

CONSEIL INTERNATIONAL POUR L'EXPLORATION DE LA MER

**Zooplankton**

**Sheet 107**

**POLYZOA (BRYOZOA)**

**ORDER CHEILOSTOMATA**

**CYPHONAUTES LARVAE**

(By J. S. RYLAND)

**1965**

Larvae found in the eastern North Atlantic

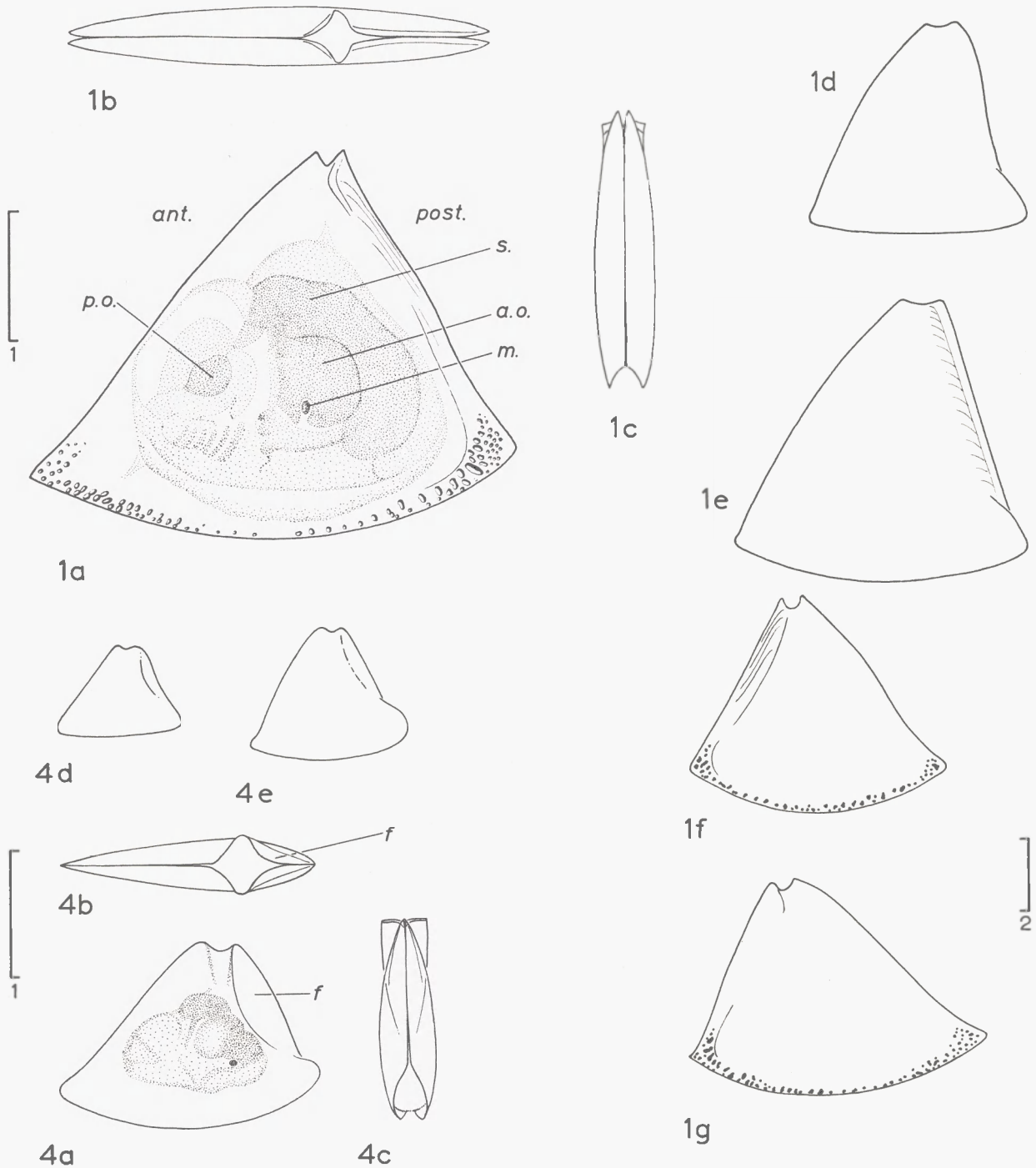


Plate I. Large cyphonautes with clear shells.

1. *Membranipora membranacea*; a, lateral view (North Sea, July); b, apical view (Øresund, October); c, anterior view (as b); d, e, shell outlines of young larvae (Plymouth); f, g, variation in shell profile (North Sea, July). — 4. *Electra pilosa* (see also Plate II); a, lateral view (Plymouth, December); b, apical view (Plymouth, January); c, anterior view (as b); d, e, shell outlines of young larvae (Plymouth). a.o., adhesive organ; f, flange; m, adductor muscle; p.o., pyriform organ; s., stomach. Scales = 200  $\mu$ . All drawings except 1f, g to scale 1. (1d, e, 4d, e, after ATKINS, 1955a; 1b, c, f, g, 4b, c, from RYLAND, 1964; 1a, 4a, original).

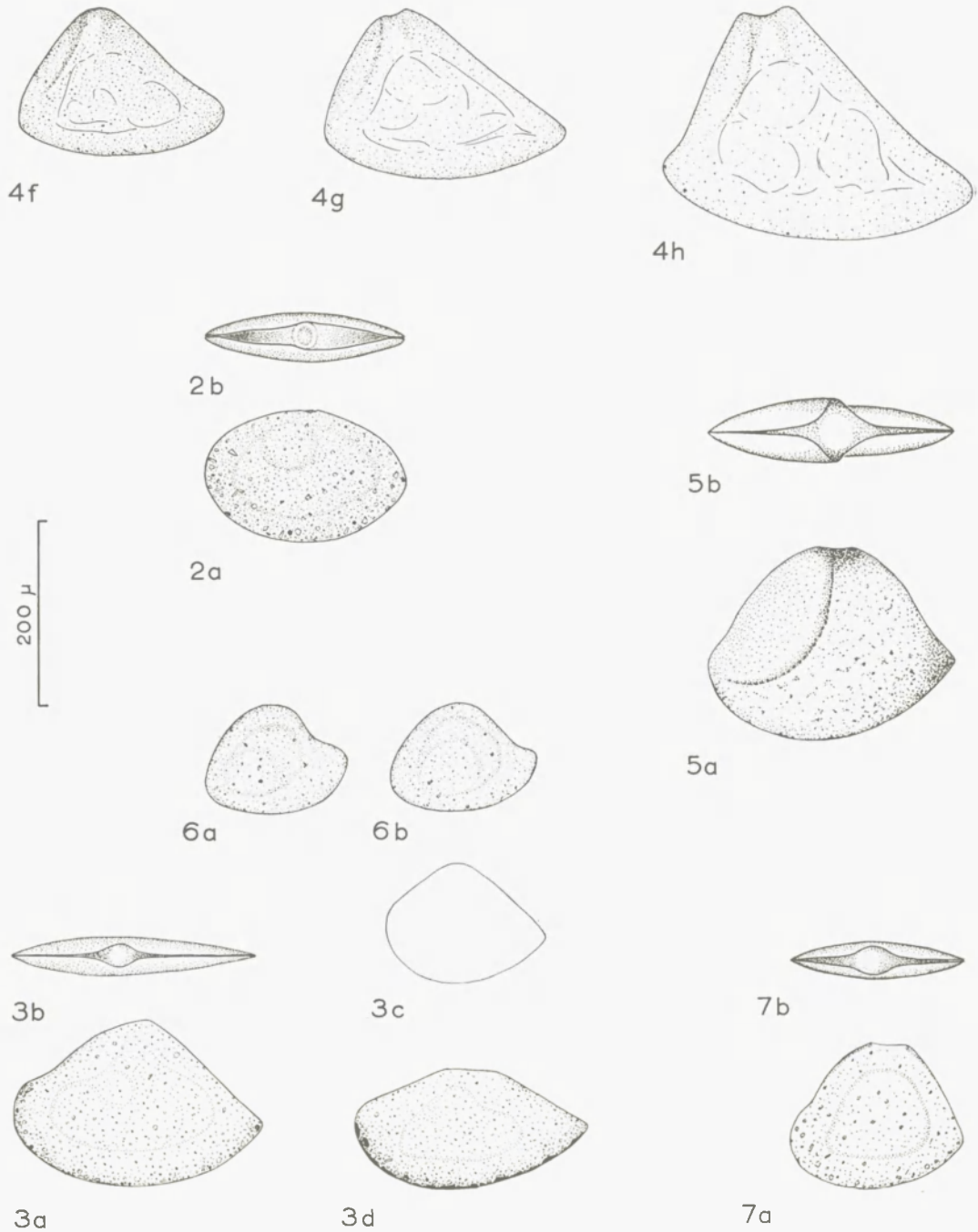


Plate II. Small cyphonautes with granular (particle-encrusted) shells.

2. *Electra crustulenta*; a, lateral view (Plymouth, January); b, apical view (as a). — 3. *E. monostachys*; a, lateral view (Plymouth, January); b, apical view (as a); c, shell profile of younger larva (Plymouth, January); d, lateral view (Burnham-on-Crouch, November). — 4. *E. pilosa* (see also Plate I); f-h, young larvae (Burnham-on-Crouch, November). — 5. *Conopeum reticulum*; a, lateral view (Burnham-on-Crouch, June); b, apical view (as a). — 6. *C. seurati*; a-b, larvae in lateral view (Burnham-on-Crouch, November). — 7. Unidentified larva; a, lateral view (Plymouth, January); b, apical view (as a). Magnification is twice that of scale 1, Plate I. (All original).

## CYPHONAUTES LARVAE

In most species of Polyzoa the developing embryos are brooded, but in a few the eggs are shed directly into the sea. These develop into larvae known as cyphonautes. The body is compressed laterally between two chitinous shell valves, which generally have a more or less triangular outline; they may be transparent or covered with minute particles. The valves are held together by an adductor muscle which shows clearly in transparent larvae (m. in Fig. 1a). At their apex the valves are cut away, and often flared (Fig. 4b, c) to accommodate the sensory apical organ. At their base the valves gape, the opening being encircled by the ciliary corona – the locomotory organ of the larva. The lower part of the space enclosed by the shell constitutes the vestibule, divided into inhalent and exhalent chambers: the two are joined through the inverted U of the alimentary canal (s. in Fig. 1a). The side of the triangle nearest the inhalent chamber is referred to as anterior, that by the exhalent chamber as posterior; though in fact the larva swims with the apical organ leading. A glandular pyriform organ borders the inhalent chamber (p.o. in Fig. 1a); the adhesive organ (a.o.) lies beside the adductor muscle. For further details ATKINS (1955a) should be consulted. Routine formalin fixation causes great shrinkage of the internal organs, especially of the apical organ, and larvae prepared in this way have the appearance shown in Figs. 1a and 4a. When the shell is covered with granular material orientation may be difficult; but if the valves are ridged the flange so formed is on the posterior side (f in Fig. 4a, b).

All figures and descriptions are made from formalin-fixed specimens.

### Key for the Identification of Species

1. Large larva ( $>350\mu$  in length) with clear shell valves (Pl. I) ..... 2  
Small larva ( $<300\mu$  in length) with granular shell valves (Pl. II) ..... 3
2. Very large larva ( $>450\mu$  in length), transparent, often with refringent spots along the lower margin of the shell valves, and a narrow linear posterior flange ..... 1. *Membranipora membranacea*  
Larva not exceeding  $450\mu$  in length, slightly opaque, lacking marginal spots, and with a broad flange behind a curved ridge descending from the apex. .... 4. *Electra pilosa*
3. Shell valves with a distinct ridge forming a posterior flange ..... 4  
Shell valves without a ridge and flange. .... 5
4. Shell valves lightly granular, much longer than high, ridge of flange close to posterior margin. .... 4. *Electra pilosa* (young)  
Shell valves opaque with dark particles, not much longer than high, apical part of ridge of flange almost in the centre of the valve ..... 5. *Conopeum reticulum*
5. Shell profile ovate. .... 2. *Electra crustulenta*  
Shell profile not ovate, often nearly triangular. .... 6
6. Anterior margin of shell straight, the anterior end pointed; up to  $250\mu$  in length and at least the older larvae much longer than high; often with dark particles along the basal margin of the shell valves. .... 3. *Electra monostachys*  
Anterior end of shell rounded; not above  $200\mu$  in length, and not much longer than high. .... 7
7. Larva with prominent bulbous posterior end; mainly in semi-enclosed subsaline waters. .... 6. *Conopeum seurati*  
Posterior end rounded, but not prominently bulbous; marine. .... 7. Unidentified larva

## ORDER CHEILOSTOMATA

### Family Membraniporidae

#### MEMBRANIPORA de Blainville

1. *Membranipora membranacea* (Linné). Shell outline triangular, the lower angles acute or acuminate. Length at metamorphosis  $750-850\mu$ , height  $600\mu$  or a little more. Valves almost flat, wholly colourless and transparent when young. Basal margins becoming brownish when a length of about  $700\mu$  is reached and then developing refringent spots, these markings being most developed in the valve angles where the spots may coalesce to form short ridges. Faint striations (growth lines) may show near the apex and down the posterior margin. Posterior flange very narrow. Notch for the apical organ deep and flared, but relatively small. Internal organs transparent.

The shape of the valves may vary considerably, the anterior and posterior margins being of approximately equal length or with the anterior margin being conspicuously longer. Shape also varies with age, young larvae being as high as they are long. (The shape of such young larvae is quite different from that of full-grown *Electra pilosa* larvae, which are of about the same size; see figures.)

Adult colonies grow on algae, particularly *Laminaria*; very common. Larvae are most abundant in coastal waters with nearby rocky shores. They may be found in the plankton throughout the year, but especially May-September.

#### ELECTRA Lamouroux

2. *Electra crustulenta* (Pallas). Shell outline more or less oval,  $160-240\mu$  long and  $120-170\mu$  high. Valves slightly convex, gaping apically but without a notch, encrusted with fine particles which give the shell a brownish or grey, granular appearance. Internal organs hardly visible, often only the stomach showing clearly.

In very young larvae (about  $100\mu$  long) the shell is almost triangular, and older larvae may show a fairly straight anterior margin (cf. *E. monostachys*).

Adult colonies grow on algae and stones on the shore and just below; confined to brackish water and recorded from salinities as low as  $2\text{‰}$ ; locally common. Larvae are found in the plankton throughout the year, with a maximum during winter and spring.

3. *E. monostachys* (Busk). Shell in the form of a triangle with a rounded lower margin, becoming steadily longer as growth proceeds; about  $260\mu$  long and  $165\mu$  high. Posterior margin straight or sinuate, rounded or bulging as it becomes basal; anterior margin longer, quite straight, its end pointed. Valves very slightly flared for the apical organ, but without a notch. Valves covered with fine particles, light grey in colour. The largest particles are found near the basal margins, where there may also be accretions of black material. Internal organs hardly visible.

Adult colonies grow on shells, stones and algae, on the shore and just below; frequently in brackish water. Larvae occur in the plankton from June until the winter.

4. *E. pilosa* (Linné). Shell outline roughly triangular, the lower angles rounded. At metamorphosis the length is  $400\text{--}500\mu$  and the height a little less than  $400\mu$ . Valves of the late larva convex, a translucent yellow-brown, without any ornamentation along the basal margins. They flatten abruptly behind the apex to form a conspicuous flange down the posterior border, and flare out towards the apex making a large cruciform gape for the apical organ. Internal organs greyish, slightly opaque.

There is considerable variation in the shape of the valves, though larvae always show the characters mentioned above. Little change in shape occurs during development. The valves of the young larva may be transparent or covered with fine particles (Plate II). In all cases the broad, curved posterior flange is conspicuous.

Adult colonies grow on stones and algae on shores and in shallow water; very common. Larvae are present in the plankton throughout the year.

#### CONOPEUM Gray

5. *Conopeum reticulum* (Linné). Shell profile roughly bell-shaped (though the anterior and posterior margins are not symmetrical), proportionally taller than in most other small cyphonautes. About  $250\text{--}290\mu$  long and  $180\text{--}200\mu$  high. Valves rather flat, truncated and strongly flared for the apical organ, and with a broad flange delimited by a prominent curved ridge running from the apex towards the posterior margin. Shell grey in colour, lightly encrusted with small dark particles. Internal organs invisible.

Adult colonies found on stones and shells on the shore and in shallow water; extends into estuaries. Larvae occur in the plankton from June until autumn.

6. *C. seurati* (Canu). Very small sub-triangular larva with a characteristic *retroussé* profile to the posterior margin; though probably becoming more nearly triangular during growth. No apical notch. About  $165\mu$  long and  $125\mu$  high. Valves covered with fine particles. Internal organs hardly visible.

Adult colonies found on shells, stones and plants in enclosed brackish waters, in salinities which may fall as low as  $1\text{‰}$ ; local. Larvae are found in the plankton from June until winter.

#### INCERTAE SEDIS

7. A small light grey larva was obtained off Plymouth during December and January. In profile it closely resembles *Conopeum reticulum*, but the shell valves lack any trace of a flange. Valves truncated and with a very slight flare for the apical organ. About  $210\mu$  long and  $180\mu$  high. Internal organs faintly visible.

Identity of the adult unknown.

Further Information on Identification

1. *Membranipora membranacea*<sup>1)</sup>: ATKINS, 1955a; RYLAND, 1964.
2. *Electra crustulenta*: COOK, 1960; LOHMANN, 1911 (as *Cyphonautes barroisi*).
3. *E. monostachys*: COOK, 1964.
4. *E. pilosa*<sup>1)</sup>: ATKINS, 1955a; RYLAND, 1964.
5. *Conopeum reticulum*: COOK, 1964.
6. *C. seurati*: none.

<sup>1)</sup> Reference to the earlier literature is not recommended for normal purposes, and should only be attempted in conjunction with the synonymies given by RYLAND (1964).

References to Work on Biology

- (i) Life history and metamorphosis; (ii) Seasonal occurrence in the plankton; (iii) General biology; (iv) Adult distribution.)
1. ATKINS, 1955a (i), 1955b (iii); KLUGE, 1962 (iv); MARCUS, 1940 (iv); MARSHALL, 1948 (ii)<sup>2)</sup>; REES, 1954 (ii)<sup>2)</sup>; RYLAND, 1963 (iv); THORSON, 1946 (ii).
  2. COOK, 1960 (i, ii), 1962 (i, ii); KLUGE, 1962 (iv); MARCUS, 1940 (iv); THORSON, 1946 (ii).
  3. COOK, 1964 (i, ii); MARCUS, 1940 (iv)<sup>3)</sup>.
  4. ATKINS, 1955a (i), 1955b (iii); KLUGE, 1962 (iv); KUPELWIESER, 1905 (i, iii); MARCUS, 1940 (iv); MARSHALL, 1948 (ii)<sup>2)</sup>; REES, 1954 (ii)<sup>2)</sup>; RYLAND, 1963 (iv); THORSON, 1946 (ii).
  5. COOK, 1964 (i, ii).
  6. COOK, 1962 (i, ii).

<sup>2)</sup> Species not distinguished. <sup>3)</sup> As *Membranipora (Electra) hastingsi*.

Distribution of Adults

| Region   | Species                                       |
|--|---|
| Gulf of Bothnia, Gulf of Finland, Northern Baltic..... | 2   |
| Southern Baltic, Belt Sea ...                          | 1, 2, 4                                       |
| Kattegat, Skagerak.....                                | 1, 2 <sup>1)</sup> , 4, 5, 6 <sup>1)</sup>    |
| North Sea.....   | 1, 2 <sup>1)</sup> , 3, 4, 5, 6 <sup>1)</sup> |
| English Channel.....                                   | 1, 2 <sup>1)</sup> , 3, 4, 5, 6 <sup>1)</sup> |
| Irish Sea.....   | 1, 2 <sup>1)</sup> , 3, 4, 5, 6 <sup>1)</sup> |
| Bay of Biscay.....                                     | 1, ?2, ?3, 4, 5, 6 <sup>1)</sup>              |
| North Atlantic.....                                    | 1, 2 <sup>1)</sup> , 3, 4, 5                  |
| Faeroes.....   | 1, ?2, 4                                      |
| Iceland.....   | 1, ?2, 4                                      |
| Norwegian Sea.....                                     | 1, ?2, 4                                      |
| Barents Sea.....                                       | 1, 2, 4                                       |

<sup>1)</sup> In suitable areas of brackish water.

References

ATKINS, D., 1955a. J. mar. biol. Ass. U.K., **34**: 441.  
 ATKINS, D., 1955b. J. mar. biol. Ass. U.K., **34**: 451.  
 COOK, P. L., 1960. Essex Nat., **30**: 258.  
 COOK, P. L., 1962. Cahiers Biol. mar., **3**: 57.  
 COOK, P. L., 1964. Cahiers Biol. mar., **5**: 391.  
 KLUGE, G. A., 1962. "Bryozoa of the northern seas of the U.S.S.R." (in Russian). Moscow and Leningrad.  
 KUPELWIESER, H., 1905. Zoologica, Stuttgart, Heft 47.  
 LOHMANN, H., 1911. Nord. Plankt., **5** (9): 31.  
 MARCUS, E., 1940. "Mosdyr (Bryozoa eller Polyzoa)." Copenhagen.  
 MARSHALL, N. B., 1952. Bull. mar. Ecol., **2**: 173.  
 REES, C. B., 1954. Bull. mar. Ecol., **4**: 47.  
 RYLAND, J. S., 1963. Sarsia, **14**: 1.  
 RYLAND, J. S., 1964. J. mar. biol. Ass. U.K., **44**: 645.  
 THORSON, G., 1946. Medd. Komm. Havundersøg., Ser. Plankton, **4** (1).