

ECHINODERMATA: CRINOIDEA - ASTEROIDEA

Phylum **ECHINODERMATA**Class **CRINOIDEA**Family **Antedonidae****ANTEDON BIFIDA** (Pennant) [*Mortensen, 1927, p. 28*]

Extremely abundant in certain small areas, but practically restricted to these (S.P.): Millbay Pit (R.A.T., S.P.): Asia Shoal, occasionally (R.A.T., S.P.): Mallard Shoal (G.C.B., J.T.C., S.P.): inside the Bridge (S.P.): the Cattewater, several specimens on bottom of coal hulk off Turnchapel (A.J.S., S.P.): Mewstone Ledge (S.P., R.A.T.): mid-way between Mallard Buoy and Batten Breakwater, black mud with clinker, 8 juveniles, 26.10.22 (E.F.)

SALCOMBE. Singly at L.W.S.T. Castle Rocks and under Marine Hotel (G.M.S.): rarely at E.L.W.S.T. at the Salstone (D.P.W.)

Breeding: the marsupia containing ova, Oct. (T.V.H.): dredged specimens from Millbay Pit giving off larvae and with clusters of segmenting eggs on the pinnules; a fair proportion of the Antedon taken were in this condition and many of the others had swollen gonads, 25.9.13 (J.H.O.): Aug. (R.W.): Pentacrinoid larvae in Feb.; also from Mallard Pit, dredged, about half a dozen in various stages of development and quite a number of very young Antedon, 24.11.19 (A.J.S.): July (R.A.T., S.P.): Aug., abundant at all stages, chiefly on Cellaria (E.W.L.H.): Sept.-Oct. (W.G.): free-swimming larvae, July 14th (H.G.N.)

The parasitic annelid *Myzostoma cirriferum* is common on the arms of this species (E.J.A.): and the semi-parasitic copepod *Enterognathus comatulae* is found in the gut (H.G.V.)

Class **ASTEROIDEA**Order **PHANEROZONIA**Family **Astropectinidae****ASTROPECTEN IRREGULARIS** (Pennant) [*Mortensen, 1927, p. 57*]

Common on fine, clean sand and moderately so on clean gravel and shell, 15-35 fm. (R.A.T., S.P.): Eddystone Grounds (E.J.A., S.P.): Mewstone Grounds (R.A.T., S.P.): Stoke Point Grounds; Rame-Eddystone Grounds; Looe-Eddystone Grounds (S.P.): occasionally 7 to 40 m. S.W. of Eddystone, 40-52 fm. (Crawshay, 1912, p. 334): one from Whitsand Bay, 7.6.22 (E.F.)

Breeding: Hand Deeps, dredged, ripe male and female, 5.7.09; 1 large specimen, Plymouth trawler, male practically ripe, gonads very full but no ripe sperm, 4.4.13 (A.J.S.): 1 male and 2 females, gonads ripe, 1 spent female, 5.7.20; 1 nearly ripe hermaphrodite, 7.7.21 (H.G.N.): ripe eggs and sperm, Eddystone Grounds, 4.7.47 (H.G.V.)

Family **Luidiidae****LUIDIA SARSI** Düben and Koren [*Mortensen, 1927, p. 69*]

Eddystone Grounds (E.J.A., J.T.C., R.A.T.): single specimen, Rame Head

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N.N.W. Eddystone W., 12.6.23 (E.F.): single specimens 18 and 39 m. S.W. of Eddystone, 42-52 fm. (Crawshay, 1912, p. 334): single specimen, 2 m. N.E. of Eddystone, 22.3.49, taken with 2 *L. ciliaris* (H.G.V.)

Breeding: a nearly ripe specimen off Polperro, trawl, 10.3.14 (A.J.S.): ripe specimen, 5.7.20 (H.G.N.): fertilization made in early June 1914 (J.G. for J.F.G.): late larvae in plankton, Aug.-Oct., 1930 (M.V.L.): late larvae abundant in plankton, Eddystone Grounds, Oct. 1951 (H.G.V.)

LUIDIA CILIARIS (Philippi) [*Mortensen*, 1927, p. 70]

Rough ground, 21-38 m. S.W. of Eddystone, 42-53 fm. (Crawshay, 1912, p. 334): frequent but never abundant, Eddystone Grounds and S. of Eddystone, 1948-52 (H.G.V.)

Breeding: June (Mortensen, 1913, p. 7): larvae in plankton, July-Oct. 1930 (M.V.L.)

Family **Poraniidae****PORANIA PULVILLUS** (O. F. Müller) [*Mortensen*, 1927, p. 90]

Occasionally at about 3 m. S. of the Breakwater (E.J.A., S.P.): Eddystone Grounds (E.J.A., R.A.T.): from 21-46 m. S.W. of Eddystone, 42-53 fm., occasionally (Crawshay, 1912, p. 335)

Breeding: Feb.-April (R.A.T.): ripe eggs, 4.2.47, spent gonads, 28.6.48 (H.G.V.)

Order SPINULOSA

Family **Asterinidae****ASTERINA GIBBOSA** (Pennant) [*Mortensen*, 1927, p. 98]

Common under stones at all rocky shore stations (S.P.): single specimen ½ m. S. of the Breakwater in 7 fm. (R.A.T.)

Breeding: May-June (W.G.): 1893, ripe June 15th (E.W.McB.): several deposited eggs in Drake's Island tank, 27.5.11 to 26.6.11, 12.5.15 (A.J.S.)

ANSEROPODA PLACENTA (Pennant) [*Mortensen*, 1927, p. 100, as *Palmipes membranaceus*]

Eddystone Grounds, moderately common (E.J.A., S.P.): Rame-Eddystone Grounds (R.A.T., S.P.): Stoke Point Grounds, not uncommon; about 3 m. S. of Breakwater, fairly common (S.P.): occasional specimens 8-48 m. S.W. of Eddystone, 40-43 fm. (Crawshay, 1912, p. 335, as *P. placenta*)

Breeding: 5.7.20, successful fertilization (H.G.N.): motile sperm, May-June 1948 (H.G.V.)

Family **Solasteridae****SOLASTER (CROSSASTER) PAPPOSUS** (L.) [*Mortensen*, 1927, p. 112]

Fairly common on coarse sand and gravel, 15-35 fm. (S.P.): the most plentiful starfish in 1892 (W.G.): Mewstone Grounds, Rame-Eddystone Grounds (R.A.T., S.P.): Eddystone Grounds (E.J.A., S.P.): Stoke Point Grounds (S.P.): Cattewater, probably from trawl refuse (R.A.T., S.P.): occasional specimens, some young, 21-39 m. S.W. of Eddystone, depth 42-52 fm. (Crawshay, 1912, p. 335)

Breeding: larvae in West Channel and off Mewstone, tow-net, 24/25.3.08

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(J.C.Si): in about a dozen males and a dozen females examined from Eddystone Grounds, the ovaries were coloured from bright orange to a deep chocolate, but no eggs were nearing ripeness and only 2 males had motile sperm, 26.5.10 (A.J.S.): 3 out of 9 apparently ripe, 5.7.20 (H.G.N.): motile sperm and apparently ripe eggs, 9.7.48 (H.G.V.)

Family **Echinasteridae**

HENRICIA SANGUIOLENTA (O. F. Müller) [*Mortensen*, 1927, p. 118]

Reny Rocks, occasional specimens at extreme low water (R.A.T.): not uncommon on the Mewstone Grounds (R.A.T., S.P.): Eddystone Grounds, occasionally on clean medium gravel (E.J.A., S.P.): Stoke Point Grounds (S.P.): occasional specimens, 21-39 m. S.W. of Eddystone, depth 43-49 fm. (Crawshay, 1912, p. 335)

Breeding: ripe male, Wembury Bay, low tide, 15.3.10; 1 apparently ripe male, Looe Island, shore, out of 3 or 4, 26.1.21 (A.J.S.)

Order FORCIPULATA

Family **Stichasteridae**

STICHASTRELLA ROSEA (O. F. Müller) [*Mortensen*, 1927, p. 136]

Three small specimens, Looe-Eddystone, 1¼-2¼ in. diameter, Agassiz trawl, 21.8.14; 1 small specimen, Rame bearing E. 7-8 m., otter trawl, 26.8.14; 1 small specimen, about 2 in. across, Bolt Tail bearing 7½ m. N.E., dredge, 29.6.14 (A.J.S.): frequently in small numbers in Mewstone-Stoke Point district (A.J.S.): occasionally (J.H.O.): single specimens trawled off Looe, 8.7.48, 29.3.49, 8.4.49, 25.4.50 (H.G.V.)

Family **Asteriidae**

ASTERIAS RUBENS L. [*Mortensen*, 1927, p. 139]

Occurs below tide-marks at most stations, but in very varying abundance in different years; it is generally plentiful, but occasionally it would seem to be almost absent; thus not a single specimen was obtainable from towards the end of Oct. 1903 until well on in the spring of 1904, although repeated search was made for it both in the Sound and in Cawsand Bay (S.P.): a small violet-coloured variety is met with on coarse ground in 15-30 fm. (E.J.A., S.P.): 1 juvenile, Eddystone W. by S., 3½ m., 25.1.23 (E.F.): one from Erme Head, N.E. by E., 2 m., 9.8.22 (E.F.): occasionally from 7-38 m. S.W. of Eddystone; depth 40-53 fm. (Crawshay, 1912, p. 335): distribution and breeding in Plymouth area described in Vevers (1949)

SALCOMBE. Only 1 specimen found, dredged in the Channel west of Salstone, in the Kingsbridge Estuary (Allen and Todd, 1900, p. 187): quite common on Laminaria, Castle Rocks, L.W.S.T., 12.4.29 (G.M.S.)

Breeding: bipinnariae off Rame Head, tow-net, 13.4.08; 2 specimens (J.C.Si): 18 fairly large specimens from crabbers (Sound) with gonads fairly well developed but not nearly ripe, 3.3.13; 15 specimens from New Grounds, about 10 females nearly ripe, 5 males with gonad small, sperms inactive, 7.3.13 (A.J.S.). Ripe eggs, 18.3.13; out of 100 from Cawsand Bay, all un-

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developed, April 28th and 29th; the same a month before (A.J.S.): ripe, 29.3.22 (J.H.O.). Gonads parasitized by the ciliate *Orchitophrya stellarum* (Vevers, 1951)

MARTHASTERIAS GLACIALIS (L.) [*Mortensen*, 1927, p. 143]

More or less common at all stations below low-water mark, but somewhat uncertain in its occurrence (S.P., H.G.V.): large specimens generally from deeper water, 30 fm. and over (E.J.A.): the Breakwater, not uncommon; River Yealm, not uncommon in dredgings, large specimens occasionally on the Sand-bank (R.A.T.): Eddystone Grounds, most abundant where *Chlamys opercularis* is plentiful (E.J.A.): occasionally, 7-46 m. S.W. of Eddystone, depth 40-43 fm. (Crawshay, 1912, p. 335)

SALCOMBE. One very large specimen on the shore of the south end of the Salstone (Allen and Todd, 1900, p. 187): a very large specimen, same locality, seen Feb. and March 1953 (D.P.W.)

Breeding: nearly ripe, 7.3.13 (A.J.S.): artificial fertilizations made March 10th (J.H.O.): ripe specimens Rame-Eddystone and Looe-Eddystone Grounds, several days 11/20.5.14 (A.J.S.): artificial fertilizations made, 12.6.13 (Mortensen, 1913, p. 3): large specimens in tank, hermaphrodite, length of each arm about 1 ft., each gonad contains large patches of male and female tissue, active sperm present, 29.4.26 (G.P.W.): out of 35 specimens examined only one (a male) with ripe gonads, 5.6.32 (J.E.H.)

Class **OPHIUROIDEA**Order **OPHIURAE**Family **Ophiotrichidae****OPHIOTHRIX FRAGILIS** (Abildgaard) [*Mortensen*, 1927, p. 174]

Generally distributed and enormously abundant at certain stations, L.W. - 35 fm.; a small, solitary, greyish-coloured form occurs under stones on the shore; in deeper water it grows to a much larger size and is usually very brilliantly coloured; this latter form favours a coarse gravel ground and lives in such profusion where it occurs that the dredge will frequently come up completely filled with a practically pure gathering of this species alone (S.P.): frequently, but nowhere in large numbers, from 8-46 m. S.W. of the Eddystone, 40-53 fm., many small specimens (Crawshay, 1912, p. 337): occasionally in Bigbury Bay (E.F.): common, mussel bed off Neille Point opposite mouth of Tavy, 3.10.28 (E.P.): young of this species, arm length 3.0 - 5.0 mm., found sheltering in genital bursae of adults, 29.12.37 (J.E.S.): large concentrations of this species photographed in 1949, 1950 and 1951, off Looe, Rame and Eddystone (Vevers, 1952)

SALCOMBE. Never met with in numbers, but occasional specimens were found on the shore, generally under stones on the Salstone and amongst the rocks at the mouth of Salcombe Harbour; a few dredged in the Kingsbridge Estuary (Allen and Todd, 1900, p. 187)

Breeding: gonads ripe, March-June (R.A.T.): Aug.-Sept. (S.P.): spawning Oct. (R.A.T.): young plutei present in tow-net in small numbers from 4.4.08 - 6.4.08 (J.C.S.): ripe female and many nearly ripe, artificial fertilizations made

by E.W.McB., 20.7.09; sperm given off in tank, 19/20.7.09 (A.J.S.): artificial fertilization made and segmenting blastulae procured, 29.8.19 (J.H.O.) and 5.6.32 (J.E.H.)

Family **Ophiocomidae**

OPHIOCOMINA NIGRA (Abildgaard) [*Mortensen*, 1927, p. 178]

This form is almost invariably found associated with *Ophiothrix fragilis*, but is generally far less abundant than the latter species, although occasionally it is the predominant form; at most stations the specimens are brilliantly coloured, but sometimes, as on the Mallard Shoal, it is possible to get a pure gathering of the typical black form (S.P.): Mallard Shoal, in abundance together with Antedon (W.G., S.P.): Millbay Pit, common; Mewstone Echinoderm Ground (R.A.T., S.P.): Eddystone Grounds, occasional specimens on stony and rocky ground, 15-30 fm. (E.J.A., S.P.): Rame-Eddystone Grounds; Stoke Point Grounds, not uncommon, but very local (S.P.): frequently, but never in large numbers, from 8-48 m. S.W. of the Eddystone; 40-52 fm. (Crawshay, 1912, p. 336, as *Ophiocoma*); 1 specimen Erme Head, N.E. by E., 2 m., 9.6.22; 4 specimens Downderry N.N.E. Looe N. by W., ½ W., 31.5.22 (E.F.)

Breeding: gonads ripe, April, July; spent individuals, Sept. (S.P.): 1899, ripe May 25th, June 2nd, June 22nd (E.W.McB): artificial fertilizations successful, 13.7.09 (E.W.N.): 11.8.11 (J.H.O.): nearly ripe eggs obtained, 3.10.11

OPHIOPSILA ARANEA Forbes [*Mortensen*, 1927, p. 180]

Mewstone Ledge, not uncommon in rock crevices (E.J.A., R.A.T., S.P.): Stoke Point Grounds, fairly common in crevices of the local red rock, especially in old Pholadidea crypts, 15-25 fm. (S.P.): Mewstone Ledge Stoke Point Grounds, 19.7.09 (A.J.S.): Stoke Point dredging grounds, 1 specimen, 20.11.28 (G.A.S., J.H.O.): New Grounds, 1 specimen, 7.12.34 (A.J.S.): Revelstoke Point, 4 specimens, 13.7.48 (H.G.V.)

Breeding: gonads ripe in Aug. (R.A.T.): 1 unripe female and arms of another, 5 m. S. of Mewstone, 7.4.11 (J.H.O.)

OPHIOPSILA ANNULOSA (M. Sars) [*Mortensen*, 1927, p. 181; *Vevers*, 1950, p. 81]

Occasionally dredged on Mewstone Grounds; single specimens, 8.7.48, 5.4.49 and 26.11.51; 2 specimens. 20.3.51 (H.G.V.)

Family **Ophiactidae**

OPHIACTIS BALLI (Thompson) [*Mortensen*, 1927, p. 200]

Common, but rather local, 15-35 fm., in crevices of rock and stones and on Chaetopterus tubes (S.P.): Millbay Channel and Pit, not uncommon (R.A.T., S.P.): Asia Shoal (T.V.H., S.P.): Mewstone Grounds; Rame-Eddystone Grounds (R.A.T., S.P.): abundant around the Eddystone (E.J.A.): Stoke Point Grounds, not uncommon (S.P.): few to many specimens from 8-48 m. S.W. of Eddystone, depth 40-41 fm. (Crawshay, 1912, p. 336): 3 specimens dredged off Revelstoke Point, 13.7.48; 10 specimens in Xylophaga crypts in teak log off Eddystone, 30.3.49 (H.G.V.)

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Breeding: gonads ripe, Sept. (S.P.): July 1913 (Mortensen, 1913, p. 11): female with practically ripe eggs, male with motile sperm, Eddystone bearing S.E. of S., 2 m., 13.7.09 (A.J.S.)

Family **Amphiuridae****AMPHIURA CHIAJEI** Forbes [*Mortensen, 1927, p. 212*]

Millbay Channel, single specimen (R.A.T.): 2 m. S. of Breakwater, single specimen (E.J.A.): single specimen, New Grounds, 12.10.10 (J.H.O.)

AMPHIURA SECURIGERA (Düben and Koren) [*Mortensen, 1927, p. 217*]

Eddystone Grounds, ca. 30 fm., July 1913, gonads apparently not ripe (T.M.)

AMPHIURA FILIFORMIS (O. F. Müller) [*Mortensen, 1927, p. 214*]

Single specimen, 2 m. W.S.W. of the Eddystone (E.J.A.): 1 specimen, Mewstone, 19.12.98; 1 specimen Cawsand Bay, 9.9.02 (J.H.O.): abundant off Borough Island, Bigbury Bay, 1923 (E.F.): single specimen taken with Petersen grab, in muddy sand, 4 m. S. of Plymouth Breakwater Light, 23.3.48 (H.G.V.)

Breeding: May 30th, Rame-Eddystone, eggs of 5 or 6 nearly ripe (J.H.O.)

ACROCNIDA BRACHIATA (Montagu) [*Mortensen, 1927, p. 218*]

Common in muddy sand on a *Zostera* bed S. of Batten Castle (E.J.A., R.A.T., S.P.): Jennycliff Bay, single specimen (R.A.T.): numerous, Eddystone, 281° T, 4 m., 21.2.52 (H.G.V.)

SALCOMBE. At low water, both sides of the Harbour (Allen and Todd, 1900, p. 187)

Breeding: Salcombe shore, 31.5.23, 2.6.23, males and females kept in a dish, several males and 1 female spawned and yielded segmenting and very yolky eggs; 1 specimen nearly ripe, Salcombe, 24.3.13; 1 specimen, Salcombe, in sand at low tide spawned in bowl during the night, but eggs not fertilized, 27.3.21; nearly ripe specimens, Salcombe, 3.4.23 (J.H.O.) 7 specimens, not ripe, from muddy sand, Salcombe, 15.2.48 (H.G.V.)

AMPHIPHOLIS SQUAMATA (Delle Chiaje) [*Mortensen, 1927, p. 221*]

Common at most stations in the Sound, L.W. - 20 fm. (S.P., H.G.V.): Rame-Eddystone Grounds, 27 fm., single specimen (R.A.T.): River Yealm (S.P.): Mewstone, 19.12.28 (J.H.O.)

Breeding: May-Sept. (W.G.): viviparous hermaphrodite breeding in all months (H.G.V.)

Family **Ophiolepidae****OPHIURA TEXTURATA** Lamarck [*Mortensen, 1927, p. 236*]

Common, 15-35 fm., on gravel and sand (S.P.): most frequent on fine hard sand (E.J.A.): Mewstone Grounds (R.A.T., S.P.): Stoke Point Grounds (S.P.): Rame-Eddystone Grounds (E.J.A., R.A.T., S.P.): Eddystone Grounds (E.J.A., S.P.): Looe-Eddystone Grounds (S.P.): occasionally from 8-39 m. S.W. of Eddystone, 40-52 fm. (Crawshay, 1912, p. 335, as *O. ciliaris*): 4 small specimens in muddy sand, Cawsand Bay, 2.6.48 (H.G.V.)

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Breeding: May (R.A.T.): Aug. (S.P.): ripe male and female, Rame bearing N., 3 m., 15.7.09 (A.J.S.): nearly ripe, 29.8.19 (J.H.O.)

OPHIURA ALBIDA Forbes [*Mortensen*, 1927, p. 239]

Lives generally on coarser soil and is less abundant than *O. texturata* (E.J.A.): Mewstone Grounds (R.A.T.): Stoke Point Grounds, fairly common; Rame-Eddystone Grounds (S.P.): Eddystone Grounds (E.J.A., S.P.): occasionally, from 8-46 m. S.W. of Eddystone, 40-50 fm. (Crawshay, 1912, p. 336)

OPHIURA AFFINIS Lütken [*Mortensen*, 1927, p. 244]

One specimen Bolt Head, shell gravel, 1895 (E.J.A.): 4 specimens, 7 m., and one 29 m. S.W. of Eddystone, 42-47 fm. (Crawshay, 1912, p. 336)

Class ECHINOIDEA

Order DIADEMATOIDEA

Family Echinidae

PSAMMECHINUS MILIARIS (Gmelin) [*Mortensen*, 1927, p. 294]

Common under stones at all shore stations, and frequently met with in dredgings, L.W.-35 fm. (S.P.): specimens from the deeper water stations are usually small (R.A.T.): largest ones from Church Reef, Wembury Bay (R.A.T.): River Yealm, very common near oyster beds, 1895 to about 1900 (E.J.A.): 1 specimen 8 m., and one 48 m. S.W. of Eddystone, 40-51 fm. (Crawshay, 1912, p. 338): 39 specimens in one trawl haul, 3-6 m. S. of Eddystone, 4.7.47 (H.G.V.)

SALCOMBE. Not uncommon in dredge material obtained in the Channel between Salstone and mouth of Harbour (Allen and Todd, 1900, p. 188): Castle Rocks, L.W.S.T., 12.4.29 (G.M.S.)

Breeding: May (W.G.): 1893, ripe, June 15th (E.W.McB.): plutei fairly common in tow-net from 6.4.08 (J.C.S.): a few mature males and females, Mewstone (shore collecting) N. side, 26.6.07; a few specimens collected, all spent, 27.6.07 (L.R.C.): ripe males and females, Wembury Bay (A.J.S.): Cawsand Bay, ripe male and female, 3.3.11 (W.DE M.): ripe female less than a halfpenny across, Wembury Bay, 14.3.11, this fertilized by sperm of *E. esculentus* and healthy blastulae obtained (W.DE M.): ripe male and female, 19 specimens, Wembury Bay, 30.5.19 (A.J.S.): 5.4.23 (J.H.O.): small specimens, not exceeding two-thirds normal size for full-grown shore specimens, from Mewstone Grounds, and especially E.1 at 70 m. depth, fully ripe, 100 per cent. fertilization obtained July and Aug. 1927, E.1 batch, Aug. 16th (A.D.H.): 1912, 1922, 1923, 1924, 1925, 1926, 1927, 1928, ripe about middle of May to middle of June (E.W.McB.)

ECHINUS ESCULENTUS L. [*Mortensen*, 1927, p. 297]

Queen's Ground, occasionally; moderately common in 15-35 fm., especially on the Mewstone Echinoderm Ground; Rame-Eddystone Grounds (R.A.T., S.P.): Eddystone Grounds (E.J.A., S.P.): Mewstone Ledge; Stoke Point Grounds, common (S.P.): Cattewater, probably from trawl refuse (R.A.T., S.P.): frequent from 8-48 m. S.W. of Eddystone, 40-52 fm.

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(Crawshay, 1912, p. 337): not common on Rame-Eddystone Grounds, 1946-52, but abundant on muddy sand and gravel grounds, S. of Looe, 1950-2 (H.G.V.)

Breeding: gonads ripe, March (R.A.T.): May (S.P.): fully formed plutei found in tow-net on 6.4.08 and were fairly common as long as plankton was examined (until 16.4.08) (J.C.Si): 1898, ripe May 25th; 1899, ripe about June 1st; 1912, ripe about middle of May (E.W.McB.): 1 female and 2 males ripe, trawlers, 21.2.12 (W.DE m.): 2 females, 2 males fully ripe, 1 male doubtful, 3 looked spent (2 females, 1 male), from Plymouth trawlers trawling from Dodman-Eddystone (outside), 6.5.13 (A.J.S.): ripe male, Eddystone Fishing Grounds, 10.3.20 (A.J.S.): ripe, Mewstone N. to N.E. 2-2½ m. and Mewstone Ledge, 22.3.23 (J.H.O.): between Mewstone and Stoke Point, between 60 and 70 good large specimens brought in in two batches, several ripe males and 1 female, all the rest spent or nearly so, 12.5.27 (A.J.S.): 10 m. S.S.W. of Eddystone, ripe males and females, 18.5.27; during the fortnight before this it had been very difficult to get any ripe specimens, nearly all were spent (A.J.S.): off the Mewstone, ripe males and females, 1.6.27 (A.J.S.): Eddystone Grounds, 29.8.27, batch of 38 examined, all except one full grown, i.e. 10 cm. or more in diameter; gonads usually about one quarter to one fifth usual size in ripe individuals, but in some very much larger ($\frac{3}{4}$), fat globules present in all, degenerating ova in some; in 15 specimens young oocytes visible of various sizes, 1 specimen contained sperm morulae and some ripe sperm (A.D.H.): adult female with ripe ovaries, 4.11.48 (A.G.L.)

The polychaete *Scalisetosus assimilis* is often found among the oral spines of this species (R.A.T.)

ECHINUS ACUTUS Lamarck [*Mortensen*, 1927, p. 300]

Not uncommon in 15-35 fm., chiefly on the finer grounds (R.A.T., S.P.): more common in deeper water, where it replaces *E. esculentus* (E.J.A.): Mewstone Grounds (R.A.T.): Stoke Point Grounds (S.P.): Rame-Eddystone Grounds (R.A.T., S.P.): Eddystone Grounds (E.J.A., S.P.): Looe-Eddystone Grounds (S.P.): occasionally from 21-31 m. S.W. of Eddystone, 40-47 fm. (Crawshay, 1912, p. 337): Captain V. Lord reports that it has disappeared since 1920; 3 large specimens were brought in by trawlers from off the Dodman 13/21.6.29 (A.J.S.): no local records since about 1930 (D.P.W.)

Breeding: in July (W.G.)

The polychaete *Flabelligera affinis* is often found associated with this form, crawling among its spines (R.A.T.)

PARACENTROTUS LIVIDUS (Lamarck) [*Mortensen*, 1927, p. 306]

Wembury Bay, April 1911 and 29.6.11, identified by Dr. Mortensen (J.H.O.): Wembury Bay, 1 fairly large specimen, 1.4.15; Wembury Bay, back of Mewstone, 2 specimens, 1 ripe female, 2.4.19 (A.J.S.): Wembury Bay, 1933, and 4 specimens 4.4.39 (J.E.F.)

ECHINODERMATA: ECHINOIDEA

Order CLYPEASTROIDEA

Family **Fibulariidae**ECHINOCYAMUS PUSILLUS (O. F. Müller) [*Mortensen, 1927, p. 316*]

Not uncommon on gravel bottom, 10-35 fm. (S.P.): Queen's Ground, occasionally (R.A.T., S.P.): Mewstone Ledge shell gravel, very occasionally; Mewstone Amphioxus Ground, moderately common (R.A.T., H.G.V.): Eddystone Grounds (E.J.A.): occasionally, from 834 m. S.W. of Eddystone, 40-49 fm. (Crawshay, 1912, p. 338): dredged commonly from finer deposits in the district, chiefly on shelly gravel (E.F.)

Order SPATANGOIDEA

Family **Spatangidae**SPATANGUS PURPUREUS O. F. Müller [*Mortensen, 1927, p. 328*]

Moderately common in coarse sand and gravel, 15-35 fm. (S.P.): Eddystone Grounds (E.J.A., S.P.): Stoke Point Grounds; Rame-Eddystone Grounds (R.A.T., S.P.): Looe-Eddystone Grounds (S.P.): Mewstone Ledge (R.A.T.): Queen's Ground (S.P.): occasionally from 20-49 m. S.W. of Eddystone, mostly small, 40-49 fm. (Crawshay, 1912, p. 338): 1 specimen Mewstone N.N.W., 1½ m., shelly gravel with some mud, 18.1.23; 1 young specimen Eddystone S.S.E. ½ E., ½ m., clean shell gravel, 20.6.22 (E.F.)

Breeding: ripe gonads, July 1913 (Mortensen, 1913, p. 14): 2 specimens from Mewstone Grounds shot out sperm on being preserved, 20.5.25; 1 other specimen spawned in laboratory about a fortnight before (J.H.O.)

The mollusc *Montacuta substriata* is very commonly attached to the oral spines of this species (R.A.T., S.P.)

ECHINOCARDIUM CORDATUM (Pennant) [*Mortensen, 1927, p. 331*]

Not uncommon, buried in sand between tide-marks in the Yealm Estuary; and in Rum Bay, on the *Zostera* beds; occasionally dredged in Cawsand Bay, and outside in 15-35 fm., on fine sand (R.A.T.): Rame-Eddystone Grounds (R.A.T., S.P.): Eddystone Grounds (E.J.A., S.P.): Looe-Eddystone Grounds; common 6 m. S. of Breakwater (S.P.): plentiful in Whitsand Bay, on a level exposed by ordinary 15.6 tides, March 1919 and 12.4.22 (J.H.O.): generally on the sandy grounds outside the Breakwater (E.F.): 30 specimens in single dredge haul, Eddystone 290° T, 41 m., May 1952 (H.G.V.): 4 specimens in thick mud, Rame Mud, 24.3.49 (H.G.V.)

SALCOMBE. Common in the clean sand between the *Zostera* beds to the north of Mill Bay (Allen and Todd, 1900, p. 188)

Breeding: on *Zostera* bank, Salcombe Mill Bay, and in bare sand below *Zostera* bank, not ripe, 24.3.13; shore opposite Marine Hotel, 1 largish female with gonads large and ripe, an unusual number of small specimens, 3.4.23 (J.H.O.): 31.5.23, shore, Salcombe, June 1st, fertilized, June 2nd, ca. 90 per cent. blastulae (J.H.O.)

The mollusc *Montacuta ferruginosa* is found associated with this species (R.A.T.)

ECHINODERMATA: HOLOTHURIOIDEA

ECHINOCARDIUM FLAVESCENS (O. F. Müller) [*Mortensen*, 1927, p. 334]

Looe-Eddystone Grounds, rare, associated with *E. pennatifidum*, but its habitat is probably on finer ground than that of the latter species (S.P.): occasionally in shelly gravel, 1923 (E.F.): 3 specimens 8 m. W. of Rame Head in about 28 fm., just about ripe, 10.7.11 (J.H.O.)

ECHINOCARDIUM PENNATIFIDUM Norman [*Mortensen*, 1927, p. 335]

Not uncommon 15-30 fm.; Rame-Eddystone Grounds; Stoke Point Grounds; Looe-Eddystone Grounds (S.P.): Eddystone shell-gravel, 27.7.49 and 24.3.50 (H.G.V.): 5 specimens in rough ground, 39 m. S.W. of Eddystone, 49 fm., 29-41 ram. in length (Crawshay, 1912, p. 339)

Class **HOLOTHURIOIDEA**

Order ASPIDOCHIROTA

Family **Holothuriidae**HOLOTHURIA FORSKALI Delle Chiaje [*Mortensen*, 1927, p. 393]

Common on the Mewstone Grounds on clean gravel (E.J.A., R.A.T., S.P.): occasional specimens have been taken in Whitsand Bay, off Penlee, Melampus Shoal (R.A.T.): Stoke Point Grounds, not uncommon (S.P.): Eddystone Grounds, on the clean shell gravel immediately adjacent to the rocks (E.J.A.): Queen's Ground (S.P.)

Breeding: gonads ripe, April (S.P.): July, Dec. (R.A.T.): July 1913 (*Mortensen*, 1913, p. 17): auricularia larvae probably belonging to this species, 8 m. S. of Mewstone, abundant from 8/16.3.08 (J.C.Si.): Sound, 14.1.13 (J.H.O.)

Order DENDROCHIROTA

Family **Cucumariidae**CUCUMARIA ELONGATA Düben and Koren [*Mortensen*, 1927, p. 399]

Fairly common in the district on all the muddy grounds from 5-30 fm. (J.H.O.): fairly common on Rame Mud, 1923 (E.F.): 1928 (M.V.L.): 2 specimens 2½ m. S. of Penlee, muddy bottom, 12.9.28 (G.A.S.)

SALCOMBE. In muddy sand on *Zostera* bed, northern end of Mill Bay, 26.3.29 (R.S.H., J.H.O.)

Breeding: June-July or later (J.H.O.)

CUCUMARIA HYNDMANI Thompson [*Mortensen*, 1927, p. 400]

Occasional specimens not uncommon on coarse ground; Stoke Point Grounds; Rame-Eddystone Grounds; Looe-Eddystone Grounds (S.P.): 1 specimen, 18 m. S.W. of Eddystone, 43 fm. (Crawshay, 1912, p. 339)

CUCUMARIA SAXICOLA Brady and Robertson [*Mortensen*, 1927, p. 401]

Not uncommon on rocky ground, in crevices and under stones, L.W - 10 fm. (S.P.): common on the shore; also taken at a depth of a few fm. (J.H.O.): Mewstone Ledge, 6.2.52 (H.G.V.)

SALCOMBE. Common, Castle Rocks, Salcombe Estuary, L.W. mark, spring tide, 12.4.29 (G.M.S.)

ECHINODERMATA: HOLOTHURIOIDEA

Breeding: larvae, probably belonging to this species, tow-net, West Channel, 26.5.11, these were to all appearances similar to those obtained from *C. saxicola* 3 weeks earlier (J.H.O.): 1 specimen deposited eggs, 12.5.15 (A.J.S.): male and female, Wembury Bay W., 21.3.20, extruded sperm and eggs, 24.3.20 (J.H.O.): ripe males and females, Wembury, Mewstone, 26.3.21; Wembury, 2.4.23 (H.G.N.): spawning period about May (J.H.O.)

CUCUMARIA NORMANI Pace [*Mortensen*, 1927, p. 402]

Not uncommon on rocky ground in crevices and under stones, L.W. - 10 fm. (S.P.): fairly common on the shore, also taken at a depth of a few fathoms (J.H.O.): off Revelstoke Point, 13.7.48 (H.G.V.)

Breeding: 1 female ripe, from shore, Cawsand Bay, 3.3.11 (A.J.S., J.H.O.): 2 fairly large specimens, Wembury Bay, gonad only slightly developed as though recently spawned, 20.4.13 (J.H.O.): spawning period about May (J.H.O.)

CUCUMARIA LACTEA (Forbes) [*Mortensen*, 1927, p. 402]

Frequently in some numbers on hydroids, algae, etc., from rocky ground and from the trawling grounds; below tide-marks to 25 fm. (S.P.): often abundant on rocky ground off the Mewstone (E.J.A.): River Yealm, not uncommon (R.A.T.): common on the shore and also taken at a depth of a few fathoms (J.H.O.)

THYONE FUSUS (O. F. Müller) [*Mortensen*, 1927, p. 406]

Occasional specimens from Millbay Channel, Cattewater, Cawsand Bay; not uncommon on the Mewstone Grounds, and occasionally met with in 15-35 fm. on other grounds (R.A.T.): 2 specimens, 17 m. S.W. of Eddystone, 42 fm. (Crawshay, 1912, p. 339)

THYONE RAPHANUS Düben and Koren [*Mortensen*, 1927, p. 407]

Nine specimens on the muddy sand or in muddy gravel, in depths from 12-30 fm., 1911-12, 2 m. S. of Mewstone, 1½ m. off Yealm Point, 3 m. S. of Rame, 5-5½ m. S. ½ E. of Rame, and Rame-Eddystone Trawling Grounds; none ripe, spawn probably in winter (J.H.O.): 1 specimen 20 m. S.W. of Eddystone, 44 fm. (Crawshay, 1912, p. 339): 91 specimens in trawl, 2½ m. S. of Revelstoke Point, 5.1.33, after very heavy S.W. gale (G.A.S.): single specimen, Mewstone Ledge, 6.2.52 (H.G.V.)

THYONE INERMIS Heller [*Mortensen*, 1927, p. 408]

One very large specimen about 7 in. long and 1½ in. in diameter at the middle of the body, Eddystone Grounds, 7.4.08; smaller specimen on Rame Eddystone Grounds, Rame Head, bearing N.N.E. 3 m., 16.4.08 (J.C.Si.)

THYONE ROSCOVITA Hérouard [*Koehler*, 1921, p. 166]

Plymouth district, not uncommon (G.P.W.): 3 m. S. of Revelstoke Point, 21 fm., 11.12.28, coarse mesh dredge (G.A.S.): one dredged, Eddystone shell-gravel, 2.4.52 (H.G.V.)

PSEUDOCUCUMIS MIXTA Östergren [*Mortensen*, 1927, p. 410]

One specimen, Eddystone Grounds, 27.2.88 (A.M.N.): anterior end of body

ECHINODERMATA: HOLOTHURIOIDEA

only (tentacles yellow, not purple as in Bell's specimens), Mewstone Ledge, 15.4.08 (J.C.Si.): 2 specimens, 9 m. S. by W. of Rame Head, 7.8.14 (J.H.O., identified by G.P.W.): 1 large specimen, Rame-Eddystone W.S.W., 6 m. from Draystone Buoy, white with a few scattered dark brown spots, 13.12.26 (G.P.W.)

Order APODA

Family **Synaptidae****LEPTOSYNAPTA INHAERENS** (O. F. Müller) [*Mortensen*, 1927, p. 427]

Drake's Island, occasional specimens; River Yealm, not uncommon between tide-marks in coarse, loose sand (R.A.T.): Rum Bay, below castle, 18.11.10 (J.H.O.): North Bank, mouth of Yealm, 1.4.15; 16 specimens, mouth of Yealm, N. shore, in *Zostera* bed, 6.3.16 (A.J.S.): 1 specimen in 15 grab hauls, muddy sand, Cawsand Bay, 2.6.48 (N.A.H.)

SALCOMBE. Not uncommon in *Zostera* banks on east and west sides of Harbour (Allen and Todd, 1900, p. 187): 4 nearly ripe females, shore opposite Marine Hotel, 9.4.13 (A.J.S.): regularly 1930-56 (D.P.W., G.M.S.)

Breeding: Yealm River, Sand-bank, 8-10 obtained by digging, 5.3.08, put into dish with sand, shed many eggs, 7.3.08 (A.J.S.)

LABIDOPLAX DIGITATA (Montagu) [*Mortensen*, 1927, p. 433]

Rame-Eddystone Grounds, occasional specimens (R.A.T.): 2 specimens, with 8 *Leptosynapta inhaerens*, mouth of Yealm, north side, in *Zostera* bed, low water (16 ft. tide), 3.3.15; 4 or 5 specimens with 18-20 *Leptosynapta inhaerens*, mouth of Yealm, north side, in *Zostera* bed, low water (16 ft. 8 in. tide), 1.4.15 (A.J.S.): single specimen, muddy sand, Cawsand Bay, 2.6.48 (N.A.H.)

SALCOMBE. One large specimen (10 in. long) and several smaller opposite Marine Hotel, in horizontal burrows in sand and mud just above low-water mark, 17.4.08 (J.C.Si.): not uncommon, E.L.W.S.T., Salcombe Harbour (D.P.W.): Mill Bay, sparingly, 1950-6 (G.M.S.)