Crangon franciscorum

Common gray shrimp

Phylum: Arthropoda, Crustacea

Class: Multicrustacea, Malacostraca, Eumalacostraca

Order: Eucarida, Decapoda, Pleocyemata, Caridea

Family: Crangonoidea, Crangonidae

Taxonomy: Schmitt (1921) described many shrimp in the genus *Crago* (e.g. *Crago franciscorum*) and reserved the genus *Crangon* for the snapping shrimp (now in the genus *Alpheus*). In 1955–56, the International Commission on Zoological Nomenclature formally reserved the genus *Crangon* for the sand shrimps only. Recent taxonomic debate revolves around potential subgeneric designation for *C. franciscorum* (*C. Neocrangon franciscorum*, *C. franciscorum franciscorum*) (Christoffersen 1988; Kuris and Carlton 1977; Butler 1980; Wicksten 2011).

Description

Size: Average body length is 49 mm for males and 68 mm for females (Wicksten 2011).

Color: White, mottled with small black spots, giving gray appearance.

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 body is laterally compressed and shrimp-like in the Caridea. The abdomen and associated appendages are outstretched and the abdomen usually has a sharp bend (Kuris et al. 2007).

Cephalothorax:

Eyes: Eyes small, pigmented and not covered by carapace (Wicksten 2011).

Antenna: Antennal scale (scaphocerite) with spine longer than blade (Fig. 2). Stylocerite (basal, lateral spine on antennule) longer than first antennule peduncle segment (Wicksten 2011). Inner flagellum of the first antenna is greater than twice as long as the outer flagellum (Kuris et al. 2007) (Fig. 2).

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). Third maxilliped setose and with exopod in *C. franciscorum* and *C. alaskensis* (Wicksten 2011).

Carapace: Thin and smooth, with a single medial spine (compare to *Lissocrangon* with no gastric spines). Also lateral (Schmitt 1921) (Fig. 1), hepatic, branchiostegal and pterygostomian spines (Wicksten 2011).

Rostrum: Rostrum straight and upturned (*Crangon*, Kuris and Carlton 1977). Short, flattened, rounded (Fig. 2) and unornamented. Rostrum length reaching or exceeding the cornea of the eye (Wicksten 2011).

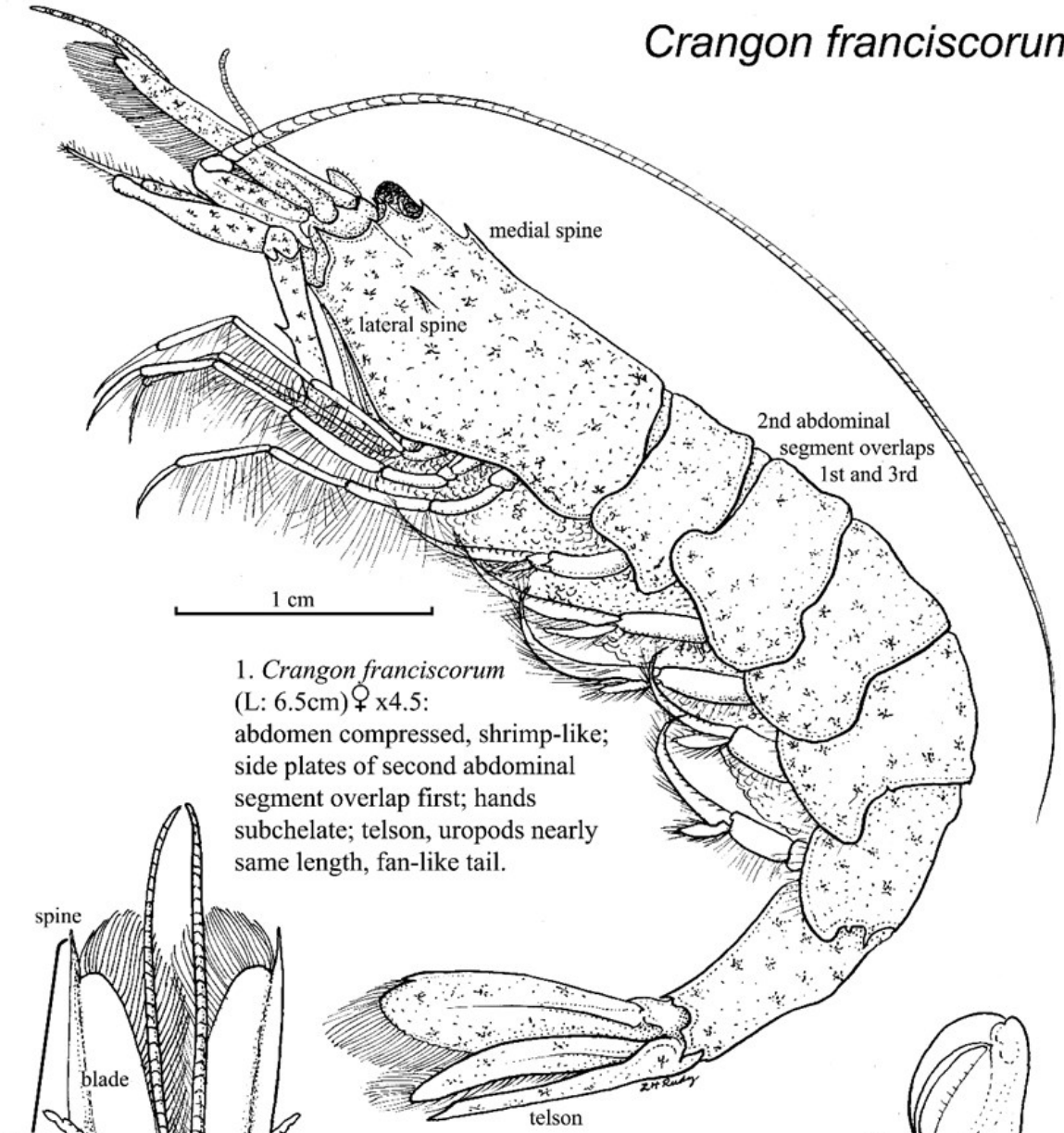
Teeth:

Pereopods: Inner spine on merus of first pereopod, hand of subchela elongate and dactyl closes longitudinally (versus obliquely) against inner spine. Second to fifth pereopod morphology as follows: second pereopod slender and chelate; third slender and with simple dactyl; fourth and fifth larger than third and bearing setae, also with simple dactyls (Wicksten 2011).

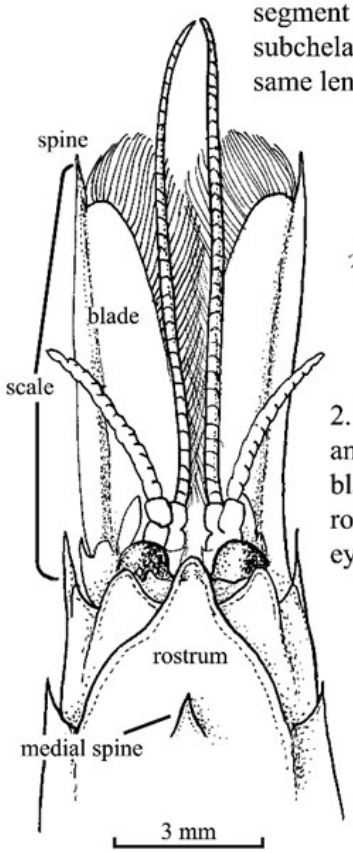
Chelipeds: Subchelate. Dactyl almost parallel to hand (Plate 319A, Kuris et al. 2007) (Fig. 3).

Abdomen (Pleon): Shrimp-like, with typical

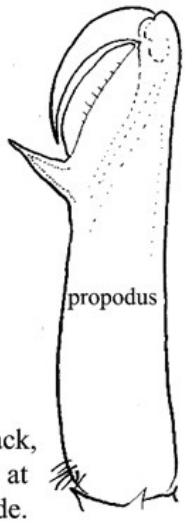
Crangon franciscorum



1. *Crangon franciscorum*
(L: 6.5cm)♀ x4.5:
abdomen compressed, shrimp-like; side plates of second abdominal segment overlap first; hands subchelate; telson, uropods nearly same length, fan-like tail.



2. Head x8:
antennal scale 3/4 length of carapace; blade broad, rounded; spine long; rostrum short, flattened; rounded; eyes free; carapace with medial spine.



3. First cheliped:
hand slender, finger turned back, nearly longitudinal; propodus at least four times as long as wide.

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caridean bend, the second segment overlaps the first (Fig. 1). Male abdomen narrow (see **Sexual Dimorphism**). Bears rounded pleura and fifth segment with postero-lateral spine. Morphology of the sixth abdominal segment is taxonomically significant—in *C. franciscorum*, the sixth segment is slender, with postero-ventral spine and ventral groove (Wicksten 2011).

Telson & Uropods: Telson shorter than uropods. Telson is narrow and with two pairs of lateral spines, acute apex (Wicksten 2011).

Sexual Dimorphism: Females often have broader and larger bodies than males, which have compressed and squat bodies (Wicksten 2011). See also variations in endopod morphology (Fig. 4, Siegfried 1989).

Possible Misidentifications

The family Crangonidae is characterized by first pereopods that are subchelate and second pereopods (if present) that are slender and equal in size, each with unsegmented carpus. Other characters include chela dactyls that close horizontally across the end of the propodus ("like the blade of a pocket knife" Wicksten 2011), a rostrum that is small and without spines and a body that is squat and somewhat depressed (although it can be broad in ovigerous females) (Wicksten 2011).

Three crangonid genera were revised in 1977 by Kuris and Carlton: *Lissocrangon*, *Crangon* and *Neocrangon.* Members of the two former genera are found locally. These genera can be differentiated by carapace spination: *Lissocrangon* lacks gastric spines; *Crangon* has one median gastric spine; and *Neocrangon* (*Mesocrangon, M. munitella,* locally) has two gastric spines.

Besides lacking gastric spines, *Lissocrangon* species have a long, narrow and sharply recurved rostrum, a telson that is shorter than the uropods and a sixth abdominal segment without a pair of dorsal carinae (keel-like ridges). This genus is monotypic, the only known member is *L. stylirostris* (Kuris and Carlton 1977; Kuris et al. 2007).

Crangon species have a straight and upturned rostrum and a telson that is of equal length or longer than uropods. The genus is divided into groups (i.e. subgenera, Kuris and Carlton 1977) based on characters of the sixth abdominal segment. In the first group, the sixth abdominal segment is smooth and lacks dorsal carinae (instead of two distal carinae). This group is further split based on a sulcate or convex sixth abdominal segment ventrum. The so-called "smooth, sulcate species group" (Kuris and Carlton 1977) includes all local *Crangon* species, *C. alaskensis*, *C. franciscorum*, *C. handi*, *C. nigricauda* and *C. nigromaculata*.

Crangon nigricauda, the black tailed shrimp, has an antennal blade and spine of nearly equal length and cheliped fingers that close almost transversely. *Crangon nigromaculata* has a striking round marking on the side of the sixth abdominal segment, its fingers also close transversely, and its range may not extend north to Oregon. *Crangon handi*, from the outer coast, has a very short, stout antennal scale, and a short sixth abdominal segment (Kuris and Cartlon 1977). *Crangon alaskensis* is a small shrimp, with a slender rostrum, and lacks *C. franciscorum*'s very long propodus. *Crangon franciscorum* can further be differentiated from *C. alaskensis* by the chela dactyl that is almost parallel to the hand (Plate 319A, Kuris et al. 2007) rather than at a 45˚ angle. Furthermore, *C. franciscorum* has a spine on the postero-dorsal corner of the fifth abdominal segment and an inner flagellum of the first antenna that is more than two times as long as the outer (Plate 316A, Kuris et al. 2007). Butler calls this species *Crangon franciscorum franciscorum*, to distinguish it from *C.f. angustimana* Rathbun 1902, the

long-clawed *Crangon* (Butler 1980). This latter species lives in deeper water, and within a narrower range of temperatures than does *C. f. franciscorum* (Butler 1980).

Ecological Information

Range: Type locality is San Francisco Bay, California. Known range includes Resurrection Bay, Alaska to San Diego, California (Schmitt 1921; Wicksten 2011).
Local Distribution: Yaquina Bay; South Slough (Collver Point, channel) (Krygier and Horton 1975).
Habitat: Shallow water in bays and estuaries with soft substrate. In bay channel with muddy and rocky substrate, also offshore in deeper water (Kuris et al. 2007; Wicksten 2011).
Salinity: Euryhaline and collected at 30, with salinity range from 0.2–34.4 (Krygier and Horton 1975; Wahle 1985; Wicksten 2011; Campos et al. 2012).
Temperature: Great toleration of temperature variation (e.g. 5–25˚C, Campos et al. 2012) prefers warmer water than *C. nigricauda* (Krygier and Horton 1975).
Tidal Level: Intertidal to 91 m (Schimitt 1921; Wicksten 2011).
Associates: Collected in a trawl with *Cancer jordani*, *Hermissenda* sp., *Rostanga pulchra*, and other sponges. Can be infested with Bopyrid isopod *Argeia pugettensis* (Butler 1980). This isopod is found next to the branchial chamber in many crangonids and forms a conspicuous bulge in the carapace (see Plate 19, Kozloff 1993; Wicksten 2011). The crangonid shrimps *L. stylirostris* and *Crangon franciscorum* may also be infected with the microspordium parasite *Pleistophora crangoni,* which occurs within their skeletal musculature (Breed and Olson 1977). *Crangon franciscorum* individuals can also be infected with chitinoclastic bacteria that causes bacterial shell disease (*Vibrio* spp. and *Pseudomonas* sp.). This type of bacterial infection causes the exoskeleton to be darkened, cracked and amorphous, with underlying tissue lesions (Arnold and Hendrickson 1997).
Abundance: Common to abundant (Kuris et al. 2007).

Life-History Information

Reproduction: Many crangonid shrimp species are considered gonochoristic, but evidence suggests that some species exhibit protandry (Bauer 2004). Identifying ovigerous females is easy as female crangonid shrimp carry eggs, which are attached with between the joints and rami of the inner pleopods, under the abdomen and spawning has been observed almost year-round (Siegfried 1989). Ovigerous females collected from Dec–May, June or August and hatching reported from early spring to summer (San Francisco Bay, California, Israel 1936; Yaquina Bay, Oregon, Krygier and Horton 1975; Strathmann 1987; Campos et al. 2012) during periods or in locations of high salinity (Israel 1936). A spawning migration was described by Krygier and Horton where ovigerous females moved to more haline and deeper water prior to spawning (1975). *Crangon franciscorum* exhibits protandric hermaphroditism where males and females can switch from one sex to another and associated morphological changes can be observed (e.g. shape of pleopod morphology) (Gavio et al. 1994; Gavio et al. 2006).
Larva: In caridean shrimp species development proceeds through several zoea larval stages (Konishi 2000; Guerao and Cuesta 2014). Crangonid zoea are characterized by a wide rostrum, hemispherical eyestalks, antennule bases that touch, unsegmented antennule scales with inner flagellum having a setose spine, an exopod present on pereopod one (not 3–5), which is subchelate and a telson that widens posteriorly (see Fig. 48.1, Guerao and Cuesta 2014; Puls 2001). Larval

stages occur in the plankton and earliest post-larval shrimp found in brackish water of shallow tidal flats—mature animals move into deeper water (Israel 1936).

Juvenile:

Longevity: Females live a maximum 1 1/2 years and males up to one year (Krygier and Horton 1975; Gavio et al. 2006).

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). Differential growth rate in C. franciscorum is large between females and males and juvenile growth ranged from 0.76–1.37 mm per week (Oregon, Krygier and Horton 1975).

Food: The diets of co-occurring crangonid species, *Crangon franciscorum* and *C. nigricauda*, have been described (Wahle 1985). Individuals feed on small invertebrates (e.g. *Neomysis mercedis*, Sitts and Knight 1979; amphipods, bivalves, Wahle 1985) and, in the Columbia River estuary *C. franciscorum* accounted for a high proportion of the total suspended particle consumption (Simenstad et al. 1990).

Predators: Demersal fishes, Dungeness crabs and harbor seals (Wicksten 2011). Commercially harvested in San Francisco Bay, California for bait with *L. stylirostris*, *C. nigricauda* and *C. nigromaculata* (Israel 1936). Annual catches ranged from 320,000 – 1,360,000 kg (1940–1957) to 2,300–25,000 kg (1980s) per year (Chace and Abbott 1980).

Behavior: Benthic shrimp that dig in the sand and remain hidden with only their eyes and antennae visible (Wicksten 2011).

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