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Echiura and Pogonophora: The Coelomate Worms

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Phylum Echiura

Echiurans are dioecious protostomes. There is marked sexual dimorphism in some species. For example, male *Bonellia* are the size of a settling larva and reside in the nephridial sack of the female (Brusca and Brusca, 1990). There is no evidence of asexual reproduction. At least one species (*Urechis caupo*) is capable of parthenogenesis (Stephano and Gould, 1995). Fertilization is external and mass spawning events have been observed (Brusca and Brusca, 1990). Echiurans have at times been placed within the annelid phylum. Recent molecular evidence suggests that they may be derived from annelids and some authors have suggested that they should be included as a family (the Echiuridae) within the annelids (McHugh, 1997).

The initial larval stage is a trochophore (Fig. 1A), which begins feeding at about 40 hours post-fertilization. The prototroch and preprotroch develop into the adult proboscis while the postprotroch develops into an elongated trunk (Fig. 1B). The trunk superficially appears to be segmented, but the segmentation is due to bands of epithelial cells. Larval development takes two to three months (Gould 1967; Brusca and Brusca, 1990). Locally, the larvae of *Urechis caupo* are the only echiuran larvae that have been described (Fig. 1). Table 1 lists species observed locally.

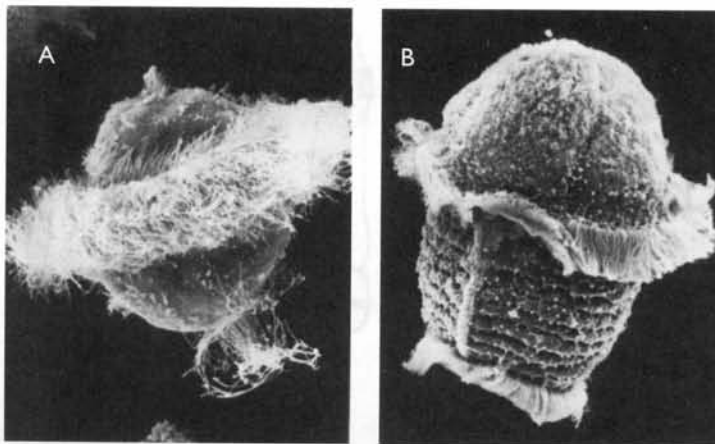


Fig. 1. Larvae of *Urechis caupo*. (A) Trochophore. (B) 15-day-old larva. Note the apparent segmentation of the trunk due to bands of epithelial cells. (From Brusca and Brusca, 1990, Fig. 9)

Table 1. Species in the phylum Echiura from the Pacific Northwest (from Kozloff, 1996)

Order Bonelloinea
Family Bonelliidae

Nellobia eusoma

Order Echiuroinea
Family Echiuridae

Arhynchite pugettensis

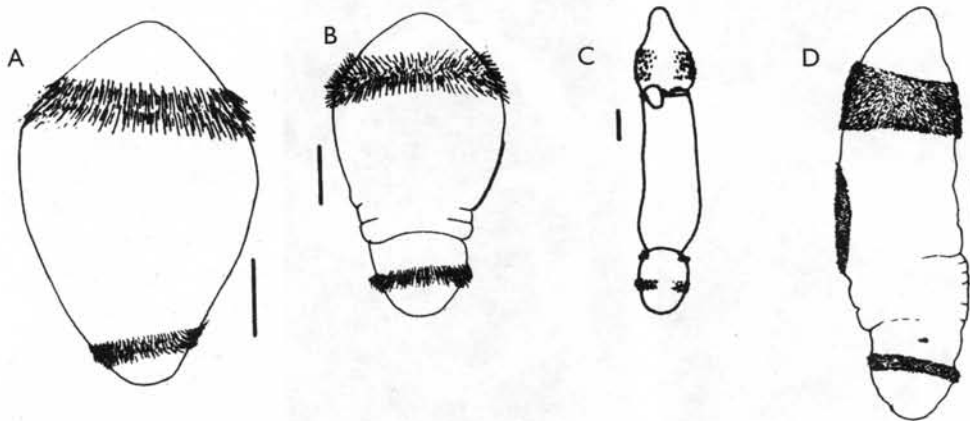
Echiurus echiurus subsp.

Alaskanus

Order Xenopneusta
Family Urechidae

Urechis caupo

Fig 2. Larval Pogonophora in the order Athecanephria; no larvae from the order Thecanephria have been described. (A, B) *Oligobranchia webbi*. (C) *Oligobranchia dogieli*. (D) *Siboglinum fiordicum*; there are two local *Siboglinum* species. Scales = 0.1 mm. (From Bakke, 1990, Fig. 5)



Phylum Pogonophora

The pogonophorans are a fairly recently discovered group, and our knowledge of them is still rather fragmentary. They are worm-shaped with generally long and thin bodies; they lack both mouth and gut. As with the echiurans, there is some discussion that the pogonophorans are derived from the annelids. They are sedentary tube dwellers, and most species are found in deep water. Some of the smaller species can be found in water as shallow as 30 m (Southward, 1975; Bakke, 1990; McHugh, 1997).

Essentially all of our knowledge of spawning and larval development has been gained from studies of species in the order Athecanephria. In this order, males release spermatophores with long thin filaments (Southward, 1975; Bakke, 1990). These presumably drift with the current, perhaps with the filament acting in an analogous fashion to the byssus thread in thread drifting bivalves (Titman and Davies, 1976). It is not clear how the female worms obtain the spermatophores. Each spermatophore contains enough sperm to fertilize the entire spawn of a female (Bakke, 1990). The site of fertilization is unclear; it occurs either within the female or in her tube. Larval development occurs in the tube, in front of the female (Southward, 1975; Bakke, 1990). At the end of the brooding period, larvae are worm-shaped and have two bands of cilia (Fig. 2). Short setae are present just anterior to the posterior ciliary band.

On leaving the maternal tube, the larvae swim upward briefly (probably for less than half an hour) before settling down to the sediment. Swimming is via the ciliary bands. The larvae swim in a helical path rotating along the longitudinal axis. Given their brief pelagic phase and weak swimming ability (Southward, 1975), the larvae are probably most common near the bottom. After settling to the bottom they

crawl around briefly before burrowing into the sediment, where metamorphosis occurs (Bakke, 1990).

No species in the order Thecanephria has been observed brooding young. There are no descriptions of their larvae. Their eggs are relatively small. Given the lack of evidence of brooding and the small egg size, they may have a free-living larval stage (Southward, 1975; Bakke, 1990). Table 2 lists species observed locally.

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Table 2. Shallow-water species in the phylum Pogonophora from the Pacific Northwest (from Kozloff, 1996)

Order Athecanephria
Family Siboglinidae

Siboglinum fedotovi
Siboglinum pusillum

Order Thecanephria
Family Polybrachiidae

Galathealinum brachiosum
Heptabrachia ctenophora
Polybrachia canadensis
Lamellisabella coronata
Lamellisabella zachsi