Phoronida

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Content

A small phylum of marine animals; in the recent past, they have been grouped with Brachiopoda and Bryozoa into the Lophophorata. The Phoronida phylum or class has no intermediate hierarchical level until the generic level. Two genera, *Phoronis* and *Phoronopsis*, are recognized with respectively seven and three well-defined species.

Habitat and distribution

Phoronids may occur in vertical tubes embedded in soft sediments (sand, mud, or fine gravel) or form tangled masses of many individuals, buried in or encrusting limestone rocks and shells of dead mollusks. *Phoronis australis* is embedded into the tube of cerianthid anemones. Phoronids secrete characteristic rigid tubes consisting of layers of chitin to which particles and debris adhere. Phoronids are found in all oceans (except the polar seas) at depths ranging from the intertidal zone to about 400 m (1300 ft).

Morphology

The body is elongate, ranging in length from about 0.1 to 18 in. (2.5 mm to more than 45 cm), and bears a terminal, bilaterally symmetrical crown of tentacles (the lophophore) that surrounds the mouth (**Fig. 1**). The anus occurs at the level of the mouth and is borne on a papilla immediately outside the lophophore. The digestive tract is therefore U-shaped, with the mouth and anus opening close together at one end.

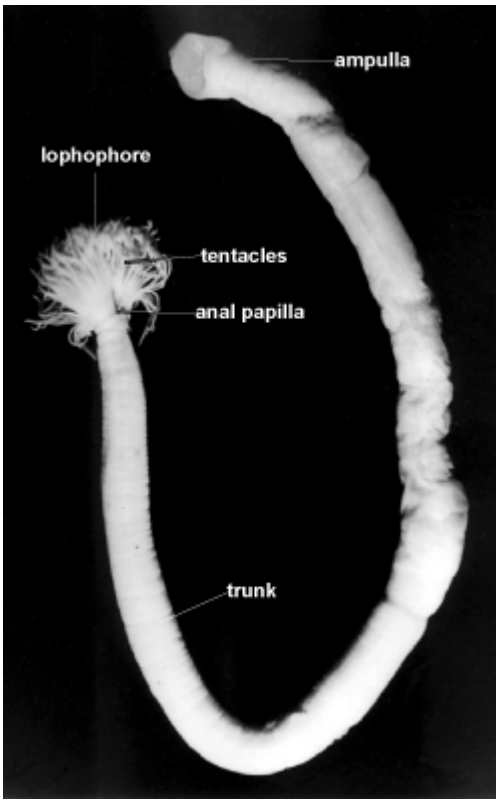

Fig. 1 *Phoronopsis harmeri* removed from its tube. Length is about 8 in. (20 cm).

The lophophore may be oval to horseshoe shaped with two spiral to helical coils; the complexity of the lophophore is generally proportional to the increase in body size. The main functions are feeding, respiration, and protection. The tentacles vary in number from 11 to over 1500 and have complex arrays of cilia that create a current which carries food particles to the mouth and absorbs oxygen for respiration. Associated with the mouth is a ciliated flap of tissue known as the epistome that occurs along the inner row of tentacles.

The digestive tract consists of a short esophagus, a long prestomach, and a stomach surrounded by a blood plexus. A muscular pylorus separates the stomach and intestine, the latter being a long slender ascending tube, which ends at the anus. The junction of the stomach and intestine occurs in the bulblike posterior or aboral extremity of the animal called the ampulla that anchors the body in the rear end of the tube. The food seems to consist chiefly of microscopic plankton such as diatoms, flagellates, peridinians, small larvae, and detritus. *See also:* **Feeding mechanisms (invertebrate) (/content/feeding-mechanisms-invertebrate/252300)**

There is a blood vascular system in which nucleated red blood corpuscles containing hemoglobin circulate. The closed vascular system consists basically of two longitudinal vessels, known as the lateral (afferent) and median (efferent) vessels, which are continuous with one another at the proximal end of the body and flow through the stomach blood plexus, a blood sinus that surrounds the gut and develops a large number of blind blood ceca. Distally, the vessels connect with two semicircular lophophoral vessels, immediately below

the tentacles. Within each tentacle is a single blind vessel which branches into two at its base and so connects with both semicircular vessels. In the living animal, corpuscles can be seen pulsating up and down in the tentacular and longitudinal vessels.

The body is divided into two parts in larval and adult forms, with each part containing its own coelomic cavity: the mesosome, represented by the lophophore, and its cavity, the mesocoelom; and the trunk or metasome and its cavity, the metacoelom. Both body parts are separated by a horizontal mesentery named a diaphragm. The metacoelom is subdivided by a series of longitudinal mesenteries extending from the digestive tract to the body wall. In most phoronids, there are four such mesenteries occupying oral, anal, right lateral, and left lateral positions, thus dividing the metacoelomic cavity into four chambers (**Fig. 2**).

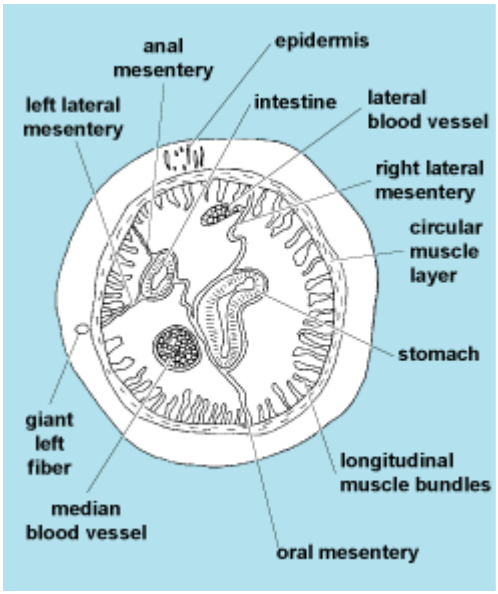

Fig. 2 Cross section through *Phoronopsis harmeri*.

The paired excretory organs are metanephridia, located in the trunk on either side of the intestine at the level of attachment of the lateral mesenteries. They open into the metacoelom by one or two funnels and discharge their contents to the exterior via a nephridiopore, located on the anal papilla (or sometimes on a nephridial ridge) on each side of the anus. The morphological characteristics of the nephridia are of prime taxonomic importance to identify a phoronid species. The nephridia also act as gonoducts.

The body wall consists of an outer layer of epithelial cells, many of them secretory and concerned with the building of the tube, and two layers of muscle. The outermost layer of muscle consists of circular fibers, and inside this is a series of bundles of longitudinal fibers (Fig. 2). A nerve plexus underlies the epidermis and continues as a more dense concentration in the form of a nerve ring at the level of the diaphragm. Extending proximally from nerve cells in this ring are either one on the left or two giant nerve fibers which taper and disappear at the proximal end of the ampulla. The giant nerve fibers are known in all species, but often are lacking in *Phoronis ovalis*, and are probably concerned with the rapid retraction of the body into the tube.

Reproduction

Phoronids include both dioecious animals and hermaphrodites. Phoronids reproduce asexually by transverse fission or sexually by internal fertilization. Reproductive tissue is formed from cells that multiply first on the thin walls of the blood ceca housed mainly in the ampulla. When ripe, the gametes are shed into the body cavity and find their way to the nephridia that serve as gonoducts. After internal fertilization, egg cleavage is total, equal, and typically radial. Three types of developmental patterns occur: (1) brooding in the parental tube, (2) brooding on nidamental glands in the lophophore until the larval stage is reached, (3) shedding fertilized embryos into the sea water that grow into a characteristic ciliated, free-swimming pelagic larva, the *Actinotrocha* or actinotroch. The actinotroch consists of an anterior preoral lobe with a nervous ganglion on the apical area, a tentacular ridge, a pair of protonephridia, and posteriorly a ciliated ring around the anus (**Fig. 3**). The larvae undergo planktotrophic development during 2–3 weeks before settling. The metamorphosis from the actinotroch larva to a slender young phoronid is “catastrophic,” occurring in less than 30 minutes.

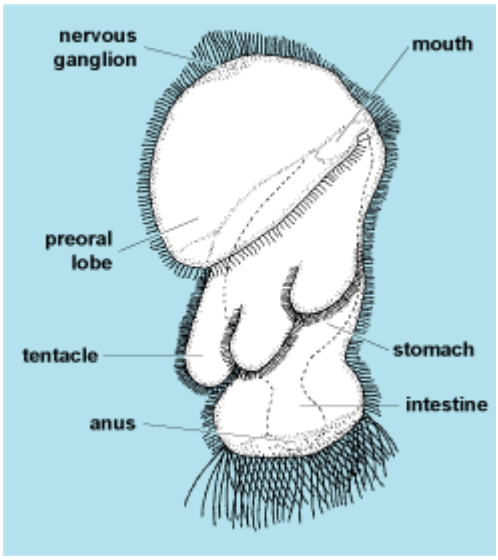

Fig. 3 *Actinotrocha vancouverensis*, the larva of *Phoronis ijimai*.

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