

LESSER-KNOWN INVERTEBRATES: POSSIBLE ANNELID RELATIVES

THREE PHYLA OF LIKELY ANNELID RELATIVES: THE ECHIURA, POGONOPHORA, AND SIPUNCULA

The coelomate phyla Echiura, Pogonophora, and Sipuncula comprise fewer than six hundred protostome species that may be annelid relatives. They probably branched off from various points along the annelid-arthropod lineage.

PHYLUM ECHIURA: THE SPOON WORMS

The echiurans (ek-e-yur'ans) (Gr. *echis*, serpent + *oura*, tail) consist of about 130 species of marine animals that have a worldwide distribution. Echiurans usually live in shallow waters, where they either burrow in mud or sand, or live protected in rock crevices. Only a thin cuticle covers the soft body. As a result, the animals keep to the safety of their burrows or crevices, even when feeding. An echiuran feeds by sweeping organic material into its spatula-shaped proboscis that contains a ciliated gutter (figure 1). Echiurans can extend the proboscis for a considerable distance, but they can never retract it into the body. Echiurans are sometimes called spoon worms because of the spatulate nature of the proboscis. Individual echiurans are from 15 to 50 cm in length, but the extensible proboscis may increase their length up to 2 m.

All echiurans are dioecious, and sexual dimorphism is extreme in some species. The eggs or sperm do not complete their development in the single ventral gonad but are released into the coelom. After they mature, special collecting organs release them into the seawater, where fertilization occurs, giving rise to free-swimming trochophore larvae. The early development of echiurans is similar to that of annelids with spiral cleavage. However, later development diverges from the annelid pattern in that no segmentation occurs.

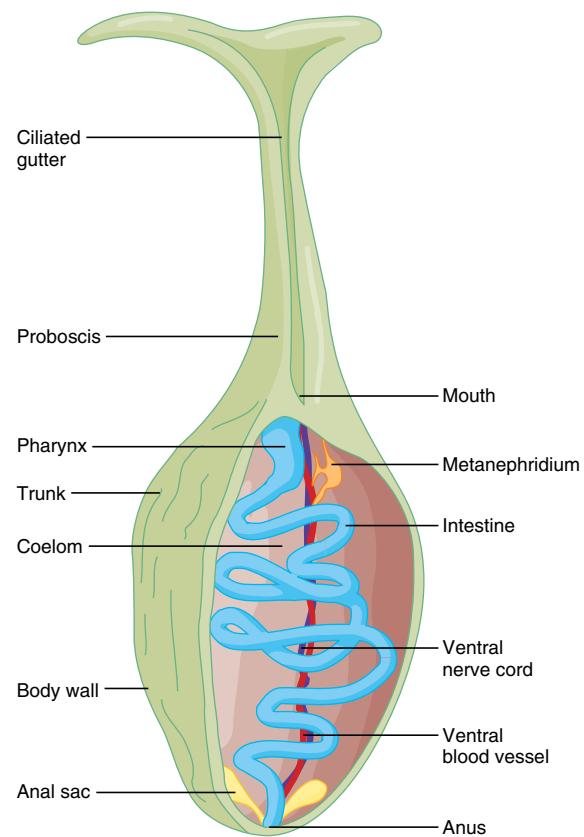


FIGURE 1 Phylum Echiura. Internal structure of an echiuran. The muscular body wall surrounds the large coelom, containing a long, coiled intestine. A simple closed circulatory system is present, as well as a ventral nerve cord that extends into the proboscis, several pairs of metanephridia, and a pair of anal sacs that empty into the anus at the end of the worm. Gas exchange occurs through the body wall and proboscis. Miller/Harley: *Zoology*, 5th ed. © The McGraw-Hill Companies.

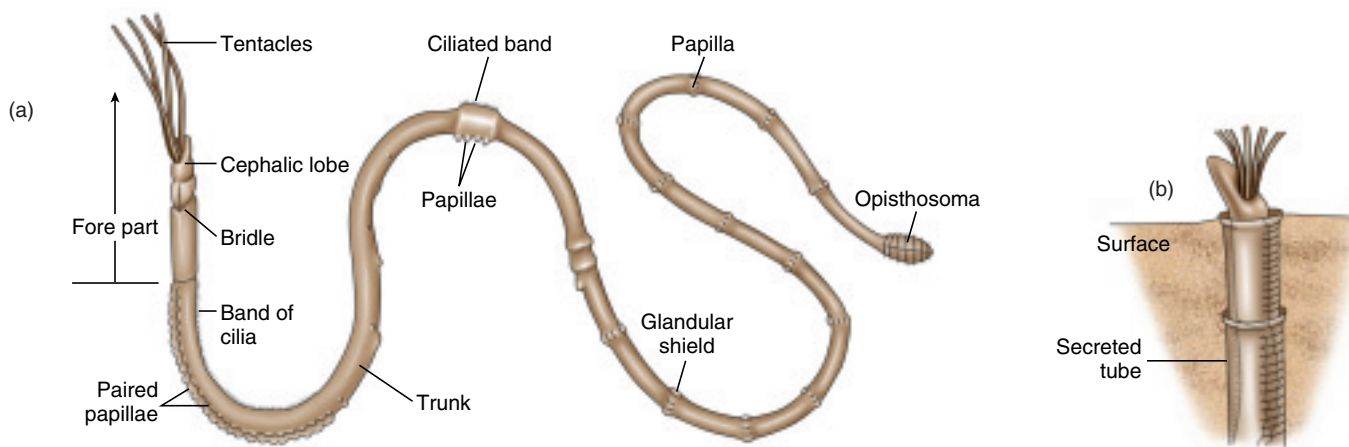


FIGURE 2 Phylum Pogonophora. (a) External structure. (b) Anterior of a pogonophoran within its tube. From Hickman, et al., *Animal Diversity*, 2nd ed., New York. © The McGraw-Hill Companies.

PHYLUM POGONOPHORA: THE POGONOPHORANS, OR BEARD WORMS

The pogonophorans (po"go-nof'or-ans) (Gr. *pogon*, beard + *phora*, bearing) or beard worms are a group of about 120 species of tube-dwelling marine worms distributed throughout the world's oceans, especially along the continental slopes and in oceanic rifts. They are named for a thick tuft of white or reddish tentacles (see box "Hydrothermal Vent Communities").

The slender, delicate body is protected in a secreted chitinous tube consisting of a series of rings, to which the worm adds as it grows (figure 2). The tubes are embedded in soft marine sediments in cold, deep (over 100 m), nutrient-poor waters. They range in length from about 10 cm to over 2 m.

Pogonophorans have no mouth or digestive tract. Nutrient uptake is via the outer cuticle and from the endosymbiotic bacteria that pogonophorans harbor in the posterior part (trophosome) of the body. These bacteria fix carbon dioxide into organic compounds that both the host and symbiont can use.

Little is known about pogonophoran reproduction and development. In general, the sexes are separate, and sperm are packaged into spermatophores before a male releases them. The mechanism of fertilization is unknown. After fertilization, a solid blastula develops following radial cleavage.

PHYLUM SIPUNCULA: THE SIPUNCULANS, OR PEANUT WORMS

The sipunculans (si-pun'kyu-lans) (Gr. *L. sipunculus*, little siphon) or peanut worms (because of their peanut shape when disturbed) consist of about 350 species of unsegmented, coelomate, burrowing worms found in oceans throughout the world. These worms live in mud, sand, or any protected retreat. Their burrows may be mucus lined, but sipunculans do not construct true tubes as do pogonophorans. They range in length from about 2 mm to 75 cm (figure 3).

Sipunculans are dioecious. Gonads attach to the coelomic wall and liberate their gametes into the coelom. After maturity,

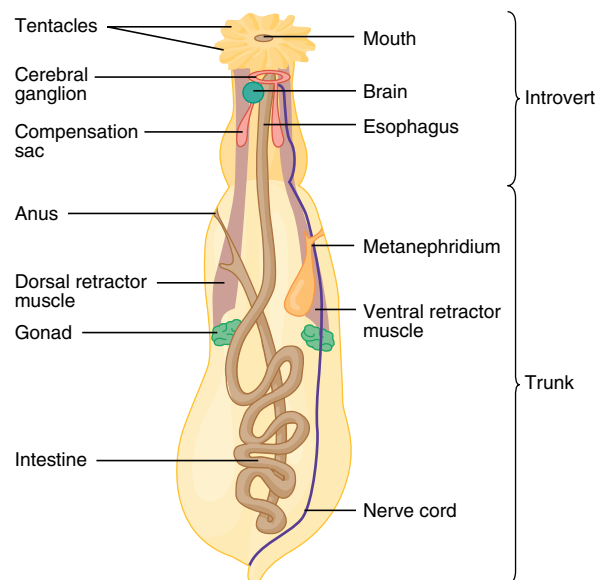


FIGURE 3 Phylum Sipuncula. Anatomy of a typical sipunculan. The body is composed of an anterior introvert and a posterior trunk. When the introvert is extended, the anterior portion, with its ciliated tentacles, surrounds the mouth. The long, U-shaped intestine is arranged in a spiral coil. Anteriorly, the intestine ends at an anus that opens to the outside, near the introvert. A large pair of metanephridia is in the anterior trunk. The anterior nervous system is annelid-like, with a supraesophageal brain and a ventral nerve cord that runs the length of the trunk. (Miller/Harley: *Zoology*, 5th ed. © The McGraw-Hill Companies.)

the gametes escape into the seawater via the metanephridia. Fertilization is external, cleavage is spiral, and development is either direct (no larva), or it may produce a free-swimming trochophore larva. The larva eventually settles to the bottom and grows into an adult. In a few species, asexual reproduction can also occur by transverse fission—the posterior part of the parent constricts to give rise to a new individual.