Heptacarpus sitchensis

A broken back shrimp, glass shrimp

Phylum: Arthropoda, Crustacea
Class: Malacostraca
Order: Decapoda
Section: Caridea
Family: Thoridae

Taxonomy: A re-examination of 263 preserved specimens revealed that *H. pictus,* previously considered a different species, is a junior synonym of *H. sitchensis* based the presence of epipods on the first and second pereopods and third maxillipeds (Wicksten et al. 1996; Wicksten 2011). Local *Heptacarpus* species were also briefly considered to be in the genus *Spirontocaris*, however members of the latter genus have two or more supraorbital spines (rather than only one in *Heptacarpus*) (Wicksten 2011). Additional synonyms for *Heptacarpus sitchensis* include *S. picta*, *S. sitchensis*, and *H picta*.

Description

Size: Individuals 16 mm (males) to 28 mm (females) in length (Wicksten 2011). This specimen (from South Slough of Coos Bay) is 15 mm long.

Color: Transparent, with orange or brown lines (longitudinal stripes), green at leg bases and black eyes (Chace and Abbott 1980; Wicksten 2011). Adult color patterns arise from chromatophores under the exoskeleton and are related to the age and sex of the individual (e.g. mature and breeding females have prominent color patterns) (Bauer 1981). Five morphs were described by Bauer (1981) for both *H. sitchensis* and *H. paludicola*, including four color morphs and one transparent morph. The most extreme variation in color was seen in *H. sitchensis*. Adults may exhibit camouflaging colors based on surrounding algae (Bauer 1981), but color patterns may be more or less fixed (genetically) and variably expressed in different environments (Bauer 1984a).

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**) (Kuris et al. 2007). The abdomen and associated appendages are outstretched in *Heptacarpus* species and the abdomen usually has a sharp bend ("broken-back shrimp" Kozloff 1993).

Cephalothorax:

Eyes:

Antennae: First segment of the antennular peduncle bears spine and stylocerite (basal, lateral spine on antennule) meets or exceeds the length of the first segment (Wicksten 2011) (Fig. 4).

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 without exopodite and with epipods (Schmitt 1921; Wicksten 2011).

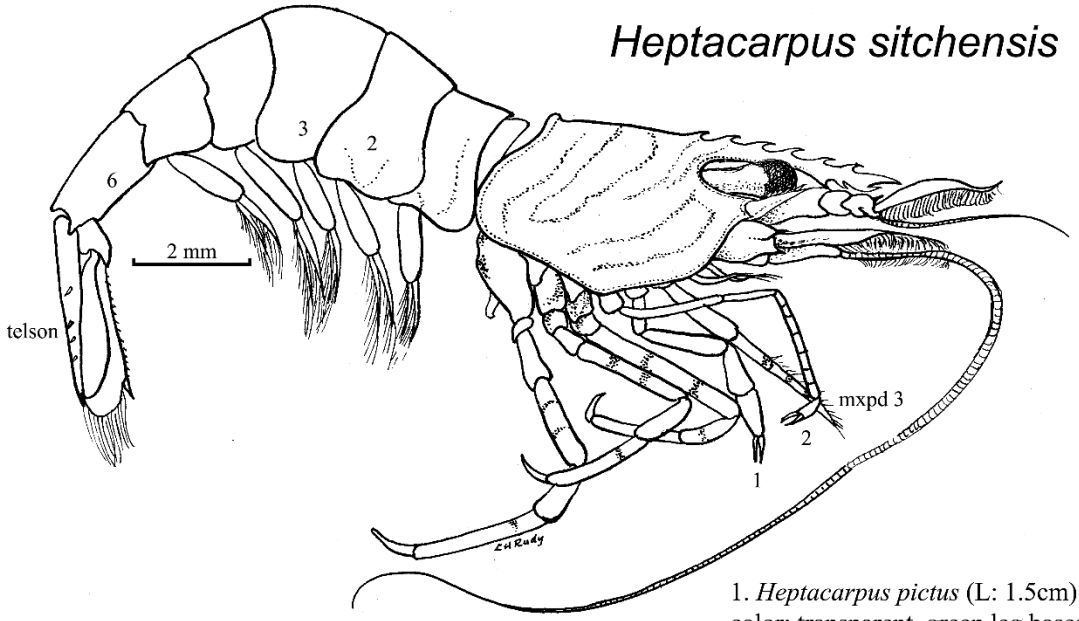
Carapace: No supraorbital or other spines (*Heptacarpus*).

Rostrum: Well developed and shorter than carapace, barely exceeding the length of the antennular peduncle (Fig. 4). Rostral teeth are slender and close together (Schmitt 1921) and include both dorsal (4–8, seven in present specimen, Fig. 1) and ventral (0–5, three in present specimen, Fig. 1) teeth (Fig. 1) (Wicksten 2011).

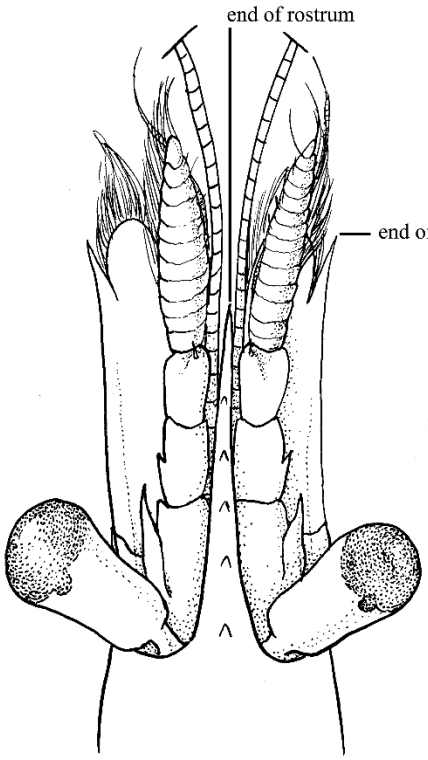
Teeth: Rostral teeth present (see **Rostrum**).

Pereopods: Epipods present on pereopods 1–2. Epipod morphology is particularly relevant to the genus *Heptacarpus* and species with a higher number are considered ancestral to the group (Bauer 1984b). Pereopods 3–5 have bifid dactyls and are thick and bear spines (merus of pereopod three with 0–9 spines; pereopods four and five with 0–5 spines) (Fig. 3) (Wicksten 2011).

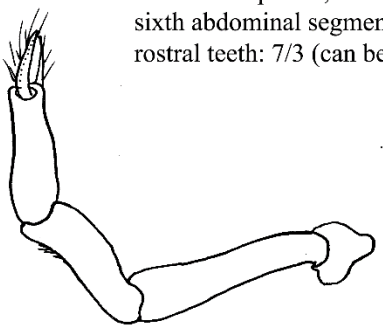
Heptacarpus sitchensis



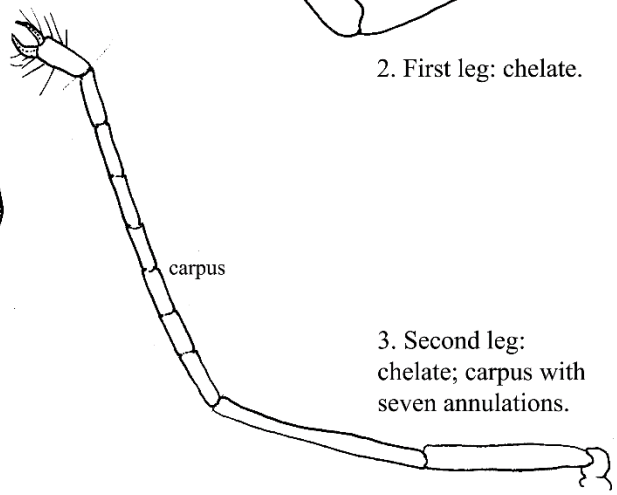
1. *Heptacarpus pictus* (L: 1.5cm) x10: color: transparent, green leg bases, red striped legs, carapace; third maxilliped without exopodite; telson longer than sixth abdominal segment; rostral teeth: 7/3 (can be 4-8/0-5).



4. Frontal region (dorsal view): rostrum narrow at eyes; rostrum more than half length of scale, but not to the end; rostrum (from posterior of orbit) shorter than carapace.



2. First leg: chelate.



3. Second leg: chelate; carpus with seven annulations.

Hiebert, T.C. 2015. *Heptacarpus sitchensis. 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.

Chelipeds: Equal and chelate (Fig. 2).

Abdomen (Pleon): Shrimp-like, with fan tail, and laterally compressed body. The side plates of the second segment overlap those of the first with sharp bend. The third segment is without hump and the sixth segment is shorter than telson (Fig. 1). Pleura of segments 1–3 are rounded and segments 4–5 bear a postero-lateral tooth (Wicksten 2011).

Telson & Uropods: Telson bears 4–5 pairs of dorso-lateral spines (Wicksten 2011).

Sexual Dimorphism: Females often have broader and larger bodies than males, which have compressed and squat bodies (Wicksten 2011). It is unknown if carapace spines are consistently sexually dimorphic, but male *H. sitchensis* appear to differ from females in that they lack a pterygostomian spine. In fact, this character once defined the two species *H. littoralis* (lacking pterygostomian spine) and *H. sitchensis* (bearing pterygostomian spine), until recent evidence revealed that *H. littoralis* was simply male *H. sitchensis* individuals (Stamatious and Jensen 2004).

Possible Misidentifications

The family Hippolytidae was split into three families in a cladistic analysis by Christoffersen (1987) that are currently recognized by some (Wicksten 2011), but not all authors (e.g. Kuris et al. 2007). These three families include the Lysmatidae, Hippolytidae and Thoridae. The Lysmatidae are characterized by very long antennular flagella. The three families can further be divided by the number of carpal articles on the second pereopod: 22 or more in Lysmatidae, three in Hippolytidae and seven in Thoridae. In addition, Thoridae and Hippolytidae can be differentiated by their supraorbital spines, one in the latter and 0–4 in the former family (Wicksten 2011). The Lysmatidae is represented by a single species locally, *Lysmata californica* (Kuris et al. 2007; Wicksten 2011). When following the above taxonomy (Christoffersen 1987; Wicksten 2011), local members of the Hippolytidae include *Hippolyte californiensis* and *H. clarki.* Meanwhile, the genus *Heptacarpus*, with eleven local species, falls within the Thoridae as do the local species *Lebbeus lagunae* and *Spirontocaris prionota* (Kuris et al. 2007; Wicksten 2011).

Heptacarpus sitchensis is morphologically most similar to the green *Zostera* dweller *H. paludicola*, with a difference chiefly in the length of the rostrum. In *H. sitchensis*, the rostrum does not reach the end of the antennular peduncle, but in *H. paludicola* the rostrum reaches and often extends beyond the antennular peduncle (Wicksten 2011). Our *H. sitchensis* specimens were only 1.5 cm, half the size of the female *H. paludicola*. *Heptacarpus sitchensis* is the most commonly found transparent shrimp in tide pools (Ricketts and Calvin 1971), while *H. paludicola* is more common in mudflats and in eelgrass.

Heptacarpus taylori, also has a short rostrum, reaching just to the eye and is often brightly colored and with a series of teeth from anterior carapace margin to the apex. *Heptacarpus brevirostris*, with smooth rostrum (without lower teeth) that reaches only the first segment of the antennal peduncle. The merus of *H. brevirostris* has a single spine on pereopods 3–4. *Heptacarpus palpator*, is similar to *Heptacarpus brevirostris*, but with a longer rostrum that can be di- or trifid, and a longer antennal scale (Wicksten 1986). *Heptacarpus stimpsoni*, from Puget Sound, whose rostrum extends over eye (only slightly), with dorsal teeth and pereopod (3–5) dactyls that are simple and curved. *Heptacarpus carinatus* is a long-rostrumed shrimp, with distal rostral teeth (3–7 dorsal and 2–6 ventral) and epipods prsent on 1–3 pereopods. *Heptacarpus franciscanus*, from San Francisco Bay, has a rostrum longer than the the carapace. *Heptacarpus pugettensis, Heptacarpus flexus*, and *H. tenuissimus* have a hump on the third abdominal segment. *Heptacarpus pugettensis* has epipods on pereopods 1–2 and a rostrum that only just reaches the end of the first segment of antennular peduncle. *Heptacarpus flexus* is morphologically similar to H. carinatus, but with epipods on pereopods 1–2 only and a narrow rostrum with teeth (4–5 dorsal and 5–8 ventral). *Heptacarpus tenuissimus* lacks teeth on the ventrum of the fourth abdominal pleon as well as an epipod on the third

maxilliped (see dichotomous key in Wicksten 2011 for *Heptacarpus* species).

Ecological Information

Range: Type locality is Sitka, Alaska. Known range includes resurrection Bay, Alaska to Baja California, Mexico (Wicksten 2011).
Local Distribution: Coos Bay distribution near the Charleston Bridge in South Slough.
Habitat: Most commonly occurring, transparent shrimp in rock pools (Ricketts and Calvin 1971) and also in *Zostera* beds (South Slough mudflats) and on floats (Kuris et al. 2007).
Salinity: Collected at salinity 30.
Temperature:
Tidal Level: Collected from +0.15 m to 12 m depths, although rarely (Wicksten 2011).
Associates: Individuals often associated with a variety of polychaete species.
Abundance: Abundant to common (Kuris et al. 2007).

Life-History Information

Reproduction: Females ovigerous in May, June and September (Butler 1980; Puget Sound, Washington, Stamatiou and Jensen 2004). Males and females may be (weakly) attracted to each other with sex phermones (Bauer 1979), but copulation is generally only initiated after physical contact (Bauer 2011). Spermatophore deposition (from male pereopods 1–2) is beneath the first abdominal segment (Zhang and Lin 2004). Females produce multiple broods in one year, molting between broods (Chace and Abbott 1980). Little is known about the development in *Heptacarpus* species (Strathmann 1987; Puls 2001).
Larva: Larval development in *Heptacarpus* species proceeds via a series of zoea, and, a final, post-zoea (decapodid) stage, each marked by a molt (Puls 2001; Guerao and Cuesta 2014). The zoea are planktotrophic, have a narrow rostrum (without teeth), cylindrical eyestalks, antennule bases that are close together, and abdomen with postero-lateral spines (Puls 2001; see Fig. 48.3, Guerao and Cuesta 2014).
Juvenile:
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: The majority of caridean shrimps are omnivorous (Chace and Abbott 1980) and *H. sitchensis* individuals have an olfactory response to food, sensing food in nearby water (Bauer 2011).
Predators: Fish and sea spiders, in particular *Achelia simplissima* individuals as well as their egg masses (Burris 2011).
Behavior: Members of the genus *Heptacarpus* have been shown to exhibit body, gill and embryo grooming in response to microbial fouling and parasites. Grooming with specialized antennal brushes is found in members of the Stenopodidea, Caridea and Dendrobranchiata and suggests a common ancestor rather than evolutionary convergence (see Bauer 1989).

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