Abarenicola pacifica

The lugworm or sand worm

Phylum: Annelida

Class: Polychaeta, Sedentaria, Scolecida

Order:

Family: Arenicolidae

Description

Size: Individuals often over 10 cm long and 1 cm wide. Present specimen is approximately 4 cm in length (from South Slough of Coos Bay). On the West coast, average length is 15 cm (Ricketts and Calvin 1971).

Color: Head and abdomen orange, body a mixture of yellow, green and brown with parapodial areas and branchiae red (Kozloff 1993).

General Morphology: A sedentary polychaete with worm-like, cylindrical body that tapers at both ends. Conspicuous segmentation, with segments wider than they are long and with no anterior appendages (Ruppert et al. 2004). Individuals can be identified by their green color, bulbous pharynx (Fig. 1), large branchial gills (Fig. 2) and a J-shaped burrow marked at the surface with distinctive coiled fecal castings (Kozloff 1993).

Body: The body of arenicolids can be divided into three regions based on the presence or absence of branchiae.

Anterior: A non-retractile prostomium is without appendages (Blake and Ruff 2007, Fig. 2). Anterior prebranchial region of six setigers without branchiae and with strong setigerous annuli.

Trunk: Posterior to the prebranchial region is a medial branchial region with large branchial gills from setigers seven to 19 (13 pairs). Thoracic epidermis very thick, strongly aerolated (Fauchald 1977).

Posterior: Caudal region is apodous, asetigerous and without appendages. The pygidium tapers gradually to anus, no appendages (Fig. 2).

Parapodia: (Fig. 3) Segments 1–19 with reduced noto- and neuropodia that are reddish and are far from the lateral line. All parapodia are absent in the caudal region.

Setae (chaetae): (Fig. 3) Bundles of notosetae arise from notopodia near branchiae. Short neurosetae extend along neuropodium. Setae present on segments 1-19 only (Blake and Ruff 2007).

Eyes/Eyespots: None.

Anterior Appendages: None.

Branchiae: Prominent and thickly tufted in branchial region with bunched setae. Hemoglobin makes the branchiae appear bright red (Kozloff 1993).

Burrow/Tube: Firm, mucus impregnated burrows are up to 40 cm long, with typical fecal castings at tail end. Head end of burrow is collapsed as worm continually consumes mud (Healy and Wells 1959). Water is pumped through burrow by pulsating movements of the body (Ruppert et al. 2004).

Pharynx: Thin-walled pharynx is simple and used for continually feeding on sediment. Pharynx described as a large, eversible sack with mucus glands called buccal papillae (Healy and Wells 1959) (Fig. 1).

Genitalia:

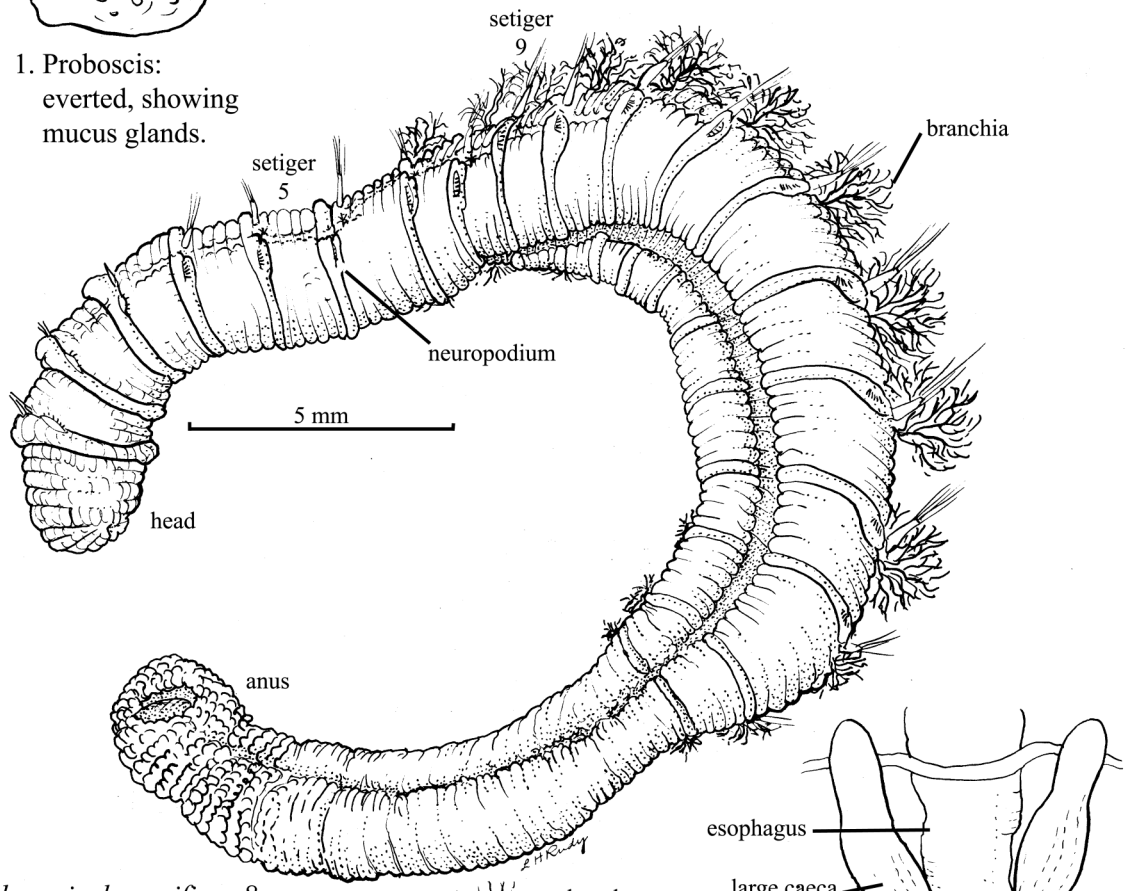
Nephridia: Five pairs of nephridia are naked (without hoods) and situated between parapodia on segments 5–9 (Fig. 2). They are sometimes difficult to observe.

Abarenicola specific characteristics

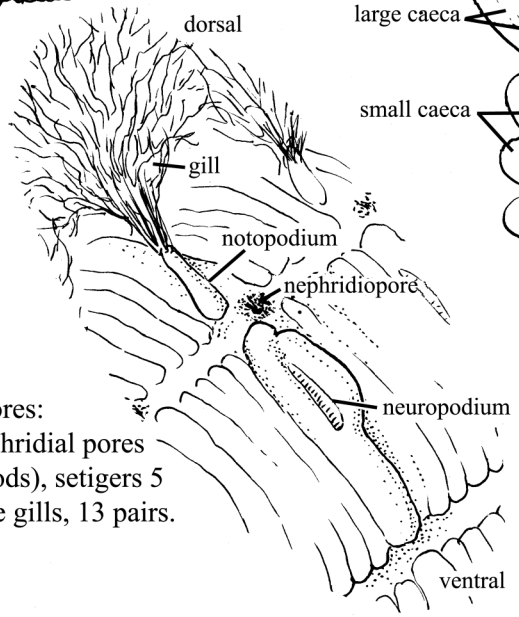
Esophageal caeca: Dissection is necessary to identify *Abarenicola* species. *Abarenicola pacifica* is distinct in having esophageal caeca

Abarenicola pacifica

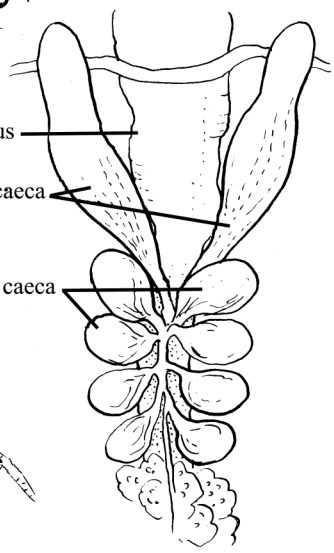
1. Proboscis: everted, showing mucus glands.



2. *Abarenicola pacifica* x8: nineteen setigers; orange head, abdomen; red parapodal areas; three body sections, medial one with branchiae.



3. Nephridiopores: exposed nephridial pores (without hoods), setigers 5 to 9; fan-like gills, 13 pairs.



4. Esophageal structure (dissection): 1 pair large caecae, 3 to 6 pairs small caecae.

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comprised of one large anterior pair and 3–6 smaller pairs (Blake and Ruff 2007, Fig. 4).

Possible Misidentifications

Other Arenicolidae have the same bushy gills in the middle third of the body. Only the genus *Abarenicola* has well-separated neuropodia, a non-retractile prostomium, more than one pair of esophageal caeca, and five pairs of nephridiopores. Both *Arenicola marina* and *pusilla* have been found in Oregon estuaries. *Abarenicola claparedii oceanica*, has hooded nephridial pores and esophageal caeca composed of 7–9 smaller pairs. *Abarenicola vagabunda*, from Puget Sound (but possibly from Oregon) (Oglesby 1973), is usually larger and dark brown. It too, has hooded nephridial pores, and smaller esophageal caeca (11–18). Finally, the burrows of *A. vagabunda* are less permanent than *A. pacifica's*, are found in deep sand and may be more subtidal (Hobson 1966).

Ecological Information

Range: Type locality is Puget Sound (Healy and Wells, 1959). Known range includes Humboldt Bay, California to Alaska, Japan.
Local Distribution: A north Pacific form and the most common lugworm (family Arenicolidae) in Puget Sound area intertidally (Hobson 1966). Found in Coos Bay from estuary mouth to Coos River mouth (marker 15) and at Sunset Bay (Oglesby 1973).
Habitat: Individuals build substantial L- or J-shaped burrows in sand and mud, mixed gravel or mud sediments (South Slough of Coos Bay) (Kozloff 1974). *Abarenicola pacifica* tolerates a muddier, less permeable, more poorly sorted sediment than does *A. c. vagabunda* (Hobson 1966), but does not live in very soft mud (Porch 1970).
Salinity: This species is not found in waters of low salinity or in heavily polluted anaerobic conditions (Porch 1970), but is an osmoconformer and can tolerate a wide range of salinities (lower salinity limit 17.5) (Oglesby 1973).
Temperature: No information is available on temperature tolerance, though temperature fluctuation between 6 and 16° C has been found to significantly affect feeding rate (Hymel and Plante 2000).
Tidal Level: Individuals are common intertidally, but no information on specific tide level is available. Hobson (1967) suggests that distribution is instead based on sediment composition.
Associates: In a commensal relationship, *Pinnixa schmitti* is known to cohabit the burrow of *A. pacifica* (O'Clair and O'Clair 1998).
Abundance: Often to 50/m^2 (Kozloff 1974) and very dense in specialized habitats. Probably 2nd most abundant macroscopic animal in Coos Bay (Porch 1970). *A. pacifica* was much less abundant than in preceding years-- it was sparse (<1/m2) on Portside beach in April 2015 (Emlet pers com).

Life-History Information

Reproduction: Iteroparous. Eggs and sperm discharged from nephridiopores, while both sexes are in their burrows. Males release thin membranous spermatophores (0.5–0.2 mm in diameter) which fall into female burrows and are ruptured by female setae (Okuda 1936; Fernald et al. 1987). Oocytes are pink to pale yellow and 160-190 µm in diameter with conspicuous envelope (Fernald et al. 1987). Fertilization occurs in female's burrow. Broods are found within burrows January-early April (Washington) and develop within gelatinous masses (Fernald et al. 1987).
Larva: Planktonic larvae are non-feeding and hatch from gelatinous masses within adult tubes as 2 setiger stages (Fernald et al. 1987). Only the larvae of two local Arenicolidae species are known (*Arenicola marina* and *Abarenicola claparedii*, Crumrine 2001).

Juvenile:
Longevity:
Growth Rate: Relative growth rate of 0–6% per day, depending on age and food quality (Linton and Taghon 2000).
Food: Primarily detritus, picked up by mucus of proboscis (Fig. 1) and digested out of sand and mud, which is then defecated. Depending on sediment type, *A. pacificia* may utilize a variety of feeding modes (deposit, suspension, direct dissolved organic matter uptake) (Hylleberg 1975). Feeding activity by *Abarenicola pacifica* is instrumental in bioturbation and generation of clay laminae (Swinbanks 1981).
Predators: Arenicolids have many predators including most estuarine creatures: man (for fish bait), birds, fish.
Behavior: Most research into the behavior of *A. pacific* is focused on bioturbation and particle selection (Hylleberg 1975).

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