
Hemigrapsus oregonensis

A hairy shore crab

Phylum: Arthropoda, Crustacea
Class: Malacostraca
Order: Decapoda
Section: Brachyura
Family: Varunidae

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 where some authors still refer to them as members of the Grapsidae *sensu lato* (Ng et al. 2008; Wicksten 2012) 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. oregonensis* is *Pseudograpsus oregonensis* (Wicksten 2012), which is not currently used.

Description

Size: Carapace 34.7 mm in width and 28.4 mm in length (Rathbun 1918; Wicksten 2012) (Fig. 1). The carapace of reproductive individuals measures approximately 50 mm (Puls 2001).

Color: Dull brownish green, gray to uniform light gray or muddy yellow with no red spots on chelipeds (compare *H. nudus*, Plate 21, Kozloff 1993; Kuris et al. 2007). Nearly white or yellow forms of both *Hemigrapsus* species have been reported (Ricketts and Calvin 1971; Wicksten 2012).

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 and orbits moderately sized (Rathbun 1918) and eyes at antero-lateral angle (Fig. 2).

Antennae:

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: Rectangular or square in shape and wider than long with rounded antero-lateral margins. Carapace surface is smooth and bears three teeth (two lateral that are posterior to postorbital) (Wicksten 2012) on antero-lateral margin, no transverse lines (Fig. 1).

Frontal Area: Less than half the width of the carapace with two prominent frontal lobes and deep median sinus (Wicksten 2012). Frontal margin without teeth (*Hemigrapsus*, Kuris et al. 2007).

Teeth: Two lateral carapace teeth, with deep sinuses, below outer orbital tooth (Fig. 2).

Pereopods: More or less hairy (compare to *H. nudus*) (Fig. 1).

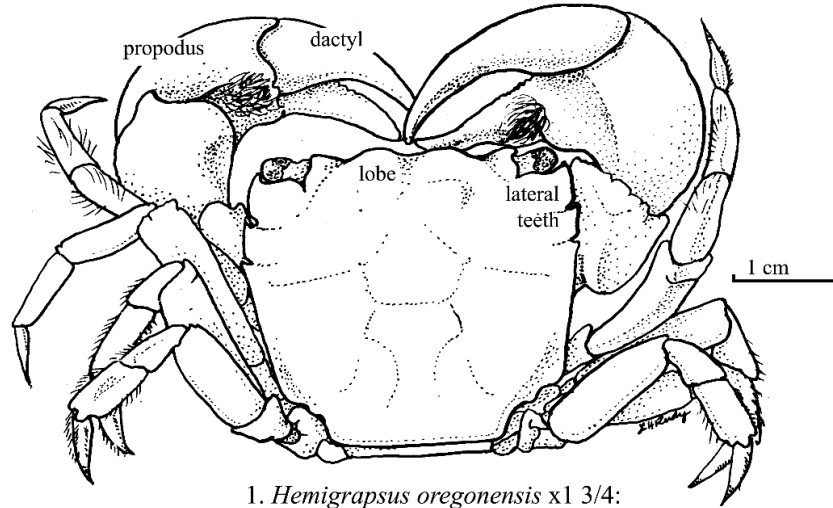
Chelipeds: Stout and equal or almost equal in size. Dactyls hollowed in shallow groove and male with mat of fine hair on propodus.

Abdomen (Pleon): Females with wide abdomen and male *H. oregonensis* have narrow abdomens that exposes the sternum at the base (see **Sexual Dimorphism**, Fig. 3).

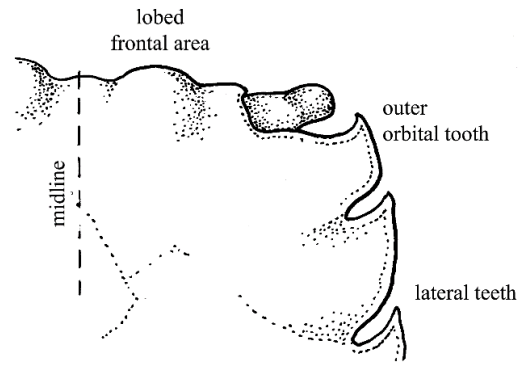
Telson & Uropods:

Sexual Dimorphism: Male and female brachyuran crabs are easily differentiable. The most conspicuous feature, the abdomen,

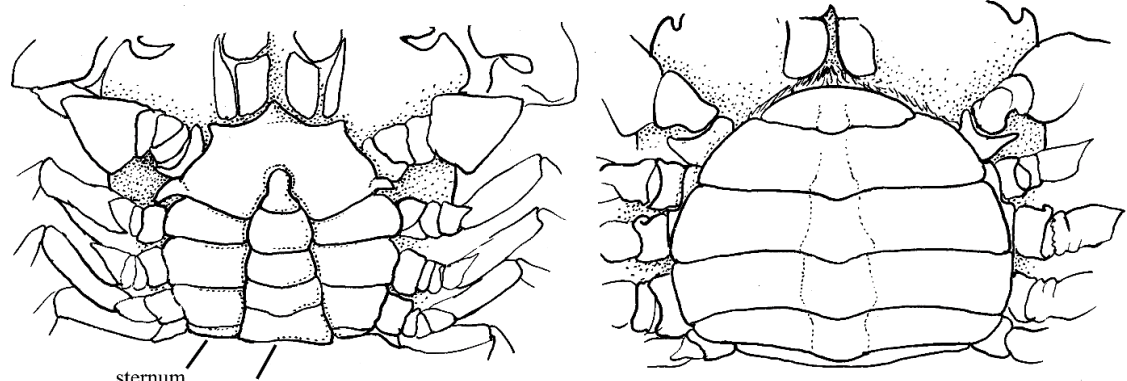
Hemigrapsus oregonensis



1. *Hemigrapsus oregonensis* x1 3/4:
actual size 32 mm; patch of fine hair
on male chela; legs hairy; carapace
quadrate, smooth; frontal area: two lobes.



2. Carapace (right frontal):
eyes moderate, at antero-lateral
angles; two deep lateral teeth.



3. Carapace (ventral view)

a. Male:
abdomen narrow, sternum visible at sides.

b. Female:
abdomen wide, sternum not visible.

is narrow and triangular in males while it is wide and flap-like in females (Brachyura, Kuris et al. 2007). Male *H. oregonensis* have a narrow abdomen that exposes the sternum (Fig. 3) and hairy chelipeds. Females have a wide abdomen and no hairy patch on palm (only a few bristles).

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 2012). The genus *Hemigrapsus* may now be 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 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 harrisi*, an introduced xanthid (Panopeidae) mud crab, is sometimes found with *H. oregonensis*. 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. Known range includes Alaska to Baja California, Mexico (Wicksten 2012).

Local Distribution: Common in many Oregon bays including Yaquina, Siletz, Tillamook, Netarts, Coos and Coquille (Ricketts and Calvin 1971).

Habitat: Quiet water, rocky habitats within estuaries, gravel shores but prefers muddy habitats (Ricketts and Calvin 1971) and salt marshes. On muddy bottoms of estuaries and on eelgrass and amongst *Enteromorpha*. Also in muddy spots on the open rocky coast. The two *Hemigrapsus* species can co-occur, but one usually finds one or the other and *H. oregonensis* prefers quieter water than does *H. nudus* (Kozloff 1993).

Salinity: *Hemigrapsus oregonensis* tolerates salinity ranging from 17.5–31.6 (San Francisco, California), likes freshwater seeps (Garth and Abbott 1980) and cannot tolerate much desiccation.

Temperature: Small animals most tolerant to temperature extremes (Todd and Dehnel 1960).

Tidal Level: Found at very high and very low tide levels, but usually lower intertidal than *H. nudus* (Todd and Dehnel 1960). Individuals can be found at higher tidal reaches of the mudflats (Ricketts and Calvin 1971) and mid to low intertidal of bays as well as sublittorally (Kuris et al. 2007).

Associates: *Hemigrapsus oregonensis* has many associates. In gravel, isopods *Idotea* and *Gnorimosphaeroma*, and occasionally *H. nudus* (Kozloff 1993). Alga *Ulva* (sublittorally), and pickleweed, *Salicornia* (in marshes) (Kuris et al. 2007; Wicksten 2012). The parasitic castrating isopod, *Portunio conformis*, is sometimes within the perivisceral cavity of *H. oregonensis* (Garth and Abbott 1980) with infection rates up to 40% (Jaffe et al. 1987; Kuris et al. 2007).

Hemigrapsus oregonensis, *H. nudus* and *P. crassipes* can all be host to the nemertean egg predator, *Carcinonemertes epialti*, 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: In great numbers, benthically, in estuaries and usually common on gravelly substrates (Wicksten 2012).

Life-History Information

Reproduction: In Vancouver, Canada, females are ovigerous in March and hatch in May, while in Puget Sound, Washington, they are ovigerous earlier (in Feb–April) and hatch between May and July. Broods include 800–11,000 embryos and 70% of females produce a second brood that will hatch in September. Embryos change color as they mature from white to purple to brown before they hatch at which time they are approximately 300–400 µm in diameter (Jaffe et al. 1987). In the lab, hatching occurs after 44 days (10–12°C, 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 *H. nudus*, *Pachygrapsus crassipes* (Roe et al. 2007). Interestingly, it may be more common on *H. oregonensis* than *P. producta*, for which it was described (Kuris 1993; Kuris et al. 2007).

Larva: Larval development in *H. oregonensis* proceeds via a series of zoea (five total) and megalopae 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 1.1 mm (measured from tip of rostrum to tip of telson) and has lateral knobs on the second segment only, where *H. nudus* has lateral knobs on the

second and third segments (Puls 2001). The larvae of *H. oregonensis* are also a bit smaller and more slender than that of the closely related *H. nudus* (Jaffe et al. 1987). The zoea of *Hemigrapsus* species and *P. crassipes* can be differentiated by body and eye size (Schlotterbeck 1976). *Hemigrapsus oregonensis* megalopae are rectangular and can be recognized by a posterior telson without setae (other than uropod setae) and a carapace that is 1.4–1.7 mm in length and 1.1–1.3 mm in width. The first in-star stage is reached after approximately 4–5 weeks (Puls 2001).

Juvenile: Very small animals have a marked frontal notch and sharp lateral spines and long dactyls on walking legs (1–3) (Smith and Carlton 1975). Juveniles in both sexes have 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 autonomized (Kuris et al. 2007).

Food: Primarily an herbivore, scraping *Ulva* or *Enteromorpha* off rocks, *H. oregonensis* uses tactile, visual and chemical sense to find food (Knudsen 1964; Kozloff 1993).

Predators: Birds (e.g. willet, Rathbun 1918).

Behavior: A moderately active species that is a good digger and probably nocturnal (Knudsen 1964; Garth and Abbott 1980; Kuris et al. 2007).

Bibliography

1. DE GRAVE, S., N. D. PENTCHEFF, S. T. AHYONG, T. CHAN, K. A. CRANDALL, P. C. DWORSCHAK, D. L. FELDER, R. M. FELDMANN, C. FRANSEN, L. Y. D. GOULDING, R. LEMAITRE, M. E. Y. LOW, J. W. MARTIN, P. K. L. NG, C. E. SCHWEITZER, S. H. TAN, D. TSHUDY, and R. WETZER. 2009. A classification of living and fossil

- genera of decapod crustaceans. Raffles Bulletin of Zoology:1-109.
2. GARTH, J. S., and D. P. ABBOTT. 1980. Brachyura: The true crabs, p. 594-630. *In: Intertidal invertebrates of California*. R. H. Morris, D. P. Abbott, and E. C. Haderlie (eds.). Stanford University Press, Stanford, CA.
 3. KNUDSEN, J. W. 1964. Observations of the reproductive cycles and ecology of the common Brachyura and crablike Anomura of Puget Sound, Washington. *Pacific Science*. 18:3-33.
 4. KOZLOFF, E. N. 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.
 5. KURIS, A. M. 1993. Life cycles of nemerteans that are symbiotic egg predators of decapod crustacea: adaptations to host life histories. *Hydrobiologia*. 266:1-14.
 6. KURIS, A. M., P. S. SADEGHIAN, J. T. CARLTON, and E. CAMPOS. 2007. Decapoda, p. 632-656. *In: The Light and Smith manual: intertidal invertebrates from central California to Oregon*. J. T. Carlton (ed.). University of California Press, Berkeley, CA.
 7. MARTIN, J. W. 2014. Brachyura, p. 295-310. *In: Atlas of crustacean larvae*. J. W. Martin, J. Olesen, and J. T. Høeg (eds.). Johns Hopkins University Press, Baltimore, MD.
 8. NG, P. K. L., D. GUINOT, and P. J. F. DAVIE. 2008. Systema brachyurorum: Part I. Annotated checklist of the extant Brachyuran crabs of the world. *Raffles Bulletin of Zoology Supplement*. 17:1-286.
 9. NYBLADE, C. F. 1987. Phylum or Subphylum Crustacea, Class Malacostraca, Order Decapoda, Anomura, p. 441-450. *In: Reproduction and development of marine invertebrates of the northern Pacific coast*. M. F. Strathmann (ed.). University of Washington Press, Seattle, WA.
 10. PULS, A. L. 2001. Arthropoda: Decapoda, p. 179-250. *In: Identification guide to larval marine invertebrates of the Pacific Northwest*. A. Shanks (ed.). Oregon State University Press, Corvallis, OR.
 11. RATHBUN, M. J. 1918. The grapsoid crabs of America. *Bulletin of the United States Natural Museum*. 97:128-145.
 12. RICKETTS, E. F., and J. CALVIN. 1971. *Between Pacific tides*. Stanford University Press, Stanford, California.
 13. ROE, P., J. L. NORENBURG, and S. MASLAKOVA. 2007. Nemertea, p. 221-233. *In: Light and Smith manual: intertidal invertebrates from central California to Oregon*. J. T. Carlton (ed.). University of California Press, Berkeley, CA.
 14. RUPPERT, E. E., R. S. FOX, and R. D. BARNES. 2004. *Invertebrate zoology: a functional evolutionary approach*. Thomson Brooks/Cole, Belmont, CA.
 15. SCHLOTTERBECK, R. E. 1976. Larval development of the lined shore crab, *Pachygrapsus crassipes* Randall, 1840. (Decapod: Brachyura: Grapsidae) reared in the laboratory. *Crustaceana*. 30:184-200.
 16. SCHUBART, C. D. 2011. Reconstruction of phylogenetic relationships within Grapsidae (Crustacea: Brachyura) and comparison of trans-isthmian versus amphi-atlantic gene flow based on mtDNA. *Zoologischer Anzeiger*. 250:472-478.
 17. SCHUBART, C. D., J. A. CUESTA, R. DIESEL, and D. L. FELDER. 2000. Molecular phylogeny, taxonomy, and evolution of non-marine lineages within the American grapsoid crabs (Crustacea: Brachyura). *Molecular Phylogenetics and Evolution*. 15:179-190.
 18. SHIELDS, J. D., and A. M. KURIS. 1988. Temporal variation in abundance of the egg predator *Carcinonemertes epialti* (Nemertea) and its effect on egg mortality of its host, the shore crab, *Hemigrapsus oregonensis*. *Hydrobiologia*. 156:31-38.

19. SMITH, R. I., and J. T. CARLTON. 1975. Light's manual: intertidal invertebrates of the central California coast. University of California Press, Berkeley.
20. SYMONS, P. E. K. 1964. Behavioral responses of the crab *Hemigrapsus oregonensis* to temperature, diurnal light variation, and food stimuli. *Ecology*. 45:580-591.
21. TODD, M., and P. A. DEHNEL. 1960. Effect of temperature and salinity on heat tolerance in two grapsoid crabs, *Hemigrapsus nudus* and *Hemigrapsus oregonensis*. *Biological Bulletin*. 118:150-172.
22. VON STERNBERG, R., and N. CUMBERLIDGE. 1998. Taxic relationships within the Grapsidae (MacLeay, 1838) (Crustacea: Decapoda: Eubrachyura). *Journal of Comparative Biology*. 3:115-136.
23. WICKSTEN, M. K. 2011. Decapod crustacea of the Californian and Oregonian Zoogeographic Provinces. <http://escholarship.org/uc/item/7sk9t2dz>. Scripps Institution of Oceanography, UC San Diego, San Diego, CA.