

**The first species of *Prionalpheus* from the eastern Pacific, and new records of caridean shrimp (Crustacea: Decapoda: Caridea) from the western coast of Mexico**

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**Abstract.**—Four species of shallow water caridean shrimp new to the Mexican fauna are reported. The specimens were collected along the coast of the state of Nayarit and at Isla Isabel, Mexico. *Prionalpheus nayaritae*, new species, represents the first occurrence of this rare genus in the eastern Pacific. The new species can be recognized by the presence of asymmetrical mandibles, a characteristic of *Prionalpheus*. Three other new records extend the previous known distributions from Panama (*Alpheus firmus*), Colombia (*Synalpheus bannerorum*), and Hawaii and Clipperton Island (*Processa hawaiiensis*), to continental Mexico. Morphological differences with specimens used in previous descriptions or reports are provided.

The shallow water caridean shrimp fauna from the Pacific coast of Mexico and their distribution have been studied by Ríos & Carvacho (1983a, 1983b), Wicksten (1983, 1984), Ríos (1989, 1992), Hendrickx (1992), and Wicksten & Hendrickx (1992). Although these studies have focused primarily on the Gulf of California, the overall distribution of the species has been summarized. According to these authors 119 species of caridean shrimp have been reported to occur along the Pacific coast of Mexico, belonging to 11 families and 51 genera (Wicksten & Hendrickx 1992).

In this study we present the description of a new species, *Prionalpheus nayaritae*, the first species of the genus to be found in the eastern Pacific. *Prionalpheus* was erected by Banner & Banner (1960) to accommodate specimens of Alpheidae in which the mouth parts were entirely unlike those of any other genus of the family. It is a rare genus known only from 21 specimens belonging to six species, of which five are from the Indo-Pacific and one from the Caribbean (Banner & Banner 1982, Bruce

1986, Martínez & Carvacho 1991). In addition, new records of three species previously unknown from Mexico are presented. Two records are for species of the family Alpheidae, which is the most diverse in the Mexican Pacific (42% of the caridean species), and one belonging to the family Processidae. These findings expand considerably our knowledge of the distribution of the four taxa, and suggest that in the future additional species known from Central and South America, and oceanic islands in the tropical eastern Pacific, will likely be discovered on the western coast of Mexico.

The material has come from five sampling trips carried out along the coast of Nayarit, Mexico, between March 1992 and November 1993, including samples from Isla Isabel, 23 km off the coast (Fig. 1). Samples of dead coral were collected at depths ranging from 1 to 5 m. The coral blocks were broken and all crustacean cryptofauna preserved in 70% alcohol. The material treated is deposited in the Colección Nacional de Crustáceos, Instituto de Biología, Universidad Nacional Autónoma de

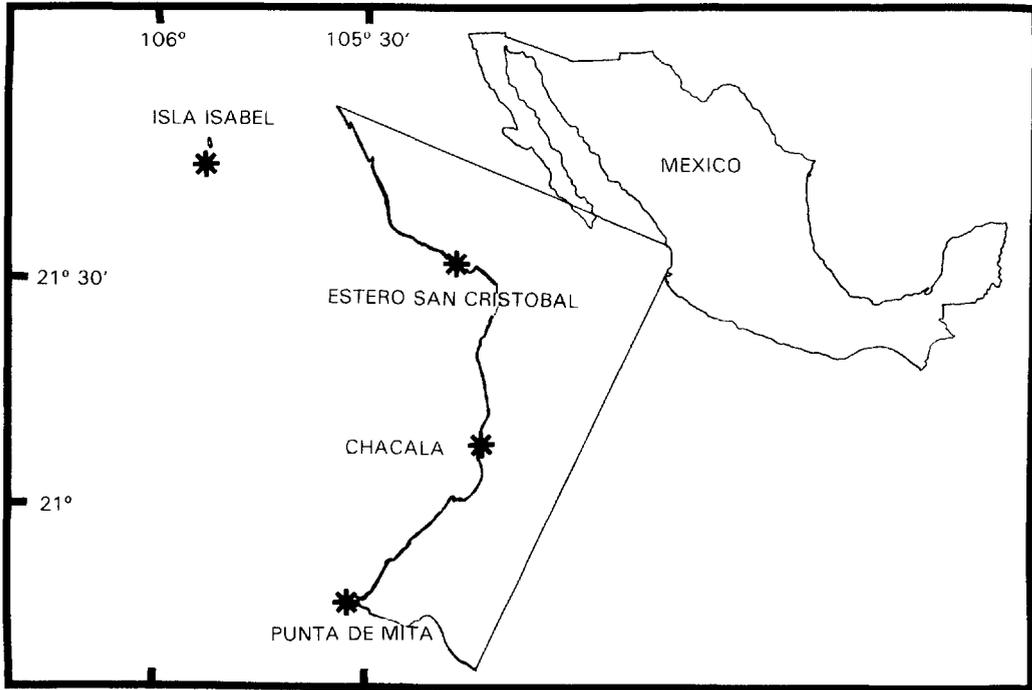


Fig. 1. Collection sites (asterisks) along the State of Nayarit, Pacific coast of Mexico.

México (CNCR), and was collected by M. E. Camacho and J. L. Villalobos. The abbreviations "cl" and "tl" indicate carapace length and total length (including rostrum), respectively.

Family Alpheidae Rafinesque, 1815  
*Alpheus firmus* Kim & Abele, 1988  
 Fig. 2

*Material examined.*—4 ♂, cl 11.0, 10.0, 9.0, 9.0 mm, tl 32.7, 27.2, 25.6, 27.3 mm; 1 ♀, cl 6.5 mm, tl 18.0 mm; 4 ♀ ovigerous, cl 17.0, 10.0, 10.0, 9.0 mm, tl 34.5, 29.7, 29.0, 25.0 mm; 23 May 1993; Estero San Cristóbal, Bahía de Matanchén, Nayarit, 21°31'N, 105°14'W; CNCR 12759.

*Remarks.*—The only existing records of *Alpheus firmus* are those of the original description, based on material collected in Panama (Kim & Abele 1988), from Miraflores Locks (holotype, a male, cl 9.2 mm) and Punta Paitilla. This is a shallow water species that has been collected intertidally (0–1 m) under rocks. Our records are from

a similar habitat in a rocky substrate in tidal pools. In live specimens, the body color is translucent, with the internal surface of both palms of chelipeds blue-green, and tip of movable finger of major chela red. Morphological differences between the type material and the organisms reported here consist in: 1) the absence in the latter of a lateral spine on the basicerite, a feature previously observed by Kim & Abele (1988) that is probably size related, and 2) a long ultimate segment of the third maxilliped (twice as long as the penultimate instead of slightly longer, as in the type material) (Fig. 2b). This new record and second for the species, extends its distribution by more than 9° of latitude.

*Synalpheus bannerorum* Abele, 1975  
 Fig. 3

*Material examined.*—5 ♂, cl 4.8, 3.0, 3.5, 3.0, 2.7 mm, tl 8.0, 5.1, 6.7, 5.8, 4.5 mm; 5 ♀ ovigerous, cl 3.7, 3.5, 3.5, 3.2, 3.0 mm, tl 7.2, 6.7, 6.5, 6.3, 5.5 mm; 29

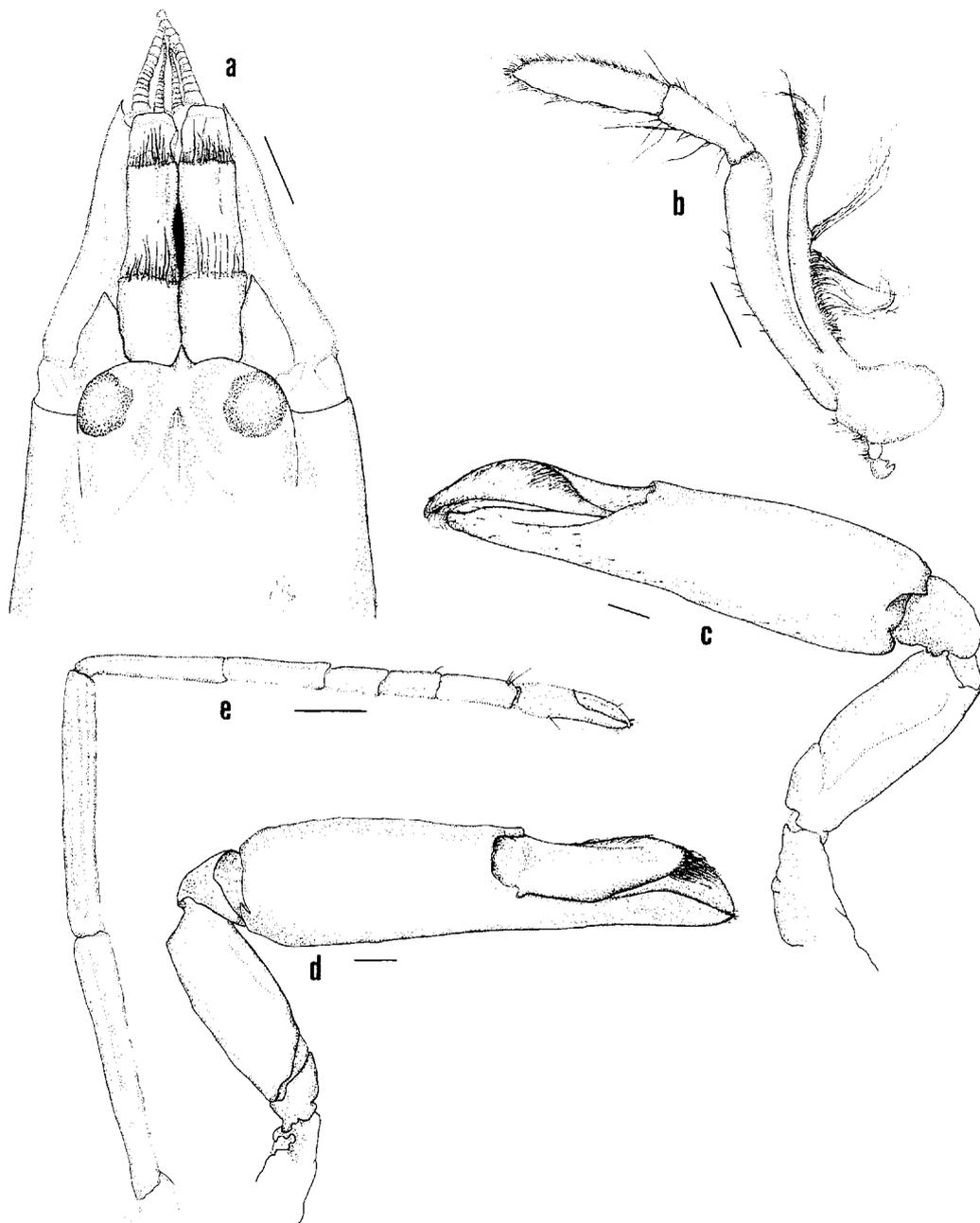


Fig. 2. *Alpheus firmus* Kim & Abele, 1988: a, anterior portion of carapace and cephalic appendages; b, third maxilliped; c, minor chela of male, internal view; d, minor chela of male, external view; e, second pereopod. Scale bars = 1 mm.

Mar 1992; Bahía Chacala, Nayarit, 20°10'N, 105°13'W; CNCR 11910. 1 ♀ ovigerous, cl 3.7 mm, tl 8.7 mm; same locality; 21 May 1993, CNCR 12746. 1 ♂, cl

3.0 mm, tl 6.6 mm; 1 ♀ ovigerous, cl 4.0 mm, tl 9.2 mm; 23 May 1993; Estero San Cristóbal, Bahía de Matanchén, Nayarit, 21°31'N, 105°14'W; CNCR 12754. 1 ♂, cl

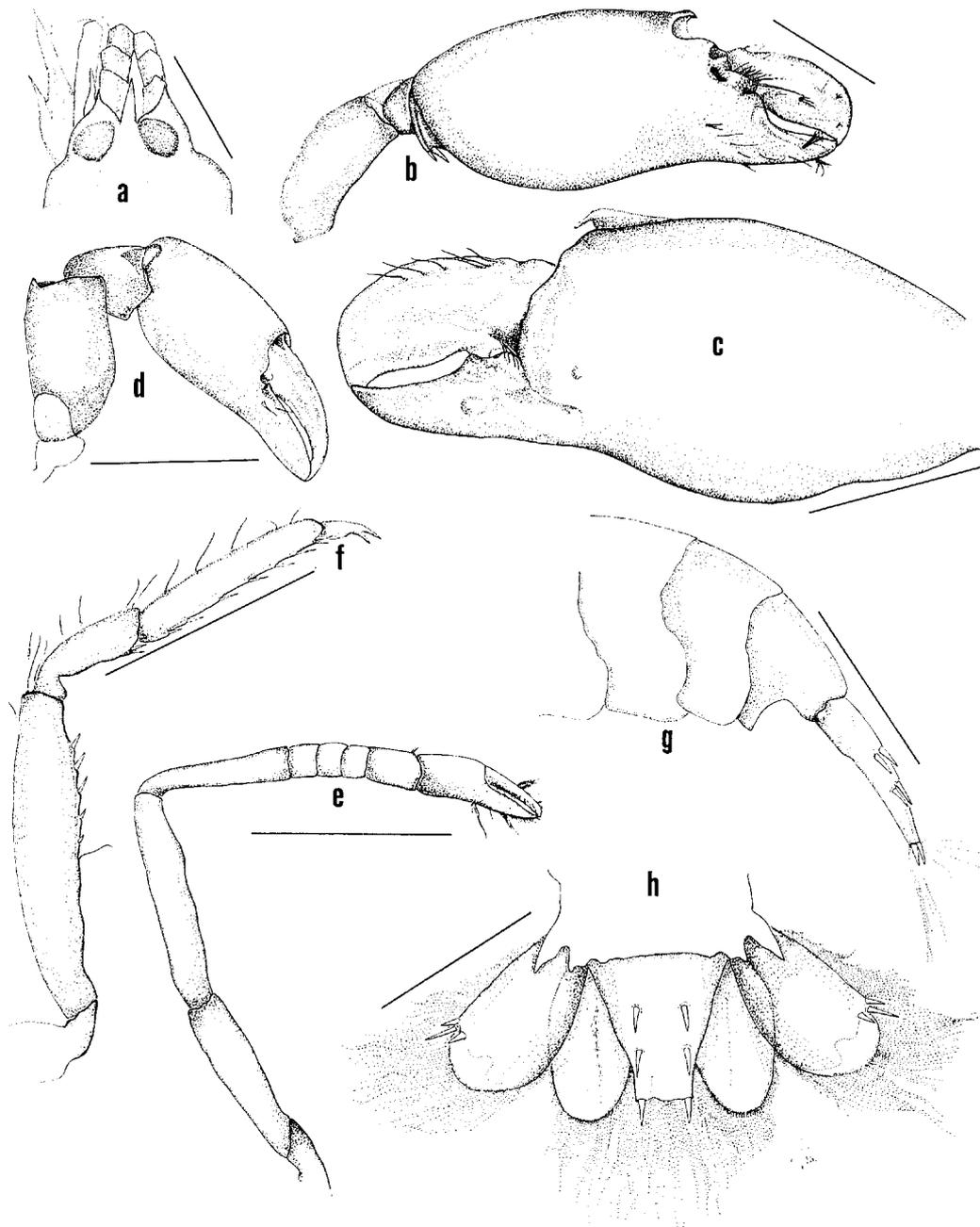


Fig. 3. *Synalpheus bannerorum* Abele, 1975: a, anterior portion of carapace, dorsal view; b, internal view of major chela; c, external view of major chela; d, external view of minor chela; e, second pereopod; f, third pereopod; g, lateral view of last three abdominal segments and telson; h, dorsal view of telson and uropods. Scale bars = 1 mm.

3.3 mm, tl 5.5 mm; 1 ♀ ovigerous, cl 4.0 mm, tl 6.5 mm; 2 Feb 1993; Punta de Mita, Nayarit, 20°46'N, 105°31'W; CNCR 12678.

*Remarks.*—*Synalpheus bannerorum* was described from Isla Malpelo, Colombia, inhabiting coral at a depth of 10 m. Compared to the original description, the morphological differences encountered here were: 1) the rostrum reaches the distal margin of the basal antennular segment (Fig. 3a), 2) in the second pair of pereopods, the first carpal segment is 5.5 times as long as the second (Fig. 3e), and 3) the fifth abdominal segment is half the length of the sixth and of equal length as the telson (Fig. 3g). Abele (1975) postulated that this species might be endemic to Isla Malpelo, and until now no other occurrences had been reported. This species seems to be abundant along the rocky portion of the coast of Nayarit (Carmacho 1996).

*Prionalpheus nayaritae*, new species  
Fig. 4

*Holotype.*—1 ♀ ovigerous, cl 2.2 mm, tl 5.0 mm; 1 Nov 1993; Punta de Mita, Nayarit, 20°46'N, 105°31'W; CNCR 12983.

*Description.*—Rostrum short, triangular, ending in acute tip with small single seta; dorsal carina low, reaching anterior half of first antennular segment (Fig. 4b). Margins contiguous to rostrum concave, not covering eyes completely dorsally or laterally (Fig. 4c). Orbital hood unarmed. Corneae oval shaped. Anterolateral margin of carapace slightly produced, descending first from eyes, then convex and produced forming blunt pterygostomial angle (Fig. 4a). Posterior margin of carapace with well marked cardiac notch (Fig. 4a). First abdominal segment with pleura straight. Second segment with large nearly circular pleura, maximum length of pleura 1.6 times that of first segment. Third segment with pleura rounded, extending posteriorly and covering part of fourth segment. Fourth and fifth segments subrectangular. Sixth segment almost as long as deep, posteroventral

angle with triangular movable plate. Telson 1.4 times longer than broad, bearing 2 pairs of dorsal spines (first pair medial, second pair closer to first pair than to posterior margin); posterior margin of telson with 2 pairs of long spines, inner pair shortest (Fig. 4i).

First antennular segment irregular in shape, longer than broad, and longer than second and third segments. Carina on ventral side of first antennular segment reaching distal margin of segment, with acute tip. Stylocerite 3.6 times longer than broad, reaching distal margin of second antennular segment. Scaphocerite 2.4 times longer than broad, laminar portion reaching distal margin of second antennular segment, lateral spine reaching beyond third antennular segment. Carpocerite 3.4 times longer than broad, reaching beyond antennular peduncle.

Mandibles asymmetrical, incisor process well developed, without palp or molar process; protruding considerably so as to be clearly seen in lateral view. Left mandible with 5 finger-like teeth decreasing in size proximally (Fig. 4d). Teeth oriented approximately in same direction; distal tooth longest, with rounded end, middle 3 teeth with tips becoming more acute proximally, proximal tooth broken. Right mandible elongated, becoming narrower distally; incisor process ending in 4 teeth, 2 middle ones the shortest (Fig. 4e). First maxilla broken, upper lacinia missing; lower lacinia 4.7 times longer than broad, armed distally with more than 10 spines; palp simple and cylindrical, with long apical setae. Second maxilla missing. First maxilliped broken, distal part of inner lobe missing. External lobe of first maxilliped broad, outer margin straight, inner margin rounded, armed with 7 spines. Second maxilliped with ischium bilobed longitudinally and fused with merus. Internal margin of merus with strong spines. Carpus broader than long, articulated along proximal margin of merus, with spines on inner margin. Exopod of second maxilliped tubular, not segmented, distally with 2 long setae. Third maxilliped missing.

First pair of pereopods missing. Second

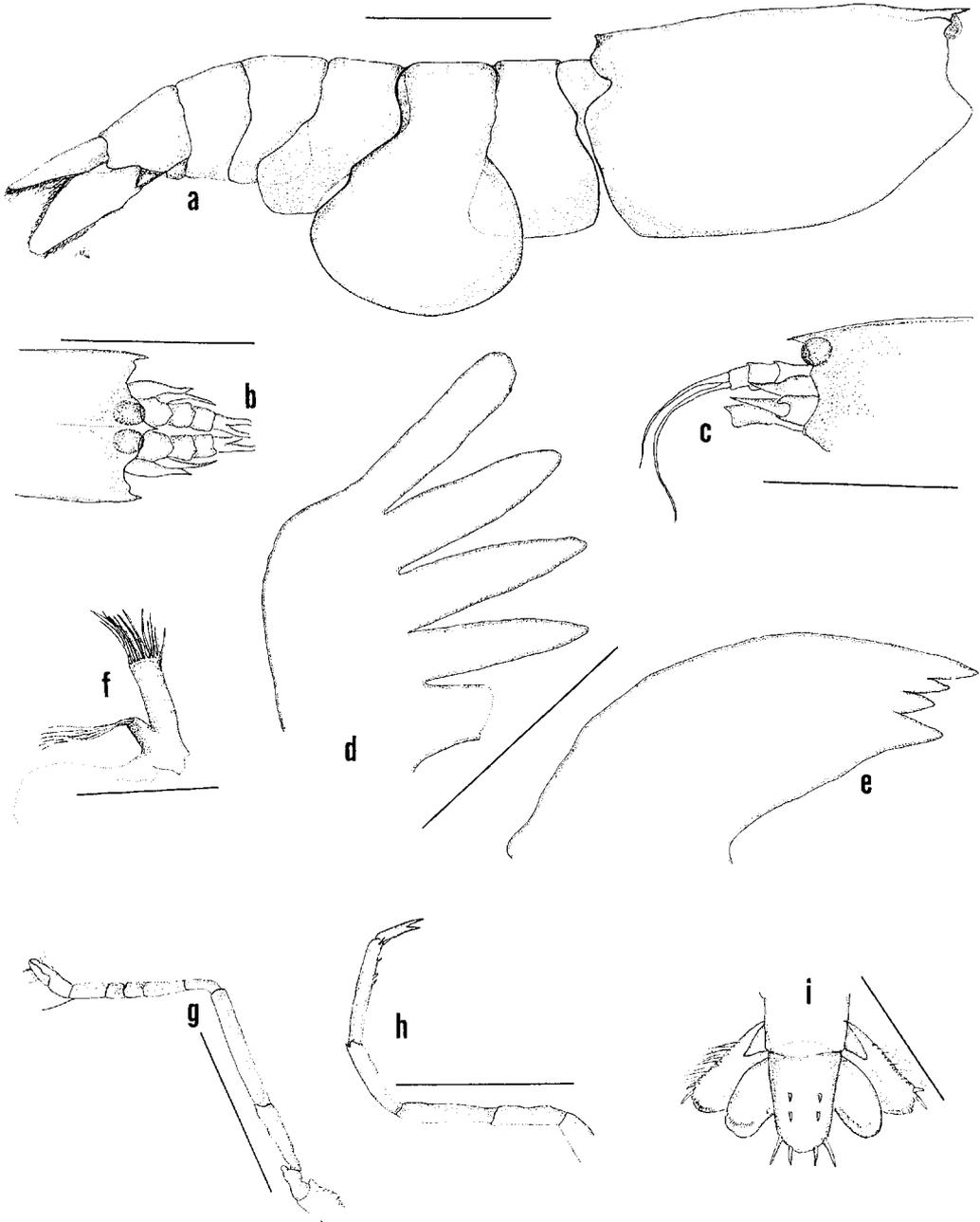


Fig. 4. *Prionalpheus nayaritae* new species, female holotype: a, lateral view of carapace and abdomen (appendages omitted); b, anterior portion of carapace, dorsal view; c, anterior portion of carapace, lateral view; d, left mandible; e, right mandible; f, first maxilla (incomplete); g, second pereopod; h, fifth pereopod; i, telson and uropods. Scale bars = 1 mm (a-c, f-i), 0.5 mm (d, e).

pereopod short and slender, basis with small rounded protuberance on distal posterior margin, carpus with 5 segments (ratio: 7.8, 10, 5, 3.8, 9), chela longer than broad with scattered setae; cutting edges of fingers simple (Fig. 4g). Fifth pereopod slender; ischium 4 times longer than deep; merus simple 4.7 times longer than deep; carpus with notch on superior distal margin; propodus the longest segment, armed with 3 spines on inferior margin and 2 on distal portion; dactyl biunguiculate, with superior hook longer and stronger than inferior one (Fig. 4h).

Uropods as long as telson; exopod with outer margin straight, setose, with 2 distal spines on external angle; endopod oval-shaped, with short setae on internal and distal margins (Fig. 4i).

*Etymology*.—The specific name of this species is derived from "Nayarit", the state where the holotype was collected.

*Remarks*.—The genus *Prionalpheus* was erected for *P. triarticulatus* Banner & Banner, 1960, based on a single specimen from Fiji, and differs from the closely related *Alpheopsis* Coutière, 1897, in the extremely modified mouthparts, specially the mandibles. Five other species had previously been assigned to *Prionalpheus*: *P. brachytomeus* Banner & Banner, 1971 (two specimens; Fiji and Tahiti); *P. sulu* Banner & Banner, 1971 (13 specimens; Philippines); *P. fissipes* (Coutière, 1908), (one specimen; Seychelles); *P. mortoni* Bruce, 1986 (two specimens; Tolo Channel, Hong Kong); and *P. gomezi* Martinez & Carvacho, 1991 (one specimen; Cuba). Banner & Banner (1982), reported two additional specimens of *P. triarticulatus* from Lizard Island, Australia, collected at a depth of 20 m from "solid reef rock." With the single specimen reported here, the total number of known specimens belonging to *Prionalpheus* is 22. Although remarkably rare, the presence of *Prionalpheus* on the western coast of America, in the Caribbean, and the Indo-Pacific, suggests a pantropical distribution of the genus.

The single specimen, an ovigerous female, reported here from Punta de Mita,

Nayarit, Mexico, differs from other known species in the area in the form of the mandibles, maxillulae, and maxillipeds, the spination pattern of the uropods, and the degree of exposure of the cornea of the eyes.

#### Family Processidae Ortmann, 1896

##### *Processa hawaiiensis* Dana, 1852

##### Fig. 5

*Material examined*.—2 ♀ ovigerous, cl 4.5, 4.8 mm, tl 11.5, 15.0 mm; 31 Jan 1993; Punta de Mita, Nayarit, 20°46'N, 105°31'W; CNCR 12655. 2 ♂, cl 3.5, 3.8 mm, tl 7.5, 9.0 mm; 1 Feb 1993; Punta de Mita, Nayarit, 20°46'N, 105°31'W; CNCR 12671. 2 ♂, cl 2.5, 2.7 mm, tl 7.0, 8.0 mm; 9 Feb 1993; Playa Pescadores, Isla Isabel, Nayarit, 21°50'N, 105°54'W; CNCR 12707. 2 ♂, cl 2.5, 3.7 mm, tl 7.2, 8.5 mm; 8 Nov 1993; Playa Las Monas, Isla Isabel, Nayarit, 21°50'N, 105°54'W; CNCR 12843.

*Remarks*.—There are only two published records of *Processa hawaiiensis*, one from Hawaii (Dana 1852), and another from Clipperton Island (Chace 1962). Morphologically, *P. hawaiiensis* differs from the other four species of *Processa* known from the western coast of Mexico (*P. aequimana* Paulson, 1875, *P. peruviana* Wicksten, 1983, *P. hemphilli* Manning & Chace, 1971, *P. pipinae* Wicksten & Mendez, 1985), in that the exopod of the third maxilliped is rudimentary and in the number of segments of the carpus and merus of the second pair of pereopods. Our material differs in minor details from the description presented by Edmondson (1930). In our specimens, the merus of the chelate first pair of pereopods is longer (2.2 to 2.6 times the length of carpus) (Fig. 5e, f), and the propodus of the fourth pair of pereopods is more than three times as long as the dactylus.

#### Discussion

The new records presented provide significant new information on the potential for dispersal of the species, and the zoogeography of the tropical eastern Pacific.

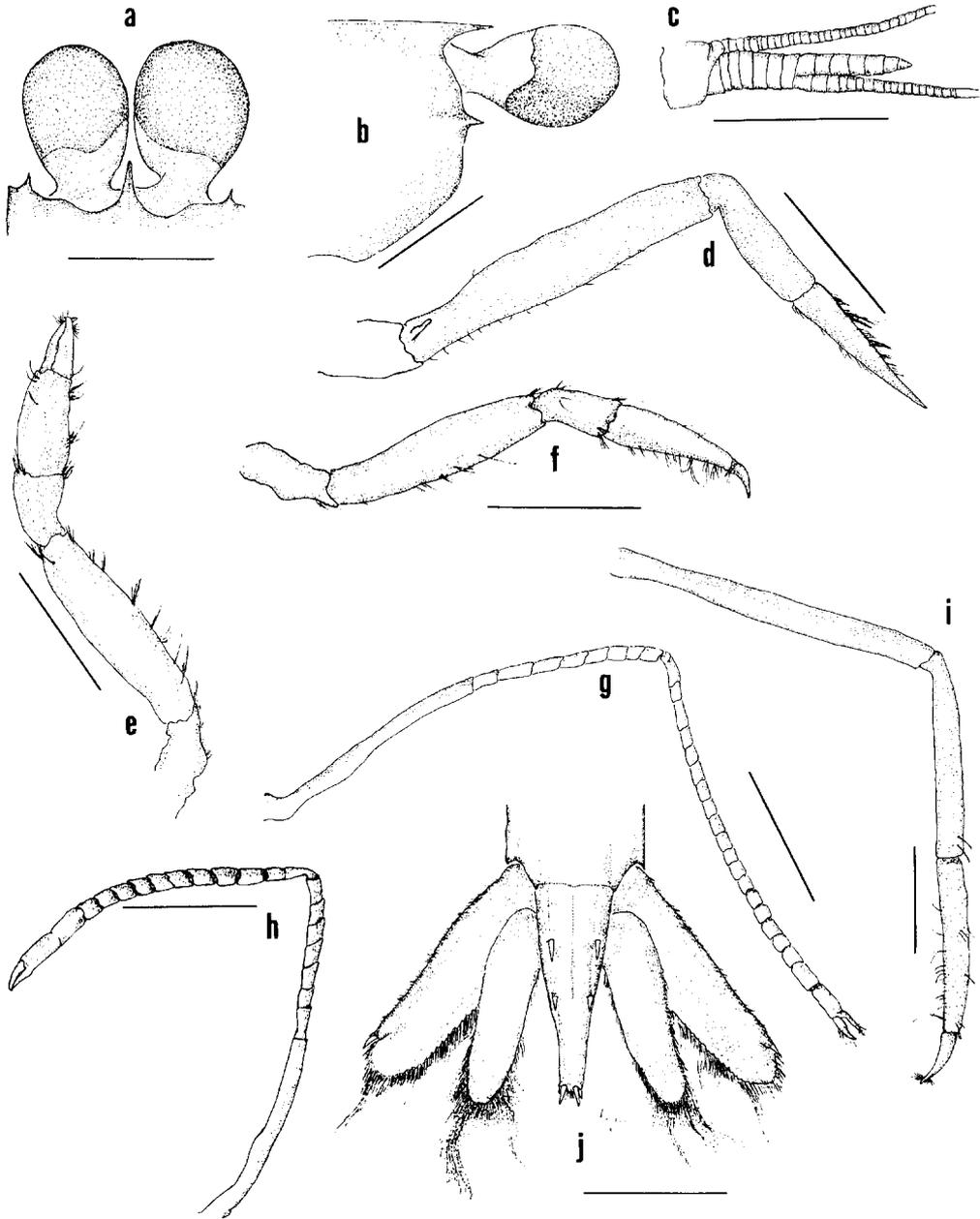


Fig. 5. *Processa hawaiensis* Dana, 1852: a, rostrum and eyes, dorsal view; b, anterior portion of carapace, lateral view; c, antennule; d, third maxilliped; e, first right pereopod; f, first left pereopod; g, second right pereopod; h, second left pereopod; i, third pereopod; j, telson and uropods. Scale bars = 1 mm.

Two of the species treated above, *Alpheus firmus* and *Synalpheus bannerorum*, were previously considered endemic to Central and South America (Abele 1975, Holthuis 1980, Kim & Abele 1988). Although minor

morphological differences were observed between our material and the original descriptions (probably as result of the small samples used in the original descriptions), it is clear that the areas of distribution of

these species range in the thousands of kilometers. The distribution of *Processa hawaiiensis* has now been increased considerably, from Hawaii to the western coast of Mexico, including Clipperton Island (Edmondson 1930). The information presented adds to the evidence used in the elucidation of the boundaries of the Panamanian and Mexican zoogeographic provinces of the tropical eastern Pacific (Briggs 1974). The finding in Mexico of two species, *Alpheus firmus* and *Synalpheus bannerorum*, previously known from Central and South America, weakens the concept of a Mexican Province (Briggs 1974); however, the southern portion of the Pacific coast of Mexico has been poorly studied.

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