THE LIFE HISTORY OF THE NEMERTEA

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The Nemertea are in general dioecious and littoral dwellers living under stones, among algae, in crevices of rocks or in shades of sessile animals or burrowing in muddy sand in the shallow sea. Their exceptional habitats, however, are found in a small number of the species belonging to the Enopla. These are monoecious (e.g., *Dichonemertes*, *Amphinemertes*, *Geonemertes*, *Prostoma* and *Nectonemertes*), terrestorial (*Prostoma* and *Geonemertes*), parasitic on crabs (*Carcinonemertes*), commensal with pelecypods (*Malacobdella*) or cirripedids (*Nemertopsis*), and pelagic or bathypelagic on the surface or in the abyssal region of the ocean (Pelagica).

Concerning the early stage of the life history, the Nemertea are divided into the following three groups by the mode of development from eggs to young worms.

Palaeonemertean group: Embryologically the palaeonemerteans belong to the direct type. The larva escaped from the egg membrane is at first round in shape and with a long apical tuft. Afterward it becomes elliptical in shape and usually with a short caudal tuft in addition to the apical tuft, e.g., *Cephalothrix* Smith, 1935), *Procephalothrix* and *Tubulanus* (Iwata, 1960). In *Cephalothrix* and *Procephalothrix*, the larvae are provided with a pair of the lateral tufts on the latero-dorsal aspects of the cephalic region.

The eggs themselves of this group contain the yolky substance to form the epithelium, the outer circular and the inner longitudinal muscle layers of the body wall, the brain and the lateral nerves, and the oesophagus and the intestine of the future adult worm. The proboscis, however, does not develope enough to be used for capturing prey. In a certain period of time, the larva provided with the organs above mentioned must take food by the ciliary movement of the mouth (Figs. 1 and 2).

Heteronemertean group: Embryologically the heteronemerteans belong to the indirect type, to which the pilidium (Salensky, 1912), Desor (Nusbaum and Oxner, 1913) and Iwata (Iwata, 1958) larva belong. The pilidium larva

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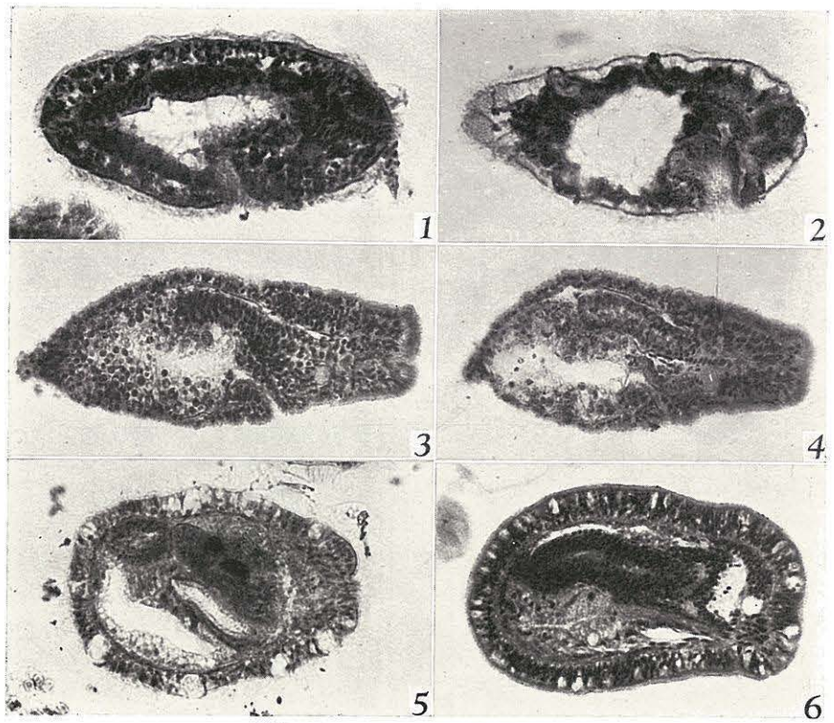

EXPLANATION OF FIGURES 1-6

Fig. 1. Sagittal section of the larva of *Procephalothrix simulus* at 209 hours after fertilization, showing that the mouth opens on the middle protion of the ventral side of the body, while the proboscis is not yet formed. ×320.

Fig. 2. Sagittal section of the larva of *Tubulanus punctatus* at 94 hours after fertilization, showing that the mouth opens on the anterior portion of the ventral side of the body, while the proboscis is not yet formed. ×290.

Figs. 3 and 4. Sagittal sections of the young worm of *Micrura akkeshiensis* at 337 hours after fertilization, showing the mouth opening on the ventral side of the body and the proboscis situated in the dorsal side of the body. ×220.

Fig. 5. Sagittal section of the larva of *Emplectonema gracile* at 133 hours after fertilization, showing the midgut in the ventral side of the body, the long ciliated oesophagus in the middle portion, and the proboscis in the dorsal side, in which the base of the central stylet is found as a dark column in shape. At this stage the rhynchodaeum opens on the anterior end of the body. ×290.

Fig. 6. Sagittal section of the young worm of *Oerstedia dorsalis* at the age of one day after the young worm escapes from the egg membrane, showing the proboscis lying in the dorsal side of the body and the narrow ciliated oesophagus and the following midgut. At this stage the oesophagus does not open yet in the rhynchodaeum and the stylet apparatus of the proboscis are not yet formed. ×220.

is helmet-shaped and with a long apical tuft. The larva alone takes food during development. The Iwata's larva is elliptical in shape and with a long apical tuft. The Desor's larva has no swimming stage during development.

The common characteristic of these larvae lies in that the epithelium of the future adult worm is originated from the five invaginations of the larval epithelium. In the larvae are differentiated the epithelium, the circular and the inner longitudinal muscle layers of the body wall, the brain and the lateral nerves, the cerebral sense organs, the proboscis, and the oesophagus and the intestine of the future adult worm. The young worms crept out from the primordial larval body may immobilize their prey with an eversible proboscis (Figs. 3 and 4).

Hoplonemertean group: Embryologically the hoplonemerteans and the bdellonemerteans belong to the direct type. The larva escaped from the egg membrane becomes elliptical in shape and with an apical tuft, e.g., *Tetrastemma* and *Drepanophorus* (Lebedinsky, 1897), *Malacobdella* (Hammarsten, 1918), *Zygonemertes* (Coe, 1943), and *Emplectonema* (Iwata, 1960). In the *Emplectonema* a caudal tuft is present in addition to the apical tuft. The young worms of *Oerstedia* (Iwata, 1960) and *Stichostemma* (Reisinger, 1926) creep out from the egg membrane, while the species of *Prosorhochmus* (Salensky, 1914) and *Geonemertes* (Coe, 1904) are viviparous.

From the eggs of this group are differentiated the epithelium, the outer circular and the inner longitudinal muscle layers of the body wall, the brain and the lateral nerves, the cerebral sense organs, the proboscis, and the oesophagus and the intestine of the future adult worm. The proboscis of the larva or the young worm opens into the rhynchodaeum together with the oesophagus in a late stage of development and is used for capturing prey (Figs. 5 and 6).

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