Ectopleura crocea

Tubular hydroid

Phylum: Cnidaria
Class: Hydrozoa, Hydroidolina
Order: Anthoathecata, Aplanulata
Family: Tubulariidae

Taxonomy: *Ectopleura crocea* was originally described by Agassiz, 1862 as *Parypha crocea*, though it was soon after classified as *Tubularia crocea* (Allman 1871). The primary synonyms are *T. crocea* and *Pinauay crocea* (Mills et al. 2007). There has been much debate about the appropriate genus for this species, but *Ectopleura crocea* is now generally accepted (van der Land et al. 2001; Schuchert 2015). Additional synonyms include *Tubularia ralphi*, *T. gracilis*, *T. australis*, and *T. warreni* (Schuchert 2010).

Description

General Morphology: The only form of *E. crocea* is the large, colonial polyp. Each polyp has a stem (hydrocaulus) covered in a rigid perisarc and an athecate hydranth with a mouth (manubrium), stomach, tentacles, and gonophores (Figs. 1, 2).

Medusa: The medusa is not free-swimming (Ricketts et al. 1985); though it is biologically similar to other free-swimming hydromedusa, it is entirely retained in the tissue of the gonophore (Kozloff 1983).

Polyp:

Size: The colony grows in large bushy clusters up to 15 cm (Ricketts et al. 1985). Stems grow to 2 cm long, and "flowers" (the hydranth) are up to 1 cm when extended. The genus *Ectopleura* contains species that are considered the largest athecate hydroids (Kozloff 1974).

Color: The hydrocaulus is white to light tan, the feeding tentacles (proximal and distal) are transparent white, the gonophores are light pink and dark coral, and the manubrium is a pale yellow-orange. The organism's dominant color comes from the pink to red hydranths (Ricketts et al. 1985).

Body:

Pedicel: The hydrocaulus is unbranched, crooked, and covered with fine "hairs" (diatoms). The stiff perisarc extends to the base of the hydranth (Mills et al. 2007).

Hydranth: The hydranth lacks a theca. The manubrium is surrounded by a whorl of tentacles, is simple, and circular (Fig. 3).

Gonophore: The gonophores each contain an abortive medusae, or gonomedusae. They are in clusters on stalks (racemes) between the two whorls of tentacles (Fig. 3). Within the gonophores develop the planulae larvae, which leave the gonophore but remain in close association with the polyp (Kozloff 1983). Female gonophores have short distal crests (Mills et al. 2007), with 4-8 flattened bladelike tentacles at the apical end (Kozloff 1987). Male gonophores lack tentacles (Mills and Strathmann 1987).

Cnidae:

Tentacles: Tentacles are filiform (thread-like), simple, and in two whorls (oral and aboral, Mills et al. 2007). The proximal, or aboral, whorl consists of long, extended feeding tentacles at the base of the hydranth, while the distal, or oral, whorl has short tentacles usually contracted around mouth (Figs. 2, 3). There are similar numbers of distal and proximal tentacles (Kozloff 1987). Older specimens have more tentacles than young ones; juveniles will have only 10 proximal tentacles.

Possible Misidentifications

The family Tubulariidae is composed of hydroids with a thick perisarc and stolons (ground-level shoots connecting branches). Species in this family have at least two tentacle whorls and gonophores between the oral and aboral whorls. The medusae in this family can be either free-swimming or retained, have four radial canals, a simple

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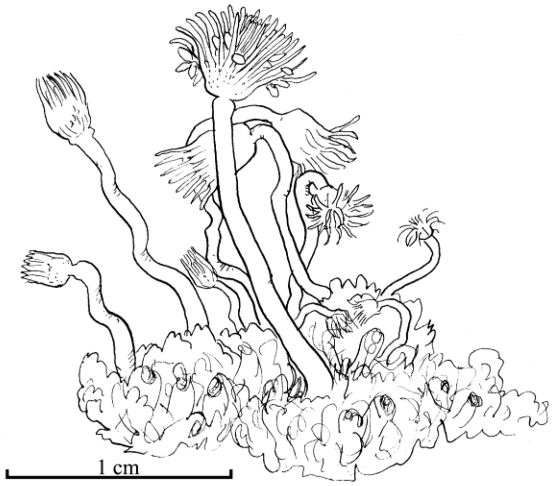
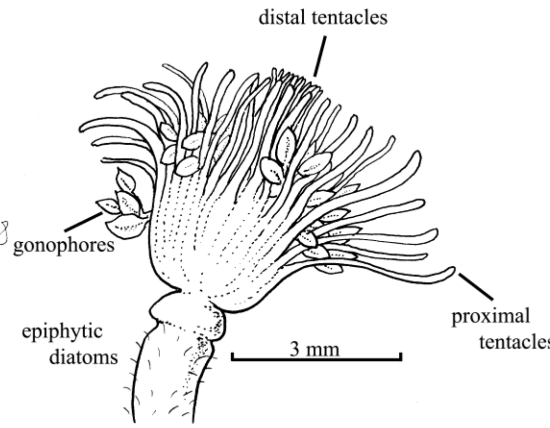
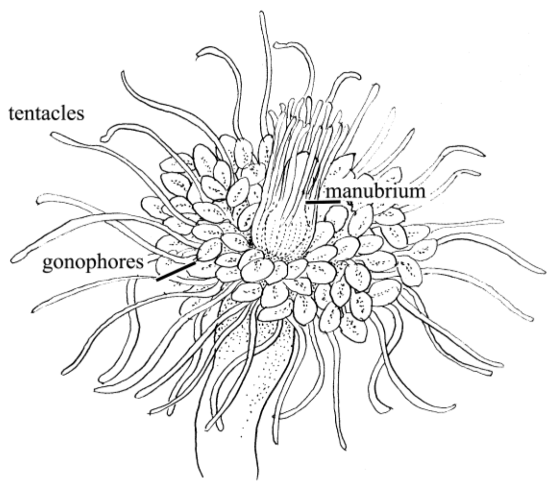
Ectopleura crocea



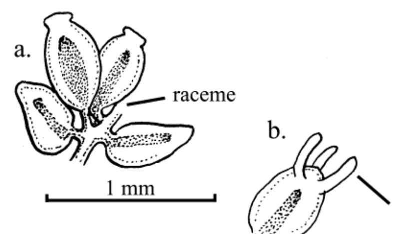
1. *Pinauay crocea* colony x4:
actual polyp height c. 2 cm.



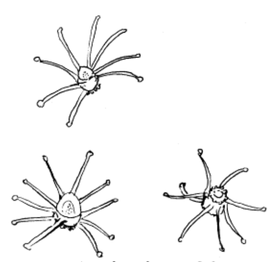
2. Hydranth x10:
actual diameter 3mm
two whorls of tentacles, distal and proximal;
gonophores between whorls.



3. Hydranth, extended x10.



4. Gonophores x30:
a. showing racemes (stems)
b. with developing marginal lappets.



5. Actinulae x30.

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mouth, and few tentacles. Divisions of the family into its genera are based on presence of stolons, texture of the stem, origin of the perisarc, and morphology of the medusa stage (Schuchert 2012).

The genus *Ectopleura* is composed of hydroids with only two tentacle whorls, one oral and one aboral. The perisarc originates below the connection between the hydranth and stem, and ends at the base of the hydranth. The stem is a hollow tube with 0-5 ridges. Stolons are present. The medusae can be free-swimming or retained (Schuchert 2012).

The other common local species of *Ectopleura*, *E. marina*, is a small, solitary athecate (without a cup-like theca) hydroid of the outer coast. Its stalk is usually about 2.5 cm long, it has fewer distal tentacles than proximal ones, and it is less showy than *E. crocea*, as it does not occur in clumps as the latter does. While *E. crocea* branches extensively from its base, *E. marina* does not (Kozloff 1983).

Other athecate hydroids often have some capitate (knobbed) tentacles as adults, i.e. *Cladonema*, *Hydrocoryne*. Of those with only threadlike tentacles, some like *Hydractinia* and *Eudendrium* have only a single whorl of tentacles, not two whorls as in *Ectopleura crocea*. Others, such as *Turritopsis* and *Clava* have tentacles in scattered patterns rather than in whorls (Rees and Hand 1975).

The species *Ectopleura larynx* looks similar to *E. crocea*, but is not found in Oregon.

Ecological Information

Range: The type locality is Boston Harbor (Agassiz 1862). This species is native to the northern Atlantic Ocean, and was introduced to the Pacific via ship bottoms (Mills et al. 2007). It has been found on both sides of the Atlantic and from the Gulf of Alaska to southern California, and thrives in northern temperate oceans (Ricketts et al. 1985).

Local Distribution: This species is common in Oregon and California estuaries, and seems to be a more northern species. In the Coos Estuary, it has been found in South Slough, Charleston, and Fossil Point.

Habitat: One of the most prominent fouling organisms, *E. crocea* is often found on undersides of floating docks, boat bottoms, and wharf pilings (Ricketts et al. 1985, Mills et al. 2007). It thrives in cold water with good movement. In the lab, it is not bothered by strong light (Mackie 1966). It is one of the invertebrate organisms most resistant to poisons, such as copper (Barnes in Pyefinch and Downing 1949). It lives in the low intertidal and down to 40 m (Mills et al. 2007), and is always attached to solid substratum rather than mud or sand (Kozloff 1987).

Salinity: Collected at 30.

Temperature: Specimens respond badly to warm water in the lab and will lose hydranths. Regression occurs with summer temperatures (Mackie 1966). *Ectopleura crocea* is usually found at temperatures above 18°C, but can be kept in laboratories at 14° C (Mills and Strathmann 1987).

Tidal Level: Low intertidal; subtidal to 40m (Haderlie et al. 1980)

Associates: On floating docks, the colonial *Ectopleura crocea* and its substrate constitute a rich microecosystem. Some of the most common epibionts are suctorian protozoans, diatoms (especially in fall, darkening stems) (Pyefinch and Downing 1949), caprellid and tube-building amphipods, isopods, copepods, and mussels. *Ectopleura crocea* has, however, become a nuisance to mussel-growing aquaculturists. The hydroid will foul on juvenile mussels, restricting their growth by impeding their ability to filter water and by competing for food. Additionally, *E. crocea* will eat incoming mussel larvae, which decrease settlement rates in commercial mussel facilities (Fitridge and Keough 2013, Fitridge 2011). A pycnogonid, *Anoplodactylus erectus*, is parasitic in the digestive tract of *Ectopleura crocea* in southern California, distending the polyps abnormally (Ricketts et al. 1985, Rees and Russell 1937). Some amphipods (*Stenothoe*) are immune to *E. crocea*'s nematocysts (Mackie 1966). The colonies also provide a habitat for the egg masses of some benthic opisthobranchs (Mills et al. 2007).

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Abundance: Colonies can be quite dense under the right conditions of water and currents. In ideal conditions, actinulae are released August-October and February-March (Elkhorn Slough, CA), and, in less favorable environments, August-November (Mills and Strathmann 1987). In warmer waters the species shows a seasonal pattern of high abundance during cool months and low abundance during warm; it has also been decreasing in abundance since about 1980, likely due to increasing ocean temperatures (Mediterranean Sea) (Di Camillo et al. 2013).

Life-History Information

Reproduction: The polyps can reproduce both sexually and asexually. In asexual reproduction, new hydranths can grow from the stolons (horizontal shoots at the base of each hydrocaulus). *Ectopleura crocea* is dioecious, so each colony is entirely male or entirely female during sexual reproduction. The gonophores correspond to the medusae stage in other hydroids, and so are called gonomedusae. In the summer, male gonomedusae release their sperm, which are attracted to the female gonomedusae and their eggs (Ricketts et al. 1985). Within the gonomedusae develop the planulae, which leave the gonomedusae but remain in close association with the polyp (Kozloff 1983) and metamorphose into the actinulae (Fig. 5). Actinulae are mobile, crawling larvae shaped like little polyps with the characteristic whorls of tentacles (Kozloff 1983). To develop into the adult polyp form, the actinulae moves away from its “parent” polyp and settles on the nearby substratum (Kozloff 1983). There is no swimming stage. One polyp can produce over 100 gonomedusae (not simultaneously) (Miller 1976). Gonomedusae most distal on the racemes (stalks) mature soonest (Mackie 1966). Mature male gonomedusae are white, while immature have a red stripe. The mechanism for spawning and larvae release is not known (Miller 1976), but possibly could be due to a change in light intensity and water speed (Pyefinch and Downing 1949). In one area, only one species of *Ectopleura* will be sexually active at a time (Miller 1976).

Larva: Actinula larvae are the larval stage; these larvae attach to substrate and become a new polyp. They can have up to 10 capitate (knobbed) tentacles containing nematocysts; visible inside are the manubrium and distal tentacle buds (Fig. 5). In *E. larnyx,* tentacles can vary from 6 to 13, though most have 10 (Pyefinch and Downing 1949).
Juvenile: Juveniles develop from settled actinulae, often near the “parent” polyp. They have fewer tentacles and will develop more as they age.
Longevity: Unknown
Growth Rate: It takes two weeks for juveniles to reach maturity, and takes 6-8 days to go from ripe female gonads to the liberation of viable actinulae (Mackie 1966). Time from settlement of actinulae to first generation of new larvae takes 24 days (Pyefinch and Downing 1949). The stolon growth rate is a steady 1 mm/day (Mackie 1966). Settlement of actinulae begins after about 24 hours (Pyefinch and Downing 1949). This species is easily grown in the lab.
Food: The polyps eat copepods, chaetognaths, portunid zooae, small mysids, siphonophores, eudoxids, and salps; they reject pteropods and pycnogonids.
Predators: The polyps are eaten by pycnogonids and nudibranchs (Mills et al. 2007; Pyefinch and Downing 1949; Strathmann 1987).
Behavior: While each polyp is technically an individual organism, behavior tends to be on a colonial scale (Pyefinch and Downing 1949). Hydranths will fall off (autotomize) in unfavorable conditions (Ricketts et al. 1985). The behavior of the actinula stage differs the most from other hydroids (see behavior in Reproduction above).

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