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Notes on the Littoral Polychæta of Torquay (Part II.).

By

Major E. V. Elwes.

Phyllodocidæ.

IT cannot be said that all the species of the Phyllodocidæ have yet been satisfactorily defined, much difference of opinion existing as to the separation of varieties and species. In the accompanying key the nomenclature of Professor McIntosh has been followed, but those Annelids, which are classed by him as varieties, but which have been hitherto generally accepted as distinct species, are shown separately. The true specific value of the arrangement and nature of the papillæ on the proboscis can only be settled by the examination of numerous individuals from various localities; in the meantime it appears best to consider Annelids differing in these particulars as at least varieties worthy of a name.

EULALIA VIRIDIS, O. F. Müller. McIntosh, Mon. Brit. Ann., vol. ii., p. 55.

The variety of *E. viridis*, most commonly found at Torquay, is coloured an uniform dark green, the cirri being rather lighter in colour. It is particularly abundant where the limestone rocks have been much eaten away from about half-tide mark downwards. It appears to like crawling about the damp rocks out of the water when the tide is low, and does not hesitate to leave the water when placed in a shallow vessel. The terminal papillæ of the proboscis numbered fourteen in all the individuals examined, like those found by de St. Joseph at Dinard; but the whole of the extended proboscis was covered with papillæ.

The variety ornata of de St. Joseph is fairly common, but does not appear to extend above the Laminarian zone. There appears to be very little doubt that this is the *P. griffithsii* of Johnstone. His specimens were obtained from Torbay, and there does not appear to be any species of *Eulalia* found there to which the description could apply.

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The number of segments per inch of length mentioned by Johnstone applies much better to *ornata* than to *E. nebulosa*, Montagu.

The variety *aurea* of Gravier is also found at Torquay in the same localities as *ornata*. The dorsal cirri are distinctly less pointed, and the breadth of the segments greater in proportion to the length than in the case of the other varieties.

EULALIA NEBULOSA, Montagu = E. punctifera, Grube. McIntosh, Mon. Brit. Ann., vol. ii., p. 53.

One specimen only from Corbyn's Head. Colour dull green rather than yellowish or red; some of the dorsal cirri heavily marked with dark colouring matter. The much longer upper limb of the bifid setigerous process of the foot is very characteristic of this species.

EUMIDA SANGUINEA, Œrsted = E. pallida, Grube. McIntosh, Mon. Brit. Ann., vol. ii., p. 66.

The real distinction between the genera *Eulalia* and *Eumida*, as defined by Malmgren and McIntosh, is that in *Eulalia* the first pair of tentacular cirri are attached to a segment divided from the head by a constriction visible at least on the ventral side, while in *Eumida* the first pair of tentacular cirri are apparently attached to the head, the first segment being soldered to the head. Such a distinction is, however, unsatisfactory, because the visibility of a dividing line between the segment and head depends so much on the method of preparation of the specimen. The only British species is, however, easily recognised as a rule by the peculiar white markings, which look as if they had been painted on with Chinese white. It is common amongst the Laminaria roots at Torquay. Most of the specimens are coloured a pale brown, but one or two were found with a decided red tinge in the posterior part of the body.

The proboscis is covered with very small papille, which almost or entirely disappear in preparations, for which reason the smoothness of the proboscis as a generic distinction is also objectionable. Some of the individuals had black patches in the intestines like those described by Gravier in his *Eumida communis*. *Bull. Sc. Fr. Belg.*, t. xxxix., p. 18.

PHYLLODOCE MACULATA, Johnstone. McIntosh, Mon. Brit. Ann., vol. ii., p. 89.

This is the only species of *Phyllodoce* which is at all common between tide marks at Torquay. It is found amongst rocks and weeds, and also in the sand. On one occasion sixteen individuals were found

in a whelk shell containing the decaying remains of a hermit crab.

The Torquay species agree well with the beautiful coloured drawing given in the Mon. Brit. Ann.

One specimen was found in a limestone pool which differed considerably from the type : the general colour much greener, the dorsal cirri larger in proportion and without spots, the distance between the feet greater. The number of the rows of papillæ on the proboscis could not be observed. Possibly this is the *Phyllodoce maculata* of Œrsted.

PHYLLODOCE LAMELLIGERA, Gmelin. McIntosh, Mon. Brit. Ann., vol. ii., p. 76.

One light-coloured individual under a stone at Hope's Nose, and another of the normal colouring at Meadfoot.

Papillæ of the proboscis could not be observed.

PHYLLODOCE PARETTI, De Blainville. McIntosh, Mon. Brit. Ann., vol. ii., p. 76.

The head and about twenty segments of one from Corbyn's Head. The specimen, mounted in weak Formalin solution, retained its beautiful colouring for some weeks, then changed gradually to a reddish brown.

Gosse, in *The Aquarium*, second edition, p. 243, describes an example of this species from Torbay.

ETEONE PICTA, De Quatrefages. McIntosh, Mon. Brit. Ann., p. 100. Small ones, about 25 mm. in length, are not uncommon amongst Laminaria roots. The pattern of the colouring agrees with that described by McIntosh, but the anal cirri are quite differently shaped to those in Pl. XLV, Fig. 3, of the Monograph, being ovate, exactly like those figured by Gravier, Bull. Sc. Fr. Belg., Pl. XVI, Fig. 14.

NOTOPHYLLUM FOLIOSUM, Sars = alatum, Langerhans. McIntosh, Mon. Brit. Ann.

One from Livermead. The dorsal cirri appear to be much more deciduous than the ventral. Colouring like that described by McIntosh for specimens kept some time in confinement, namely, brownish green without the red iridescence.

Nepthydidæ.

NEPTHYS HOMBERGH, Lamark. McIntosh, Mon. Brit. Ann., p. 17.

Moderate-sized examples of this species, about 90 mm. in length, are common in the sand at Tor Abbey Sands and Livermead. They were

also found in rather dirty, muddy sand in the inner harbour of Torquay. The posterior lamina of the ventral branch of the foot is more pronouncedly directed upwards and more truncate than is shown in any of the figures given in the monograph.

NEPTHYS CIRROSA, Ehlers. *McIntosh*, *Mon. Brit. Ann.*, vol. ii., p. 36. In clean sand in company with *N. Hombergii*, but not quite so numerous. It may be distinguished at once from *N. Hombergii* by its comparatively narrow width and the light colour of the bristles.

McIntosh says (p. 38) that de St. Joseph distinguishes this species by the larger size of the branchiæ. But it is not the branchiæ themselves, but the "cirre branchial" (called by McIntosh "the dorsal cirrus at the base of the branchia") which de St. Joseph says becomes larger and larger, until, for about the thirty last segments, it is almost longer than the branchiæ. See Ann. Sc. Nat., 8th series, xvii., p. 21.

Hesionidæ.

CASTALIA FUSCA, Johnston = Kefersteinia cirrata, Kef. McIntosh, Mon. Brit. Ann., vol. ii., p. 127.

Common under stones, especially at Meadfoot; also in Laminaria roots. It is an extremely brittle species which, like other very brittle annelids, is best lifted up with a soft camel-hair brush.

MAGALIA PERAMATA, Mar. and Bobr. McIntosh, Mon. Brit. Ann., vol. ii., p. 136.

Common amongst Laminaria roots.

Nereidæ.

MICRONEREIS VARIEGATA, Clpd. Claparède, Beob. über anat. wirbel thiere, etc., 1863, p. 57 and Pl. XI, Figs. 56–7; and Glanures parmi les Ann. de Port Vendres, p. 122, Pl. XIII, Fig. 4a.

This little aberrant member of the Nereidæ is not recorded in the "Fauna of Plymouth." Four or five individuals were found amongst red algæ and Lithothamnion from the rocks between Oddicombe and Babbicombe beaches.

The length is 4 mm., number of segments 21. The head, which is rounded in front, has no tentacles or palps: There are four eyes, the lateral pair close together, the posterior pair close to the margin of the head; the first pair have conspicuous crystalline lenses. There are four pairs of tentacular cirri, the front pairs situated on the front edge of the buccal segment low down; the posterior pairs, which are inserted higher up, are slightly longer than the other. The tentacular cirri are

fusiform and are tinged with yellow. The body is coloured purple. The jaws are about twice as long as broad, the number of teeth in each jaw five. There are no denticles. The first pair of feet, which are uniramous, are attached to the buccal segment. The second pair are also uniramous, but all the other feet are deeply bifid.

There are about twenty bristles in each foot, the terminal pieces of which are straight and narrow; they are much longer in proportion to their length than those shown in Claparède's drawing. Bristles and spines are colourless. The drawing given by Claparède is quite accurate for an individual drawn under compression, but the feet and cirri as shown there are much flattened out.

LEPTONEREIS VAILLANTI. de St. Joseph, Ann. des Sc. Nat. Zool., vol. v., 1888, p. 246.

One imperfect male Heteronereid form of this species was found in the month of February at Oddicombe. The posterior of the three regions into which the body is divided was absent, but the remaining segments agreed with the description and figures given by de St. Joseph. It is not recorded in the "Fauna of Plymouth."

NEREILEPAS FUCATA, Savigny. McIntosh, Mon. Brit. Ann., vol. ii., Pl. LXI, Figs. 6 and 6a.

This is not strictly a littoral species, but may be sometimes found in whelk shells thrown up on the shore. One lived for about six months in a small aquarium in a broken whelk shell, but without any hermit crab. It usually had the head and about ten or twelve segments of the body protruding from the shell; this part of the body being curved and continually waved backwards and forwards, giving the worm a most curious resemblance to a cobra.

NEREIS PELAGICA, L. McIntosh, Mon. Brit. Ann., vol. ii., Pl. LX, Figs. 6 and 6a.

This Nereis is extremely common in the roots of the Laminaria, nearly every root containing one or two. Several of the Heteronereid form were found in the same situation in January and February, 1907, on Oddicombe beach. They measured about 30 mm. in length.

NEREIS DUMERILII, Aud. and Ed. McIntosh, Mon. Brit. Ann., vol. ii., Pl. LX, Figs. 10 to 10c.

Small individuals, 20 to 30 mm. in length, are very common amongst lagæ from rock pools and the Torquay harbour.

NEREIS IRRORATA, Mgrn. McIntosh, vol. ii., Pl. L, Fig. 17; and Pl. LX, Fig. 8.

Occasionally under stones at Petit Tor Bay and Babbicombe beach; also amongst roots of Zostera at Corbyn's Head.

The glands in the feet are very conspicuous in this species, both when living and preserved.

NEREIS CULTRIFERA, Grube. McIntosh. Mon. Brit. Ann., vol. ii., Pl. LX.

Under stones, not very common, on the edge of the submerged forest at Tor Abbey Sands.

KEY TO THE GENERA OF PHYLLODOCIDÆ FOUND ON THE FRENCH AND ENGLISH COASTS OF THE CHANNEL.

	(Two pairs of tentacular cirri	. R		13		S. C	2	ETEONE, Savigny.
Four tentacles	. <	Three pairs of tentacular cirr	i.				1.		Mystides, Théel.
	(Four pairs of tentacular cirri							PHYLLODOCE, Savigny.
Five tentacles		Four pairs of tentacular cirri	foot foot	unira biran	mous nous ((one two s	spine spines	e))	EULALIA, Œrsted (including EUMIDA and PTEROCIRRUS). NOTOPHYLLUM, Œrsted.

KEY TO THE SPECIES OF PHYLLODOCIDÆ FOUND ON THE FRENCH AND ENGLISH COASTS OF THE CHANNEL.

Genus ETEONE.

	Dorsum spotted with red	A deep notch between the head and first segment on <i>*incisa</i> , de St. Jose each side. Dorsal cirri semiorbicular. Length, 40 mm.	ph.
Head as broad or broader	or brown	Without a deep notch as above described. Dorsal cirri { picta, Qftg.	
0		No spots; colour white. Dorsal cirri obliquely cordate. { *foliosa, Qftg. Length, 80 mm.	
Head longer than broad		Dorsal cirri obliquely ovate. Length, 40 mm pusilla, Œrsted.	

Genus Mystides.

One pair of tentacular cirri on each of the first three segments. Length, 20 mm. . (*Protomystides*) *bidentata, Lang. A pair of tentacular cirri on the first segment, two pair on the second segment, the posterior pair with a leaf-like appendage. Length, 10 mm. (*Mesomistides*) * limbata, de St. Joseph.

* Not recorded from the British area.

Genus Phyllodoce.

Median dors suborbicular	al cirri	Colour brown. papillæ in Terminal pa	On each side of the proboscis two rows of large lanceolate anterior part, and three rows of small papillæ at the base. }	* macropapillosa, de St. Joseph.	354
		Colour greenis lines on each Width of bo papillæ, 17	h yellow with a brown spot formed of transverse segment, and usually a spot on each dorsal cirrus. It without feet, 1 mm. Length, 80 mm. Terminal Four rows of	maculata, Johnst.	NOTES
Median dorsal cirri subrectangular Dorsal cirri g lines. Ven cles on fro Terminal p			papillæ . f eyish green, each segment marked with blue and brown transverse al cirri with a nipple-like tip. Proboscis with six rows of tuber- part of proboscis and six rows of papillæ on each side of base. pillæ, 17. Width of body without feet, 3 mm. Length, 180 mm.	groenlandica, Œrsted = mucosa, Malmgren.	ON THE L
		* <i>pulchella</i> , Malmgren.	ITTORAL		
	(Longest +	antaanlan sinni	Tentacles and tentacular cirri fusiform. Dorsal cirri bright yellow and green. Width, 4 to 5 mm. Length, 300 mm.	Paretti, De Blainvill= splendens, de St. Joseph.	POL
Median	not twi anterior	ce as long as dorsal cirri	Dorsal cirri green spotted with brown; bases of anal cirri, swollen; eyes very large. Thirty-six rows of papillæ on proboscis. Width, 1 mm. Length, 30 mm	* macropthalma, Schmarda. rubiginosa, de St. Joseph.	YCHÆTA OF
dorsal cirri cordate or elongate			Dorsal cirri, dull green; body, iridescent blue or green. Width without feet, 3 to 4 mm. Length, 160 to 750 mm.	lamelligera, Gmelin.	TORQUA
ovate,	Longest to several	entacular cirri times longer	papilla	var. laminosa, Savigny.	Y.
	than dorsal c	the anterior) irri	Colour pale, with transverse brown or blue lines on each segment. Front part of proboscis with six longitudinal rows of red tuber- cles, then six rows of large papillæ, each row of three large papillæ followed by numerous rows of small papillæ. Terminal papillæ, 16. Width, 4 mm. Length, 300 mm.	* papulosa, de St. Joseph.	

* Not recorded from the British area.

Ventral cirri of the second pair of tentacular cirri Brown or dull green. Terminal papillæ, 48. Length, 50 mm. macroceros, Grube. forming a long lanceolatefoliaceous process = Pinkish grev. Terminal papillæ, 24. Length, 7 mm. * limbata, Clpd. subgenus PTEROCIRRUS. Green with a brown spot on each segment except the first. Proboscis without lateral papillæ. Terminal papillæ, 8. Length, * parva, de St. Joseph. 8 mm. . Green. Terminal papillæ, 14 to 21. Length, 80 mm. . viridis, L. Dorsal cirri Yellow, with a dark spot on the middle of each segment and two lanceolate viridis, var. ornata, de St. parallel bars on each side of the segment. Terminal papillæ, 18. tapering to Joseph. Length, 60 mm. a point. Yellow, with two longitudinal violet lines on each side of the Ventral cirri of second pair of tentacular cirri central line, and a dark line on each side of the segment. viridis, var. aurea, Gravier. Terminal papillæ, 20. Length, 80 mm. not foliaceous . . . Green, with a dark line broken into three parts on the centre of) * trilineata, de St. Joseph. each segment. Terminal papillæ, 8. Length, 15 mm. First and second segments uniform brown, remaining segments spotted. Unpaired tentacle half-way between the eyes and part / * venusta, de St. Joseph. of head. Terminal papillæ, 14. Length, 30 mm.

* Not recorded from the British area.

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Genus EULALIA.

GENUS EULALIA-continued.

			Pale brown. First segment and some of the others marked with a white bar like Chinese white. Length, 30 to 60 mm.	(Eumida) sanguinea, $Ersted = pallida$, Clpd.
	Unpaired	tentacle in line	Body dull brown, with red dorsal cirri. Length, 14 mm.	rubiginosa, de St. Joseph.
Dorsal cirri		very little in the eyes	Green, with two brown spots on the head in front of the eyes. Upper limb of setigerous process much longer than the lower. Length, 150 mm.	nebulosa, Montagu = punctifera, Grube.
cordate.	Unpaired tentacle half- way between eyes and front of head		Brilliant yellow and green, brown spots on dorsal and ventral cirri. Length, 150 mm.	* splendens, de St. Joseph.
			Clear brown. Length, 20 to 30 mm.	*fuscescens, de St. Joseph.
	Unpaired posterio head .	tentacle on the r edge of the	Greyish brown, covered with fine spots. Length, 30 mm $\left\{ \right.$	(Eumida)*sanguinea,Œrsted, var. communis, Gravier.
		Straw-coloured 40 to 80 mm.	with a dark line along each side at the base of the feet. Length, $\left. \begin{array}{cccccccccccccccccccccccccccccccccccc$	bilineata, Johnston.
Dorsal cirri oval elongate, pointed Brownish, with papillæ of pr			a green longitudinal line in the middle of the back. Terminal oboscis, 28. Length of dorsal cirri, 0.1 mm. Length, 12 mm.	* pusilla, Œrsted.
		Three conspicu papillæ, 14.	ous green or black spots on the back of each segment. Terminal } Length, 100 mm.	tripunctata, McIntosh = Claparedii, de St. Joseph.

Genus NOTOPHYLLUM.

Head furnished posteriorly with a flap on each side. Dorsal cirri uniform . . . foliosum, Sars = alatum, Langh.

* Not recorded from the British area.

KEY TO THE NEREIDÆ OF THE FRENCH AND ENGLISH COASTS OF THE CHANNEL.

No denticles (paragnaths) on proboscis.	Buccal segn Length, 4 Buccal segn one kind o	nent with fee to 6 mm. nent without of bristle. L	t and bristles feet. Head ength, 30 mm.	s. No palps or rounded; cor	tentacles. Bristles a spicuous glands in fe	all of one kind. 	Micronereis variegata, Clpd. Leptonereis Vaillanti, de St. Joseph.
	Denticles on mud-dwel	ly present on ling worm.	lower half of Length, 400 m	proboscis in exo m	clusion, and inconspicue	ous. Very long	Eunereis longissima, Johnston.
Denticles horny, not joined together, all conical.	Denticles present in upper part of proboscis in exclusion.	Lower media with a lea Lower median dorsal group of denticles absent.	an dorsal gro f-like process. No hump at base of dorsal cirri in anterior part of body. Hump at base of dorsal cirrus.	up of denticles Large green v No conspicuous glands in feet. Glands in feet conspicuous. Two white ban crab, Leng	present. Upper lobe form. Length, 400 mm (Head longer than cirri longer than 80 mm Head broader than cirri not longer th ticles very small. dorsal surface fa spirit. Length, 88 (Upper lobe of notope and cirrus-like in 1 of body. Length, ads on dorsum. Comm th, 150 mm.	of notopodium } h. broad. Dorsal feet. Length, long. Dorsal han feet. Den- Front part of wn-coloured in mm	Nereis (Alitta) virens, Sars. Nereis pelagica, L. Nereis (Hediste) diversicolor, O. F. Müller. Nereis (Praxithea) irrorata, Malmgren. Nereis (Nereilepas) fucata, Savigny.

KEY TO THE	NEREIDÆ OF THE	FRENCH AND ENGLISH COASTS OF THE C	HANNEL—continued.
	(Upper part of notopodium) much enlarged in pos- terior portion of body.	Notopodium with three lobes. Length, 40 to 70 mm	Nereis Marionii, Aud. and Ed.
Denticles horny, not joined together, some conical, others oblong.	Upper branch of noto- podium not enlarged .	Broad worm. Denticles on ventral surface of lower proboscis arranged in two rows at regular intervals. Length, 170 to 200 mm. Denticles as above irregularly arranged in two rows. Dorsal cirri posteriorly longer than the foot. Length, 40 to 70 mm.	Nereis cultrifera, Grube. Nereis Floridana, Ehlers.
Denticles horny, in some groups at least very small, very close to- gether, and arranged in comb-like rows	Tentacular cirri very long, Conspicuous glands in not 70 mm	, reaching fifteenth segment \cdot	Nereis Dumerilli, Aud. and Ed.

NOTE. - The main divisions of this key are taken from the table given by Baron de St. Joseph, Ann. des Sc. Nat. Zool., series 8 T.V., 1898.

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

By

Alexander Reynell.

THIS paper deals with the Mollusca collected on the cruise of the s.s. *Huxley* to the north side of the Bay of Biscay in August, 1906, with the exception of the Cephalopoda, which are being worked out by Dr. W. E. Hoyle.

The collection, though small, taking into account the area over which dredgings were taken, contains a fair number of interesting species. Though there is nothing new, there are several species represented which one would not expect to find in such high latitudes, and their discovery adds somewhat to our, as yet, slight knowledge of the fauna of the deeper seas and its distribution.

Seventy-five species were identified, divided as follows :---

Amphineura		1
Pelecypoda		34
Scaphopoda		2
Gastropoda		37
Nudibranchia		1
		75

Of these seventy-five species, sixty-two have been recorded from the British Area, and of the remaining thirteen three are Pelecypods.

Pecten bruéi, Payraudeau.—Mostly known as a Mediterranean species, but has been confounded with *P. sulcata* (Müll.), which is a northern species. They meet in the Bay of Biscay, as both are represented in this collection.

Lima marioni, Fischer.—With reference to this species, Mr. E. A. Smith tells me it is the same as L. lata, found by the Challenger Expedition and described by him as new in his work dealing with the Lamellibranchs brought home by that expedition. Though an addition

to the fauna of the actual Bay of Biscay, it had been previously found and recorded from off the coast of Portugal by the *Travailleur*.

Lima excavata (Fabricius).—Fragments and odd valves of this northern species have been found south of the Bay of Biscay, by the *Porcupine* off Cape St. Vincent, and by the *Talisman* off the west coast of the Soudan. The single specimen found during the *Huxley* cruise, though smaller than the northern specimens I have seen, contained the animal, and thus proves its extended habitat, which was suggested by the discovery of the above-mentioned fragments.

The two species of Scaphopoda are both recorded as British.

Of the non-British Gastropods, two cannot be identified on account of their condition, but the remaining eight species are of interest.

Emarginula multistriata, Jeffreys. — A Mediterranean species recorded from off the coast of Portugal.

Calliostoma obesulum (P. Fischer) and *C. cleopatra* (P. Fischer) have only been recorded from off the Atlantic coasts of Northern Africa, and the fact of their having been found living, the former in large numbers, so far north, is a valuable indication of the possible very wide distribution of deep-water species.

Natica operculata, Jeffreys.—Jeffreys records the species as having been found by the *Porcupine* off the Spanish coast.

Ranella gigantea (Lamarck).—The most northerly habitat of this species so far recorded.

Scala richardi (Dautzenberg and de Boury).—This species has not been found living, the type being described from a dead shell dredged off the Azores. The remarks applied to the two species of *Calliostoma* apply to this species as well.

Pseudomurex richardi (P. Fischer).—Previously recorded from the Bay of Biscay.

Cavolina trispinosa (Lesueur).—Has an almost world-wide distribution, but is probably killed by coming into cold areas.

I tender my sincere thanks to the following gentlemen for their kind assistance in many ways: Mons. Ph. Dautzenberg, Sir Charles Eliot, K.C.M.G., Mr. E. R. Sykes, B.A., Mr. E. A. Smith, I.S.O., and Mr. H. B. Preston, F.Z.S. Finally I feel very much indebted to Dr. E. J. Allen for allowing me the opportunity of examining a collection of material of very considerable interest in many ways.

MOLLUSCA.

AMPHINEURA.

APLACOPHORA.

NEOMENIIDÆ.

RHOPALOMENIA, Simroth.

Rhopalomenia aglaopheniæ, Kovalevsky and Marion.

Rhopalomenia aglaophenia.-Kovalevsky and Marion, 1887. Ann. Mus. Hist. Nat., Marseille, iii.

> Garstang, 1896. Proc. Malac. Soc., Lond. Vol. ii, No. 3, p. 124, pl. x,

fig. 3.

Distribution. Plymouth (Garstang) [Banyuls, Marseille].

,,

I, 75 fathoms. One coiled round stem of Aglaophenia Station myriophyllum.

One coiled but free. XIII, 412

PELECYPODA.

PROTOBRANCHIA.

NUCULIDÆ.

NUCULA, Lamarck.

(1) Nucula sulcata, Bronn.

Nucula sulcata, Bronn, 1831. Italiens Tertiärgebild, p. 109.

polii, Philippi, 1836. Enum. Moll. Sicil., p. 63, pl. v, fig. 10. 52 Generally distributed in the North Atlantic and throughout the Mediterranean, and as far south as the coast of Guinea. Found in both shallow and deep water.

Station IX. 240 fathoms. One fragment of a broken valve.

(2) Nucula nitida, G. B. Sowerby.

Nucula nitida. G. B. Sowerby, 1833. Conch. Ill. (Nucula), p. 5, fig. 20.

Generally distributed in the North Atlantic from Scandinavia to Gibraltar and throughout the Mediterranean.

Station XII. 246 fathoms. One odd valve.

FILIBRANCHIA.

ANOMIACEA.

ANOMIIDÆ.

ANOMIA, Linné.

Anomia ephippium, Linné.

Anomia ephippium, Linné, 1758. Syst. Nat., édit. x, p. 701.

This well-known species has many synonyms and is very variable. All the specimens under consideration are or have been attached to the spines of Echini.

This is a very widely distributed species, and is found on both sides of the Atlantic, "Iceland to Egypt and Madeira, Labrador to Long Island Sound" (Jeffreys). Found by the *Challenger* off Pernambuco, the Nightingale Islands, and Tristan d'Acunha.

Station IV. 109 fathoms. One living, young.

, IX. 240 fathoms. Many living, all young.

" XI. 146 fathoms. Two living, both young.

XII. 246 fathoms. Five living, all young.

ARCACEA.

ARCIDÆ.

LIMOPSIS, Sassi.

(1) Limopsis aurita (Brocchi).

Arca aurita, Brocchi, 1815. Conch. Foss. Subapp., ii, p. 485, pl. xi, fig. 9.

Pectunculus auritus, Philippi, 1836. Enum. Moll. Sicil., i, p. 63.

Limopsis aurita, Jeffreys, 1863–69. Brit. Conch., ii, p. 161, pl. iv, fig. 3; v, p. 174, pl. xxx, fig. 1.

A very widely distributed species. Seas of Europe from Norway to the Mediterranean. It has also been recorded from the Azores, New Jersey, Virginia, Cape Hatteras, Georgia, Florida, West Indies. Jeffreys (*Porcupine*, etc.) records it from Japan.

Station IX. 240 fathoms. One living, four odd valves.

... XII. 246 fathoms. One living, three odd valves.

(2) Limopsis minuta (Philippi).

Pectunculus minutus, Philippi, 1836. Enum. Moll. Sicil., i, p. 63, pl. v, fig. 3.

Limopsis Borealis, Woodward, 1865. In Jeff. Brit. Conch., v, p. 174, pl. 100, fig. 3.

Limopsis minuta, Jeffreys, 1879. Proc. Zool. Soc., p. 585, pl. xlvi, fig. 9.

This species has a very wide distribution. It has been recorded from the North Atlantic, on the east side, from the Loffodens to the Canary Islands, on the west from New Jersey to the Gulf of Mexico, also from Barbados and in the Mediterranean.

Station XII. 246 fathoms. Five odd valves.

GLYCYMERIS, da Costa.

Glycymeris glycymeris (Linné).

Arca glycymeris, Linné, 1758. Syst. Nat., édit. x, p. 695.

Glycymeris orbiculata, da Costa, 1778, p. 168, pl. xi, fig. 2.

Pectunculus pilosus, etc., Turton, 1822. Conch. Insul. Brit., pp. 172-4, pl. xii, figs. 2-6 (non Linné).

Generally distributed in the European seas, though rare in the Mediterranean; also found on the Senegal coast, Madeira, and the Canary Islands. Jeffreys records it from the north of Japan.

Station I. 75 fathoms. Two living, one very young. , V. 109 fathoms. One odd valve.

ARCA, Linné.

(1) Arca nodulosa, Müller.

Arca nodulosa, Müller, 1766. Zool. Daniæ Prodr., p. 247.

" scabra, Poli, 1795. Test. utr. Siciliæ, ii, pl. xxv, fig. 22.

Barbatia scabra, Brusina, 1886. Contr. Fauna Dalmat., p. 101.

Arca (Barbatia) scabra, Dautzenberg et H. Fischer, 1897. In Mém. Soc. Zool. France, x, p. 199.

Appears to be a widely distributed species in the Atlantic Ocean, north of the equator, and is recorded from the Hebrides, Faroe Islands, British coasts, Bay of Biscay, Portugal coast, Senegal, Canary Islands, Gulf of Mexico, and the Florida coast; it is also found throughout the Mediterranean Sea.

Station VII. 444 fathoms. Twelve of various ages and all living.

,, XIII. 412 fathoms. Twenty-five of various ages, all living with the exception of a couple of odd valves.

(2) Arca obliqua, Philippi.

Arca obliqua, Philippi, 1844. Enum. Moll. Sicil., vol. ii, p. 43, pl. 15, fig. 2.

Jeffreys, 1863. Brit. Conch., vol. ii, p. 175; vol. v, p. 175, pl. xxx, fig. 4.

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2 C

Distribution, Bergen and Shetland to the Ægean, Azores (Jeffreys). Not recorded as being found during either the *Caudan* or *Travailleur* and *Talisman* expeditions.

Station V. 109 fathoms. One, living.

MYTILACEA.

MYTILIDÆ.

VOLSELLA, Scopoli.

Volsella phaseolina (Philippi).

Modiola phaseolina, Philippi, 1844. Enum. Moll. Sicil., ii, p. 51, pl. xv, fig. 14.

Widely distributed from Iceland and Finmark to the Straits of Gibraltar and throughout the Mediterranean. Not recorded as having been found during the *Travailleur* and *Talisman* expeditions, nor that of the *Caudan*.

Station II. 75 fathoms. Two, living.

PSEUDOLAMELLIBRANCHIA.

PECTENIDÆ.

PECTEN, Müller.

Pecten bruei, Payraudeau.

Pecten bruei, Payraudeau, 1826. Moll. Corse, p. 78, pl. ii, figs. 10-14. , leptogaster. Brusina, 1866. Contr. Fauna Dalmat., p. 45.

This species appears to me to be easily separable from *P. sulcata*, being much more regularly and definitely costulated, and our solitary specimen is quite typical of the species with the exception of its being without colour. Its geographical range seems limited to the Mediterranean and Atlantic coasts of Europe from the Bay of Biscay to the south of Cape Verde. Our specimen was dredged further to the north than any previously recorded.

Station IX. 240 fathoms. One living.

CHLAMYS, Bolten.

Chlamys sulcatus (Müller).

Pecten sulcatus, Müller, 1776. Zool. Daniæ Prodr., p. 248.

Ostrea arata, Gmelin, 1789. Systema Naturæ, édit. xiii, p. 3326.

Pecten aratus, G. O. Sars, 1878. Moll. Reg. Arct. Norveg., p. 17, pl. 11, fig. 3.

Locard's reference, in his Travailleur and Talisman mollusca,

to the synonymy of this species in Forbes and Hanley's "History of British Mollusca," 1855, vol. ii, p. 281, is a mistake, for this refers to *P. striatus*, Müller, and it is not surprising he found the synonymy very complex and doubtful. I have not been able to find any mention of *P. sulcatus* in Forbes and Hanley's work except J. Sowerby's fossil variety of *P. opercularis*.

The only identified specimens of this species I have been able to inspect are in the National Collection, and with the exception that they are richly coloured and somewhat larger and more solid than the specimens under consideration, I can see no difference.

The range of this species is considerable, and if we omit the Mediterranean locality given by Jeffreys as doubtful, it has been recorded in the Atlantic from Norway and the Faroe Islands to the seas west of the coast of the Soudan.

Station XIII. 412 fathoms. One living, young; three dead valves of various ages.

ÆQUIPECTEN, Fischer.

Æquipecten opercularis (Linné).

Ostrea opercularis, Linné, 1758. Syst. Nat., édit. x, p. 698.

Pecten opercularis, Montagu, 1803. Test. Brit., p. 145.

Chlamys (Æquipecten) opercularis, P. Fischer, 1886. Man. Conch., p. 944.

Generally distributed in the European seas and Asiatic and African coasts of the Mediterranean and off the Azores. From 5 fathoms to 600 or more. Locard remarks that the shells dredged by the *Caudan* were much smaller than usual, and the same can be stated of the living shells under consideration, the largest of which measures only 21 mm. by 20 mm. in breadth. The dead shells and fragments show that the species attains a much larger growth in the same locality.

Station I. 75 fathoms. One living (small). Three odd valves of various sizes.

Station II. 75 fathoms. One living, one dead, and an odd valve.

,, IV. 109 fathoms. Four fragments.

,, V. 109 fathoms. Many small living and dead and broken fragments of larger shells.

Station XI. 146 fathoms. One living (small), and two odd valves.

PALLIOLUM, Monterosato.

(1) **Palliolum similis** (Laskey).

Pecten similis, Laskey, 1811. In Mem. Werner Soc., i, p. 387, pl. viii, fig. 8.

Pecten tumidus, Turton, 1822. Conch. Insul. Brit., p. 212, pl. xvii, fig. 3.

Found generally in the seas of Europe and on the African coast of the Mediterranean.

Station V. 109 fathoms. Two living.

(2) Palliolum vitreus (Chemnitz).

Pallium vitreum, Chemnitz, 1782. Conch. Cab., vii, p. 335, pl. lxvii, fig. 637a.

Chlamys vitrea, Dautzenberg, 1889. Contr. Faune Mala. Açores, p. 76.

A very widely distributed species in the North Atlantic, found on both the American and European coasts.

Station VII. $\overline{444}$ fathoms. Seventeen living, of various sizes, and one odd valve.

Station XIII. 411 fathoms. Two living.

LIMIDÆ.

LIMA, Brugière.

(1) Lima excavata (Fabricius).

Ostrea excavata, Fabricius, 1780. In Schroter's Naturg., ii, p. 117. Excavata fabricii, Chemnitz, 1784. Conch. Cab., vii, p. 355, pl. lxviii, fig. 654.

Lima excavata, Loven, 1846. Index. Moll. Scand., p. 32.

Radula (Acesta) excavata, Dautzenberg et H. Fischer, 1897. In Mém. Soc. Zool., France, x, p. 186.

This species must be much more generally distributed than was at one time supposed, for in 1883 the *Talisman* dredged it off the west coast of the Soudan. The *Lightning* and *Porcupine* only found fragments, though Jeffreys remarks in one case (*Lightning*, 1868, north of Hebrides, St. 5) the pieces were quite fresh and united by the cartilage.* *Lima excavata* has usually been considered to be confined to almost Arctic seas.

Station VII. 444 fathoms. One living.

(2) Lima marioni, P. Fischer.

Lima marioni, P. Fischer, 1882. In Journ. Conch., xxx, p. 52.

" lata, Smith, 1885. Voy. Challenger, xiii, p. 257, pl. xxiv, fig. 3.

* Those found by the Porcupine (1870) off St. Vincent were semi-fossil.

Radula lata, Dautzenberg et H. Fischer, 1897. In Mém. Soc. Zool., France, x, p. 186.

Apparently a very widely distributed deep-water species.

Challenger, N.E. of Brazil, Philippine Islands.

Hirondelle and Princess Alice. Off the Azores.

Travailleur. West of Portugal.

Talisman. West coasts of Morocco and the Soudan.

Station VII. 444 fathoms. Eight living, of various sizes.

,, XIII. 412 fathoms. Seven living, of various sizes, one curiously malformed.

(3) Lima subauriculata (Mont.).

Pecten subauriculatus, Montagu, 1808. Test. Brit. Suppl., p. 63, pl. xxix, fig. 2.

Lima subauriculata, Turton, 1822. Conch. Insul. Brit., p. 218.

, sulcata, Brown, 1827. Ill. Conch. Gt. Britain, pl. xxxi, fig. 4-5.

nivea, Philippi, 1836. Enum. Moll. Sicily, vol. i, p. 78.

Found on both sides of the Atlantic, in the Mediterranean, and off the Canary Isles.

Station V. 109 fathoms. One valve.

EULAMELLIBRANCHIA.

SUBMYTILACEA.

ASTARTIDÆ.

ASTARTE, J. Sowerby.

Astarte sulcata (da Costa).

Pectunculus sulcatus, da Costa, 1778. Brit. Conch., p. 192.

Venus danmonana, Montagu, 1808. Test. Brit. Suppl., p. 45, pl. xxix, fig. 4.

Astarte sulcata, Fleming, 1828. Hist. of Brit. Anim., p. 439.

" Forbes and Hanley, 1853, Hist. Brit. Moll., i, p. 452, pl. xxx, fig. 6 (as *A. danmoniensis*).

A difficult species, very variable, and provided with many synonyms. Generally distributed in European seas, Siberia, East Greenland, North-east America, Gulf of Mexico, Canaries.

Station	ı I.	75	fathoms.	One odd valve.	
"	II.	75	fathoms.	One living.	
,,	IX.	240	fathoms.	One living, and severa	l odd valves.
"	XII.	246	fathoms,	One living, and severa	l odd valves (small).

TELLINACEA.

SCROBICULARIDÆ.

SYNDOSMYA, Récluz.

Syndosmya prismatica (Mont.).

Ligula prismatica, Montagu, 1808. Test. Brit. Suppl., p. 23, pl. xxvi, fig. 3.

Scrobicularia prismatica, Jeffreys, 1863-69. Brit. Conch., vol. ii, p. 435; vol. v, p. 189, pl. xlv, fig. 1.

Generally distributed throughout the seas of Europe.

Station II. 75 fathoms. Three odd valves.

, XI. 146 fathoms. Three odd valves.

MACTRIDÆ.

SPISULA, Gray.

Spisula elliptica (Brown).

Mactra elliptica, Brown, 1827. Ill. Conch. Gt. Brit., pl. xv, fig. 6.

" gracilis, Locard, 1890. In Bull. Soc. Maloc. France, vii, p. 4, pl. i, fig. 1.

With Mr. E. A. Smith's help I carefully compared these specimens with those dredged by the *Porcupine* expedition, but still felt very doubtful as to their true specific position. I submitted them to Mons. Dautzenberg, whose works on the North Atlantic mollusca are well known, and he confirms my opinion, and says, "it is the true *M. elliptica* of Brown, but not of the greater number of authors, and the *M. gracilis* of Locard is a synonym."

This species is probably widely distributed in the North Atlantic. The Gulf of Cadiz is the locality given by Mons. Locard for the single valve found by the *Talisman* expedition.

Station I. 75 fathoms. Eight odd valves.

,, II. 75 fathoms. One living, and ten odd valves.

" V. 109 fathoms. Two living.

••

XI. 146 fathoms. Three living, and two odd valves.

VENERACEA.

VENERIDÆ.

LUCINOPSIS, Forbes and Hanley.

Lucinopsis undata (Pennant).

Venus undata, Pennant, 1777. British Zoology, ed. 4, vol. iv, p. 95, pl. lv, fig. 51.

Lucinopsis undata, Forbes and Hanley, 1853. Hist. Brit. Moll., vol. i, p. 435, pl. xxviii, figs. 1 and 2, pl. M, figs. 1 and 2.

This species is widely distributed in the seas of Europe, from Norway and the Loffoden Isles to Spain and Portugal, and in the Mediterranean as far east as the Adriatic.

Station V. 109 fathoms. One odd valve.

VENUS, Linné.

(1) Venus (Ventricola) casina (Linné).

Venus casina, Linné, 1758. Syst. Nat., édit. x, p. 685.

This species is known under a dozen or more synonyms, which appear to me to be unnecessary to repeat, as the shell is well known, and they can be found in many standard works.

Generally distributed in European seas, and also off the Canary Islands and Madeira.

Station I. 75 fathoms. One living and one odd valve.

" IV. 109 fathoms. Five living and many odd valves.

V. Two living; young shells.

(2) Venus (Timoclea) ovata (Pennant).

Venus ovata, Pennant, 1767. Brit. Zool., iv, p. 97, pl. lvi, fig. 56. Cytherea radiata, Stossich, 1866. Enum. Moll. Trieste, p. 31. This species has many other synonyms.

Generally distributed in European seas and the Mediterranean coast of Africa.

Station	ı I.	75	fathoms.	Several odd valves.
,,	II.	75	fathoms.	One odd valve.
,,	V.	109	fathoms.	One living and several odd valves.
,,	XI.	146	fathoms.	Four living and several odd valves.
	XII.	246	fathoms.	Two odd valves.

GOULDIA, C. B. Adams.

Gouldia minima (Montagu).

Venus minima, Montagu, 1803. Test. Brit., p. 121, pl. iii, fig. 3.

Cyprina minima, Turton, 1822. Conch. Insul. Brit., p. 137.

Cytherea minima, Brown, 1827. Ill. Conch., Gt. Britain, pl. xix, fig. 3. Circe minima, Forbes and Hanley, 1853. Hist. Brit. Moll., l, p. 446, pl. xxvi, figs. 4, 5, 6, 8.

Circe (Gouldia) minima, P. Fischer, 1887. Man. Conch., p. 1081.

This species has a very extended synonymy. Locard gives twentythree, but in a paper of this sort such an extension seems needless, the shell being common enough and well-known. Its distribution is general in the North Atlantic, from Great Britain to the Azores, and throughout the Mediterranean.

Station V. 109 fathoms. Two odd valves.

CARDIACEA.

CARDIUM, Linné.

(1) Cardium minimum, Philippi.

Cardium minimum, Philippi, 1836. Enum. Moll. Sicil., i, p. 51.

- " " " 1844. Loc. cit., ii, p. 38, pl. xiv, fig. 18.
 - saldiense, Reeve, 1845. Conch. Icon., pl. xxii, fig. 132.
- " loveni, Thompson, 1845. In Ann. Mag. Nat. Hist., xv, p. 317, pl. xix, fig. 7.

suecicum, Lovén, 1846. Index. Moll. Scand., p. 189.

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Very widely distributed in European seas, from the Loffoden Isles and Norway as far east as Siberia in Asia, British, French, Spanish, and Portuguese coasts, and, though rarer, throughout the Mediterranean. In shallow and very deep water.

Station IX. 240 fathoms. One specimen, perfect though dead.

(2) Cardium (Lævicardium) norvegicum (Spengler).

Cardium lævigatum, da Costa, 1778. Brit. Conch., p. 178, pl. xiii, fig. 6.

norvegicum, Spengler, 1790. Skrift. Natur. Selsk., i, p. 42.

, crassum, Gmelin., 1790. Syst. Nat., éd. xiii, p. 3354.

" serratum, de Lamarck, 1819. Anim. sans Vert., vi, i, p. 11.

" vitellinum, Reeve, 1844. Conch. Icon., pl. vii, fig. 77.

Lævicardium norvegicum, H. and A. Adams, 1858. Gen. Rec. Moll., ii, p. 457, pl. cxii, fig. 2.

Cardium (Lævicardium) norvegicum, Issel, 1878. Croc. del "Violante," p. 37.

Generally distributed in the European seas, off Madeira, the Canary Isles, and coast of Senegal.

Station IV. 109 fathoms. One broken valve.

MYACEA.

GARIDÆ.

GARI, Schumacher.

Gari costulata (Turton).

Psammobia costulata, Turton, 1822. Conch. Insul. Brit., p. 87, pl. vi, fig. 8.

> discors, Philippi, 1836. Enum. Moll. Siciliæ, i, p. 23 pl. iii, fig. 8.

Distributed in the Atlantic Ocean, from Norway to Madeira and the Canary Islands, and throughout the Mediterranean.

Station V. 109 fathoms. One specimen, dead, but the valves attached

SAXICAVIDÆ.

SAXICAVA, Fleuriau Bellevue.

Saxicava arctica (Linné).

Mya arctica, Linné, 1766. Systema Naturæ, édit. xii, p. 1113.

The synonymy of this genus or species is very much involved, the number of species still being a very open question. Mr. E. A. Smith's opinion is that *rugosa* is the only species, the other so-called ones being varieties. The shells under consideration are undoubtedly the *rugosa* var. *arctica* figured by Jeffreys in his "British Conchology," v, pl. li, fig. 4. Generally distributed in the North Atlantic, from Greenland and Norway to Cadiz Bay, and in the Mediterranean.

Station I. 75 fathoms. Six living. ., II. 75 fathoms. Two living.

ANATINACEA.

PANDORIDÆ.

PANDORA, Brugière.

Pandora inæquivalvis (Linné).

Tellina inæquivalvis, Linné, 1766. Systema Naturæ, édit. xii, p. 1118. *Pandora rostrata*, Forbes and Hanley, 1853. Hist. Brit. Moll., vol. i, p. 207, pl. viii, figs. 1–4.

One valve only in poor condition, and this circumstance makes an examination of Mons. Locard's remarks, when dealing with *P. pinnoides* (Moll. Test. Trav. et Tal.) of doubtful utility, though he appears to have had only one specimen to base his conclusions on.

Station V. 109 fathoms. One left valve.

LYONSIIDÆ.

LYONSIA, Turton.

Lyonsia norvegica (Chemnitz).

Mya norvegica, Chemnitz, 1788. Conch. Cab., vol. x, p. 345, pl. 170, f. 1647.

Lyonsia striata, Turton, 1822. Conch. Insul. Brit., p. 35, pl. 3, figs. 6, 7.

Hyatella striata, Brown, 1827. Ill. Conch. Gt. Brit., pl. xvi, figs. 26, 27.

Generally distributed throughout the European seas and Mediterranean.

Locard splits this species into two, *norvegica* (Chem.) and *striata* (Mont.). Not having sufficient material at hand, I am content to let the generally accepted name stand for the present.

Station I. 75 fathoms. One living.

ANATINIDÆ.

THRACIA, Leach in Blainville.

Thracia papyracea (Poli).

Tellina papyracea, Poli, 1795. Test. Utr. Sic., vol. i, p. 43, pl. xv, figs. 14, 18.

Thracia phaseolina, Forbes and Hanley, 1853. Hist. Brit. Conch., vol. i, p. 221, pl. xviii, figs. 5, 6.

Ranges from Iceland and Loffoden Isles to throughout the Mediterranean, Madeira, the Canary Isles. Locard does not mention this species at all as having been found by the *Talisman* and *Travailleur* expeditions, or the *Caudan* expedition. Jeffreys reports it from the *Porcupine* expeditions of 1869–70.

Station V. 109 fathoms. One valve and three fragments.

SEPTIBRANCHIA.

CUSPIDARIIDÆ.

CUSPIDARIA, Nardo.

(1) Cuspidaria abbreviata (Forbes).

Neæra abbreviata, Forbes, 1843. In Proc. Zool. Soc., Lond., p. 75. Neæra vitrea, Lovén, 1846. Ind. Moll. Scand., p. 48.

Cuspidaria (Tropidomya) abbreviata, Dautzenberg, 1881. Mem. Soc. Zool., Fr., iv., p. 612.

Atlantic and Mediterranean: from Norway and the West of Ireland to Algiers and the Ægean Sea.

Station XII. 246 fathoms. Two odd valves.

(2) Cuspidaria cuspidata (Olivi).

Tellina cuspidata, Olivi, 1792. Zool. Adriat., p. 101, pl. iv, fig. 3.

Corbula cuspidata, Philippi, 1836. Enum. Moll. Sicil., i, p. 17, pl. i, fig. 19.

Appears to have the same geographical distribution as the last species. Locard doubts if the Mediterranean form is the same as the Atlantic, and proposes Brown's name *brevirostris* for the latter. I have carefully compared, with Mr. E. A. Smith's kind assistance, our specimens with those from the *Porcupine* expedition, in the British Museum.

Station XI. 146 fathoms. One odd valve. ,, XII. 246 fathoms. One odd valve.

(3) Cuspidaria curta (Jeffreys).

Necera curta, Jeffreys, 1876. In Ann. and Mag. Nat. Hist., 4th Ser. xviii, p. 495.

> 1881. Proc. Zool. Soc., Lond., p. 943, pl. Ixxi, fig. 10.

Cuspidaria curta, Dautzenberg, 1883. Contr. Faune Malac., Açores, p. 88.

Known only from the Atlantic, in which it is widely distributed on both sides, from the Behring Straits to the Bermudas and from the Bay of Biscay to Morocco.

Station XII. 246 fathoms. Two odd valves.

SCAPHOPODA.

DENTALIIDÆ.

DENTALIUM, Linné.

(1) Dentalium entalis, Linné.

Dentalium entalis, Linné, 1758. Syst. Nat., éd. x, p. 785.

" " Forbes and Hanley, 1853. Hist. Brit. Moll., vol. ii., p. 449, pl. lvii., fig. 11.

According to Jeffreys this species is much more common in the north than in the south of England. He remarks also that he has not been able to identify this species as Mediterranean or Adriatic, though the name occurs in nearly all the accounts of the shells of those seas. Locard, on the contrary, gives various localities in those seas for this species, on the coasts of Spain, France, Italy, Corsica, Malta, African coast, Gulf of Gabes, and also mentions Vigo, the Azores, and Cape Bonne Esperance as Atlantic localities. It has also been recorded from Iceland, Loffoden Isles, Northern Russia, Maine, and Vancouver Island in North America.

Station	I.	75 fathoms.	Several; living and dead.
,,	ν.	109 fathoms.	Three living.
"	1X.	240 fathoms.	Two, one living, one large fragment much
		corroded.	그렇다?, ^^

" XI. 146 fathoms. Five, all dead, some fragmentary.

(2) Dentalium panormitanum (panormum) (Chenu).

Dentalium panormum, Chenu, 1842-47. Ill. Conch., pl. vi, fig. 13. Dentalium lessoni, Sowerby, 1842-83. Thesaur. Conch., pl. xv, fig. 18.

A rather difficult species, and I can find only one specimen in the British Museum (Nat. Hist.), and this appears to be similar to the solitary specimen under consideration, which is in rather a bad state. Jeffreys (Moll. of *Lightning-Porcupine* Expds., 1868–70, part v, P. Z. S., 1882, p. 657) decides in favour of its validity. It is a rare shell, which has been recorded only from the Bay of Biscay, Portuguese and Spanish coasts, and in the Adriatic. The *Talisman* dredged it off Senegal and in the tropical seas, in 1883, from four stations.

Station IX. 240 fathoms. One dead, corroded shell.

GASTROPODA.

PROSOBRANCHIA.

ASPIDOBRANCHIA.

RHIPIDOGLOSSA.

FISSURELLIDÆ.

PUNCTURELLA, R. T. Lowe.

Puncturella noachina (Linné).

Patella noachina, Linné, 1767. Mantissa plantarum, p. 551.

"fissura, Müller, 1788–1806. Zool. Daniæ, pl. xxiv, figs. 5, 6. Syphostriata noachina, T. Brown, 1827. Ill. Conch. Gt. Brit., etc., pl. xxvi, figs. 14–16.

Cemoria noachina, Gould, 1841. Invert. Mass., p. 156, fig. 18.

Rimula Flemingii. Macgillivray, 1843. Hist. Moll. Anim. Aberdeen, etc., pp. 65 and 178.

This species is very widely distributed in the seas of the sub-polar and temperate regions of the world.

Station XII. 246 fathoms. One dead.

EMARGINULA, Lamarck.

(1) Emarginula fissura (Linné).

Patella fissura, Linné, 1758. Syst. Nat. édit. x, p. 784.

Emarginula reticulata, Forbes and Hanley, 1853. Hist. Brit. Moll., ii, p. 477; figured as *Mülleri*, iv, pl. 63, fig. 1.

Generally distributed in the European seas and off the Canary Isles.

Station I. 75 fathoms. One dead

(2) Emarginula multistriata, Jeffreys.

Emarginula multistriata, Jeffreys, 1882. In Ann. Mag. Nat. Hist., p. 30.

Proc. Zool. Soc., p. 680,

pl. l, fig. 12.

Recorded from the Atlantic, off the coast of Portugal, and from the Mediterranean.

Station VII. 444 fathoms. One dead shell.

TROCHIDÆ.

CALLIOSTOMA, Swainson.

(1) Calliostoma obesulum (P. Fischer).

Zizyphinus obesulus, P. Fischer, 1883, in Collect.

Gibbula obesula, Locard, 1898. Exp. Sci. Trav. et Talis., ii, p. 47, pl. iii, figs. 1-4.

This is another species that seems to have been previously recorded only from the coast of Morocco and the Soudan coast of the North Atlantic. Locard's figures above-mentioned are not particularly good, and I am indebted to Mons. Dautzenberg for its correct identification, the species not being represented in our National Collection.

Station VII. 444 fathoms. Twenty-four living, one fragment. ,, XIII. 412 fathoms. One living, two dead.

(2) Calliostoma cleopatra (P. Fischer).

Trochus cleopatra, P. Fischer, 1883, in Collect.

Zizyphinus cleopatra, Locard, 1898. Exp. Sci. Trav. et du Tal., vol. ii, pl. ii, figs. 20-23.

Only recorded by Locard from one station (*Talisman*, 1883, Station 83) off the Sahara coast, and the fact of this scarce shell turning up. living, in the north of the Bay of Biscay is very interesting.

Station VII. 444 fathoms. One living.

(3) Calliostoma miliaris (Brocchi).

Trochus miliaris, Brocchi, 1814. Conch. Foss. Subappen., p. 253, pl. iv, fig. 1.

Trochus millegranus, Philippi, 1836. Enum. Moll. Sicil., I, p. 183, pl. x, fig. 25.

Zizyphinus miliaris, Locard, 1886. Prodro. Conch., Franc., p. 309.

Calliostoma miliaris, Pilsbry, 1889. Man. Conch., part xliva, p. 387, pl. xviii, figs. 10, 11.

Generally distributed in the North Atlantic and throughout the Mediterranean in shallow and deep water.

Station I. 75 fathoms. One young, dead.

(4) Calliostoma granulatum (Born.).

Trochus granulatus, Born, 1778. Ind. Rerum Nat. Mus. Vindobon, p. 343.

Trochus papillosus, da Costa, 1778. Brit. Conch., p. 38, pl. iii, figs. 5 and 6.

Trochus fragilis, Pultney, 1799. Cat. Dorset Shells, p. 48, pl. xvi, fig. 6. Trochus tenuis, Montagu, 1803. Test. Brit., i, p. 275, pl. x, fig. 3.

Fairly distributed in European seas, Britain, France, Spain, and Portugal. In the Mediterranean and Adriatic, Morocco, Madeira, Canaries, etc.

Station V. 109 fathoms. Five living, including one var. lactea (Jeff.) and one young shell.

Station VI. 87 fathoms. One living.

PECTINIBRANCHIA.

TÆNIOGLOSSA PLATYPODA.

CAPULIDÆ.

CAPULUS, de Montfort.

Capulus hungaricus (Linné).

Patella ungarica, Linné, 1758. Syst. Nat. édit. x, p. 782.

Pileopsis hungaricus, Forbes and Hanley, 1853. Hist. Brit. Moll., vol. ii, p. 459, pl. lx, figs. 1 and 2 (as *C. hungaricus*).

A widely distributed species, ranging from Iceland, Norway, and the Eastern coasts of Europe to the Azores, and throughout the Mediterranean to the south-east coasts of the United States. It was not found by either the *Caudan* or *Travailleur* and *Talisman* expeditions.

Station IV. 109 fathoms. One living on Venus verrucosa.

NATICIDÆ.

NATICA, Scopoli.

(1) Natica (Lunatia) sordida (Philippi).

Natica sordida, Philippi, 1844. Enum. Moll. Siciliæ, ii, p. 139, pl. xxiv, fig. 15.

British seas, and very generally distributed in the European seas, including the Mediterranean, and off Madeira.

The synonymy of this species is not very clear. Locard considers it to be the *N. fusca* of Blainville, 1821. (Dict. des Sciences Nat.)

The specimens under consideration are all young, but compare very well with those in the British Museum (Nat. Hist.) from the *Lightning* and *Porcupine* expeditions.

Station IX. 240 fathoms. Three dead.

,, XII. 246 fathoms. Three dead.

(2) Natica (Lunatia) catena (da Costa).

Cochlea catena, da Costa, 1778. Brit. Conch., p. 83, pl. v, fig. 7. Natica monilifera, Lamarck, 1822. Anim. s. Vert., vi, ii, p. 199. Natica catenata, Locard, 1886. Prodr., p. 274. 1892. Conch. Franc.,

p. 182, fig. 157.

Generally distributed in the European seas.

Jeffreys does not appear to have recorded this species in his mollusca of the *Lightning* and *Porcupine* expeditions, nor is it mentioned by Locard as having been found during the *Travailleur* and *Talisman* expeditions, but he records it as commonly found in the Gulf of Gascogny cruise of the *Caudan*.

Station II. 75 fathoms. One dead.

(3) Natica (Lunatia) alderi (Forbes).

Natica alderi, Forbes, 1838. Malac. Monensis, p. 31, pl. ii, figs. 6, 7. "nitida, Forbes and Hanley, 1853. Hist. Brit. Moll., iii, p. 330, pl. C (100), figs. 2-4.

Jeffreys (P.Z.S., Jan. 20th, 1885, p. 30) considered this species to be identical with Linné's *N. glaucina* (Fauna Suecica, ed. 2, p. 533, No. 2197), while Locard ("Travailleur et Talisman") decides that he described under this name several European Naticas. The latter also removes *Natica poliana*, Delle Chiaje, from the synonymy of this species, thus making it more an oceanic species by excluding it from the Mediterranean list, and giving *Natica poliana* specific rank.

British seas and the oceanic coasts of Europe and the Sahara coast of Africa.

Station V. 109 fathoms. Eight dead, of various sizes.

Station XI. 146 fathoms. One dead, small, broken.

(4) Natica (Lunatia) montagui (Forbes).

Natica montagui, Forbes, 1838, Malac. Monensis, p. 172, pl. ii, figs. 3, 4.

Lunatia montagui, G. O. Sars, 1878. Moll. Reg. Arch. Norvegiæ, p. 157.

Natica montacuti, Jeffreys, 1885. In P.Z.S., Lond., p. 31. British and European seas, including the Mediterranean.

Station V. 109 fathoms. | Three dead.

XI. 146 fathoms. Three, one living, two dead.

,, XII. 246 fathoms. One dead, which appears to be *var. conica* of Jeffreys.

(5) Natica (Lunatia) operculata (Jeffreys).

Natica operculata, Jeffreys, 1885. Proc. Zool. Soc., p. 34, pl. iv, fig. 7.

Distributed in the North Atlantic. Jeffreys' localities are from the neighbourhood of Cape St. Vincent to south-west of Cadiz, and in the Mediterranean, Adventure Bank. He also gives North Japan (St. John) as a habitat.

I am indebted to Mons. Dautzenberg for the identification of the one small specimen.

Station I. 75 fathoms. One, small, dead.

LAMELLARIIDÆ.

LAMELLARIA, Montagu.

Lamellaria perspicua (Linné).

Helix perspicua, Linné, 1758. Syst. Nat., édit. x, p. 775.

According to Jeffreys, the distribution of this species is Norway, Faröe Islands, Great Britain, Ireland, Brest (Daniel), Atlantic coasts of France and Spain (Hildago), throughout the Mediterranean and Adriatic, Canaries (McAndrew), Labrador, Canada, and the United States.

This species is not recorded by either the *Caudan* or *Travailleur* and *Talisman* expeditions.

Mons. Dautzenberg records it from San Miguel and Pico in the Azores, remarking that all the examples were young, the shell hyaline white, marked with three opaque bands.

Station VI. 87 fathoms. Five living, two male, three female.

TRITONIIDÆ.

RANELLA, Lamarck.

Ranella gigantea (Lamarck).

Murex reticularis, Born, 1780. Test. Mus. Cæsar, Vindobon, pl. xi, fig. 51, non Linné.

Argobuccinum (Gyrina) gigantea, Dautzenberg, 1892. In Mem. Soc. Zool., France, iv, p. 605.

Locard considers that the shell found in the Atlantic differs from that found in the Mediterranean, and calls them *var. atlantica* and *var. mediterranea*, the sculpture of the latter being stronger than in the former. Not having had the opportunity of examining a large series from both localities, I do not care to offer an opinion, as Locard also remarks that the Atlantic variety was not always confined to this habitat, as he has found it in the Post-pliocene of Italy.

Station IV. 109 fathoms. Four living, two male, two female, the latter being the largest. This appears to be the most northernly record for this species.

SCALIDÆ.

SCALA, Humphrey.

(1) Scala clathrus (Linné).

Turbo clathrus, Linné. Syst. Nat., 1758, éd. x, p. 765 (partly). Scalaria communis, Lamarck. An. s. Vert. 1822, vi. (2), p. 228.

> " Forbes and Hanley, 1853, Hist. Brit. Moll. pl. lxx, figs. 9 and 10.

Dredged by the *Porcupine*, 1869, in Donegal Bay, 1870, off Cape Sagres, and in the Mediterranean at Algeciras Bay and on the Adventure Bank.

Station I. 75 fathoms. One dead shell.

(2) Scala trevelyana (Leach in Johnston).

Scalaria trevelyana (Leach MS.), 1853. In Forbes and Hanley, Hist. Brit. Moll., iii, p. 213, pl. lxx, figs. 7 and 8; pl. FF, figs. 1–3.

Distribution, North Atlantic, from Norway to the Sahara coast.

Station XI. 146 fathoms. One dead shell.

(3) Scala richardi (Dautzenberg et de Boury).

Scalaria richardi, Dautzenberg and de Boury, 1897. Mem. Soc. Zool. de France, x, p. 68, pl. ii, fig. 5.

Dredged by the *Hirondelle*, 1888, off the Azores; and *Princess Alice*, 1895, also off the Azores.

None but dead shells seem to have been found, and the species was described from imperfect specimens.

Station IX. 240 fathoms. One dead shell with the mouth imperfect.

TURRITELLIDÆ.

TURRITELLA, Lamarck.

Turritella communis, Risso.

Turritella communis, Risso, 1826. Hist. Nat. Europe Mérid., iv, p. 106, fig. 37.

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2 D

This well-known species has an extensive habitat in the seas of Europe, living as far north as the Faroe Islands. It is found throughout the Mediterranean and off the coast of Morocco.

Locard splits this species into two on the strength of distinctions pointed out by de Monterosato, but I do not know how far this distinction has been adopted, nor have I been able to inspect a series of each. Our solitary specimen is both young and damaged, but can be without doubt referred to the *var. gracilis* of Jeffreys.

Station XI. 146 fathoms. One dead, young and broken.

TRICHOTROPIDÆ.

TORELLIA, Jeffreys.

Torellia vestita, Jeffreys.

Recluzia aperta, Jeffreys, 1859. Ann. Mag. Nat. Hist., 3rd ser., iii, p. 114, pl. iii, fig. 22 a-c.

Torellia vestita, Jeffreys, 1867. Brit. Conch., iv, p. 244, pl. iv, fig. 1; v, pl. lxxix, fig. 5.

Little seems to be known as to the distribution of this species. Jeffreys mentions Loffoden Isles southwards on the authority of Lovén and others, Shetland (Barlee) and New England coasts of the United States (Verrill). It is not recorded from either the *Travailleur*, *Talisman*, or *Caudan* expeditions, which makes this an interesting Bay of Biscay record.

Station XIII. 412 fathoms. One living.

STENOGLOSSA.

RHACHIGLOSSA.

BUCCINIDÆ.

BUCCINUM, Linné.

(1) Buccinum undatum (Linné).

Buccinum undatum, Forbes and Hanley, 1853. Hist. Brit. Moll., iii, p. 401, pl. cix, figs. 3 and 5.

This species seems to be confined to the North Atlantic, its habitat extending from the North Cape (Sars, Friele), and Iceland (Steenstrup), to the north, Massachusetts (Gould), Cape Hatteras (Dall.), New York State (De Kay, Smith, Prime, Tryon, Man. Conch.), to the west, and Rochelle (D'Orbigny père and Aucapitaine) to the south.

It is not recorded by Locard as having been found in either the *Travailleur*, *Talisman*, or *Caudan* expeditions.

Station I. 75 fathoms. One living.

, II. 75 fathoms. One dead and one fragment.

, V. 109 fathoms. One living and two young shells dead.

,, VI. 87 fathoms. One living and one dead.

Remarks.—The shells are much thinner than those usually found in the English Channel and southern part of the North Sea, and might be considered as approaching the variety *striata*, Pennant.

(2) Buccinum, Sp.

Two young living specimens of some species; without further material it is not much use attempting to give them a specific position. Mons. Dautzenberg suggests they may be the young of *B. schneideri*, Verkrüzen.

Station V. 109 fathoms. Two living, young.

LIOMESUS, Stimpson.

Liomesus dalei (J. Sowerby).

Buccinum dalei, J. Sowerby, 1825. Min. Conch., p. 139, pl. 486, figs. 1, 2.

> " Forbes and Hanley, 1853. Hist. Brit. Moll., iii, p. 408, pl. cix, figs. 1, 2.

Buccinopsis " Jeffreys, 1867. Brit. Conch., iv, p. 298, pl. v, fig. 3; v, pl. lxxxiii.

Jeffreys gives several localities on the authority of others; for instance, west coast of Ireland, 100 fathoms; soft ground beyond the Doggerbank, Aberdeenshire; places between the Loffenden Isles, the North Cape, 40–50 fathoms, while he dredged it himself from a bottom of fine sand and mud in 72–87 fathoms off the northern and eastern coasts of Shetland.

Not recorded by Locard in either the *Travailleur*, *Talisman*, or *Caudan* expeditions.

Station V. 109 fathoms. One living and two dead, the latter young shells.

Station IX. 240 fathoms. Three young shells dead.

,, XI. 146 fathoms. Two young shells, one living, one dead.

" XII. 246 fathoms. One young shell dead.

TRITONOFUSUS, Beck.

(1) Tritonofusus gracilis (da Costa).

Buccinum gracile, da Costa, 1778. Brit. Conch., p. 124, pl. vi, fig. 5. Fusus gracilis, Alder, 1848. Cat. Moll. North. and Dur., p. 63.

Neptunea gracilis, P. Fischer, 1878. In Act. Soc. Lin., Bord., xxxii, p. 190.

Distribution, Norway, Sweden, the seas of Northern Europe pretty generally. Locard is of the opinion that its reputed discovery in the Mediterranean requires confirmation.

I am, to some extent, doubtful as to the identification of all the specimens I have referred as belonging to this species, their condition not being good in most cases.

Station I. 75 fathoms. One of average size but long dead, one smaller, dead and broken.

Station II. 75 fathoms. Two, both dead, one with remnants of epidermis.

Station V. 109 fathoms. Two, both dead, and young shells.

,, IX. 240 fathoms. One of average size but long dead, and one fragment.

(2) Tritonofusus (Siphonorbis) propinquus (Alder).

Fusus (Siphonorbis) propinguus, Alder, 1848. Cat. Moll. North. and

Dur., p. 63.

Forbes and Hanley, 1853. Hist. Brit. Moll., vol. iii, p. 419, pl. 103, fig. 2.

I cannot find much recorded relating to the distribution of this species, and the *Porcupine* material has not yet been worked out. Jeffreys' localities, given in his *British Conchology*, are all Northern or Irish Sea, and Dautzenberg records it from the coast of Loire-Inférieur. I do not find it mentioned as having been found by the *Caudan*, *Travailleur et Talisman*, or the Prince of Monaco's expeditions.

Station V. 109 fathoms. One young, dead.

, IX. 240 fathoms. One living.

" XI. 146 fathoms. One dead embryonic, one dead but covered with epidermis.

(3) Tritonofusus turritus (Sars).

Tritonium turritum, Sars, 1858. Arct. Moll. Norg. in Vet. Forh. Christ., p. 39.

Fusus propinguus, var. turrita, Jeffreys, 1867. Brit. Conch., iv, p. 339.

Distribution, Norway, etc., and according to Jeffreys, in 78 fathoms off the coast of Shetland. Locard does not record this species from either the *Travailleur* and *Talisman* or *Caudan* expeditions.

Station XIII. 246 fathoms. One living and one dead.

(4) Tritonofusus (Siphonorbis) jeffreysianus (Fischer).

Fusus Jeffreysianus, P. Fischer, 1868. In Journ. Conch., xvi, p. 37, Neptunia Jeffreysiana, P. Fischer, 1878. In Act. Soc. Lin., Bordeaux, xxxii, p. 198.

Sipho Jeffreysiana, Tryon, 1881. Man. Conch., part x, p. 126, pl. 41, fig. 308.

Neptunia Jeffreysiana, Locard, 1896. Campagne du Caudan, facic. i, pl. v., fig. 6.

Locard remarks that this species is very local in its distribution, it being more or less confined to the Bay of Biscay, the commonest form of the French coast.

It was dredged in the Porcupine, Travailleur, 1882, Hirondelle, 1886, Caudan, 1895, expeditions in the Bay of Biscay.

Station V. 109 fathoms. Two living, both males. One dead, young and broken.

, IX. 240 fathoms. One dead.

(5) Tritonofusus fusiformis (Broderip).

Buccinum fusiforme, Broderip, 1829. In Zool. Journ., v, p. 45, pl. iii, fig. 3.

Fusus fenestratus, Turton, 1832. In Ann. Mag. Nat. Hist., vii, p. 351.

Neptunea fenestrata, Kobelt, 1875. In Martini und Chemnitz, Conch. Cab., 2^e édit., p. 97, pl. xxvi, fig. 6.

Sipho fusiformis, G. O. Sars, 1878. Moll. reg. arct. Norvegiæ, p. 377, pl. xiv., fig. 1.

Neptunea (Siphonorbis) fusiformis, Friele, 1879. Norsk. Nordh. Exped., Buccin, p. 18.

Sipho (Siphonorbis) fusiformis, Ed. Smith, 1889. In Ann. Mag. Nat. Hist., 6^e sér., p. 424.

This species seems to be widely distributed in the North Atlantic, from Scandinavia and Finmark to the coasts of Morocco. Mons. Locard points out that in the north it inhabits comparatively shallow water, living at greater and greater depths as its most southern recorded habitat is reached.

Statio	on V.	109 fathoms.	One dead.
"	IX.	240 fathoms.	One young, living.
.,	XII.	246 fathoms.	One dead.

Note.—At first I concluded that specimens from Stations 9 and 12 were referable to *Neptunea peregra*, Locard (*Exped. du Trav. et du Talis., vol. i*, p. 371, pl. xviii, figs. 8 to 11). I submitted them to Mons. Dautzenberg, who decided they were the young of the above species. Is *Neptunea peregra*, Locard, a distinct species ?

FASCIOLARIIDÆ.

BUCCINOFUSIS (Conrad).

Buccinofusus berniciensis (King).

Fusus berniciensis, King, 1846. In Ann. and Mag. Nat. Hist. xviii, p. 246.

Boreofusus berniciensis, G. O. Sars, 1878. Moll. Reg. Arct. Norvegiæ, p. 278.

Troschelia berniciensis, Friele, 1882. Norske Nord. Exped. i, p. 26. Neptunia berniciensis, Locard, 1886. Prodr. Conch. Franc., p. 176.

Dredged at various stations, in deep water, from the North of Spain to Cape Verde, also by Mr. Holt of the Irish Board of Agriculture, in 337 fathoms, 48 miles to the N.W. of Tearaght, Co. Kerry, 1904. It has been recorded from several localities in the British area, Norway, Faröe Islands, North Russia and Davis Straits.

Station IX. 240 fathoms. One dead, in very poor condition.

PSEUDOMUREX, Monterosato.

Pseudomurex richardi (P. Fischer).

Murex richardi, P. Fischer, 1882. In Journ. Conch., xxx, p. 49.

Pseudomurex richardi, Monterosato, 1890. Coq. Prof. Palermo, p. 23. Distribution: In deep water from the Bay of Biscay to the west coast of Morocco and in the Mediterranean.

Station XIII. 412 fathoms. Two living.

MURICIDÆ.

TROPHON, Montfort.

Trophon muricatus (Montagu).

Murex muricatus, Montagu, 1803. Test. Brit., p. 262, pl. ix, fig. 2. Fusus echinatus, Philippi, 1836. Enum. Moll. Sicil., I, p. 206, pl. xi, fig. 10.

Trophon muricatus, Forbes and Hanley, 1853. Hist. Brit. Moll., iii, p. 439, pl. cxi, figs. 3, 4.

Trophon (Trophonopsis) muricatus, Buquoy and Dautzenberg, 1882. Moll. Rous., I, p. 39, pl. vi, fig. 7.

Generally distributed in European seas as far north as Belgium and south to the Mediterranean and Ægean seas. The single specimen found falls in with Locard's remarks as to the small size of the dredged examples, it being only 10.5 millimetres in height.

Station V. 109 fathoms. One (young) dead.

" XI. 146 fathoms. One dead.

COLUMBELLIDÆ.

ANACHIS, H. and A. Adams.

Anachis costulata (Cantraine) auct.

Fusus costulatus, Cantraine, 1835 (?). Diagn. Esp. Nouv. in Bull. Acad., Bruxelles, p. 20.

Columbella haliæti, v. albula, Jeffreys, 1867. Brit. Conch., iv, p. 356, pl. vi, fig. 5.; 1869, v, p. 219, pl. lxxxviii, fig. 3.

Bela grimaldi, Dautzenberg, 1889. Contrib. Faune Malac., Açores, p. 26, pl. ii, figs. 2a, 2b, 2c, 2d.

Bela limatula, Locard, 1896. Résultats Scient. de la Camp. du Caudan, Mollusques, p. 141, pl. v, fig. 3.

I submitted the two specimens to Mons. Dautzenberg, having in vain endeavoured to trace them in the National Collection or figured and described in the above-mentioned works, neither Locard's or Dautzenberg's figures showing the teeth on the outer lip, both having been drawn from young shells.

This species must be widely distributed in the North Atlantic, though the records are few.

Station XII. 146 fathoms. Two dead shells.

OPISTHOBRANCHIA.

TECTIBRANCHIA.

BULLACEA.

SCAPHANDRIDÆ.

SCAPHANDER, de Montfort.

Scaphander lignarius (de Montfort).

Bulla lignaria, Linné, 1758. Sys. Nat., édit. x, p. 727. Scaphander lignarius, de Montfort, 1810. Conch. Syst., ii, p. 334. Bulla lignaria, Gray, 1815. In Ann. Phil., p. 408.

Very widely distributed on the coasts of Europe, from Norway to throughout the Mediterranean, in shallow and deep water.

Station	ν.	109 fathoms.	One large living and one smaller, dead.
,,	XI.	146 fathoms.	One fragmentary, dead.
,,	XII.	246 fathoms.	One small and broken.

CAVOLINIIDÆ.

CLIO, Linné.

Clio pyramidata, Linné.

Clio pyramidata, Linné, 1767. Syst. Nat., 12th Ed., p. 1094.

Hyalæa lanceolata, Lesueur, 1813. Nouv. Bull. Soc. Philom. de Paris, iii, p. 284, pl. v, fig. 3.

This species has many synonyms, whose repetition is hardly necessary.

It is cosmopolitan in its distribution throughout the oceanic world.

Station XII. 246 fathoms. Thirteen specimens, more or less fragmentary, though two or three contained the animal in a much contracted state.

CAVOLINIA, Abildgard.

(1) Cavolinia trispinosa (Lesueur).

Hyalæa trispinosa, Lesueur, 1821. In de Blainville, Dict. Hist. Nat., xii, p. 82.

Hyalæa mucronata, Quoy and Gaymard, 1827. In Ann. Sci. Nat., x, p. 231, pl. viii, B.

Hyalæa depressa, Bivona, 1832. Ejemer. Scient. Sicil., pl. ii, figs. 4, 5.

Cavolinia trispinosa, Locard, 1886: Prodrom. Conch. Franc., p. 22. Cavolinia (Diacria) trispinosa, Dall, 1889. In Bull. United States Nat. Mus., xxxvii, p. 82, pl. lxvi, fig. 115.

I have compared our solitary, nearly perfect specimen with those from the Atlantic in the British Museum (Nat. Hist.).

This species is widely distributed, and is recorded from the east and west coasts of the Atlantic, the Mediterranean, West Indies, Madeira and Canary Isles, and Pacific Ocean.

Station XII. 246 fathoms. One dead and one fragment.

(2) Cavolinia inflexa (Lesueur).

Hyalæa inflexa, Lesueur, 1813. Nouv. Bull. Soc. Philom., vol. iii, p. 285, pl. v, fig. 4, A-D.

Hyalæa labiata, d'Orbigny, 1836. Voyage dans l'Amerique Meridionale, vol. v, p. 104, pl. vi, figs. 21-25.

Cavolinia inflexa, Tesch., 1904. The Thecosomata and Gymnosomata of the Siboga Expedition, p. 43, pl. ii, figs. 54-63.

This is a very variable species and has extensive synonymy: our two shells seem to be referable to *v. labiata* from an examination of those so named in the British Museum (Nat. Hist.).

Station XII. 246 fathoms. Two empty shells.

PLEUROBRANCHACEA.

PLEUROBRANCHIÆ.

PLEUROBRANCHUS, Cuvier.

Pleurobranchus, Sp.

I have submitted this specimen to Sir Charles Eliot, who remarks, "an immature *Pleurobranchus*, very likely *P. plumula*, Montagu; but the dorsal skin has been torn off. The species cannot be identified."

Station XIII. 412 fathoms.

NUDIBRANCHIA.

KLADOHEPATICA.

ÆOLIDIIDÆ.

Genus ?

Sir Charles Eliot remarks, "The body of an Æolid which has lost all but its papillæ and is otherwise in poor preservation. It is not possible to determine even the genus."

Station VII. 444 fathoms.

DOTONIDÆ.

Doro, Oken.

Doto, Sp.

Sir Charles Eliot remarks, "A *Doto*, probably *D. fragilis*, Forbes." It is common on the British coasts, and is very likely generally distributed in the Atlantic.

Station II. 75 fathoms.

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,,	4.	"	"	"	1881.	
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	6.	.,	"	,,	1883.	
	7.				1884.	
••	8.				1884.	
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STATI	on]	No.				I	II	IV	v	VI	AII	IX	XI	XII	XIII
Latitu Longi	de, 1 Jude,	w.	: :	:		$rac{48^{\circ}}{6^{\circ}}rac{25}{28'}$	${48^\circ\over6^\circ}{24'\over28'}$	47° 48′ 7° 25′	$rac{47^\circ}{7^\circ} rac{48'}{46'}$	$rac{47^{\circ}}{7^{\circ}}rac{46'}{12'}$	${47^\circ 36' \over 7^\circ 31'}$	48° 71 8° 137	$rac{48^{\circ}\ 10^{\prime}}{8^{\circ}\ 11^{\prime}}$	43° 7/ 8° 18/	48° 77 8° 13
Fathor	ms					75	75	109	109	87		240	146	246	412
					BRITISH SPECIES										
Amphineura.															
1. Rhopalomenia aglaopheniæ					+	+									+
Pelecypoda.													2.2		
2 Nucula sulcata	18		÷.,	1227	+							+			
3 nitida					+									+	
4 Anomia enhippium				1	+							+	+	+	
5. Limonsis aurita	1	ं			+			+				+		+	
6 minuta		Ċ			+									+	
7. Glycymeris glycymeris					+	+			+						
8. Area nodulosa	· ·	<u> </u>			+						+				+
9 obliqua		<u>.</u>			+				+						
0. Volsella phaseolina	<u></u>	ċ		1	+		+								
1 Pecten bruei		•		1	+										+
2 Chlamys sulcatus					+							+			
3 Æquipecten opercularis	85				+	+	+	+	+				+		
4 Palliolum similis				1	+				+						
5 vitreus		Ċ			+			· · ·			+				+
6 Lima excavata			10								+				
7 marioni											+				+
8 subsurioulate									-+-						
0 Actorto enlosta	•	•		•	I. I				1			+		+	+
20. Sundoamya nyiematica					T I	т	T						+		
20. Synuositya prisinatica ,					T		1						+		

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

ST	ATION	No.				I	II	IV	v	VI	VII	IX	XI	XII	XIII
La Lo	titude, ngitude	N. e, W.		:		48° 25/ 6° 2 8′	48° 24/ 6° 28/	47° 48' 7° 25'	47° 48′ 7° 46′	47° 46′ 7° 12′	47° 36/ 7° 31/	48° 7′ 8° 13/	48° 10′ 8° 11′	48° 7′ 8° 13′	48° 7' 8° 13
Fat	thoms		• •			75	75	109	109	87	. 444	2 40	146	246	412
					BRITISH SPECIES										-
Pelecypoda—continued.															
22. Lucinopsis undata .					+				+						
23. Venus casina					+	+		+	+						
4. ,, ovata					+	+	+		+				+	+	
5. Gouldia minima , ,					+				+						
6. Cardium minimum .					+							+			
7. Lævicardium norvegicum					+			+							
8. Gari costulata					+				+						
9. Saxicava arctica					+	+	+								
0. Pandora inæquivalvis .					+				+						
1. Lyonsia norvegica .					+	+									
2. Thracia papyracea .					+				+						
33. Cuspidaria abbreviata .					+									+	
34. ,, cuspidata .	10				+								+	+	
35. ,, eurta					+									+	
scaphopoda.															
36. Dentalium entalis	1.00	2.20			+	+			+			+	+-		
37. ,, panormitianu	m.				+							+			
łastropoda.															
88. Puncturella noachina	12.	10.57			+								1	+	
39. Emarginula fissura					+	+									

LIST OF SPECIES, AND THE STATIONS AT WHICH THEY OCCUR-continued.

Gastropoda-continued.

40.	Emarginula multistriata				1	1	1	1	1	+	1	1	1		
41.	Calliostoma obesulum .				1					+				+	
42.	,, cleopatra .									+					
43.	, miliaris			+	+										12
44.	granulatum			+											NO NO
45	Capulus hungarieus							T.	-						R
46	Natica (lunatia) sordida						T								TH
47	(initialia) solutia	• • •	•	. +							+		+		н
19	,, (,,) catena					+									IS
40.	,, (,,) arderi .		•	+				+				+			Ð
49.	" (",) montagui		• •	. +				+				+	+		E
50.	,, (,,) operculata	• •			+										0
51.	Lamellaria perspicua .			. +					+						H
52.	Ranella gigantea		2 B				+								H
53.	Scala clathrus			. +	+										H
54.	,, trevelyana		2 2	. +								+			E
55.	,, richardi										+				B
56.	Turritella communis			. +								-			A
57.	Torellia vestita			+											R
58	Buccinum undatum	· ·	• •		-1-	-1-								Ŧ	0
59	sp	• •	• •		-	T		T	т						5
60	Liomesus dalei	• •	• •					+							в
61	Tritonofuma gracilia	· ·	: .					+			+	+	+		S
69	(Sinhananhia)		•	+	+	+		+			+			•••	C.A
02.	,, (Siphonorbis)	propinquus	• •	+ +				+			+	+			Y
03.	3 3 3	turritus		+									+		
64.	33 33	jeffreysianus	s,	+				+			+				R
65.		fusiformis		+				+			+		+		
66.	Buccinofusus berniciensis			. +							+				A
67.	Pseudomurex richardi .													+	DG
68.	Trophon muricatus .			+				+				+			D
69.	Anachis costulata			+											20
70.	Scaphander lignarius .			+				+				1	1		ŗ
71.	Clio pyramidata			+									T		<u> </u>
72.	Cavolinia trispinosa			-									T		9
73.	infleya	• •	• •	1									+		00
74	Pleurobranchus en												+		
/ 2.	i leurobranenus ap	• •												+	
Nn	dibranchia														
TA U															00
75.	Doto sp			+		+									9

[392]

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

By

Alexander Reynell.

OF the three species of Brachiopoda found, two, *Magellania cranium* and *M. septigera*, are found in the British list. The third species, *Mühlfeldtia truncata*, has not, as far as I can discover, previously been recorded from so high a latitude, Turton's Torbay locality being very doubtful.

BRACHIOPODA.

ARTICULATA.

TEREBRATULIDÆ.

MAGELLANIA, Bayle.

(1) Magellania cranium, Müller.

Terebratula cranium, Müller, 1776. Zool. Dan. Prodr., p. 249.

Anomia cranium, Gmelin, 1789. Syst. Nat., édit. xiii, p. 3347.

Waldheimia cranium, Reeve, 1860. Conch. Icon., pl. iii, fig. 6.

Magellania (Macandrevia) cranium, P. Fischer et Œhlert, 1891. Trav. and Talis. Expedit., Brach., p. 73, pl. v, figs. 10a-10s.

Distributed from Greenland and Norway to the south-west of France, according to Jeffreys. A. Adams records it from Northern Asia and Japan.

Mons. Dautzenberg kindly identified this species.

Station V. 109 fathoms. One living.

,,

XII. 246 fathoms. One living.

(2) Magellania septigera, Lovén.

Terebratula septigera, Lovén, 1846. Index Moll. Scand., p. 29.

Waldheimia septigera, Davidson, 1855. Ann. and Mag. Nat. Hist. [II], vol. xvi, 1855.

Terebratula septata, Jeffreys, 1878. Proc. Zool. Soc., London, p. 407, pl. xxiii, fig. 1.

THE BRACHIOPODA COLLECTED BY THE "HUXLEY."

There seems to be some doubt as to whether this species is the same as the *Terebratula septata* of Philippi. Both Jeffreys and Locard are of the opinion that it is, but Fischer and Œhlert do not even mention Philippi's name. I, under the circumstances, think it the wisest plan to follow the latter authorities. This species seems to be distributed in the eastern part of the North Atlantic, from Norway and the Hebrides and Shetland Islands to the West Coast of Africa and the Canary Islands.

Station XI. 146 fathoms. One small, living. .. XIII. 412 fathoms. Eleven living.

MÜHLFELDTIA, Bavle.

Mühlfeldtia truncata (Linné).

Anomia truncata, Linné, 1767. Syst. Nat., édit. xii, p. 1152, No. 229.

Terebratula truncata, Philippi, 1836. Enum. Moll. Sicil., I, p. 95, pl. vi, fig. 12.

Mühlfeldtia truncata, P. Fischer and D. P. Ehlert, 1891. Trav. et Talis. Brachiopoda, p. 80, pl. vii, figs. 11a-11t.

This species is recorded as being very common in the Mediterranean, and has been found in the Bay of Biscay, at many stations off Cape Finisterre, the North of Spain, and has been dredged off the Morocco coast, and the Canary Isles. Turton's record of a specimen from Torbay is generally considered doubtful, as far as being a proof of its living in the British area is concerned.

Station VII. 144 fathoms. Three living.

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Locard, A.—Brachiopods. Résultats Scientifiques de la Campagne du Caudan dans le Golfe de Gascogne, August-September, 1895, 1896.

Many Brachiopods are, of course, included in the older works dealing with the Mollusca as detailed in the bibliography of that group on pages 387 and 388.

Mackerel and Sunshine.

By

E. J. Allen, D.Sc.,

Director of the Marine Biological Association.

With Figs. 1-5 in the Text and Tables I.-VII. at the end.

IN his paper on "Plankton Studies in Relation to the Western Mackerel Fishery," in the last number of this Journal (Vol. VIII., p. 269), G. E. Bullen shows that for the years 1903–1907 there appears to be a correlation between the number of mackerel taken during May and the amount of Copepod plankton, upon which the mackerel feed, taken in the neighbourhood of the mackerel fishing grounds during the same month.

It was clearly worth while, therefore, to consider what conditions favour the production of an abundant supply of Copepods in the fishing area, since it appears to be this supply of food which attracts the mackerel into that area, or at any rate into its surface waters.

The hydrographical investigations carried out at the mouth of the English Channel have rendered it probable that the movement of the water there is comparatively slow. It may therefore be assumed that on the mackerel grounds to the westward of the Cornish coast the water which is present at any particular time has not recently moved into the district from any very remote region, and, treating the matter broadly, has been subjected for some time to the general climatic conditions of the neighbourhood.

The question then suggests itself, can the differences which occur from year to year in the abundance of the Copepods be referred in any way to such climatic conditions? If such a connection exists it will probably be not direct, but indirect, through the action of the climatic conditions on the food of the Copepods. The food of Copepods seems to be largely the vegetable organisms of the plankton, chiefly diatoms and Peridinidæ,*

^{*} This has long been recognised in a general way, but useful direct evidence of it has recently been brought forward by W. J. Dakin. Notes on the Alimentary Canal and Food of the Copepoda. Internat. Revue der gesam. Hydrobiologie u. Hydrographie, I., 1908.

though even if a considerable proportion of it were found to consist of minute animal organisms, these in their turn would feed upon the phytoplankton. It is therefore to the conditions which favour the production of phytoplankton, the fundamental food supply, that we must turn.

The three most obvious matters to be considered in connection with the production of this vegetable plankton are: (1) the composition of the sea-water itself, (2) the temperature, and (3) the amount of light which is available for the production of plant life.

With regard to the composition of the sea-water itself, the only information available refers to its salinity, and up to the present it has not been possible to show any simple relation between changes in salinity and changes in the vegetable or animal production in the area under consideration. The same is true of temperature, though this will be considered in more detail below.

It is the object of the present paper to call attention to what appears to be evidence of the influence of the third factor, the intensity of light. Experiments on the cultivation of marine plankton diatoms in the laboratory, upon which I had been engaged, had drawn my attention to the great importance to be attached to the intensity of the light to which the diatoms were exposed. It therefore occurred to me that a special abundance of Copepods during the month of May in any year might be due to a special amount of sunshine during the earlier months of the year, which would increase the amount of phytoplankton, the Copepod food. An attempt was therefore made to correlate the average quantity of mackerel per boat taken in May with the number of hours of bright sunshine recorded during the first quarter of the year.

The official statistics of mackerel landed are not very satisfactory for such a purpose, since they give only the total quantities of fish and give no information as to the number of vessels from which the fish are obtained. In making use of them, therefore, one must bear in mind that the number of vessels to which the figures relate varies from year to year, although the amount of this variation over a small number of consecutive years will not generally be very large.

In order to get figures of a more definite character, I applied to Messrs. Peacock & Co., of Lowestoft, who have had vessels engaged in the western mackerel fishery for many years. Messrs. Peacock were good enough to furnish me with a series of figures giving the number of hundreds of mackerel landed each month from February to June, at Newlyn and Milford,* by three of their steam drifters, for each of the

* These vessels landed fish only at Newlyn and Milford, so that, by combining the figures for the two ports, we get the total number of fish taken by each boat from the western fishing grounds.

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years 1902–1908, as well as similar figures for three sailing drifters. These figures are given in Tables I. and II.

Messrs. Peacock's figures show that by far the largest quantities of mackerel are landed in the month of May, and that, as in the case of the official statistics (cf. Bullen, *loc. cit.*, p. 277), the figures representing the May landings dominate the curve representing the total landings from the spring fishing. Moreover, it is practically certain that the vessels fished throughout May, whereas for the other months, except, perhaps, April, one has not generally any definite knowledge as to when they began or ended their fishing.

In the diagram below (Fig. 1) the average number of mackerel per



FIG. 1.—The dotted line indicates the average number of hours of bright sunshine recorded for the months of February and March, in each of the years 1902–1908, at the meteorological stations at Plymouth, Falmouth, and Seilly. The continuous line indicates the average number of "hundreds" (120 fish)

The continuous line indicates the average number of "hundreds" (120 fish) of mackerel per boat landed at Newlyn and Milford in the month of May of the same years 1902-1908, by three steam drifters belonging to Messrs. Peacock & Co., of Lowestoft.

boat in "hundreds" (each "hundred" really means 120 fish) landed in May by Messrs. Peacock's three steam drifters is represented by the continuous line, whilst the number of hours bright sunshine during February and March is represented by the dotted line. The sunshine figures were obtained by taking the average of the number of hours

recorded at the three meteorological stations, Plymouth, Falmouth, and Scilly. Although the extreme closeness of the agreement between the two curves may be due to chance, it seems scarcely possible to doubt that they indicate a fundamental correlation between the abundance of mackerel in May and the amount of bright sunshine during the earlier months of the year. The sunshine curve, it should be added, has practically the same shape, whether it is taken for the three stations chosen, or for the whole south-western district of England, which includes inland stations, or for the south-west of England and south Ireland combined. The figures on which the sunshine curve is based will be found in Table III.

In Fig. 2 the continuous line gives the total number of cwts. of mackerel landed on the south and west coasts of England and Wales in May* for each of the years from 1886-1908, as given by the official statistics of the Board of Trade and Board of Agriculture and Fisheries (see Table IV.), whilst the dotted line gives the average number of hours bright sunshine recorded for the south-west of England and south Ireland for the first quarter of the year (Jan.-March), as given in the reports of the Meteorological Office (see Table V.). As already pointed out, the official figures of mackerel landed take no account of the number of boats fishing, and those taken during the first four or five years are known to be very imperfect and should therefore be neglected. It is practically certain that the fishing power has increased during the years for which the records are given, more especially since the introduction of steam drifting about 1902. Comparing the two curves in Fig. 2 generally, and bearing in mind the above limitations, there is, I think, sufficient similarity in the way in which they rise and fall together to justify us in regarding them as in no way contradicting the very definite agreement shown between Messrs. Peacock's figures and the sunshine curve as seen in Fig. 1.

Considering in more detail the years 1902–1908, it will be seen that the most striking difference between the curve given by the official figures and that representing the averages for Messrs. Peacock's boats is the great drop which the official figures show in 1906. A similar though less marked drop in 1906 is also shown by the curve given in Fig. 3, which represents the average number of "hundreds" of mackerel landed by Messrs. Peacock's three sailing drifters. A reference to the figure given by Bullen (*loc. cit.*, p. 279, Fig. 1) also shows a minimum in 1906 for the Copepods taken at the International Stations E.5. and E.6. The high figure for 1906 given by the three steam drifters, although it agrees with the high February and March sunshine for that

* Most of the fish are landed at Newlyn and Milford Haven.





The continuous line indicates the number of hundredweights of mackerel recorded as landed on the South and West Coasts of England and Wales, in the month of May, for each of the years 1886–1908 (Official Statistics).

year, does not therefore agree with the official figures for mackerel, with the catches of the three sailing drifters, nor with the figure taken to represent the Copepods. Any explanation of this discrepancy can only be of a speculative kind, but it is probable that the steam drifters fished much further west of the Scillies than the sailing drifters would go, or than the International Stations are situated. If this is the explanation of the difference shown, it would seem to suggest that in May, 1906, there was some local factor at work on the grounds nearer the shore which did not operate on those which were more distant.





Before leaving the question of sunshine it should be stated that curves representing the bright sunshine in the months of April and May have not shown any kind of correlation with the quantities of mackerel taken.

In order to ascertain whether the temperature of the water during the fishing months in the different years bore any relation to the takes of mackerel, and to meet the suggestion that the effect of the bright sunshine might have been simply to increase that temperature, a series of curves have been drawn showing the average temperature of the surface water in February, March, April, and May for each of the years 1902-1908 in the area between 48° and 50° North Latitude and 4° and 10° West Longitude. The temperatures given in Table VI., and

represented in Fig. 4, are the means of the six temperature averages given for this area on the Monthly Pilot Charts of the North Atlantic, issued by the Meteorological Office in London. For comparison with these, Table VII., and Fig. 5 give the mean temperatures at the surface and at 10 meters (5 fathoms) depth found at Stations E.5. and E.6. on the International Cruises carried out in May in each of the years 1903-8. It will be seen that the two curves follow; the same general course. The outstanding feature of these temperature curves is the occurrence of two very marked maxima in 1903 and 1905. On



FIG. 4.—Curves showing the mean surface temperature of the sea in degrees Centigrade in the area between Lat. 48° and 52° N., and Long. 4° and 10° W., as given on the Monthly Pilot Charts of the Meteorological Office for the months of February, March, April, and May, in the years 1902–1908.

comparing the curves with the curves representing the catches of mackerel, either with that given by Messrs. Peacock's figures, or by the official figures, no relation between the two can be traced. Whilst the 1905 temperature maximum agrees with the maximum total catch of mackerel as shown by the official statistics and the high average catch shown by Messrs. Peacock's figures, the temperature maximum of 1903 is accompanied by low catches of mackerel. The other parts of the curves also give no indication of any close connection between the surface sea temperatures and the mackerel catches. I have to thank Mr. G. E. Bullen for assistance in plotting the early curves which rendered the relation between sunshine and mackerel probable, though I am myself entirely responsible for the accuracy of the curves and figures as given in this paper. Mr. D. J. Matthews has also helped me in various ways.

My thanks are especially due to Messrs. Peacock & Co., of Lowestoft, for the very great trouble they have taken in supplying the figures showing the numbers of mackerel caught by their vessels and for allowing them to be used. Without their ready co-operation this paper could not have been written.





TABLE I.

Table showing the number of "hundreds" of Mackerel landed by three STEAM DRIFTERS at Newlyn and Milford Haven for the years 1902-8, from figures supplied by Messrs. Peacock & Co., of Lowestoft.

			LANDI	ED AT NI	EWLYN.	LANDE	D AT MI	LFORD.	Average Number of 'hundreds' per boat
			Steam drifter A.	Steam drifter B.	Steam drifter C.	Steam drifter A,	Steam drifter B.	Steam drifter C.	landed at Newlyn and Milford.
1902.			Hds.	Hds,	Hds.	Hds.	Hds.	Hds.	Hds.
March	•	•	1002	2221	18	-	-	-	120
May	•	•	1032	2632	1345	-	—	-	201
June			287	2891	1102	<u> </u>	_	_	288
1002			201	2002					200
March			0471	1071	1001				9.61
Anril	•	•	24/2	12/4	409 <u>4</u> 909	-	_	941	162
May		:	328	218	1961		_	603	268
June			1171	571	47		_	_	74
1904.						and a star			
March			3001	3471	2371	_	_	_	295
April		• •	1113	2163	313	-		34	225
May			$293\frac{3}{4}$	293	1971	-	-	-	261
June			$277\frac{1}{2}$	143	_	-	-	-	210
1905.									
Februa	ry		_	191		96	491	121	59
March			$120\frac{1}{2}$	182	374‡	981	871	25	296
April		•	$235\frac{3}{4}$		2911		4294	-	319
May	•	•	585	37	4704	-	3784	—	490
June	•	•	4/2		_	-	-	-	41
1906.									
Februa	ry	•		-		4			
April	•	•	2/2	10	125	4	1114	12‡	195
May	•		269	767	7081		002		581
June			29		21			_	25
1907.									
March			1601	91	481		391		83
April			1051	3201	105	_	41		178
May			457	869	$584\frac{3}{4}$	-	-4		637
June	:		-	-	-	-	-		-
1908.									
March			1095	661*	37+	_			71
April			$363\frac{3}{4}$	266	3261	-		_	319
May			418	$616\frac{3}{4}$	$237\frac{3}{4}$ ¶	-		-	517++
June	•	•		-	—		-	-	-

* Steam drifter B is not the same vessel in 1908 as in previous years.

+ Commenced March 17th.

¶ Finished May 19th.

++ Average for vessels A and B.

TABLE II.

Table showing the number of "hundreds" of Mackerel landed by three SAILING DRIFTERS at Newlyn and Milford Haven for the years 1902-7, from figures supplied by Messrs. Peacock & Co., of Lowestoft.

			LANDE	D AT NE	EWLYN.	LANDE	D AT MI	LFORD.	Average Number of 'hundreds' per boat
			Sailing drifter A.	Sailing drifter B.	Sailing drifter C.	Sailing drifter A.	Sailing drifter B.	Sailing drifter C.	landed at Newlyn and Milford.
1902.			Hds.	Hds.	Hds.	Hds.	Hds.	Hds.	Hds,
March			$1\frac{1}{2}$	9	· -	-	-	_	5
April			571	241	$129\frac{1}{2}$	-	-	-	144
May	•	•	-	1501	215		-		113
1903.	•	•	-	-	113	-	-	-	
March			11	531	_			_	27
April			831	160	771	-	-	-	107
May			931		$123\frac{1}{4}$	-	202	-	139
June	•	•	88	572	1664		. —	-	104
1904.									
March			_	31	$10\frac{3}{4}$	-	594	-	318
April			19	-	471	-	86		51
May	•	•	187	107	1435	-	35		107
1905.	•	•	113	812	1034		-	-	50
March			_	_	1621		240		201
April			423	\	2371	_	265%		182
May			2591	250	457=	-	70		346
June		•	521	-	-	-	-	-	$52\frac{1}{2}$
1906.									-
March			191	_	61	-	121		13
April			2263	_	1571	-	151		178
May			90	-	1111	-	443	-	215
June		•	-	101	-	-	-	-	101
1907.									
March			561	-	_	_	155	_	36
April			2401	64	$148\frac{3}{4}$		801	-	178
May			-	58	260	-	$266\frac{1}{2}$	-	292
June	•	•	-	-	_	-	-		-
	-			A State of the state of the	11				in the second

TABLE III.

Table showing the average number of hours of BRIGHT SUNSHINE recorded at the three Meteorological Stations, Plymouth, Falmouth, and Scilly, in January, February, and March of the years 1902–8.

1902.		January.	February.	March.	Average for
Plymouth		45.6	92.5	108.4	February and
Falmouth		49.3	87.0	123.3	March together.
Scilly		56.5	92.7	121.5	1671.5
Somy					
Aver	age .	50.4	90.7	117.7	208.4
1903.					
Plymouth		38.6	59.3	110.8-	
Falmouth		55.3	63.3	126.7	
Scilly		71.5	50.2	129.6	
				2010	1. 1. 1. 1. 1.
Aver	age .	51.5	57.6	122.4	180.0
1904.			1 0.001	-	
Plymouth		42.0	52.1	121.5	
Falmouth	• • • •	48.0	57.7	104.7	
Scilly		49.6	55.5	123.3	
Sellig		10 0		120 0	
Aver	age .	46.5	55.1	116.5	171.6
1905.					
Plymonth	-	69.4	81.0	136.6	
Falmouth		65.1	88.0	137.7	
Seilly		61.7	81.9	146.3	
Aver	are	65.4	83.6	140.2	223.8
	uge .	00 ±	000	1 110 1	1 220 0
1906.					
Plymouth		66.9	96.2	142.9	
Falmouth		64.6	110.7	164.8	- 0.5 C
Seilly		77.9	101.7	154.3	
Aver	age .	69.8	102.9	154.0	256.9
1907.					
Plymouth		75	91	186	-
Falmouth	•	71	76	178	
Sailly	•	66	60	186	
Semy	•	. 00		100	
Aver	age	. 72	79	183	262
1908.					
Plymouth		72	67	147	
Falmouth		49	74	153	
Seilly		. 56	61	158	-
Avei	rage	. 59	67	153	220

TABLE IV.

Table showing the number of hundredweights of MACKEREL landed at Ports on the South and West Coasts of England and Wales in the month of MAY for the years 1886–1908, compiled from official statistics of the Board of Trade and Board of Agriculture and Fisheries.

		May.			May.	
Year.	No	of cuts. Mackerel.	Year.	No.	of cuts. Mac	kerel.
1886		63,338	1898		146,769	
1887		71,117	1899		207,962	0 3 1
1888		139,739	1900		138,723	
1889		173,828	1901		169,020	
1890		280,444	1902		169,857	
1891		127,148	1903		152,753	
1892		127,183	1904		199,884	
1893		105,754	1905		378,157	
1894		139,384	1906		108,273	
1895		135,238	1907		222,151	
1896		119,323	1908		108,144	
1897		193,769				

TABLE V.

Table showing the Number of Hours of BRIGHT SUNSHINE recorded over *England S.W. and S. Wales* and *Ireland S.* for the first Quarter of the years 1886–1908. From the records of the Meteorological Office.

Year.	England S.W. and S. Wales. Hours.	Ireland S. Hours.	Mean. Hours.
1886	 174	203	188
1887	 314	309	312
1888	 240	260	250
1889	 227	243	235
1890	 239	247	243
1891	 300	300	300
1892	 305	257	281
1893	 285	244	264
1894	 330	293	312
1895	 292	260	276
1896	 195	190	192
1897	 215	237	226
1898	 260	255	257
1899	 304	286	295
1900	 234	256	245
1901	 240	238	239
1902	 217	215	216
1903	 205	201	203
1904	 207	193	200
1905	 272	268	270
1906	 286	250	268
1907	 315	256	286
1908	 246	229	238

TABLE

Table showing the average surface temperature in degrees Centigrade of the Area between 48° and 52° North Latitude and 4° and 10° West Longitude from February to May, as given on the Monthly Pilot Charts of the Meteorological Office. Each temperature given is the average of six means printed on the charts.

	1902.	1903.	1904.	1905.	1906.	1907.	1908.	
February	 8.7	10.0	9.1	9.6	9.3	8.4	9.4	
March	 9:2	9.9	8.9	9.7	. 9.2	9.0	9.0	
April	 9.7	10.3	9.6	9.9	9.3	9.6	8.9	
May	 10.7	11.6	10.7	11.9	10.4.	10.6	10.8	

TABLE VII.

MAY HYDROGRAPHIC CRUISES.

TEMPERATURES (C°) AT STATIONS E.5 AND E.6.

		Sur	face.		10 meters.				
10.10	1.	E.5.	E.6.	Mean.	E.5.	E.6.	Mean.		
1903		11.08	10.20	10.64	11.02	10.19	10.60.		
1904		9.63	9.30	9.46	9.60	9.15	9.37		
1905		11.39	10.83	11.11	11.25	10.71	10.98		
1906		10.16	9.68	9.92	10.03	9.62	9.82		
1907		 10.69	9.79*	10.24	10.63	9.33*	9.98		
1908		10.69	9.91	10.30	10.69	9.85	10.27		

Station E.5 is situated in Lat. 49° 6' N., Long. 6° 32' W.; i.e. about 50 miles to the southward of the Scilly Isles.

Station E.6 is situated in Lat. 50° 24' N., Long. 6° 5' W.; i.e. about 30 miles to the northward of the Scilly Isles.

The Temperature records are taken from the Bulletin des résultats acquis pendant les

* Sta. E. 1907. V. 14. 50° 35′ N. Lat., 6° 14′ W. Long., 89 m., worked for E.6. (about 11 miles further north). Probable surface temp. at E.6. would be 0.4° lower.

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With Preface by

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

PROFESSOR OF COMPARATIVE ANATOMY IN THE UNIVERSITY OF OXFORD.

OBJECTS

OF THE

Marine Biological Elssociation

OF THE UNITED KINGDOM.

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

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

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

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

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