

The Fauna of the Salcombe Estuary.

By

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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*, *Ascidella 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*, *Maclovina 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.

- Prosthecereus 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.
Maclovia 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.

Nephthys 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.

POLYCHÆTA.

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.

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

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

Maclovia 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 zosteria bank.

MOLLUSCA.

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

Morchellium argus. An occasional piece among the zosteria.

Zosteria 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 Zosteria 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 zosteria 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 zosteria 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.

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| <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.

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

TUNICATA.

Morchellium argus. Small pieces only.

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

[July 12th, 1900.]

ECHINODERMA.

Amphiura elegans. One.

CRUSTACEA.

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

PYCNOGONIDA.

Phoxichilus spinosus. Two.

MOLLUSCA.

- | | |
|--|---|
| <p><i>Trochus striatus</i>. Two.</p> <p>„ <i>cinerarius</i>. One.</p> <p><i>Littorina littoralis</i>. One.</p> | <p><i>Rissoa labiosa</i>. Several.</p> <p>„ <i>ulvæ</i>. A few.</p> <p><i>Cerithium reticulatum</i>. One.</p> |
|--|---|

PISCES.

Gobius Ruthensparri. Two or three. | *Centrolabrus exoletus*. One.

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. |
|---------------------------------|--------------------------------------|

TURBELLARIA.

Prosthiostomum sp. One.

POLYCHÆTA.

- | | |
|--|---|
| <i>Euphrosyne 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.
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MOLLUSCA.

Mactra solida. A dozen.		Trochus magus. Shell.
Pecten opercularis.		Philine aperta. One.
Emarginula reticulata. One on <i>Pecten</i> shell.	|	

POLYZOA.

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

TUNICATA.

Asciidiella scabra.		Molgula sp.
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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 <i>Nassa</i>
Clione celata. Boring shells, etc.	|	<i>reticulata</i> .

ACTINOZOA.

Anthea cereus. One or two.

HYDROZOA.

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

ECHINODERMA.

Amphiura elegans. Several.		Echinus miliaris. Several.
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NEMERTINA.

Micrura fasciolata. Several.

GEPHYREA.

Phascolion strombi. One in *Turritella communis* shell.

POLYCHÆTA.

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

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.
Acmæa virginea. Several.	Goniodoris nodosa. One.
Calyptræa 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 LEVIS (*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 *Ascidiella* 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.

HALCAMPYA 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 zostera beds to the north of Millbay, on the east side of Salcombe Harbour. Specimens are seldom found actually in the zostera 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 zostera 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 zostera) 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 (*Quatrefores*). 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 zosteria 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 zosteria 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, *Middlehavets 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 *zostera* 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 *zostera* bank off Millbay, which was only uncovered at low water. It was also not uncommon on the sand and *zostera* 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 *zostera* 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 *zostera* 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.