
Cancer antennarius

The ghost shrimp

Phylum: Arthropoda, Crustacea

Class: Multicrustacea, Malacostraca, Eumalacostraca

Order: Eucarida, Decapoda, Pleocyemata, Brachyura,
Eubrachyura, Heterotremata

Family: Cancroidea, Cancridae

Taxonomy: The most recent taxonomic debate regards this species being placed in the recently elevated genus, *Romaleon* (Schweitzer and Feldmann 2000). However, molecular work does not always support the monophyly of this or other cancrinid genera (Harrison and Crespi 1999). Although many researchers have switched to the name *R. antennarius* (or *R. antennarium*) (e.g., Wicksten 2011), we follow the most current local intertidal guide that retains the name *Cancer antennarius* (Kuris et al. 2007).

Description

Size: Females up to 148 mm in carapace width and males 178 mm (Puls 2001). Type specimen carapace is 118 mm in width (Rathbun 1930).

Color: Reddish color dorsally, light yellow ventrally with red spots, especially frontally (Ricketts and Calvin 1971). Chelae dactyls dark (Wicksten 2011) (Fig. 1).

General Morphology: The body of decapod crustaceans can be divided into the **cephalothorax** (fused head and thorax) and **abdomen**. They have a large plate-like carapace dorsally, beneath which are five pairs of thoracic appendages (see **chelipeds** and **pereopods**) and three pairs of maxillipeds (see **mouthparts**). The abdomen and associated appendages are reduced and folded ventrally (Decapoda, Kuris et al. 2007).

Cephalothorax:

Eyes: Eystalks short, orbits small. Eyes are frontal with a small supra-orbital tooth (Fig. 1).

Antenna:

Mouthparts: The mouth of decapod crustaceans comprises six pairs of append-

ages including one pair of mandibles (on either side of the mouth), two pairs of maxillae and three pairs of maxillipeds. The maxillae and maxillipeds attach posterior to the mouth and extend to cover the mandibles (Ruppert et al. 2004). Merus of third maxillipeds with distal margin and rounded angles in *C. antennarius* (Wicksten 2011).

Carapace: Oval and widest at eighth tooth. Antero-lateral and postero-lateral margins meet at distinct angle. Carapace surface lumpy, uneven and finely granulated (Fig. 1).

Frontal Area: Frontal area not produced with five medial (three central) teeth, of which the outer pair is the largest, center tooth small (Fig. 2) (Kuris et al. 2007; Wicksten 2011).

Teeth: 11 antero- and post-lateral teeth are curved forward (Fig. 2).

Pereopods: Walking legs rough and hairy. Dactyls with five longitudinal rows of bristles (Rathbun 1930).

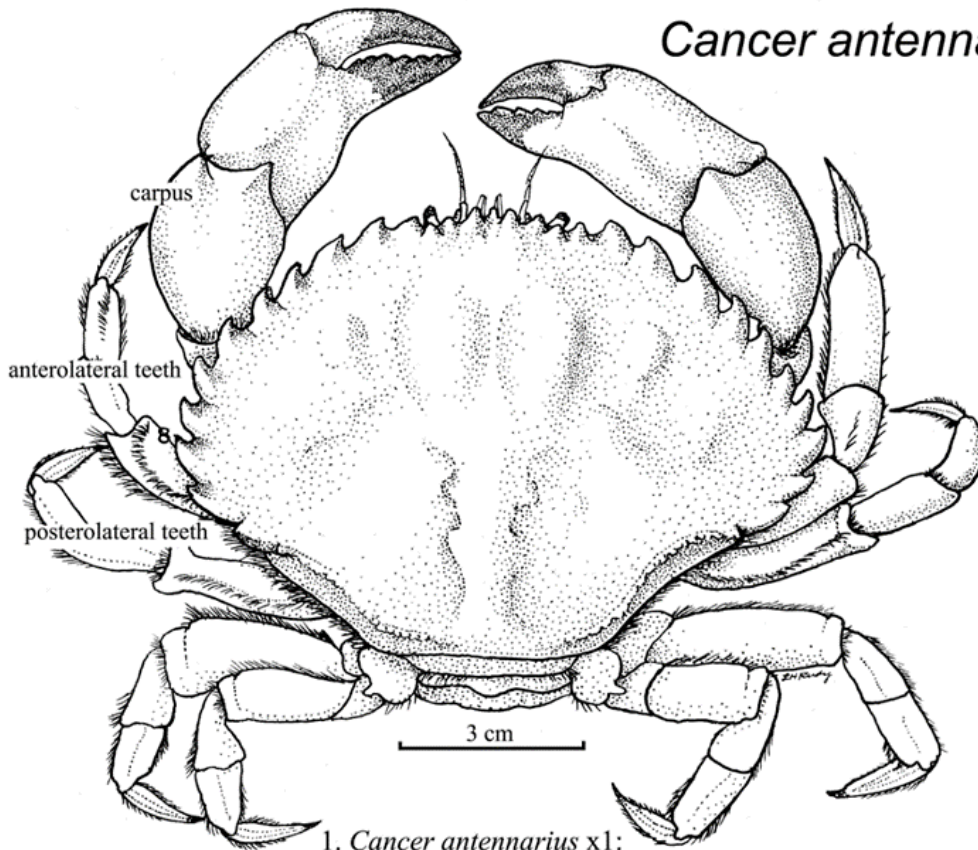
Chelipeds: Chelae heavy, nearly smooth and black-tipped. Inner carpus (wrist) with single sharp spine. Chelipeds can be slightly unequal in size (Wicksten 2011).

Abdomen (Pleon): Abdomen narrow in male, broad in female (e.g. see *Cancer magister*, Fig. 3).

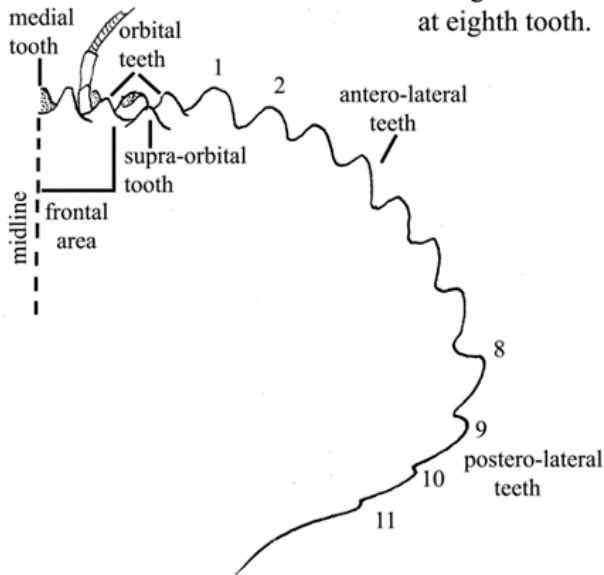
Telson & Uropods:

Sexual Dimorphism: Male and female brachyuran crabs are easily differentiated. The most conspicuous feature, the abdomen, is narrow and triangular in males while it is wide and flap-like in females. Additionally, males have one large chelae and two pleopod pairs specialized for copulation however, the third and fourth pleopods are absent. Females, on

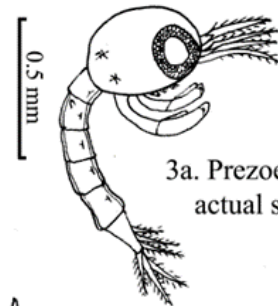
Cancer antennarius



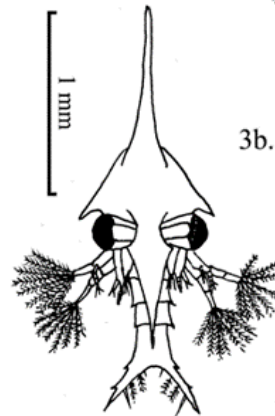
1. *Cancer antennarius* x1:
actual size 10 cm; dark red;
black tipped claws; red spots
on light underbody; widest
at eighth tooth.



2. Carapace (right front)
eleven antero- and post-
lateral teeth; frontal area
not produced; eyes small,
frontal; supra-orbital tooth;
small medial tooth (below).



3a. *Prezoea* x45:
actual size 1.65 mm.



3b. Third zoea x30:
actual size 2.25 mm
(from Roesijadi, 1976).

the other hand, have all four pleopod pairs, each with long setae for egg attachment (Brachyura, Kuris et al. 2007).

Possible Misidentifications

According to some authors, the genus *Cancer* comprises 23 species (Harrison and Crespi 1999 but see Schweitzer and Feldmann 2000). This genus is differentiated from other brachyuran genera by the broadly oval carapace, presence of five frontal teeth and antennules that fold back over carapace. Characters unique to *Cancer antennarius* include 11 antero-lateral teeth, carapace widest at 8 tooth, red color, black-tipped cheliped dactyls and small size (Kuris et al. 2007). *Cancer antennarius* is smaller than most of the other adult *Cancer* species. In color, *C. productus* is most similar to *C. antennarius* (dark red, black-tipped chelae), but never has red spots on its underbody, though its legs may be mottled. They also occur in the same ecological niches. Furthermore, *C. productus* has ten teeth (not 11). *Cancer antennarius* is also smaller than *C. productus*, and lacks its obviously pronounced frontal area.

There are eight *Cancer* species known locally (Kuris et al. 2007). *Cancer magister* (adults at least 30 mm in width), *C. productus* (adults over 20 mm in width) and *C. antennarius* (adults typically 100 mm in width) are the largest species. *Cancer productus* and *C. magister* have 10 antero-lateral teeth and five subequal frontal teeth (Kuris et al. 2007). The carapace of *C. magister* is widest at the tenth tooth, is more subtly pigmented and does not have black tipped dactyls seen in *C. productus* (Schmitt 1921; Kuris et al. 2007; Wicksten 2011).

The remaining four species tend to be smaller and have nine antero-lateral teeth (sometimes ten in older specimens,

Wicksten 2011). *Cancer branneri* is a small species (35 mm) that is rare intertidally and recognizable by cheliped dactyls that are long, straight, black and spiny. *Cancer gracilis* (27 mm) has white-tipped cheliped dactyls and *C. jordani* (25 mm) has a hairy carapace and sharp curving teeth. *Cancer anthonyi*, the yellow rock crab, is larger than the previous three at 52 mm and has black-tipped cheliped dactyls (Kuris et al. 2007; Wicksten 2011). Populations of *C. productus*, *C. anthonyi* (southern California) and *C. magister* support commercial fisheries (Kuris et al. 2007). *Cancer antennarius* is a common species used in biochemistry and physiology studies (e.g. Spaziani et al. 1997; Kang and Spaziani 1996; Rudolph and Spaziani 1991).

Ecological Information

Range: Type locality is San Francisco.

Known range includes British Columbia, Canada to Baja, California. Not common in Puget Sound.

Local Distribution: In Coos Bay (and probably other Oregon estuaries) individuals are most common on protected outer coast.

Habitat: Often buried in the sand and under rocks (Ricketts and Calvin 1971).

Salinity: In San Francisco, found at salinities ranging from 26.6 to 33.3 (Schmitt 1921). *Cancer antennarius* cannot tolerate brackish conditions and cannot osmoregulate (Garth and Abbott 1980).

Temperature: In San Francisco Bay, individuals collected at 8.7–14.3° C (Schmitt 1921).

Tidal Level: Occurs in lower tide pools (Ricketts and Calvin 1971) and subtidally to 91 m (Kittredge et al. 1971; Puls 2001).

Associates: Often encrusted with polychaetes (family Lphitimidae) in branchial cavities (southern California) (Kuris et al. 2007).

Abundance: Common in California and Oregon, becomes rarer farther north.

Life-History Information

Reproduction: Mating occurs when the female is about to molt, male *C. antennarius* clasp females several days prior to molting and copulation takes place after molting occurs. In the lab, males were stimulated to pre-mating behavior by the release of a molting hormone by *Pachygrapsus crassipes* (Kittredge et al. 1971). Fertilization is internal, occurs after molting and egg deposition occurs months later (November–January, Ricketts and Calvin 1971).

Females with eggs were encountered in Humboldt Bay, California in April (Puls 2001). All decapod crustacean females attach recently laid gelatinous egg masses to their pleopods. The outer embryo membrane thickens and a strand develops that attaches each embryo to pleopod setae (Decapoda, Kuris et al. 2007).

Larva: The larvae of *C. antennarius* were described by Roesijadi (1976). Larval development proceeds via a series of zoea (five total, telson with single lateral spine at each fork, Lough 1975) and megalopae stages, each marked by a molt (Roesijadi 1976).

Cancer antennarius zoea are planktotrophic and have large compound eyes and four spines: one each dorsal and rostral and two lateral (Fig. 3b) (see Fig. 4, Roesijadi 1976; Puls 2001; Martin 2014). Larval size (measured from tip of rostrum to tip of telson) proceeds from 1.8 mm (Zoea I) to 4.4 mm (Zoea V) (Puls 2001). Megalopae are 2.3–3.3 mm from rostrum tip to posterior carapace and 1.4–2.4 mm in width. The megalopae bear one stout spine on ischiopodite of cheliped and exhibit similar morphology to the larvae of *C. gracilis* (Puls 2001). The larvae of cancrid species are difficult to distinguish, especially the prezoal stages (Fig. 3a), but the zoea and megalopae of *C. antennarius* are smaller and possess fewer setae than other species. In larvae reared at 13.8°C, hatching from the fifth zoeal stage to the megalopa occurred at 36

days, which is shorter than observed for *C. magister* or *C. productus* (Roesijadi 1976).

Juvenile: Juvenile *C. antennarius* may have second small spine on carpus. Their carapace is widest at the ninth tooth, the tenth (and last) tooth is prominent and shiny. Carapace is crowded with granules. The manus of cheliped are light in color, fingers (dactyls) bear dark pigment and extreme tips are light in color. Legs may bear more setae than is seen in adult individuals (Wicksten 2011).

Longevity:

Growth Rate: Growth occurs in conjunction with molting. In pre-molting periods the epidermis separates from the old cuticle and a dramatic increase in epidermal cell growth occurs. Post-molt individuals will have soft shells until a thin membranous layer is deposited and the cuticle gradually hardens. During a molt decapods have the ability to regenerate limbs that were previously autotomized (Kuris et al. 2007).

Food: A scavenger and predator, particularly of hermit crabs (Garth and Abbott 1980).

Predators: Octopuses, sea otters and occasionally harvested by sport fishermen. Larvae are preyed upon by plankton feeders (herring, salmon, etc.).

Behavior:

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Updated 2015

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