevirostris .	"	3	0
Virbius varians .	"	2	6
Crangon vulgaris .	"	1	0
trispinosus .	"	2	0
Nephrops norvegicus .	each	1	6

PRICE LIST OF MARINE SPECIMENS.

		s.	d.		s.	d.
Homarus vulgaris	each*	2/6	to 5/-	Ammothea echinata	per doz.	2 6
Palinurus vulgaris	each	2/6	to 7/6	Phoxichilidium femoratum	„	2 6
Galathea squamifera	per doz.	3 6		Phoxichilus spinosus	„	2 0
dispersa	„	3 6		Pycnogonum littorale	„	2 6
strigosa	each	1 0				
Eupagurus Bernhardus	„	0 6		POLYZOA.		
Prideauxii	„	0 6		Terminology that of T. Hincks' <i>British Marine Polyzoa.</i>		
cuanensis	„	0 6		Scrupocellaria scruposa	per tube	1 6
lævis	„	0 3		elliptica	„	1 6
Diogenes varians	„	0 4		Bicellaria ciliata	„	1 6
Porcellana platycheles	per doz.	2 6		Bugula turbinata	„	1 6
longicornis	„	1 6		flabellata	„	1 0
Ebalia Bryeri	each	1 0		Cellaria fistulosa	„	1 0
Cranchii	„	1 0		sinuosa	„	1 0
Pennantii	„	1 0		Flustra foliacea	„	2 0
Stenorhynchus phalangium	„	0 6		Membranipora pilosa	„	1 0
ægyptius	„	1 6		membranacea	„	1 0
longirostris	„	0 6		Membraniporella nitida	per tube	1 6
Achaeus Cranchii	„	0 6		Microporella Malusii	„	1 6
Inachus scorpion	„	0 6		Schizoporella linearis	„	1 0
dorychus	„	1 0		Hippothoa divaricata	„	1 6
Maia squinado	„	3 6		Lepralia foliacea	„	1 6
Pisa Gibbsii	„	1 6		Smittia trispinosa	„	1 0
tetraodon	„	1 6		Mucronella Peachii	„	1 0
Hyas araneus	„	2 0		ventricosa	„	1 0
coarctatus	„	1 6		Cellepora avicularis	„	1 6
Eurynome aspera	„	0 4		pumicosa	„	1 6
Cancer pagurus	„	1/-	to 5/-	ramulosa	„	1 6
Pirimela denticulata	„	1 6		Crisia eburnea	„	1 0
Xantho rivulosa	„	0 6		Stomatopora major	„	1 6
florida	„	0 6		Tubulipora flabellaris	„	1 0
Pilumnus hirtellus	„	0 6		Idmonea serpens	„	1 0
Portunus puber	„	0 4		Diastopora patina	„	1 0
depurator	„	0 4		Lichenopora hispida	„	1 0
pusillus	„	0 4		Aleyonidium gelatinosum	„	1 0
arcuatus	„	1 0		Flustrella hispida	„	1 0
marmoreus	„	0 6		Amathia lendigera	„	1 0
corrugatus	„	1 0		Bowerbankia imbricata	„	1 0
Polybius Henslowii	„	1 0		Cylindrocium dilatatum	„	1 0
Carcinus menas	„	0 4		Valkeria uva	„	2 0
Atelecyclus heterodon	„	0 6		Pedicellina cernua	„	1 0
Corystes cassivelaunus	„	0 6		Loxosoma phascolosomatum	„	1 6
Pinnotheres pisum	„	2 0				
Gonoplax rhomboides	„	2 6		MOLLUSCA.		
Zoææ and other larval stages	per tube	2 0		Terminology that of Forbes and Hanley, <i>British Mollusca.</i>		
PYCNOGONIDA				AMPHINEURA		
Terminology that of Hoek, <i>Nouvelles études sur les Pycnogonides</i> , Arch. zool. expér. et gen. ix. 1881.				Chiton marginatus	per doz.	2 6
Nymphon gracile	per doz.	2 0		fascicularis	each	0 6
gallicum	„	2 0		asellus	per doz.	3 0

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PRICE LIST OF MARINE SPECIMENS.

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	s.	d.		s.	d.
Proneomenia aglaopheniae (Kowalevsky)	each	2 0	Goniodoris nodosa	per doz.	3 0
Dondersia Banyulensis (Pruvot)	"	2 0	castanea	each	0 6
GASTROPODA			Archidoris tuberculata	"	1 0
Patella vulgata	per doz.	2 0	flammea	"	1 0
pellucida	"	2 6	Jorunna Johnstoni	"	0 6
Acmæa virginea	"	3 6	Platydorid planata	"	0 6
Emarginula reticulata	each	0 6	Rostanga coccinea	"	0 6
Fissurella græca	"	0 6	Doris maculata (Garstang)	"	1 6
Trochus zizyphinus	per doz.	1 0	Acanthodoris pilosa	"	0 6
granulatus	each	0 6	Lamellidoris aspera	"	0 6
cinerarius	per doz.	1 0	bilamellata	"	0 6
umbilicatus	"	1 0	Æolis papillosa	"	1 0
magus	each	0 6	Hero formosa	"	0 6
Phasianella pullus	per doz.	2 6	Æolidiella Alderi	"	0 6
Littorina littorea	"	1 0	glauca	"	0 6
littoralis	"	1 0	Cratena viridis	"	0 6
Rissoa parva	"	2 0	olivacea	"	0 6
Capulus hungaricus	each	0 3	amæna	"	0 6
Calyptrea sinensis	"	0 3	Galvina tricolor	"	0 6
Cypræa europea	"	0 3	Coryphella rufibranchialis	"	0 6
Natica nitida	"	0 6	Landsburgii	"	0 6
Lamellaria perspicua	"	0 6	smaragdina	"	0 6
Aporrhais pes-pellicani	"	0 6	Facelina coronata	"	0 6
Scalaria communis	"	0 6	Antiopa cristata	"	0 6
Turritella terebra	per doz.	3 0	Doto fragilis	"	0 6
Buccinum undatum	each	0 9	coronata	"	0 6
for dissection	"	0 6	Elysia viridis	"	0 6
Nassa reticulata	per doz.	2 0	Limapontia capitata	"	1 0
incrassata	"	2 0	nigra	"	0 6
Murex erinaceus	"	2 0	Terminology that of Forbes and Hanley, <i>British Mollusca.</i>		
Purpura lapillus	"	1 0	SCAPHOPODA		
Otina otis	"	4 0	Dentalium entalis	each	1 0
Scaphander lignarius	each	0 6	LAMELLIBRANCHIA		
Haminea hydatis	"	1 0	Nucula nucleus	"	0 9
Philine aperta	"	0 3	Anomia ephippium	per doz.	2 6
punctata	"	0 6	Pectunculus glycymeris	"	3 0
Runcina coronata (Quatrefages)	"	0 6	Arca tetragona	each	1 0
Aplysia punctata	each	0 9	lactea	"	1 0
Oscanius membranaceus (Montagu)	each	0 4	Mytilus edulis	per doz.	1 6
Pleurobranchus plumula	"	0 6	Pinna pectinata	each	1 6
Terminology that of R. Bergh, <i>System</i> <i>der Nudibranchiaten Gasteropoden.</i>			Ostrea edulis	"	0 6
Tritonia Hombergii	each	2 6	Pecten maximus	"	0 6
Candiella (Tritonia) plebeia	"	0 3	tigrinus	"	0 6
Dendronotus arboreescens	"	1 0	opercularis	per doz.	2 6
Lomanotus genei	"	1 0	Lima Loscombii	each	0 6
Triopa claviger	"	0 6	Cyprina islandica	"	2 0
Polycera quadrilineata	"	0 3	Kellia suborbicularis	"	0 6
Ægirius punctilucens	"	0 6	Scrobicularia piperata	"	0 6
Ancula cristata	"	0 6	Mactra solida	"	0 4
			Venus fasciata	"	0 6
			striatula	"	0 6
			ovata	"	0 6

		s.	d.
Artemis exoleta . . .	each*	0	8
Astarte sulcata . . .	"	0	8
Lucina borealis . . .	"	1	0
flexuosa . . .	"	1	0
Tapes pullastra . . .	per doz.	2	6
virginea . . .	each	0	6
Cardium edule . . .	per doz.	2	0
echinatum . . .	each	0	9
norvegicum . . .	per doz.	6	0
Tellina crassa . . .	each	0	9
Psammobia ferroensis . . .	"	1	0
telinella . . .	per doz.	5	0
Lutraria elliptica . . .	each	2	0
Montacuta substriata . . .	"	0	3
ferruginosa . . .	"	0	3
Crenella marmorata . . .	"	0	3
Solen marginatus . . .	"	0	9
ensis . . .	per doz.	4	0
Saxicava rugosa . . .	"	1	6
Pholas parva . . .	each	1	0
dactylus . . .	"	1	0
Pholadidea papyracea . . .	"	1	0
Teredo norvegica . . .	"	1	6
Lyonsia norvegica . . .	"	2	0
Pandora obtusa . . .	"	1	0
Veligers, and other larval stages . . .	per tube	2	0

CEPHALOPODA

Ommastrephes sagittatus . . .	each	3	6
Sepiolo atlantica . . .	per doz.	3	6
Loligo Forbesii . . .	each 1/- to 2/6		
media . . .	"	1	6
Sepia officinalis . . .	"	1	0
elegans . . .	"	1	6
Octopus vulgaris . . .	"	2	6
Eledone cirrhosus . . .	"	1	0
Rossia Oweni . . .	"	3	0

TUNICATA.

Terminology in general that of Herdman,
Revised Classification of the Tunicata.
Jnl. Linn. Soc. vol. xxiii. 1891.

Oikopleura dioica . . .	per doz.	2	6
Thalia (Salpa) democratica- mucronata . . .	"	2	0
Thalia (Salpa) containing embryos . . .	"	3	6
Thalia (Salpa) fragments of chain . . .	each	2	0
Doliolum tritonis . . .	per tube	1	6

		s.	d.
Botryllus violaceus . . .	per col.	1	0
smaragdeus . . .	"	2	0
Botrylloides rubrum . . .	"	1	6
Styela aggregata . . .	per doz.	2	0
Styelopsis grossularia . . .	"	2	0
Polycarpa varians . . .	"	9	0
Molgula oculata . . .	each	1	0
Perophora Listeri . . .	per col.	2	6
Ascidiella aspersa . . .	per doz.	5	0
scabra . . .	each	0	6
venosa . . .	"	0	8
Ascidia depressa (Garstang) . . .	"	0	8
mentula . . .	"	1	0
Phallusia mammillata . . .	"	1	6
Corella larvæformis . . .	"	0	6
Ciona intestinalis . . .	"	0	6
Diazona violacea . . .	per col.	2	0
Pycnoclavella aurilucens . . .	"	2	0
Clavelina lepadiformis . . .	"	2	0
Archidistoma aggregatum . . .	"	2	6
Distaplia rosea . . .	"	1	0
Diplosoma Listeri . . .	"	1	0
Leptoclinum sp. . .	"	1	0
Didemnum sp. . .	"	1	0
Circinalium conerescens . . .	"	2	6
Amaroucium Nordmanni . . .	"	2	6
proliferum . . .	"	2	6
Fragarium elegans . . .	"	2	6
Morchellium argus . . .	"	1	6

CEPHALOCHORDA.

Amphioxus lanceolatus . . .	each	0	9
In calm weather living specimens may be procured at 2/6 each.			

PISCES.

Terminology is that of F. Day in *British Fishes.*

Unpreserved specimens at two-thirds of these prices.

ELASMOBRANCHII

Mustelus vulgaris . . .	each	2	0
Galeus vulgaris . . .	"	2	6
Scyllium canicula; Formalin- spirit each . . .		1	0
chromic . . .	"	1	3
embryos . . .	"	2	0
skeleton . . .	"	5	6

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PRICE LIST OF MARINE SPECIMENS.

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		s.	d.			s.	d.		
Scyllium	catulus	each	2	0	Centronotus	gunellus	each	1	6
	embryos	"	3	6	Mugil	chelo	"	3	6
Acanthias	vulgaris	"	1	3	Gasterosteus	aculeatus	"	1	0
	embryos	"	1	0		spinachia	"	1	0
Rhina	squatina	"	2	0	Labrus	maculatus	"	2	0
Raia	batis	"	4	6	Ctenolabrus	rupestris	"	2	6
	clavata	"	4	6	Crenilabrus	melops	"	3	6
	maculata	"	4	6	<i>Anacanthini</i>				
	blanda	"	4	6	Gadus	morrhua	each	3	6
	microcellatus	"	4	6		luscus	"	1	6
	circularis	"	4	6		merlangus	"	1	0
	sp. embryos	"	3	6		pollachius	"	2	6
TELEOSTEI									
<i>Acanthopterygii</i>									
Labrax	lupus	each	3	6		virens	"	2	6
Mullus	barbatus	"	4	0	Merluccius	vulgaris	"	2	6
Pagellus	centrodontus	"	3	0	Molva	vulgaris	"	3	6
Trigla	cuculus	"	2	0	Motella	triccirrata	"	2	0
	lyra	"	2	0	Ammodites	tobianus	"	1	0
	gurnardus	"	2	6	Rhombus	maximus	each	2/6 to 10/-	
	hirundo	"	2	0		laevis	each	2/6 to 10/-	
Cottus	scorpius	"	1	0	Arnoglossus	laterna	each	1	0
	bubalis	"	1	0	Pleuronectes	platessa	"	1	0
Agonus	cataphractus	"	1	0		limanda	"	1	0
Lophius	piscatorius	"	5	0		flesus	"	1	0
Trachinus	draco	"	2	6		microcephalus	"	1	6
	vipera	"	3	6	Solea	vulgaris	each	2	0
Scomber	scomber	"	2	0		variegata	"	2	6
Caranx	trachurus	"	2	0		lascaris	"	2	0
Capros	aper	"	1	0	<i>Physostomi</i>				
Zeus	faber	"	2	6	Engraulis	encrasicholus	"	1	6
Gobius	niger	"	1	0	Clupea	harengus	"	0	6
	minutus	"	0	6		pilchardus	"	0	6
	ruthensparri	"	0	6		sprattus	"	0	6
	paganellus	"	0	6	Anguilla	vulgaris	"	1	6
Callionymus	lyra	"	0	9	Conger	vulgaris	each	3/6 to 10/-	
Cyclopterus	lumpus	"	2	0	<i>Lophobranchii</i>				
Blennius	pholis	"	1	0	Syngnathus	acus	each	1	0
	gattorugine	"	1	6	Nerophis	lumbriciformis	"	1	0
	ocellaris	"	1	0		aequorius	"	1	0
					Syphonostoma	typhle	"	1	0

ALGÆ.

THE following algæ have been carefully selected during the period in which the vegetative structure or reproductive organs are in a state suitable for laboratory work, and are put up in tubes at one shilling each. Larger quantities can be supplied to laboratories at a reduced rate.

PHEOPHYCEÆ

Cystoseira ericoides
 granulata
 Pycnophycus tuberculatus
 Ascophyllum nodosum

Fucus serratus
 vesiculosus
 Pelvetia canaliculatus
 Himanthalia lorea
 Desmarestia aculeata

Desmarestia viridis
 Arthrocladia villosa
 Sporochnus pedunculatus
 Laminaria digitata
 Scytoliphon tomentaria
 Chorda filum
 Lomantaria articulata
 Cutleria multifida
 Dictyota dichotoma
 Dictyopteris polypodioides
 Stilophora rhizodes
 Asperococcus echinatus
 bullosus
 Litosiphon pusillus
 Mesogloia Griffithsiana
 viridis
 Leathesia Berkeleyi
 difformis
 Elachista fucicola
 flaccida
 stellulata
 scutulata
 velutina
 Myrionema sp.
 Cladostephus verticillatus
 Stypocaulon scoparium
 Sphacelaria cirrhosa
 Ectocarpus fasciculatus
 Pilayella littoralis

RHODOPHYCEÆ

Rytiphlaea fruticulosa
 Polysiphonia urceolata
 elongata
 byssoides
 fastigiata
 violacea
 Dasya coccinea
 Rhodomela subfusca
 Bonnemaisonia asparagoides
 Laurencia dasyphylla
 Chylocladia kaliformis

Chylocladia clavellosa
 Jania rubens
 Corallina officinalis
 Melobesia lithophyllum
 Delesseria sanguinea
 hypoglossum
 Nitophyllum punctatum
 Hilliæ
 Stenogramme interrupta
 Rhodymenia bifida
 laciniata
 Gracilaria confervoides
 multipartita
 Gelidium corneum
 Gigartina mamillosa
 Cystoclonium purpurascens
 Chondrus crispus
 Gymnogongrus plicatus
 Polyides rotundus
 Halymenia ligulata
 Ginannia furcellata
 Nemaleon multifidum
 Dudresnaia coccinea
 Ceramium ciliatum
 decurrens
 rubrum
 Spyridia filamentosa
 Wrangelia multifida
 Helminthora divaricata
 Callithamnion corymbosum
 plumula
 virgatulum
 pedicellatum

CHLOROPHYCEÆ

Codium tomentosum
 Bryopsis plumosa
 Enteromorpha sp.
 Ulva latissima
 Porphyra sp.

CYANOPHYCEÆ

Rivularia bullata

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 no case does any one salary exceed £250.

The Association has received some £31,000, of which £15,000 has been granted by the Treasury. The annual revenue which can be at present counted on is about £1,820, of which £1,000 a year is granted by the Treasury, the remainder being principally made up in subscriptions.

The admirable Marine Biological Laboratory at Naples, founded and directed by Dr. Dohrn, has cost about £20,000, including steam launches, &c., whilst it has an annual budget of £7,000.

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.

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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.