Seventh Annual Report of the Fishery Board for Scotland, Part III, pp. 311–324, 1889.

V. SOME ADDITIONS TO THE FAUNA OF THE FIRTH OF FORTH WITH NOTES OF SOME RARE EAST COAST FORMS. By THOMAS SCOTT.

Since the publication of the Revised List of the Crustacea of the Forth in the last Report of the Fishery Board for Scotland, several interesting additions have been made to some of the groups therein described, and it has been considered desirable that these should now be recorded, as well as some species belonging to the *Protozoa*, the *Echinodermata*, the *Mollusca*, and *Pisces*, which hitherto do not appear to have been observed within the limits of the estuary. Though the chief object of the present paper is the recording of species new to the fauna of the Firth of Forth, reference is also made to rare and interesting organisms which have from time to time been observed while engaged in the trawling experiments carried on, under the directions of the Scientific Committee of the Fishery Board, in the Firth of Forth, in the Moray Firth, and in the Firth of Clyde. Though the recording of such discoveries may be of secondary importance when compared with the Board's other investigations, yet this tends to show that the work that is being carried on is benefiting science in various ways.

INVERTEBRATA.

FORAMINIFERA.

In a valuable paper by Mr H. B. Brady on Brackish-water Foraminifera, several species are recorded as occurring in the higher reaches of the Forth, particularly in the vicinity of Bo'ness. Professor Franz Eilhart Schulze, in the Report of the German Expedition of 1872, gives a list of species observed mostly in the lower parts of the estuary during that expedition, all of which are included in Leslie and Herdman's *Invertebrate Fauna of the Firth of Forth*. The *Foraminifera* recorded in that work comprise three species of *Miliolidæ*, two of *Lituolidæ*, thirteen of *Lagenidæ*, fourteen of *Globigerinidæ*, and three of *Nummulinidæ*; to these Professor J. R. Henderson added *Astrorhiza limicola*, Sandahl. The following are some further additions of species (twenty-three in number), that have been observed while collecting data in connection with the trawling experiments.

MILIOLIDÆ.

Cornuspira foliacea (Phillipi).

Orbis foliacea, Phillipi, Enum. Moll. Sicil., vol. ii. p. 147, tab. xxiv. fig. 25 (1844).

Cornuspira planorbis, Schultze, Uber den Org. der Polyth., t. ii. fig. 21 (1854).

Spirilina foliacea, Williamson, Rec. For. of G. Brit., p. 91, pl. vii. figs. 199–201 (1858).

Cornuspira foliacea, H. B. Brady, Foram. of the Chall. Exped., p. 199, pl. xi. figs. 5–9 (1884).

Habitat.—A few specimens among material dredged in the South Bay; one of the specimens was perfect, the others were young.

Cornuspira striolata, H. B. Brady.

Cornuspira striolata, Brady, Proc. Roy. Soc. Edin., vol. xi. p. 713 (1882).

Habitat.—One specimen, near Inchkeith, 10 to 12 fathoms. The specimen has unfortunately been damaged but is still perfect enough for identification. This species has been found in the cold water channel near the Faroe Islands in over 500 fathoms.

Copepoda, see p. 316, 326

Vertebralina striata, d'Orbigny.

Vertebralina striata, d'Orbigny, 1826, Tableau Method, Modèles, No. 81.

Habitat.—One specimen from each of the following places, Aberlady Bay, Inchkeith, and Largo Bay.

Biloculina ringens (Lamarck).

Miliolites ringens, Lam., 1804, Ann. du Mus., vol. v. p. 351; vol ix. p. 2, pl. xvii. fig. 1.

Biloculina ringens, Williamson, 1858, Rec. For. of G. Brit., p. 79, pl. vi. figs. 169, 170.

Habitat.—A few specimens among material dredged in Aberlady Bay.

Biloculina depressa, d'Orbigny.

Biloculina depressa, d'Orb., Ann. Sc. Nat., vol. vii. p. 298 (1826).

Lagenula marginata, Fleming, Brit. Anim., p. 235 (1828).

Biloculina ringens, Williamson (in part), Rec. For. of G. Brit., p. 78, pl. vii. figs. 172–174 (1858).

Biloculina depressa, H. B. Brady, Foram. of the Chall. Exp., p. 145, pl. ii. figs. 12, 15–17., and pl. iii. figs. 1, 2 (1884).

Habitat.—One or two specimens among dredged material, also from South Bay; this species is of frequent occurrence in the Clyde.

Biloculina elongata, d'Orbigny.

Biloculina elongata, d'Orb.

Biloculina ringens, var. *patagonica*, Williamson, Rec. For. of Gr. Brit., p. 80, pl. vii. figs. 175, 176 (1858).

Biloculina elongata, Robertson, Fauna and Flora of the W. of Scot., p. 51 (1876).

Biloculina elongata, H. B. Brady, Foram. of the Chall. Exp., p. 144, pl. xi. figs. 9, *a*, *b* (1884).

Habitat.—A few specimens among material dredged in the same locality as last, and others from Aberlady and Largo Bays.

Miliolina oblonga (Montagu).

Vermiculum oblongum, Mont., Test. Brit., p. 522, pl. xiv. fig. 9 (1803).

Vermiculum oblongum, Fleming, Brit. Anim., p. 233 (1828).

Triloculina oblonga, D'Orb., Tableau Method, p. 300 (1826).

Miliolina seminulum, Williamson (in part), Rec. For. of G. Brit., p. 85, pl. vii. figs. 86, 87 (1858).

Miliolina oblonga, H. B. Brady, Foram. of the Chall. Exp., p. 160, pl. v. fig. 4, *a*, *b* (1884).

Habitat.—Two perfect specimens among dredged material from the vicinity of Inchkeith, and a few from Aberlady Bay.

Miliolina trigonula (Lamarck).

Miliolites trigonula, Lam., 1804, Ann. du Mus., vol. iv. p. 351, No. 3.

Miliolina trigonula, H. B. Brady, Foram. of the Chall. Exped., p. 164, pl. iii. figs. 14–16 (1884).

Habitat.—A few specimens among material from Aberlady Bay.

Miliolina secans, d'Orbigny.

Miliolina secans, d'Orb.

Miliolina seminulum, var. *disciformis*, Williamson, Rec. For. of G. Brit., p. 88, pl. vii. figs. 188, 189 (1858).

Quinqueloculina secans, Robertson, Fauna and Flora of the W. of Scot., p. 51 (1876).

Miliolina secans, H. B. Brady, Foram. of the Chall. Exp., p. 167, pl. vi. figs. 1, 2 (1884).

Habitat.—Two specimens in material dredged, in 12 to 14 fathoms, to the east of Inchkeith, and one or two from Aberlady Bay.

Miliolina bicornis (Walker and Jacob).

Serpula bicornis ventricosa, W. & J., Test. Min. Rar., p. 2, tab. i. fig. 2 (1784).

Triloculina brongniartii, d'Orb., Ann. Sci. Nat., vol. vii. p. 300, No. 23 (1826).

Vermiculum bicorne, Fleming, Brit. Anim, p. 234 (1828).

Miliolina bicornis, Williamson, Rec. For. of G. Brit., p. 85, pl. vii. figs. 190–198 (1858).

Quinqueloculina bicornis, Robertson, Fauna and Flora of the W. of Scot., p. 51 (1876).

Miliolina bicornis, H. B. Brady, Foram. of the Chall. Exp., p. 171, pl. vi. figs. 9, 11, 12 (1884).

Habitat.—A few specimens in material dredged in the South Bay. It is over a hundred years since this species was first made known as British by William Boys, the well-known conchologist, in his work, *Testacea Minuta Rariora.*

Miliolina agglutinans, d'Orbigny.

Miliolina agglutinans, d'Orb.

Quinqueloculina agglutinans, Robertson, Fauna and Flora of the W. of Scot., p. 51 (1876).

Quinqueloculina agglutinans, H. B. Brady, Foram. of the Chall. Exped., p. 180, pl. viii. figs. 6–7 (1884).

Habitat.—One specimen in material dredged in the vicinity of Inchkeith, and others from Aberlady and Largo Bays. This does not appear to be a very common species in the Forth. It is easily distinguished by having numerous grains of sand incorporated in the matrix of the shell, so that it looks as if it properly belonged to the arenaceous group *Lituolidæ*. It is moderately common in the Clyde.

Miliolina ferussacii (d'Orbigny).

Quinqueloculina ferussacii, D'Orb., Ann. Sci. Nat., vol. vii. p. 301, No. 18 (1826).

Miliolina bicornis, var. *augulata*, Williamson, Rec For. of G. Brit., p. 88, pl. vii. fig. 196 (1858).

Miliolina ferussacii, H. B. Brady, Foram. of the Chall. Exped., p. 175, pl. cxiii. fig. 17, *a*, *b* (1884).

Habitat.—One specimen in material dredged in the South Bay, in 6 to 7 fathoms water, and a few from Aberlady Bay.

Lituolidæ.

Haplophragmium pseudo-spirale (Williamson).

Proteonina pseudo-spiralis, Will., Rec. For. of G. Brit., p. 2, pl. i. figs. 2, 3 (1858).

Haplophragmium pseudo-spirale, H. B. Brady, Foram. of the Chall. Exped., p. 302, pl. xxxiii. figs. 1–4 (1884).

Habitat.—Not unfrequent among material dredged a little west of Inchkeith. Skye is the only locality given for this species by Williamson, where it was first discovered by Barlee. I have met with it in Loch Fyne and Rothesay Bay, but it does not appear to be a common species.

LAGENIDÆ.

Lagena hexagona, Williamson.

Lagena squamosa, var. *hexagona*, Will., 1858, Rec. For. of G. Brit., p. 13, pl. i. fig. 31.

Lagena hexagona, H. B. Brady, Foram. of the Chall. Exped., p. 472, pl. lviii. figs. 32, 33 (1884).

Habitat—One or two specimens dredged in Aberlady Bay. This differs from *Lagena squamosa* in having the surface reticulations in the form of more or less regular hexagons.

Vaginulina linearis (Montagu).

Nautilus linearis, Montagu, 1808, Test. Brit. Suppl., p. 87, pl. xxx. fig. 9.

Dentalina legumen, var. *linearis*, Williamson, 1858, Rec. For. of G. Brit., p. 22, pl. ii. figs. 46–48.

Vaginulina linearis, H. B. Brady, Foram. of the Chall. Exped., p. 532, pl. lxvii. figs. 10–12 (1884).

Habitat.—Two specimens in material dredged in Aberlady Bay.

× *Ammodiscus incertus* (d'Orbigny).

Operculina incerta, d'Orb. 1839, Foram. Cuba., p. 71, pl. vi. figs. 16, 17.

Spirillina arenacea, Williamson, 1858, Rec. For. of G. Brit., p. 93, pl. vii. fig. 203.

Amonodiscus incertus, H. B. Brady, Foram. of the Chall. Exped., p. 330, pl. xxxviii. figs. 1–3 (1884).

Habitat.—Among some material dredged near Inchkeith.

Nodosaria pyrula, d'Orbigny.

Nodosaria pyrula, d'Orb, Tableau Method, 1825.

Nodosaria pyrula, Will., Rec. For. of G. Brit., p. 17, pl. ii. fig. 39 (1858).

Nodosaria pyrula, H. B. Brady, Foram. of the Chall. Exped., p. 497, pl. lxii. figs. 10–12 (1884).

Habitat.—An imperfect specimen in material dredged in the vicinity of Inchkeith, and two in Largo Bay. On account of the slender form of this species it is seldom a perfect specimen is found.

Cristellaria rotulata (Lamarck).

Cristellaria calcar, Williamson, Rec. For. of G. Brit., p. 27, pl. ii. figs. 52–53 (1858).

Lenticulites rotulata, Lamk., Annal., Mus., v. p. 188, tab. lxii. fig. 11 (1804).

Nautilus calcar, Flem., Brit. Anim., p. 228 (1828).

Cristellaria rotulata, D'Orb., Mem. Soc. Geol. France, tome iv. p. 26, tab. xxii. figs. 15–18 (1839).

Cristellaria rotulata, H. B. Brady, Foram. of the Chall. Exped., p. 549, pl. lxix. fig. 13 *a*, *b* (1884).

Habitat.—Two specimens in material dredged near Inchkeith, and one or two from Aberlady Bay. This is moderately common in the British seas, and is found in shallow as well as in comparatively deep water.

Cristellaria crepidula (Fichtel and Möll).

Nautilus crepidula, Fichtel and Möll, 1803, Test. Micr. p. 107, pl. xix. figs. *g–i*.

Cristellaria crepidula, d'Orbigny, 1839, Foram. Cuba, p. 64, pl. viii. figs. 17, 18.

Habitat.—A few specimens in material dredged in Aberlady Bay.

Polymorphina oblonga, d'Orbigny.

Polymorphina oblonga, d'Orb., 1846, For. Foss. Vien., p. 232, pl. xii. figs. 29–31.

Habitat.—A few specimens in material dredged in Aberlady Bay. This is not the *Polymorphina lactea*, var. *oblonga*, of Williamson, the cells (or segments) of which are differently arranged and having the sutures flush, whereas the species here recorded has the segments inflated and separated by excavated sutures.

Polymorphina gibba (d'Orbigny).

Globulina gibba, d'Orb., Foram. de Vienne, tab. xiii. fig. 13, 14 (1846).

Polymorphina gibba, Robertson, Trans. Geol. Soc. Glasg., p. 24 (1883).

Polymorphina gibba, H. B. Brady, Foram. of the Chall. Exped., p. 561, pl. lxxi. fig. 12 (1884).

Habitat.—One specimen among material dredged west of Inchkeith, and several specimens from Aberlady Bay.

GLOBIGERINIDÆ.

Orbulina universa, d'Orbigny.

Orbulina universa, d'Orbigny, 1839, Foram. de Cuba, p. 3, No. 1, pl. 1 fig. 1.

Habitat.—Several specimens from Aberlady and Largo Bays.

Bolivina dilatata, Reuss.

Bolivina dilatata, Reuss, 1849, Denkschr, d. k. Akad. Wiss. Wein., vol. i. p. 381, pl. xlviii. fig. 15.

Bolivina dilatata, H. B. Brady, Foram. of the Chall. Exp., p. 418, pl. lii. figs. 20, 21 (1884).

Habitat.—Two specimens in some material dredged in South Bay. This species differs from *B. punctata* in being triangular in shape, whereas *B. punctata* has the sides nearly parallel; it differs also from *B. pygmæa* in the cells not terminating in free spinous processes along the edges, as in that species.

Virgulina schreibersiana, Czjzek.

Virgulina schreibersiana, Czjzek, 1847, Haidingars. Naturw. Abhandl., vol. ii. p. 147, pl. xiii. figs. 18–21.

Bulimina pupoides, var. *compressa*, Williamson, Rec. For. G. Brit., p. 63, pl. v. fig. 131 (1858).

Virgulina Schreibersiana, H. B. Brady, Foram. of the Chall. Exp., p. 414, pl. lii. figs. 1–3 (1884).

Habitat.—One specimen from material dredged near Inchkeith, and a few from Aberlady Bay.

Polystomella crispa (Linné).

Nautilus crispus, Linné, 1767, Syst. Nat., 12th ed., p. 1162–275.

Polystomella crispa, Williamson, Rec. For. of G. Brit., p. 40, pl. iii. figs. 78–80 (1858).

Habitat.—A few dredged in Aberlady Bay. This is one of the commonest species of British foraminifera.

ECHINODERMATA.

ASTEROIDEA.

Brissopsis lyrifera (L. Agass.).

Brissus lyrifer, Forbes, Hist. Brit. Starfishes, p. 187 (1841).

Brissopsis lyrifera, L. Agassiz, Des., 1847, C. R. Ann. Sci. Nat., vol. viii. p. 15.

Habitat.—Taken north-west of May Island; one full grown specimen. We do not find any previous record of the occurrence of this species in the Firth of Forth. It usually frequents a muddy bottom, and, where the conditions are favourable, is sometimes found in considerable abundance. While on board a trawler in Rothesay Bay in the early part of 1887, I found among a quantity of fine tough mud brought up in the net a large number of *Brissus*. I counted over sixty specimens, some of which were comparatively large, as the following two samples show—1st (?) male, length 69 mill., breadth 61 mill., thickness 38 mill.; (?) female, length 69 mill., breadth 56 mill., thickness 41·5 mill. These measurements show a considerable variation in the form of the two specimens,—the one being high and narrow, the other broad and depressed and this variation was not confined to the two specimens of which the measurements are given, but was observable in most of those captured. I was not able at the time to ascertain satisfactorily whether the variation was due to difference in sex; but that, however, is the correct explanation of it. They were all of a dark purplish colour, which seems to be the normal colour of this species; but specimens of a light cream colour having the line which forms the supposed figure of a lyre on the dorsal aspect dark have been sent to the University from the Clyde.

CRUSTACEA.

COPEPODA.

ARTOTROGIDÆ.

Cymbasoma rigidum, I. C. Thompson.

Cymbasoma rigidum, I. C. Thompson, Journ. Linn. Soc. (Zoology), vol. xx. p. 154, pl. xiii. figs. 1–4 (1887).

Habitat.—Two specimens of this interesting Copepod were taken a little to the east of Inchkeith with the surface tow-net in October last year (1888), and is the first record of its occurrence in the East of Scotland. One specimen (the first) was taken by Mr Thompson with a tow-net at Orotava, Teneriffe, and he made it the type of the new genus *Cymbasoma*. It has been observed in several localities since it was discovered at Teneriffe. Mr Thompson has records of its occurrence in the Mediterranean and near Jersey (Channel Islands), also in Lamlash Bay, Arran, and Loch Linnhe in the west of Scotland; but there is no previous record of its occurrence on the east coast.

OSTRACODA.

CYTHERIDÆ.

Pontocypris mytiloides (Norman).

Cythere mytiloides, Norman, Ann. and Mag. Nat. Hist., vol. ix. p. 50, pl. iii. figs. 1–3 (1862).

Pontocypris mytiloides, Brady and Norman, Mon. of the M. and Fw. Ostrac. of the N. Atlantic and N.-W. Europe, p. 107 (1889).

Habitat.—A few specimens among material from Aberlady and South Bays. This is a moderately common species.

Cythere cuneiformis, Brady.

Cythere ventricosa, G. O. Sars, Oversigt of Nor. Mar. Ostrac., p. 34.

Cythere cuneiformis, Brady, Mon. Rec. Brit. Ostrac., p. 404, pl. xxxi. figs. 47–54 (1868).

Habitat.—Two specimens of this species were found inside the dead shell of a *Cyprina islandica* dredged in Aberlady Bay, 2¾ to 3 fathoms.

Cythere pellucida, Baird.

Cythere pellucida, Baird, Brit. Entom., p. 173, pl. xxi. fig. 7 (1850).

Cythere castanea, G. O. Sars, Oversigt of Norges Marine Ostracoder, p. 32 (1865).

Cythere pellucida, Brady and Norman, Mon. of the M. and Fw. Ostrac. of the N. Atlantic and N.-W. Europe, p. 126, pl. xiv. figs. 13–15 (1889).

Habitat.—A few specimens taken with hand-net among sea-weed at low-water at Cramond Island. What has hitherto been known as *Cythere pellucida*, Baird, is now *Cythere confusa*, Brady and Norman (see Monograph).

Cythere (?) *semipunctata*, Brady.

Cythere (?) *semipuncata*, Brady, Mon. Rec. Brit. Ostrac., p. 411, pl. xxix. figs. 33–38 (1868).

Habitat.—One specimen dredged in Aberlady Bay, and another in Largo Bay, new to the east of Scotland. The position of this species in this genus remains doubtful.* I have also found it in Loch Fyne, near Tarbert.

Cythere navicula, Norman.

Cythere navicala, Norman, Last Report Dredging among the Shetland Isles, Brit. Assoc. Report, p. 292 (1868).

Cythere navicula, Brady and Norman; Mon. of the M. and Fw. Ostrac. of the N. Atlantic and N.-W. Europe, p. 143, pl. xvi. figs. 15, 16 (1889).

Habitat.—A single specimen of this species was dredged off St Monance (The Fluke Hole). The only previous records of its occurrence in Scotland are Shetland and the Minch.

Cytheridea punctillata, Brady.

Cytheridea punctillata, Brady, Mon. Rec. Brit. Ostrac., p. 424, pl. xxvi. figs. 35–38, pl. ix. figs. 9–11 (1868).

Cytheridea punctillata, Brady and Norman, Mon. of the M. and Fw. Ostrac. of the N. Atlantic and N.-W. Europe, p. 173 (1889).

Habitat.—Among material dredged in Largo Bay. New to the east of Scotland.

Loxoconcha impressa (Baird).

Cythere impressa, Baird, Brit. Entom., p. 173, t. xxi. fig. 9 (1850).

Loxoconcha impressa, Brady and Norman, Mon. of the M. and Fw. Ostrac. of the N. Atlantic and N.-W. Europe, p. 183, pl. xxiii. fig. 7 (1889).

Habitat.—A few specimens dredged in Aberlady and Largo Bays.

* Brady and Norman, *Mon. of the Marine and Freshwater Ostracoda of the N. Atlantic and N.-W. Europe*, p. 130.

Xestoleberis aurantia (Baird).

Cythere aurantia, Baird, Brit. Entom., p. 171, t. xxi. fig. 8 (1850).

Xestoleberis aurantia, Brady and Norman, Mon. of the M. and Fw. Ostrac. of the N. Atlantic and N.-W. Europe, p. 188 (1889).

Habitat.—Several specimens dredged in Aberlady and Largo Bays. The only previous record of it for the east of Scotland is Berwick Bay (Dr Baird). I have this species also from E. Loch Tarbert, the living shells of which had a pale rosy hue.

Cytherura producta, Brady.

Cytherura producta, Brady, Mon. Rec. Brit. Ostrac., p. 443, pl. xxxii. figs. 60, 61 (1868).

Habitat.—One or two specimens dredged in Largo Bay. There does not seem to be any previous record of this species from the east of Scotland.

Cytherura similis, G. O. Sars.

Cytherura similis, G. O. Sars, Oversigt of Norges Marine Ostracoder, p. 72 (1865).

Cytherura similis, Brady and Norman, Mon. of the M. and Fw. Ostrac. of the N. Atlantic and N-W. Europe, p. 203, pl. xviii. figs. 7–9 (1889).

Habitat.—Two specimens dredged in Largo Bay. This seems to be new to the east of Scotland.

Cytheropteron angulatum, Brady & Robertson.

Cytheropteron angulatum, B. & R., Ann. and Mag. Nat. Hist., Ser. iv. vol. iv. p. 62, pl. ii. figs. 7, 8 (1872).

Cytheropteron angulatum, Brady & Norman, Mon. of the M. and Fw. Ostrac. of the N. Atlantic and N.-W. Europe, p. 217, pl. xix. figs. 17, 18 (1889).

Habitat.—Two specimens from material dredged in Aberlady Bay. New to the east of Scotland.

Cytheropteron depressum, Brady and Norman.

Cytheropteron subcircinatum, Brady, Mon. Rec. Brit. Ostrac. p. 447, pl. xxxiv. figs. 39–42 (1868), (not *C. subcircinatum*, G. O. Sars).

Cytheropteron depressum, Brady and Norman, Mon. of the M. and Fw. Ostrac. of the N. Atlantic and N.-W. Europe, p. 218, pl. xx. figs. 22, 23 (1889).

Habitat.—One or two specimens in material dredged in Aberlady and Largo Bays. Apparently new to Scotland.

Bythocythere constricta, G. O. Sars.

Bythocythere constricta, Sars, Oversigt of Norges Marine Ostrac., p. 85 (1865).

Bythocythere constricta, Brady and Norman, Mon. of the M. and Fw. Ostrac. of the N. Atlantic and N.-W. Europe, p. 220 (1889).

Habitat.—Frequent among material dredged in Aberlady and Largo Bays.

CLADOCOPA.

Polycope compressa, B. and R.

Polycope compressa, B. and R., Ann. and Mag. Nat. Hist., p. 372, pl. xxi. (1869).

Habitat.—Four specimens of this species were found among material dredged off St Monance (The Fluke Hole). In form they are much more

compressed laterally than *P. orbicularis*, and the shells are distinctly denticulate on the anterior margin and ~~this~~ differs from the typical *P. compressa* as described in the Annals. The valves of the *shells are white* and the surface polished. This appears to be a rare species and new to Scotland. Two species of *Ostracoda* recorded from the Forth in the monograph by Brady and Norman, viz., *Argillœcia cylindrica*, G. O. Sars, and *Pseudocythere caudata*, G. O. Sars, were also dredged in the 'Fluke Hole.'

AMPHIPODA.

Gammaridæ.

Stenothoe marina (Spence Bate).

Montagua marina, S. Bate, Brit. Assoc. Report, 1855, p. 57.
Montagua marina, Bate and Westwood, Brit. Sess.-eyed Crust., vol. i. p. 58, 1863.
Stenothoe marina, A. Boeck, Crust. Amphip. Bor. et Arct., 1870, p. 59.

Habitat.—In various parts of the Forth, from Inchkeith to May Island, but not very common. It has been taken at Banff by Mr Edward; at Dunoon and Cumbrae, Firth of Clyde, by Mr Robertson; and amongst trawled material near Eddystone Lighthouse by Messrs Bate and Westwood. This species is easily distinguished by the peculiar form of the hands of the second pair of gnathopods.

Callisoma crenata (Spence Bate).

Scopelocheirus crenatus, S. Bate, Brit. Assoc. Report, 1855.
Callisoma crenata, S. Bate, Cat. Amphip. Brit. Mus., p. 85, pl. xiv. fig. 5 (1862).
Callisoma crenata, S. Bate and Westwood, Brit. Sess.-eyed Crust., vol. i. p. 120 (1863).

Habitat.—Not unfrequent near May Island. In the Moray Firth, on board the Messrs Johnston's steam trawler 'Southesk,' in February last, a large dead cod-fish (partly decomposed) was brought up in the trawl-net, and these Amphipods were observed by me in great numbers crawling over, and burrowing in, the decomposing flesh of the dead fish. Mr Robertson also records * that he found a 'partly broken test of *Brissus lyrifer* crowded with this species,' which thus appears to be one of those very useful organisms termed the scavengers of the sea.

Metopa alderi (Spence Bate).

Montagua alderi, S. Bate, Brit. Assoc. Report, 1855.
Montagua alderi, B. &. W., Brit. Sess.-eyed Crust., vol. i. p. 61 (1863).
Metopa alderi, A. Boeck, Crust. Amphip. Bor. et Arct. (1870), p. 273.
Metopa alderi, A. Boeck, Skand. Arkt. Amphip. (1876), 456.

Habitat.—Occurred occasionally in bottom tow-nettings between Inchkeith and May Island (S.F.B.); Firth of Forth by the staff of the Scottish Marine Station; dredged between Cumbrae Lighthouse and Arran, 50 fathoms; Mull of Kintyre, in 49 fathoms, by Dr Murray; and Cullercoats by Mr Joshua Alder and the Rev. A. M. Norman.†

* *Amphip. and Isop. of the Firth of Clyde*, p. 19 (1888).
† *Loc. cit.*, p. 90.

Anonyx longipes, Spence Bate.

Anonyx longipes, S. Bate, Cat. Amphip. Crust. Brit. Mus., p. 79, pl. xiii. fig. 4.

Anonyx longipes, Bate and Westwood, Brit. Sess.-eyed Crust., i. p. 113 (1863).

Anonyx ampulla, Bate and Westwood, *loc. cit.*, i. p. 116.

Tryphosa longipes, A. Boeck, Crust. Amphip. Bor. et Arct., p. 38 (1870).

Anonyx longipes, Robertson, Amphip. and Isop. of the Firth of Clyde, p. 18 (1888).

Habitat.—Several specimens among bottom tow-net material from the 'Fluke Hole,' off St Monance.

Pontocrates norvegicus (A. Boeck).

Œdiceros norvegicus, A. Boeck, Forhandl. ved. de Skand. Naturf., 8de mode (1860), p. 650.

Kroyera arenaria, S. Bate, Tyneside Nat. Field Club, vol. iv. (1863), p. 15, pl. i. pl. ii. fig. 1.

Pontocrates norvegicus, A. Boeck, Crust. Amphip. Bor. et Arct. (1870), p. 91.

Habitat.—Considerable numbers were observed on the sandy flat called 'Sand End,' east of Burntisland, at the edge of the retiring tide. They burrowed very quickly out of sight in the wet sand.

Phoxus holbölli, Kröyer.

Phoxus holbölli, Kröyer, Naturh. Tidsskr., 1 R. iv. (1842), p. 151.

Phoxus holbölli, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 143 (1863).

Habitat.—A few specimens taken west of May Island; it does not seem to be very common in the Forth. This species has been taken in Loch Fyne, 80 fathoms; near low water, Balloch Bay, Cumbrae, and other places in the Clyde, by Mr Robertson; Moray Firth, by Rev. G. Gordon and Mr Edward; Dublin Bay, by Prof. Kinahan; and Vedlom Voe, Shetland, by Dr J. G. Jeffreys and Rev. A. M. Norman.

Lafystius sturionis, Kröyer.

Lafystius sturionis, Kröyer, Naturhist. Tidsskr., 1 R. B. iv. p. 157 (1842).

Darwinia compressa, S. Bate., Cat. Amphip. Crust., Brit. Mus., p. 108, pl. xvii. fig. 7 (1862).

Darwinia compressa, Bate and Westwood, Brit. Sess.-eyed Crust., vol. i. p. 184 (1863).

Lafystius sturionis, Robertson, Amphip. and Isop., Firth of Clyde, p. 93 (1888).

Habitat.—One specimen was found moving about on the deck of the 'Garland' among the contents of the shrimp-trawl which had been towed from near Port-Seaton to West Point in South Bay. A small cod was taken in the shrimp-trawl, and the *Lafystius* may have been brought up attached to the young cod. The ground colour of the Amphipod was white, ornamented with numerous pale pink lines, which extended the whole length of the animal; these lines could only be observed by using a hand lens. Though occasionally found in considerable numbers attached to diseased fishes, it does not seem to be a common British species. I have found this Amphipod on a cod-fish taken in Rothesay Bay. Mr Robertson states that a dog fish captured in Kilbranan Sound had been eaten into by great numbers of this species. These, when turned out, were nearly

sufficiently numerous to fill a tea cup.* It has been found in the Moray Firth by Mr Edward of Banff, and Mr Grigor of Macduff.

Atylus vedlomensis (Bate and Westwood).

Dexamine vedlomensis, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 242 (1865).

Atylus vedlomensis, A. Boeck, Crust. Amphip. Bor. et Arct. (1870), p. 112.

Habitat.—Occasionally in bottom tow-net material collected between Inchkeith and May Island. Not uncommon in the Clyde (Robertson); Vedlom Voe, Shetland (Rev. A. M. Norman).

Amathilla sabini (Leach).

Gammarus sabini, Leach, App. to Ross's First Voyage (Oct. 1819), 2nd Edit., p. 178.

Amathia carino-spinosa, White, Cat. Crust. Brit. Mus. (1847).

Amathilla sabini, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 361 (1863).

Habitat.—We observed one or two specimens among bottom tow-net material collected near May Island, and also in St Andrews Bay. 'Only 'taken on one occasion at Cumbrae in the surface-net after sunset' (Robertson).† Two specimens were captured by me in East Loch Tarbert, Loch Fyne, in March 1886. The specimens found at Tarbert had the dorsal carina very little developed. The Forth specimens have the dorsum much carinated, and probably belong to that form described as *A. carino-spinosa*.

× ? *Gammarus edwardsii*, Spence Bate.

Gammarus edwardsii, Bate, Cat. Amphip. Crust. Brit. Mus. (1862), p. 208, pl. xxxvii. fig. 2.

Gammarus edwardsii, B. & W., Brit. Sess.-eyed Crust., vol. i. (1863) p. 386.

Habitat.—Observed among some bottom tow-net material collected near May Island, and in St Andrews Bay. Taken in the sand at very low-water at Kames Bay, Millport, Cumbrae, by Mr Robertson; taken by me off Ardine Point, opposite Rothesay, March 1887. This species is easily distinguished by having the posterior pleopods short, the rami of which are equal, and not longer than the peduncle.

ISOPODA.

Anceidæ.

Anceus maxillaris (Montagu).

Cancer maxillaris, Mont., Trans. Linn. Soc., vii. p. 66, t. vii. fig. 2, ♂.

Anceus maxillaris, B. & W., Brit. Sess.-eyed Crust., vol. i. p. 187 (1863).

Habitat.—Near Inchkeith, November 1888. Not very common in Rothesay Bay, and Loch Fyne, near Tarbert. Inverkip Bay, Balloch Bay, Cumbrae, Clyde (Robertson). Those taken near Inchkeith were young females.

* *The Amphip. and Isop. of the Firth of Clyde*, pp. 93–94 (1888).

† *Amphip. and Isop. of the Firth of Clyde*, p. 49 (1888).

× It will be better to consider this record as doubtful, meantime. W.C. 9/89.

CUMACEA.*

Diastylidæ.

Eudorella truncatula (Sp. Bate).

Eudora truncatula, Sp. Bate, Ann. Nat. Hist., 2nd Ser., vol. xvii., p. 457, pl. xiv. fig. 111.

Eudorella inermis, Meinert, Crust. Isop. Amphip. it Decapod. Daniæ, p. 183 (mas adultus).

Eudorella truncatula, Norman, Mus. Nor., pt. iii. p. 10 (1886).

Habitat.—Occasionally in bottom tow-net material collected near Inchkeith (Nov. 1888).

SCHIZOPODA.

Mysidæ.

Erythrops goesii, G. O. Sars.

Mysis erythrophthalma, Goes, Crust. Decap. Mar. Svec., p. 18.

Nematopus goesii, G. O. Sars, Beretning om en i Sommeren, 1865, foretagen zoologisk Reise ved Kysterne af Christianias og Christiansands Stifter, p. 15.

Erythrops goesii, G. O. Sars, Mon. over de ved Norges Kyster Forekommende Mysider., Frste Hefte, p. 24, tab. i. (1870).

Habitat.—Frequent all over the Forth, from Inchkeith to May Island, as well as outside of the South Bay. How it happens that this species has escaped observation hitherto may not be easily explained. *Erythrops pygmæa* and *serrata* have recently been observed by me in considerable numbers in the Moray Firth. *E. pygmæa* was added to the British fauna in 1886, when specimens were taken by me in E. Loch Tarbert, Loch Fyne, while carrying on the Board's work at that place; the other has been taken at the Shetland Islands, by the Rev. A. M. Norman, and is described in his last Dredging Report (1868). All the species of Erythrops are small, but are readily recognised when living by their bright red eyes; when they are kept a while in spirit, however, the eyes turn white. *E. goesii* is an addition to the British fauna.

Mysidopsis didelphys (Norman).

Mysis didelphys, Norman, 'Dredging Report,' Trans. Tyne Nat. F. Club, vol. v. p. 270, pl. xii. figs. 9–11.

Mysidopsis didelphys, G. O. Sars, Beretning om en i Sommeren, 1863, foretagen zoologish Reise, p. 27.

Mysidopsis didelphys, G. O. Sars, Mon. Norges Mysider (2), 1872, p. 20, pl. vii. figs. 1–32.

Habitat.—Two specimens were observed in some bottom tow-net material, collected near Fidra, and one was taken near Inchkeith, November 1888. Though this species seems to be somewhat rare in the Firth of Forth, it was of frequent occurrence among bottom tow-net material collected in the Moray Firth. Dr Henderson records two

* The following Cumacea have been taken at Kames Bay, Bute, and at Tarbert, Loch Fyne:—*Iphinoe serrata*, Norman, Kames Bay, Bute, March 1887. *Vaunthompsonia cristata*, Bate, Tarbert, Loch Fyne, 1886. *Lamprops fasciata*, G. O. Sars, Tarbert, Loch Fyne, 1886, and Rothesay Bay, 1887. *Hemilamprops uniplicata*, G. O. Sars, Tarbert, Loch Fyne, 1886. *Diastylis rathkii*, Kröyer, Tarbert, Loch Fyne, 1886. *Diastylis lævis*, Norman, Kames Bay, Bute, March 1887. *Diastylis lamellata*, Norman, Kames Bay, Bute, March 1887. *Pseudo-cuma cercaria*, Van Ben., Tarbert, Loch Fyne, 1886, and Rothesay Bay, 1887. *Campylaspis costata*, G. O. Sars, Kames Bay, Bute, March 1887; new to Britain. *Leucon nassicus*, Kröyer, Tarbert, Loch Fyne, 1886.

specimens taken off the Cloch Lighthouse, in 43 fathoms, muddy bottom.* *Mysidopsis angusta*, G. O. Sars, was frequently observed among the tow-net material collected in the Moray Firth. Two specimens of this species were taken by me at North Bay, Barmore, Loch Fyne, February 12, 1886, which was the first record of its occurrence in the Clyde district.

Leptomysis gracilis, G. O. Sars.

Mysis gracilis, G. O. Sars, Beretning om en i Sommeren 1863, foretagen zoologisk Reise, p. 23.

Mysidopsis hispida, Norman, Last Report of Dredging among the Shetland Isles: Report of the Brit. Assoc. for the Advancement of Science, 1868, p. 267.

Leptomysis gracilis, G. O. Sars, Mon. over de ved Norges Kyster forekommende Mysider, P. 3, p. 31, pls. xix., xx.

Habitat.—Several specimens of this species have been taken among bottom tow-net material collected eastward of Inchkeith, off St Monance, and near Fidra during October and November 1888. Previous British records for *L. gracilis*, are the Shetland Islands (Norman), and the Moray Firth. A good number of specimens were observed by me among the tow-net material collected in the Moray Firth.

Heteromysis formosa, Smith.

Heteromysis formosa, Smith, Report upon the Invertebrate Animals of Vineyard Sound and Adjacent Waters.

Habitat.—One or two specimens taken in some tow-net material collected eastward of Inchkeith during October 1888. Two specimens were also taken by the Rev. A. M. Norman at Guernsey in 1865, and these are the only records of its occurrence in Britain. It comes very near *Heteromysis* (*Chiromysis*) *microps*, G. O. Sars, which only seems to differ from *H. formosa* in the inner branch of the uropods being furnished with only a single spine on the inner margin.

Siriella armata (M. Edwards).

Cynthia armata, M. Edw., Hist. Nat. de Crust.

Mysis griffithsiæ, Bell, Brit. Stalk-eyed Crust., p. 342 (1853).

Siriella armata, G. O. Sars, Nye Bid. til kund. om Mid.-hav. invert.-fauna, p. 96, tab. xxxv. (1876).

Mysis griffithsiæ, Henderson, Decap. and Schizop. Crust. of the Firth of Clyde, p. 41, and (*Siriella armata*), App., p. 43, (1886).

Habitat.—One specimen (fem.) among bottom tow-net material from the 'Fluke Hole' off St Monance, collected February 1889. This differs from the specimen figured by G. O. Sars by having five small spines between the two large ones at the distal end of the telson, instead of four as in his figure. The specimen he has figured is a male, and exhibits one or two other points of difference, but which are merely sexual. It was first described as British by Prof. Bell, from specimens sent to him by Mrs Griffiths, who obtained them at Torquay. It was taken by me in the vicinity of East Loch Tarbert (Loch Fyne) about the end of October 1885. It is also recorded from Cumbrae, on the authority of Mr Robertson in Henderson's *Decapod and Schizopod Crustacea of the Firth of Clyde.* Previous to the summer of 1887, only four authentic species of *Schizopoda* were known to occur in the Firth of Forth (the three forms recorded by Goodsir are not sufficiently described to admit of their being identified with known species); whereas, eighteen are now included among the invertebrate fauna of the estuary.

* *Decapod and Schizopod Crust. of the Firth of Clyde*, p. 39, 1886.

The following Schizopods have also been observed by me in the Moray Firth, in addition to those already referred to, viz., *Mysis ornata*, G. O. Sars, which was of frequent occurrence in the bottom tow-net material. *Boreophausia raschi*, M. Sars, taken on several occasions in great abundance in the tow-net attached to the end of the beam of the trawl. *Nyctiphanes norvegica* (M. Sars) occurred in the material along with *Boreophausia*, but was not very common. Where the Schizopods were plentiful, good hauls of fish were frequently taken by the beam-trawl yet Schizopods were very seldom observed in the stomachs of the fish examined, which included cod, haddock, whiting, gurnards, plaice, common dabs, long roughs, &c.

DECAPODA—MACRURA.

Palæmonidæ.

Hippolyte gaimardii, M. Edwards.

Hippolyte gaimardii, M. Edwards, Hist. Nat. des Crust., ii. p. 378.

Hippolyte pandaliformis, Bell, Brit. Stalk-eyed Crust., ii. p. 294.

Habitat.—Occasionally in the bottom tow-net above Queensferry, in moderately deep water. I have found it to be of frequent occurrence in East Loch Tarbert, and in neighbouring parts of Loch Fyne.

MOLLUSCA.

Lamellibranchiata.

Lepton nitidum, Turton.

Lepton nitidum, Turt., Conch. Dith., p. 63.

Kellia nitida, F. and H., ii. p. 92, pl. xxxvi. figs. 3, 4, and (*L. nitidum*), App., iv. p. 255.

Habitat.—Occasionally among material dredged in the vicinity of May Island.

Gasteropoda.

Stilifer turtoni, Broderip.

Phasianella stylifera, Turton, Zool. Jour., ii. p. 367, t. xxii. fig. 11.

Stilifer turtoni, Brod., Proc. Zool. Soc., 1832, p. 61.

Stilifer turtoni, F. & H., iii. p. 226, pl. xc. figs. 8, 9, and (Animal) pl. 00, fig. 5.

Habitat.—On the spines of *Echinus esculentus*, brought to Newhaven by one of the fishing boats from the vicinity of May Island, two living specimens were taken off the *Echinus*. This interesting species seems to be found nowhere else when living than on *Echini*, and although its distribution in the British seas extends from Shetland to the English Channel, it is not a common mollusc. We are indebted to Miss Janet E. Carphin, grand-daughter of the late Principal Cunningham, for this very interesting addition to the Fauna of the Firth of Forth.

Limapontia nigra, Johnston.

Limapontia nigra, Johnston, Louden's Mag. N. H., ix. p. 79.

Limapontia nigra, Ald. & Hanc., Ann. Nat. Hist., 2nd ser., i. p. 402, pl. xix. figs. 4–8.

Habitat.—In pools among the stones left dry at low water a little east of Newhaven Pier, August 1887. This very small and curious mollusc does not appear to be very rare in the pools referred to, but is

not easily perceived unless when crawling. *Pleurophyllidia loveni*, Bergh, an interesting species belonging to a group closely allied to *Limapontia*, was found among some trawled material on board the steam trawler 'Southesk,' while engaged fishing in the Moray Firth. Dr Jeffreys says, 'My friend the late Mr Barlee, dredged on the coast of Shetland a single 'specimen, which I exhibited at the Birmingham Meeting of the British 'Association in 1849. The Rev. R. C. Abbes procured another specimen 'from a fishing boat at Whitburn, co. Durham.'* I do not know of any British habitat for this species, other than the two mentioned by Jeffreys, and that of the Moray Firth now recorded.

PTEROPODA.

Spirialis retroversus (Fleming).

Fusus retroversus, Flem., Mem. Wern. Nat. Hist. Soc., iv. p. 498, t. xv. fig. 2.

Spirialis retroversis, Jeffreys, Brit. Conch., v. p. 115, pl. iii. fig. 4, and pl. xcviii. fig. 4 (1869).

Habitat.—Occasionally in tow-nettings between Inchkeith and May Island, but not very common.

Clione borealis (Bruguiere).

Clio borealis, Brug.

Clio retusa, Müll. & Tab.

Habitat.—One specimen in some surface-net material collected east of Inchkeith. I kept the specimen alive for two days, when it was accidentally killed. The mollusc appeared to move only by means of the two fin-like processes placed immediately behind the head, which were thrown at the same time alternately backwards and forwards, something like the movement of the wings of a bird, but differing by the mollusc's fins nearly meeting every time in both the backward and forward movements. The plane of the fin was in line with the body, but the mollusc when propelling itself through the water did so by twisting the fin so as to strike the water with it in a manner somewhat similar to that of the blade of a steamship's propeller. The mollusc gradually sank to the bottom of the jar in which it was unless the fins were kept in constant motion, and it did not seem to have the power of moving very rapidly through the water.

VERTEBRATA.

Pisces.

Arnoglossus megastoma (Donovan).

Pleuronectes megastoma, Don., Brit. Fish., iii. pl. li.

Sail fluke, A. Carter, Couch, Fish. Brit. Isles, iii. pp. 163, 167, pls. clxiii. clxiv.

Arnoglossus megastoma, Day, Brit. Fish., ii. p. 21, pl. xcviii. (1880–84.)

Habitat.—A few specimens inside May Island and near Fidra. This species is not recorded by Dr Parnell in his *Fishes of the Firth of Forth*, and is probably not very common in the estuary. Its distribution in the British seas extends from the Orkneys to the English Channel. It is easily distinguished from the 'witch' or 'long flounder,' which it somewhat resembles, by having a much larger mouth, and especially by being a left-sided fish—that is, having the eyes and mouth on the left

* *Brit. Conch.*, vol. v. p. 18 (1869).

side, like the turbot. It may be stated that in St Andrews Bay two left-handed specimens of the common, or white fluke, or fresh-water flounder (*Pleuronectes flesus*), were observed. They were not merely coloured on the 'wrong' side, but the eyes, mouth, and fins were reversed, as in the turbot. These are the first of this abnormal form that have been taken during the investigations carried on by the S.S. 'Garland.' Both specimens have been preserved, and will be placed among the Board's Collection of Fishes.

Phycis blennoides (Brün.).

Gadus blennoides, Brün., Ich. Mass., p. 24.
Phycis blennoides, Gmel., Linn. p. 1165.
Greater Fork Beard, Couch., Fish. Brit. Isles, iii. pp. 125, 128, pls. clxiii. clxiv.
Phycis blennoides, Day, Brit. Fish., i. p. 303, pl. lxxxv. fig. 2 (1880–84).

Habitat.—Off St Monance, one specimen taken with beam-trawl, February 1889. There does not seem to be any previous record of the occurrence of this species in the Firth of Forth. Mr Cornish observes that the flesh of *Phycis* is extremely delicate, and superior to the whiting. It has been recorded for St Andrews Bay, but does not appear to be very common on the east coast. That so few fishes have been added to those recorded by Dr Parnell proves the great care and thoroughness of his investigation, and a revision of his *Fishes of the Firth of Forth* is only necessary because of the changes in the terminology that have been made since he wrote his valuable monograph.

Lumpenus lampetriformis, Walb.

Lumpenus lampetriformis, Day, Proc. Zool. Soc., 1884, p. 445, pl. xli.

Habitat.—Eight specimens were taken with the shrimp-net when trawling a few miles east of Inchkeith on the 14th May 1889, and several others a little outside the May a day or two afterwards. This species was first found in British waters by Professor MacIntosh, F.R.S., in May 1884, since then by Mr Sim of Aberdeen; it has been known for a long time as a Norwegian fish. Last year when examining the stomachs of cod trawled in the Forth I noticed this fish on several occasions among the contents of the stomachs, but the specimens being always more or less mutilated I failed to recognise the species.

Trachinus draco, Linné.

Trachinus draco, Linné, Syts. Nat., i. p. 435.
Greater Weever, Couch., Fish. Brit. Isles, ii. p. 43, pl. lxxiii.

Habitat.—One specimen taken with shrimp-net in 'Fluke Hole' off St Monance.

CORRIGENDA.

To Revised List of the Crustacea of the Firth of Forth in the Fishery Board's Report for 1888 (p. 235):—

COPEPODA.

Notodelphys agilis, Brady, should be

Notolelphys cærulea, Thorell., Brady, Mon. Brit. Cop., vol. i. p. 130, pl. xxvii., figs. 10–13 (1876).

Orchomene serrata, Boeck, should be
Tryphosa ciliata, G. O. Sars = *Tryphosa nana*, Kröyer, Norman, Mus. Nor., part iii. p. 14 (1886).
Mœra grossimana, Mont., should be
Mœra loveni, Bruzelius, S. Bate, Cat. Amphip. Crust. Brit. Mus., pl. 193, p. xxxv. fig. 1 (1862).

For Gulland Bay, *read* South Bay.

Note.—Since this paper was written I have been informed by Dr A. M. Norman, that among the *Boreophausia* I sent him from the Moray Firth for identification are one or two specimens of *Boreophausia inermis*, Kröyer, new to the east coast, and which has just been added to the British fauna by Brook and Hoyle, who found it on the west of Scotland; and that a specimen of *Siriella norvegica*, G. O. Sars, new to Britain, was found among some tow-net material collected by me in the Moray Firth, February 1889.