New Series, I.

This report last in book

DOVE MARINE LABORATORY,

CULLERCOATS, NORTHUMBERLAND.

REPORT

For the year ending June 30th, 1912.

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and
Director of the Dove Marine Laboratory.

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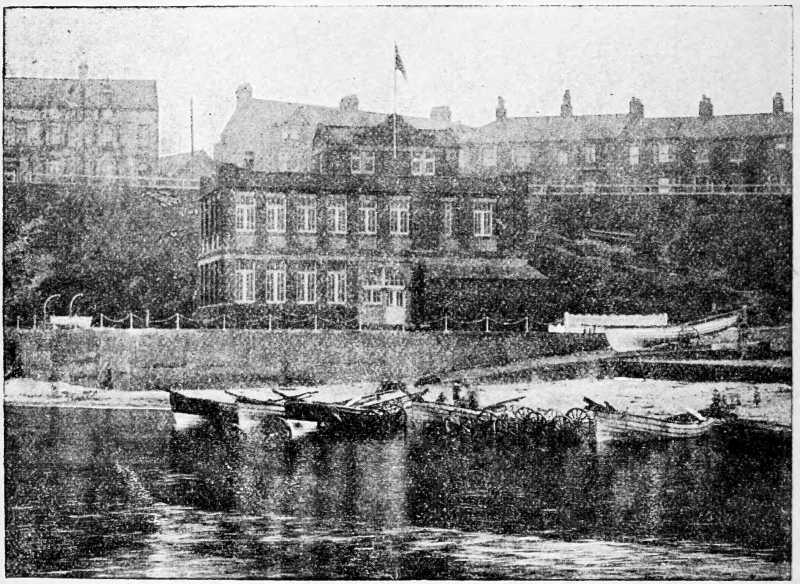


DOVE MARINE LABORATORY, CULLERCOATS.

SUMMARY AND GENERAL REPORT.

The papers in this Report deal with Fishery questions and with the more purely scientific work of the Laboratory.

Samples of trawled and drift net herring were examined in the past year, but the report with regard to them is withheld until we get an opportunity of examining more material this season.

Mr. Storrow has added to the account he gave of the Prawn (Norway Lobster) Fishery of North Shields, tables dealing with the months which, owing to the coal strike, were not included in the report of last year. These will be found to satisfactorily complete the description of this form in so far as it is possible to do so from an examination of market material.

Further experiments have been made on the migrations of the crab. As in previous years it was found that a proportion of the females—those which are to spawn in the next season—migrate northwards. The females which remain in the district of liberation are evidently females which will spawn in the following year, the migration being similarly postponed for a year. It is probable that both the ripening of the gonads and the migration are in the case of the older females postponed for even two years.

The experiments in lobster culture were mainly directed to finding out the best means of obtaining a large quantity of healthy larvæ, and the results pointed plainly to the value of large tanks or ponds.

The mussel culture experiments at Holy Island have also been continued. A quantity of mussels was successfully transplanted from Blyth and from the region of the Mill Burn at Holy Island

to the scaup, and bouchots have been erected at various places to see especially if they would encourage the lodgment of spat. In the paper dealing with the experiments it has been suggested that the fishermen at Holy Island could assist materially in developing the mussel beds on the scaup by similarly removing mussels from the various regions where they occur to the scaup. The beds on the scaup would be extended, and the waters in the neighbourhood enriched with spat.

Opportunities have been taken at various places on the coast, by lecture, conference, and conversation, to direct the attention of the inshore fishermen to questions affecting them. This year this has been especially important, from the fact that two Government Committees have been collecting evidence with reference to inshore fisheries. One of the Committees has under consideration the territorial waters and proposals for the extension beyond three miles. The other is collecting evidence relating to inshore fisheries in general.

The trawl fishermen of North Shields often visit the Laboratory also, and evince their interest in the institution by bringing specimens.

The *Evadne* was employed in obtaining plankton and bottom samples at selected stations. A great deal of the material has already been worked out, and the results are given under the title "Biological Investigations."

Miss Roper has busied herself during the year she has held a Research Studentship, examining our collections of Polyzoa and material gathered by herself in the Cullercoats region. As she will not be able to continue her work—at all events at present—I have thought it well to publish her complete list of the Polyzoa of the district so far as they are known. Miss Roper has added nine species and three varieties to the lists given by Alder.

Miss Robson has similarly been working at Hydrozoa, and as a Research Student will continue her work on the Coelenterates. Miss Robson gives an account of 13 species new to the district, and also some interesting observations on the habits of the ephyra of Cyanea.

Mr. Kramp, of Copenhagen, spent a few weeks here in June working at the same group, and the lists which he sent confirm three of the species new to the district recorded by Miss Robson.

An account is given of the early development of the Teleostei, with special reference to the origin of the entoderm and the fate of the peripheral protoplasm. A short paper and a plate also indicate the general development of the whiting.

Mr. Wood has written a description of the compressed air apparatus which was installed early this year, and has already proved most useful. For this we have to thank again an anonymous donor. The apparatus was designed and constructed by Messrs. Sleigh & Wood, Newcastle-on-Tyne.

This year also a valuable microscope was presented to the Laboratory by Messrs. L. Evans and T. Davidson, in memory of J. B. Evans, the brother of the former donor, who was interested in Natural History.

The coble in which Grace Darling and her father rescued, on September 7th, 1838, the survivors of the "Forfarshire," has now found a permanent home in the Laboratory. Lady John Joicey-Cecil presented the boat to the Royal National Life-Boat Institution with the request that it should remain in the County of Northumberland. An arrangement has been made that a proportion of the fees received from visitors to the Aquarium will be handed over to the funds of the Life-Boat Institution.

It is now my melancholy duty to record here the loss by death of two leading members of the fishing community of Northumberland. The trawl fisheries of North Shields lost

a whole-hearted representative on the Northumberland Sea Fisheries Committee and at many enquiries where the interests of trawl fisheries were involved by the death of William Purdy, on December 31st, 1912. He took a great interest in the work of the Laboratory, and we have reason to be grateful for the constant and ready facilities he gave for our work at North Shields and at sea.

Inshore fisheries lost also, on 12th June, 1913, its Grand Old Man by the death of John Douglas, Beadnell. All who have followed the accounts which have been given for a large number of years of the migration experiments with reference to the crab and the lobster will know that it was through Mr. Douglas that these experiments have been so successful. It will be seen from the paper which is given in this Report on the Migrations of the Crab that one of the last duties he performed was to mark and liberate 500 crabs, and the results show that the work was carried out with characteristic care and selection. He was also a member of the Northumberland Sea Fisheries Committee, and, as his brother fishermen are well aware, he was keenly interested in all questions affecting inshore fisheries. He had views regarding the natural conservation of the local fishing grounds, which he did his best by example and precept to inculcate. He was a diligent observer, and his kindly nature endeared him to all with whom he came in contact.

Reference was made in the last Report to the fate of our application to the Development Commissioners for a grant in aid of our Fishery Investigations. The report of the Board has not yet been presented to the Commissioners, and in the meantime a small interim grant has been given to the Laboratory.

ALEXANDER MEEK.

30TH JUNE, 1913.

THE PRAWN (NORWAY LOBSTER, *Nephrops norvegicus*), AND THE PRAWN FISHING OF NORTH SHIELDS.

By B. STORROW.

Owing to the coal strike in March, 1912, which rendered fishing very irregular at North Shields, it was impossible, for that month, to make investigations relating to the Norway Lobster. This was unfortunate. because March proved to be a month for which particulars relating to the casting of male prawns would have been of interest.

In February, March and April of this year some 1,800 Norway Lobsters have been examined, and particulars with regard to the number of males, non-berried females and berried females occurring in the samples are to be found in Table I., whilst in Table II. these are summarised. The mean sizes for males and females in the samples examined were 14.5 and 11.5 cm. respectively, a difference of about one centimetre from the mean sizes obtained last year, when between seven and eight thousand were examined during eleven months.

The number and percentages of males and females for the three months are as follows :—

	Number Examined.	Number of Males.	Number of Females.	Percentage of Males.	Percentage of Females.
February ...	519	264	255	50·9	49·1
March.....	772	435	337	56·3	43 7
April	558	303	255	54·3	45·7

No berried females were obtained. These figures differ so little from those of last year that no comment is necessary.

From the facts available last year it was stated that the chief month for the casting of males was April, but it was also noted that fishermen and buyers of prawns obtained numbers of large prawns in a soft condition during the month of March. In Tables III. and

IV. particulars are given relating to male and female prawns found in a soft condition or recovering from casting. It will be noted that as many as 21·6 per cent. of the males examined in March were recovering from casting. For February and April the percentages were 4·5 and 10·5 respectively, differing little from those for the same months of last year when the percentages were 3·6 and 9·8.

March is then the chief month for the casting of male prawns, though many cast in April.

Females recovering from casting were few in numbers, the percentages being February 0·4, March 0·9, April 1·9. Last year they were found to be 0·6 and 2 for February and April respectively.

It was stated in last year's report that the female prawns cast after the hatching season, and also that attempts were being made to hatch out larvæ in the tanks of the Laboratory. On the 3rd of November, 1911, twenty-nine berried females, three of which afterwards died, were placed in a large tank; they were examined periodically, and the changes in the eggs and the fact that the eggs were few in number in April, 1912, have been previously recorded. During May and June the water of the tank was frequently netted but no larvæ were obtained. On the 23rd of July the tank was emptied, and it was then found that the prawns had, with the exception of one individual, all cast their shells.

Of the 565 prawns which were marked and liberated in April, 1912, only two have been recaptured. On the 7th of May, 1912, the skipper of the "Reaper" reported catching one to the east of Blyth, but the cook accidentally threw it overboard. The other was a male of 16 cm., and was caught 10 miles E.S.E. of the Tyne in 40 fathoms on the 20th of June, 1912. The creature had cast its shell, and although the wound made by the punch had healed, with the exception of a small portion, yet the area punched out could be distinctly traced. This prawn was liberated 12 to 14 miles east of Newbiggin. The amount of migration was small, and had been towards the southern portion of the prawn ground.

It is evident that the method of marking by punching out a piece of the telson is not satisfactory, the mark failing to attract the attention of the fishermen and the buyers. If further experiments of the same nature are to be undertaken on a future occasion, some sort of label will have to be employed similar to that used for marking crabs and lobsters.

TABLE I.

19th February, 1913. **Measured at Fish Quay.**

CENTIMETRES.

	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Total.
Males ...	1	4	5	7	38	20	18	48	27	34	18	12	21	7	3	1	264
Non-berried Females...	...	5	3	8	40	42	63	49	35	3	7	...	...	...	...	...	255
Berried Females...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
																	519

5th March, 1913. **Measured at Fish Quay.**

Males ...	...	...	2	2	18	27	27	11	29	37	38	35	9	12	2	...	249
Non-berried Females...	...	3	...	7	19	12	52	33	47	7	...	1	...	...	...	...	181
Berried Females...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
																	430

13th March, 1913. **Measured at Fish Quay.**

Males ...	1	...	1	5	7	4	15	20	15	40	26	28	16	6	2	...	186
Non-berried Females...	...	1	5	4	15	39	25	46	16	5	...	...	...	...	...	...	156
Berried Females...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
																	342

18th April, 1913. **Measured at Fish Quay.**

Males ...	...	...	3	4	12	6	8	40	38	47	39	29	34	21	16	6	303
Non-berried Females...	...	...	9	18	24	42	63	54	25	18	2	...	...	...	...	...	255
Berried Females..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
																	558

TABLE II.

TOTALS.

CENTIMETRES.

	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Total.
Males ...	2	4	11	18	75	57	68	119	109	158	121	104	80	46	23	7	1002
Non-berried Females...	...	18	33	55	109	196	175	167	76	10	8	...	...	...	...	...	847
Berried Females...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
																	1849

TABLE III.

MALES IN A SOFT CONDITION OR RECOVERING FROM CASTING.

LENGTH IN CENTIMETRES.

	10	11	12	13	14	15	16	17	18	19	20	21	Total.	No. of Males Examined.	Per-centage.
February ...	...	...	...	...	1	4	3	2	1	1	...	...	12	264	4·5
March ...	...	...	3	2	8	17	19	20	16	7	2	...	94	435	21·6
April ...	...	...	1	9	6	9	4	1	1	1	...	...	32	303	10·5

TABLE IV.

FEMALES IN A SOFT CONDITION OR RECOVERING FROM CASTING.

LENGTH IN CENTIMETRES.

	10	11	12	13	14	15	16	17	18	19	20	21	Total.	No. of Females Examined.	Per-centage.
February ...	...	...	...	1	...	...	...	...	...	...	...	..	1	255	·4
March ...	...	1	...	2	...	...	...	...	...	...	...	...	3	337	·9
April ...	...	...	...	2	2	1	...	...	...	...	...	...	5	255	1·9

THE MIGRATIONS OF CRABS.

By ALEXANDER MEEK.

During the years 1902-05, 781 crabs were marked and liberated at various places along the coast of Northumberland, principally at Beadnell. Reference to the accounts of the experiments in the reports for the years mentioned will show that the results were remarkably consistent. The crabs were marked in the autumn, those used being "white" crabs or crabs which were becoming hard after a recent ecdysis. The label used throughout has been the same, viz., a brass label bearing the letter N and a number, and fastened to one of the chelæ by copper wire. It was found that a proportion of the females migrated in a northerly direction along the coast, reaching for the most part the Firth of Forth, and some of them the coasts of Forfarshire and Kincardineshire. The males did not exhibit any tendency to migrate, although in one or two cases they were free for two years. There is, as is well known, an annual winter migration from the coast, and it is during this migration that many at least of the females which are about to spawn migrate northwards.

As will be seen from the accounts of these earlier experiments, most of the crabs were marked and liberated by my late and much regretted friend, John Douglas, Beadnell. I thought it desirable in view of the proposed protection of the crab during the season of casting or ecdysis, to repeat the experiment on a larger scale, and I asked Mr. Douglas to mark and liberate 500. This he did between the dates October 7th and December 7th, 1912, marking some 400 females and 100 males,—see the accompanying table.

Up to June 30th, 1913, 110 have been recovered, or 22 per cent. Of these 28 were females or presumably females, which had migrated into Scottish waters; the remainder consisted of 22 males and 59 females which had remained in the Beadnell district or had migrated only a short distance, and a female which appeared to have migrated southwards,—see below.

The results therefore are practically the same as before. It will be seen from the accompanying table that with one exception, which will be referred to presently, the females had migrated northwards; one, No. 172, having actually got as far as Gardenstown, Banff (Moray Firth), where it was caught on June 23rd after an absence of $8\frac{1}{2}$ months.

It has been clear during the course of these experiments that there has been a great deal of variation with respect to the migration of the females. All the females do not migrate. During the period that females are being returned to us from northern fishing ports, others are also being caught at Beadnell. And while it is true that the first recaptures of the migratory females are made in the Berwick district, afterwards our marked crabs are still being caught in that district at the time that stragglers, so to speak, are being caught off the coast of Kincardineshire. On the south side of the Forth recaptures were made in every month from November to June and it may be noted here that they are still being made in July. One was caught off Cellardyke (Fife) in April, another off Catterline in May, and one off Bervie in June. It was also in June, as has been stated, that the recapture was made at Gardenstown. At Beadnell, during the whole period, females have been recaptured along with the non-migratory males. In one case, No. 242, the crab was recaptured in November, liberated, and caught a second time on the Beadnell ground in March, again liberated, and afterwards recaptured in April. No. 262 was caught twice in the months February and April. Nos. 455 and 460 have a similar history, although the former and a number of others caught several miles to the north of Beadnell, may be said to point to a possible late migration of the females to the north. It is plain, therefore, that a large number of females do not migrate, or rather did not migrate up to the time of their recapture. They were more than probably females which were not to become " berried " this year.

The present experiment is interesting from the light it throws on the rapidity of migration. No. 358 reached 2 miles E.N.E. of Berwick, a distance of 18 miles, by February 5th, on which date it was captured after being free three months, Others were got in the neighbourhood of Berwick in March, April and May, after absences of four to six months. No. 30 reached Burnmouth (24 miles) on January 22nd after a free period of $3\frac{1}{2}$ months. No. 157 was

captured off Burnmouth on January 6th after an absence of not quite three months. Recaptures continued to be made at Burnmouth in February, March and April, and it may be added are still being made in July. No. 75 was captured at Eyemouth (26 miles) on December 30th, after being free for 82 days. The recaptures made at St. Abb's (28 miles) furnish even more surprising results. It may be worth while to reproduce these in tabular form.

No.	4—	liberated	Oct.	7,	recaptured	Jan.	27 =	112 days.
,,	161—	,,	,,	11	,,	Nov.	21 =	41 ,,
,,	164—	,,	,,	11	,,	Jan.	6 =	87 ,,
,,	227—	,,	,,	12	,,	Dec.	16 =	65 ,,
,,	290—	,,	,,	17	,,	Dec.	23 =	67 ,,
,,	291—	,,	,,	17	,,	Nov.	22 =	36 ,,

Recaptures were also made at St. Abbs in February and March.

At Dunbar (41 miles) Nos. 91 and 214 were recaptured on December 25th (77 days), and on January 7th (87 days) respectively. Recaptures continued to be made at Dunbar in February, June and also in July.

On the other side of the Forth, No. 282 was captured in April at Cellardyke in less than six months. And still farther north, No. 143 was obtained from Bervie (80 miles) on June 3rd, and No. 110 from Catterline (84 miles) on May 22nd, in $7\frac{1}{2}$ to 8 months. The Gardenstown specimen was captured after being free for $8\frac{1}{2}$ months.

It took about the same time, $8\frac{1}{2}$ months, in 1902-3 for a crab to reach Portlethen, Kincardineshire; and in 1905-6, $7\frac{1}{2}$ months, for one to migrate to Montrose. In previous years, likewise, we have had records of migrations to Burnmouth and St. Abbs in $3\frac{1}{2}$ months.

In a former season also we had an example of a crab captured in the second year after liberation. This one was marked at Newbiggin between October 19th and November 10th, 1905, and recaptured on July 24th, 1907, at Catterline, Kincardineshire.

The above records now make it fairly clear that the migration is completed during the one season, and the last cited example may be said to show that the crab does not immediately return if it ever does, or, more than likely, that the northerly migration took place in the second year.

I have now to refer to an example which indicates an exceptional migration to the south. This is No. 29 in the table—a female liberated on October 7th, and recaptured at Staithes, 66 miles

south, on March 13th. I do not intend at present to seriously consider it, for the reason that I heard of a skipper of a trawler who caught one of our marked specimens, and threw it overboard on his way to Hull. If this should come to his notice I should be glad to hear from him as to whether he took a note of the number on the label, and if he remembers where and when he caught it, and where he set it free again.

This and the previous experiments make it evident that during the last three months of the year many of the females migrate from the Northumberland coast to the north, those of the Beadnell region reaching the St. Abbs district and even Dunbar. A comparison of the experiments for a number of years shows also that the time of migration is subject to seasonal variation. There is also individual variation, for while some females marked at the same time are being caught in the Berwick and St. Abbs regions, others have crossed the Firth of Forth, and some have actually got as far as Forfarshire, Kincardineshire, and even the Moray Firth. At the same time, as has been noted, a large number of females are recaptured during the period of migration in or near the district of liberation.

In such a crab-fishing district as Beadnell the assemblage of crabs of both sexes in the autumn gradually moves out into deeper water, and returns during the early months of the year towards the coast. During the period of the outward migration a varying proportion of the females, which have in the same season cast, segregate themselves from their companions towards the north, and the migration is continued in this direction during the months when the crab population generally is approaching the shore. The time when they actually leave the district of Beadnell, and also the degree of migration, are evidently matters of individual variation. Both however, are susceptible of explanation if the factors were known. There can be no question to my mind that the principal factor is the ripening of the gonads. But while we know that the ova of the migratory females are approaching the fully developed condition we do not yet know for comparison the condition of the gonads of the females which have remained in the Beadnell district. The question is one to which I hope to have an opportunity of returning.*

* Since this was written I have had the opportunity of examining the ovaries and spermathecæ of crabs which have not migrated. The spermathecæ have been charged with sperms, but the ovaries are not so large as those of the females which have migrated, and the ova are only half the size of those of the latter. It may be concluded, therefore, that migration is in response to the ripening of the ova. It is a spawning migration which takes place in the same or the next season after casting, and, in the case of the older crabs, may be postponed for still another year.

In contrast to the females the males remain altogether in the place of liberation, only moving out and in during the annual migration already stated, and to a very limited extent along the coast. Two, Nos. 136 and 323, were caught, liberated again, and recaptured a second time in the Beadnell district, and similar results have been reported in former years.

While the males then remain in the district, and we have records of them having done so for two years, a certain proportion of the females migrate to a variable, sometimes to a considerable, distance to the north. I have shown in previous reports from actual observations and from marking experiments that spawning and ecdysis are not annual in the older crabs. Still every time the female crab becomes ripe the migration presumably takes place. The question is, does it always take place in the same direction ?

I have been speaking of the crabs of the Northumberland coast, a number of the females of which scatter themselves along the eastern coast of Scotland. Where do they go after the next ecdysis, or rather when the ripening of the ova is taking place ? Do these crabs replace females which previously occupied the Scottish region ? Where do the latter migrate to ?

In 1897-8 * Williamson marked and liberated at Dunbar a large number of crabs, but of these only one, a female, indicated a similar migration to that which has been described for Northumberland. This one migrated between September 25th and April 26th, 7 months, to St. Andrew's Bay (18 miles). Even this solitary example is interesting, as it shows that at all events there is a tendency for the females on the south side of the Forth to migrate northwards.

Some years ago a number of crabs were marked on the Yorkshire coast, and some of the females were recaptured at different places on the coast of Northumberland.

It is evident, therefore, that the northward migration of the females applies not only to Northumberland but to the districts on either side of Northumberland.

Our experiments led to Mr. Donnison,† on behalf of the Eastern Committee, marking and liberating over a thousand crabs on the coasts of Norfolk and Lincolnshire. The results were very similar to those obtained by Williamson. None of the crabs made any

* 18th Ann. Rep. Fish. Bd. for Scotland.
† Eastern Sea Fish. Dist. Rep. on crab Investigations. 1912, *Ibid.*, Inspector's Rep.

conspicuous migration, except those which were caught on the Yorkshire coast, and liberated on the Lincolnshire coast. Of these, both males and females exhibited a strong tendency to return to the original place of capture. Experiments, accidental and otherwise, have been cited before which indicate that crabs have a homing tendency, but the removal from one district into another introduces a complication which at present it is not necessary to discuss. If the experiments with reference to such crabs as were marked and liberated at the place of capture are to be taken as conclusive, then it appears that at or about the Wash the conditions undergo a change. This is very probably the case, and more than likely is associated with a hydrographical change.

But more experiments are wanted. It is greatly to be desired that an arrangement should be entered into for the marking and liberating of a given number of crabs in the same or corresponding seasons in the same year in as many districts as possible, with a view to stating still more accurately a migration which is of such biological and economic interest and importance. This should be followed by similar experiments with reference to lobsters and Norway lobsters.

MIGRATION OF CRABS.

LIBERATED.	CAPTURED.			
Date.	No. of Label.	Date.	Sex.	Place and Migration.
7 x., 1912 ...	4	27 i., 1913 ...	F. (15.5 cm.)	¾ mile off Castle Head, St. Abb's, 28 miles N.
	19	11 vi., 1913 ...	M.	1 mile E. of Beadnell.
	29	13 iii., 1913 ...	F. (17.8 cm.)	18 fathoms, 3 miles N.E. from Staithes, 66 miles S.
	30	22 i., 1913 ...	F. (18 cm.)	1¾ miles E. of Burnmouth, 24 miles N.
	48	20 vi., 1913 ...	M.	1 mile E. of Beadnell.
	49	25 x., 1912 ...	F.	3 miles E. of Beadnell.
9 x., 1912 ...	63	5 iv., 1913 ...	M. (15 cm.)	Beadnell. Sent from Walter Green, Sheffield.
	75	30 xii., 1912 ...	F. (17.4 cm.)	2 miles E.N.E. of Eyemouth, 26 miles N.
	87	14 iii., 1913 ...	F.	5 miles E.N.E. of Beadnell.
	91	25 xii., 1912 ...	F. (14.5 cm.)	2 miles E. of Dunbar, 41 miles N.
	102	23 x., 1912 ...	M.	2 miles E. of Beadnell.
	106	14 v., 1913 ...	M.	1 mile E. of Beadnell.
	110	22 v., 1913 ...	F. (16 cm.)	14 fathoms, 1 mile off Catterline, Kincardineshire 84 miles N.
	111	28 x., 1912 ...	F.	4 miles E.N.E. of Beadnell.
	114	7 xi., 1912 ...	M.	3 miles E. of Beadnell.
	116	28 iv., 1913 ...	F.	2 miles E. of Beadnell.
10 x., 1912 ...	129	23 iv., 1913 ...	F.	4 miles N.E. of Beadnell.
	134	18 iv., 1913 ...	F.	2 miles N. of Longstone, Farne Islands.
	136	2 i., 1913 ...	M.	1 mile S.E. of Beadnell. Caught in same pot as No. 323; liberated, and again captured 2 miles E. of Beadnell, 9 vi., 1913.
	140	6 iii., 1913 ...	F.	1½ miles N. of St. Abb's, 29 miles N.
	143	3 vi., 1913 ...	F. (18.5 cm.)	1 mile off Bervie, 80 miles N.
	144	27 v., 1913 ...	F.	1 mile E. of Beadnell.
	149	12 v., 1913 ...	F.	5 miles N. of Beadnell.
	154	22 v., 1913 ...	M.	2 miles E. of Beadnell.
	157	6 i., 1913 ...	F. (17.5 cm.)	1½ miles E. by N. of Burnmouth, 23 miles N.
11 x., 1912 ...	161	21 xi., 1912 ...	F.	2 miles E. of St. Abb's, 28 miles N.
	164	6 i., 1913 ...	F. (17 cm.)	2 miles S. of St. Abb's, 26 miles N.
	165	10-12 iii., 1913	F. (15 cm.)	Sea Houses. Received from Board of Agriculture and Fisheries. The crab had been sent to Billingsgate by Messrs. J. Brook & Son, of Birmingham, who received it from Chathill.
	171	7 vi., 1913 ...	F.	2 miles E. of Beadnell.
	172	23 vi., 1913 ...	F. (17 cm.)	Gardenstown, Banff, 148 miles N.
	176	19 ii., 1913 ...	F.	5 miles E.N.E. of Beadnell.
	178	31 iii., 1913...	F.	3 miles E.S.E. of Beadnell.
12 x., 1912...	189	9 iv., 1913...	F. (18.5 cm.)	1½ miles S.E. of Burnmouth, 22 miles N.
	201	12 v., 1913 ...	M.	2 miles E. of Beadnell.
	203	22 v., 1913 ...	F.	5 miles N.E. of Beadnell.
	205	8 iv., 1913 ...	M.	3 miles E. of Beadnell.
	208	16 vi., 1913 ...	F. (15.5 cm.)	1½ miles E. of Dunbar and ½ mile off, 42 miles N.
	210	24 ii., 1913 ...	?	2 miles N. of St. Abb's. Claw only received. 30 miles N.
	214	7 i., 1913 ...	F. (16.5 cm.)	2 miles E. of Dunbar, 41 miles N.
	225	15 xi., 1912...	F.	4 miles S.E. of Beadnell.
	227	16 xii., 1912...	F. (16 cm.)	2 miles E. of St. Abb's, 28 miles N.
15 x., 1912 ...	242	18 xi., 1912...	F.	3 miles E.S.E. of Beadnell. Liberated, recaptured 18 iii., 1913, 4 miles E. of Beadnell; liberated and again recaptured 26 iv., 1913, 1½ miles S.E. of Beadnell.
	244	31 iii., 1913...	F.	5 miles E.N.E. of Beadnell.
	253	27 i., 1913 ...	M.	4 miles E.N.E. of Beadnell.
16 x., 1912 ...	259	18 iv., 1913 ...	F.	3 miles S.S.E. of Beadnell. Liberated, recaptured 24 vi., 1913, 2 miles N.E. of Beadnell.
	260	4 iii., 1913 ...	M.	3 miles E. of Beadnell.
	261	28 x., 1912 ...	F.	3 miles E. of Beadnell.
	262	5 ii., 1913 ...	F.	4 miles E.S.E. of Beadnell. Liberated, recaptured 3 iv., 1913, 3 miles E. of Beadnell.
	265	8 iv., 1913 ...	M.	2 miles E.S.E. of Beadnell.
	267	20 v., 1913 ...	F.	2 miles N.E. of Beadnell.
	268	19 iii., 1913 ...	M.	3 miles E. of Beadnell.
	270	11 vii., 1913 ...	F. (16 cm.)	1½ miles E. of Dunbar, 42 miles N.
	274	6 ii., 1913	?	24 fathoms N. of Emmanuel Head, Holy Island. Label only.
	282	8 iv., 1913 ...	F. (15 cm.)	Close inshore, off Cellardyke Harbour, 55 miles N.
17 x., 1912 ...	290	23 xii., 1912 ...	F. (17 cm.)	2 miles E. of St. Abb's, 28 miles N.
	291	22 xi., 1912 ...	?	2 miles E. of St. Abb's. Label only. 28 miles N.
	293	7 v., 1913 ...	F.	3 miles N.E. of Beadnell.
	297	10 iv., 1913 ...	F.	2 miles N. of Longstone, Farne Islands.
	298	31 iii., 1913 ...	F.	4 miles E.N.E. of Beadnell.
	305	14 ii., 1913 ...	F.	5 miles E.N.E. of Beadnell.
	306	29 x., 1912 ...	F.	2 miles E. of Beadnell.

MIGRATION OF CRABS—*continued.*

LIBERATED.	CAPTURED.			
Date.	No. of Label.	Date.	Sex.	Place and Migration.
17 x., 1912 ...	307	19 iii., 1913 ...	F.	Received from W. Baker & Son, Sheffield.
	308	18 iv., 1913 ...	F.	1 mile S.E. of Beadnell.
	309	25 vi., 1913 ...	F.	1 mile N.E. of Beadnell.
	313	14 v., 1913 ...	F.	2 miles N.E. of Beadnell.
18 x., 1912 ...	323	2 i., 1913 ...	M.	1 mile S.E. of Beadnell. Caught in same pot as No. 136. Liberated, recaptured 16 v., 1913, 1 mile N.E. of Beadnell.
	336	24 v., 1913 ...	F.	1 mile E. of Beadnell.
	340	3 iv., 1913 ...	F.	3 miles E. of Beadnell.
	342	3 iv., 1913 ...	F.	3 miles E. of Beadnell.
	343	25 iv., 1913 ...	M.	3 miles S.E. of Beadnell.
	344	14 vi., 1913 ...	F. (16 cm.)	Sea Houses. Received from W. Baker & Son, Sheffield.
	348	24 v., 1913 ...	F.	1 mile E. of Beadnell.
	351	29 iv., 1913 ...	F.	4 miles N.E. of Beadnell.
	353	17 v., 1913 ...	?	Sea Houses. Label only. Received from J. Spender, Trowbridge.
4 xi., 1912 ...	356	14 v., 1913 ...	F.	5 miles N. of Beadnell.
	358	5 ii., 1913 ...	?	2 miles E.N.E. of Berwick. Label only. 18 miles N.
	363	4 vii., 1913 ...	F. (16 cm.)	¼ mile off Burnmouth, 23 miles N.
	364	?	?	Berwick ? Received label from Mr. Dunn, of Whitley Bay, who obtained it from Mr. Robinson, of Whitley Bay, who bought crab in Berwick in April, 1913. 18 miles N.
7 xi., 1912 ...	370	28 iv., 1913 ...	F.	2 miles E. of Dunstanborough Castle.
	371	31 xii., 1912 ...	?	Holy Island. Label only. In consignment of crabs sent from Holy Island to Birmingham.
	373	13 v., 1913 ...	F.	1 mile E. of Beadnell.
	374	28 iv., 1913 ...	F. (14.8 cm.)	Beadnell. Forwarded by J. Brooks & Son, Birmingham, to Board of Agriculture and Fisheries.
	380	16 v., 1913 ...	F.	2 miles E. of Beadnell.
	391	3 iv., 1913 ...	F. (16.5 cm.)	12 fathoms, 5 miles S.E. of Berwick, 13 miles N.
16 xi., 1912 ...	393	1 ii., 1913 ...	F. (18.5 cm.)	1 mile S.E. of St. Abb's Head, 30 fathoms, 28 miles N.
	400	10 v., 1913 ...	F.	2 miles N.E. of Beadnell.
	408	4 iii., 1913 ...	M.	4 miles E. of Beadnell.
	409	31 iii., 1913 ...	?	Berwick. Label only. Sent by Messrs. Stevens and Son, King's Lynn, to the Board of Agriculture and Fisheries. 18 miles N.
1 xii., 1912 ...	415	5 v., 1913 ...	F.	3 miles N.E. of Beadnell.
	417	15 v., 1913 ...	F.	5 miles N. of Beadnell.
	424	1 iv., 1913 ...	F.	4 miles E.N.E. of Beadnell.
	430	9 vii., 1913 ...	F. (15 cm.)	1 mile N. of Burnmouth, 25 miles N.
	432	9 vi., 1913 ...	F.	1 mile N. of Longstone, Farne Islands.
	434	26 v., 1913 ...	F.	1 mile N. of Longstone, Farne Islands.
2 xii., 1912 ...	437	4 iii., 1913 ...	M.	3 miles E. of Beadnell.
	443	26 v., 1913 ...	F.	2 miles N.E. of Beadnell.
	448	23 iv., 1913 ...	F.	4 miles N.N.E. of Beadnell.
	449	5 vii., 1913...	F.	1 mile N.E. of Beadnell.
	454	3 vii., 1913...	F.	1 mile N.E. of Beadnell.
	455	3 v., 1913 ...	F.	5 miles N. of Beadnell. Liberated, recaptured 26 v., 1913, 1 mile N.E. of Beadnell.
	460	12 ii., 1913	F.	4 miles E.S.E. of Beadnell. Liberated, recaptured 12 v., 1913, 1 mile E. of Beadnell.
	461	8 iv., 1913 ...	M.	2 miles E.S.E. of Beadnell.
	463	25 iv., 1913 ...	M.	1½ miles S.E. of Beadnell.
	464	9 vii., 1913...	F.	Burnmouth, Label only. 24 miles N.
	480	26 ii., 1913 ...	F.	1 mile S.E. of Longstone, Farne Islands.
	481	3 v., 1913 ...	M.	1 mile E. of Beadnell. Liberated, recaptured 26 v., 1913, 2 miles S.E. of Beadnell.
3 xii., 1912 ...	488	1 v., 1913 ...	F. (16.5 cm.)	½ mile from Green's Haven, Berwick, 10 fathoms, 18 miles N.
	490	19 iii., 1913 ...	F.	5 miles E. of Beadnell.
	492	19 ii., 1913 ...	F.	5 miles E.N.E. of Beadnell.
7 xii., 1912...	495	28 vi., 1913 ...	M.	¼ mile S.W. of Beadnell harbour.
	498	26 iv., 1913 ...	F.	3 miles E. of Beadnell.
	499	18 iv., 1913 ...	F.	1 mile S.E. of Beadnell.
	500	10 iii., 1913 ...	F.	Burnmouth. "Brought in to Lowestoft by purchaser, who found it in a consignment that he received from R. Kelly, of Burnmouth, N.B." 24 miles N.

LOBSTER CULTURE.

By ALEXANDER MEEK.

I do not intend to refer at length to the results of the experiments made last year, for the reason that the experiments now under operation this year will allow of a more complete statement being made with regard to the subject.

The experiments last year were principally directed to finding out the best means of procuring larvae in large numbers. In former years small shallow tanks were used, and it was found that small numbers were hatched and that the larvae were not usually in good condition. The berried lobsters under such confined conditions are very liable to strip the ova from the abdominal appendages. This year eleven berried lobsters were placed in three of the Aquarium tanks, and these yielded either none or few larvae, the berried lobsters again stripping the eggs from underneath them. On the other hand, we had a great deal of success by placing eight berried lobsters in the new supply tank, a tank holding when full 15,000 gallons. A large number of larvae was obtained. These were not only numerous but far stronger and more active than those obtained in the smaller tanks of the Laboratory. We did not attempt to count the larvae carefully, but the impression, based on counting and corrected by our experiments of this year, was that many thousands were thus successfully hatched. They were allowed to remain in the tank, where in spite of the large area, they appeared to be over-crowded, and a large proportion, which again it is difficult to state, since accurate numbers are not available, passed into the fourth stage.

The larvae were first observed in the supply tank on June 27th, and some passed into the fourth stage on July 17th. Fifty-seven of the latter were removed to a tank in the Laboratory. Two of these are still living, and we have a young lobster reared from the experiments of 1911.

From the experiments being made this year it will be possible to state the actual number hatched from a given number of berried lobsters, and also the numbers successfully reared by different methods to the fourth stage.

MUSSEL CULTURE.

By B. STORROW.

In previous reports accounts have appeared of the experimental work with regard to the formation of mussel beds at Holy Island. It has been pointed out that mussels, if transplanted to what is known as the Oyster Scaup, grow much more rapidly than if left to develop on Fenham Flats or at other places, such as the Hen Pool and the Snook. These three places have mussels in plenty, but the growth is too slow, and the mussels do not grow to a size which is suitable for bait. There is no doubt that if transplantation were undertaken on a large scale an industry would be created which would supply not only the greater number of the fishing villages of the Northumberland coast with bait mussels, but would also be very beneficial to the fishermen of Holy Island, some of whom, at present, have to be content at certain periods of the year, with a bare existence derived by the gathering of winkles from an area which, with the expenditure of a little capital and labour, could be made to have a much higher financial value. Further, provided reasonable care were taken and the beds kept clear of weed, there is good reason for stating that the mussels would be fit for human consumption.—Report, 1909-10, p. 26.

The mussels which were first laid down are now much fewer in number, but are of such a size as to form a very good bait. Those transplanted from the Snook, owing to rough weather shortly after the transplantation, have not been able to establish themselves. This year in March some two-and-a-half tons of mussels were taken from Blyth and placed on the Oyster Scaup. These mussels were well grown, and were of a size which would make it necessary to use two for a bait ; there was also a small number large enough to form a bait. At the same time a quantity was obtained from Fenham Flats in the region to the south of the Mill Burn, and also placed on the Scaup. These were as a rule smaller than the mussels from Blyth ; the shells were heavy, with coarse ridges, and they had the general appearance of mussels which had been stunted in growth.

In order to see if it would be possible to encourage spatting two fences were erected, one to the south of the Mill Burn and the other on the Oyster Scaup. These fences were about eight yards long. Three stakes were driven about three feet into the ground leaving almost five feet above the surface. The stakes were given suitable side supports, and three wires were run from one end to the other. Hazel branches were fastened with rope yarn to the wires, and then the tops were bent over and interlaced with the lower portions of the branches. After these fences were completed a number of stout branches were placed in the muddy ground to the west of the Oyster Scaup.

In June the beds were visited. The transplanted mussels were well established, and this year's growth had commenced. There was a quantity of weed on the beds, which would have been improved and rendered less liable to destruction by heavy seas had there been time to remove the weed.

The fence erected on Fenham Flats was standing and in good condition, but covered with a fair quantity of weed. That erected on the Oyster Scaup was down, and two of the small stakes used for side supports, together with the wire of these supports, were missing. It is strange that this portion which was considered to be the strongest part of the fence, should not only come loose but also be washed away. What was left of the fence was fastened securely, and although not in its original condition, it will serve to show if such erections will be of value in encouraging spatting.

At the same time portions of the Oyster Scaup and Fenham Flats were examined. Two beds of mussels made by some of the fishermen are doing well, but they also were covered with weed, and would be improved if they were taken up and spread less thickly. To this opinion the fishermen themselves agreed. In the region of the fence on Fenham Flats small beds of mussels, which doubtlessly had spatted last year, were seen. On the Oyster Scaup between the beds formed by transplantation and Holy Island are two patches of young mussels, also of last year's spat, which together will cover an area of about one-and-a-half acres. In the middle of these patches short stakes were driven in order to fix their location. The development of these young mussels will be watched with interest, for they are in a favourable position for rapid growth.

The experiment will be continued, but it would be helped considerably if the fishermen would transplant mussels and form for themselves beds which would in a short time yield them a supply of good bait mussels. The labour entailed need not be great, for sufficient mussels to last a year could be transplanted in a few days. This work could be done when it would be impossible to go to sea on account of weather, and if it were undertaken in a systematic manner from year to year the supply of bait mussels would be continuous, for as one year's bed became exhausted, the next year's mussels would be ready for use. The exhausted beds could be re-stocked again by transplantation. As well as providing a stock of bait mussels for themselves, the fishermen would be helping to increase the natural resources of the district, the value coming from which must to a large extent find its way into the hands of the men living in the neighbourhood of the mussel beds.

This opportunity is taken of expressing our thanks to Mr. Leyland, of Haggerston Castle, for his kindness in supplying us with suitable material for the erection of the fences, and also to Mr. Cayley, Haggerston Castle Estate Office, for the arrangements made for the delivery of this material.

HYDROIDA NOT PREVIOUSLY RECORDED FOR THE DISTRICT.

By JOYCE HILDRETH ROBSON, B.Sc.

Sub-Order I.—ANTHOMEDUSAE. (*Gymnoblastia*).

CLAVA SQUAMATA, Muller.

Hydra squamata, Muller, Zool. Dan. i. 3, tab. IV., figs. 1-3.

Coryne squamata, Lamk.,An. sans Vert. (2nd edit.), ii., 73.

Clava membranacea, T. S. Wright, Ed. New Phil. Jour. (n.s.) for July, 1857, pl. ii., figs. 2, 3.

Clava squamata, Hincks, Brit. Hydroid Zoophytes, pl. I., fig. 2.

Locality.—Found once only, on the beach near the Bear's Back Rocks, Cullercoats, on a piece of *Fucus vesiculosus* washed up after a storm, Oct. 2nd, 1912 (with gonophores).

Geographical Distribution.—Queensferry, Firth of Forth, on *Fucus vesiculosus* ; Lerwick, low water, on same weed ; Denmark on same weed ; Plymouth.

The appearance of this hydroid is very striking, the brilliant orange-red polypites being set very closely together in moss-like tufts, with the oldest individuals in the centre of the cluster. The stolonic network forming the base gives rise to "runner"-like shoots, which spread over the surface of the Fucus and produce new clusters at short intervals. There are from 20 to 30 pellucid white tentacles covering the distal one-third of the polypite, and very large racemous clusters of pedunculated gonophores of a rather darker red, immediately below the proximal tentacles.

The polypite when fully extended measures about half-an-inch, tapering towards the base, and presenting the form of a long slender column, supporting a head which varies rapidly in shape from fuse to cup ; the whole body quickly contracting to half its original height when touched.

SYNCORYNE GRAVATA, T. S. Wright (plate I., figs. 1 and 2).

Coryne gravata, Wright, Obser. on Brit. Zooph. Ed. New Phil. Jour. for April, 1858, pl. vii., fig. 5.

Coryne mirabilis, Agassiz, N.H.U.S., iv., 185, pl. xvii. (vol. iii.).

Sarsia mirabilis (the sexual zooid), *Agassiz,* Mem. Amer. Acad. of Arts and Sciences (1860), iv., part ii., 224, pl. 4, 5.

Tubularia stellifera, Conth., Boston Journal, N.H., ii., 56.

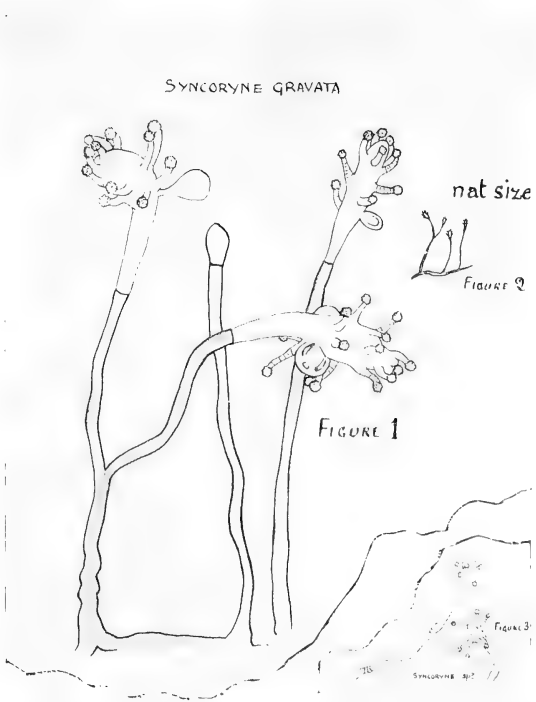
Locality.—Growing on a bottle with *Alcyonium digitatum* and *Actinoloba dianthus* brought by the fishermen from $21\frac{1}{2}$ fathoms east by south of Marsden on the Durham coast.

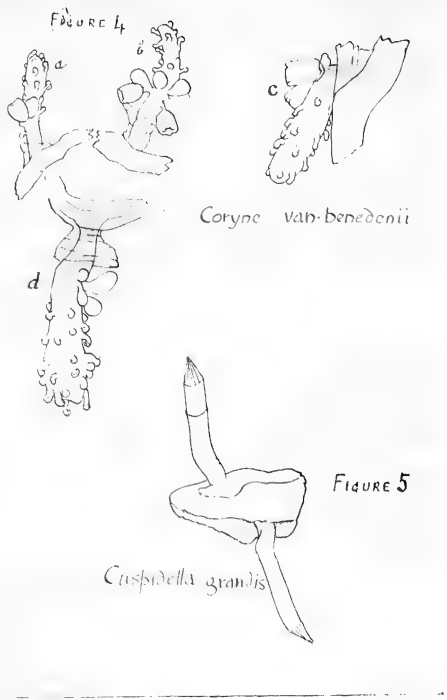
Geographical Distribution.—North Berwick ; Filey Brigg, Yorkshire ; "*Syncoryne* (? *sp.*) *gravata,* rocks under the Hoe, Plymouth ; Mount Edgcumbe ; Drake's Island ; Garden Battery, North America.

The specimens procured did not live more than two weeks in the tank, and no medusoids were produced ; they appeared to agree most nearly with Hincks' description of *S. gravata,* with the exception that the number of tentacles was less than in that species ; in this respect the specimens resembled *S. decipiens,* but there was no trace of the prominent proboscis so characteristic of the latter. A certain amount of variation in the number of tentacles is so common in this genus that an exact statement as to the number cannot be made.

Stem, simple or very slightly branched, rooted by a creeping stolon ; smooth, or with a few indistinct wrinkles at the base ; colour, pale horn, with the pink colour of the cœnosarc showing through. Polypite more or less clavate ; with a long slender base (forming almost half its length) devoid of tentacles ; then slightly enlarged and bearing 8-14 tentacles. Colour, pale pink. Tentacles extensile, capitate, transparent white ; thread cells very large and distinct. Gonophores, one to three in number, borne on a small stalk just below the lowest tentacles. Height of hydroid, 6-12 mm.

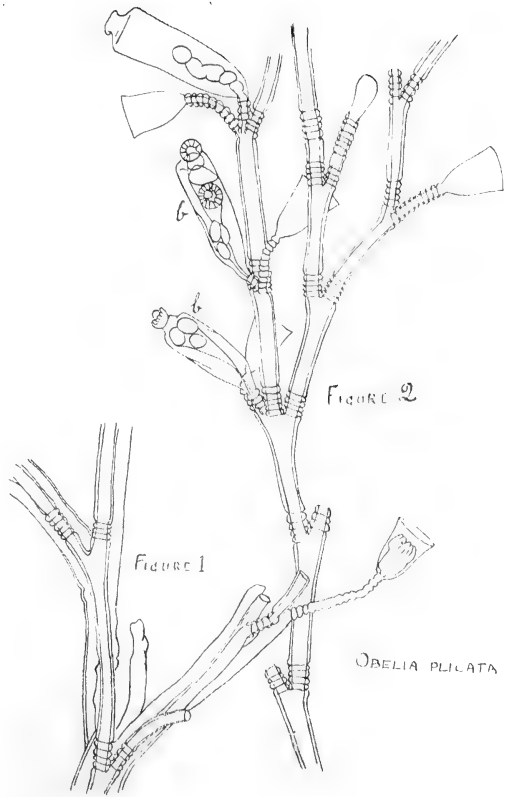
A number of much smaller *Syncoryne* of doubtful species were dredged from stations 2, 3, 7 and 8, growing on other zoophytes ; possibly young specimens of *Syncoryne sarsii* (plate I., fig. 3).

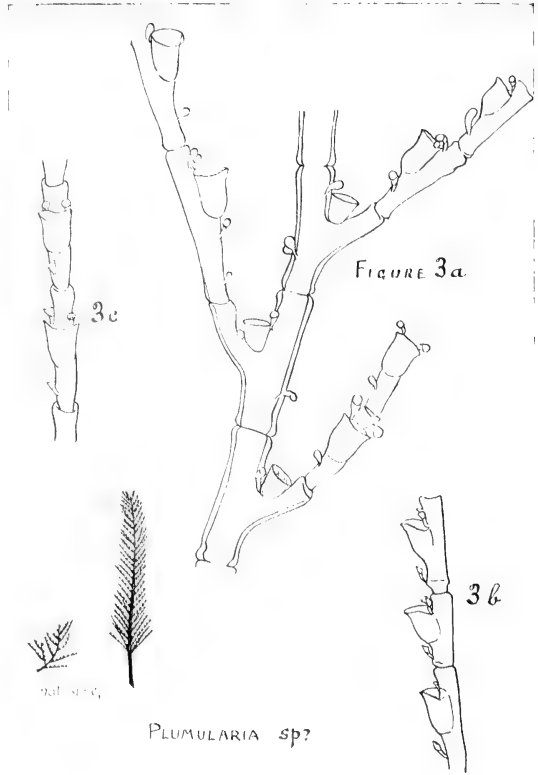




HYDROIDA.—PLATE I.

CLADONEMA (? sp.)
HYDROIDA.—PLATE II.





HYDROIDA.—PLATE III.

CORYNE VAN-BENEDENII, Hincks (Plate I., figs. 4, *a*, *b*, *c and d*.

Syncoryna pusilla, Van Beneden, Rech. sur les Tubul., 52, pl. iii., figs. 1-10.

Coryne pusilla, Johnston, B.Z., 41, pl. iv., figs. 1, 2.

Locality.—Dredged " Raider No. 2," July, 1911 ; and growing on *Cellepora avicularis,* in 40 fathoms east of Coquet Island.

Geographical Distribution.—" I am unable to give any British habitat. Dr. Johnston . . . .has a figure of it, which was taken from British examples, and he states that it is often parasitical on *Tubularia indivisa* " (Hincks' B.H.Z.).

Ostend (Van Beneden). Liverpool (L.M.B.A., 1896, p. 430).

The specimens observed (in spirit) were poor, but the following characteristics were noted :—

A transparent wavy stolon, from which the polypite arises, with a very delicate cup at the base. Polypite rather long, with twenty or more short clavate tentacles. Gonophores round the base of the polypite 2-6 in number, on a short stalk, very large (plate i., fig. 4*c*).

CLADONEMA—sp. (Plate 2).

Cf. *Cladonema radiatum* (free zooid), *Dujardin.* Ann. des Sc. Nat. xx. (1843), 370 ; Ann. des Sc. Nat. (3rd ser.), Zool., iv., 271.

Cladonema radiatum, Hincks. Brit. Hy. Zooph. pl. xi.

Coryne stauridia, Gosse, Dev. Coast, 257, pl. xvi., figs. 1-5.

Locality.—In one of the laboratory tanks, May, 1913.

Geographical Distribution.—Devonshire ; in the tanks in the Zoological Gardens, and in Mr. Holdsworth's aquarium. St. Malo ; Messina ; Belgium.

Polypite.—Not observed.

Gonozooid.—Umbrella deep bell-shaped, with many thread cells ; manubrium long, with four of five oral lobes covered with thread cells ; marginal tentacles 16, springing from orange bulbs, simple, very extensile, roughened by conspicuous groups of thread cells, and each furnished with a suctorial appendage ; radial canals, 4.

This description is taken from "Brit. Hy. Zooph." (Hincks) where it applies to *C. radiatum*, and modified to suit the present specimen, which differs from *C. radiatum* in the following respects :—

C. radiatum.	*C.—Sp. ?*
Suctorial appendages, usually 3 in number; 2 or 4 or rarely only 1.	One only.
Appendage filiform.	Short and squat.
,, attached near proximal end of the tentacle.	Attached near distal end.
Tentacles, 8 in number.	16.
,, branched.	Simple.
Radial canals, 8—10.	4.
Colour, red (bulbs of tentacles).	Orange (bulbs, manubrium and canals).

The four sense organs were very large clear spheres, with a small opaque white spot.

In habits the medusoid strongly resembled *C. radiatum ;* it "frequently fixes itself firmly by means of its suckers, and the arms are thrown back and stand erect around the umbrella. It swims by short and rapid jerks, and when in motion the tentacles are closely retracted."

Unfortunately the medusoid did not survive long, so that it was impossible to make any further observations on its development. It may have been a young example of *C. radiatum*, in which the additional radial canals, suctorial appendages, and the branches of the tentacles had not yet developed ; but on the other hand, the medusoid was large and apparently well developed, the bell measuring 1·5 mm. in height, and possessed double the number of arms present in *C. radiatum.*

While the species is doubtful, the genus in which this medusoid must be placed can only be Cladonema ; I can find no previous records of a Cladonema having been found so far north.

Sub-Order II.—LEPTOMEDUSAE (*Calyptoblastia*).

CAMPANULARIA CALICULATA, Hincks.

Clytia poterium, Agassiz, N.H.U.S., iv., 297, pl. xxviii.

Campanularia caliculata, Hincks, Ann. N.H. for March, 1863, (ser. 2), xi., 178, pl. v. *b.*

Campanularia caliculata, Allman, Proc. Roy. Soc., Edin., 1857-58.

C. breviscyphia, Sars, Middelhavet's Litt. Faun., 49. pl. i., figs. 12, 13.

Locality.—Dredged at Station VI. (the Fairway between the inner Farne Island and Bamburgh), Sept. 16th, 1911 (8-9 fathoms).

Geographical Distribution.—Old Head of Kinsale, Cork; Ilfracombe; Swanage, Dorset; near Ramsgate; Jersey; Courtmasherry Harbour, Cork. (Also Messina, Bergen, Labrador (15 fathoms), Massachusetts and Nova Scotia).

A very small colony, consisting of a smooth stolonic network and five or six calycles rising from it on pedicels of various lengths with three or four very distinct rings at the base, and 10-20 crenations, surmounted by one well-marked ring immediately below the calycle.

Hydrothecae with greatly thickened walls, in some cases thickened unevenly and presenting a ridged outline; a large spherical cavity below the diaphragm. Gonothecae not observed.

Although a northern species, *C. caliculata* has not previously been recorded for the North of Britain.

CAMPANULINA TURRITA.

Campanulina turrita, Hincks, Brit. Hy. Zooph., pl. xxxvi., fig. 2.

Localities.—St. Andrew's Bay; Station IV.

Geographical Distribution.—Holywood, Belfast Lough.

Very little was obtained on either occasion.

Stem distinctly ringed for the entire length, and groups of two or three ringed pedicels arising at the bends, bearing long tapering calycles, with an operculum composed of about ten segments.

Polypites very extensile.

OBELIA PLICATA, Hincks. (Plate 3.)

Obelia ? plicata. "Referred provisionally to this genus."—Hincks, Brit. Hy. Zooph., pl. xxx., fig. 1.

Localities.—Dredged at Station IX. (in 15 fathoms), with capsules, June 27th, 1912; Station IV. (17 fathoms); Station VIII.; Station VII. Growing on stones and the cases of worms, and often encrusted with *Alcyonidium parasiticum*.

Geographical Distribution.—Shetland (Jeffreys); Liverpool.

The specimens dredged were rather poor (the finest not exceeding an inch in height), but showed the characteristic compound stem formed by a number of tubules bound closely together, and gradually becoming simpler and more slender towards the extremity of the shoot as the branches are given off (*see* fig. 1).

The branches themselves again branch freely, forming a bushy shoot with a delicate and graceful appearance.

The stem is annulated (4-8 rings) above the origin of the calycles and branches ; calycles alternate, campanulate, with entire margins, and borne on erect pedicels (with 5-12 rings) ; gonothecae axillary, urn-shaped, with a raised aperture, and borne on a short four-ringed stalk, and altogether much resembling the gonotheca of *O. geniculata* (fig. 2*b*).

Gonozooids only observed inside the gonotheca ; apparently with 24 tentacles, and similar to those of *O. geniculata*.

GONOTHYREA ? HYALINA, Hincks.

G. ? hyalina. " Referred provisionally to this genus." Hincks, Brit. Hydr. Zooph., pl. xxxv., fig. 2, and " On New Brit. Hydroida," Ann. Nat. Hist., xviii. (3rd ser.), 297.

Localities.—Station VIII., Station III., Station I., 8 miles E. $\frac{1}{2}$ S. of Cullercoats. On shells, zoophytes and Ascidian tests (15 fathoms).

Geographical Distribution.—" Profusely investing Tubularia, Halecium, &c., from Shetland, and, I believe, from deep water." (Hincks' Brit. Hy. Zooph.)

Although occurring frequently, none of the specimens showed the " densely clustered, tall and much branched " aspect described by Hincks.

A large species, with stem annulated (5-8 rings) above the origin of the branches or pedicels. Pedicels with 5-15 rings, supporting a handsome long slender calycle with castellated denticles (about ten in number), the denticles themselves showing distinct indentations. Gonotheca not observed.

GONOTHYREA GRACILIS, Sars.

Laomedea gracilis, Sars, Beretning om en Zoolog-Reise i Lofoten og Finmarken, 18; Middelhavet's Littoral Faun. 51, pl. ii, figs. 1-4.

Gonothyrea gracilis, Allman, Ann. Nat. Hist. for May, 1864.

Gonothyrea gracilis, Hincks, Brit. Hy. Zooph., pl. xxxvi., fig. 1.

Localities.—Station VIII., Station I. (15 fathoms); 8 miles east by south of Cullercoats. On Flustra and shells.

Geographical Distribution.—Birterbuy Bay, Connemara; Bergen; Messina (var.).

Stem (i.) A creeping interlaced stolon, on which arise long pedicels, with 8-12 rings at the base, a smooth middle portion, and 4-5 rings below the calycle (not *two*, as given by Hincks).

(ii.) A second specimen showed the peculiar branching, the main stem bearing "a single shoot, which has the appearance of growing *upon* it rather than out of it" (Hincks).

Hydrothecae long and slender, with about ten very sharply pointed denticles.

Gonotheca axillary, large, (twice as long as the hydrotheca), borne on a short ringed stalk; shape, an elongated oval with flat top, tapering below. (Also borne on the stolon.)

CUSPIDELLA GRANDIS, Hincks (Plate I., fig. 5).

Cuspidella grandis, Hincks, Brit. Hydroid. Zooph., pl. xl., fig. 4.

Localities.—Dredged 4 miles east by south of Newbiggin; 17 miles south east by south of the Crumstone; 5-6 miles south-east of the Crumstone. Growing on old mussel and fan shells, pieces of lava, and the roots of other zoophytes.

Geographical Distribution.—"Birterbuy Bay, Connemara, Shetland" (Hincks). "On stems of *Halecium tenellum*" (Jour. Mar. Biol. Assoc.), Plymouth.

A minute species.

Hydrothecae rising singly from a smooth stolon; cylindrical in shape, slightly curved, and about five times as high as they are broad; the margin forms an operculum of about ten pointed denticles.

PLUMULARIA—sp. ? (Plate 3, fig. 3 *a*, *b*, *c*).

Localities.—Stations VII. and VIII.

Shoot sturdy, of a dark chestnut brown colour, and attaining a height of about an inch ; stem sometimes compound below, tapering above ; straight, jointed ; pinnae in one plane, often forked just above the first joint, straight, alternate, usually one to each internode, sometimes two ; hydrothecae adnate, on one side of the pinna only, deep, with an even horseshoe-shaped margin very slightly everted ; one to each internode on the pinnae, and one on the main stem in the axil of the branch ; nematophores one below the hydrotheca and two above, and on the main stem, bithalamic, sessile, expanding into a wide-mouthed cup above.

This species most resembles *P. frutescens*, but in none of the specimens was there more than one calycle to each internode. Hincks does not mention an axillary calycle (which is a constant and conspicuous feature in the present specimen), but it is figured as occasionally present in Johnston's B.Z. plate of *P. frutescens*.

OBELIA FLABELLATA, var. ? (Plate 4).

A number of specimens of Obelia were obtained from Stations I., III., IV. and V. (with reproductive capsules), and VII.; and also washed up on the beach at Cullercoats. Growing on *Laminaria*. They appear to be intermediate between *O. geniculata* and *O. flabellata*.

Stem flexuous, much branched, with 2-4 distinct rings above the origin of the branches and pedicels ; hydrothecae alternate ob-conical, with plain margin, borne on short pedicels with four rings, slightly tapering and sub-erect ; gonothecae axillary, erect, urn-shaped, on a short three-ringed stalk.

Hincks describes *O. geniculata* as being " divided by *simple* joints into a number of short and stout internodes, elbowed above on alternate sides, so that a kind of bracket is formed for the calycles."

One specimen (washed up) was a beautiful pale pink, and was setting free great numbers of lively gonozooids, each with a pink spot on the manubrium, eight lithocysts, and twenty-four tentacles.

Another specimen presented the subverticillate aspect ascribed by Hincks to *O. flabellata*.

Geographical Distribution.—Tenby (in pools) ; Scotland.

AGLANTHA ROSEA, Forbes.

Aglantha rosea, Browne, Zool. Soc. Lond. Proc., 1897, p. 833, pl. XLIX., figs. 1, 1*a*, 1*b*.

Circe rosea, Forbes, Monogr. of the Brit. Naked-eyed Medusæ (Ray. Soc. 1848), p. 34, pl. I.

Aglantha digitalis, Hartlaub, 1894.

Medusa digitale, Muller, 1766.

Locality.—All Stations in October, 1912, especially Station III.

Geographical Distribution.—Heligoland (Hartlaub), Shetland Isles (Forbes), St. Andrews (McIntosh and Crawford), Valencia Harbour (E. T. Browne).

Large numbers of the Leptomedusa described and figured by Forbes as *Circe rosea* and by Browne as *Aglantha rosea* were taken in the plankton catches for October. The characteristic mitre-shaped umbrella measured 3·5 mm. in height and 2 mm. diameter; the gonads just appearing as bulbous swellings at the summit of the eight radial canals; the peduncle rather short, extending not more than half the length of the umbrella, and distinctly constricted at the point of junction with the stomach. No tentacles and no marginal vesicles could be seen. Velum narrow, with a plain margin.

Note.—Mr. P. Kramp found *Gonothyrea gracilis* on the rocks at Cullercoats, and 6 miles E. of Longstone (40 fs.); *Gonothyrea hyalina*, 6 miles E. of Longstone; *Campanulina repens*, 6 miles E. of Longstone in June, 1913.

NOTES ON AN ABNORMAL EPHYRA OF *CYANEA CAPILLATA*.

By JOYCE HILDRETH ROBSON, B.Sc.

On February 27th a large yellow ephyra, measuring 2 millimetres in diameter, was observed in the codling tank amongst the *Aurelia aurita* epyhra.

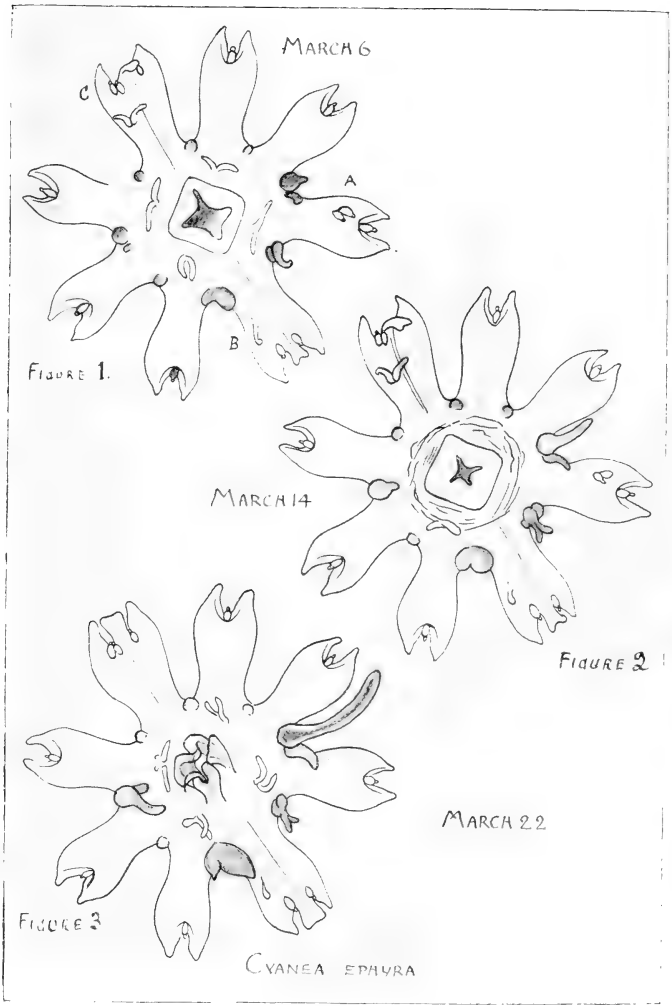
It had eight arms, six of which were of the normal ephyra formation, viz., two-lobed, with one sense organ between the lobes.

The other two arms were opposite ; they were each composed of three lobes, with two sense organs between them ; the middle lobe was indented, and at first only half the length of the other two, but rapidly grew until it was double their size. A band of clear yellow tissue in the sub-umbrella, stretching from the base of the arm to the centre of this third lobe, seemed to act as a kind of tendon, for the third lobe was generally depressed, making an angle with the plane of the arm varying from 80°-20° or less.

Irregularities in the distribution of the sense organs were also observed. The six normal arms had each one sense organ between its two lobes, as is usual ; but one of these arms had also two sense organs close together about halfway between the base and apex of the arm, to one side of the middle line (fig. 1*a*). The same thing was noticed in one of the two abnormal arms, while the other arm of this pair had a single organ in the same position (fig. 1*b*). The former arm had in addition two sense organs to one side of the third lobe (fig. 1*c*) instead of one, making a total of five sense organs for that arm, and three for the other.

Between the arms the tentacles were just beginning to grow out, showing as brownish buds (fig. 1).

The ephyra was placed in a glass tank, with a number of Aurelia ephyra and small medusoids. It was not observed to eat any of these till April 2nd, when a small Aurelia, about one-third its own size, was noticed caught in its manubrium (fig. 5). Next day this was reduced to half its size, while it was entirely digested



ABNORMAL EPHYRA.

PLATE V.

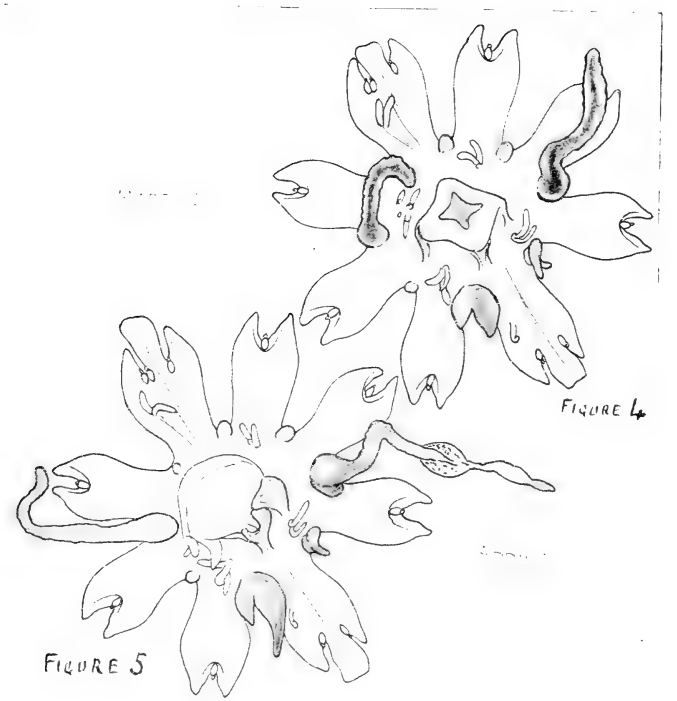
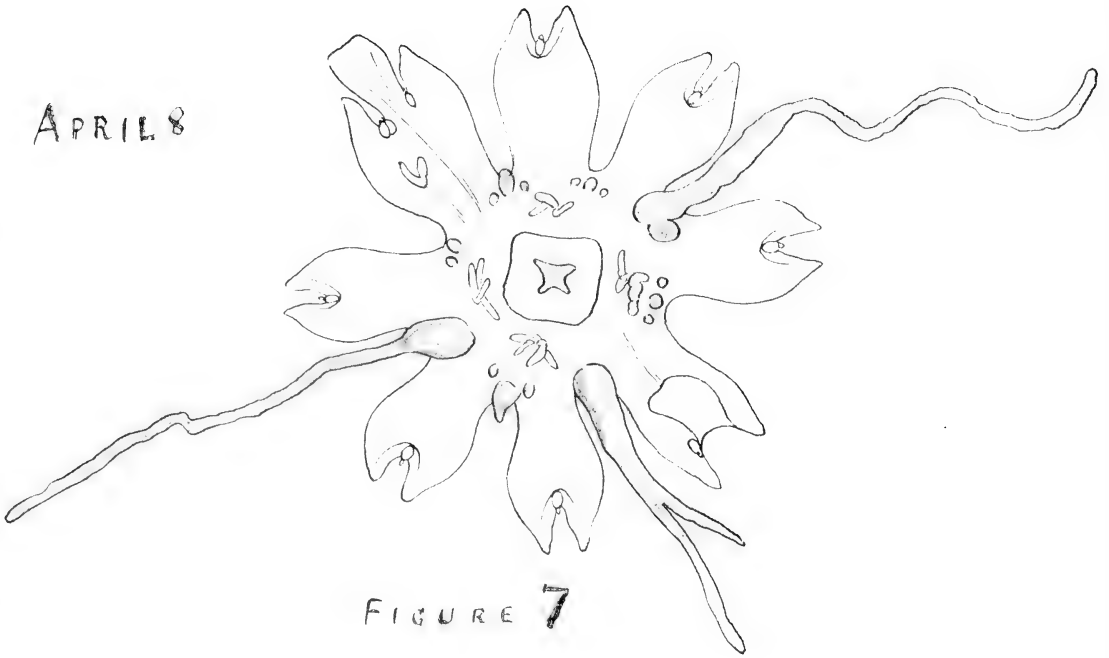


FIGURE 6

ABNORMAL EPHYRA.

PLATE VI.



ABNORMAL EPHYRA.

PLATE VII.

by the third day. After this the Cyanea was put into a small glass dish, and given a partially killed Aurelia, which it wafted towards the manubrium with its arms. It did not appear to use the tentacles (even when well developed) for catching or holding the prey, but there seemed to be some mucous-like substance produced by the manubrium, which aided in holding it.

The ephyra developed rapidly after these meals. Additional tentacles began to bud (*see* fig. 7). These developed in the order shown in the drawings. Its habits remained sluggish, and it often lay on the bottom of the tank and appeared unable to catch and hold a lively ephyra or medusoid. Its sedentary habits probably caused its untimely end, for one day it vanished, and suspicion rested on a worm which had been put into the tank and forgotten.

THE MARINE POLYZOA OF NORTHUMBERLAND.

By ROSA E. ROPER, B.Sc.

The following list contains the names and local distribution of all the Marine Polyzoa which have up to the present time been recorded from the coast of Northumberland. Ninety-six species (exclusive of the very small number for which localities on the Durham coast only are given) are recorded in Alder's Catalogue (1857), in the supplementary catalogue 1861, and in the dredging reports for 1862–64. Several of these species I have not been able to find, but I have to record nine species and three varieties new to the district. These are marked with an asterisk.

The months in which I have observed the oœcia are given, but the fact that these are in almost all cases the summer months is probably only due to the fact that nearly all the material examined was dredged during the summer. Oœcia have been found in mid-winter on species living in the aquarium tanks and washed up on the shore, the larvae of *Cribrilina punctata* and *Escharella immersa* hatching out in the tanks in December and January.

The order and nomenclature followed throughout has been that adopted by Canon Norman in his catalogue of the Polyzoa contained in his collection, published in 1910. The names which appear in italics after these names are those of Alder's original list. The letters (*a*), (*b*), (*c*) and (*d*) refer to the volumes of the Transactions of the Tyneside Naturalists' Field Club in which the records occur.

(*a*) Vol. III., 1854–8 ; (*b*) V., 1860–62 ; (*c*) VI., 1863–64 ; (*d*) Nat. Hist. Trans. of Northumberland and Durham, I., 1865–67.

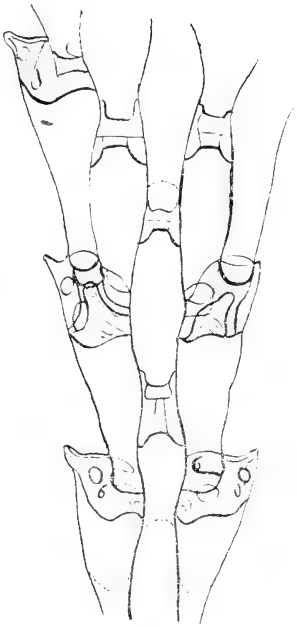
CHEILOSTOMATA.

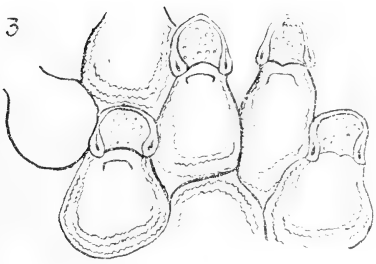
Aeteidae.

1.* AETEA TRUNCATA (Landsborough).

Three or four cells of this species were found growing on a valve of *Venus ovata*. The cells were furnished with the characteristic tubular appendage given off from the middle of the dorsal surface, but did not branch. This species has been previously recorded from various places on the south and west of our coasts, as well as from Southern Norway.

I





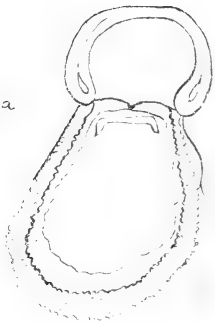


Fig 1. Bugula murrayana, var. fruticosa. ... ovicell surface

2. Bugula ? ... group

3 Alderia ... ovicells

3 a. Loxosoma ... ovicell ... of margin

II

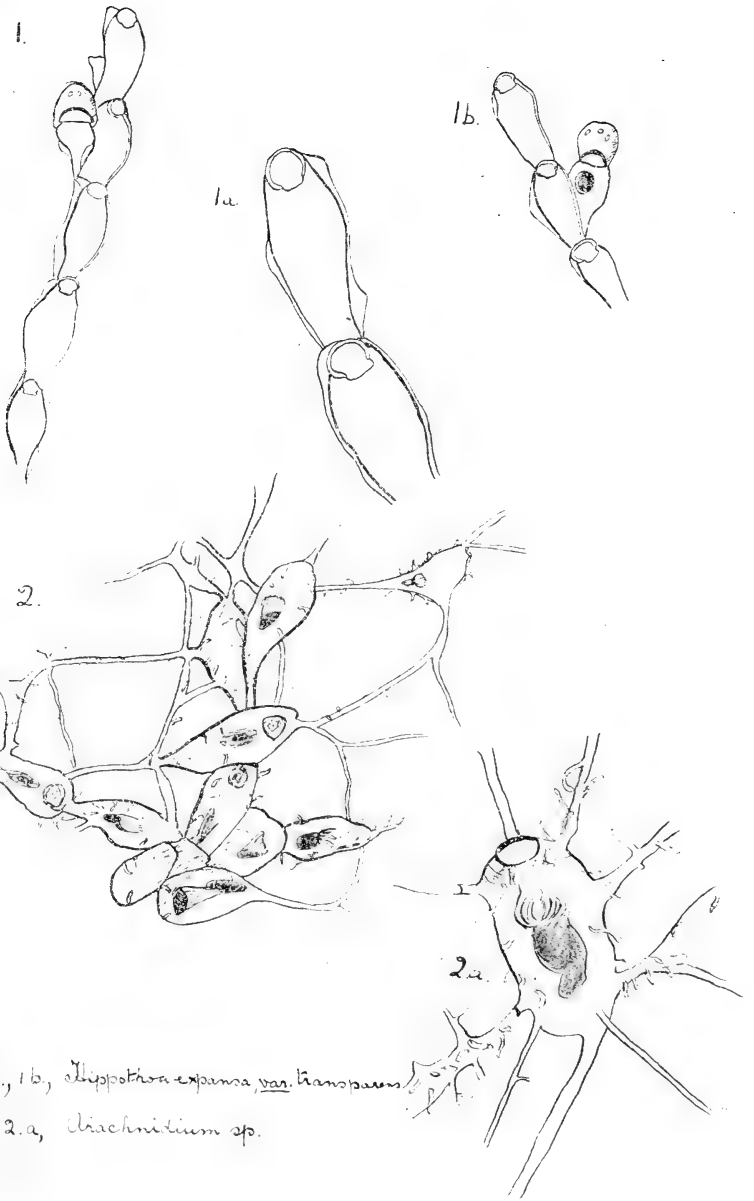


Fig 1., 1a., 1b, Hippothoa expansa, var. transversa.
Fig. 2., 2.a, Alecto dichotoma sp.

BICELLARIIDÆ.

2. EUCRATEA CHELATA (Linnæus).

Parasitical on small seaweeds and on other zoophytes, between tide marks and a little beyond. Bamburgh, Berwick Bay and Cullercoats. *Alder* (*a*).

Common from Stations III., IV. and V. Also found at Stations II., VI., VII. and VIII. Rare between tide marks, Cullercoats.

3. GEMELLARIA LORICATA (Linnæus).

Very abundant in the coralline zone. *Alder* (*a*).

Common from Stations I., III. and IV. Also found at Stations II., VI., VII. and IX.

Obtained from nearly every dredging. Very commonly washed up along the coast.

4. BUGULA AVICULARIS (Linnæus).

On shells and zoophhytes from deep water, occasionally. *Alder* (*a*).

Obtained in small quantities from Stations I., IV., VII. and IX. From 17 fathoms east of Howick Burn on *Hyas coarctatus*.

Oœcia.—June and October.

5. BUGULA PLUMOSA (Pallas).

From deep water boats. *Alder* (*b*).

Obtained once only from Station IV.

Oœcia.—July.

6. BUGULA PURPUROTINCTA, Norman. *B. fastigiata* (*Fabricius*).

Cullercoats, common ; washed up. *Coppin* (*a*).

I have occasionally found this species washed up at Cullercoats, and have also found a few colonies only about three-quarters of an inch in height growing on shells from deep water.

7. BUGULA FLABELLATA (J. V. Thompson).

On *Flustra foliacea*, shells, &c., from the coralline zone ; not rare.

On rocks at extreme low-water mark, Bamburgh. *Alder* (*a*).

Very young colonies, one-quarter of an inch or less in height. very common on Flustra and other Polyzoa during the summer months.

Fine colonies from Stations III. and IV. Small colonies from Station I. Washed up at Cullercoats.

Oœcia.—July, August and October.

8. BUGULA MURRAYANA (Johnston).

From the fishing boats, Cullercoats, rather rare. More common from the deep water boats. *Alder* (*a*).

The normal variety has been obtained at Station VIII., and from 40 fathoms east of the Longstone.

Oœcia.—June.

* Var. FRUTICOSA. Plate I., Fig. 1.

This variety has been obtained once from Station VII., and in fair abundance from one of the Station IV. dredgings. The front surface of these colonies resembles Hincks' figure exactly, but the dorsal surface is very different, being complicated by the presence of a peculiarly shaped calcareous framework. This structure is also present on a few zoœcia of one of the colonies of the normal form of *B. murrayana*. I have not been able to find out the nature or the use of this structure, but give a figure representing it.

10.* BUGULA GRACILIS var. UNCINATA, Hincks. Plate I., Fig. 2.

A few very small colonies of a species of Bugula have been found growing on the stems of a hydroid which was coated with *Alcyonidium parasiticum* from 30 fathoms east of Newbiggin and from the Import Dock, Blyth.

The form of the zoœcium resembles that of *B. gracilis* figured by Hincks.

Dr. Harmer, who has examined this specimen, has referred it to *B. gracilis* var. *uncinata*, Hincks, with some doubt, owing to the fact that the colonies are very young.

FLUSTRIDÆ.

10. FLUSTRA FOLIACEA (Linnæus).

Common on hard ground in a few fathoms water. *Alder* (*a*).

Very abundant from Stations III., IV. and IX. Also found at Stations I., II. and V.

Oœcia.—May and October.

11. FLUSTRA SECURIFRONS (Pallas). *F. truncata Linn.*

In the laminarian and coralline zones ; abundant. *Alder* (*a*).

Very common from Stations III. and IX. Also found at Stations I., II., IV. and V. Washed up in great quantities at Cullercoats.

Oœcia.—May, June, September and October.

Var. PAPYRACEA (Dalyell) Cullercoats. *Alder.*

12. CARBASEA SOLANDERI, Norman. *C. papyrea Pallas.*

From deep water, frequent. *Alder* (*a*).

Only one colony has been dredged, and that from Station I.

SCRUPOCELLARIIDÆ.

13. SCRUPOCELLARIA REPTANS (Linnæus). *Cellularia reptans* (*Linn.*).

On *Flustra foliacea* and other zoophytes, on Fuci and stones from within tide marks to deep water ; frequent. *Alder* (*a*).

In rock pools, Cullercoats, and very commonly from Stations I., III., IV., V., VI. and IX., on similar habitats and on crabs.

Oœcia.—May to October.

14. SCRUPOCELLARIA SCABRA (Van Beneden). *Scrupocellaria delilii* (*Audouin*).

From the deep water boats. *Alder* (*d*).

15. SCRUPOCELLARIA SCRUPOSA (Linnæus). *Cellularia scruposa* (*Linn.*).

Parasitical on other zoophytes, Laminariae, shells, &c., from within tidal range to deep water ; common. *Alder* (*a*).

Dredegd from every Station except IX.

Oœcia.—September and October.

16. SCRUPOCELLARIA SCRUPEA, Busk. *Cellularia scrupea* (*Busk*).

From the deep-water boats a single small specimen. *Alder* (*a*).

17. BUGULOPSIS PEACHII (Busk). *Cellularia peachii, Busk.*

Numerous specimens from the five-men boats. *Alder* (*a*), (*b*).

Occurred twice on shells from Stations VII. and VIII.

From these and other considerations of the relationship of value to the statistics which they have procured, the Board arrives at the following calculation which is made the basis for a plea for the enforcement of a 9 in. limit, against which we have nothing to urge since we have already in Northumberland adopted this limit. But the further statement that the berried lobster is not so well worth protecting cannot be allowed to pass without contradiction.

Protective Measure.	Value Sacrificed.	Number Protected.	Ratio of Number to Value.
9 in. limit	12·5 per cent. ...	23·9 per cent. ...	1·91
Protection of Berried Females	12·8 ,, ...	10·48 ,, ...	0·82

It is said "From this table it would appear that the 9 in. limit protects more than double the number of lobsters with the same loss of value." It will be noticed at once that the whole point and purpose of protecting the berried lobster has either been forgotten or ignored. No one to my knowledge has ever proposed to protect the berried lobster as a lobster, the desire has been to protect her because of the crop of embryo lobsters which she is carrying. If this essential point be taken into consideration the number protected in relation to the value sacrificed assumes an altogether different aspect. The number protected is the berried lobster, and the number of the larvæ which will survive to maturity.

Perhaps it will be better to put this matter of the protection of the berried lobster into figures. According to the results obtained by the Board from Sussex, the berried lobster constitute 10·48 of the total catch. In the North Eastern district it is 12·4 of the total catch. In the case of Northumberland if we take the Beadnell figures, the percentage of berried lobsters is 12·1, but as the small lobsters are already protected up to 9 in., the percentage less the small is 13, and if the berried lobster be deducted since they are also protected practically altogether by the close time in force on the Northumberland coast, the percentage may be put at 15 of the total marketable catch at the present time.

Now in 1911 there were landed in Northumberland 50,734 lobsters, and the number of berried lobsters caught would therefore be 8,610. If only one of the larvæ survive in each case the total number protected will not be, say 8,500, but 17,000; if two survive, the number would be 25,500.

The reasons for the protection of the berried lobster have been stated and restated in the reports submitted to the Northumberland Sea Fisheries Committee. The following may now be advanced in further evidence of the good results likely to follow from protecting the berried lobster.

Taking again the North Eastern district for comparison with Northumberland. In the former the lobster is protected from 1st September to 1st February, a season which from the Board's results and our own gives practically no protection at all. In both districts the size limit has been raised to 9 inches, and in the Northumberland district the berried lobster is protected for the months when it is mainly in evidence, viz., from 1st April to 31st July. We have therefore by the incidence of these bye-laws a means of contrasting the effects of protecting the berried lobster. There is no necessity for referring to the evidence in detail. It was given in the report for 1904, and in the following reports, the last paper on the subject having been given in the report for 1909-10, p. 21. In these papers it was pointed out that five years after the passing of the bye-law, viz., in 1904, Northumberland took the first position with reference to the landing of lobsters on the east coast of England, replacing the North Eastern with its much larger sea board in this respect. Northumberland has occupied the first position since, that is during the last eight years, and the North Eastern has sunk into the third position, the Eastern having advanced into the second place. This in spite of the fact that it is more than probable that the northern portion of the North Eastern district benefits from the protection given by the Northumberland bye-law. The following figures will bring the evidence furnished in the reports for 1904, and for 1909-10 up to 1911 :—

Year.	Eyemouth.	Northumberland.	North Eastern.	Eastern.
1910...	... 3,145	... 48,877	... 34,215	... 48,100
1911...	... 3,076	... 50,734	... 41,725	... 45,000

There can be no question in the face of this evidence of the desirability of protecting the berried lobster. The contrast tends to show, moreover, that it is more important to protect the berried lobster than to raise the size limit from 8 to 9 inches.

If it be found then that the statements in the paper emanating from the Board with reference to the protection of the berried lobster are not supported by the facts, the remarks

28.* ALDERINA IMBELLIS (Hincks). Callopora, Levinsen. Plate I., Figs. 3 and 3*a*.

Two colonies on shells, one from Station VII. and the other from Station VIII, have been referred to this species, of which they may be a variety. They differ from those figured by Hincks, chiefly in the form of the oœcium. The quadrate area in front which Hincks describes as being depressed is in one of these colonies the most prominent part, and is covered with little nodules similar to those on the margin of the cell. The thickened margin of the oœcium surrounding this area is divided into two parts by a small space just above the bottom of the oœcium on each side. In the other colony which I have, the front portion of the oœcia appear to have been rubbed off by some means or another. The lower front edge of the oœcium is in some cases produced downwards into a point. The zoœcia are closer together than in Hincks' figures, and the margins are very decidedly crenate and covered with small protuberances. In this respect and in shape and thickness the margin agrees with my specimens of *Callopora aurita*, and it is also very like, though thicker, than the margin of some colonies of *Amphiblestrum flemingii*. In Vol. I. of the Nat. Hist. Trans. of Northumberland and Durham, Alder records the dredging of *Membranipora imbellis*, but gives neither description nor figure by which it might be ascertained whether his specimens were of the normal type or resembled this variety.

29. AMPHIBLESTRUM FLEMINGII (Busk) = Callopora, Levinsen. *Membranipora flemingii, Busk.*

On shells, stones, Flustrae, &c., from between tide marks to deep water; common. *Alder* (*a*).

From Stations VII., VIII. and IX. Also from shells of Neptunea, occupied by hermit crabs, from 16 fathoms south-east of St. Mary's Island.

Oœcia—May, June and August.

30. TEGELLA UNICORNIS (Fleming). *Membranipora unicornis* (*Fleming*).

On old bivalve shells, on stones, and on test of *Ascidia sordida;* frequent. *Alder* (*a*).

On *Ascidia sordida* from 36 fathoms east of Newbiggin, and on shells from 16 fathoms south-east of St. Mary's Island, and 29–32 fathoms east by south of the Tyne.

Oœcia.—August, October, May and June.

The larvae of this species hatched out in the tanks in May.

CRIBRILINIDÆ.

31. MEMBRANIPORELLA NITIDA (Johnston). *Lepralia nitida, Johnston.*

Rare. Berwick Bay on *Patella cœrulea. Johnston* (*a*).

On a limpet shell washed up in a Laminaria root, and on the root itself. Dredged from Station V.

Oœcia.—October.

32. CRIBRILINA PUNCTATA (Hassall). *Lepralia punctata, Hassall.*

On the under side of stones in tide-pools; common. Rare in in deep water. *Alder* (*a*).

Has been dredged only once from Station VII. Common on stones between tide marks, Cullercoats.

Oœcia.—April, May, August and December.

33. CRIBRILINA ANNULATA (Fabricius). *Lepralia annulata.*

Two specimens dredged off Northumberland, 1864. *Alder* (*d*).

CELLULARIIDÆ.

34. CELLULARIA FISTULOSA (Linnæus). *Salicornaria farciminoides* (*Ellis and Sol.*).

On shells, &c., from deep water; frequent. *Alder* (*a*).

Common from Stations VII. and VIII., from 40 fathoms east of the Longstone, 18 fathoms east of Cullercoats, $2\frac{1}{2}$ - 3 miles east of Dunstanborough Castle.

HIPPOTHOIDÆ.

35. HIPPOTHOA DIVARICATA, Lamouroux.

Dredged off Northumberland in 1864. *Alder* (*d*).

Common on shells and stones from Station VII.

Oœcia.—June and September.

36. HIPPOTHOA HYALINA (Linnæus). *Lepralia hyalina* (*Linn.*)

Very common on roots and stems of *Laminaria digitata* and other Fuci, on stones, &c., between tide marks and in shallow water. *Alder* (*a*).

The Laminaria roots washed up by storms are very often almost covered with this species. It has also been obtained from Stations V. and VI.

Oœcia.—September and October.

37. BERENICEA PROMINENS, Lamouroux. *Lepralia brongniartii* (*Audouin*).

Rare. On a stone from deep water, Cullercoats. *Alder* (*a*).

38.* HIPPOTHOA EXPANSA, Dawson, var. TRANSPARENS new variety. Plate II., Figs. 1, 1*a*, 1*b*.

A small colony of a species of Hippothoa has been found on the stem of a Tubularian hydroid from 40 fathoms east of the Longstone. The Zoœcia are uniserial but are not prolonged into a narrow connecting fibre as in *H. divaricata*. The orifice in the majority of the cells is orbicular, but in some there is a wide but shallow sinus. The walls of the zoœcia are hyaline, and not ribbed or striated in any way. There is in some of the cells a slight lateral calcareous expansion. The oœcia are borne on an imperfectly developed cell, which is attached to the side of a normal zoœcium by a short stalk. There are from two to four punctures in the upper part of the oœcium.

The species is, I think, referable to *H. expansa*, the only previous British locality for which seems to be 100 fathoms off Unst, Shetland, and which has been found on shells and stones. The lack of any striation, the punctured ovicell, and wide shallow sinus seem, however, to entitle the specimen to rank as a new variety, for which I propose the name *transparens*, as the walls of the zoœcia and oœcia are so clear that the polypide and embryo can be most distinctly seen through them.

39. HAPLOPOMA IMPRESSUM (Audouin). *Lepralia granifera*, Johnston.

On slaty rocks, in front of the coves of Holy Island, and in Berwick Bay. *Johnstone*. On *Modiola vulgaris*, between tide marks at Bamburgh ; not rare. *Alder* (*a*).

RETEPORIDÆ.

40. RETEPORA BEANIANA, King.

From the deep water fishing boats. *King.* From deep water, Embleton Bay. *Embleton* (*a*).

41. RHYNCOZOON BISPINOSUM (Johnston) *Lepralia bispinosa, Johnston.*

On *Modiola vulgaris* from Berwick Bay. *Johnston* (*a*).

ESCHARELLIDÆ.

42. ESCHARELLA IMMERSA (Fleming) = PEACHII (Johnston). *Lepralia peachii.*

Common on stones and shells from near low water mark to deep water. The variety *immersa* is more frequent in deep water. *Alder* (*a*).

Common between tide marks, Cullercoats. On shells from Stations VI. and VII. and from $2\frac{1}{2}$ to 3 miles east of Dunstanborough Castle.

Oœcia.—August, October and December.

43. ESCHARELLA VENTRICOSA (Hassall). *Lepralia ventricosa, Hassall.*

On *Neptunea antiqua* from deep water; rare, Cullercoats. *Alder* (*a*).

Fairly common on various shells and stones from Station VII.

Oœcia.—August.

44. ESCHARELLA VARIOLOSA (Johnston). *Lepralia variolosa, Johnston.*

On stones from the coralline zone; rather rare, Cullercoats. *Alder* (*a*).

45. ESCHAROIDES COCCINEA (Abildgaard). *Lepralia coccinea* (*Abild.*).

On the roots of *Laminaria digitata*, on stones, &c., at and beyond low water mark; frequent. *Alder* (*a*).

46. SCHIZOPORELLA UNICORNIS (Johnston). *Lepralia unicornis, Johnston.*

On the under side of stones in tide pools; frequent at Cullercoats, rare in deep water. *Alder* (*a*).

47.* ESCHARINA SPINIFERA (Johnston).

Schizoporella spinifera (Hincks). B.M.P., page 241 Plate 35.

A small colony growing on a Laminaria root washed up at Cullercoats. Previously recorded from many parts of the coast, including St. Andrews.

48. MICROPORELLA CILIATA (Pallas). *Lepralia ciliata* (*Pallas*).

On stones and shells from low water mark to deep water, but not common. Frequent on the littoral variety of *Modiola vulgaris* at Bamburgh. *Alder* (*a*).

From Stations IV. and VII.; not common.

Oœcia.—May and September.

49. FENESTRULINA MALUSII (Audouin). *Lepralia malusii* (*Audouin*).

On shells and stones from deep water; occasionally. Holy Island and Cullercoats. *Alder* (*a*).

From Station VII., on a good many shells and stones.

Oœcia.—August, September and October.

SMITTINIDÆ.

50. PORELLA CERVICORNIS, var. COMPRESSA (Sowerby). *Cellepora cervicornis, Pallas.*

In deep water, Embleton Bay. *Embleton* (*a*).

51. PORELLA CONCINNA (Busk). *Lepralia concinna,* (*Busk*).

On *Volutopsis norvegicus* from the deep-water boats; rare. *Alder* (*a*).

Not rare on various shells from Station VII, and on Neptunea from deep water.

Oœcia.—July.

52. PORELLA SKENEI (Ellis and Solander). *Cellepora skenei* (*Ellis and Sol.*).

In deep water, attached to shells and zoophytes; rather rare. *Alder* (*a*).

53 SMITTINA TRISPINOSA (Johnston). *Lepralia trispinosa, Johnston.*

Common on shells and stones from deep water. *Alder* (*a*).

Once from Stations III. and IV. Fairly common from Station VII.

Oœcia.—July and October.

54. SMITTINA LANDSBOROVII (Johnston). *Eschara landsborovii* (*Johnston*).

A fine specimen of the erect form on the north coast of Northumberland. *Embleton* (*a*).

A small double-layered fragment, about $\frac{3}{16}$ inch square, was found attached to a colony of *Scrupocellaria reptans* by three or four radical fibres, Station V.

55. SMITTINA RETICULATA (MacGillivray). *Lepralia reticulata, MacG.*

On Fusi, Modiolae and other shells from deep water ; not rare.

Two or three colonies on shells from Cullercoats. *Alder* (*a*).

56. SMITTINA AURICULATA (Hassall). *Lepralia auriculata, Hassall.*

On shells from deep water ; rare. *Alder* (b).

57. SMITTINA LINEARIS (Hassall). *Lepralia linearis, Hassal.*

On shells and stones from deep water ; common. *Alder* (*a*).

On shells and stones from Stations VII. and VIII. Also found on stones between tide marks, Cullercoats.

On *Flustra securifrons* from 40 fathoms east of the Longstone.

Oœcia.—July and October.

58. SMITTINA PALLASIANA (Moll). *Lepralia pallasiana*(*Moll*)

On stones and shells between tide marks, Bamburgh and Cullercoats. *Alder* (*a*).

I have found one colony of this species on a stone in one of the laboratory tanks. Of Hincks' figures it most resembles Plate XXXIII., fig. 3.

59. SMITTINA FASCIALIS (Pallas) var. FOLIACEA (Ellis and Solander). *Eschara foliacea Ellis and Sol.*

From deep water, Embleton Bay ; rare. *Embleton* (*a*).

60. DISCOPORA VERRUCOSA (Esper). *Lepralia verrucosa (Esper).*

On stones, shells, and the roots of Laminariae, between tide marks ; frequent. Common at Bamburgh. *Alder* (*a*).

On rocks and Laminaria roots between tide marks, Cullercoats.

61. DISCOPORA PAVONELLA (Alder). *Eschara pavonella, Alder.*

Cullercoats. *Alder* (*d*). Coast of Northumberland, deep water. *A. Hancock.*

62. PALMICELLARIA (?) CRIBRARIA (Johnston). *Eschara cribraria, Johnston.*

From the deep-water fishing boats ; occasionally. Berwick Bay in 35 fathoms. *Johnston.* Northumberland coast. *Hancock, King, Alder* (*a*).

CELLEPORIDÆ.

63. CELLEPORA PUMICOSA, Linnæus.

On the stems of other zoophytes, on stones and shells, and on the roots and stems of Laminariae, from beyond low water mark to deep water ; common. *Alder* (*a*).

From Stations III., IV.,V. and VII.; but not common.

Oœcia.—July.

64. CELLEPORA AVICULARIS, Hincks.

Common off Holy Island. *Alder* (*c*).

This is a very common species, and the colonies in some cases reach a large size. One piece I have is about two inches long and an inch wide. I have obtained the species from Stations III., IV., V., VII. and IX.

Oœcia.—May, June and September.

65. CELLEPORA DICHOTOMA, Hincks.

Off Holy Island ; rather common. *Alder* (*c*).

Common from Stations VII. and VIII.

Oœcia.—September.

66. CELLEPORA RAMULOSA, Linnæus.

In deep water, attached to shells ; frequent. *Alder* (*a*).

From Station VII. in only one haul, and from 40 fathoms east of the Longstone.

Oœcia.—October and June.

67. SINIOPELTA COSTAZII (Audouin). *Cellepora hassalii* (*Johnston*).

On the stems and roots of Lamimariae and other seaweeds, between tide marks, Bamburgh. *Alder* (*a*).

From Stations III., IV. and V., chiefly on hydroids, and from 40 fathoms east of the Longstone.

Oœcia.—May, June and September.

CYCLOSTOMATA.

68. CRISIA EBURNEA (Linnæus).

On other zoophytes, and on seaweeds, from low water mark to deep water; common. *Alder* (*a*).

Fairly common between tide marks at Cullercoats.

Dredged from all Stations except VI., abundantly from III. and IV., and from 40 fathoms east of the Longstone, 18 fathoms east of Brown's Point, 32 fathoms east by south of Cullercoats, &c.

Oœcia.—May, June, August and October.

69. CRISIA DENTICULATA (Lamarck).

Berwick Bay. *Johnston.* Cullercoats. *Alder* (*a*).

70. CRISIA CORNUTA (Linnæus). *Crisidia cornuta* (*Linn.*).

On other zoophytes from deep water. Cullercoats; rather rare. *Coppin and Alder* (*a*).

This species has not occurred in any of the sixty or more dredgings examined, but has been found two or three times washed up at Cullercoats on Laminaria roots, and at Bamburgh on Flustra.

Oœcia.—November.

71.* CRISIA ACULEATA, (Hassall.)

One small colony of this species was found growing on a worm tube which was attached to *Hydrallmania falcata.*

72. STOMATOPHORA GRANULATA (Milne Edwards). *Alecto granulata* (*M. Edwards*).

On old shells from deep water; rather rare. *Alder* (*b*).

A few colonies on shells and stones from Station VII.

73. STOMATOPHORA MAJOR (Johnston). *Alecto major, Johnston.*

On *Modiola vulgaris* and other shells, from deep water; not common. *Alder* (*a*).

On shells from Station VII.

74. STOMATOPHORA DILATANS (Johnston). *Alecto dilatans, Johnston.*

On an old bivalve (*Tellina crassa*), from deep water, Northumbzland coast. *King* (*a*).

On shells from Station VII.

75. STOMATOPHORA FUNGIA (Couch). *Tubulipora penicillata, Johnston.*

Very rare, Tynemouth. Three specimens have been obtained from shell sand. *Alder* (*a*).

One colony on a shell from Station VII.

76. TUBULIPORA LILIACEA (Pallas). *Tubulipora serpens* (*Linn.*).

On other zoophytes, shells, &c., from deepish water; common. *Alder* (*a*).

From Stations III., V., VII., VIII. and IX., from 40 fathoms east of the Longstone (very fine colonies), 18 fathoms east of Cullercoats, 30 fathoms east of Newbiggin, 32 fathoms east by south of Cullercoats, 40-42 fathoms east of Coquet Island, &c.

Oœcia.—June, September nad October.

77. TUBULIPORA FIMBRIA (Lamarck). *Tubulipora flabellaris* (*Fab.*)

On *Volutopsis norvegicus*, from deep water; rare. *Alder* (*a*).

Three colonies on a shell of Neptunea from 16 fathoms south-east of St. Mary's Island.

78. TUBULIPORA LOBULATA (Hassall).

Dredged off the Northumberland coast in 1864. *Alder* (*d*).

A few young colonies probably belonging to this species on shells and stones from Station VII.

79. DIASTOPORA PATINA (Lamarck). *Tubulipora patina, Lamarck.*

On corallines from deepish water ; frequent. *Alder* (*a*).

On Laminaria roots washed up at Cullercoats, occasionally.

Dredged from Stations I. and VII., but only once from each place.

On shells of Neptunea from deep water.

80. DIASTOPORA OBELIA, Johnston.

On *Modiola vulgaris* from deep water ; frequent. *Alder* (*a*).

81. LICHENOPORA HISPIDA (Fleming). *Tubulipora hispida* (*Fleming*).

On *Plumularia falcata, Carbasia papyrea,* &c., not rare.

The variety B. Johns. (*T. orbiculus,* Lamk.) is the form usually met with. *Alder* (*a*).

Dredged from Stations I., III., V., VII., VIII. and IX. on hydroids, other Polyzoa and shells, also from 40 fathoms east of of the Longstone, and 32 fathoms east by south of Cullercoats.

Oœciostome observed in June.

CTENOSTOMATA.

82. ALCYONIDIUM HIRSUTUM (Fleming).

On *Corallina officinalis* and other seaweeds between tide marks and in shallow water ; common. *Alder* (*a*)

Encrusting form very common between tide marks at Cullercoats. Erect palmate growth about 3 by 3 inches washed up.

83. ALCYONIDIUM MAMILLATUM, Alder.

On old shells from deep water ; not uncommon. *Alder* (*a*).

The species has been obtained in fair abundance on the shells of Neptunea and *Buccinum undatum* occupied by hermit crabs and on *Modiola modiolus.*

84. ALCYONIDIUM MYTILI, Dalyell. *Alcyonidium hexagonum, Hincks.*

On stones and shells from between tide marks to deep water ; frequent. Not yet observed upon seaweeds. *Alder* (*a*).

On stones and Fucus between tide marks, Cullercoats ; common.

Dredged from Station VII. on shells occupied by hermit crabs, and from 29 fathoms east of Blyth.

85. ALCYONIDIUM POLYOUM (Hassall).

On the underside of stones in tide pools, with the last, frequent. *Alder* (*a*).

Some colonies of Alcyonidium on shells of Neptunea from 16 fathoms south-east of St. Mary's Island have been referred provisionally to this species. There appear, however, to be many intermediate forms between this species and *A. mytili* and *A. mamillatum*, differing according to age and the degree of contraction of the polypides.

86. ALCYONIDIUM PARASITICUM (Fleming).

On *Plumularia falcata* and other zoophytes from deepish water ; common. *Alder* (*a*).

From Stations III. and IX., and from 26 fathoms east of Blyth (on Gemellaria), and 30 fathoms east of Cullercoats.

87. ALCYONIDIUM GELATINOSUM (Linnæus).

Attached to old shells and stones in the Laminarian and Coralline zones ; frequent. On the sides of rocks at low-water mark, Bamburgh. *Alder* (*a*),

One specimen found in rock pool, Cullercoats.

From Stations IV., V. and VIII. Small colonies measuring not more than 2 inches. Numerous much-lobed colonies, some measuring about 8 inches in length on a shell from 29-32 fathoms east $\frac{1}{4}$ south of the Tyne.

88 ALCYONIDIUM ALBIDUM, Alder.

Surrounding the stem of *Plumularia falcata* in small patches from the deep-water fishing boats ; rare. *Alder* (*a*).

Several colonies probably of this species have been dredged from about 40 fathoms E. of Coquet Island. They invest various species of hydroids, chiefly Tubularians.

89. ALCYONIDIUM LINEARE, Hincks.

On shells from deep water, Cullercoats ; not unfrequently. *Alder* (*b*).

90. ARACHNIDIUM FIBROSUM ? *Arachnidium hippothooides Hincks.* Plate II., figs. 2, 2A.

The species described by Alder (*b*) as *A. hippothooides* has been split up by Hincks in the " British Marine Polyzoa " into the two species *A. fibrosum* and *A. hippothooides.*

On the tests of Ascidiæ, shells, &c., from deep water, Cullercoats. *Alder.*

I have found a species resembling this both on *Ascidia sordida* (from 34-37 fathoms between the Tyne and Newbiggin), and on a shell of Neptunea from 29½ fathoms east of Blyth.

In each case the colony consisted in part of a large number of cells massed together, surrounded by a network of cells joined by anastomosing fibres. Specimens have been sent to Dr. Harmer, who thinks that although differing considerably from Hincks' figure, they are to be referred to this species.

91.* ARACHNIDIUM CLAVATUM, Hincks.

On the test of *Ascidia sordida* from 40 fathoms east of Coquet Island. The only previously recorded British locality for this species is Shetland. There is no massing together of the cells in the colonies of this species.

92. FLUSTRELLA HISPIDA (Fabricius).

On *Fucus serratus* and other seaweeds between tide marks, and occasionally on stones; common. *Alder* (*a*).

Very abundant between tide marks, Cullercoats.

93. VESICULARIA SPINOSA (Linnæus).

Cullercoats, a single specimen. *Alder* (*a*).

94. AMATHIA LENDIGERA (Linnæus). *Serialaria lendigera* (*Linn.*).

On Fuci and zoophytes from low-water mark to deep water. not rare. *Alder* (*a*).

95. BOWERBANKIA IMBRICATA (Adams) var. DENSA Farre.

In tide pools, on *Corallina officinalis ;* frequent. *Alder* (*a*).

In addition to the above habitat, I have found this variety covering stones in the aquarium tanks very thickly. It has been dredged from Stations III. and IV., growing in dense masses on the fronds of *Flustra foliacea.*

" At extreme low water mark, Cullercoats, a Bowerbankia is found of a more lax mode of growth, sending off free shoots, and having the cells a little more elongated and slender. This I take to be a depauperated form of the true *B. imbricata*." *Alder* (*a*).

96.* BOWERBANKIA CAUDATA, Hincks.

A small colony of this species, consisting of only about half-a-dozen cells, was found on the leg of *Hyas coarctatus* from Station V.

Osburn (Bryozoa of the Woods Hole Region) gives this species as *Bowerbankia gracilis var. caudata*, and records it from various parts of the east coast of America.

Previously recorded British localities are Ilfracombe, Plymouth and Anglesea.

97. FARRELLA PEDICELLATA, Alder.

Triticella pedicellata. Duerden, 1893 ; Hincks, 1880.

On old shells of *Buccinum undatum* and *Neptunea antiqua*, from deep water ; not uncommon. *Alder* (*a*).

This species has only been recorded from one other British locality, viz., from the west coast of Ireland (by Duerden in 1893), where it was also growing on old shells. I have only found it once when it was growing on *Dicoryne conferta*, which was itself growing on the carapace and legs of *Hyas coarctatus* from deep water. Nordgaard also notes it growing on *Dicoryne conferta*. The cells in this large colony grow from a thin creeping stolon as described by Alder, and not from a continuous horny crust (Duerden). The pedicels vary in length from $\frac{1}{2}$ to 4 or 5 times the length of the cell.

98. CYLINDROECIUM DILATATUM (Hincks). *Avenella fusca* (*Busk*).

On *Flustra truncata* and *Plumularia catherina*, from the coralline zone, Cullercoats. *Alder* (*a*).

On *Gemellaria loricata* from Stations II. and IV.

99. BUSKIA NITENS, Alder.

On *Plumularia falcata, Campanularia dumosa*, &c., from deep water ; rather rare. *Alder*. On a stone at low water mark, Whitley. *Coppin* (*a*).

This species appears to be common on both hydroids and branching Polyzoa from Stations II., IV., V., VII. and VIII

100.* TRITICELLA KORENII, G. O. Sars.

In the report from this laboratory for 1911 Professor Meek recorded the finding of this species growing on two specimens of *Calocaris macandreæ*, a crustacean which is only rarely found on this coast. Triticella is growing on the back, legs and telson in thick clumps, but after a closer examination I have come to the conclusion that while the colony on the telson and uropods is undoubtedly *T. korenii*, those on the back and legs must be referred to *T. bœckii*. The zoœcia in these latter are much shorter, while the frenaculum is very distinct, and is at least one-third of the length of the cell from the base.

This year the stomach of a locally caught sturgeon was opened and found to contain a great many of the Calocaris, which were in a fairly good condition. Most of those which were in a fit state for examination were found to be covered with dense colonies of *Triticella korenii*.

Previous British localities, Kerrera Sound, Oban ; Berehaven, south-west Ireland.

101.* TRITICELLA BŒCKII, G. O. Sars.

On the back and legs of *Calocaris macandreœ* from 34-35 fathoms east of St. Mary's Island. Previously recorded from Christiania Sound on *Geryon tridens* ; Berehaven, south-west of Ireland, on *Portunus depurator* (Duerden, Proc. Roy. Irish Acad., 3rd ser., vol. III., No. 1) ; the Irish Sea (47-60 fathoms north-west of Bradda Head) on *Calocaris macandreœ* (L.M.B.C., 8th Report) ; and Plymouth on *Gonoplax rhomboides* (M.B.A., new series, vol. VII., No. 2).

102. VALKERIA UVA (Linnæus).

In tide pools on *Corallina officinalis ;* frequent. *Alder.*
Very common on various small algae in tide pools, Cullercoats.
* var. CUSCUTA (Linnæus).
In a tide pool, St. Mary's Island.
Small colonies dredged from Stations IV., V., VII. and VIII.
None of these colonies exceeded half-an-inch in length.

ENTOPROCTA.

103. PEDICELLINA CERNUA (Pallas). *Pedicellina echinata. Sars.*

On small seaweeds and corallines, near low-water mark ; frequent. *Alder.* (a).

Very common on all kinds of algae between tide marks, Cullercoats.

Dredged abundantly on hydroids and other Polyzoa from all Stations, except VI. and IX., and from 40 fathoms east of Longstone.

* var. BELGICA, Gosse.

From Station V.

104. PEDICELLINA BELGICA, Van Beneden.

On other zoophytes, Cullercoats ; rare. *Alder.*

Hincks does not include this in his list of British species, and Alder gives neither description nor figure by which his identification might be confirmed.

105. ASCOPODARIA GRACILIS (M. Sars).

On the under side of stones, and on the stems of zoophytes, Cullercoats and Tynemouth. *Alder.*

On shells, stones, hydroids and Polyzoa from Stations III., IV., VII. and VIII. Very common. Also from 40 fathoms east of the Longstone, 32 fathoms east by south of Cullercoats, and between tide marks, Cullercoats.

106.* LOXOSOMA NITSCHEI, Vigelius.

In June of this year a species of Loxosoma was found growing in one of the tanks of the aquarium here in very great abundance. It is growing on several very different kinds of Algae, two or three hydroids, several species of Polyzoa, including *Alcyonidium hirsutum, Cribrilina punctata*, &c., and on a piece of coal. There are numerous buds which move about independently, and expand and contract their tentacles before being set free, and which swim about with the head hindmost, and move in a series of somersaults after being liberated. The chief differences between this species and *L. singulare*, which of those described by Hincks it most resembles, are (1) the peduncle is frequently longer than the body, (2) there are always only eight tentacles, (3) the peduncle does not end in a foot.

Dr. Harmer, of the British Museum, has kindly accepted specimens for examination, and a further note on the species will appear later.

The species appears to be *L. nitschei, Vigelius.*, described and figured in Niederl. Arch. F. Zool. supp. Band I.—Catalogue of the Polyzoa collected during the Dutch north-polar cruises of the "Willem Barents." Vigelius. This description is very inadequate, being founded on badly preserved material, which probably accounts for the fact that the length of the individuals is given as only 0·15 mm., which is less than half that of the present living specimens.

The locality for Vigelius' specimens is unknown, probably Barents' Sea, and the habitat *Menipea ternata*.

BIOLOGICAL INVESTIGATIONS.

By the aid of the "Evadne" a number of stations were visited during the months of May to October, and catches were made with surface nets and dredges.

The surface catches have been examined by Mr. Storrow, and the Polyzoa and Hydroids obtained by the dredge are here reported on by Miss Roper and Miss Robson. The remainder of the material will be used to throw further light on the nature of the fauna of the district.

The stations and the nature of the bottom were as follows :—

STATION 1, N.E. of Newbiggin Church, ca. 15 faths. Rocky with occasional patches of sand.
STATION 2, Druridge Bay, Creswell Trees bearing W. by S., ca., 20 faths. Sand.
STATION 3, ½ mile E. of Boulmer Steel Buoy. ca. 12 faths. Rocky.
STATION 4, E. of Dunstanborough Castle, ca. 17 faths. Rocky.
STATION 5, ½ mile E. of North Sunderland Buoy, ca. 12 faths. Rocky.
STATION 6, Between the Inner Farne and Bamburgh Castle. Rocky.
STATION 7, 5-6 miles S.E. of the Crumstone (Farne Is.), ca. 35 faths. Gravel and broken shells.
STATION 8, 17 miles S.E. by S. of the Crumstone, ca. 35 faths. Gravel and broken shells.
STATION 9, 4-5 miles E. of Newbiggin Church, ca. 25 faths. Muddy.

Stations 1 to 6 were visited in one day, the night was spent at the Farnes or Holy Island, and during the following day catches were taken at stations 7, 8 and 9.

The date, time and the state of the sea when the various stations were visited are given in the following table :—

STATION.	1	2	3	4	5	6	7	8	9	STATE OF SEA.
May 11, 12, 13	2·5 P.M.	—	10·15 A.M.	12 NOON	1 P.M.	1·45 P.M.	11·10 A.M.	12·15 P.M.	3·30 P.M.	Sea rough on 11th, had to put into Amble on account of weather. Heavy swell on 12th and 13th.
June 26, 27 ...	12·25 P.M.	1·45 P.M.	3·30 P.M.	4·30 P.M.	5·30 P.M.	6·15 P.M.	11·15 A.M.	1·5 P.M.	4·10 P.M.	Sea smooth.
July 31, 30 ...	10·20 A.M.	11 A.M.	12·30 P.M.	1·50 P.M.	3 P.M.	3·50 P.M.	8·25 A.M.	11·55 A.M.	3·40 P.M.	Sea moderate on 30th, rough on 31st.
Aug. 21, 22 ...	10·40 A.M.	11·10 A.M.	1·15 P.M.	2·30 P.M.	3·40 P.M.	4·20 P.M.	10·55 A.M.	1·20 P.M	5·40 P.M.	Sea choppy.
Sept. 12, 13 ...	12 NOON	12·50 P.M.	2·45 P.M.	4 P.M.	5·15 P.M.	6 P.M.	1·20 A.M.	3·30 P.M.	6·20 P.M.	Heavy swell on 12th, light swell on 13th.
Oct. 9, 10 ...	10·50 A.M.	11·15 A.M.	2 P.M.	3·10 P.M.	5 P.M.	5·10 P.M.	10·30 A.M.	12·25 P.M.	4·10 P.M.	Sea choppy.

In the tables the asterisks indicate the relative abundance of the organisms and groups mentioned. * the presence of the organism, ** in small numbers, *** in fairly large numbers, **** in large numbers, ***** in extremely large numbers.

SURFACE LIFE.

By B. STORROW.

Fish Eggs.

Fish eggs were taken in the surface net during the months of May, June and July, but by far the greater numbers were found in June. In May the eggs in the catches made at the inshore stations consisted of those of the flounder and dab (*P. limanda*); whilst these, with Gadoid eggs varying in size from 1·03 -1·15 mm., together with the eggs of the dragonet, were in the catches from stations 7, 8 and 9.

In June the eggs taken were as follows :—

STATION.	1	2	3	4	5	6	7	8	9	Total.
Brill	—	14	2	6	—	—	—	—	—	22
Flounder	1	1	4	1	2	—	1	1	1	12
Dab *P. limanda*	3	13	—	25	—	—	1	1	1	44
Dragonet	2	2	—	—	—	—	—	—	—	4
Gurnard	—	—	—	—	—	—	—	4	—	4
Rockling	2	6	16	37	5	—	2	1	—	69
Sprat	—	—	—	—	—	—	—	—	6	6
Gadoid	—	14	1	—	—	—	2	2	—	19

Owing to the early stages of development in the Gadoid eggs, and the variation in size which may occur in eggs of the same species, it is impossible to name them with any degree of certainty.

The rockling eggs varied in size from 0·65 to 0·96 mm., and occasionally the oil globule was pigmented.

The eggs taken in July were flounder (3), rockling (1), Gadoid (1).

Appendicularians.

Appendicularians were found in the catches from May to September. In June they were most abundant in the northern part of the district, in the neighbourhood of the Farne Islands. The maximum was reached in July when they were generally distributed. In August and September they were present in small numbers, except at station 9 (September), where they occurred in fairly large numbers.

Isopods and Amphipods.

The only species of Isopods found in the catches were *Idotea balthica* (Pallas) at station 1 in May, June and October, and *Eurydice pulchra*, Leach, at station 5 in July.

The commonest of the Amphipods was *Euthemisto compressa* (Goës). *Apherusa borealis* (Boeck), *Apherusa bispinosa* (Bate), and a juvenile Metopa were also taken.

Copepods.

Copepods were most abundant in the months June to September, but in May they were present in large numbers at stations 7 and 8, and in October at station 7. The commonest forms and those forming the bulk of the catches were *Pseudocalanus elongatus*, Boeck, and *Acartia clausi*, Giesbrecht.

Juvenile forms were taken in the largest numbers in May and June, and again in September, though in the latter month there were few juvenile forms from stations 7 and 8.

Calanus helgolandicus (Claus) was found in all months, but not at every station. It was generally most abundant in the offshore waters, and was taken only in small numbers in August and September.

Pseudocalanus elongatus, Boeck. One of the commonest of our copepods. It occurred only sparingly in May ; in June it was more plentiful in the northern part of the district, whilst in July, August and September it formed the greater part of the catches.

Centropages typicus, Kroyer. It was only in September that this species was taken in any quantity, and then in the offshore waters. One or two occurred in June in the catch from station 8, none in July, few in August from stations 1 and 8, and in October it was present, but in small numbers, in all catches.

Centropages hamatus (Lilljeborg). This species though rarely occurring in any great numbers was commoner than the preceding, and was taken every month, being most abundant in July.

Temora longicornis, Müller, was taken in greatest numbers in the inshore waters of the northern part of the district in September. It was found every month.

Anomalocera patersoni, Templeton. Was most abundant in the offshore waters. It was fairly plentiful in May at stations 7 and 8, and again in September at station 7, in which month it was more

generally distributed; this was probably due to the state of the sea, for on the 12th September there was a heavy swell due to a strong north-east wind on the 11th.

Acartia clausi, Giesbrecht. This species is one of our commonest copepods and in July, August, and September, together with *Pseudocalanus elongatus*, formed the greater bulk of the surface catches.

Acartia longiremis (Lilljeborg). Another common form, but rarely occurring in such numbers as the preceding species; was found in June at stations 3 and 4 to be by far the most abundant copepod in the samples.

Oithona similis, Claus. Was present from May to October. It was very plentiful in July at stations 7 and 8, where it was taken in large numbers.

Other copepods occasionally taken were *Longipedia scotti*, G. O. Sars, *Alteutha interrupta* (Goodsir), *Eupelte purpurocincta* (Norman), *Rhynchothalestris rufocincta* (Norman), *Dactylopusia tisboides* (Claus), and *Cyclopicera gracilicauda*, Brady. The commonest of these were *Dactylopusia tisboides* and *Longipedia scotti*, there being several of the latter in the September catches from stations 5 and 6.

Cladocera.

Evadne nordmanni, S. Lovén. Was taken in every month except October. In May it was only obtained in two catches; in June at station 8 it was present in very large numbers, and in July it was generally distributed, and, as a rule, occurred in fairly large numbers. The August and September samples contain it, but only in small numbers.

Podon polyphemoides (Leuckart). This form appeared first in the July samples, but always in small numbers. One or two were found also in August.

Sagitta.

Sagitta bipunctata (Quoy and Gaimard). Only odd individuals were present in the May and June catches. In July and August there was a slight increase in numbers, the August catches for stations 8 and 9 yielding fairly large numbers. In September at stations 7 and 8 large numbers of adult specimens occurred, and were followed in October by large catches of young forms at most of the stations.

Ctenophores.

In June thousands of Beroe, together with Lesueuria, Pleurobrachia and Mertensia were to be seen in the waters of the district, and with them were often countless numbers of Aurelia and Cyanea. They were as a rule most numerous where the tides meet, and often formed long lines some distance from the shore. They do not, except Pleurobrachia, occur in any number in the catches, as such localities were missed when taking the samples. They were noticed in most abundance off Cullercoats, in Druridge Bay, and in the "Kettle," an anchorage between the Inner Farne and the Wide Opens.

Pleurobrachia was also taken in October.

Ceratium.

No attempt has been made to distinguish the different species of Ceratium. Under *Ceratium tripos* are included all Euceratium forms; *Ceratium furca* includes the Biceratium forms, and probably the young of *Ceratium tripos*, and *Ceratium fusus* the Amphiceratium forms. Ceratium was generally most abundant in the offshore waters, and was found every month, being very common from July to October.

Peridinium.

Peridinium appeared in June, and obtained its maximum in July. In August and September it was generally present in small numbers, and only occasionally in October. The most important species is probably *P. divergens*.

Diatoms.

Diatoms were not found generally in any quantity, except in September. In May, at station 3, Rhizosolenia, Chaetoceros and Biddulphia were found in fair numbers, and in June, at station 9, Rhizosolenia occurred in large numbers.

In September, when large quantities of diatoms were taken, the chief forms were *Rhizosolenia delicatula* and *R. styliformis*, with Chaetoceros, Eucampia, Coscinodiscus and Biddulphia.

Larval Forms.

Larval forms of invertebrates were found in every month, and sometimes added considerably to the bulk of the catches.

Echinoderm larvæ were present every month, but never in any great numbers, except in July, when at station 8 many were taken. In the catches for the other months they occurred but sparingly.

Larval Molluscs were found in every month. In May they were few in number, but increased in June, reaching their maximum in July and August ; in September there was a slight decrease in numbers, followed by a slight increase in October. Lamellibranch larvæ were more abundant than Gasteropod larvæ, the latter in June being taken in very small numbers, and then only in one catch.

Larval Decapods were never taken in any great numbers, except in August at station 7, where Brachyura megalopas were common. They were absent in May, and in June found only in the catches from the northern part of the district. In July and August they were most abundant, few in numbers in September, whilst in October there was a slight increase.

Barnacle larvæ occurred every month, but were most abundant in May when the Cypris stage as well as the Nauplius was taken in fairly large numbers at the stations in the northern part of the district.

Polychaet larvæ were present every month, but never in any number, except in June and July at stations 3 and 1 respectively. Polybostrichus, the bud of Autolytus, was found in June to be fairly common in the southern part of the district, and in September and October it occurred in the samples from the northern stations. In August and September pelagic polychaets, free swimming stages of Syllids, were obtained.

Larval Polyzoa (Cyphonautes) were taken every month.

Medusoids occurred in October in greatest numbers.

There were also in the catches some forms which could not be determined in the preserved condition. Some of them are probably the cysts of Peridinium, others are comparable with the Ovum hispidum of Cleve, the " Barbierbeckenstatoblast " and Umrindete cyst of Hensen.

SURFACE LIFE.

MAY.

STATION	1	†2	3	4	5	6	7	8	9
Fish eggs				4	3	4	5	11	5
Appendicularians			*		*	*			
Actinotrocha									
Starfish—Juv.									
Pluteus			*	*				*	*
Bipinnaria									
Larval Gasteropods			*	*	*	*			
Larval Lamellibranchs			*		*	*			*
CRUSTACEANS.									
LARVAL DECAPODS.									
Macrura—Zoëa									
Mysis									
Anomura—Zoëa									
Metazoëa									
Brachyura—Zoëa									
Megalopa									
ISOPODS	*								
AMPHIPODS.									
Euthemisto compressa (Goës)									
COPEPODS	**		***	***	***	***	****	****	***
Juv.	**		***	***	***	***	**	**	*
Calanus helgolandicus (Claus.)... ...	*		**	**	**	**	*	****	*
Pseudocalanus elongatus, Boeck ...				*	*				
Centropages typicus, Kroyer									
Centropages hamatus (Lilljeborg) ...	*		*	*	*	*		*	*
Temora longicornis, Müller			*	*	*	*			
Anomalocera patersoni, Templeton ...							****	***	*
Acartia clausi, Giesbrecht			**	**	**	**	**	****	***
Acartia longiremis (Lilljeborg)... ...	*		**		**	*	*	*	*
Oithona similis, Claus.			***	**	*	*			
Barnacle—Nauplius	*		***	**	***	***			*
Cypris			**	**	***	***	****	**	*
Cast cuticle					*				
Evadne nordmanni, S. Lovén				**	*				
Podon polyphemoides (Leuckart)... ...									
WORMS									
Pelagic Polychaets									
Polybostrichus									
Larval Polychaets			**	*	*	*		*	
Tomopteris helgolandica, Greeff. ...							1	2	
Sagitta bipunctata (Quoy and Gaimard)									
Larval Polyzoa—Cyphonautes			**	*	*	*			*
Medusoids									
Ctenophores									
Ceratium tripos			*	*	*		*	**	**
Ceratium furca									
Ceratium fusus				*				*	*
Peridinium sp.									
Diatoms			***	*					**

† Catch not taken at this Station in May.

SURFACE LIFE—*continued.*

JUNE.

STATION	1	2	3	4	5	6	7	8	9
Fish eggs	8	50	23	69	7		6	9	8
Appendicularians					*	**	***	*	*
Actinotrocha									
Starfish—Juv.					*				
Pluteus						*	*		*
Bipinnaria									
Larval Gasteropods							*		
Larval Lamellibranchs			**		***	***	**		*
CRUSTACEANS.									
LARVAL DECAPODS.									
Macrura—Zoëa								*	
Mysis								*	
Anomura—Zoëa					*	*		*	
Metazoëa									
Brachyura—Zoëa						*		**	*
Megalopa									
ISOPODS	*								
AMPHIPODS.					*	*			
Euthemisto compressa (Goës)					*	*			
COPEPODS	*	*	****	*****	****	****	***	****	**
Juv.	*	*	***	**	*	*	***	**	*
Calanus helgolandicus (Claus.)				*	**	***	***	****	
Pseudocalanus elongatus, Boeck ...			*	*	***	***	***	**	*
Centropages typicus, Kroyer								*	
Centropages hamatus (Lilljeborg) ...	*		**	*	**	*	*	*	
Temora longicornis, Müller				*	***	***			
Anomalocera patersoni, Templeton ...									
Acartia clausi, Giesbrecht	*		*	**	***	*	**	****	**
Acartia longiremis (Lilljeborg)... ...	*		****	*****	*			***	*
Oithona similis, Claus.					*	*	**	*	
Barnacle—Nauplius					*	*			
Cypris	*		***	*	*				
Cast Cuticle	*	*	*	***	*				
Evadne nordmanni, S. Lovén	*	*	*	*	*	**	**	*****	**
Podon polyphemoides (Leuckart) ...									
WORMS.									
Pelagic Polychaets									
Polybostrichus	***		***						*
Larval Polychaets			****	*	**	*	*		
Tomopteris helgolandica, Greeff. ...									
Sagitta bipunctata (Quoy and Gaimard)								*	
Larval Polyzoa—Cyphonautes	*		**	*	**	*	*		*
Medusoids					*				
Ctenophores		*		*	*	*		*	*
Ceratium tripos	*		*		*		***	*	**
Ceratium furca	*		*				*	*	**
Ceratium fusus	*		*				**	*	**
Peridinium sp.	*		*	*	*	*	**	*	***
Diatoms	**		*				*		****

SURFACE LIFE—*continued.*

JULY.

STATION	1	2	3	4	5	6	7	8	9
Fish eggs	3					1		1	
Appendicularians	***	***	****	***	**	***	**	***	***
Actinotrocha	*		*				*	*	
Starfish—Juv.	*					*	*		
Pluteus		*	*		*	*	***	****	*
Bipinnaria							*		
Larval Gasteropods			*	*	**	**	*	*	**
Larval Lamellibranchs	****	*	*	*	**	***	*	*	*
CRUSTACEANS.									
Larval DECAPODS.									
Macrura—Zoëa						*			
Mysis						*			
Anomura—Zoëa		*	*		*		*		
Metazoëa		*							
Brachyura—Zoëa		***	*			**	**	**	
Megalopa				*			*	*	*
ISOPODS					*				
AMPHIPODS.									
Euthemisto compressa (Goës)									
COPEPODS	****	****	****	****	****	****	****	****	****
Juv.	*		*	*	*		*	*	*
Calanus helgolandicus (Claus.)	*	**	*		*	*	****	*	**
Pseudocalanus elongatus, Boeck ...	**	****	****	***	****	***	*	**	****
Centropages typicus, Kroyer									
Centropages hamatus (Lilljeborg) ...	**	*	*	***	*	*	*	*	**
Temora longicornis, Müller	**	*	*		**	**	*		*
Anomalocera patersoni, Templeton ...		*	*					*	
Acartia clausi, Giesbrecht	***	****	****	****	****	****	**	****	***
Acartia longiremis (Lilljeborg)... ...	**		**	*	*	**	*	**	*
Oithona similis, Claus.	**	**	**	**	*	***	****	****	***
Barnacle—Nauplius	**			**	**	*			
Cypris	*			*	*	*			*
Cast Cuticle		*			*				
Evadne nordmanni, S. Lovén	***	***	**	***	***	**	**	***	**
Podon polyphemoides, Leuckart	*		*	*	**	**	*	*	*
WORMS.									
Pelagic Polychaets									
Polybostrichus				*		*			
Larval Polychaets	***	*			*		*	*	
Tomopteris helgolandica, Greeff. ...									
Sagitta bipunctata (Quoy and Gaimard)	**	*	*		*	*	*	*	
Larval Polyzoa—Cyphonautes	***	*	*	*	*	*	*	*	*
Medusoids	*							*	
Ctenophores									
Ceratium tripos	**	**	**	***	**	**	****	****	****
Ceratium furca	*	***	***	**	**	*	****	***	****
Ceratium fusus	*	*	*	*	*	**	***	**	*
									*
Peridinium sp.	*	***	***	***	*	*	***	****	*****
Diatoms	*		*	*	*	*	*		*

SURFACE LIFE—*continued.*

AUGUST.

STATION	1	2	3	4	5	6	7	8	9
Fish eggs									
Appendicularians	*	*	*	**	*	*	*	*	*
Actinotrocha	*				*	*		*	
Starfish—Juv.		*			*				
Pluteus								*	*
Bipinnaria									
Larval Gasteropods	*	*	*	*	*	*	*	**	**
Larval Lamellibranchs	*	**	*	**	*	*	**	**	*
CRUSTACEANS.									
LARVAL DECAPODS.									
Macrura—Zoëa	*	*							
Mysis									*
Anomura—Zoëa		**							
Metazoëa	*	**							*
Brachyura—Zoëa	*	**	*				*		***
Megalopa		*					****	*	*
ISOPODS									
AMPHIPODS	*	*							
Euthemisto compressa (Goës)									
COPEPODS	****	****	****	****	****	****	****	****	****
Juv.	*	*	*	*		**		*	*
Calanus helgolandicus (Claus.)... ...		*			*		**		**
Pseudocalanus elongatus, Boeck ...	****	***	***	****	**	*	***	****	****
Centropages typicus, Kroyer	*							**	
Centropages hamatus (Lilljeborg) ...	**	*	*	**	**	*	*	*	*
Temora longicornis, Müller	**	**	*	*	*	*			**
Anomalocera patersoni, Templeton ...	*	*						**	*
Acartia clausi, Giesbrecht	****	****	****	****	****	****	****	****	****
Acartia longiremis (Lilljeborg) ...		*	**	**	**	**			
Oithona similis, Claus.	**	***	*	*	*	*	***	**	**
Barnacle—Nauplius	*	*	*	**	*	*	*		
Cypris	*	*	*		*	*			
Cast Cuticle									
Evadne nordmanni, S. Lovén	*	*			*	*	**	**	**
Podon polyphemoides (Leuckart)		*			*				
WORMS.									
Pelagic Polychaets	*		*		*				*
Polybostrichus									
Larval Polychaets	*	*	*		*	*	*		*
Tomopteris helgolandica, Greeff. ...	...		**						
Sagitta bipunctata (Quoy and Gaimard)	*	*	*	*			*	***	***
Larval Polyzoa—Cyphonautes	*	*	*	*	*	*	*	*	*
Medusoids		*		*				*	*
Ctenophores									
Ceratium tripos	*	*	*	*	*	*	***	****	***
Ceratium furca	*	*	*	*	*	*	*	***	**
Ceratium fusus	*	*						**	
Peridinium sp.		*			*	*	*	*	*
Diatoms	*	**	*	*	*	*			***

SURFACE LIFE—*continued.*

SEPTEMBER.

STATION	1	2	3	4	5	6	7	8	9
Fish eggs						†			
Appendicularians	**	**		*	*	*	*	*	***
Actinotrocha				*					
Starfish—Juv.									
Pluteus						*	*		
Bipinnaria									
Larval Gasteropods		*	*	*	*	*	*	*	*
Larval Lamellibranchs	*	*	*	*	*	*			*
CRUSTACEANS.									
LARVAL DECAPODS.									
Macrura—Zoëa									
Mysis					*				
Anomura—Zoëa					*	*			
Metazoëa									
Brachyura—Zoëa									
Megalopa			*	*		*	*		
ISOPODS									
AMPHIPODS.									
Euthemisto compressa (Goës)									
COPEPODS	****	****	****	****	****	****	***	****	***
Juv.	***	***	**	**	***	***	*	*	**
Calanus helgolandicus (Claus.) ...			*	**	*	*	*	*	
Pseudocalanus elongatus, Boeck ...	*	*	**	***	****	****	***	*	***
Centropages typicus, Kroyer	*	*	*	*	*	**	***	****	*
Ceniropages hamatus (Lilljeborg) ...	*	**		*	*	*	*	*	
Temora longicornis, Müller	*	*	**	*	****	***			**
Anomalocera patersoni, Templeton ...		*	**	**	*	**	***	*	
Acartia clausi, Giesbrecht	****	****	****	****	**	**	**	*	*
Acartia longiremis (Lilljeborg) ...				*	**	*	*	*	*
Oithona similis, Claus.	**	*	*	**	*	*	**	*	**
Barnacle—Nauplius	*	*	*	*	**	**			*
Cypris	*	*	*						*
Cast Cuticle				*	*				
Evadne nordmanni, S. Lovén	*	*	*	*	**	**	*	*	
Podon polyphemoides (Leuckart)... ...									
WORMS.									
Pelagic Polychaets		*		*		*			*
Polybostrichus					**	*			*
Larval Polychaets					*	*			*
Tomopteris helgolandica, Greeff. ...					*	*			
Sagitta bipunctata (Quoy and Gaimard)	*		*	*		***	****	*****	*
Larval Polyzoa—Cyphonautes	*	*					*	*	*
Medusoids	*			*	*	*	*		*
Ctenophores									
Ceratium tripos	**	**	**	***	**	****	*****	*****	***
Ceratium furca	*	*	*	*	*	***	***	****	*
Ceratium fusus				*		*	**	*	*
Peridinium sp.	*	*		*		*	*	*	*
Diatoms	****	****	*	***	**	****	*****	****	**

† Larval herring.

SURFACE LIFE—*continued.*

OCTOBER.

STATION	1	2	3	4	5	6	7	8	9
Fish eggs									
Appendicularians									
Actinotrocha									
Starfish—Juv.					*	*	*		
Pluteus								*	
Bipinnaria									
Larval Gasteropods		*	*	*	*	*	***	**	*
Larval Lamellibranchs		*	**	**	*	**	***	*	
CRUSTACEANS.									
LARVAL DECAPODS.									
Macrura—Zoëa									
Mysis									
Anomura—Zoëa			*		*	**			*
Metazoëa									
Brachyura—Zoëa			**		*	*			
Megalopa			*			*	*		
ISOPODS	*								
AMPHIPODS		***	***			*			*
Euthemista compressa (Goës)		***	***			*			*
COPEPODS	**	***	***	**	***	***	****	***	***
Juv.		*				*			
Calanus helgolandicus (Claus.)... ...	*	*	**	*	*	**	****	***	***
Pseudocalanus elongatus, Boeck ...	*	**	***	*	***	***	**	*	**
Centropages typicus, Krover	*	*	*	*	*	*	*	*	*
Centropages hamatus (Lilljeborg) ...		*	*						*
Temora longicornis, Müller	*	*	**	*	**	**	**	**	***
Anomalocera patersoni, Templeton ...							*		
Acartia clausi, Giesbrecht	**	**	*	*	*	*			*
Acartia longiremis (Lilljeborg)... ...		*	*	*	*	*			*
Oithona similis, Claus.	*	**	*	*	*	*	*	*	**
Barnacle—Nauplius	*	*	*	*	*	*			
Cypris			*	*	*	*	*		
Cast Cuticle									
Evadne nordmanni, S. Lovén									
Podon polyphemoides (Leuckart)... ...									
WORMS.									
Pelagic Polychaets									
Polybostrichus					*	*			
Larval Polychaets			*		*	*			
Tomopteris helgolandica, Greeff. ...			*		*	*			
Sagitta bipunctata (Quoy and Gaimard)	****	****	****	**	***	***	****	***	****
Larval Polyzoa—Cyphonautes				*	*		*		
Medusoids	***	***	*****	***	***	**	****	****	****
Ctenophores	**	**		**	**	*			
Ceratium tripos	**	****	**	***	****	****	****	*****	****
Ceratium furca	*	*	*	*	*	*	*	**	**
Ceratium fusus	*	**	*	*	*	***	**	***	***
Peridinium sp.					*	*		*	
Diatoms	*	**	*	*	*			*	

POLYZOA.

By R. E. ROPER, B.Sc.

STATION I.

	May.	June.	July.	Aug.	Sept.	Oct.
Gemellaria loricata (Linn.)		*	***			
Scrupocellaria scruposa (Linn.) ...						**†
Scrupocellaria reptans (Linn.)			*			*
Bugula avicularis (Linn.)			*			
Bugula flabellata (J. V. Thompson) ...						*
Flustra foliacea (Linn.) ...		*	*			*
Flustra securifrons (Pallas)						*
Carbasea solanderi, Norman						*
Electra pilosa (Linn.)			*			
Crisia eburnea (Linn.)			*			
Diastopora patina (Lamarck)						*
Lichenopora hispida (Fleming) ...						*
Pedicellina cernua (Pallas)			*			*

STATION II.

	May.	June.	July.	Aug.	Sept.	Oct.
Eucratea chelata (Linn.)			*			
Gemellaria loricata (Linn.)			*		*	
Scrupocellaria scruposa (Linn.) ...						*
Flustra foliacea (Linn.)					*	
F. securifrons (Pallas)			*			*
Crisia eburnea (Linn.)						*
Buskia nitens, Alder						*
Cylindroecium dilatatum (Hincks) ...			*			
Pedicellina cernua (Pallas)			*			*

† Oœcia present.

POLYZOA—*continued.*

STATION III.

	May.	June.	July.	Aug.	Sept.	Oct.
Eucratea chelata (Linn.)	*	**		**	*	*
Gemellaria loricata (Linn.)	*	**		**	*	*
Menipea ternata (Ellis and Sol.) ...				*		
Scrupocellaria scruposa (Linn.) ...		*		**	*	*
Scrupocellaria reptans (Linn.)	***	*		*		***†
Bugula flabellata (J. V. Thompson) ...	*	*		*†	*	*†
Flustra foliacea (Linn.)...	***†	**				***†
Flustra securifrons (Pallas)	*			*	***	
Electra pilosa (Linn.)	*		*	*	*	*
Membranipora membranacea (Linn.) ...						*
Callopora dumerilii (Audouin)... ...		*				
Smittina trispinosa (Johnston) ...	*					
Cellepora pumicosa, Linn.			*			
Cellepora avicularis, Hincks				*	*†	
Siniopelta costazii (Audouin)	*†	*			*†	
Crisia eburnea (Linn.)	*†	*		*	*	*†
Tubulipora liliacea (Pallas)	*	*				*
Lichenopora hispida (Fleming) ...	*	*			*	
Alcyonidium, sp.		*				
Alcyonidium parasiticum (Fleming) ...				*		
Bowerbankia imbricata (Adams) ...		*				
Valkeria uva (Linn.)				*		
Pedicellina cernua (Pallas)	*	*		*		*
Ascopodaria gracilis (Sars)		*		*		

STATION IV.

	May.	June.	July.	Aug.	Sept.	Oct.
Eucratea chelata (Linn.)...	**	*	*	*	*	*
Gemellaria loricata (Linn.)	**		***	*	*	***
Menipea ternata (Ellis and Sol.) ...	**	**	**		*†	**
Scrupocellaria scruposa (Linn.) ...	*	*	**	*	*†	**
Scrupocellaria reptans (Linn.)... ...	***†	***†	*	*	*	***†
Bugula avicularis (Linn.)	*	*†				*
Bugula flabellata (J. V. Thompson) ...			***†			
Bugula plumosa (Pallas)			*†			
Bugula murrayana var. *fruticosa* (Packard)			**			
Flustra foliacea (Linn.)...	**	*	*			
Flustra securifrons (Pallas)	*†	*	*			*
Electra pilosa (Linn.)		*	*		**	
Callopora aurita (Hincks)			*			
Membranipora membranacea (Linn.) ...					**	
Microporella ciliata (Pallas)	*†					
Cellepora pumicosa, Linn.					*	
Cellepora avicularis, Hincks	*					*
Siniopelta costazii (Audouin)			*			
Crisia eburnea (Linn.)	*	*†	*		*	
Alcyonidium gelatinosum (Linn.) ...			*			
Bowerbankia imbricata (Adams) ...	***					
Buskia nitens (Alder)	*		*			*
Cylindroecium dilatatum (Hincks) ...						*
Valkeria uva (Linn.)	*		*			**
Pedicellina cernua (Pallas)	*		*		*	*
Ascopodaria gracilis (Sars)	*	*			*	*

† Oœcia present.

POLYZOA—*continued.*

STATION V.

	May.	June.	July.	Aug.	Sept.	Oct.
Eucratea chelata (Linn.)			**	*	*	*
Menipea ternata (Ellis and Solander)...			**†	**†	*	**
Scrupocellaria scruposa (Linn.) ...	*		*		*†	*
Scrupocellaria reptans (Linn.)... ...	*	*†	*†			**
Cellularia fistulosa (Linn.)						*
Flustra foliacea (Linn.)...	*					**
Flustra securifrons (Pallas)						*
Electra pilosa (Linn.)		*	*		*	**
Membranipora membranacea (Linn.) ...		**			*	
Membraniporella nitida (Johnston) ...						*†
Hippothoa hyalina (Linn.)					*	
Smittina landsborovii (Johnston) ...						*†
Cellepora pumicosa, Linn.			*			
Cellepora avicularis, Hincks						**
Siniopelta costazii (Audouin)			*			
Crisia eburnea (Linn.)			*	*†	*	*
Tubulipora liliacea (Pallas)				*		
Lichenopora hispida (Fleming) ...			*			*
Alcyonidium gelatinosum (Linn.) ...			*			
Bowerbankia caudata (Hincks) ...					*	
Buskia nitens, Alder				*		
Valkeria uva (Linn.)				*		
Pedicellina cernua (Pallas)				*		
Var. *glabra*			*			

STATION VI.

	May.	June.	July.	Aug.	Sept.	Oct.
Eucratea chelata (Linn.)		*	**			
Gemellaria loricata (Linn.)			*		*	
Menipea ternata (Ellis and Sol.) ...						
Scrupocellaria scruposa (Kinn.) ...					*†	
Scrupocellaria reptans (Linn.)... ...					*†	*
Electra pilosa (Linn.)		*		*		
Membranipora membranecea (Linn.) ...						**
Escharella peachii (Johnston)		*				
Hippothoa hyalina (Linn.)						*

† Oœcia present.

POLYZOA—*continued.*

STATION VII.

	May.	June.	July.	Aug.	Sept.	Oct.
Eucratea chelata (Linn.)...					*	*
Gemellaria loricata (Linn.)		*			*	
Bugulopsis peachii (Busk)			*			
Scrupocellaria scruposa (Linn.) ...		*	*	*	*	*
Bugula avicularis (Linn.)						*†
Bugula murrayana var. *fruticosa* (Packard)					*	
Cellularia fistulosa (Linn.)		*	*	*	*	*
Electra pilosa (Linn.)					*	
Electra catenularia (Jameson)... ...		*	*		**	
Callopora dumerilii (Audouin)... ...			*		*†	*
Callopora aurita (Hincks)						*†
Callopora flemingii (Busk)				*		*
Callopora imbellis (Hincks		*†				
Cribrilina punctata (Hassall)				*†		
Microporella ciliata (Pallas)		*			*†	
Fenestrulina malusii (Jullien)... ...			*	*†	**†	*†
Hippothoa divaracata, Lamouroux ...		**†	*		**†	*
Porella concinna (Busk)			**†		**	
Smittina trispinosa (Johnston)... ...			**†		**	**†
Smittina linearis (Hassall)					*†	**†
Escharella ventricosa (Hassall)... ...		*		**†	**	*
Escharella peachii (Hassall)				**†	**	*†
Cellepora pumicosa, Linn.						*
Cellepora ramulosa, Linn.						**†
Cellepora dichotoma, Hincks			*		***†	
Cellepora avicularis, Hincks		*	*		**	**
Crisia eburnea, (Linn.)		*				*
Stomatophora granulata (M.-Edwards)				*		*
Stomatophora major (Johnston) ...		*			*	*
Stomatophora dilatans (Johnston) ...					*	*
Tubulipora liliacea (Pallas)	*				**†	**†
Diastopora patina (Lamarck)						*
Lichenopora hispida (Fleming) ...			*			*
Alcyonidium mytili, Dalyell					*	
Buskia nitens, Alder			*		***	*
Pedicellina cernua, (Pallas)			*		***	*
Ascopodaria gracilis (Sars)			*		**	*

† Œcia present.

POLYZOA—*continued.*

STATION VIII.

	May.	June.	July.	Aug.	Sept.	Oct.
Eucratea chelata (Linn.)					*	
Bugulopsis peachii (Busk)			*			
Menipea ternata (Ellis and Sol.) ...			*			
Scrupocellaria scruposa (Linn.) ...						*
Bugula purpurotincta, Norman ...		*				
B. murrayana (Johnston)		*†				
Cellularia fistulosa (Linn.)			**			
Electra pilosa (Linn.)		*				
Callopora dumerilii (Audouin)... ...		*	*†			
C. imbellis (Hincks)		*†				
C. flemingii (Busk)		*†	*			
Smittina trispinosa (Johnston) ...			*			
S. linearis (Hassall)		*				
Cellepora dichotoma, Hincks		*	*		*	
Crisia eburnea, (Linn.)		*	*			
Tubulipora liliacea (Pallas)		*				
Alcyonidium gelatinosum (Linn.) ...		*				
Buskia nitens, Alder					*	
Valkeria uva (Linn.)					*	
Farella pedicellata, Alder					*	
Pedicellina cernua (Pallas)			*		*	
Ascopodaria gracilis (Sars)		**	*		*	

STATION IX.

	May.	June.	July.	Aug.	Sept.	Oct.
Gemellaria loricata (Linn.)		*	*	*		*
Scrupocellaria reptans (Linn.)					*	
Bugula avicularis (Linn.)		*†				
Flustra foliacea (Linn.)...				***	*	
Flustra securifrons (Pallas)		**†	*	*		
Membranipora membranacea (Linn.) ...				*		
Callopora dumerilii (Audouin)... ...		*				
Callopora flemingii (Busk)				*†		
Cellepora avicularis, Hincks	*†			**		
Crisia eburnea (Linn.)		*†				
Tubulipora liliacea (Pallas)	*					
Lichenopora hispida (Fleming) ...			*	*		
Alcyonidium parasiticum (Fleming) ...	*		*	**		

† Oœcia present.

POLYZOA—*continued.*

2½-3 miles East of DUNSTANBOROUGH CASTLE, July 31st, 1912.

Eucratea chelata (Linn.)	*
Aetea truncata (Landsborough)	*
Flustra foliacea (Linn.)	*
Electra pilosa (Linn.)...	*
Cellularia fistulosa (Linn.)	*
Hippothoa divaricata, Lamouroux	*†
Escharella immersa (Fleming)	*
Microporella ciliata (Pallas)...	*†
Fenestrulina malusii (Audouin)	*
Cellepora pumicosa (Linn.)	*†
Cellepora avicularis, Hincks...	*
Cellepora dichotoma, Hincks...	*†
Siniopelta costazii (Audouin)	*†
Crisia eburnea (Linn.)	**†
Tubulipora liliacea (Pallas)	*†
Pedicellina cernua (Pallas)	**
Ascopodaria gracilis (Sars)	*

East of HOWICK BURN, 17 fathoms, May 12th, 1912.

Gemellaria loricata (Linn.)	*
Scrupocellaria scruposa (Linn.)	*
Bugula avicularis (Linn.)	* on *Hyas coarctatus*
Bugula flabellata (J. V. Thompson) ...	* young colonies
Flustra foliacea (Linn.)	**
Flustra securifrons (Pallas)	*
Eucratea chelata (Linn.)	*

CULLERCOATS, 8 miles East by South.

	32 fathoms.		30 fathoms.
	Sept. 22, 1911.	**July 9, 1912.**	**Sept. 17, 1912.**
Gemellaria loricata (Linn.)		*	*
Scrupocellaria scruposa (Linn.) ...	*		
Flustra securifrons (Pallas)	*		
Electra pilosa var. *dentata* (Ellis and Sol.)	*		
Cellepora avicularis, Hincks... ...	*		
Crisia eburnea (Linn.)	*		
Cellepora dichotoma, Hincks... ...	*		
Tubulipora liliacea (Pallas)	*		
Lichenopora hispida (Fleming) ...	*		
Diastopora patina (Lamarck) ...	*		
Alcyonidium, sp.	*		
Alcyonidium parasiticum (Fleming)			*
Ascopodaria gracilis (Sars)	*		

† Oœcia present.

HYDROIDS.

By J. H. ROBSON, B.Sc.

STATION I.—15 fathoms N.E. NEWBIGGIN.

	June 26.	July 30.	Aug. 21.	Sept. 12.	Oct. 9.
Perigonimus repens (Wright)... ...	?				
Tubularia indivisa, Linn.	*				
Tubularia coronata, Abildgaard ...					stalks
Campanularia volubilis (Linn.) ...	*				
Campanularia ? raridentata, Alder ...		*			
Clytia johnstoni (Alder)	*†				
Opercularella lacerata (Johnston) ...		*			
**Obelia plicata*, Hincks...	*		No hydroids.	No hydroids.	
Obelia geniculata (? sp.) (Linn.) ...					*
Filellum serpens (Hassall)	*				
Calycella syringa (Linn.)	*†	**			
Halecium halecinum (Linn.)	***‡				
Hydrallmania falcata (Linn.)... ...	*†	*			
Sertularia argentea, Ellis and Sol. ...	**				
Sertularia abietina Linn.	***				
Sertularella rugosa (Linn.)					*
Thuiaria thuja (Linn.)...	*	*			
Plumularia echinulata, Lamarck ...	**				
Antennularia antennina (Linn.) ...					**
Medusae (sp. ?)	**				
Aglantha rosea (Forbes)					**

STATION II.—DRURIDGE BAY.—E. by N. of CRESSWELL TREES. 22 fathoms. July 30th, 1912.

Syncoryne (? sp.) *sarsii* (Lovén).
**Obelia plicata*, Hincks.
Clytia johnstoni (Alder).
Campanularia verticillata, Linn.
Opercularella lacerata (Johnston).
Filellum serpens (Hassall).
Halecium tenellum, Hincks.
Sertularia abietina, Linn.
Hydrallmania falcata (Linn.).
Thuiaria thuja (Linn.).
Sertularella tenella, Alder.

Note.—All these specimens found in extremely small quantities, and none at all present on August 21st from Station II.

September 12th.—E. by N. of CRESSWELL TREES, 20 fathoms.

Sertularia abietina, Linn.

October 9th.

Antennularia antennina (Linn.), *Hydrallmania falcata* (Linn.), *Calycella syringa* (Linn.), *Lafoëa fruticosa* (Sars), *Sertularella rugosa* (Linn.).

* New to the District. † With reproductive capsules. ‡ With male capsules.

HYDROIDS—*continued.*

STATION III.—BOULMER STEEL BUOY.

300 yds. E. (May), 1 mile W.N.W. (June). 500 yds. E. (July), ½ mile E. (Aug., Sept. and Oct.)

	May 12.	June 26.	July 30.	Aug. 21.	Sept. 12.	Oct. 9.
Aglantha rosea (Forbes)						*****
Alcyonium digitatum, Linn.	*					
Syncoryne (? sp.)				*		
Eudendrium (sp. ?) *ramosum* (Linn.)...		*		stalks		
Tubularia indivisa, Linn.		*				1
Clytia johnstoni (Alder)		*				*
Campanularia verticillata (Linn.) ...				*		
Campanularia volubilis (Linn.) ...	***	**			*	
Campanularia (? sp.)		****				
Obelia geniculata (? sp.)	**					*
**Gonothyrea ? hyalina*, Hincks... ...				*		
**Campanulina turrita*, Hincks... ...			*			
Operculariella lacerata (Johnston) ...	****	*		*		
Calycella syringa (Linn.)	*	***		**	**	
Lafoëa fruticosa, Sars				**	*	
Filellum serpens (Hassall)				**	*	
Halecium halecinum, Linn.				*		
Halecium muricatum (Ellis and Solander)	*					
Halecium tenellum, Hincks		*				
Hydrallmania falcata (Linn.)... ...		**	*	*		**
Thuiaria thuja (Linn.)				*		
Diphasia rosacea (Linn.)		*	*	*		
Sertularia abietina, Linn.	**		*	*	**	
Sertularia argentea, Ellis & Solander...	*	*		**	*	*
Sertularia operculata, Linn.			*			
Sertularella rugosa (Linn.)				**		
Antennularia antennina (Linn.) ...						1

HYDROIDS—*continued.*

STATION IV.—E. of DUNSTANBOROUGH CASTLE.

	May 12.	June 26.	July 30.	Aug. 21.	Sept. 12.	Oct. 9.
Endendrium ramosum ? (Linn.) ...		*			stalks	
Tubularia simplex ?, Alder		*				
Tubularia indivisa, Linn.	2		*		stalks	
Clytia johnstoni (Alder)						**
Campanularia hincksii, Alder ...		*				
Campanularia flexuosa, Hincks ...		*				
Campanularia neglecta (Alder) ...		*†				
**Gonothyrea ? hyalina*, Hincks... ...	**					
Campanularia volubilis, Linn. ...			*			
Campanulina turrita, Hincks... ...						
**Obelia plicata*, Hincks...			*			
Obelia geniculata (sp. ?) (Linn.) ...	*					
Lafoëa dumosa (Fleming)	*		*			
Filellum serpens (Hassall)	***	*			***	
Calycella syringa (Linn.)	**	***†	*		*	1
Halecium tenellum, Hincks			*			
Halecium beanii, Johnston	*					
Halecium halecinum (Linn.)		*				
Sertularella rugosa, Linn.	*					
Sertularia cupressina, Linn.			*			
Sertularia filicula, Ellis and Solander	1		*			
Sertularia argentea, Ellis & Solander	**†	*	*	*	**	**
Sertularia abietina, Linn.	**		*			
Hydrallmania falcata (Linn.)... ...	*		*			1
Diphasia rosacea (Linn.)	*		*			
Antennularia antennina (Linn.) ...						*
Plumularia setacea (Ellis)		*				
Alcyonium digitatum Linn.	*			*		
Aglantha rosea (Forbes)						***

† With reproductive capsules.

HYDROIDS—*continued.*

STATION V.—½ mile East of NORTH SUNDERLAND BUOY.

	May 12.	June 26.	July 30.	Aug. 21.	Sept. 12.	Oct. 9.
Tubularia coronata (Abildg.)... ...			stalk			
Campanularia volubilis (Linn.) ...			**			**
Obelia geniculata (?) (Linn)	***†	1			***†	
Clytia johnstoni (Alder)		*			*	
Opercularella lacerata (Johnst.) ...						****
Calycella syringa (Linn.)	*		****			*
Halecium tenellum, Hincks		*	*			
Sertularia argentea, Ellis and Solander			****	*	*	1
Sertularia abietina, Linn.	stalks		*			
Hydrallmania falcata (Linn.)... ...						**
Aglantha rosea (Forbes)						**

† With capsules.

STATION VI.—The Fairway, between BAMBURGH and INNER FARNE.

	Sept. 16, 1911.	May 12, 1912.	June 26, 1912.	July 30, 1912.	Aug. 21, 1912.	Sept. 12, 1912.	Oct. 9, 1912.
Dicoryne conferta, Alder ...				*			
Obelia dichotoma (Linn.) ...							
Campanularia volubilis (Linn.)		***	*	*			
Clytia johnstoni (Alder) ...	*					*	
Obelia geniculata (Linn.) ...	*						****
Obelia (? sp.)	*						
**Campanularia caliculata* Hincks	*						
Operculariella lacerata (Johnst.)						*	
Calycella syringa (Linn.) ...		**	*				
Filellum serpens (Hassall) ...	*	**		**			
Lafoëa dumosa (Fleming) ...	*	**					
Halecium tenellum, Hincks ...			***			**	
Hydrallmania falcata (Linn.)...	*	**†	*			*	
Sertularia abietina (Linn.) ...	*	1		*			
Sertularia argentea, Ellis and Solander	*	*					
Sertularella tenella, Alder ...	*						
Sertularella rugosa (Linn.) ...							
Aglantha rosea (Forbes) ...				*			**

No hydroids.

* New to the district.

† With reproductive capsules.

HYDROIDS—*continued.*

STATION VII.—5-6 miles S.E. of THE CRUMSTONE.

	May 13.	June 27.	July 31.	Aug. 22.	Sept. 13.	Oct. 9.
Podocoryne areolata (Alder)	No hydroids.				*	
Syncoryne sarsii (young sp. ?) (Lovén)						*
Eudendrium capillare (?) Alder ...					**	
Eudendrium rameum (Pallas) ...		*	1	stalks		
Perigonimus repens (Wright)... ...			**		*	
Tubularia coronata, Abildg.					*	
Tubularia indivisa, Linn.					**	**
Clytia johnstoni (Alder)		**	**‡		***	**
Campanularia flexuosa, Hincks ...			1			stalks
Campanularia ? raridentata, Alder ...						*
**Obelia plicata*, Hincks...		1			*	
Obelia (sp. ?)		1				
Obelia dichotoma (Linn.)					**	
Operculariella lacerata (Johnst.) ...					**	
Filellum serpens (Hassall)			**		***	*
Calycella syringa (Linn.)		1	***	1	****	
Lafoëa dumosa (Fleming)		***	****		*****	*
Lafoëa fruticosa, Sars		**		1	***	
Cuspidella humilis, Hincks					*	*
**Cuspidella grandis*, Hincks				**		
Halecium tenellum, Hincks					*	**
Halecium halecinum (Linn.)		***			*†	
Halecium beanii, Johnst.				*	***‡	1
Halecium muricatum (Ellis and Solander)		*			**	
Sertularia abietina, Linn.						*
Sertularia filicula. Ellis and Solander		**	**		****	****
Sertularia pumila, Linn.		*‡				
Sertularia fusca, Johnst.		*			**	
Sertularia argentea, Ellis & Solander...		**				*
Sertularella tenella, Alder					*	
Sertularella polyzonias (Linn.) ...		***	**		****‡	2
Diphasia rosacea (Linn.)			*		***	
Diphasia tamarisca (Linn.)			*			
Thuiaria thuja (Linn.)...		*	*		**	
Hydrallmania falcata (Linn.)... ...		**	***	*	****	1
Antennularia antennina (Linn.) ...		*			***‡	
Antennularia ramosa, Lamarck ...					**	*
Plumularia setacea (Ellis)		1				
Plumularia echinulata, Lamarck ...		1			**‡	
Plumularia catharina, Johnston ...		1	1	1	***	**
Plumularia pinnata (Linn.)			**		?	*
**Plumularia* (sp. ?)			**			*
Aglantha rosea (Forbes)						**

* New to the district. † With female capsules. ‡ With reproductive capsules.

immediately assimilate them. This view seems to explain the remarkable difference in the composition of weeds growing so close to one another.

In many parts of the British Isles and France seaweed is looked upon as a valuable general manure. Its value in this respect is well brought out by analysis and depends upon the fact that it contains about the same amount of nitrogen, much less phosphate but more potash than rotted dung. As all the nitrogen in seaweed is more or less albuminoid in character, it has no manurial value till the seaweed has been allowed to decay. It decays rapidly, however, and therefore quickly becomes of value as a fertiliser. The potash of the seaweed is, however, immediately available, for when seaweed is simply washed in water a large amount of its potassium salts is leached out. Again, all the potassium is present in seaweed in a soluble form, either as sulphate or chloride, and therefore water need only act on seaweed to make all its potash available. The case of the phosphate is very similar to that of the nitrogen, as it does not come into play as a fertiliser till the seaweed has been allowed to decay. Seaweed is therefore a potash manure, and may be used for crops especially requiring potash, such as potatoes. Professor Hendrick has experimentally proved (op. cit.) that "weight for weight seaweed gives just as great a crop of potatoes as farmyard manure—but to get the best results it should be supplemented with phosphate."

The analyses show that about 15 to 20 per cent. of the original seaweed is dry matter, and of this 60 to 70 per cent. is organic or combustible matter. When seaweed, therefore, is used as a manure, only 3 per cent. of the 60-70 per cent. of the organic matter is used, the remainder being practically valueless. Hence at present (and in those places only, where seaweed is used as a manure), only 15 per cent. (this being a maximum) of the dry matter of seaweed has any commercial value. With these facts in view the organic portion of seaweed has been carefully analysed and subjected to very varied and different processes. The resulting substances, though small in bulk and in many cases obtained in a very impure state, seem to point to the fact that seaweed (more especially of the fleshy type, such as *Laminaria digitata*), when properly treated is capable of yielding

substances of great commercial importance. The production of one of the more important of these, in quantity and in a pure state, is at present being investigated.

The results of these observations seem to admit of the following conclusions :—

I. That the "Algin" of Stanford is a mixture and has no definite composition, although it undoubtedly contains one and probably more protein bodies.

II. That the composition of sea plants largely depends upon their immediate environment, and is affected by the assimilation of certain salts dissolved from the rock bottom on which they grow.

III. That, from the point of view of chemical composition, seaweed is as good a general manure as farmyard manure, though it should give best results on crops requiring a potash manure.

THE SEALS AT THE FARNE ISLANDS.

By A. MEEK.

Some years ago the late Mr. Morley Crossman made complaints at the meetings of the Northumberland Sea Fisheries Committee regarding the destruction to salmon and to the stake nets by seals. From the proximity of the Goswick Salmon Fishery to the head-quarters of the seals at the Farne Islands, it was clear that seals were to be seen in the neighbourhood of the nets, and also that they were occasionally caught in the nets, but the evidence obtainable was not convincing as to the destruction, and the question was allowed to drop.

It has been raised again, and the suggestion has been made that on the Northumberland coast and in other parts of the country steps should be taken to keep down their numbers. Before such measures are considered and the powers of local authorities and of owners of fisheries enquired into, it would be well to ascertain whether the seal actually is guilty of the depredations complained of. With that in view I have recently sent the following notes to Mr. Fryer of the Board of Agriculture and Fisheries who has taken great interest in the question.

Seals were at one time very plentiful on the North-east coast. There was a large colony at the mouth of the Tees, but with the development of that region commercially about the middle of last century the colony was much reduced, and it came to an end in the sixties. The only colony now left is the Farne Island colony, about which I have the following information, largely obtained from Mr. J. Douglas, Beadnell. It is mentioned by Wallis (History of Northumberland) and by Mennell and Perkins in their Catalogue of the Mammalia of Northumberland and Durham.*

*Trans. Tynes. Nat. Field Club, v. 6, 1863-64, p. 135.

Numbers.—The fishermen say that the colony consists of about 50 to 60 seals. Mr. Douglas saw about 50 when he visited the Crumstone on June 12th.

Position of Colony.—The colony is at the Crumstone, a rock about one mile south of the Longstone. The Longstone used to be the headquarters of the colony, and it was when the lighthouse was built in 1826 that they removed to the Crumstone. Stragglers are met up and down the coast, but it is rare that they are seen or caught at a great distance from the Farne Islands. They appear to approach the shore most frequently in the spring at the period when the paddle or lumpsucker is spawning amongst the rocks.

Food.—Mr. Douglas says they are fond of the lumpsucker. The watchers at the Farne Islands have corroborated this by telling me that they often see the seals feeding on the lumpsucker. Sometimes in the winter they follow the fishing boats to get such fish as may be thrown overboard. The fishermen think that the food is principally codling. The seals we kept at the Laboratory were fed on small gadoids like codling, haddock, whiting, and also on herring. The salmon is certainly not the food of the seal. As the majority of the seals remain in the neighbourhood of the Crumstone they are far away from any salmon fishery. It is generally believed that it is a habit of the seal to take a large bite out of the salmon and leave it. From the description of the size of the bite, I have no hesitation in saying that it would be anatomically impossible for the seal to make it. It is just such a wound as would be made by a porpoise or a dolphin. Furthermore, in our experience in feeding the seals at the Laboratory it is not their habit to make a bite and leave the food. If the fish is too large to deal with in one bite they tear it with claws and teeth until it is all disposed of. Seals have been caught in the salmon nets at Goswick, and it has been presumed that they were caught because they were chasing salmon. The only evidence upon which the charge could be substantiated has not been produced, viz., that the seals were feeding on salmon. This could be obtained by the examination of the seals caught in the nets at Goswick or at any other place where it was alleged the depredations occurred.

Uses.—The fishermen from the ports adjacent to the Farne Islands claim that the presence of the seals at the Crumstone is of great value to them in fog. The roaring of the seals indicates to the fishermen their position, a matter of some moment in a region where rocks and shoals are so numerous. So apart from their æsthetic value, it may be said that they have a use.

Breeding.—Breeding takes place also at the Crumstone, the young appearing in the autumn. During easterly gales in November some of the young are washed ashore. The numbers are kept down by accidents such as these, and by a good deal of shooting indulged in by visitors. The impression of Mr. Douglas is that for a great many years the numbers have remained pretty much the same.

SAND EELS.

By W. MARK PYBUS.

In the summer, about 25 years ago, I was on the Fairy Rocks at Newbiggin with some of my children. My son and some of the other boy visitors there were fishing, but their efforts had not been attended with any success. The tide was high. So far as I remember the hooks were baited with herring. A shoal of sprats appeared, and many of them leaped out of the sea on to the rocks. The bait on the hooks was changed for sprats, and in a few minutes a number of large Blackjack or Coalsaithe, some 3 feet long, were caught by the boys. The caves under the Fairy Rocks were a wriggling mass of Blackjack. Returning to Newbiggin, we saw that on the sands at the back of the Ship Inn, boys were fishing with cords attached to sticks, and wading in the sea to the depth of about one foot and a half. They were catching large eels almost as quickly as they could take them off the hooks. In the evening towards dark I walked along the sands. At every step I took there were phosphorescent flashes of light. I took home with me a handful of sand where it had appeared most luminous, and on a careful examination of it I found many fish scales, such as apparently might come from sprats or herrings.

About two summers later I was again on the sands at Newbiggin. The sun was very powerful, and the sand was heated to excess. In a moment I saw Sand Eels spring out of the sand and die. At a rough estimate I should think a dozen carts could have been filled with Sand Eels from a space of about 100 square yards.

Yesterday, Sunday, 7th July, 1912, I was on the Carr Rocks at Warkworth with a visitor I had. There was a fog at sea. The morning was not particularly cold, but the temperature was certainly lower than usual in July. My son-in-law, who was staying in Alnmouth, came along to the rocks to bathe. He told

me that sea-birds were gathering on the sands in exceptionally large numbers between Alnmouth and Warkworth. I told him that there must be a large number of small fish, Sprats or Sand Eels, well in-shore, or in the sand, and I was reminded of the two above occurrences and referred to them. My son-in-law crossed over to the narrow southern ledge of rock, and after he had got on his bathing costume I noticed that he was trying to attract my attention. We thought he had discovered something amongst the rocks, and we walked over. There we found on the beach countless thousands of small Sand Eels. They were floating about in the sea, and lying in large numbers in pools and on the sand, in places several inches thick. In places their heads were sticking out of the sand. Many of them came up and died. Where the sand was disturbed with a stick, a number of them were disclosed dead or dying. This existed from the Carr Rocks down to the Killicrankie Road, and I am unable to say whether it went further in the direction of Amble. Probably it did. I ascertained in the afternoon that the same state of things prevailed right along the coast from the Carr Rocks up to Alnmouth, and that there were large numbers of Sand Eels on the north side of the Aln, but how much further north they went I do not know. When first I saw such large numbers of Sand Eels come up and die, I concluded that they had been killed by the excessive heat of the sun, but on this last occasion I could not reconcile the occurrence with any unusual temperature, in fact it was cooler than it usually is at this time of the year. What quantity of Sand Eels were washed about in the sea and lying about on the beach I cannot say, but in the aggregate they must have weighed many tons. All the Sand Eels were small, and measured about three inches long. My son-in-law informed me that when he went in to bathe he could feel larger fish rubbing against him in the water. These, no doubt, had followed the Sand Eels, and were feeding upon them. Amongst the Sand Eels, between the Carr Rocks and Alnmouth, were some dead flat fish and whiting, but not any great number, though many more than are found on the beach at any time, unless it be after a big storm.

Though all the Sand Eels I saw were about the same size, viz., 3 to $3\frac{1}{2}$ inches, I have been told by others who saw them on the beach that there were many in the pools considerably larger, some of them even the length of about 15 inches, but the larger ones did not appear to have been numerous.

In all cases it appears that the Sand Eels are driven into shallow water pursued by blackjack, codling, sea-trout and other fish. When they get into shallow water they burrow into the sand. The following may be suggested by way of explanation of the enormous destruction. After the retreat of the tide, a great increase in the temperature of the sand offers a solution in one case. But probably and most frequently the heavy death rate is due to the Sand Eels being prevented from getting back to sea by waves breaking upon the beach, and disturbing and churning up the sand to such an extent as to knock the fish about and stun them.

A similar observation is recorded in Day's "British Fishes." A.M.

FAUNISTIC NOTES.

By B. STORROW.

Lagenorhynchus albirostris. (J. E. Grey.) A male 5 feet 2 inches long was taken in the salmon nets at the north side of the mouth of the Tyne, on the 24th of August, 1911.

Acanthias vulgaris, Risso. On August 25th, 1911, several of the North Shields trawlers had very large catches of dogfish which had been taken locally. One of the vessels had from three to four cartloads, and in another the gear was broken when hauling the catch on board.

Torpedo nobiliana, Bonop. On the 2nd of December, 1911, Mr. Willitts of Tynemouth sent us a fine specimen which had been caught by a trawler, fishing 12 miles E.N.E. of the Tyne in 47 fathoms.

Raniceps raninus, Linn. Two specimens are here recorded. One was caught by a trawler 4 miles E. of Souter Point, on December 19th, 1911, and brought to the laboratory by Fishery Officer Taylor. The other was taken on the lines at Cullercoats on March 4th, 1912.

Aplysia punctata, Cuv. This mollusc has recently been found in extremely large numbers on the local rocks. It was first obtained on January 23rd, 1912, the specimens being small. Later and up to the present, June 14th, larger examples have been plentiful. Some spawned in the laboratory on April 18th, and shortly after this many strings of spawn, generally attached to Fucus, were observed on the rocks.

Hermea dendritica, A. & H. This nudibranch which appeared in one of the tanks of the laboratory last year, and was then first recorded for this district, has again appeared in greater numbers in the same tank in June of this year.

Antiopella cristata (Delle Chiaje). A record of which was given in last year's Report was again taken on August 28th, 1911, in $16\frac{1}{2}$ fathoms to the E. of Whitley Bay when dredging with the "Evadne."

Pleurophyllidia loveni, Bergh. Has not previously been found in this district. On 30th August, 1911, it was found in the net of a trawler fishing in 34 fathoms E.N.E. of the Tyne, and is also recorded in "Biological Investigations" of this Report.

Tisbe furcata (Baird). This copepod was found in large numbers in all the tanks in the Laboratory during March and April of 1912.