

EIGHTH  
ANNUAL REPORT

OF THE

FISHERY BOARD FOR SCOTLAND,

Being for the Year 1889.

*IN THREE PARTS.*

PART I.—GENERAL REPORT.

PART II.—REPORT ON SALMON FISHERIES.

PART III.—SCIENTIFIC INVESTIGATIONS.

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**PART I.—GENERAL REPORT.**

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## VII.—ADDITIONS TO THE FAUNA OF THE FIRTH OF FORTH.

By THOMAS SCOTT, F.L.S. (Plates XII, XIII.)

In the present paper there are recorded over 90 species not previously recognised as belonging to the fauna of the Firth of Forth. A few of these are now recorded for the first time for the east of Scotland, one or two are additions to the British fauna, and one or two new to science.

Most of them were obtained last year, during the investigations carried on on board the 'Garland,' since the publication of the Seventh Annual Report, only a few having been obtained earlier, but not determined in time to be included in either of the two previous papers on the Forth fauna.\*

The forms here recorded belong exclusively to the Invertebrata, and comprise 23 species of Foraminifera, 61 species of Crustacea, and 7 species of Mollusca. Other invertebrate groups are being studied, and information as to their distribution, &c., collected with a view to publication later on.

As was pointed out in a previous paper, the study of the marine Invertebrata, from a fishery point of view, is of considerable interest and importance. As regards the Crustacea, the Rev. A. M. Norman says (*Museum Normaniarum*, part 3):—'I venture to prophecy that when the Crustacean Fauna of the Arctic and Temperate regions shall have been thoroughly investigated, it will hereafter be found to embrace not less than 5000 species. It was little suspected a generation ago that the Crustacea is the class which undoubtedly embraces more forms than any other outside the Insecta.' The scientific investigations carried out under the directions of the Fishery Board have helped very much to prove that the Crustacea is also one of the most important groups—if not the most important of the Invertebrata—that constitute the food supply of fishes. The movements of fishes are also undoubtedly partly influenced by the prevalence in particular localities of invertebrate forms which they, for the time being, may be partial to as a source of food. The study therefore of the distribution, habits, and life-histories of the Invertebrata should hold a place next in importance to the study of the food, distribution, habits, spawning, and development of the fishes themselves. This study has been and is being carried on from year to year on board the 'Garland,' along with the other and more important fishery investigations, as opportunity offers, and the present and previous similar papers are the results of an attempt to collect all the information within reach bearing on the distribution and habits of these lower forms of life, especially within the area of the Firth of Forth.

The information contained in these papers, especially in the present one and in the one published last year, is mainly the outcome of a personal examination of the various organisms referred to in them; and though the restricted area to which the information principally applies imparts to it a value which is perhaps chiefly of local importance, yet the more thorough and accurate the information relating to the fauna of separate areas becomes, its value will increase tenfold, because reliable comparisons of various kinds will become possible, and from these comparisons theories and principles of great importance may be worked out. There has also resulted a wider acquaintance with, and greater certainty

\* *Sixth Ann. Report*, Part iii. p. 235, 1888; *Seventh Ann. Report*, Part iii. p. 311, 1889.

in identifying, the different objects observed in the stomachs of fishes ; and therefore more satisfactory and reliable information respecting the food of fishes is now being collected.

In preparing this paper the following among other works have been consulted :—

1850. Baird, *British Entomostraca*.  
 1868. Williamson, *Recent Foraminifera of Great Britain*.  
 1870. H. B. Brady, "The Foraminifera of Tidal Rivers, *Annals and Magazine of Natural History*.  
 1884. " " *Foraminifera of the Challenger Expedition*.  
 " G. S. Brady, *Monograph of the British Copepoda*.  
 1868. " " *Monograph of Recent British Ostracoda*.  
 1870. " " and David Robertson, *The Ostracoda of Tidal Rivers*.  
 1889. " " and A. M. Norman, *Monograph of the Marine and Fresh Water Ostracoda of the North Atlantic and North-Western Europe*.  
 1863. Bate and Westwood, *British Sessile-eyed Crustacea*.  
 1872. G. O. Sars, *Monograph of the Norwegian Mysidæ*.  
 1876-79. " " *Monograph of the Mediterranean Mysidæ and Cumacea*.  
 1862-69. J. G. Jeffreys, *British Conchology*.

I have also to acknowledge the kindness of Professor G. S. Brady, F.R.S., Dr H. B. Brady, F.R.S., the Rev. A. M. Norman, D.C.L., F.L.S., Rev. T. R. R. Stebbing, F.L.S., and Mr David Robertson, F.L.S., F.G.S., in naming obscure and difficult species. Indeed, but for the help of these gentlemen, this paper could not possibly have been so full or so valuable.

#### FORAMINIFERA.

I am indebted to Mr Robertson for indentifying a few of the species in this group mentioned below ; and also for notes of the occurrence of others which have not as yet come under my own observation.

#### MILIOLIDÆ.

##### *Miliolina tricarinata* (d'Orbigny).

*Triloculina tricarinata*, d'Orb., Ann. Sci. Nat., tome vii. p. 277, No. 7 a ; Modelé, No. 94 (1826).

*Miliolina tricarinata*, H. B. Brady, Foram. Chall. Exped., p. 165, pl. iii. fig. 17, a-b (1884).

*Habitat*.—Vicinity of Bass Rock. This species is easily distinguished from *M. trigonula* by the three sharp keel-like ridges extending from end to end and about equidistant from each other. It is much rarer in the Forth than *M. trigonula*.

##### *Miliolina fusca*, Brady.

*Miliolina fusca*, Brady, Ann. and Mag. Nat. Hist., ser. iv., vol. vi. p. 286, pl. xi. fig. 2, a-c (1870).

*Miliolina fusca*, Robertson, Fauna and Flora of the W. of Scotland, p. 51 (1876).

*Habitat*.—Brackish water pools by the shore near Aberlady, common. This is an arenaceous species. It is much smaller than *M. agglutinans*, and frequently dark brownish in colour. It is considered to be a somewhat rare species, and seems confined to water more or less brackish.

## ASTRORHIZEDÆ.

*Psammosphæra fusca*, F. E. Schulze.

*Psammosphæra fusca*, F. E. Schulze, II. Jahresberichte d. Komm. Untersucht d. deutsch. Meere., p. 113, pl. ii. fig. 8, a-f (1874).

*Psammosphæra fusca*, H. B. Brady, Foram. of the Chall. Exp., p. 249, pl. xviii. figs. 1-8 (1884).

*Habitat*.—East of Inchkeith, not common. This species has been obtained off Loch Seavaig, Skye, in 45 to 60 fathoms. It has also been found in seven of the Challenger stations in the South Atlantic in depths of from 150 to 2800 fathoms, and in the North Atlantic from 440 to 2750 fathoms.

## LITUOLIDÆ.

*Reophax fusiformis* (Williamson).

*Proteonino fusiformis*, Williamson, Rec. Foram. Gt. Brit., p. 1, pl. i. fig. 1 (1858).

*Reophax fusiformis*, H. B. Brady, *op. cit.*, p. 290, pl. xxx. figs. 7-11 (1884).

*Habitat*.—Largo Bay, off St Monance, and other parts of the Forth, but nowhere very common—a much more robust species than *R. scoriurus*.

*Reophax nodulosa* (?) H. B. Brady.

*Reophax nodulosa*, Brady,\* Quart. Jour. Micr. Sci., vol. xix. N. S., p. 52, pl. iv., figs. 7, 8 (1879); Brady, Foram. Chall. Exped., p. 394, pl. xxii. figs. 1-9 (1884).

*Habitat*.—Off St Monance, Largo Bay, and other parts of the Forth, frequent. This is a very variable species as regards size. The Forth specimens are very small, but H. B. Brady says (*op. cit.*) that there are specimens of this species which are amongst the very largest of recent arenaceous Foraminifera.

*Reophax findens* (Parker).

*Lituola findens*, Parker (in Dawson's paper) Canad. Nat. vol. v. N.S., p. 177, pl. 180 fig. 1 (1870).

*Reophax findens*, H. B. Brady, Foram. of the Chall. Exp., p. 299, pl. xxxi. figs. 10-11 (1884).

*Habitat*.—East of Inchkeith, not very common. The only other British examples are from the estuary of the Dee, N. Wales (J. D. Siddal). There appears to be no other authenticated British locality for this species.

*Ammodiscus gordialis* (Jones and Parker).

*Trochamina squamata gordialis*, Jones and Parker, Quart. Jour. Geol. Soc., vol. xvi. p. 304 (1860).

*Ammodiscus gordialis*, H. B. Brady, *op. cit.*, p. 333, pl. xxxviii. figs. 7-9.

*Habitat*.—Aberlady Bay, rather rare, structure arenaceous, colour brownish; the test consists of a tube coiled upon itself in an irregular manner, inclining to complanate.

\* There is some diversity of opinion as to whether the organisms here referred to *R. nodulosa* are foraminiferal; it is therefore with some hesitation that they are included in the present list.

*Trochamina inflata* (Montagu).

*Nautilus inflata*, Montagu, Test. Brit., Suppl., p. 81, pl. xviii. fig. 3 (1808).

*Rotalina inflata*, Williamson, Rec. Foram. Gt. Brit., p. 50, pl. iv. figs. 93, 94 (1858).

*Trochamina inflata*, H. B. Brady, *op. cit.*, p. 338, pl. xli. fig. 4, a-c.

*Habitat.*—Brackish water pools by the shore near Aberlady; vicinity of Inchkeith, and others parts of the Forth; rare, except at Aberlady, where it is comparatively common. This seems to be an inshore, rather than a deep water species. Colour brownish.

*Trochamina macrescens* (?) Brady.

*Trochamina inflata*, var. *macrescens*, Brady, Ann. and Mag. Nat. Hist., ser. iv. vol. vi. p. 290, pl. xi. fig. 5, a-c. (1870).

*Trochamina macrescens*, Robertson, Fauna and Flora of the W. of Scotland, p. 51 (1876).

*Habitat.*—With the last, but not so common; the cells of this species are concave above and below, and look as if the sides had been partially crushed in. The cells are not all equally concave, those in the centre being frequently only flattened—probably a form of *H. canariense*.

*Trochamina ochracea* (Williamson).

*Rotalina ochracea*, Williamson, Rec. For. Gt. Brit., p. 55, pl. iv. fig. 112; pl. v. fig. 113 (1858).

*Trochamina ochracea*, H. B. Brady, Foram. of the Chall. Exp., p. 338 (1884).

*Habitat.*—Off St Monance, common; other parts of the Forth rather rare. This is a very small species, 'and,' as Brady remarks, 'composed of a large number of segments.' 'On the inferior side the septal lines are arcuate, 'flexuose, and very prominent.' It is not uncommon in the British seas, though not previously recorded for the Forth.

## TEXTULARIDÆ.

*Textularia gramen*, d'Orbigny.

*Textularia gramen*, d'Orbigny, For. Foss. Vien., p. 248, pl. xv., figs. 4-6 (1846).

*Textularia gramen*, H. B. Brady, *op. cit.*, p. 365, pl. xliii. figs. 9-10.

*Habitat.*—Off St Monance, and from other parts of the Forth. This seems to be a generally distributed species. The test is of an elongated tapering form, is not so compressed as *T. sagittula*, and the lateral edges are rounded instead of being sharply keeled.

*Textularia variabilis*, Williamson.

*Textularia variabilis*, Williamson, Rec. Foram. Gt. Brit., p. pl. figs.

*Habitat.*—Granton Harbour (David Robertson).

*Gaudryina filiformis*, Berthelin.

*Gaudryina filiformis*, Berthelin, Mém. Soc. géol. France, ser. 3, vol. i. No. 5, p. 25, pl. i., fig. 8 (1880).

*Gaudryina filiformis*, H. B. Brady, Foram. of the Chall. Exp. p. 380, pl. xlvi. fig. 12, a b c (1884).

*Habitat.*—East of Inchkeith, not very common.

*Bulimina elegans*, d'Orbigny.

*Bulimina elegans*, d'Orbigny, Ann. Sci. Nat., vol. vii. p. 270, No. 10; Modelé, No. 9 (1826).

*Bulimina elegans*, Brady, *op. cit.*, p. 398, pl. l. figs. 1-4.

*Habitat*.—Bo'ness (David Robertson). East of Inchkeith, not uncommon. In this species the cells are arranged in a triserial manner, and the shell tapers gradually towards the apex, it is thus distinctly different from *B. elegantissima*, d'Orb.

*Bulimina fusiformis*, Williamson.

*Bulimina pupoides*, var. *fusiformis*, Williamson, Rec. Foram. Gt. Brit., p. 63, pl. v. figs. 129–130 (1868).

*Habitat*.—East of Inchkeith, not common.

#### LAGENIDÆ.

*Lagena pulchella*, Brady.

*Lagena pulchella*, H. B. Brady, Ann. and Mag. Nat. Hist., ser. iv., vol. vi. p. 294; pl. xii. fig. 1, a. b. (1870).

*Habitat*.—Granton Harbour (David Robertson). This species has a tricarinate form, and the "convex" faces are ornamented with irregular longitudinal, branching costæ.

*Lagena melo* (d'Orbigny).

*Oolina melo*, d'Orbigny, Form. Amer. Merid., p. 20, pl. v. fig. 9 (1839).

*Habitat*.—Granton Harbour (David Robertson).

*Polymorphina compressa*, d'Orbigny (fistulose variety).

*Polymorphina compressa*, d'Orbigny, Foram. Foss. Vien., p. 233, pl. xii. figs. 32–34 (1846).

*Polymorphina compressa*, var. *fistulosa*, Williamson, Rec. Foram. Gt. Brit., p. 72, pl. vi. fig. 150 (1858).

*Polymorphina compressa* (fistulose form), H. B. Brady, *op. cit.*, p. 566, pl. lxxiii. fig. 17.

*Habitat*.—Near Phidra, rather rare.

*Uvigerina angulosa*, Williamson.

*Uvigerina angulosa*, Williamson, Rec. Foram. Gt. Brit., p. 67, pl. v. fig. 140 (1868).

*Uvigerina angulosa*, H. B. Brady, Foram. of the Chall. Exp., p. 576, pl. lxxiv. figs. 15–18 (1884).

*Habitat*.—East of Inchkeith, not very common.

#### ROTALIDÆ.

*Rotalia nitida* (Williamson).

*Rotalia nitida*, Will., Rec. Foram. Gt. Brit., p. 54, pl. iv. figs. 106–108 (1858).

*Rotalia nitida*, Robertson, Fauna and Flora of the West of Scotland, p. 52 (1876).

*Habitat*.—Various parts of the estuary of the Forth, frequent; a much smaller and more delicate species than *R. beccarii*.

*Spirillina vivipara*, Ehrenberg.

*Spirillina vivipara*, Ehrenberg, Abhandl. k. Akad. Wiss. Berlin, p. 442, pl. iii. fig. 41 (1841).

*Spirillina vivipara perforata*, Williamson, Rec. Foram. Gt. Brit., p. 92, pl. vii. fig. 202 (1858).

*Spirillina vivipara*, H. B. Brady, *op. cit.*, p. 630, pl. lxxxv. figs. 1–5.

*Habitat*.—Aberlady Bay, rare. This is a widely distributed species, but does not seem to be very common; I have found it also in the Clyde.

*Patellina corrugata*, Williamson.

*Patellina corrugata*, Williamson, Rec. Foram. Gt. Brit., p. 46, pl. iii. figs. 86-89 (1858).

*Patellina corrugata*, H. B. Brady, *op. cit.*, p. 634, pl. lxxxvi. figs. 1-7.

*Habitat.*—Largo Bay, rare; a small but pretty species. It has been found at a depth of 620 fathoms in the South Pacific.

#### NUMMULINIDÆ.

*Operculina ammonoides* (Gronovius).

*Nautilus ammonoides*, Gronovius, Zooph. Gron., p. 282, No. 1220, and pl. v. (1781).

*Nonionina elegans*, Williamson, Rec. Foram. Gt. Brit., p. 35, pl. iii. figs. 74, 75 (1858).

*Operculina ammonoides*, H. B. Brady, *op. cit.*, p. 745, pl. cxii. figs. 1-2.

*Habitat.*—Largo Bay, not very common.

*Note.*—The curious Rhizopods *Dendrophrya erecta*, Str. Wright, and *Dendrophrya radiata*, Str. Wright, discovered by Dr Wright in low-water pools in the Old Quarry at Granton, and described by him in the Annals and Magazine of Natural History in 1861, seem to have been overlooked by the authors of the "Invertebrate Fauna of the Firth of Forth." I am indebted to my friend Mr David Robertson for drawing my attention to these species; he informs me that he also has found *D. erecta* in Granton Old Quarry; he has found both forms in low-tide pools at Cumbrae. So far as I can learn, there does not seem to be any known British habitat for these curious organisms other than the localities here referred to.

### CRUSTACEA.

#### COPEPODA.

##### CALANIDÆ.

*Candace pectinata*, Brady.

*Candace pectinata*, Brady, Mon. Brit. Copep., vol. i. p. 49, pl. viii. figs. 14, 15; pl. x. figs. 1-12 (1878).

*Habitat.*—In surface and bottom tow-net gatherings from various parts of the Forth between Inchkeith and May Island, moderately frequent, and easily distinguished from the other and commoner Copepoda by the dark-coloured plumes and terminal spines of the swimming feet. The only place where this species was obtained by Dr Brady and Mr Robertson, as stated in the monograph referred to above, was 'on very hard ground, and in a depth of about 40 fathoms south-west of the Island of St Agnes, Scilly,' where a very few specimens were dredged. The dark-coloured strongly-toothed crest on the joint next to and above the hinge of the right antennæ of the male is a peculiar and striking object. I have also obtained this species in St Andrews Bay, and off Montrose, 20 to 30 miles S.E.

##### MISOPHRIIDÆ.

*Pseudocyclops obtusatus*, Brady and Robertson.

*Pseudocyclops obtusatus*, Brady and Robertson, Ann. and Mag. Nat. Hist., ser. iv., vol. xii. p. 12; pl. viii. figs. 4-7 (1873).

*Pseudocyclops obtusatus*, Brady, *op. cit.*, vol. i. p. 84; pl. xii. figs. 1-13 (1878).

*Habitat.*—Off St Monance, where it was taken with the dredge, but somewhat sparingly. The body is robust, and the dorsal aspect is boldly arched, the abdomen is slender, the antennæ moderately short and stout.

## CYCLOPIDÆ.

*Thorellia brunnea*, Boeck.

*Thorellia brunnea*, Boeck, Oversigt over de ved Norges Kyster iagt. Copep., p. 26 (1864).

*Thorellia brunnea*, Brady, *op. cit.*, vol. i. p. 95, pl. xvi. figs. 1-10.

*Habitat.*—Near Oxcar, 30 to 40 fathoms, and Largo Bay, rather rare. I have found this species frequently at Tarbert, Loch Fyne, and at Rothesay amongst weeds in shallow water.

## HARPACTICIDÆ.

*Ectinosoma melaniceps*, Boeck.

*Ectinosoma melaniceps*, Boeck, Oversigt Norges Copepoder, p. 30 (1864).

*Ectinosoma melaniceps*, Brady, *op. cit.*, vol. ii. p. 11, pl. xi. figs. 17-20.

*Habitat.*—Largo Bay and other parts of the Forth, moderately frequent. This is a smaller species than *E. spinipes*, which it somewhat resembles, but from which it may be distinguished by a small, more or less distinct, black patch near the base of the rostrum.

*Ectinosoma erythrope*, Brady.

*Ectinosoma erythrope*, Brady, *op. cit.*, vol. ii. p. 12, pl. xxxvi. figs. 11-17.

*Habitat.*—Off St Monance, 10 to 15 fathoms, bottom clean sand or gravel; and Largo Bay, rather rare. This species is readily distinguished by its having two brilliant red eye-spots, one on each side close to the anterior margin of the cephalic segment. The eye-spots appear to lose their colour when the specimens are kept a while in spirit.

*Ameira longipes*, Boeck.

*Ameira longipes*, Boeck, Oversigt Norges Copepoder, p. 49 (1864).

*Ameira longipes*, Brady, *op. cit.*, vol. ii. p. 37, pl. liii. figs. 1-10.

*Habitat.*—Largo Bay and off St Monance, as well as other parts of the Forth. This is not a very satisfactory species, and great care is required in discriminating between it and *Stenhelia ima*,

*Laophonte serrata* (Claus).

*Cleta serrata*, Claus, Die frei-lebenden Copepoden, p. 123, t. xv. figs. 13-20 (1863).

*Laophonte serrata*, Brady, *op. cit.*, vol. ii. p. 71, pl. xxxiii. figs. 1-14.

*Habitat.*—Off St Monance, rare.

*Laophonte longicaudata*, Boeck.

*Laophonte longicaudata*, Boeck, Oversigt Norges Copepoder, p. 55 (1864).

*Laophonte longicaudata*, Brady, *op. cit.*, vol. ii. p. 82, pl. lxxiv., figs. 12-15; pl. lxxvi. figs. 10-15.

*Habitat.*—Off St Monance, rather scarce.

*Laophonte hispida* (Brady and Robertson).

*Asellopsis hispida*, B. and R., Ann. and Mag. Nat. Hist., vol. xii. p. 137, pl. ix. figs. 6-10 (1873).

*Laophonte hispida*, Brady, *op. cit.*, vol. ii. p. 85, pl. lxxxii. figs. 1-11.

*Habitat*.—Largo Bay, frequent. This species is rather robust, with short caudal segments; these and one or two of the last abdominal segments are more or less covered with close-set short hairs.

*Cletodes limicola*, var. *gracilis*, Brady.

*Cletodes limicola*, var. *gracilis*, Brady, *op. cit.*, vol. ii. p. 96.

*Habitat*.—Largo Bay, off St Monance, and other parts of the Forth in company with the type. The caudal segments in this form are long and slender, and have a prominent jointed (?) spine arising nearly at right angles from the upper surface and near the middle of each segment. I have observed both male and female, the latter with ova, in material dredged off St Monance in from 12 to 14 fathoms. With the exception of the long caudal segments (which are fully two-thirds the length of those of *C. longicaudata*), very little difference can be observed between this variety and the typical *C. limicola*.

*Cletodes longicaudata*, Brady and Robertson.

*Cletodes longicaudata*, B. & R., Brit. Assoc. Report, p. 196 (1875).

*Cletodes longicaudata*, Brady, *op. cit.*, vol. ii. p. 92, pl. lxxix. figs. 13–19.

*Habitat*.—Off St Monance, rare. This species has long, slender, caudal segments, and differs from the *C. limicola*, var. *gracilis*, by the form of the fifth feet and anterior antennæ; the caudal segments are also longer.

*Enhydrosoma curvatum* (Brady and Robertson).

*Rhizothrix curvata*, B. & R., Brit. Assoc. Report, p. 197 (1875).

*Enhydrosoma curvatum*, Brady, *op. cit.*, vol. ii. p. 98, pl. lxxxi. figs. 12–15; pl. lxxxii. figs. 11–19.

*Habitat*.—Largo Bay, not uncommon; the extremities of both branches of the first feet are furnished with two long slender setæ, at the ends of which are a few fine flagellum-like hairs.

*Thalestris serrulata*, Brady.

*Thalestris serrulata*, Brady, Mon. Brit. Cop., vol. ii., p. 133, pl. lix., figs. 2–11 (1880).

*Habitat*.—East of Inchkeith, several specimens taken with surface net. This species was described by Dr Brady from a single specimen—a male—dredged on a bottom of muddy sand in New Grimsbay Harbour, Scilly. Last year (1889) another specimen—a female—was observed by I. C. Thompson in a tow net gathering from Puffin Island.\* The Forth specimens comprised both male and female, and were of a dark brick-red colour, which made them very conspicuous in the tow-netting. Some of the coloured copepoda, as *Alteutha*, retain their colour for a considerable time after being in spirit; but in the case of this *Thalestris* not a trace of colour remained after a few hours immersion. I have obtained this species also in Dornoch Firth. This seems to be the first record of it for Scotland.

*Harpacticus flexus*, Brady and Robertson.

*Harpacticus flexus*, B. & R., Ann. and Mag. Nat. Hist., ser. iv., vol. xii. p. 134, pl. ix. figs. 17–21 (1873).

*Harpacticus flexus*, Brady, *op. cit.*, vol. ii. p. 152, pl. lxiv. figs. 12–18.

*Habitat*.—Off St Monance, scarce.

*Zaus goodsiri*, Brady.

*Zaus ovalis*, Claus, Die frei-lebenden Copepoden, p. 146, tab. xxii. fig. 18; tab. xxiii. figs. 11–18 (1863).

*Zaus goodsiri*, Brady, *op. cit.*, vol. ii. p. 156, pl. lxvi. figs. 10–13.

\* *Proc. Biol. Soc., Liverpool*, iii., p. 188 (1889).

*Habitat.*—Off St Monance, frequent. Dr Brady says that this species 'must be looked upon as one of the rarest, as it is certainly one of the 'finest of the British Harpacticidæ.' It has, somewhat like *Alteutha depressa*, a broad reddish purple band across the thorax.

(Family uncertain.)

*Cylindropsyllus lævis*, Brady.

*Cylindropsyllus lævis*, Brady, *op. cit.*, vol. iii. p. 30, pl. lxxxiv. figs. 1-8.

*Habitat.*—Off St Monance, frequent. This species, which does not seem to have been previously recorded for Scotland, might be easily passed over as belonging to some other group than the *Copepoda*. Its comparatively long and cylindrical form and short swimming feet impart to it a somewhat close resemblance to a young *Pseudatanais*—a kind of Isopod. Both the genus and species were described from a single specimen dredged off Hartlepool, and from the structure of the mouth it was conjectured to be of parasitic or semiparasitic habits. All the specimens found by me have, however, been unattached to any other organism. I also found this species in East Loch Tarbert (Loch Fyne) in 1885, but it was not recorded. It has been observed by the Rev. A. M. Norman at Plymouth.

Fifteen species of Copepoda are recorded above, which brings up the number observed within the area of the Firth of Forth to sixty. I expect that this number will be yet further increased. There are several forms that are doubtful, or that have not yet been identified with described species, which will be recorded later on. I am greatly indebted to Dr G. S. Brady for the trouble he has taken in examining and identifying doubtful species, not only belonging to this, but also to the following group, the Ostracoda.

#### OSTRACODA.

Thirty-two species of Ostracoda are here added to those recorded in my two previous papers. Four of these have not as yet been identified with known species, and are for the present provisionally named and described. I am also indebted to Mr David Robertson for notes of a few species not as yet observed by me in the Firth of Forth.

#### PODOCOPA.

##### CYPRIDIDÆ.

*Aglaia complanata*, Brady and Robertson.

*Aglaia complanata*, Brady and Robertson, *Ann. and Mag. Nat. Hist.*, ser. iv., vol. iii. p. 66, pl. xx. figs. 4, 5 (1869).

*Aglaia complanata*, Brady and Norman, *Mon. of the M. and Fw. Ostrac. of the N. Atlantic and N.-W. Europe*, p. 94 (1889).

*Habitat.*—Bo'ness (David Robertson). A note of the occurrence of this rare and interesting species was communicated to me by Mr Robertson, who observed it among some material he had collected at Bo'ness some years ago. The only localities where it had previously been recorded from are Westport Bay, Roundstone Bay, and Birterbuy Bay, Ireland.

*Pontocypris acupunctata*, Brady.

*Pontocypris acupunctata*, Brady, *Mon. Rec. Brit. Ostrac.*, p. 386, pl. xxiv. figs. 53-56 (1868).

*Pontocypris acupunctata*, Brady and Norman, *op. cit.*, p. 109.

*Habitat.*—Off St Monance, several specimens, and one or two from other parts of the Forth. This species seems to have been previously recorded from only two places in Scotland—St Magnus Bay, Shetland, and the Minch (see Monograph by Brady and Norman). I have, however, also observed it among some material dredged last year (1889) among the Orkney Islands.

*Pontocypris trigonella*, G. O. Sars.

*Pontocypris trigonella*, Brady, *op. cit.*, p. 387, pl. xxv. figs. 31–34; pl. xxxviii. fig. 3.

*Pontocypris trigonella*, Brady and Norman, *op. cit.*, p. 109 pl. xxii. figs. 18–25; pl. xxiii. fig. 6.

*Habitat.*—Largo Bay and other parts of the Estuary, but not very common.

#### BAIRDIIDÆ.

*Bairdia inflata*, Norman.

*Bairdia inflata*, Brady, *op. cit.*, p. 388, pl. xxvii. figs. 9–17; pl. xxxviii., fig. 5.

*Bairdia inflata*, Brady and Norman, *op. cit.*, p. 112.

*Habitat.*—Off St Monance, rare.

#### CYTHERIDÆ.

*Loxoconcha viridis* (Müller).

*Cythere viridis*, Müller, Entom., p. 64, pl. vii. figs. 1, 2 (1785), non Brady.

*Loxoconcha elliptica*, Brady, *op. cit.*, p. 435, pl. xxvii. figs. 38, 39; 45–48; pl. xl. fig. 3.

*Loxoconcha viridis*, Brady and Norman, *op. cit.*, p. 185.

*Habitat.*—Granton Harbour (David Robertson). This is a brackish-water species, and may have accidentally got into the harbour.

*Loxoconcha multifora* (Norman).

*Cytheropteron multiforum*, Brady, *op. cit.*, p. 449, pl. xxix. figs. 38–42.

*Loxoconcha multifora*, Brady and Norman, *op. cit.*, p. 185.

*Habitat.*—Granton Harbour (David Robertson). These two species of *Loxoconcha* were observed by Mr Robertson in material collected by him in Granton Harbour twenty years ago.

*Cythere finmarchica* (G. O. Sars), ♂ ♀.

*Cythere finmarchica*, Brady, *op. cit.*, p. 410, pl. xxxi. figs. 9–13.

*Cythere finmarchica*, Brady and Norman, *op. cit.*, p. 163.

*Habitat.*—Off St Monance, frequent.

*Cythere whitei* (Baird).

*Cythereis whitei*, Baird, Brit. Entom., p. 175, t. xx. figs. 3, 3a (1850).

*Cythere whitei*, Brady, *op. cit.*, p. 416, pl. xxx. figs. 21–24.

*Cythere whitei*, Brady and Norman, *op. cit.*, p. 169.

*Habitat.*—Largo Bay, rather rare.

*Cythere* (?) *semiovata*, n. s. (Pl. XII. figs. 1–2).

Shell seen from the side semiovate, dorsal and ventral margins nearly parallel; dorsal margin a flattened curve sloping downwards posteriorly, and forming with the nearly straight ventral margin a somewhat bluntly angular extremity; anterior end sharply rounded below, then curving obliquely upwards and backwards till it merges in the dorsal margin.

Seen from above, the width is greatest near the anterior end, but varies

little for about three quarters of the length, when the sides converge and form posteriorly a somewhat wedge-shaped extremity. The anterior end is broadly rounded, inclining to angular in the middle, where the valves meet; greatest breadth equal to height; height about  $\frac{1}{3}$  the length. Surface of the valves smooth, but having a slightly resinous appearance. Length, .35 mm.

*Habitat*.—Off St Mounance, not very rare. Specimens of this form have been dredged on several occasions at this place, depth 12 to 14 fathoms, bottom clean gravel and sand. The animal has not yet been made out, the species is therefore for the present doubtfully referred to *Cythere*.

*Cytheridea torosa* (Jones).

*Cytheridea torosa*, Brady, *op. cit.*, p. 425, pl. xxviii. figs. 7-12; pl. xxxix. fig. 5.

*Cytheridea torosa*, Brady and Norman, *op. cit.*, p. 175.

*Habitat*.—Brackish water pools by the shore at Aberlady Bay, common. Associated with *Cytherura gibba* (Müller), *Candona caudata* (Müller), *Trochamina inflata* (Mont.), *Haplophragmium canariense*, &c., Granton Harbour (Robertson). I have this species also from Montrose Basin and from Orkney; it is a brackish-water species. The above are the only records of its occurrence on the east of Scotland.

*Krithe bartonensis* (Jones).

*Krithe bartonensis*, Brady, *op. cit.*, p. 432, pl. xxxiv. figs. 11-14; pl. xl. fig. 5.

*Krithe bartonensis*, Brady and Norman, *op. cit.*, p. 179.

*Habitat*.—Near the mouth of the Estuary, moderately common. This species is new to the east of Scotland.

*Cytherura gibba* (Müller).

*Cythere gibba*, Müller, Entomostraca, p. 66, pl. vii. figs. 7-9, ♀ (1785).

*Cytherura robertsoni*, Brady, *op. cit.*, p. 444, pl. xxxii. figs. 16-18, ♀.

*Cytherura gibba*, Brady and Norman, *op. cit.*, p. 190 (non *Cytherura gibba*, Brady, Mon. Rec. Brit. Ostrac.)

*Habitat*.—Largo Bay, rare (dead), frequent in brackish-water pools at Aberlady Bay (living); Granton Harbour (Robertson); it occurs also in Montrose Basin. This is a brackish-water species, and is sometimes observed in moderate abundance where the water is only slightly saline. Its occurrence in Largo Bay and in Granton Harbour is probably accidental.

*Cytherura cornuta*, Brady.

*Cytherura cornuta*, Brady, *op. cit.*, p. 445, pl. xxxii. figs. 12-15.

*Cytherura gibba*, idem ibidem, p. 444, pl. xxxii. figs. 68-70, ♀ (non *Cytherura gibba*, Müller).

*Cytherura affinis*, idem ibidem, p. 443, pl. xxxii. figs. 17-21, ♀ var. (non *Cytherus affinis*, G. O. Sars).

*Cytherura lineata*, idem ibidem, p. 443, pl. xxxii. figs. 30-34 (jun.).

*Cytherura cornuta*, Brady and Norman, *op. cit.*, p. 192, pl. xviii. figs. 21, 22.

*Habitat*.—Vicinity of Phidra, off Musselburgh, and Burntisland, but not common. Though of frequent occurrence on the west coast, I do not find any previous record of it from the east coast of Scotland.

*Cytherura bodotria*,\* n. s. (Pl. XII. figs. 6, 7).

Shell seen from the side of nearly equal height throughout; dorsal and

\* *Bodotria*, the ancient name of the Forth.

ventral margins nearly straight, the former is slightly convex towards the anterior extremity; anterior margin evenly rounded, posterior extremity with a short beak situated about the middle, its termination narrow, truncate. Seen from above, ovate, slightly constricted in front, where the valves meet. At the posterior end, the middle is bluntly mucronate, and the sides are produced to an acute angle, so as to impart to it a somewhat tridentate appearance; dorsal ridge prominent, where it bends downwards in front. Surface sculptured with flexuous longitudinal riblets, crossed by a few indistinct ones arranged irregularly. Length, .5 mm.; breadth,  $\frac{2}{3}$  length; height, fully  $\frac{1}{3}$  the length.

*Habitat*.—Off St Monance, in 12 to 14 fathoms, bottom sand and gravel, rare.

This species somewhat resembles *Cytherura acuticostata*, but differs in being not so stout, and in having the valves produced backwards, so that the posterior extremity of the shell has a tridentate form.

*Cytherura mucronata*, n. s. (Pl. XII. figs. 3, 5).

Shell seen from the side, elongate, narrow; height about equal at both ends, length two and a half times the height; dorsal margin nearly straight, ventral margin slightly and evenly concave, posterior end much produced and wedge-shaped, forming a 'beak,' which is situated below the middle; anterior margin broadly rounded, somewhat produced in the middle. Seen from above, oval, with the ends acuminate; the margin at each end, especially the anterior margin, is produced, so as to form a distinct 'mucro.' The surface is marked with indistinct raised lines, which are somewhat irregularly distributed; the breadth is equal to the height; length, .33 mm.

*Habitat*.—Off St Monance, not very rare.

*Cytherura simplex*, Brady and Norman.

*Cytherura simplex* (name only), Brady and Robertson, Ann. and Mag. Nat. Hist., ser. iv., vol. xi. p. 66 (1872).

*Cytherura sarsii* ("local variety"), idem ibidem, vol. xiii. p. 117, pl. iv. figs. 6, 7 (1874).

*Cytherura simplex*, Brady and Norman, *op. cit.*, p. 200, pl. xviii. figs. 1, 2.

*Habitat*.—Off St Monance, frequent, depth 12 to 15 fathoms; bottom clean sand, part gravel. Viewed laterally, the shell of this species differs somewhat from the usual form of *Cytherura*, which has a more or less distinct 'beak' at the posterior end, whereas this has no posterior beak. New to the east of Scotland.

*Cytherura fulva*, Brady and Robertson.

*Cytherura fulva*, Brady and Robertson, Ann. and Mag. Nat. Hist., ser. iv., vol. xiii. p. 116, pl. iv. figs. 1-5 (1874).

*Cytherura fulva*, Brady and Norman, *op. cit.*, p. 205, pl. xix. figs. 9-11.

*Habitat*.—Largo Bay and other parts of the Estuary, but not common. New to the east of Scotland.

*Cytheropteron punctatum*, Brady.

*Cytheropteron punctatum*, Brady, *op. cit.*, p. 449, pl. xxxiv. figs. 45-48.

*Cytheropteron punctatum*, Brady and Norman, *op. cit.*, p. 211.

*Habitat*.—Off St Monance, rather rare. I do not find any previous record of this species for the east of Scotland.

*Bythocythere turgida*, G. O. Sars.

*Bythocythere turgida*, Brady, *op. cit.*, p. 452, pl. xxxiv. figs. 35–38.

*Bythocythere turgida*, Brady and Norman, *op. cit.*, p. 221.

*Habitat*.—Off Musselburgh and other parts of the Estuary, but not common. The only other Scotch localities where this species has been observed are the Clyde, Orkney, and Shetland.

*Bythocythere recta* (Brady).

*Cytheropteron rectum*, Brady, *op. cit.*, p. 476.

*Bythocythere recta*, Brady and Norman, *op. cit.*, p. 222, pl. xix. figs. 13–14.

*Habitat*.—Largo Bay, rare. This species has also been recorded from Lerwick and St Magnus Bays, Shetland, which appear to be the only records of it for Scotland.

*Cytherois fischeri* (G. O. Sars).

*Paradoxostoma fischeri*, Brady, Nat. Hist. Trans. Northumb. and Durham, vol. iii. p. 362, pl. xii. figs. 1–3 (1870).

*Cytherois fischeri*, Brady and Norman, *op. cit.*, p. 228, pl. xxi. figs. 20–22.

*Habitat*.—Generally distributed throughout the Estuary; common in brackish pools by the shore at Aberlady, where it is more or less of a dark bluish colour: those dredged off St Monance are nearly white.

#### PARADOXOSTOMATIDÆ.

*Paradoxostoma variabile* (Baird).

*Paradoxostoma variabile*, Brady, *op. cit.*, p. 459, pl. xxxv. figs. 1–7, 12–17; pl. xli. fig. 8.

*Paradoxostoma variabile*, Brady and Norman, *op. cit.*, p. 229, pl. xxiii. fig. 10.

*Habitat*—Largo Bay and other places, frequent

*Paradoxostoma obliquum*, G. O. Sars.

*Paradoxostoma obliquum*, Brady, *op. cit.*, p. 459, pl. xxxv. figs. 18–21.

*Paradoxostoma obliquum*, Brady and Norman, *op. cit.*, p. 230.

*Habitat*.—Off Phidra, Musselburgh, and Burntisland, rare.

*Paradoxostoma hibernicum*, Brady.

*Paradoxostoma hibernicum*, Brady, *op. cit.*, p. 460, pl. xxxv. figs. 35, 36; pl. xl. fig. 7.

*Paradoxostoma sarniense*, idem *ibidem*, p. 460, pl. xxxv. figs. 26–29; pl. xl. fig. 9.

*Paradoxostoma hibernicum*, Brady and Norman, *op. cit.*, p. 232, pl. xxi. figs. 15–17.

*Habitat*.—Largo Bay, rare. Neither this nor the previous species appear to have been recorded before for the east of Scotland.

*Paradoxostoma arcuatum*, Brady.

*Paradoxostoma* (?) *arcuatum*, Brady, *op. cit.*, p. 461, pl. xxv. figs. 37–38.

*Paradoxostoma arcuatum*, Brady and Norman, *op. cit.*, p. 234, pl. xxi. figs. 5, 6.

*Habitat*.—Off St Monance, Largo Bay, and near Inchkeith; several specimens Granton Harbour (Robertson).

*Paradoxostoma hodgei*, Brady

*Paradoxostoma hodgei*, Brady, Nat. Hist. Trans. Northumberland and Durham, vol. iii. p. 371, pl. xii. figs. 12, 13 (1870).

*Paradoxostoma hodgei*, Brady and Norman, *op. cit.*, p. 235, pl. xxi. figs. 7, 8.

*Habitat.*—Off St Monance and Phidra, frequent. New to the east of Scotland.

*Paradoxostoma* (?) *affine*, provisional name. (Pl. XII. figs. 8–9).

Shell seen from the side elongate, subovate, highest a little behind the middle; dorsal margin evenly but not boldly arched, inferior nearly straight, slightly sinuate towards the anterior extremity; anterior extremity rather higher than the posterior, and the margins of both evenly rounded; surface smooth, with a few irregular scratched lines. Outline seen from above compressed, ovate, the posterior half of nearly equal breadth, with the extremity obtusely pointed; anteriorly the shell is more compressed, the extremity being somewhat acuminate; breadth about equal to height and a third of the length; length, .42 mm.

This form resembles a small *P. arcuatum*, but is not so narrow posteriorly, and the greatest breadth is nearer the posterior extremity.

*Habitat.*—Off St Monance, not common.

## MYODOCOPA.

## CYPRIDINIDÆ.

*Asterope marie* (Baird).

*Cypridina marie*, Baird, Proc. Zool. Soc. Lond., part xviii. (1850), p. 257, pl. xvii. figs. 5–7.

*Cylindroleberis marie*, Brady, Mon. Rec. Brit. Ostrac., p. 465, pl. xxxiii. figs. 18–22; pl. xli. fig. 1 (1868).

*Asterope marie*, Robertson, Fauna and Flora of the West of Scotland, p. 39 (1876).

*Habitat.*—Bass Rock, but not common. This is a generally distributed, though not an abundant species. I have specimens from the Moray Firth and from Orkney: it is not uncommon in the Clyde.

## CLADOCOPA.

## POLYCOPIDÆ.

*Polycope orbicularis*, G. O. Sars.

*Polycope orbicularis*, G. O. Sars, Oversigt af Norges Marine Ostracoder, p. 122.

*Polycope orbicularis*, Brady, *op. cit.*, p. 471, pl. xxxv. figs. 53–57.

*Habitat.*—Off Phidra, rare. There is no previous record of this species for the east of Scotland.

*Note.*—In the Monograph by Brady and Norman, recently published by the Royal Dublin Society, the following species are recorded from the Firth of Forth:—*Loxococoncha fragilis*, G. O. Sars; *Loxococoncha pusilla*, Brady and Robertson; and *Cythere pulchella*, Brady, which, with the exception of the first, I also have observed in different parts of the Estuary.

## AMPHIPODA.

## GAMMARIDÆ.

*Gitana sarsi*, Boeck.

*Gitana sarsi*, Boeck, De Skand. Arkt. Amphip., p. 439, pl. xi. fig. 2 (1876).

*Amphilochus sabrinæ*, Stebbing, Ann. and Mag. Nat. Hist., p. 364, pl. xv. (1878).

*Habitat*.—Off Inchkeith (Nov. 1889) rare. This is a small species, and easily missed when mixed up among a lot of other things.

*Guernia coalita* (Norman).

*Helleria coalita*, Norman, Ann. and Mag. Nat. Hist., p. 418, pl. xxii. fig. 8; pl. xxiii. figs. 1–6 (1868).

*Guernia coalita*, Chevreux, Cat. Amphip. du Sud-ouest de la Bretagne (1889).

*Habitat*.—Off St Monance. A few specimens only of this curious little species were observed in material dredged off St Monance, depth from 12 to 14 fathoms, bottom sand and gravel.

*Hippomedon holbölli* (Kröyer).

*Anonyx holbölli*, Kröyer, Natur. Hist. Tidsskr., 2 R, 2 B, p. 8 (1846).

*Anonyx denticulatus*, Sp. Bate, Cat. Amphip. Crust. Brit. Mus., p. 75 (1862).

*Hippomedon holbölli*, A. Boeck, De Skand. Arkt. Amphip., p. 136, pl. v. fig. 6; pl. vi. fig. 7 (1876).

*Habitat*.—A little north-west of May Island (1888), rare.

*Megaluropus agilis*, Norman.

*Megaluropus agilis*, Norman, Ann. and Mag. Nat. Hist. (1889), p. 446, pl. xviii. figs. 1–10.

*Habitat*.—Largo Bay, frequent. 'The most remarkable characters in the genus,' to which this species belongs, 'are the eye, which is situated on a greatly projected lobe, and the expanded foliaceous branches of the last uropods.\*' The peculiar form of these uropods is even more striking than the prominent eye on its curious stalk-like lobe, which projects forward between the peduncles of the antennules and antennæ. In Scotland this species has been observed at Cumbrae, Firth of Clyde (D. Robertson), and 25 miles off May Island, Firth of Forth (John Murray). This last station is considerably beyond the limits of the Forth, and the present is therefore the first record of the occurrence within the Estuary.

*Monoculodes carinatus*, Bate.

*Westwoodia carinata*, Bate, Brit. Assoc. Rep. (1855), p. 58.

*Monoculodes carinata*, Bate and Westw., Brit. Sess.-eyed Crust., vol. i. p. 165.

*Monoculodes stimpsoni*, *ibid* *ibidem*, p. 160, ♂ (jun.)

*Monoculodes affinis*, Boeck, Crust. Amphip., bor. et arct., p. 84 (1870).

*Monoculodes carinatus*, Norman, Ann. and Mag. Nat. Hist. (1889), p. 447, pl. xix. figs. 1–5.

*Habitat*.—Off St Monance, near Phidra, and in Largo Bay, but not common. In Largo Bay, *M. longimanus*, Bate (a species I have already recorded for the Forth), is of frequent occurrence; females with ova are occasionally observed. This species is not so large nor so robust as the other, being scarcely half the size. *M. carinatus* has been taken '25 miles off May Island,' which is considerably beyond the limits of the Firth of Forth. This is the first record of its occurrence within the Estuary. Mr Robertson records it from several places in the Firth of Clyde, and T. Edward at Banff.

\* Norman, Ann. and Mag. Nat. Hist. (1889), p. 446.

*Urothoe elegans*, Spence Bate.

*Gammarus elegans*, Spence Bate, Brit. Assoc. Rep. (1855).

*Urothoe elegans*, Spence Bate, Sess.-eyed Crust., vol. i. p. 200 (1863).

*Habitat*.—Largo Bay, not uncommon. A small but robust species, which does not appear to have been previously recorded for the Forth.

*Leucothoe spinicarpa* (Abildgaard).

*Gammarus spinicarpus*, Abildgaard, Zool. Dan., vol. iii. p. 66, pl. cxxix. figs. 1-4.

*Leucothoe spinicarpa*, A. Boeck, Crust. Amph., bor. et arct., p. 78 (1870).

*Leucothoa spinicarpa*, Bate and Westwood, Brit. Sess.-eyed Crust., vol. i. p. (1863).

*Habitat*.—Largo Bay, rare. *Leucothoe* is readily distinguished by the peculiar form of the hands of the first pair of gnathopods, which somewhat resemble the blades of a pair of scissors with curved points. I have frequently taken this species, but usually in the branchial cavities of large Ascidians, and very seldom otherwise. I have observed it in such situations at East Loch Tarbert (Loch Fyne), at Scapa Flow, Orkney, and in the Moray Firth. It is of a delicate reddish or pink colour, and moderately active. It is curious that this somewhat semiparasitic habit of *L. spinicarpa* has been so seldom referred to by authors.

*Phoxocephalus fultoni*,\* n. s. (Pl. XII. figs. 10-12), and Pl. XIII. figs. 13-19.

Rostrum (fig. 12) extending to about the end of the second joint of the peduncle of the antennules. Antennules short, not longer than the peduncle of the antennæ; joints of peduncle stout, sparsely furnished with hairs, the last rather more than half the length of the penultimate joint; flagellum shorter than the peduncle, 4-jointed joints sub-equal; secondary appendage 3-jointed, extending to the end of the second joint of the flagellum. Antennæ short, stout, furnished with a few hairs, especially on the upper distal margin of the joints. There is no very marked difference between the peduncle and flagellum; second and third joints of peduncle about equal in length; flagellum 3-jointed, rather longer than the last joint of the peduncle. The thigh of the first gnathopods is long, the anterior distal angle of the short stout meros is produced into a small rounded process; the adjacent parts of meros and wrist are correspondingly hollowed out, and thus a kind of ball and socket joint is formed (fig. 15, *a*); hand (fig. 15) subquadrate, the length about twice the breadth; sides nearly straight and parallel; palm slightly convex, and produced forward at an obtuse angle from the joint of the finger; finger slightly curved, the point reaching nearly to the extremity of the palm, and fitting into a small notch. Second gnathopods very like the first, but the hand is to some extent proportionally broader; the hands of both first and second gnathopods have a fringe of short hairs along each side of the palm. The first, second, and third perieopods are short and stout; the fourth are longer, the fifth are also short and stout. The outer branch of posterior pleiopods is 2-jointed, the terminal joint being very much shorter than the other; the inner branch is 1-jointed, and small, being scarcely more than half the length of the first joint of the outer branch (fig. 19).

I obtained two forms of this species; they resemble each other closely.

\* It gives me much pleasure to have the opportunity to name this species after my friend, Dr T. Wemyss Fulton, Secretary to the Scientific Department of the Fishery Board.

The one that seems to be the female differs from that now described chiefly in the following points:—The flagellum of the antennules is 5-jointed, the first and second joints rather shorter than the others (figs. 10–11). The flagellum of the antennæ is 10-jointed; the first joint is moderately long—longer than the next two together, which are short, and about equal in length, fourth joint rather longer than the preceding; the remaining joints gradually increase in length, and become more slender (fig. 11). The inner joint of the posterior pleiopods, which is also 1-jointed, is rather longer than, and as stout as the first joint of the outer branch; the two forms are very much alike otherwise.

*Habitat*.—Off St Monance, in 12 to 15 fathoms, not very common.

*Amphithopsis latipes* (M. Sars).

*Calliope ossiani*, Bate and Westwood, Brit. Sess.-eyed Crust., vol. i. p. 261 (1868).

*Calliope fingalli*, idem ibidem, vol. i. p. 263.

*Amphithopsis latipes*, Norman, Mus. Norm., part iii. p. 15 (1868).

*Habitat*.—Several specimens attached to a Zoophyte (*Antennularia*) brought up in the trawl-net a few miles east of Inchkeith; they were, with one or two exceptions, all prettily marked by brown bands extending from the side along the posterior edge of each segment of the posterior pleon; the coxæ were also of the same colour. In the form of the antennules and antennæ, and of the gnathopods and in the coloration, they agreed with the form described by Spence Bate as *Calliope ossiani*. The Rev. T. R. R. Stebbing, to whom I submitted specimens, and who corroborated my diagnosis, informs me that Boeck and Norman identify *Calliope ossiani* and *C. fingalli*, Bate and Westwood with *Amphithopsis latipes* (M. Sars). I have therefore followed them in ascribing my specimens to Sars's species.

*Epimeria cornigera* (Fabricius).

*Gammarus cornigera*, Fab., Reisenach Norwegen (1779), p. 383.

*Acanthonotus testudo*, White, Cat. Crust. Brit. Mus. (1847), p. 57.

*Acanthonotus owenii*, Bate and Westwood, Brit. Sess.-eyed Crust., vol. i. p. (1863).

*Epimeria cornigera*, A. Boeck, Crust. Amphip., bor. et arct. (1870), p. 105.

*Habitat*.—East of Inchkeith, about 3 miles. The colour of this pretty species is white, somewhat pellucid, beautifully variegated with bright red; the postero-lateral margins of each segment is of this colour, which is also more or less diffused over the dorsal surface. I have also got this species in the Moray Firth; and Mr Robertson records it from various places in the Clyde district.

#### COROPHIIDÆ.

*Siphonæcetus colletti* (?), Boeck.

*Siphonæcetus colletti*, Boeck, Crust. Amphip., bor. et arct. (1870), p. 178.

*Siphonæcetus colletti*, idem, De Skand. og Arkt. Amph. (1876), p. 633, pl. xxviii. fig. 9.

*Habitat*.—Largo Bay, frequent. New to Britain. It is quite possible that this may have been passed over as a *Corophium*, otherwise it is difficult to account for its not being previously recorded. The specimen comes very near to *S. typicus*, and it may ultimately be found to belong to that species. I prefer therefore to consider it for the present as doubtful.

## ISOPODA.

## SPHÆROMIDÆ.

*Sphæroma rugicauda*, Leach.

*Sphæroma rugicauda*, Leach, Edin. Enc., vol. vii. pp. 405, 408.

*Sphæroma rugicauda*, Bate & Westwood, Brit. Sess.-eyed Crust., vol. ii. p. 408 (1863).

*Habitat*.—In brackish-water pools on the shore at Aberlady Bay, Common. They appeared mostly to creep upon or through the surface layer of the soft oozy mud forming the bottom of the pools; and only when the mud was stirred would they rise and swim very rapidly through the water for a short distance, then drop down again and burrow among the mud. When prevented from swimming, or when taken out of the water, they rolled themselves into a ball. Though observed at Berwick-on-Tweed by Dr Johnston, they do not appear to have been previously recorded for the east of Scotland. Mr Robertson found them plentiful in a weedy brackish pool with a soft muddy bottom at Hunterston, Ayrshire.

## CUMACEA.

Only four species are added to the Forth Cumacea in this Report, viz. :—

## CUMIDÆ.

*Cuma pulchella*, G. O. Sars, ♂ ♀.

*Cuma pulchella*, G. O. Sars, Nye Bidrag til Kundakaben om Middelhavets Invert-fauna, part ii., Cumacear, p. 24, tab. vi. and tab. lx. (1879).

*Habitat*.—Off St Monance, and in the vicinity of Phidra; Largo Bay, common. This is a small species, and easily overlooked. Dr Norman says that 'a good point for distinguishing the species is the first joint of the second foot, which is furnished with a series of backward directed 'tooth-like processes,' which is well shown in tab. lx. fig. 7, of Sars' Monograph referred to above. This seems to be the first time that *C. pulchella* has been observed in Britain; previously it has been noticed at Naples by G. O. Sars, and Bayonne by Marquis de Folin. The integument is ornamented with numerous microscopic circular depressions arranged in irregular oblique rows; the anterior part of the cephalon is dorsally of a dusky colour, and is darkest in the vicinity of the rostrum.

*Eudorellopsis deformis* (Kröyer).

*Leucon deformis*, Kröyer, Voyage en Skand., pl. vi. fig. 3.

*Eudorella? deformis*, G. O. Sars, Beskrivelse af de paa Fregatten Josephines Exped., fundne Cumaceer, p. 50, figs. 118–121 (1871).

*Habitat*.—Off St Monance and Aberlady Bay, not common. Dr Norman states in reference to this species, 'not yet recorded as British, but I have had specimens in my collection, determined, since 1866, when I found them in a gathering from Bridlington, sent me by G. S. Brady.' It does not seem to have been observed anywhere else in Britain, and thus forms an interesting addition to the Forth Fauna. In 1882 G. O. Sars described this under the generic name *Eudorellopsis*.

*Diastylus rugosa*, G. O. Sars.

*Diastylus rugosa*, G. O. Sars, Om den aberrante Krebsdyrgruppe Cumacea og dens nordiske Arter, p. 41.

*Diastylus strigata*, Norman, Ann. Nat. Hist., ser. 5, vol. iii. p. 62 (male).

*Diastylus rugosa*, G. O. Sars, Middelhavets Cumaceer, p. 98, Tab. 34–38 (1879).

*Habitat*.—Largo Bay and other parts of the Forth. This seems to be a well-marked species, though it has not previously been recorded for the Estuary.

*Campylaspis affinis*, G. O. Sars, ♂ ♀.

*Campylaspis affinis*, G. O. Sars, Nye Dybrands Crustaceer fra Lofoten, p. 160 (1870); Extract, p. 16.

*Habitat*.—Vicinity of the Bass Rock, rare. The cephalic shield is thickly sprinkled with purple spots, which impart to it a somewhat uniform purplish colour. The Rev. T. R. R. Stebbing, to whom I submitted the specimen, points out that it comes very close to *C. rubricunda* (Liljeborg) in the form of the tail appendages; it differs in the coloration.

## SCHIZOPODA.

### MYSIDÆ.

*Erythrops serrata*, G. O. Sars.

*Nematopus serratus*, G. O. Sars, Beretning om en Sommeren (1862), foretagen Zoologisk Reise i Christianias og Trondhjems Stifter, p. 43.

*Nematopus serratus*, Norman, Last Report on Dredging among the Shetland Isles: Report Brit. Assoc. (1868), p. 270.

*Erythrops serrata*, G. O. Sars, Mon. over de ved Norges Kyster Forkommende Mysider., Frste Helte, p. 27, tab. ii. figs. 1–2 (1870).

*Habitat*.—South-east of the Bass Rock 4 or 5 miles, rather rare. In this species the outside edges of the antennal scales are deeply toothed, with the teeth pointing forwards, and thus differs from the other two species of *Erythrops* recorded for Britain. There appears to have been some confusion in previous records of the distribution of *Nyctiphanes norvegica* and *Boreophausia raschii*, the first being understood to be a more common species. I find, on the contrary, that the latter is comparatively abundant, especially in the outward part of the Estuary, while the other is rather rare.

## MOLLUSCA.

Miss J. E. Carphin kindly placed her extensive collections of Forth Mollusca at my service, which has enabled me to include a few interesting additions to the local list of species belonging to this group.

## LAMELLIBRANCHIATA.

### LUCINIDÆ.

*Diplodonta rotundata* (Montagu).

*Telene rotundata*, Mont., Test. Brit., p. 74, t. ii. fig. 3.

*Diplodonta rotundata*, Jeffreys, Brit. Conch., vol. ii. p. 254; vol. v. pl. xxxiii. fig. 4.

One living specimen of this pretty bivalve was found at Newhaven Pier by Miss J. E. Carphin. It had been brought in from the outer part of the Estuary on the fishermen's lines.

### CARDIIDÆ.

*Cardium nodosum*, Turton.

*Cardium nodosum*, Turt., Conch. Dith., p. 186, t. xiii. fig. 8.

*Cardium nodosum*, Jeffreys, Brit. Conch., vol. ii. p. 283; vol. v. pl. xxxv. fig. 4.

*Habitat*.—Between Inchkeith and May Island, several specimens of this species were dredged, a few being alive. Though widely distributed, it does not appear to be a common species. My friend Mr J. T. Marshall, M.C.S., Torquay, kindly examined one of the specimens for me, and confirmed my identification. He says 'it is a rare species in Scotland, and I have it thence from only two localities.' It may be remarked that some experience is necessary to enable one to discriminate the smaller species of *Cardium*.

## CYPRINIDÆ.

*Circe minima* (Montagu).

*Venus minima*, Mont., Test. Brit., p. 121, t. iii. fig. 3.

*Circe minima*, Jeff., Brit. Conch., vol. ii. p. 322, pl. vi. fig. 4; vol. v. pl. xxxvii. fig. 6.

Procured from the fishermen's lines at Newhaven Pier by Miss J. E. Carphin.

## GASTEROPODA.

## TROCHIDÆ.

*Trochus montacuti*, W. Wood.

*Trochus montagui*, Wood, Ind. Test., Suppl., pl. vi. fig. 43.

*Trochus montacuti*, Jeff., Brit. Conch., vol. iii. p. 320; vol. lxiii. fig. 1.

This species was found at Newhaven Pier by Miss J. E. Carphin, having been brought in from the outward part of the Estuary on the fishermen's lines.

*Trochus zizyphinus*, L., var. *lyonsii* (Leach).

*Trochus lyonsii*, Flem., Brit. Anim., p. 323.

*Trochus zizyphinus*, var. *lyonsii*, Jeff., Brit. Conch., vol. iii. p. 331.

Two fine and living specimens of this pretty variety of *Trochus zizyphinus* were found by Miss J. E. Carphin at Newhaven Pier; they had been brought in attached to the fisherman's lines from the outer part of the Estuary. I have also obtained two living specimens of this variety and one typical specimen among trawl refuse a few miles west of May Island, while trawling the Forth stations.

## EULIMIDÆ.

*Eulima polita* (Linné).

*Turbo politus*, Linn, S. N. p. 1241.

*Eulima polita*, Jeff., Brit. Conch., vol. iv. p. 201; vol. v. pl. lxxvii. fig. 3.

*Habitat*.—Off St Monance, rare. Two adult living specimens and one or two young ones were dredged at this locality.

## NUDIBRANCHIATA.

## HERMÆIDÆ, A. &amp; H.

*Alderia modesta* (Løven).

*Stiliger modestus*, Løven, Trans. Royal Swedish Academy.

*Alderia modesta*, idem, Index Molluscorum Scandinaviæ.

*Alderia modesta*, A. & H., Brit. Nud. Moll., fam. 3, pl. xli. figs. 1-5.

*Alderia modesta*, J. G. Jeffreys, Brit. Conch., vol. v. p. 33 (1869).

*Habitat*.—Brackish-water pools between tide marks, Aberlady Bay, frequent, but easily overlooked. Not before recorded for the Forth. Jeffreys says\*—'This curious animal is almost amphibious, being only

\* *Brit. Conch.*, vol. v. p. 33.

' found in very shallow brackish-water barely within the reach of the tide, and occasionally crawling on the moist weed beyond. It is a rare [or local] species, but generally plentiful where it does occur.' I obtained one specimen of this species in the vicinity of Skeirvuie—a small island near the head of East Loch Tarbert (Loch Fyne)—where *Zostera marina* grows in considerable abundance; the specimen was kept alive for some time, and carefully examined by myself and others, so that though the conditions of the locality mentioned are different from those of the *habitat* which this species is said to be restricted to as stated above, there was no doubt as to the correct identification of the specimen.

*Note*.—In the course of our examination of the stomachs of fishes, taken in the Firth of Forth by the 'Garland's' trawl-net, the Annelids *Priapulus caudatus* and *Echiurus oxyurus*, and the Tunicate *Pelonaia corrugata* have been occasionally observed, and in some instances so little injured as to indicate that they had been quite recently captured by the fish. It is in the stomach of the haddock and cod that these organisms are usually observed. *Priapulus* and *Pelonaia* have been recorded from the Forth; but so far as I know, *Echiurus* has not been hitherto observed in the Estuary. In St Andrews Bay, however, it is occasionally met with. *Macropsis slabberi*, which, as a British species, was considered to be confined to the upper part of the Firth of Forth, has been taken by me during the last year in the vicinity of the Bass, in St Andrews Bay, and and in the Estuary of the Tay opposite Tayport; this would indicate that its distribution is not so restricted as was supposed, or that it is spreading gradually to other parts of our coast. I have also obtained the somewhat rare *Isocardia cor* and *Palmipes membranacea (placenta)* in the Moray Firth. Of the first, two large specimens—one living and one dead—were brought up by the trawl of the 'Southesk' last year during the time I was on board; a specimen of the other was brought up by the 'Southesk's' trawl on one or two occasions while I was on board in the early part of this year (1890).

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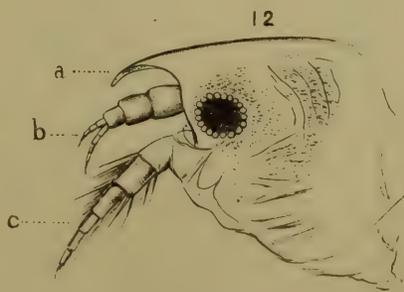
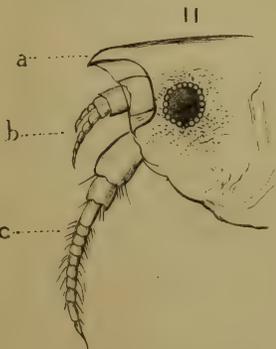
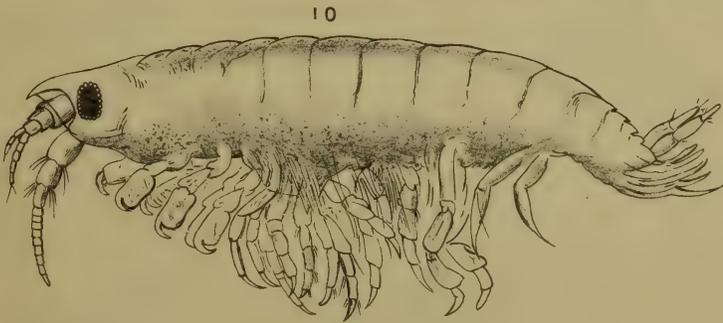
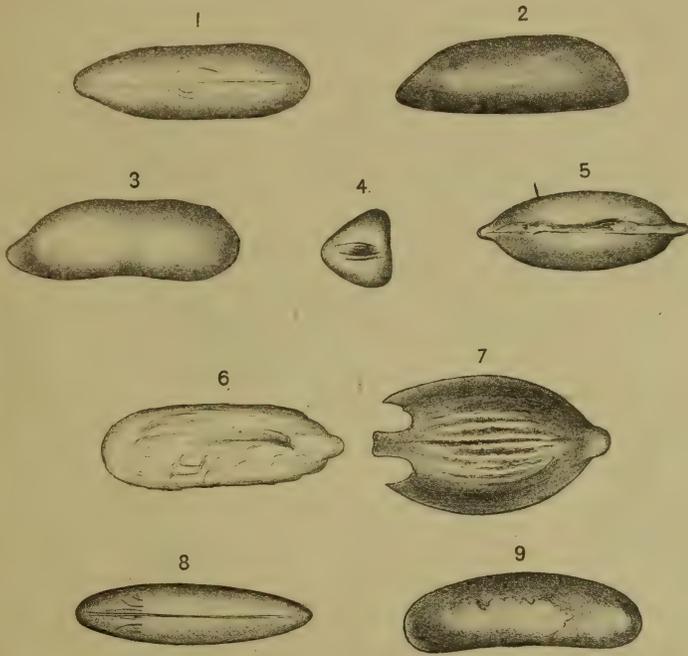
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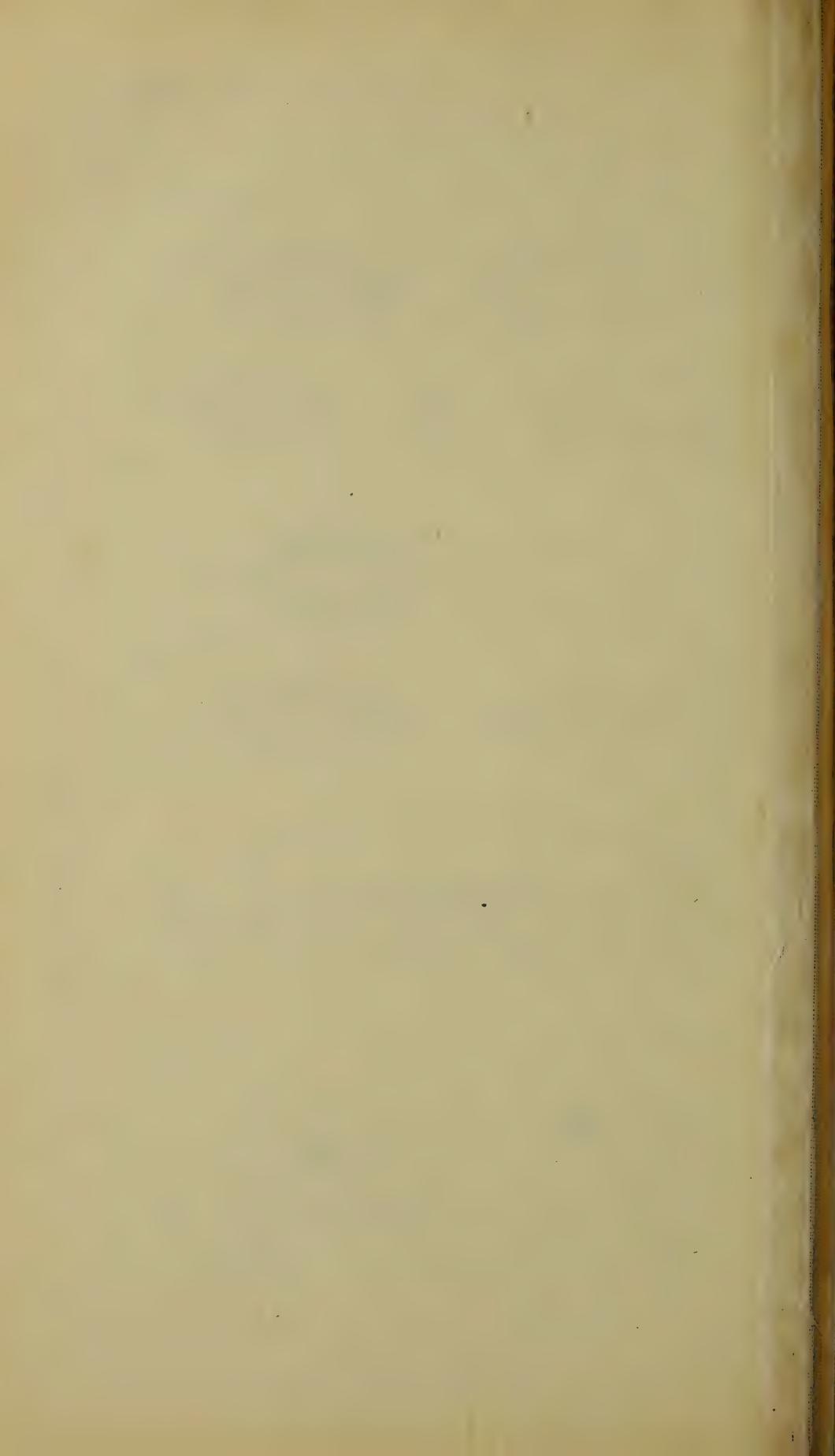
In my paper 'Some Additions to the Fauna of the Firth of Forth,' in last year's Report, the Amphipods referred by me to *Gammarus edwardsi*, Spence Bate (p. 321), I am now satisfied do not belong to that species, but are a form of *G. locusta*, L.

Note on *Cymbasoma rigidum* (Thompson), Scott, 'Some Additions to the Fauna of the Firth of Forth,' *Seventh Annual Report*, pt. iii. p. 316 (1889).

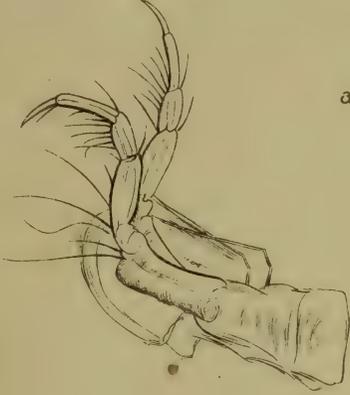
In a paper by G. C. Bourne, M.A., F.L.S., Director of the Plymouth Laboratory of the Marine Biological Association, on the genus *Monstrilla*, Dana, in the *Quarterly Journal of Microscopical Science*,† this genus is fully and carefully described; short descriptions are also added of various species belonging to it which have been more or less satisfactorily determined. In this paper Mr Bourne identifies *Cymbasoma*, Thompson, with *Monstrilla*, Dana, and refers the form recorded by me for the Firth of Forth in the *Seventh Annual Report* as *Cymbasoma rigidum* to *Monstrilla helgolandica*, Claus (of which there is no previous record for

† Vol. xxx. pt. iv. pp. 565-578, pl. xxxvii. (February 1890).

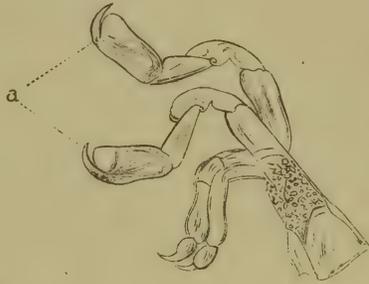




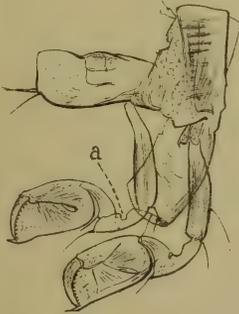
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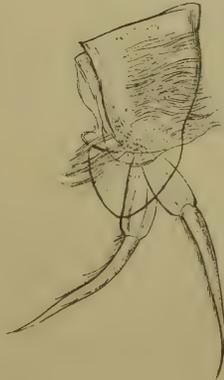
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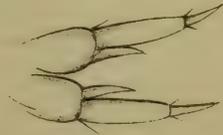
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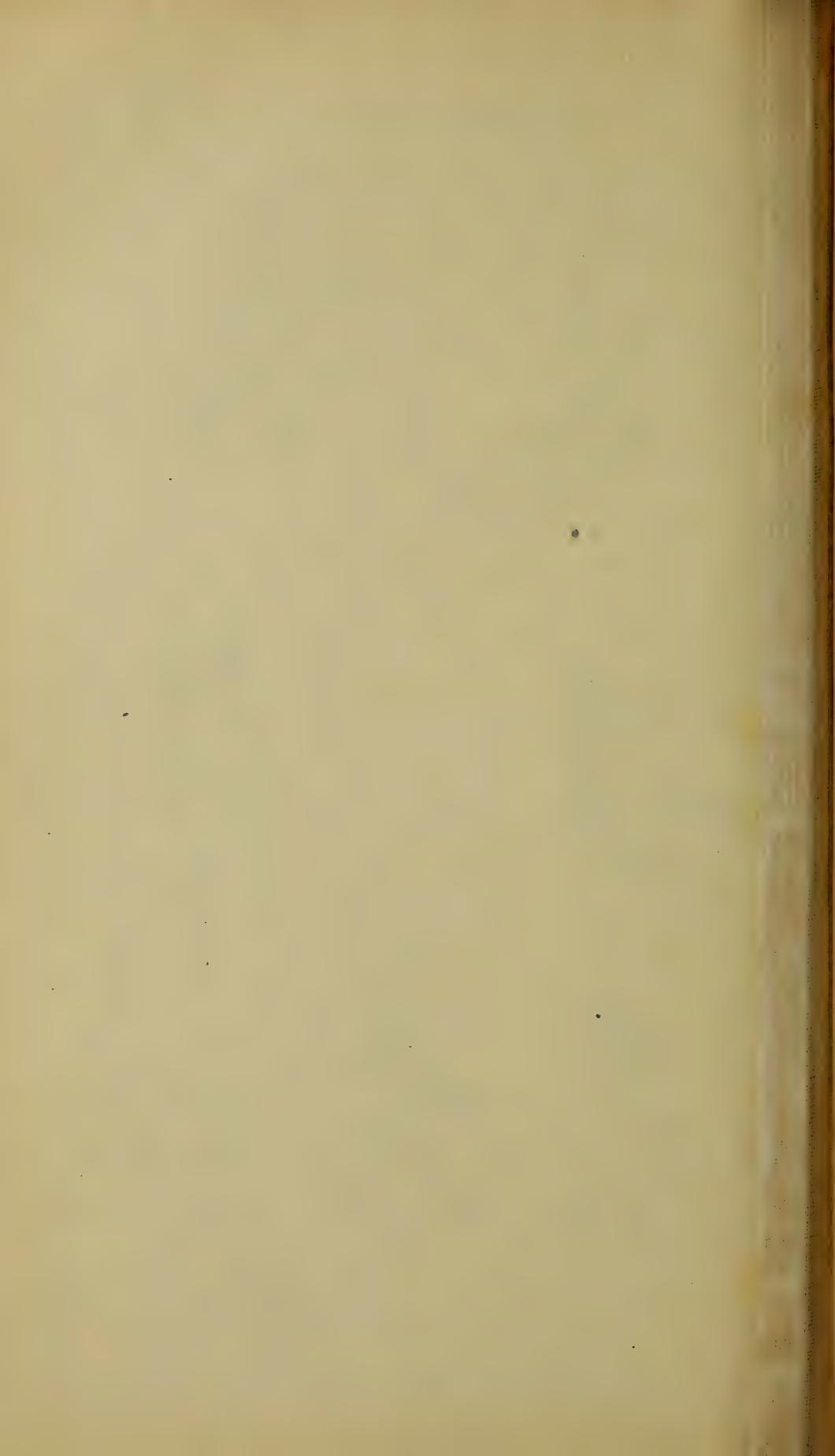


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Britain). Its distinctive characters, as described by Bourne—who examined the dissections of my specimens—are ‘six setæ on each furcal member, four abdominal segments, antennæ four-jointed, the two last joints elongate, subequal. The protopodite of the swimming feet bears a spine on its interior lower angle.’

*Habitat.*—Heligoland and Firth of Forth.

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EXPLANATION OF PLATES XII., XIII.

PLATE XII.

- Fig. 1. *Cythere* (?) *semiorata*, seen from above.  
 Fig. 2.     "                  "          seen from right side.  
 Fig. 3. *Cytherura mucronata*, seen from right side.  
 Fig. 4.     "                  "          end view.  
 Fig. 5.     "                  "          seen from above.  
 Fig. 6. *Cytherura bodotria*, seen from left side.  
 Fig. 7.     "                  "          seen from above.  
 Fig. 8. *Paradoxostoma* (?) *affine*, seen from above.  
 Fig. 9.     "                  "          seen from right side.  
 Fig. 10. *Phoxocephalus fultoni* ♀ ?  
 Fig. 11.     "                  "          ♀ ? *a* rostrum, *b* antennules, *c* antennæ.  
 Fig. 12.     "                  "          ♂ ? *a* rostrum, *b* antennules, *c* antennæ.

PLATE XIII.

- Fig. 13.     "                  "          2nd perieopods.  
 Fig. 14.     "                  "          1st gnathopods.  
 Fig. 15.     "                  "          2nd     "  
 Fig. 16.     "                  "          3rd perieopods.  
 Fig. 17.     "                  "          1st     "  
 Fig. 18.     "                  "          1st pleiopods.  
 Fig. 19.     "                  "          posterior pleiopods.