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A New Species of *Heptacarpus* from California, with a Redescription of *Heptacarpus palpator* (Owen) (Caridea: Hippolytidae)

Mary K. Wicksten

Department of Biology, Texas A&M University, College Station, Texas 77843-3258

Abstract.—A new species of *Heptacarpus,* a small shrimp marked with brown dots, is described. It ranges from Santa Rosa Island, California to Guadalupe Island, Mexico. Related to *H. palpator* and *H. brevirostris,* it can be distinguished from them by having only one large distal spine on the first segment of the antennular peduncle, and often having a spine at the distal end of the carpus of the first pereopod. *Heptacarpus palpator* is redescribed and better distinguished from *H. brevirostris. Heptacarpus palpator* ranges from Monterey Bay, California to the south, while *H. brevirostris* usually lives north of Monterey Bay.

Members of the family Hippolytidae, often called broken-back shrimp, are common inhabitants of tidepools, kelp beds, and rocky subtidal bottoms along the coast of California and northern Mexico. *Heptacarpus palpator* (Owen) and *H. brevirostris* (Dana) have been reported often from shallow areas along the coast of California (Schmitt 1921; Johnson and Snook 1955; Ricketts et al. 1968; Carlton and Kuris 1975; Word and Charwat 1976; Chace and Abbott 1980). However, there are only two keys that distinguish between these two species, that given by Schmitt (1921) and the one prepared by Word and Charwat (1976). Both distinguish between the two species on the basis of the length of the antennal scale to that of the telson: equal to the telson or shorter in *H. brevirostris,* or longer than the telson in *H. palpator.*

I tried to use the proportions of the antennal scale to the telson in identifying specimens of *Heptacarpus* spp. from the coast of California. This proved to be unsatisfactory. In many specimens labelled *H. palpator,* the telson was about 0.85× the length of the antennal scale. To distinguish between the species, careful, time-consuming measurement with calipers was necessary. Schmitt (1921) noted the variability in the rostra of the two species, but made no mention of other parts of the body that might be useful in distinguishing between them.

The original descriptions of *H. palpator* and *H. brevirostris* are very short. The descriptions and illustrations given by Schmitt (1921, as *Spirontocaris palpator* and *S. brevirostris*), and Word and Charwat (1976) also are not extensive. However, Butler (1980) redescribed *H. brevirostris* in detail, with a clear illustration. I was unable to locate the holotype of *H. palpator* for comparison.

To determine for myself the differences between *H. palpator* and *H. brevirostris,* I examined all the specimens designated as these species in the collections of the Allan Hancock Foundation (AHF), University of Southern California, totalling over 200 specimens from 97 stations. I also studied all the specimens of *H. palpator*

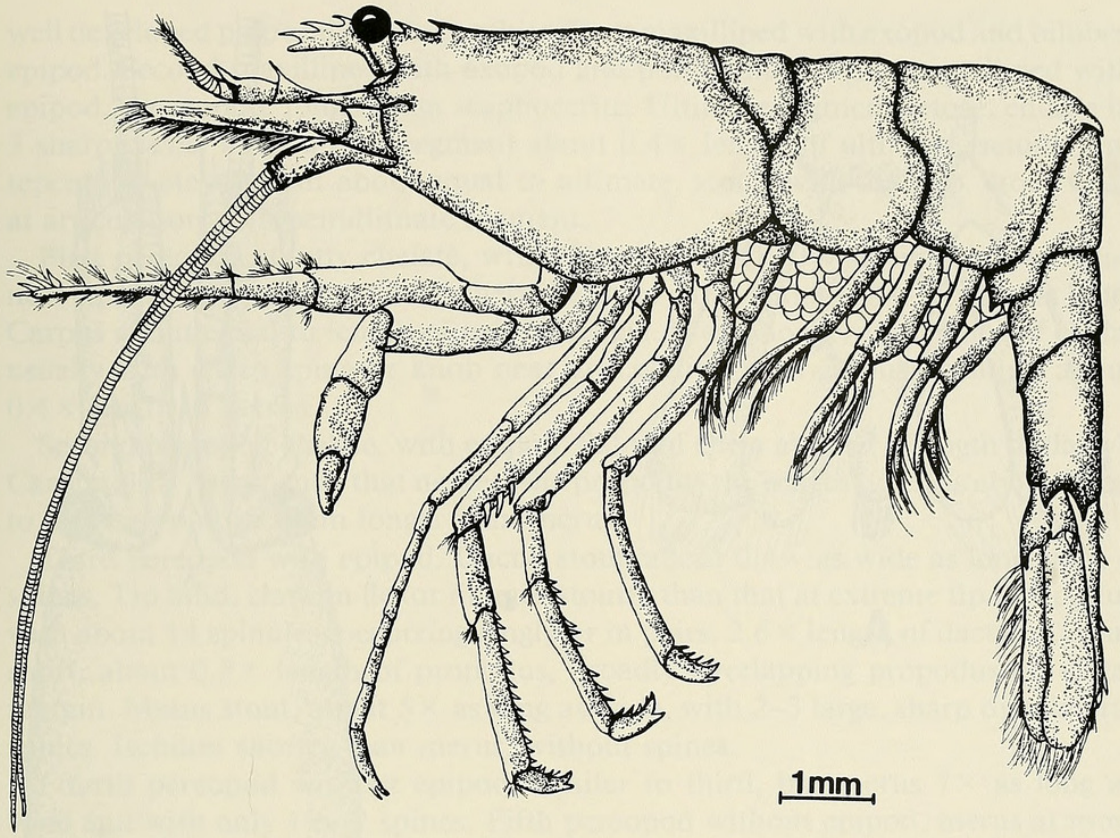

Fig. 1. *Heptacarpus fuscimaculatus.* Ovigerous female, total length in millimeters 14.9. Avalon Harbor, Santa Catalina Island, California; CAS Number 031713.

at the California Academy of Sciences (CAS) as well as specimens labelled *H. brevirostris* from south of San Francisco, a total of 32 specimens from 12 stations.

Comparison of all the specimens revealed differences between *H. palpator* and *H. brevirostris* in the rostrum, spines of the carapace, spines of the pereopods, and ranges in California. However, further examination of the series labelled *H. palpator* disclosed an undescribed species. The new species is described herein, and *H. palpator* is redescribed.

Heptacarpus fuscimaculatus new species
Figs. 1–2

Rostrum straight, with 1–3 (usually 2) spines on carapace and 2–3 spines on dorsal margin proper; 1 or no spines on lower surface. Tip single or bifid. In one specimen, second spine of carapace bifid. Rostrum slightly exceeding first segment of antennular peduncle.

Eyes shorter than rostrum, corneas round and pigmented.

Carapace with large antennal, prominent pterygostomial, and no branchiostegal spines.

Abdominal segments 1–3 rounded at margins. Faint notch of dorsal surface of second segment. Pleura of fourth segment rounded, each with marginal spine posterolaterally. Pleuron of fifth segment with prominent posterolateral spine. Sixth segment about 1.5 × length of fifth segment, with sharp spine on ventrolateral margin and on lateral margin at articulation with telson. Sixth segment slightly shorter than telson.

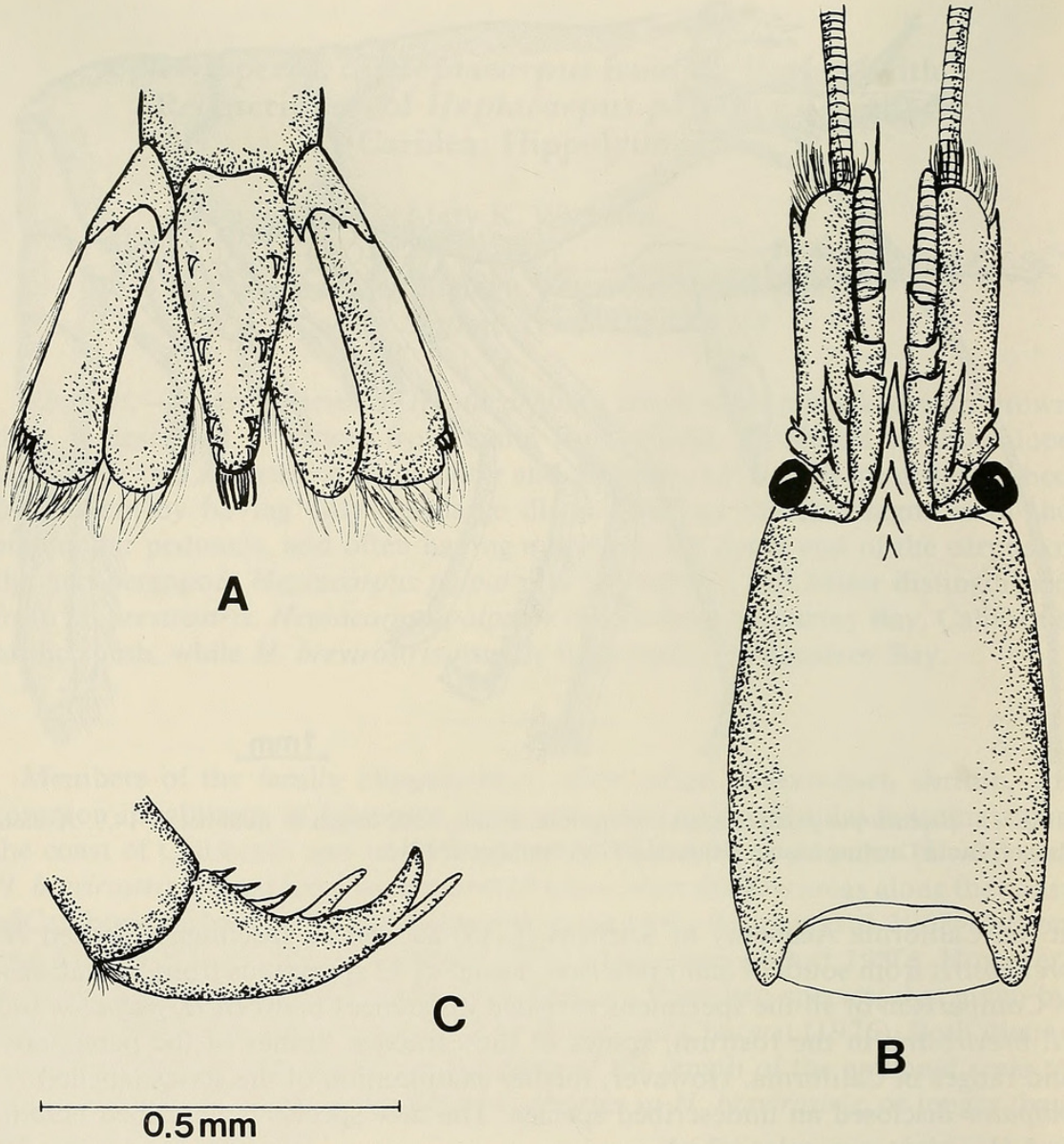

Fig. 2. *Heptacarpus fuscimaculatus.* A, telson and uropods; B, front in dorsal view; C, dactyl of third pereopod.

Telson shorter than uropods; with 3–5 pairs dorsolateral spines and 3 pairs terminal spines with straight setae.

First antenna with prominent, sharp-tipped stylocerite, reaching end of first segment of its peduncle. Latter with large, curved marginal spine, no spinules. Second segment about 0.33× length of first, with sharp terminal spine laterally. Third segment slightly shorter than second, with sharp terminal spine mesially. Inner flagellum stout, with about 12 segments and fringe of setae; outer slim, with at least 15 segments, but often broken during capture.

Second antenna with sharp lower spine on basicerite. Carpocerite about equal to second segment of antennular peduncle. Scaphocerite shorter than antennular flagella, 3× as long as broad; blade shorter than marginal spine, fringed with setae.

Mandible with palp. First maxilla with broad upper endite, small lower endite and bilobed palp. Second maxilla with small lower endite, bilobed upper endite,

well developed palp and scaphognathite. First maxilliped with exopod and bilobed epipod. Second maxilliped with exopod and podobranch. Third maxilliped with epipod, no exopod, longer than scaphocerite. Ultimate segment setose, ending in 3 sharp claws. Penultimate segment about 0.4× length of ultimate, setose. Antepenultimate segment about equal to ultimate, stout, with 2 sharp, stout setae at articulation with penultimate segment.

First pereopod stoutly chelate, with epipod. Dactyl curved, with tuft of setae near tip, about equal to palm of chela. Palm of chela about 0.7× as wide as long. Carpus about equal to length of palm of chela. Merus longer than palm of chela, usually with sharp spine or knob near articulation with carpus. Ischium about 0.4× length of merus.

Second pereopod chelate, with epipod. Palm of chela about 2× length of dactyl. Carpus with 7 segments, that nearest the propodus the longest. Merus about equal to 0.5× carpus, ischium longer than merus.

Third pereopod with epipod. Dactyl stout, about 0.4× as wide as long, with 4 spines. Tip bifid, claw on flexor margin stouter than that at extreme tip. Propodus with about 14 spinules, occurring singly or in pairs; 2.6× length of dactyl. Carpus short, about 0.5× length of propodus, broadly overlapping propodus on distal margin. Merus stout, about 5× as long as wide, with 2–3 large, sharp distolateral spines. Ischium shorter than merus, without spines.

Fourth pereopod without epipod, similar to third, but merus 7× as long as wide and with only 1 or 2 spines. Fifth pereopod without epipod, merus at most 1 spine.

Second pleopods with appendix interna in male, also with appendix masculina.

Uropods longer than telson, fringed with setae. Outer branch with 2 sharp marginal teeth.

HOLOTYPE: Female, total length in millimeters 12.0. Big Fisherman's Cove, Santa Catalina Island, California (33°27′N, 118°28′W), taken by dip net by night light, among low-growing algae on floating dock, 17 July 1982, water temperature 18°C, Mary K. Wicksten, AHF type number 821.

PARATYPES: California, U.S.A.: Becher's Bay, Santa Rosa Island (34°01′N, 120°02′W), 18 m, sand, 2 Aug. 1938, *Velero III* sta. 881-38, 1 specimen.—2.5 mi. E. of S. Pt., Santa Rosa Is. (33°53′45″N, 120°03′40″W–33°53′45″N, 120°03′40″W), 31–33 m, gravel and red algae, 10 April 1941, *Velero III* sta. 1282-41, 2 ovigerous females.—E. of Gull Is., S. of Santa Cruz Is. (33°57′15″N, 119°47′15″W–33°57′30″N, 119°48′05″W), 11–18 m, sand and algae, 31 Oct. 1940, *Velero III* sta. 1197-40, 10 specimens.—E. of Santa Barbara Island (33°29′N, 119°02′W), shoal to 74 m, sand, 12 Aug. 1938, *Velero III* sta. 895-38, 1 ovigerous female.—E. of Santa Barbara Is. (33°28′N, 119°00′W), 46–50 m, sand, 27 May 1938, *Velero III* sta. 975-39, 1 ovigerous female.—E. of Santa Barbara Is., 30 July 1919, *Anton Dohrn,* 2 specimens.—4 mi. E. of Landing, Santa Barbara Is. (33°28′40″N, 119°40′00″W–33°28′35″N, 119°30′00″W), 74 m, 28 Aug. 1941, *Velero III* sta. 1398-41, 1 ovigerous female.—Big Fisherman's Cove, Santa Catalina Island, 17 July 1982, Mary K. Wicksten, 2 specimens other than holotype, private collection of MKW.—Big Fisherman's Cove, Santa Catalina Island, among seaweed, 29 Sept. 1950, F. Ziesenhenne, 1 specimen.—Big Fisherman's Cove, Santa Catalina Island, on dock, 6 Aug. 1984, Mary K. Wicksten, 1 specimen, Catalina Mar. Sci. Center reference collection.—Off Howland's Landing, Santa Catalina

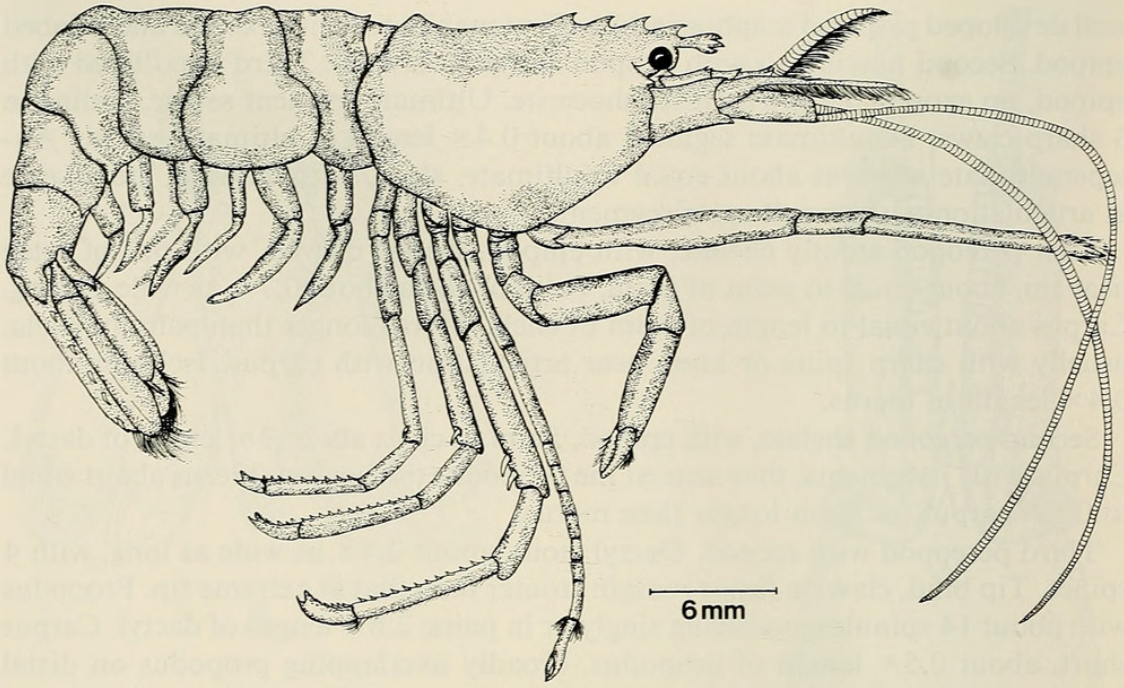

Fig. 3. *Heptacarpus palpator* (Owen). Female, total length in millimeters 44.2. Monterey Municipal Wharf, Monterey, California; CAS Number 034340.

Island (33°29′28″N, 118°33′30″N–33°29′45″N, 118°34′10″W), 240–295 m, mud, 10 Sept. 1940, *Velero III* sta. 1183-40, 1 specimen.—1 mi. NW of White Cove, Santa Catalina Island (33°24′20″N, 118°22′00″W), 4–6 m, among kelp holdfasts, 4 Aug. 1941, *Velero III* sta. 1378-41, 14 specimens.—1 mi. ESE of Willow Cove, Santa Catalina Island (33°22′50″N, 118°19′45″W–33°23′05″N, 118°21′10″W), 63–92 m, 13 Sept. 1941, *Velero III* sta. 1403-41, 1 specimen.—White's Cove, Santa Catalina Island (33°23′N, 118°22′W), 22–28 m, kelp holdfast, 17 Oct. 1948, *Velero IV* sta. 1621-48, 1 ovigerous female.—Avalon, Santa Catalina Island (33°20′45″N, 118°19′45″W), kelp holdfast, 20 Sept. 1938, G. S. Myers, R. L. Bolin and party, CAS, 1 ovigerous female.—BAJA CALIFORNIA, MEXICO: Melpomene Cove, Guadalupe Island (28°N, 118°W), 8 Dec. 1946, Carl Hubbs sta. H46-152, 1 specimen.—S. end of Melpomene Cove, Guadalupe Island, 74–83 m, boat *Orca,* sta. H50-42, 5 specimens. Except as noted, all specimens are in the collection of the Allan Hancock Foundation.

Size range.—8.5–15.5 mm in total length.

Remarks.—*Heptacarpus fuscimaculatus* is related to *H. palpator* and *H. brevirostris* in having epipods on the first three pereopods and having a rostrum shorter than the antennular peduncle. All three species have stout, spiny dactyls on the walking legs, rather than the simple, slender dactyls of *H. stimpsoni,* a species which also has epipods on the first three pereopods. Both *H. brevirostris* and *H. palpator* have spinules at the distal end of the first segment of the antennular peduncle; *H. fuscimaculatus* has only one spine. Neither of the other two species has a spine or tubercle at the end of the merus of the first pereopod. *Heptacarpus fuscimaculatus* often has three spines on the merus of the third pereopod, *H. palpator* usually has two and *H. brevirostris* often has only one. *Heptacarpus fuscimaculatus* usually is found on sandy bottoms or among algae off the islands

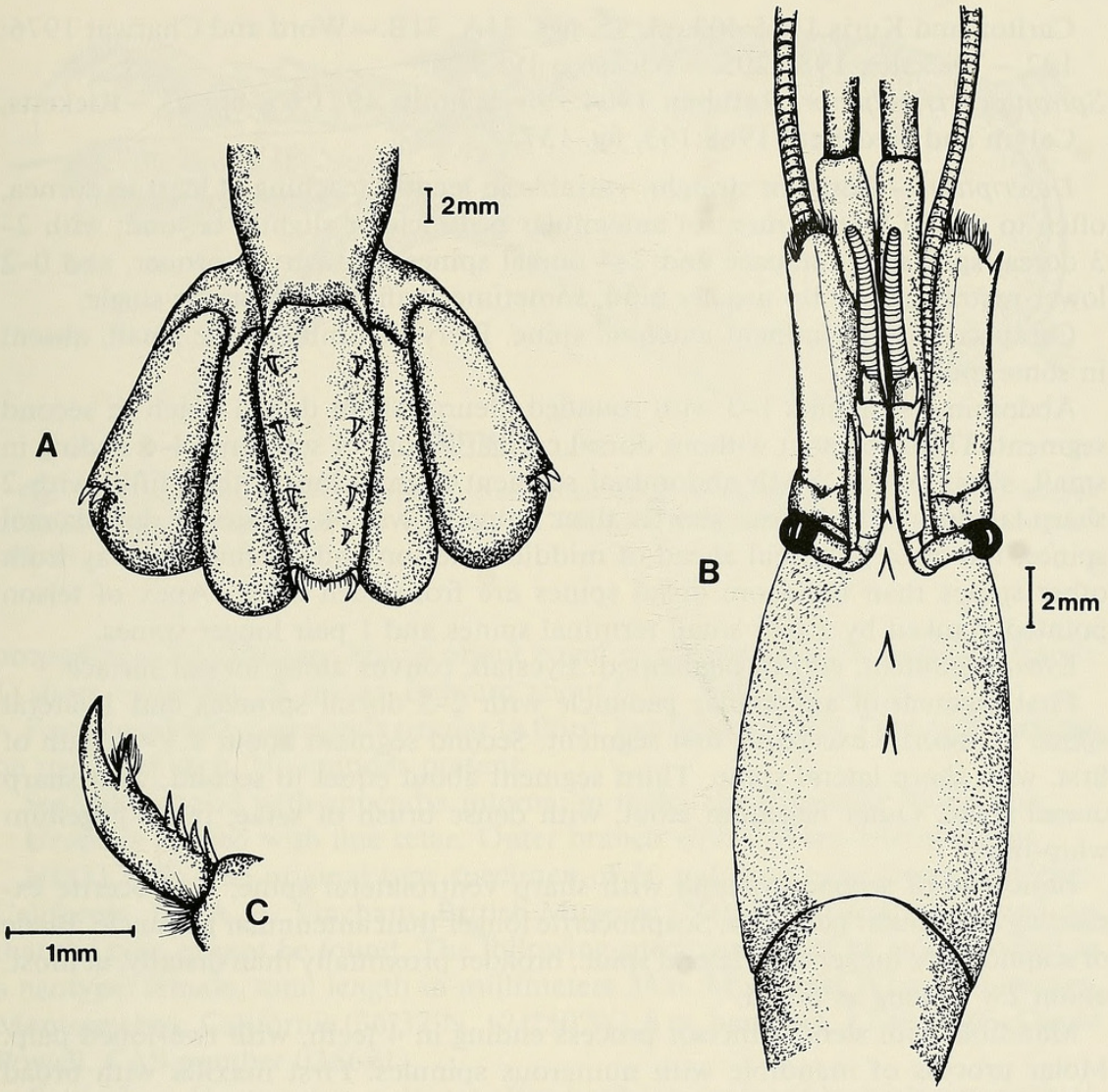

Fig. 4. *Heptacarpus palpator* (Owen). A, telson and uropods; B, front in dorsal view; C, dactyl of third pereopod.

of southern California and northwestern Mexico, rather than along the mainland coast. *Heptacarpus fuscimaculatus* also is usually smaller as an adult than either of the other two species.

All of the specimens that I collected at the type-locality, Big Fisherman's Cove, were clinging to algae on a floating dock after dark. The grass shrimp *Hippolyte clarki* Chace was taken at the same time. In life, three of the animals were translucent with brown spots formed by chromatophores. The species' name refers to these brown spots. The animal taken in 1984 was pale green. A color slide of a living *H. fuscimaculatus* has been deposited in the collection of the California Academy of Sciences.

Heptacarpus palpator (Owen)
Figs. 3–4

Hippolyte palpator Owen 1839:89, pl. 28, fig. 3.
Heptacarpus palpator: Holmes 1900:196, pl. 3, figs. 48, 49.—Holthuis 1947:12.—

Carlton and Kuris 1975:403, pl. 95, figs. 31A, 31B.—Word and Charwat 1976: 122.—Wicksten 1980:205.—Wicksten 1983:26.

Spirontocaris palpator: Rathbun 1904:98.—Schmitt 1921:65, fig. 43.—Ricketts, Calvin and Hedgpeth 1968:163, fig. 137.

Description.—Rostrum straight, variable in length: reaching at least to cornea, often to end of first segment of antennular peduncle or slightly beyond; with 2–3 dorsal spines on carapace and 2–4 dorsal spines on rostrum proper, and 0–2 lower rostral spines; tip usually bifid, sometimes trifid, occasionally single.

Carapace with prominent antennal spine. Pterygostomian spine small, absent in some individuals.

Abdominal segments 1–3 with rounded pleura. Slight dorsal notch in second segment. Third segment without dorsal carina. Pleura of segments 4–5 ending in small, sharp points. Sixth abdominal segment slightly longer than fifth, with 2 sharp lateral points. Telson shorter than uropods, with 4–5 pairs of dorsolateral spines, the most proximal ahead of middle of telson and set further away from other spines than the more distal spines are from each other. Apex of telson pointed, flanked by 5 pair small terminal spines and 1 pair longer spines.

Eyes prominent, cornea pigmented. Eyestalk convex along mesial surface.

First segment of antennular peduncle with 2–3 dorsal spinules and 1 lateral spine. Stylocerite exceeding first segment. Second segment about 0.3× length of first, with sharp lateral spine. Third segment about equal to second, with sharp dorsal spine. Outer flagellum stout, with dense brush of setae; inner flagellum whip-like.

Basicerite of second antenna with sharp ventrolateral spine. Carpocerite exceeding antennular peduncle. Scaphocerite longer than antennular peduncle. Blade of scaphocerite longer than lateral spine, broader proximally than distally, at most, about 2× as long as broad.

Mandible with slender incisor process ending in 4 teeth, with two-lobed palp. Molar process of mandible with numerous spinules. First maxilla with broad upper endite, small lower endite and bilobed palp. Second maxilla with small lower endite, bilobed upper endite, well developed palp and scaphognathite. First maxilliped with exopod and bilobed epipod. Second maxilliped with exopod and podobranch. Third maxilliped longest appendage of body. Inner branch about 2× length of carpace in male, 1.5× length of carapace in female; with epipod, no exopod. Ultimate segment witih 6 dark claws at tip, and with straight setae along its entire length. Penultimate segment about 0.3× length of ultimate, exceeding antennular peduncle. Antepenultimate segment about equal to ultimate, with fine setae.

First pereopod stout, chelate. Fingers of chela about 0.5× length of palm, tipped with tufts of setae. Palm 2× as long as wide. Carpus about as long as fingers of chela. Merus about equal to chela, with lateral row of stout setae. Ischium about 0.3× merus. Epipod present.

Second pereopod slender, chelate, with epipod. Fingers of chela about 0.4× length of palm, with tufts of setae at tip. Carpus with 7 segments, the first the longest. Merus 0.6× length of carpus. Ischium longer than merus.

Third pereopod stout. Dactyl with 2 stout terminal claws and 4 smaller spines, about 2× as long as wide. Propodus 2.5× length of dactyl, with row of small spines on flexor margin. Carpus about 0.5× length of propodus, overhanging

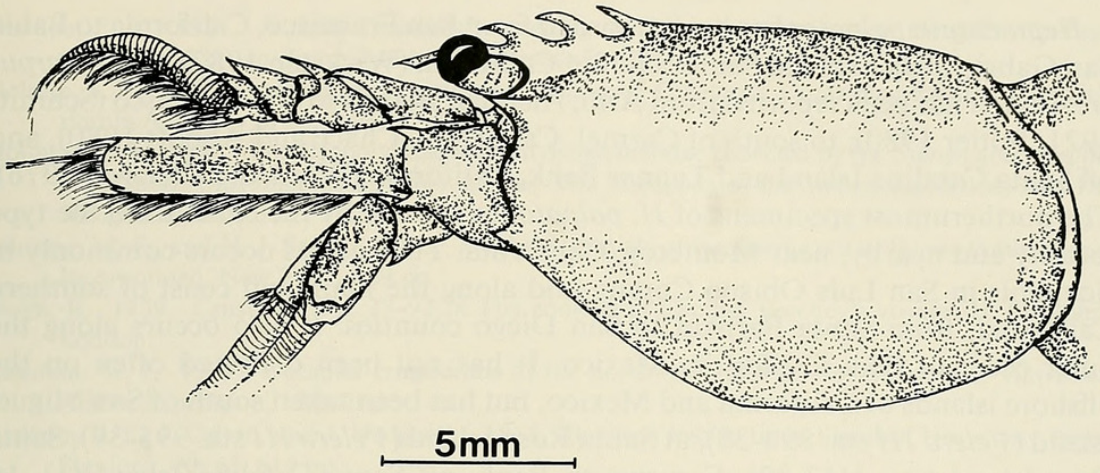

Fig. 5. *Heptacarpus brevirostris* (Dana). Male, total length in millimeters 42.4. North of Salmon Creek, Sonoma County, California; AHF sta. 1627-48. Left, dorsal view of front; right, lateral view of front.

propodus at articulation. Merus about equal to propodus, with usually 2 (rarely 1) sharp ventrolateral spines. Ischium about 0.5× length of merus.

Fourth and fifth pereopods similar to third, but more slender. One or two spines on merus of each. No epipods present.

Second pleopod with appendix interna; in male, also appendix masculina.

Uropods fringed with fine setae. Outer branch with 2 sharp lateral spines.

NEOTYPE: The original type specimen of *H. palpator* came from Monterey, California. Dr. A. A. Fincham, British Museum (Natural History) informed me that the type cannot be found. The following specimen therefore is designated as a neotype: female, total length in millimeters 38.6. Municipal Wharf, Monterey, Monterey Bay, California (36°37′N, 121°50′W), 8 m, hand net, 2 Feb. 1963, David Powell, CAS number 035671.

Remarks.—*Heptacarpus palpator* often has been confused by biologists with *H. brevirostris,* a very similar species (Fig. 5). Both are found in intertidal and shallow subtidal areas on hard bottoms, have rostra that do not reach the end of the second segment of the antennular penduncle, have stout dactyls on the walking legs with bifid tips, have similar patterns of spines on the carapace and antennae, and have epipods on the first three pereopods. To distinguish between the two species, a combination of features is useful. In *H. palpator,* the scaphocerite is slightly longer than the telson; in *H. brevirostris,* it is equal to or shorter than the telson. In *H. palpator,* the spines on the carapace behind the rostrum are not large relative to those on the rostrum proper; in *H. brevirostris,* the spines on the carapace form a descending series toward the rostrum. The spines on the carapace of *H. brevirostris* are larger than those of the rostrum proper. The rostrum of *H. palpator* often has a bifid or trifid tip, and often exceeds the cornea; in *H. brevirostris,* the tip usually is single and does not exceed the cornea. The meri of the third–fifth pereopods of *H. palpator* usually bear 2, 2, and 1 spines, respectively; in *H. brevirostris,* these meri bear no more than one spine. *Heptacarpus palpator* seems to be slightly smaller than *H. brevirostris:* the largest specimen recorded had a total length of 46.6 mm (Schmitt 1921), while Butler (1980) reported *H. brevirostris* up to a total length of 62 mm.

Heptacarpus palpator has been recorded from San Francisco, California to Bahía San Gabriel, Isla Espíritu Santo, Gulf of California (Wicksten 1983). *Heptacarpus brevirostris* has been reported from Attu, Aleutian Islands to San Francisco (Schmitt 1921; Butler 1980); to south of Carmel, California (Chace and Abbott 1980), and off Santa Catalina Island and Tanner Bank, California (Word and Charwat 1976). The northernmost specimens of *H. palpator* examined by me come from the type locality and nearby, near Monterey, California. The species occurs commonly in tidepools in San Luis Obispo County and along the mainland coast of southern California, from Santa Barbara to San Diego counties. It also occurs along the outer coast of Baja California, Mexico. It has not been collected often on the offshore islands of California and Mexico, but has been taken south of San Miguel Island (*Velero III* sta. 894-38), at Santa Rosa Island (*Velero III* sta. 995-39), Santa Cruz Island (sta. H47-89), Farnsworth Bank, off Santa Catalina Island (11–16 Dec. 1970, AHF collections); off Natividad Island, Baja California (*Velero IV* sta. 1706-49), and between Melpomene Cove and the inner island, Guadalupe Island, Mexico (*Velero IV* sta. 1912-49). There is only one record from the Gulf of California. The species probably rarely ranges south of Magdalena Bay, one of the most southerly areas of upwelling along the west coast of Baja California (Dawson 1951).

Heptacarpus brevirostris seems to prefer colder water than *H. palpator*. It is one of the most common intertidal shrimps along the coast of British Columbia (Butler 1980). The species has been collected often along the coasts of Washington and Oregon, U.S.A. I have observed it in tidepools in Humboldt County, California. It has been taken intertidally and in shallow subtidal waters off Mendocino County, near Bodega Head in Sonoma County, and along the coasts of San Mateo and northern Santa Cruz counties, California. I have been unable to examine the specimens on which Word and Charwat (1976) based their records from southern California.

Heptacarpus palpator often is found on wharf piles, among algae, and in tide pools at lower tide levels and in shallow subtidal areas. The deepest record known to me is 37 m (Santa Monica Bay, California, AHF collections). The color is variable in life, from translucent with brown lines to a uniform deep brown.

Acknowledgments

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