

Phoronida

[phoronids (e), Phoronidiens (f), Hufeisenwürmer (g), Foronideos (s)]

Finding adult Phoronida during a student marine field course at European coasts is a highlight, but generally a rare incident. The larvae of the few species, however, are regularly present in plankton samples for longer periods of the spring and summer season, due to the fact that they are planktotrophic and feed about 2-3 weeks in the pelagial.

The actinotrocha larva is one of the largest marine larval forms and one of the most beautiful elements of the plankton in the area. These larvae got their own scientific names, sometimes different from the adult form, e.g. *Actinotrocha branchiata* is the larva of *Phoronis muelleri* (length 1.2 mm). Metamorphosis is unique and certainly one of the most bizarre developmental events that can be observed in the animal kingdom. The anterior region of the larval body is the pre-oral lobe with an apical nerve ganglion. The mouth is located under this lobe. The middle region, termed collar, bears a ring of larval tentacles, the number of which increases with the age of the larva (up to 48 in *A. branchiata*). In this species there is a second ring of tentacles (adult tentacles) under the first, giving rise to the lophophore of the adult. In other species the lophophore will be developed out of larval tentacles. Tentacles are provided with cilia, which are responsible for both locomotion and feeding. The pre-oral lobe has a fringing band of cilia that beat posteriorly towards the mouth. The cilia on the post-oral band running along the margin of the tentacles beat away from the mouth (upstream). The other areas of the body are ciliated also, most heavily the oral field between tentacular band and mouth. Mostly phytoplankton cells are taken up. The digestive tract consists of an oesophagus, stomach, and intestine.

The posterior part of the larval body, the trunk, contains the larger part of the digestive system with the terminally positioned anus. The latter is surrounded by the heavily ciliated ring of the telotroch, which can contribute considerably to swimming activity and velocity of locomotion. Fluid-filled coelomic cavities lie around the digestive system. A so-called metasomal sac is the most conspicuous organ. It is a prominent invagination of the ventral larval body wall into the trunk. This structure is crucial for metamorphosis and adult organisation.

Bacterial films present in sandy-muddy sediments are settlement cues for the actinotrochs of *P. muelleri* (see Fig. 11). Metamorphosis is a very rapid catastrophic process and does

not last longer than 15-30 min. It starts with the eversion of the metasomal sac extending the ventral surface in such a way that the gut is pulled out into a U-shaped position within the presumptive adult trunk, while mouth and anus remain close together forming the anterior end of the adult body. Larger parts of the larval body including the pre-oral hood and the collar are histolysed and resorbed. The new trunk secretes a chitinous tube, anchored within the sediment.

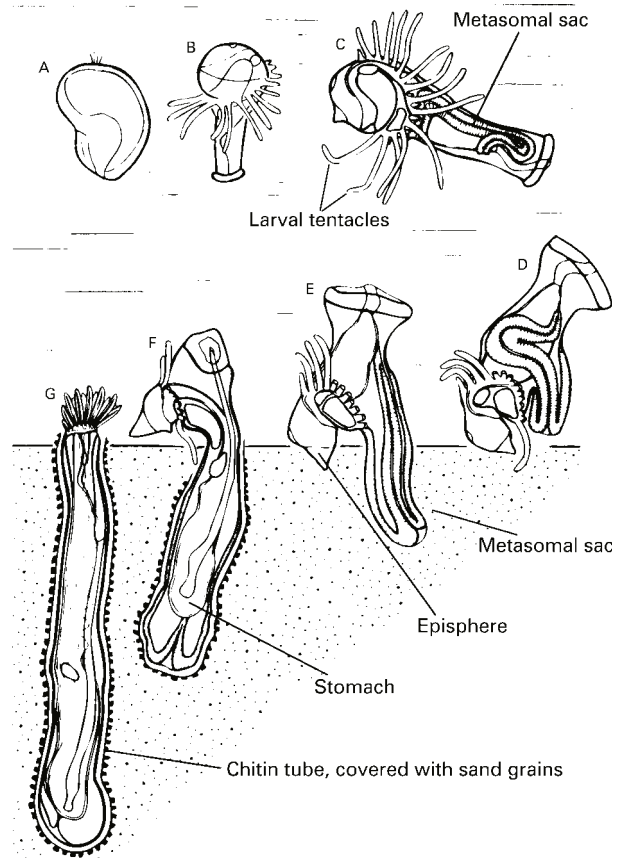


Fig. 11. Metamorphosis of actinotrocha larva (*Phoronis muelleri*). After Herrmann, from Westheide and Rieger (1996).

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Phoronida. A-C, *Actinotrocha* larvae, undetermined, early stages. A, Length ca. 50 μm . B, Length 55 μm . C, Length 210 μm . D, *Actinotrocha sabatieri* of *Phoronis psammophila* Cori, 1898. Length 300 μm . E-K, *A. branchiata* of *Phoronis muelleri* Selys-Longchamps, 1903. Different stages. E, Length 300 μm . F, Length 420 μm . G, Length ca. 700 μm . H, Length ca. 1.3 mm. I, Shortly before metamorphosis. Length ca 1 mm. J, Pharynx and apical ganglion. Width 110 μm . K, Frontal view. Length 950 μm . L, Pre-oral lobe with muscle fibres. Width 130 μm .

