Hemigrapsus nudus

The purple shore crab

Phylum: Arthropoda, Crustacea

Class: Multicrustacea, Malacostraca, Eumalacostraca

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

Family: Grapsoidea, Varunidae, Varuninae

Taxonomy: The brachyuran family Grapsidae, the shore crabs, was a very large family with several subfamilies and little taxonomic scrutiny, until recently. Based on molecular and morphological evidence, authors (von Sternberg and Cumberlidge 2000; Schubart et al. 2000; de Grave et al. 2009; Schubart 2011) elevated all grapsid subfamilies to family level, reducing the number of species formally within the Grapsidae. Recent molecular evidence has placed *Hemigrapsus* species within the Varunidae, but this is currently debated and some authors still refer to them as members of the Grapsidae *sensu lato* (Ng et al. 2008; Wicksten 2011) and others have adopted the new familial designation (e.g. Kuris et al. 2007). Besides the higher taxonomic classifications, the known specific synonym for *H. nudus* is *Pseudograpsus nudus* (Wicksten 2011), which is not currently used.

Description

Size: Carapace 56.2 mm in width and 48 mm in length (Rathbun 1918; Wicksten 2011) (Fig. 1). An adult male from Coos Bay, was 32 mm in width and weighed 17.5 g (wet weight).

Color: Red, purple, or whitish with chelipeds that are red-spotted (compare to *H. oregonensis*, Plate 21 Kozloff 1993; Kuris et al. 2007) (Fig. 1). Although coloration is generally species-specific among grapsid crabs, nearly white or yellow forms of both *Hemigrapsus* species have been reported (Wicksten 2011).

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: Eyestalks and eyes of moderate size with eyes that are at antero-lateral angles (Fig. 2). Grapsid species apparently have keen vision (Wicksten 2011).

Antenna:

Mouthparts: The mouth of decapod crustaceans comprises six pairs of appendages 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).

Carapace: Flat, smooth, punctate (Schmitt 1921) and bears three teeth (two lateral that are posterior to postorbital) (Wicksten 2011). Square in shape, with rounded antero-lateral margins (Rathbun 1918) and no transverse lines (compare to *P. crassipes*) (Fig. 1). Posteriorly, carapace is flat (Wicksten 2011) (Fig. 1).

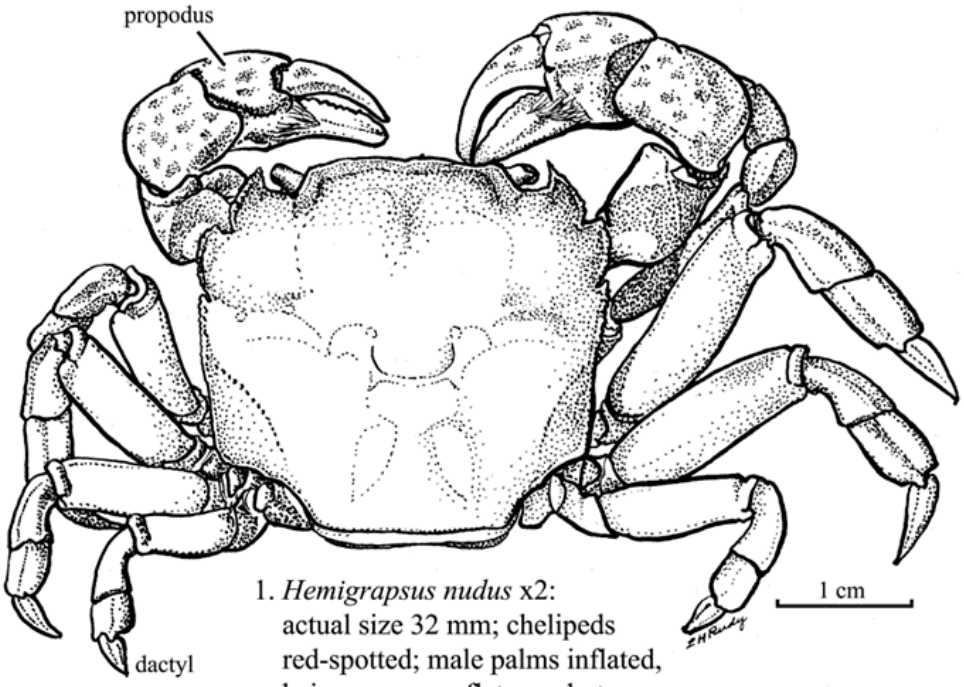
Frontal Area: Very slightly rounded and without prominent lobes (Fig. 2).

Teeth: Two carapace teeth below the orbital tooth, which are lateral, while the last tooth is small (Fig. 2) (Wicksten 2011).

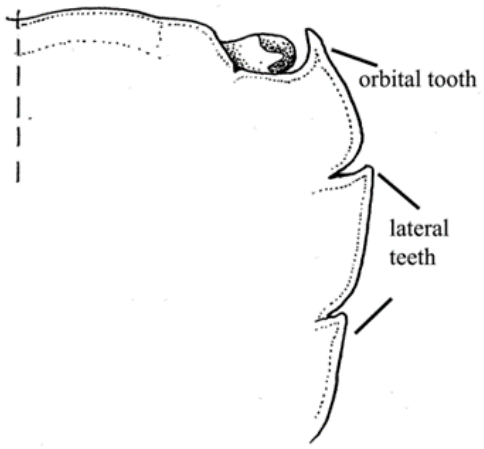
Pereopods: Naked (without hair) and rather short (Schmitt 1921) with short dactyls (Fig. 1) (Wicksten 2011).

Chelipeds: Smooth, equal or almost

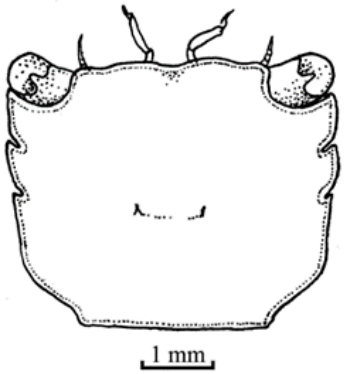
Hemigrapsus nudus



1. *Hemigrapsus nudus* x2: actual size 32 mm; chelipeds red-spotted; male palms inflated, hairy; carapace flat, quadrate; legs hairless; frontal area slightly rounded.



2. Carapace (right frontal): eyes moderate, at antero-lateral angle; two lateral teeth (one small).



3. Juvenile x10: actual size 5 mm; shallow frontal depression; slight lateral spines; eyes large.

Hiebert, T.C. 2015. *Hemigrapsus nudus. In:* Oregon Estuarine Invertebrates: Rudys' Illustrated Guide to Common Species, 3rd ed. T.C. Hiebert, B.A. Butler and A.L. Shanks (eds.). University of Oregon Libraries and Oregon Institute of Marine Biology, Charleston, OR.

equal in size with curved fingers (Wicksten 2011). Chelipeds stout, mottled above, with teeth on margins and with small round red spots (Fig. 1). Male with inflated palms and a patch of fine hair on inner surface.
Abdomen (Pleon): Females with wide abdomen and male *H. nudus* have narrow abdomens that exposes the sternum at the base (see **Sexual Dimorphism**, Fig. 3).
Telson & Uropods:
Sexual Dimorphism: Male and female brachyuran crabs are easily differentiable. The most conspicuous feature, the abdomen, is narrow and triangular in males while it is wide and flap-like in females (Brachyura, Kuris et al. 2007). Male *H. nudus* have a narrow abdomen, exposing the sternum at the base (Fig. 3) and the palm of the male cheliped with a patch of long, fine hair. Females have a wide abdomen, hiding the sternum (Fig. 3), and only a few isolated bristles on the palm of the cheliped.

Possible Misidentifications

Hemigrapsus species were formally members of the Grapsidae, a family characterized by the carpus of the third maxilliped not articulating near the anterior merus angle and by lateral mouth margins that are parallel or convergent (Wicksten 2011). The genus *Hemigrapsus* may now a member of the family Varunidae (see **Taxonomy**) characterized by chelae morphology, gaping third maxillipeds and setose walking legs (Ng et al. 2008). Two *Hemigrapsus* species occur locally, *H. oregonensis* and *H. nudus*. *Hemigrapsus nudus*, the purple shore crab, is larger than *H. oregonensis,* is “naked” (i.e. not hairy) on its walking legs and has chelipeds with conspicuous red spots. *Hemigrapsus nudus* lives mostly on the rocky open coast, but is also found in salt marshes (Knudsen 1964). *Hemigrapsus oregonensis* has been called a small, bleached edition of *H. nudus* (Ricketts and Calvin 1971). The following features are particularly useful in differentiating the two *Hemigrapsus* species: 1) *H. oregonensis* has a marked frontal notch where *H. nudus* has a shallow depression, 2) the lateral spines of *H. oregonensis* are sharp and distinctly separated from the side but *H. nudus* spines are not, 3) The dactyls of walking legs 1–3 are long in *H. oregonensis* and short in *H. nudus* and 4) the dactyl of the fourth walking leg is round in *H. oregonensis* and flat in *H. nudus* (Kuris et al. 2007). The final varunid crab that occurs locally is the introduced Chinese mitten crab, *Eriocheir sinensis*, but this species is very large and easily differentiable from either *Hemigrapsus* species.

Pachygrapsus crassipes, a consistent member of the Grapsidae, is a dark green crab with many transverse dark red striations on its legs and carapace (*H. oregonensis* is smooth), its frontal margin is straight and it has one lateral tooth, not two (Symons 1964). The only other, locally occurring grapsid crab, *Planes cyaneus*, is a pelagic species that is only found washed ashore on drift logs with gooseneck barnacles (Kuris et al. 2007). *Rhithropanopeus harrisii*, an introduced xanthid (Panopeidae) mud crab, is sometimes found with *H. oregonensis* and potentially *H. nudus*. It has a slightly convergent sides, strong dorsal ridges on its carapace and three sharp carapace teeth.

Ecological Information

Range: Type locality is Puget Sound, Washington (Ricketts and Calvin 1971). Known range includes Sitka, Alaska, to Gulf of California (Rathbun 1918). Uncommon in Southern California (Garth and Abbott 1980; Jaffe et al. 1987; Wicksten 2011).
Local Distribution: Coos, Siletz, and Tillamook Bay estuaries (and probably more Oregon estuaries) in rocky, brackish habitats.
Habitat: Semi-protected and protected rocky coasts and bays. Prefers coarse sand to

gravel substrates overlain with large rock cover (Schmitt 1921; Kuris et al. 2007). In salt marshes, but not as commonly encountered as *H. oregonensis,* and in burrows and under driftwood. Less common in California salt marshes (Kozloff 1993). *Hemigrapsus nudus* is common in mid tide pool regions (Ricketts and Calvin 1971) and is found in areas of swift water and large boulders (Puget Sound, Knudsen 1964). *Hemigrapsus nudus* can be found in more exposed situations than *H. oregonensis* and withstands desiccation better (large specimens). The two *Hemigrapsus* species do co-occur, but one usually finds one or the other (Kozloff 1993).

Salinity: Occurs in outer shore full strength seawater, brackish and hyper-saline (estuarine marsh) waters. Can endure low salinities better at high temperatures (Todd and Dehnel 1960).

Temperature: *Hemigrapsus nudus* individuals can tolerate temperatures up to 33.6˚C but are more tolerant of cold than warm temperatures and modify their behavior to regulate body temperature (McGaw 2003). Survival is most poor with low temperature combined with low salinity, but smallest specimens are most resistant to temperature extremes (Todd and Dehnel 1960).

Tidal Level: Strictly littoral (Ricketts and Calvin 1971) and found higher than *H. oregonensis*, but both species are found from high to low levels (Todd and Dehnel 1960). Occurs is the rockweed belt, underneath rocks and is commonly found just below high-tide level (Monterey, California, Hiatt 1948). *Hemigrapsus nudus* is often found with *Pachygrapsus,* which extends higher into the intertidal and prefers larger rocks.

Associates: Territory overlaps with *Pachygrapsus crassipes* over whom it is dominant (Hiatt 1948) and occasionally with *H. oregonensis*. Parasitic castrating isopod, *Portunion conformis,* occurs in perivisceral cavity of some individuals (Garth and Abbott 1980). Can be host to nemertean *Carcinonemertes epialti*. *Hemigrapsus nudus*, *H. oregonensis* and *P. crassipes* can all be host to this nemertean egg predator, which can negatively impact brood mortality in these species (Shields and Kuris 1988). These three species can also serve as intermediate hosts for a variety of parasites including trematode metacercariae, larval trypanorhynch tapeworms, as well as *Polymorphus* acanthocephalan and nematode (*Ascarophis*) larvae (Kuris et al. 2007).

Abundance: Locally abundant (Ricketts and Calvin 1971) and less common south (e.g. Morrow Bay, California, Kuris et al. 2007).

Life-History Information

Reproduction: In Puget Sound, Washington, mating occurs between December and January and is similar to *Pachygrapsus* (Hiatt 1948; see Fig. 2, 3, Knudsen 1964), however *P. crassipes* exhibits peak breeding in summer months compared to winter months in *H. nudus* (Boolootian et al. 1959). Females ovigerous January through April, 70% ovigerous in late January and 99% with fertilized eggs early April. Hatching occurs between May and June (Puget Sound, Washington). This timeline can be earlier (hatching Oct–May in Monterey Bay, California) or later (ovigerous April–May, British Columbia, Canada and hatching July, Friday Harbor, Washington) (Jaffe et al. 1987; Puls 2001) depending on water temperature. Each brood contains 400–36,000 embryos and the production of second brood is rare. Embryos are approximately 380 µm in diameter and become 450 µm upon hatching (Jaffe et al. 1987). The reproduction and life-cycle of *C. epialti* is dependent on and corresponds to that of its host species. However, this nemertean is not host specific (unlike *Carcinonemertes errans* on *Cancer*

magister) and occurs amongst egg masses of other species including *Hemigrapsus oregonensis*, *Pachygrapsus crassipes* (Kuris 1993; Roe et al. 2007; Kuris et al. 2007).

Larva: Larval development in *H. nudus* proceeds via a series of zoea (five total) and megalopa stages, each marked by a molt. The zoea are planktotrophic and have large compound eyes and four spines: one each dorsal and rostral and two lateral (see Fig. 32, Puls 2001; Fig. 54.5, Martin 2014). The rostrum and dorsal spines are of equal length and the two lateral spines are shorter (Puls 2001). The first zoea has exospines on the telson, is approximately 1.2 mm (measured from tip of rostrum to tip of telson) and has lateral knobs on the second and third segments, where *H. oregonensis* has lateral knobs on only the second segment (Puls 2001). The larvae of *H. nudus* are also a bit larger and more robust than those of closely related *H. oregonensis* (Jaffe et al. 1987). The zoea of *Hemigrapsus* species and *P. crassipes* can be differentiated by body and eye size (Schlotterbeck 1976). *Hemigrapsus nudus* megalopae are rectangular and can be recognized by a posterior telson with setae (other than uropod setae) and a carapace that is 1.8 mm in length and 1.5 mm in width (Puls 2001).

Juvenile: A shallow depression is present along the frontal area, notches and lateral spines are not terribly sharp or clearly separated from the side. Eyes are large (Fig. 3) and dactyls are short with the dactyl of leg four quite flat (Carlton and Kuris 1975). Juveniles of both sexes with narrow abdomens.

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: An herbivore and detritivore that ingests algae infrequently (Kozloff 1993). Individuals forage in large numbers on the tops of rocks and stomach contents reveal amphipods and other crustaceans provide a small part of the diet (Knudsen 1964).

Predators: Fish, raccoons and probably blue herons. Also predated by *Pachygrapsus* (on newly molted animals).

Behavior: Although shore crabs are generally believed to be fast moving (Wicksten 2011), *H. nudus* is rather sluggish and sometimes feigns death when disturbed (Hiatt 1948; Kuris et al. 2007). *Hemigrapsus nudus* is a nocturnal feeder (Garth and Abbott 1980) and males are more aggressive than females, fighting when attacked. Females, on the other hand, autotomize easily in order to escape (Knudsen 1964).

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