

CONSEIL INTERNATIONAL POUR L'EXPLORATION DE LA MER

Zooplankton

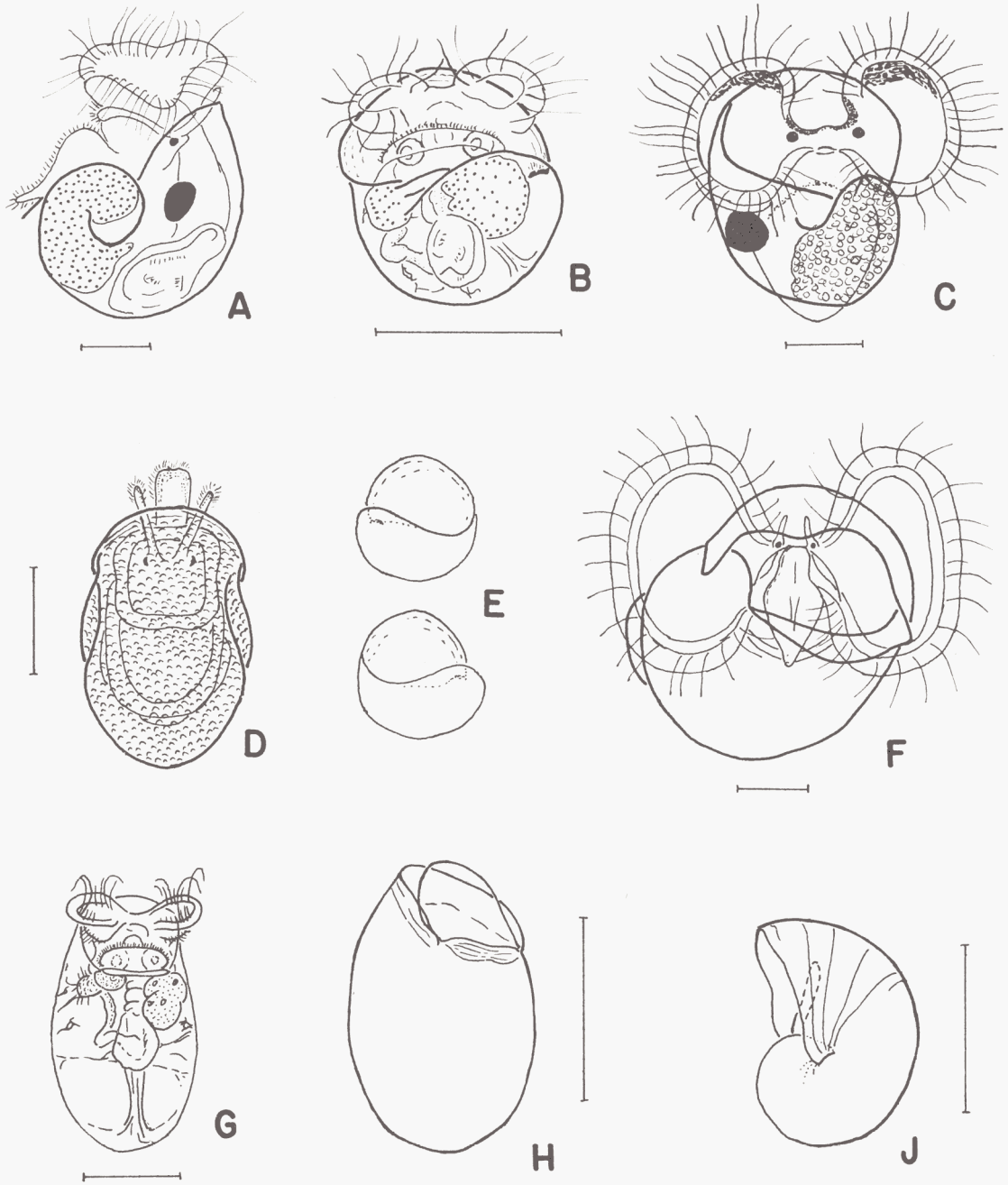
Sheet 106

OPISTHOBRANCHIA

**The Veliger Larvae of the
Nudibranchia**

(BY MICHAEL G. HADFIELD)

1964



A, *Philine aperta*. B, *Aeolidiella glauca*. C, *Limapontia capitata*. D, *Acmaea testudinalis*. E, top, dextrally coiled prosobranch larval shell; bottom, sinistrally coiled opisthobranch larval shell. F, *Rissoa inconspicua*. G, *Eubranchnus pallidus*. H, larval shell of *Eubranchnus exiguus*. J, larval shell of *Polycera quadrilineata*. Heavy black spheres in Figures A and C represent the larval kidney. All scales equal 0.1 mm. (Figures A, C, D, and F after THORSON, 1946. Figure G after RASMUSSEN, 1944. Figure J after THOMPSON, 1961.)

The Veliger Larvae of Nudibranchiate Gastropods

Veliger larvae with single, nautiloid or simple inflated, egg-shaped shells. Operculum always present. Velum simple and bilobed, unpigmented. With or without eyes, but always possessing paired statocysts. Gut consisting of mouth, straight esophagus, rounded stomach, two digestive diverticula (the left one always much larger), and a slightly twisted intestine. Kidney, if present, unpigmented or light yellow. Retractor muscle elongate and attaching near or at the posterior terminus of the shell.

The specific identification of planktonic nudibranch larvae is, at the present state of knowledge, impossible. The northern European marine fauna includes at least 65 species of nudibranchs, nearly all of which produce planktonic larvae. These larvae are remarkable because of their extreme similarity rather than their differences. Two different types of nudibranch veligers are identified on the basis of their shells. These two types are variously referred to as types A and B, 1 and 2, etc. For convenience I shall follow THOMPSON'S (1961) example and refer to them as types 1 and 2 (type 1, Fig. J and type 2, Fig. H). THOMPSON (1961) has separated the presently known larvae into two groups of families based on the shell differences.

Key to the separation of nudibranch veligers from those of other gastropods

1. Veliger larvae with *dextrally* coiled shells and simple to multilobed vela. Shell growth obvious in older larvae, producing up to 5 whorls. Shell often sculptured. Larvae variously pigmented or not (Figs. F and E top) Prosobranchia
2. Veligers with *sinistrally* coiled shells (Fig. E bottom) Opisthobranchia
 - A. Shells simple, showing no, or only slight growth indicated by concentric lines around shell mouth; never more than 1½ coils. Animals usually totally unpigmented, including velum and kidney. With or without eyes (Figs. B and J) Nudibranchia
 - B. Shells variously smooth or sculptured. Growth occurring during planktonic stage producing additional whorls and flaring of shell mouth. Larval vela often or always pigmented. Larval kidney large, rounded and usually black or purple (Figs. A and C) other Opisthobranchia
3. Larvae with simple egg-shaped, inflated, non-coiled shells some nudibranchs, some prosobranchs
 - A. Shells minutely sculptured, bilaterally symmetrical; shell mouth wide. Shells with lateral infoldings. Larval velum single and rounded, not bilobed (Fig. D) Prosobranchia, Patellacea
 - B. Shells thin, not sculptured, inflated; shell mouth not large. Larval vela always bilobed (Figs. G and H) Nudibranchia

Nudibranch larvae with coiled shells (type 1, Fig. J) can be assigned to the following group of families:

Duvauceliidae	Lomanotidae
Polyceridae	Aeolidiidae
Dorididae	Coryphellidae
Iduliidae	Zephyrinidae
Heroidae	

Nudibranch larvae with simple egg-shaped shells (type 2, Fig. H) can be assigned to the following group of families:

Tergipedidae	Fionidae
Dendronotidae	Calmidae
Eubranchidae	

References

ALDER, J., & HANCOCK, A., 1845-55. "A monograph of the British nudibranchiate Mollusca". Ray Soc. Publ.

BRANDT, K., & APSTEIN, C., 1911. "Die Gastropoden des nordischen Planktons". In Nordisches Plankton. Verlag von Lipsius und Tischer. Kiel and Leipzig.

CASTEEL, D. G., 1904. "The cell-lineage and early larval development of *Fiona marina*, a nudibranchiate mollusk". Proc. Acad. Nat. Sci. Philadelphia, **56**: 325-405.

HADFIELD, M. G., 1963. "The biology of nudibranch larvae". *Oikos*, **14** (1): 85-95.

PELSENEER, P., 1911. "Recherches sur l'embryologie des gastropodes". Mém. Acad. roy. Belg., Ser. 2, **3** (6): 1-167.

RASMUSSEN, E., 1944. "Faunistic and biological notes on marine invertebrates, I. Eggs and larvae". Vidensk. Medd. dansk naturh. Foren. Kbh., **107**: 207-33.

RASMUSSEN, E., 1951. "Faunistic and biological notes, II. Danish gastropods". Vidensk. Medd. dansk naturh. Foren. Kbh., **113**: 201-49.

THOMPSON, T. E., 1958. "The natural history, embryology, larval biology and post-larval development of *Adalaria proxima*". Phil. Trans., B, **242**: 1-58.

THOMPSON, T. E., 1961. "The importance of the larval shell in the classification of the Saccoglossa and the Acoela". Proc. Malac. Soc. Lond., Zool., **34** (5): 233-38.

THOMPSON, T. E., 1962. "Studies on the ontogeny of *Tritonia hombergi* Cuvier". Phil. Trans., B, **245**: 171-218.

THORSON, G., 1946. "Reproduction and larval development of Danish marine bottom invertebrates, with special reference to the planktonic larvae in the Sound." Medd. Danm. Havundersøg., Kbh., Ser. Plankt., **4** (1): 523 pp.

TREGOUBOFF, G., & ROSE, M., 1957. "Manuel de Planctologie Méditerranéenne". Tomes I and II. Centre National de la Recherche Scientifique. Paris.

VESTERGAARD, K., & THORSON, G., 1938. "Über den Laich und die Larven von *Duvaucelia plebeja*, *Polycera quadrilineata*, *Eubranchus pallidus* and *Limapontia capitata*". Zool. Anz., **124**: 129-38.