
Thoracophelia mucronata

A bloodworm

Phylum: Annelida
Class: Polychaeta
Order: Opheliida
Family: Opheliidae

Taxonomy: The genus *Thoracophelia* was revalidated in 2011 (Blake) and replaced the polychaete genus *Euzonus*, a junior homonym of the arthropod genus *Euzonus* (Brewer et al. 2011). For a brief period in 1956, *Thoracophelia* was a subgenus of *Euzonus* based on the presence or absence of pinnules on respiratory branchiae. Subgenera were deemed not necessary when research showed that pinnule development is an adaptation to habitat (Parke 1973; Blake 2011). *Thoracophelia mucronata* was described as *Ophelina mucronata*, but is more commonly seen under the name *Euzonus mucronata* or *Euzonus (Thoracophelia) mucronata*.

Description

Size: Typically 25–35 mm in length (maximum length around 50 mm) and 1–2 mm in width (Ricketts 1952).

Color: Iridescent and shimmering dark blue to dark red to purple. Some specimens have a pebbly surface. Males are more pinkish-red than the purple-red color found in reproductive females. This is likely due to the lower hemoglobin concentrations in male individuals (Law et al. 2013).

General Morphology: Small opheliid worms with red color and slender body that tapers to a point anteriorly and posteriorly (Fig. 1).

Body: The body of *Thoracophelia* species consists of 38 segments (Dales 1952) and can be divided into three body regions (Blake 2011; Law et al. 2013).

Anterior: Triangular head (Ricketts 1952) (Fig. 4). The cephalic region includes the prostomium and setigers one and two and is set off from the rest of the body by a constriction (head, Fig. 1). The mouth is a small

slit that is found ventral of the first setiger (McConnaughey and Fox 1949).

Trunk: A mantle covers the first eight segments and the thoracic region (setigers 2–10) is rather swollen (Blake 2011). The setigers are distinctly marked with several muscle bands between them.

Posterior: The posterior body region is long and narrow and exhibits a well-defined ventral groove is limited to the posterior area (Fig. 1) (Blake 2011; Law et al. 2013). Pygidium pointed with a large ventral cirrus (McConnaughey and Fox 1949) and 6–7 lateral cirri that surround the anus (McConnaughey and Fox 1949).

Parapodia: Small, simple, biramous (family Opheliidae, Blake and Ruff 2007).

Setae (chaetae): Simple, and hair-like. Second somite chaetae and those in posterior telescoping segments are longer than the other body regions (McConnaughey and Fox 1949).

Eyes/Eyespots: Three asymmetrical eyes are present in the brain area (McConnaughey and Fox 1949).

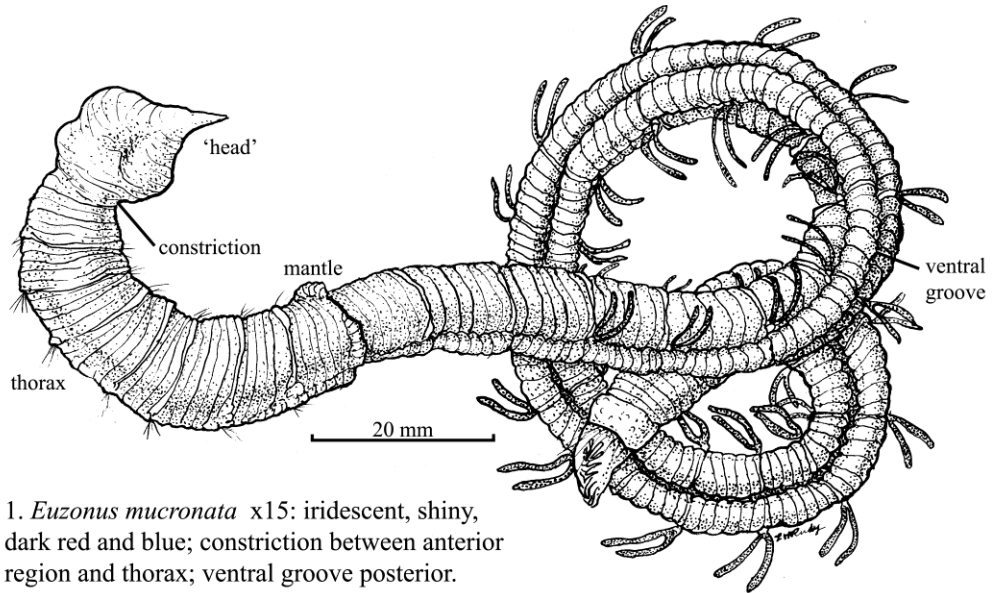
Anterior Appendages: None.

Branchiae: Parapodial branchiae are branched and biramous and simple (without pinnules or not feather-like) (Fig. 2). Branchiae are found on the posterior middle two-thirds of the body (Ricketts 1952) but not the posterior most segments (Blake 2011).

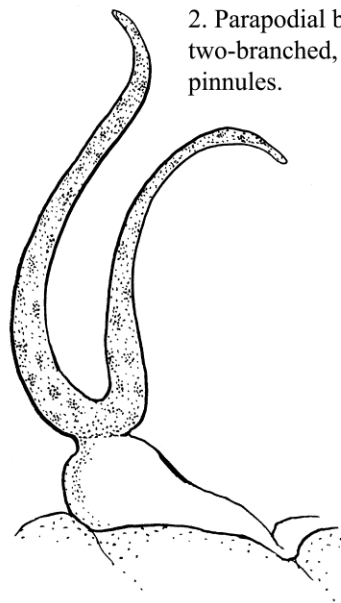
Burrow/Tube: *Thoracophelia mucronata* is an active burrower and does not inhabit a permanent burrow.

Pharynx: Consists of three soft, ciliated lobes and bears eversible proboscis (McConnaughey and Fox 1949; Dales 1952) (Fig. 3).

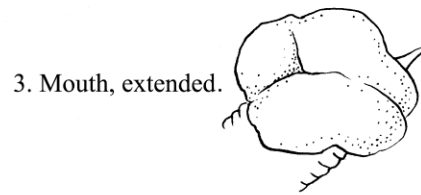
Thoracophelia mucronata



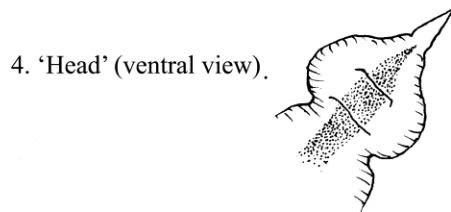
1. *Euzonus mucronata* x15: iridescent, shiny, dark red and blue; constriction between anterior region and thorax; ventral groove posterior.



2. Parapodial branchia: two-branched, simple, without pinnules.



3. Mouth, extended.



4. 'Head' (ventral view).

Genitalia:

Nephridia: Protonephridial and found from the fifth branchial segment to the 1st post-branchial segment (McConnaughey and Fox 1949). **Possible Misidentifications**

Among the Opheliidae, there are at least six genera in our area, all of which are sand or mud dwellers with limited segmentation, simple prostomia, biramous parapodia and capillary setae.

Ophelina (= *Ammotrypane*) spp. have a ventral groove along the whole body length (Fauchald 1977), cirriform branchiae only on posterior setigers, no lateral eyes and a long narrow anal tube with two internally attached ventral cirri (ibid).

Travisia spp. are cigar-shaped, without a ventral groove but with branchiae and their posterior parapodia have large lobes.

Polyopthalmus spp. have a ventral groove along the whole body length, no branchiae but lateral eyes. They have a short anal tube with small anal cirri (Fauchald 1977).

Ophelia spp. have a fusiform body morphology, inflated anterior and posterior ventral groove. They generally have branchiae on setigers 8–10.

Armandia spp. have a ventral groove along the whole body length, cirriform branchiae, lateral eyes and a long slender anal tube with paired long and internally attached ventral cirri and shorter dorsal cirri. *Armandia brevis* is the only local species in the genus *Armandia*.

Thoracophelia (= *Euzonus*) spp. live on clean sandy beaches and can be recognized by three distinct body regions, an inflated anterior set off from the thoracic region with a marked constriction and a narrow posterior with branchiae and a ventral groove. Other *Thoracophelia* species to be found on sandy beaches include *T. williamsi* and *T. dillonensis* and species can be differentiated by their branchial structure. There are 18 pairs of dorsal branchiae in *T. mucronata* which are bifurcating while in *T. williamsi* have 2–3 main branches (16–17 total branchial pairs, Law et al. 2013), one or

more bearing side branches and lateral pinnules. *Thoracophelia dillonensis* has single, not double branchiae (15 pairs, Law et al. 2013), with 15–20 pectinate divisions on one side “resembling a comb” (Kozloff 1993). (see Fig. 1 Law et al. 2013).

Ecological Information

Range: Type locality is southern California (Blake 2011). Range includes British Columbia to northern Baja California.

Local Distribution: Clean sand of outer shore beaches and bays including in Coos Bay Crown Point, Fossil Point and North Bay. Also in Cape Arago beaches.

Habitat: Clean sand exposed to high wave action, where populations can shift after strong storm events (Dales 1952). The “inhabitant par excellence” of the protected beaches (Ricketts 1952).

Salinity:

Temperature:

Tidal Level: Mid to higher intertidal and may correspond to worm age (Dales 1952).

Associates:

Abundance: Often found in dense mats of many hundreds of thousands of worms.

Thoracophelia mucronata can be found in a narrow band (less than 1 m wide) at the mid tide line marked with tiny holes in the surface sand. Within this band, worms can be abundant and reach densities of 100 individuals 10/cm² (Kozloff 1993). Densities of over 40,000/m² have been reported in southern California (McConnaughey and Fox 1949).

Life-History Information

Reproduction: Dioecious and atokous. Spawning takes place in summer months, April to September (southern California, Dales 1952), oocytes are 65 µm in diameter and disc-shaped. Development occurs quickly with embryos reaching 16-cell stage after just two hours (15–18° C, Dales 1952).

Larva: Young trochophore larvae are non-feeding and begin swimming at six hours post fertilization (Dales 1952). By five days the larvae are 100µm in length and possess an

equatorial prototroch, a posterior telotroch and a pair of eyes. Settlement of two-setiger larvae begins after 10 days (McConnaughey and Fox 1949; Dales 1952; Fernald et al. 1987).

Juvenile: The larval apical tuft is lost after 10 days and the proboscis is fully formed and eversible when juveniles are 1.0 mm in length. The prostomium becomes pointed and marked from the thoracic region when they reach a length of 2.0 mm when ventral and posterior adhesive anal papillae are present and the juvenile bears 25 chaetigerous segments. Between these four papillae the adult cirrus will grow from the pygidium (Dales 1952). The total number of adult segments has been reached (38) once juveniles are 5.0 mm in length.

Longevity:

Growth Rate: Little is known about the growth rate, but individuals continue to grow in length with age (Dales 1952).

Food: Deposit feeders. Micro-organisms filtered from and having been attached to fine sands in which they burrow much as to earthworms.

Predators: Shore birds (e.g. sandpipers, godwits and curlews) (McConnaughey and Fox 1949).

Behavior: As is true for other members of the Opheliidae, *T. mucronata* is an active and rapid burrower and, when the tide is out, occur buried as deep as 20 cm (Kozloff 1993).

Bibliography

1. BLAKE, J. A. 2011. Revalidation of the genus *Thoracophelia* Ehlers, 1897, replacing *Euzonus* Grube, 1866 (Polychaeta: Opheliidae), junior homonym of *Euzonus* Menge, 1854 (Arthropoda: Diplopoda), together with a literature summary and updated listing of *Thoracophelia* species. *Zootaxa*:65-68.
2. BLAKE, J. A., and E. R. RUFF. 2007. Polychaeta, p. 309-410. *In*: Light and Smith manual: intertidal invertebrates from central California to Oregon. J. Carlton (ed.). University of California Press, Berkeley, CA.
3. BREWER, M. S., P. SIERWALD, and J. E. BOND. 2011. A generic homonym concerning chordeumatid millipedes (Arthropoda: Diplopoda) and ophellid worms (Annelida: Polychaeta). *Zootaxa*. 2744:65-68.
4. DALES, R. P. 1952. The larval development and ecology of *Thoracophelia mucronata* (Treadwell). *The Biological Bulletin*. 102:232-242.
5. FAUCHALD, K. 1977. The Polychaete worms: definitions and keys to the orders, families and genera. Natural History Museum of Los Angeles County, Los Angeles.
6. FERNALD, R. L., C. O. HERMANS, T. C. LACALLI, W. H. WILSON, JR, and S. A. WOODIN. 1987. Phylum Annelida, Class Polychaeta, p. 138-195. *In*: Reproduction and development of marine invertebrates of the northern Pacific coast. M. F. Strathmann (ed.). University of Washington Press, Seattle, WA.
7. HARTMAN, O. 1969. Atlas of the sedentariate polychaetous annelids from California. Allan Hancock Foundation, University of Southern California, Los Angeles, CA.
8. KOZLOFF, E. 1993. Seashore life of the northern Pacific coast: an illustrated guide to northern California, Oregon, Washington, and British Columbia. University of Washington Press, Seattle, WA.
9. LAW, C. J., K. M. DORGAN, and G. W. ROUSE. 2013. Validation of three sympatric *Thoracophelia* species (Annelida: Opheliidae) from Dillon Beach, California using mitochondrial and nuclear DNA sequence data. *Zootaxa*. 3608:67-74.
10. MCCONNAUGHEY, B. H., and D. L. FOX. 1949. The anatomy and biology of the marine polychaete *Thoracophelia mucronata* (Treadwell) Opheliidae. University of California Publications in Zoology. 47:318-340.
11. PARKE, S. R. 1973. Biological aspects of speciation in three sympatric *Euzonus* species at Dillon Beach, California (Polychaeta:

Opheliidae). M.S. University of the Pacific, Stockton.

12. RICKETTS, E. F. 1952. Between Pacific tides: an account of the habits and habitats of some five hundred of the common, conspicuous seashore invertebrates of the Pacific coast between Sitka, Alaska, and Northern Mexico. Stanford: Stanford University Press, Stanford.