

CONSEIL INTERNATIONAL POUR L'EXPLORATION DE LA MER

Zooplankton

Sheet 105

**ECHINODERMATA:
LARVAE**

**Classes: Ophiuroidea
and Echinoidea
(PLUTEI)**

(By S. R. GEIGER)

1964

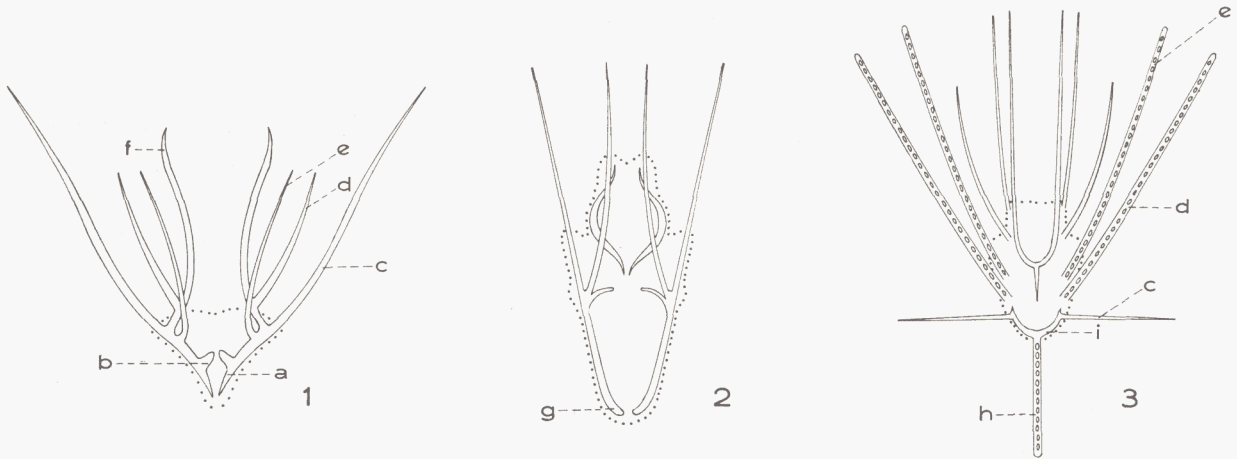


PLATE I

1. *Ophiopluteus*; a, end rod; b, transverse rod; c, postero-lateral rod; d, postero-dorsal rod; e, postoral rod; f, antero-lateral rod. — 2. *Echinopluteus* of Diadematoidea; g, body rod. — 3. *Echinopluteus* of Spatangoidae; c, postero-lateral rod; d, postero-dorsal rod; e, postoral rod; h, posterior rod; i, arch. Details of body skeletons not shown. Body outlined by dotted lines. Diagrams after various authors.

PLUTEI

URSIN (1960) lists 28 species of benthic ophiuroids and echinoids as occurring in the North Sea at depths of less than 100 metres. One of these, the ophiuroid *Amphiopholis squamata*, does not have a pelagic larva. Larval development is unknown or very incomplete for eight of the species. In addition descriptions exist for two ophioplutei from the North Sea for which the adults are unknown; *Ophiopluteus dubius* and *O. minor*.

Skeletal structure can be used to distinguish ophioplutei and echinoplutei from other planktonic larvae and to separate the species from each other. As most workers do not have the opportunity to work with living material only the 21 species with adequate descriptions of skeletal parts are considered. Even for these more descriptive work needs to be done, particularly on younger stages. T. MORTENSEN repeated most of his larval information, including drawings, in several publications, but reference is made only to readily available works for each species. In the following annotated list the species are arranged alphabetically within each of the major taxonomic groups.

The distribution and abundance of the adults is discussed by URSIN (1960) and that of the larvae by REES (1954). Only those synonyms that affect the proper association of larva and adult, within the references cited, are included. For a more complete consideration of the synonymy, see MORTENSEN (1927).

Three kinds of plutei are found among the ophiuroids and echinoids. Ophioplutei are quite similar and can be separated from echinoplutei by their possession of end and transverse rods of about equal size and arranged as in Plate I, Fig. 1. There are two types of echinoplutei in the North Sea (Plate I, Figs. 2, 3), one with skeletal rods that are fenestrated and the other lacking fenestration.

CLASS OPHIUROIDEA

The structure of the body skeleton (Plate II) is relied on heavily in identification.

1. *Amphiura filiformis* (*Ophiopluteus mancus*) has six arms (postero-dorsal arms missing) rather than the more common number of eight, curved spines along the inner surface of the postero-lateral skeletal arm rods (skeletal arm rods are hereafter referred to as rods) and a short incomplete recurrent rod from each postoral arm rod.
2. *Ophiactis balli* has a compound body skeleton with recurrent rods located dorsally and ventrally, transverse rods with simply branching ends, postero-dorsal arms missing and advanced stages have well-developed spines on the inner surface of the postero-lateral rods which become much longer than the other rods.
3. *Ophiocomina nigra* is separated from the other species by the presence of inwardly directed processes on the end rods. There is a difference between the transverse rods figured in MORTENSEN (1927) and MORTENSEN (1931).
4. *Ophiecten sericeum* has a compound body skeleton, but usually has only dorsal recurrent rods and transverse rods with bi- or tripartite ends.
5. *Ophiopholis aculeata* does not develop a median rod from each of the transverse rods until quite late and is difficult to distinguish from some other species before that time.
6. *Ophiothrix fragilis* has a single median rod that may be separated from the transverse rods as well as long postero-lateral arms.
7. *Ophiura albida* (*Ophioglypha albida*) has smooth, simple transverse and end rods.

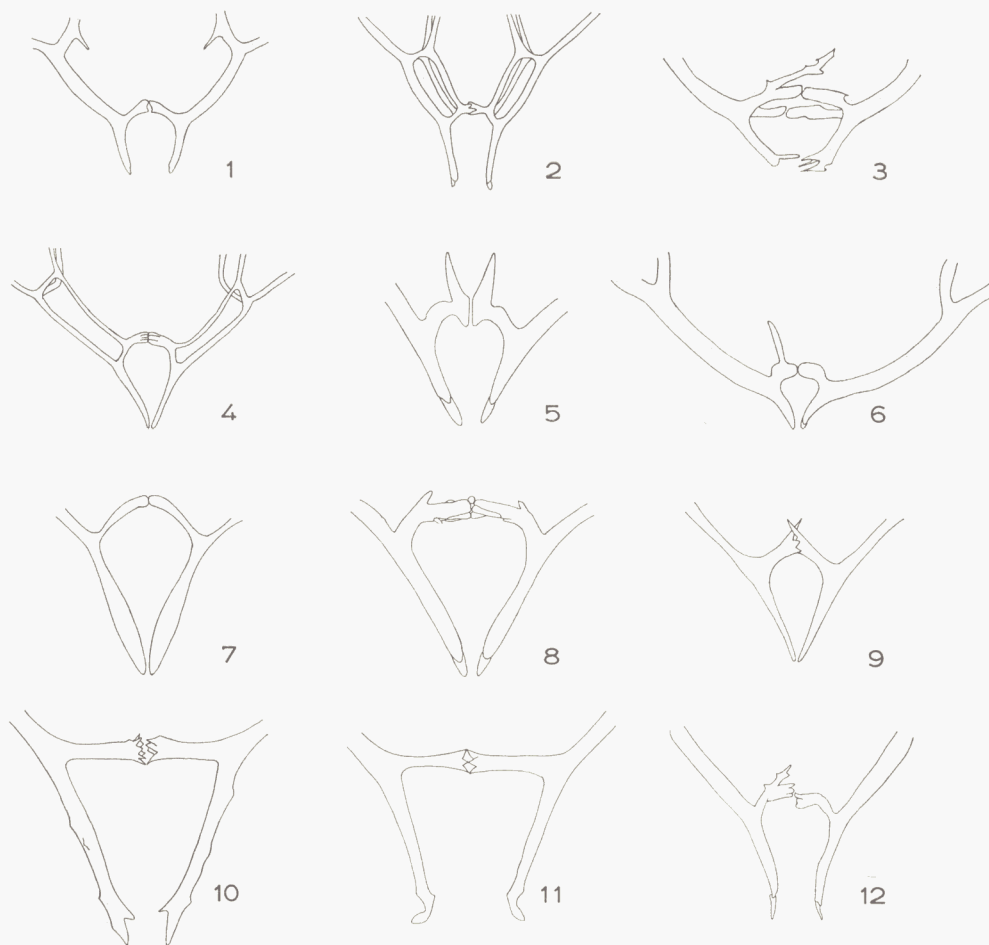


PLATE II. OPHIUROIDEA: Body skeletons.

1. *Amphiura filiformis*. — 2. *Ophiactis balli*. — 3. *Ophiocomina nigra*. — 4. *Ophiocten sericeum*. — 5. *Ophiopholis aculeata*. — 6. *Ophiothrix fragilis*. — 7. *Ophiura albida*. — 8. *O. robusta*. — 9. *O. sarsi*. — 10. *O. texturata*. — 11. *Ophiopluteus dubius*. — 12. *O. minor*.

Figs. 1, 5, 6, 7, 8, 10, 11 after MORTENSEN, 1900. Fig. 2 after MORTENSEN, 1913. Fig. 3 after MORTENSEN, 1931. Figs. 4, 9 after THORSON, 1934. Fig. 12 after OLSEN, 1942.

8. *Ophiura robusta* (*Ophiopluteus compressus*) has flattened and irregularly indented transverse rods. *Ophiopluteus compressus* was assigned to *Ophiura robusta* by THORSON (1946). URSIN (1960) believes that *O. compressus* possibly is a collective name for *O. robusta* and *O. affinis*. See *O. sarsi*.
9. *O. sarsi* has bipartite ends and an anteriorly directed thorn on the transverse rods. THORSON (1946) re-assigned his original description of *O. robusta* to *O. sarsi*.
10. *O. texturata* (*O. ciliaris*) has fenestrated postero-lateral rods.
11. *Ophiopluteus dubius* lacks postero-dorsal arms, has straight transverse rods and strong thorns on the arm rods just before they join the postero-lateral rods.
12. *O. minor* has more elaborate projections on the transverse rods than *Ophiura sarsi*, but otherwise is quite similar to it.

CLASS ECHINOIDEA (Plate III)

Order Diadematoidea

Skeletal rods are not fenestrated in the representatives of this order as in the other two orders of echinoids or in the ophiuroid *Ophiura texturata*. The structure of the posterior end of the body rods is used to separate the species (Plate III, Figs. 1–4). Four species are represented *Echinus acutus*, *E. esculentus* (*Echinopluteus thélaii*), *Psammechinus milaris* (*Echinus milaris*) and *Strongylocentrotus droebachiensis*.

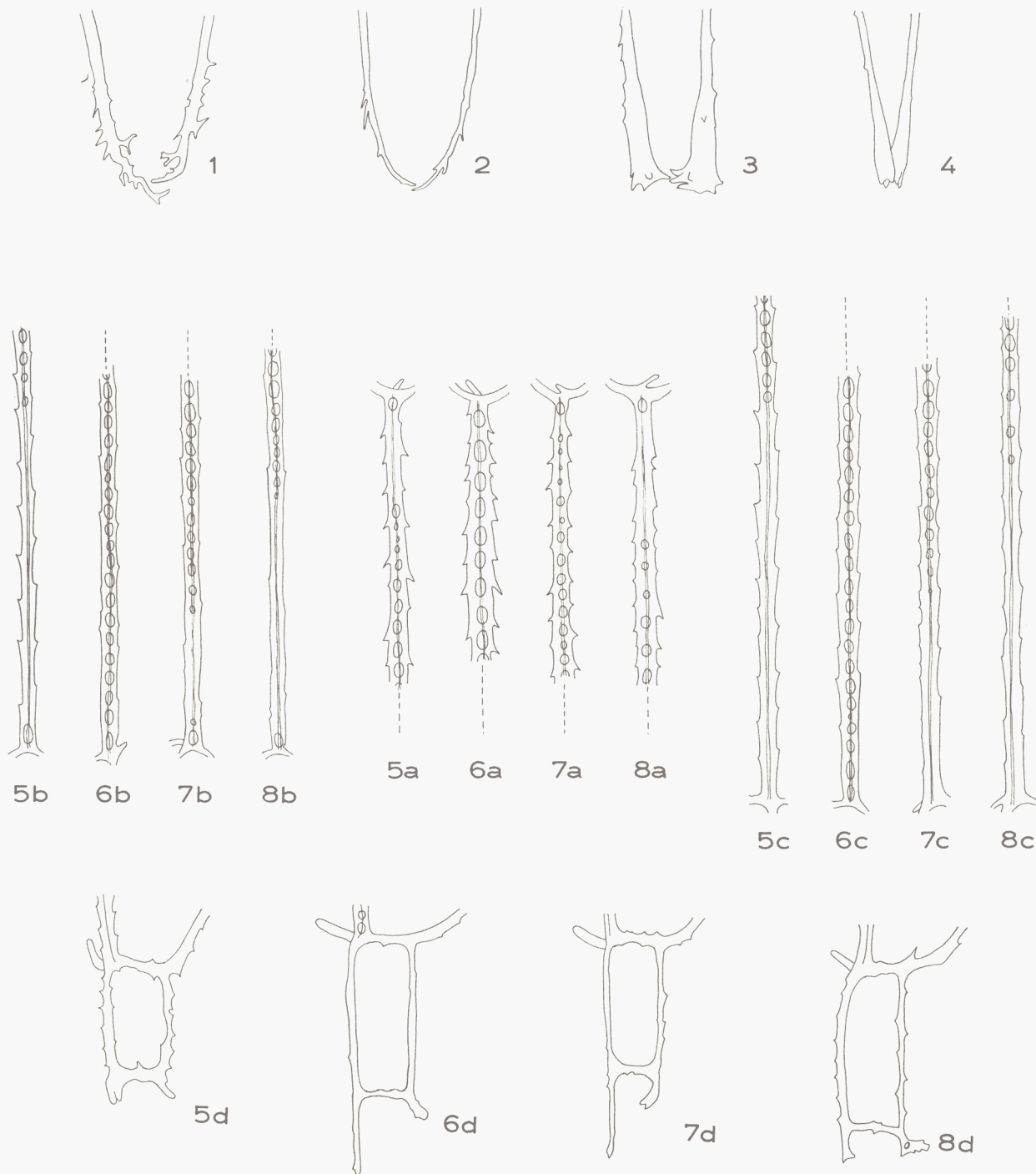


PLATE III. ECHINOIDEA:

Class Diadematoidea: 1. *Echinus acutus*. — 2. *E. esculentus*. — 3. *Psammechinus milaris*. — 4. *Strongylocentrotus droebachiensis*. Figs. 1-4, posterior end of body rods. Class Spatangoidea: 5. *Brissopsis lyrifera*. — 6. *Echinocardium cordatum*. — 7. *E. flavescens*. — 8. *Spatangus purpureus*. a, posterior rod; b, postero-dorsal rod; c, postoral rod; d, body skeleton. Figs. 1-4 after MORTENSEN, 1927. Figs. 5-8 after REES, 1953.

Order Clypeastroidea

The single species *Echinocyamus pusillus* is separated from the species in the following order by its lack of the skeletal component composed of the posterior rod (aboral spike), postero-lateral rods and the arch connecting them.

Order Spatangoidea (Plate III, Figs. 5–8)

A detailed examination of the body skeleton is necessary in order to separate the four species that are known, as the specific characteristics that are used overlap. This applies particularly to the degree of fenestration in the posterior, postero-dorsal and postoral rods, as well as the structure of the body skeleton. There is considerable change during development. Four species have been described *Brissopsis lyrifera*, *Echinocardium cordatum*, *E. flavescens* and *Spatangus purpureus*.

Descriptions of skeletal parts are found in the works listed below. An asterisk after the reference number designates the inclusion of descriptions of the skeletons of a series of stages.

OPHIUROIDEA

Amphiura filiformis 1*, 2, 3, 5, 6, 7
Ophiactis balli 4, 5
Ophiocmina nigra 5, 6, 7
Ophiocten sericeum 16
Ophiopholis aculeata 3, 10*
Ophiothrix fragilis 1, 3, 5, 7, 8*
Ophiura albida 1, 3, 5, 6, 7
O. robusta 1, 3, 5, 7, 9
O. sarsi 16
O. texturata 1, 3, 5, 6, 7
Ophiopluteus dubius 2, 3, 9
O. minor 9

ECHINOIDEA

Diadematoidea
Echinus acutus 5, 7, 14*
E. esculentus 5, 7, 14*
Psammechinus milaris 2, 5, 7, 14*
Strongylocentrotus droebachiensis 2, 5, 7, 13*
Clypeastroidea
Echinocyamus pusillus 3, 5, 7, 15*
Spatangoidea
Brissopsis lyrifera 11*
Echinocardium cordatum 11*
E. flavescens 11*
Spatangus purpureus 11*

Plutei are unknown or poorly known for the following ophiuroids (see MORTENSEN (1927)); *Acrocrida brachiata*, *Amphilepis norvegica*, *Amphiura chiajei*, *Asteronyx loveni* (has a large egg which suggests non-pelagic development), *Gorgonocephalus caput-medusae* (has eggs that are shed into the water), *Ophiura affinis* (an incomplete description exists, also see *O. robusta*) and *Paramphiura punctata* and for the echinoid; *Echinocardium pennatifidum*.

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