

Zooplankton

Sheet 146

(Replacing sheet 82)

CTENOPHORA

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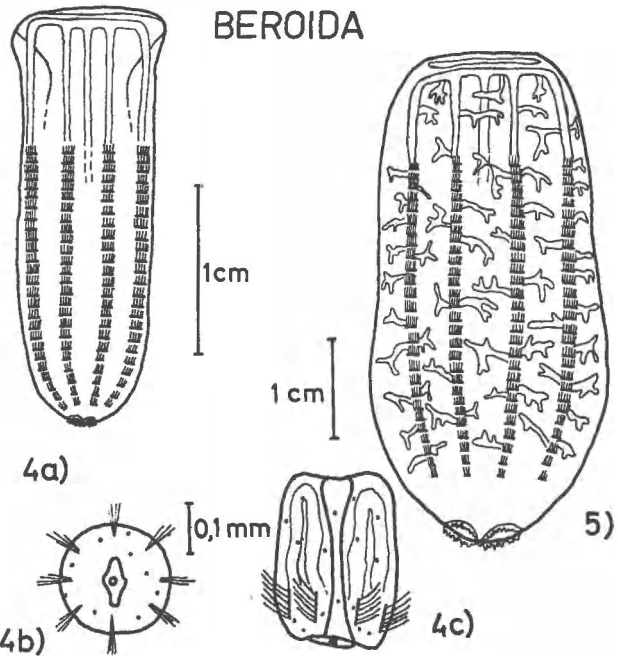
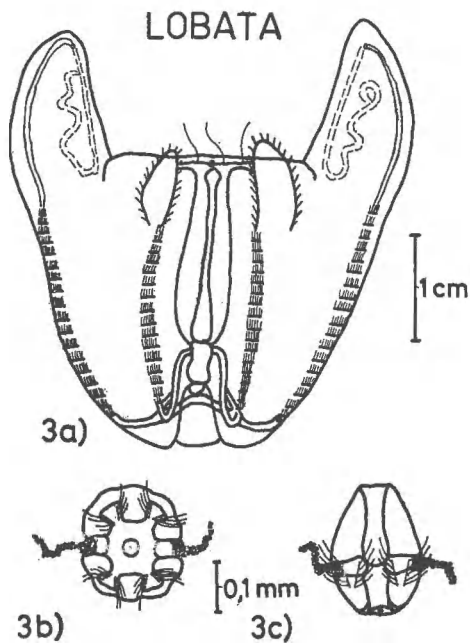
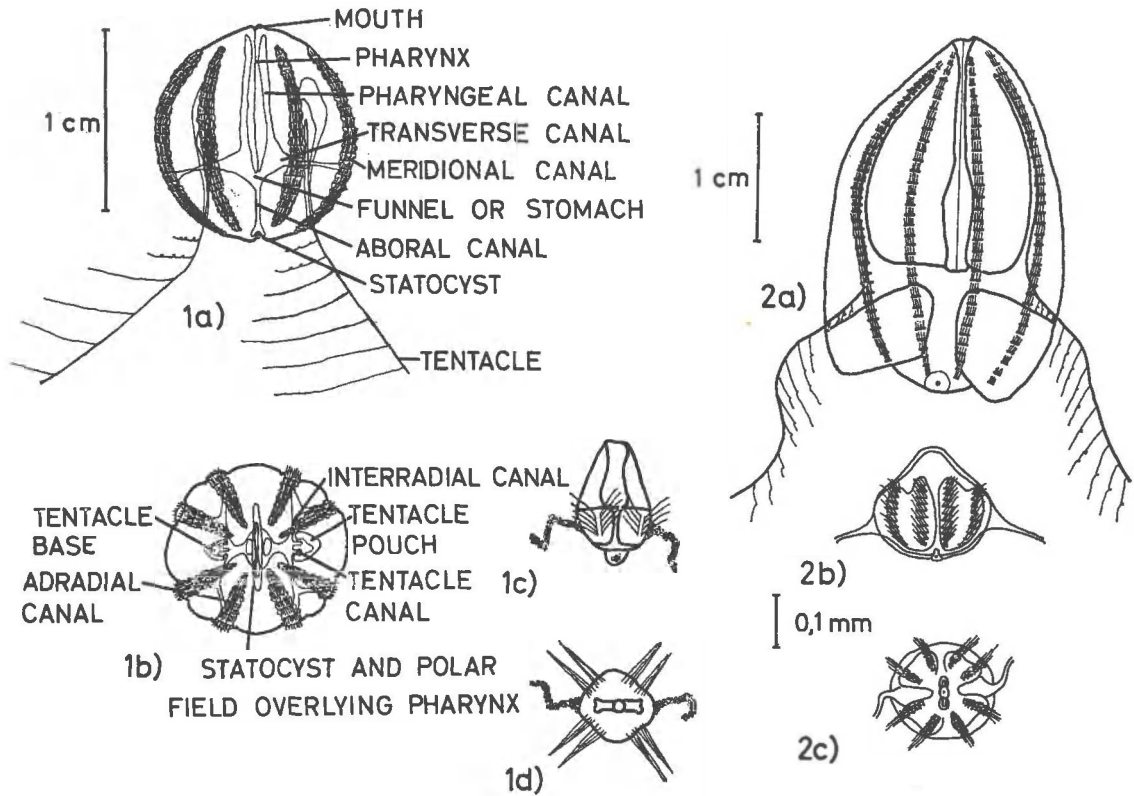
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CYDIPPIDA



1. *Pleurobrachia pileus*: a, lateral view; b, aboral view; c & d, idem for specimen after hatching. 2. *Mertensia ovum*: a, lateral view; b & c, lateral and aboral view of specimen after hatching. 3. *Bolinopsis infundibulum*: a, lateral view; b & c, aboral and lateral view of specimen after hatching. 4. *Beroe gracilis*: a, lateral view; b & c, aboral and lateral view of specimen after hatching. 5. *Beroe cucumis*: lateral view of adult, aboral and lateral view of hatched specimen identical with 4 b, c. - Figs. 2 a-c after Agassiz.

PHYLUM CTENOPHORA

Biradially symmetrical radiata with gelatinous ectomesoderm containing mesenchymal muscle fibres, with eight meridional rows of ciliary plates present throughout life, or as in four genera, in the larvae only; and with two tentacles (with the exception of one genus) and a biradially structured gastrovascular system. All five orders are marine, four are planktonic throughout their lives, but the platyctenids assume a creeping or sessile or parasitic existence as adults. The species occurring in the North Atlantic and the coastal waters of NW Europe are: 1. *Pleurobrachia pileus*; 2. *Mertensia ovum*; 3. *Bolinopsis infundibulum*; 4. *Beroe gracilis*; 5. *Beroe cucumis*. Doubtful species have been excluded from this list if their occurrence could not be confirmed. Among these species are: 6. *Hormiphora plumosa*; 7. *Aulacoctena acuminata*; 8. *Lesueuria vitrea*; 9. *Cestus veneris*; 10. *Beroe forskalii*.

Order Cydippida

Body simple rounded, oval or cylindrical, in some species compressed laterally in the sagittal plane; tentacles retractible into sheaths; meridional gastrovascular canals ending blindly.

Genus *Pleurobrachia* Fleming, 1822

Pleurobrachia pileus (O. F. Müller, 1776). Fig. 1. Egg to spherical shaped body; tentacular diameter slightly wider than the sagittal; height along the oral-aboral axis in the adult 10–25 mm. Rows of ciliary combs equal in length, starting near to the aboral pole and extending more than three quarters of the distance towards the mouth. Tentacle base widely separated from the pharyngeal vessel; contractile tentacle may be fifteen to twenty times the length of the body. There is a row of similar lateral filaments along one side of the tentacles. Comb rows milky opaque; ectomesoderm glassy transparent; tentacles and sheath and pharynx are milky or in some specimens dull orange in colour. In newly hatched specimens four pairs of parallel comb rows form clusters of interradially placed long combs; the body is pear shaped and the tentacles develop at the surface. During development the comb rows lengthen and separate, the tentacle base invaginates and the lateral filaments develop, the body becomes more spherical.

Genus *Mertensia* Lesson, 1836

Mertensia ovum (Fabricius, 1780). Body oval in the tentacular plane, markedly compressed in the sagittal plane; adult up to 55 mm high. Sub-tentacular ciliary comb rows are longer than the sub-sagittal comb rows and arise nearer to the aboral pole than the latter. Tentacles long and contractible with numerous similar short lateral filaments. Tentacles, comb rows, and pole plate are light pink in colour. The young form of *Mertensia* is difficult to distinguish from *Pleurobrachia*. The relative length of the comb rows, their distance from each other and the relative size of the tentacle may be helpful with the determination.

Order Lobata

Two large oral lobes and four auricles; tentacles reduced and without sheaths; oral ends of vascular system anastomosed.

Genus *Bolinopsis* L. Agassiz, 1860

Bolinopsis infundibulum (O. F. Müller, 1776). Body pear shaped in sagittal plane, laterally compressed in the tentacular plane; large oral lobes comprise one third of the body height; adult up to 150 mm high. Sub-tentacular comb rows extend in the oral direction into the auricles; subsagittal comb rows much longer and extend into the free outer ends of the oral lobes. Internally the meridional gastrovascular canals anastomose and send loops into lobes and auricles. Tentacle reduced in length, without sheaths, situated at each side of elongated mouth; accessory tentacles present along the edge of the mouth. The adult has a milky appearance, the extension of the subsagittal comb-rows into the oral lobes may be black in its outer part.

The early larva may be distinguished from the young stages of *Pleurobrachia* by the V-shape of the comb-rows being in pairs close to each other at the aboral end and more distant orally. The tentacle of the larva is inserted in the body of *Bolinopsis* while in *Pleurobrachia* and *Mertensia* the basis of the monofilamentous tentacle is on the surface of the body. During development the tentacle bulbs migrate orally, the oral lobes appear and with it the modifications of the gastrovascular system. It is extremely fragile, and only when caught and preserved with great care will identifiable fragments of the animal remain.

Order Beroida

Of conical or cylindrical form, with very wide mouth and pharynx.

Genus *Beroe* Browne, 1756

Beroe gracilis Künne, 1939. Body slender cylindrical with slight lateral compression in the "tentacular" plane; adult up to 30 mm high. Ciliary comb-rows equal in length extending from the aboral pole to about three quarters of the distance towards the mouth. There is a row of branched papillae in the form of a figure 8 around the pole plate at the aboral pole. The four meridional canals of each broad side are in connexion orally by means of the oral fork of the pharyngeal canal. The meridional canals have no side branches. The adult has a milky appearance, some specimens may be coloured slightly pink. The young can be distinguished from the other orders by the lack of tentacles and by the arrange-

ment of the comb-rows which are situated in 8 single rows as in the adults. The pink coloration of the young is concentrated in pigment-spots. *Beroe cucumis* Fabricius, 1780. Body sack or vase shaped, often compressed in what corresponds to the tentacular plane; adult up to 150 mm high. Ciliary comb-rows equal in length extending from the aboral pole and to about three-quarters of the distance towards the mouth. There is a row of branched papillae in the form of a figure 8 around the pole plate at the aboral pole. The four meridional canals of each broad side are in connexion orally by means of the oral forks of the pharyngeal canal. From the meridional canals branched anastomoses protrude into the ectomesoderm, mature specimens are pink in colour especially along the meridional canals and comb-rows. The young cannot be distinguished from *Beroe gracilis*.

B. gracilis may occur with *B. cucumis*. *B. gracilis* feeds exclusively upon *Pleurobrachia*; if offered *Bolinopsis* simultaneously, *B. cucumis* prefers *Bolinopsis*.

Species	Body form	Lateral compression	Comb-rows	Gastrovascular system	Tentacles
1. <i>Pleurobrachia pileus</i>	Oval to spherical	Very slight in sagittal plane	Adult: Equal; after hatching: 4 close parallel pairs	Blind ending; unbranched	Long; similar lateral filaments
2. <i>Mertensia ovum</i>	Oval	Marked; in sagittal plane	Adult: Subtentacular longer than sub sagittal; after hatching: 4 parallel pairs not so close	Blind ending; unbranched	Long; similar lateral filaments
3. <i>Bolinopsis infundibulum</i>	Pear shaped; large oval lobes	Moderate; in tentacular plane	Adult: Sub. sag. longer than subtentacular; after hatching: 4 V-shaped pairs	Complicated; looped anastomosed ends	Short; close to the mouth in the adult. Longer in young specimens
4. <i>Beroe gracilis</i>	Slender cylindrical	Moderate; in tentacular plane	Adult: Equal; after hatching: 8 single rows	Unbranched; connected orally on each broad side	None
5. <i>Beroe cucumis</i>	Sack shaped	Marked; in tentacular plane	Adult: Equal; after hatching: 8 single rows	Branched; connected orally on each broad side	None

Further Information on Identification

Agassiz (1849), Chun (1880), Krumbach (1927), Künne (1939), Liley (1958), Mayer (1912), Mortensen (1912), Vanhöffen (1903). Synonymy is discussed by Mayer (1912) and Mortensen (1912).

References to Work on Biology

(a) *Distribution*: Delap (1907), Fraser (1970), Greve (1971), Hartlaub (1894), Kramp (1910-31, 1939), Künne (1939), Laverack and Blackler (1974), Lenz (1972), Lindquist (1958), Mayer (1912), Manteufel (1941), Mortensen (1912, 1932), Moser (1909), Plymouth Marine Fauna (1957), Scott (1913, 1919), Shih (1971), Vanhöffen (1903).

(b) *Physiology, Biochemistry and Fine Structure*: Agassiz (1849), Bargmann (1972a, 1972b), Coonfield (1934, 1936), Chun (1880), Gemmill (1918), Gothlin (1929), Harvey (1952), Heider (1927), Hernandez-Nicaise (1973, 1974a and b), Horridge (1963, 1965, 1966, 1969), Hykes (1929, 1931), Hyman (1940), Knight-Jones and Quasim (1955), Krisch (1974), Krogh (1916), Lowndes (1942, 1943), Mortensen (1915), Rose (1913), Vernon (1895), Ward and Seliger (1974a, 1974b), Zirpolo (1942).

(c) *Reproduction and Development*: Agassiz (1865, 1874), Allman (1862), Hyman (1940), Kowalevsky (1866), Kuhl et al. (1973), Mayer (1912), Ortolani (1963), Dunlap (1974), Reverberi (1971), Teissier (1934).

(d) *Food and Feeding Behaviour*: Baker and Reeve (1974), Bigelow (1910, 1924), Bishop (1968), Chun (1880), Fraser (1970), Greve (1970), Hirota (1972), Kamshilow (1960a), Krumbach (1927), Köhl (1932), Lebour (1922, 1923), Lojaco (1908), Main (1928), Nagabushanam (1966), Nelson (1925), Remane (1956), Swanberg (1974), Thorson (1946), Weill (1935).

(e) *Predators and Parasites*: Agassiz (1865), Bigelow (1924), Brusca (1970), Greve (1971), Hansen (1949), Kamshilow, (1960a), Lebour (1916, 1923), Mortensen (1912), Scott (1913), Van Cleave (1927).

(f) *Effect on Plankton and Fisheries*: Bigelow (1915, 1924), Bigelow & Leslie (1928), Fraser (1962, 1970), Manteufel (1941), Nelson (1925), Russell (1935), Scott (1913).

Distribution

Species

(Species in brackets occur only exceptionally)

Gulf of Bothnia	1
Gulf of Finland	1
Baltic proper	1, (3)
Belt Sea	1, 3, (4), 5
Kattegat	1, 3, (4), 5
Skagerak	1, 3, (4), 5
Northern North Sea	1, 3, 5
Southern North Sea	1, 3, 4, 5
English Channel (eastern)	1, (3), (4), 5
English Channel (western)	1, (3), 5
W Scotland, Bristol Channel and Irish Sea	1, 3, 4, 5
South and West Ireland and Atlantic	1, 3, 5
Faroe - Shetland area	1, 3, 5
Iceland	(2), 3, 5
Norwegian Sea and Norwegian coastal water	(1), 3, 5
Barents Sea and Spitsbergen	(1), 2, 3, 5

REFERENCES

- AGASSIZ, L., 1849. Mem. Am. Acad. Arts Sci., N.S. 4: 313-74.
- AGASSIZ, L., 1865. Illus. Cat. Mus. comp. Zool. Harv., (2): xiv, 234 pp.
- AGASSIZ, L., 1874. Mem. Am. Acad. Arts Sci., N.S., 10: 357-98.
- BAKER, L. and REEVE, M., 1974. Mar. Biol., 26: 57-62.
- BARGMANN, W., 1972a. Z. Zellforsch. mikrosk. Anat., 123: 66-81.
- BARGMANN, W., 1972b. Z. Zellforsch. mikrosk. Anat., 123: 121-52.
- BETHE, A., 1895. Biol. Zbl., 15: 140-45.
- BIGELOW, H. B., 1910. Proc. U.S. nat. Mus., 37: 301-20.
- BIGELOW, H. B., 1915. Bull. Mus. comp. Zool. Harv., 59: 149-359.
- BIGELOW, H. B., 1924. Bull. U.S. Bur. Fish., 40 (968): 509 pp.
- BIGELOW, H. B. and LESLIE, M., 1928. Bull. Mus. comp. Zool. Harv., 70: 430-581.
- BISHOP, J. W., 1968. Ecology, 49: 996-97.
- BRUSCA, G. J., 1970. Bull. S. Calif. Acad. Sci., 69: 179-81.
- CHUN, C., 1880. Fauna Flora Golf. Neapel, 1: xviii, 313 pp.
- COONFIELD, B. R., 1934. Biol. Bull. mar. biol. Lab. Woods Hole, 66: 10-21.
- COONFIELD, B. R., 1936. Biol. Bull. mar. biol. Lab. Woods Hole, 70: 460-71; 71: 421-28.
- DELAP, M and C., 1907. Scient. Invest. Fish. Brch Ire., (1905) (7): 141-59.
- DUNLAP PIANKA, H. L., 1974. Acad. Press., Inc. Mar. Invertebr., Vol. 1 (4): 201-65.
- FARFAGLIO, G., 1963. Acta Embryol. Morph. exp., 6: 191-203.
- FRASER, J. H., 1962. Rapp. P.-v. Reun. Cons. perm. int. Explor. Mer, 153: 121-23.
- FRASER, J. H., 1970. J. Cons. int. Explor. Mer, 33: (2) 149-168.
- GEMMILL, J. F., 1918. Proc. Zool. Soc. Lond.: 263-65.
- GOTHLIN, G. F., 1929. Skand. Arch. Physiol., 58: 11-32.
- GREVE, W., 1970. Helgoländer wiss. Meeresunters., 20: 304-17.
- GREVE, W., 1971. Helgoländer wiss. Meeresunters., 22: 303-25.
- GREVE, W., 1972. Helgoländer wiss. Meeresunters., 23: 141-64.
- HANSEN, P. M., 1949. Rapp. P.-v. Reun. Cons. perm. int. Explor. Mer, 123: 77 pp.
- HARDY, A. C., 1956. The open sea. London, Collins, xv, 335 pp.
- HARTLAUB, C., 1894. Wiss. Meeresunters., N.F. Abt. Helgoland 1(1).
- HARVEY, E. N., 1952. Bioluminescence. New York, Acad. Press, xvi, 649 pp.
- HEIDER, K., 1927. Nachr. Ges. Wiss. Göttingen, math.-phys. Kl., (2): 144-57.
- HERNANDEZ-NICAISE, M. L., 1973. Z. Zellforsch. mikrosk. Anat. 143: 117-133.
- HERNANDEZ-NICAISE, M. L., 1974a. Tissue and Cell 6 (1): 43-47.
- HERNANDEZ-NICAISE, M. L., 1974b. Systeme nerveux et integration chez les ctenaires. Etude ultrastructurale et comportementale. These (Dr. Sci. Nat.). Univ. Claude Bernard (Lyon I). N. D'Ordre: 276 pp.
- HIROTA, J., 1972. In Biological oceanography of the northern North Pacific Ocean, edited by A. Y. Takenouti. Tokyo, Idemitsu Shoten: 465-84.
- HIROTA, J., 1974. Fish. Bull., 72 (2): 295-335.
- HORRIDGE, G. A., 1963. Q. Jl mar. Sci., 106: 311-17.
- HORRIDGE, G. A., 1965. Proc. R. Soc., Ser. B, 162: 351-63.
- HORRIDGE, G. A., 1966. In Some contemporary studies in marine science, ed. by H. Barnes. London, Allen & Unwin: 395-405.
- HORRIDGE, G. A., 1969. Tissue and Cell, 1: 341-53.
- HYKES, O. V., 1929. Biol. Spisy vys. Sk. zverolek., Brno, 8 (9): 10 pp.
- HYKES, O. V., 1931. C.r. hebd. Seanc. Acad. Sci., Paris, 106: 328-29.
- HYMAN, L., 1940. The invertebrates. New York: McGraw Hill, 1, ch. 8.
- KAMSHILOV, M. M., 1960. Dokl. Akad. Nauk SSSR, 130 (5): 1138-40.
- KNIGHT-JONES, E. W. and QUASIM, S. Z., 1955. Nature, London, 175: 191-92.
- KOWALEVSKY, A., 1866. Mem. Acad. Sci. St. Petersb., Ser. 7, 10 (4): 28 pp.

- KRAMP, P. L., 1910-1931. Bull. trimest. Result. Crois. period. Cons. perm. int. Explor. Mer, 1902-08.
- KRAMP, P. L., 1939. Zoology Iceland, 2 (56), 37 pp.
- KRISCH, B., 1974. Z. Zellforsch., 142: 241-62.
- KROGH, A., 1916. Monograph of biochemistry. London: Longmans, Green & Co: 173 pp.
- KRUMBACH, T. L., 1927. Tierwelt N.-u. Ostsee, 7 (3): 50 pp.
- KUHL, W., 1932. Natur Mus., Frankf., 62: 130-33.
- KÜNNE, C., 1939. Zool. Anz., 127: 172-74.
- KÜNNE, C., 1952. Helgoländer wiss. Meeresunters., 4 (1): 14-17; 28-44.
- KUHL, W., KUHL, G. and WESTHEIDE, W., 1973. Inst. f. d. wiss. Film. Göttingen, 3-18.
- LAVERACK, M. S. & BLACKLER, M. eds. 1974. Fauna & flora of St Andrew's Bay. Edinburgh: Scottish Acad. P., 1974, 310 pp.
- LEBOUR, M. V., 1916. J. mar. biol. Ass. U.K., 11: 57-59.
- LEBOUR, M. V., 1922. J. mar. biol. Ass. U.K., 12: 644-77.
- LEBOUR, M. V., 1923. J. mar. biol. Ass. U.K., 13: 70-92.
- LENZ, J., 1973. J. Cons. perm. int. Explor. Mer, 35 (1): 32-35.
- LINDQUIST, A., 1958. Commentat. biol., 17 (2): 1-10.
- LOJACONO, M., 1908. J. Physiol. Path. gen., 10: 1001-08.
- MAIN, R. J., 1928. Biol. Bull. mar. biol. Lab. Woods Hole, 55: 69-78.
- MANTEUFEL, B. P., 1941. Trudy polyar. nauchno-issled. Inst. morsk. ryb. Khoz. Okeanogr., 7 (3): 125-218.
- MAYER, A. G., 1912. Publs. Carnegie Instn (162): 58 pp.
- MORTENSEN, T. L., 1912. Dan. Ingolf-Exped., 5 (2): 95 pp.
- MORTENSEN, T. L., 1915. Vidensk. Meddr dansk naturh. Foren., 66: 45-51.
- MORTENSEN, T. L., 1934. Rep. M. Sars. N. Atl. Deep Sea Exped., 3 (2): 9 p.
- MOSER, F., 1909. Dt. Südpol-Exped., 2, (Zool.), (3): 115-92.
- NELSON, C. T., 1925. Biol. Bull. mar. biol. Lab. Woods Hole., 48: 92-111.
- NAGABUSHANAM, A. K., 1959. Nature, Lond. 184: 829 only.
- ORTOLANI, G., 1963. Acta Embryol. Morphol. exp., 7: 55-71.
- PETIPA, T. S., PAVLOVA, E. V. and MIRONOV, G. N., 1970. In Marine food chains, edited by J. H. Steele. Berkeley. Univ. Calif. Press: 143-167.
- PLYMOUTH MARINE FAUNA 1957. 3rd edition. xiii, 457 pp.
- RAJAGOPAL, P. K., 1963. Curr. Sci., 32: 319-20.
- REES, C. B., 1939. J. mar. biol. Ass. U.K., 23: 397-425.
- REMANE, A., 1956. Kieler Meeresforsch., 12: 72-75.
- REVERBERI, G., 1971. Experimental Embryology of Marine Invertebrates. North Holland Publ., 85-103, Amsterdam.
- RÖMER, F., 1904. Fauna arct., 3: 67-90.
- ROSE, M., 1913. Bull. Inst. oceanogr. Monaco, 276: 15 pp.
- RUSSELL, F. S., 1935. J. mar. biol. Ass. U.K., 20: 309-32.
- SCOTT, A., 1913. Rep. Lancs. Sea-Fish. Labs 22: 19-25.
- SCOTT, A., 1919. Rep. Lancs. Sea-Fish. Labs, 28: 6-15.
- SHIH, C. T., et al., 1971. Bull. Fish. Res. Bd Can. (176): vii, 265 pp.
- SWANBERG, N., 1974. Mar. Biol., 24, 69-76.
- TEISSIER, G., 1934. Trav. Stn. Biol. Roscoff, 12.
- THORSON, G., 1946. Meddr Kommn Danm. Fisk.- og Havunders., 4 (1), 523 pp.
- VAN CLEAVE, H. J., 1927. Trans. Am. micr. Soc., 46: 214-15.
- VANHOFFEN, E., 1903. Nord. Plankt., 11: 1-7.
- VERNON, H. M., 1895. J. Physiol., 19: 18-70.
- WARD, W. W. and SELIGER, H., 1974a. Biochemistry, 13(7): 1491-99.
- WARD, W. W. and SELIGER, H., 1974b. Biochemistry, 13(7): 1500-09.
- WEILL, R. A., 1936. C. R. Acad. Sci., Paris, 201: 850-52.
- ZIRPOLO, G., 1942. Boll. Soc. Nat. Napoli, 53 (12): 143-69.