Calif. Fish and Game, 54(4): 270–277. 1968.

FIRST REPORT OF THE CRAB FAMILY CHIROSTYLIDAE OFF CALIFORNIA, AND DESCRIPTION OF A NEW SPECIES OF *CHIROSTYLUS*[1]

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A new crab, *Chirostylus perarmatus* (Decapoda, Anomura, Chirostylidae), is described from deep water off southern California, and its relationship to other eastern Pacific *Chirostylus* is discussed. Both the genus and the family are new to Californian waters.

INTRODUCTION

In the course of fishery investigations, California Department of Fish and Game vessels frequently capture rare and unusual organisms. In early 1961 several crabs collected during one of these investigations were brought to the Allan Hancock Foundation for identification. They were immediately recognized as *Chirostylus* (family Chirostylidae), a genus and family unreported from Californian waters. Subsequent study indicated that they could not be placed in any described species.

The specimens were collected by the California Department of Fish and Game vessel *Alaska* in deep water at Station 16 (61A1-16). They were taken in a beam trawl along with 14 species of fishes, a spiny sea urchin (probably *Allocentrotus*), two species of sea pen, a squid (*Rossia pacifica*), jellyfish, and several species of crustaceans.

The Chirostylidae are related to the Galatheidae, a family represented in Californian waters by at least eight species. The best known of these is the pelagic red crab, *Pleuroncodes planipes* Stimpson, which is normally confined to Mexican waters, but attracts a good deal of attention in California when it comes northward during years of warm ocean temperatures (Glynn, 1961; Radovich, 1961). The rest of the Californian galatheids live in deep water and are seldom seen by the casual observer, but they are frequently caught by fisheries and research vessels. *Chirostylus* bears a superficial resemblance to some of these, particularly *Munida*.

SYSTEMATIC ACCOUNT

The Chirostylidae belong to section (formerly tribe) Anomura and superfamily Galatheidea, which also includes the marine families Porcellanidae (porcelain crabs or rocksliders) and Galatheidae, as well as the South American freshwater family Aeglidae. Schmitt (1921) presents a key to the anomuran families known from California; the portion of this key dealing with the Galatheidea may be modified as follows to include the Chirostylidae:

[1] Accepted for publication March 1968. Contribution No. 321 from the Allan Hancock Foundation. This study was supported in part by Grant GB-3225 from the National Science Foundation.

Body depressed, abdomen bent under, folded upon itself or against thorax, often with a transverse suture on telson (superfamily *Galatheidea*).

1. Abdomen bent upon itself, but not folded against thorax; body shrimp-like; first legs greatly elongated, slender.
   a. Telson with a transverse fissure and folded beneath the preceding abdominal somites along with the tail-fan.
      Chirostylidae
   b. Telson without a transverse fissure and not folded beneath the preceding abdominal somites.
      Galatheidae
2. Abdomen folded against thorax; body crab-like; first legs only moderately elongate, stout.
   Porcellanidae

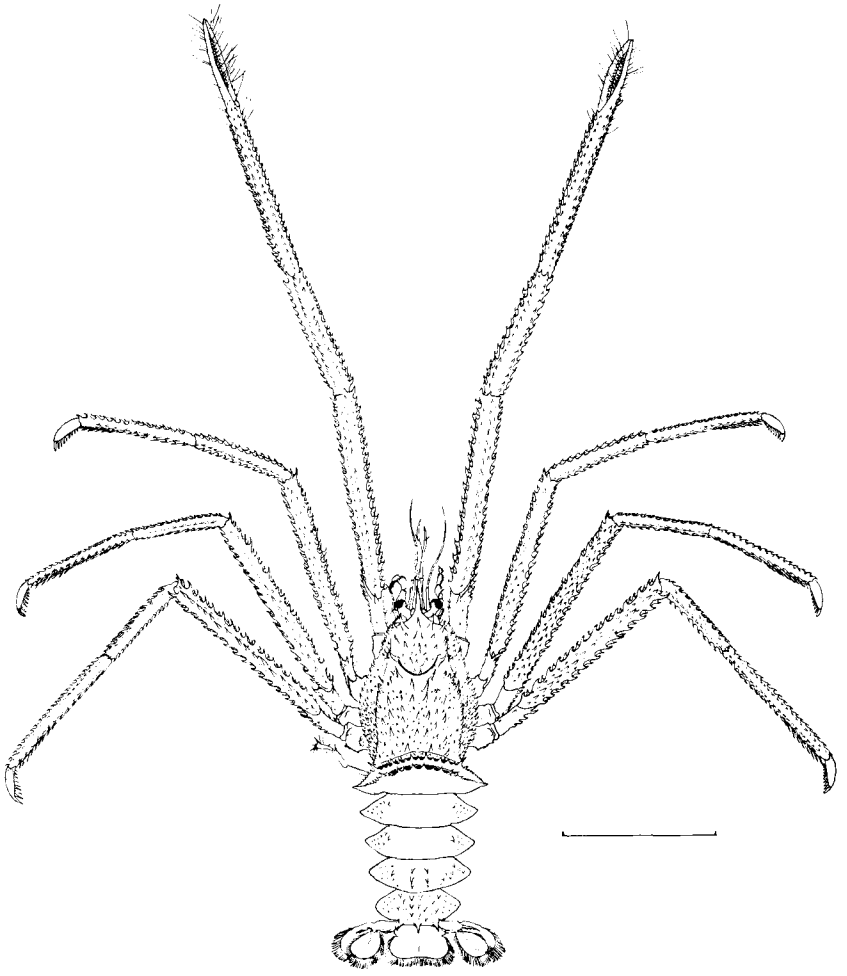

FIGURE 1—Holotype of *Chirostylus perarmatus*. (Scale represents 20 mm.)

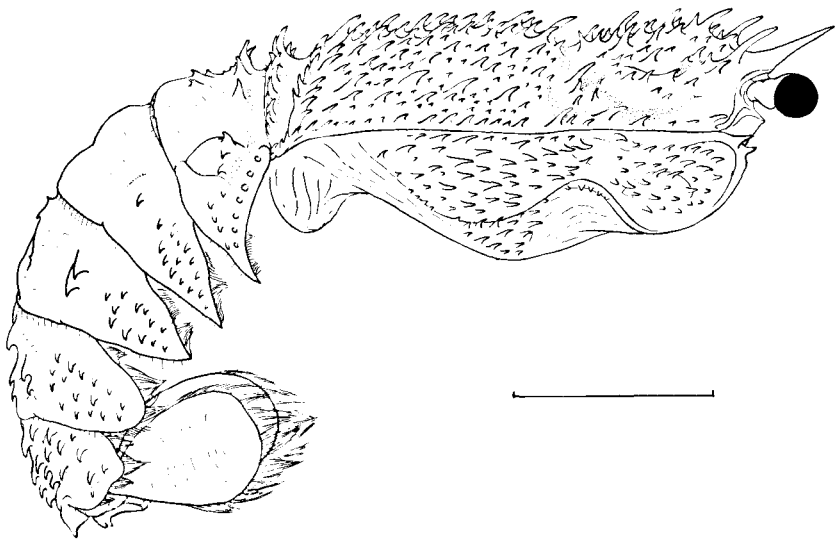

FIGURE 2—Holotype of *Chirostylus perarmatus;* carapace and abdomen in lateral view. (Scale represents 10 mm.)

Family Chirostylidae

Body shrimp-like. Abdomen bent upon itself but not folded up against the thorax; telson with a transverse fissure and folded beneath the preceding abdominal somites along with the tail-fan. First legs chelate, greatly elongated, slender. Antennal peduncle five-segmented, the second and third article being distinctly separated; flagellum of moderate length.

Genus *Chirostylus* Ortmann

Carapace convex, the lateral borders inflated and not sharply defined; rostrum spiniform; antennal acicle wanting; chelipeds and first three pairs of walking legs slender and of enormous length.

Chirostylus perarmatus sp. n.

Holotype

Male, AHF 6138; deposited in the Allan Hancock Foundation. Collected January 20, 1961, by California Department of Fish and Game vessel *Alaska* at Station 16 (61A1-16), north of Anacapa Island, California, 34° 05.8′ N, 119° 23.3′ W to 34° 06.0′ N, 119° 24.3′ W; 125 fathoms, green mud bottom.

Paratypes

Four males and five females, all collected with the holotype. At present these specimens are in the Allan Hancock Foundation, but part of the material is to be distributed elsewhere.

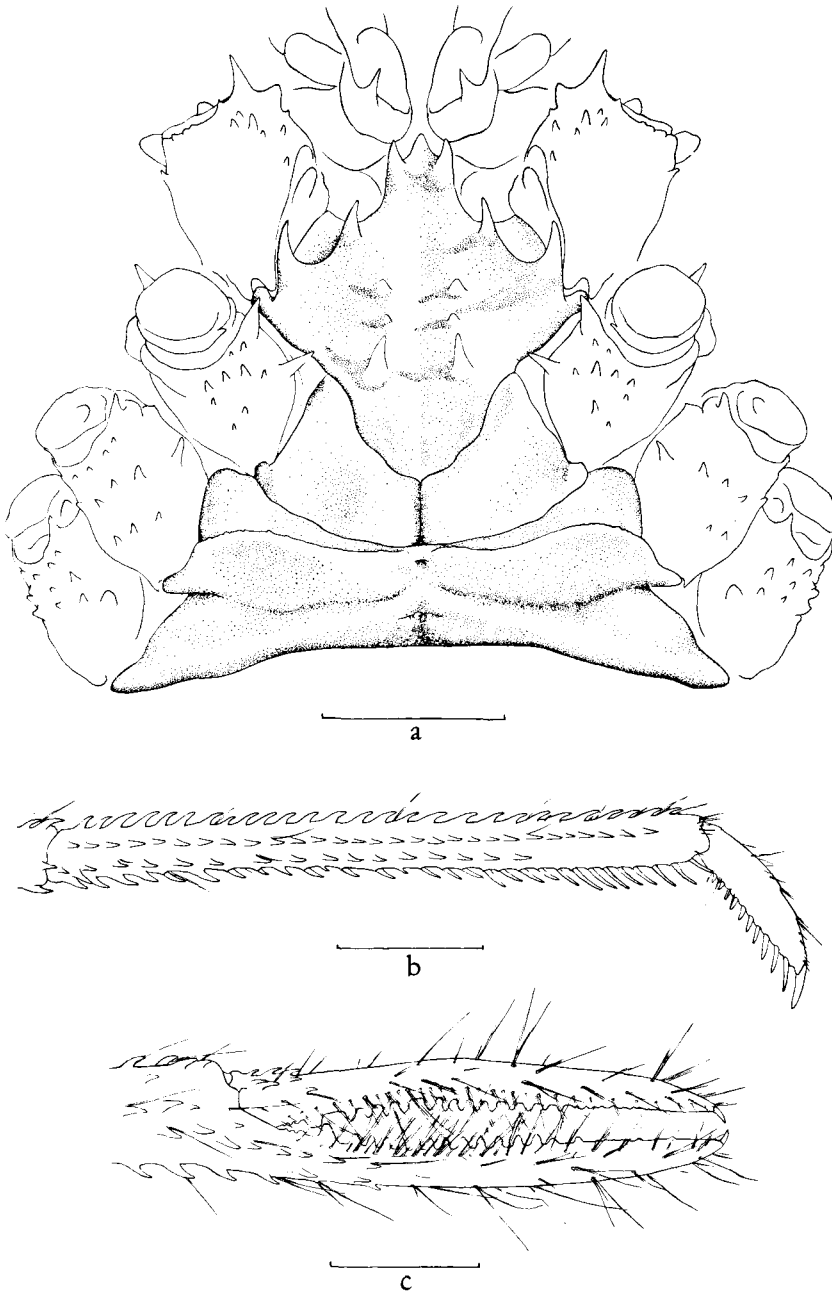

FIGURE 3—Holotype of *Chirostylus perarmatus*. A, sternal plastron; B, right walking leg; C, fingers of right chela. (Scales represent 5 mm.)

Description

The carapace, including the rostrum, is about twice as long as its greatest width and as long as the first six segments of the abdomen; it is narrowest anterior to the cervical groove. The lateral margins are subparallel and slightly convex behind the cervical groove, which forms a deep, transverse depression separating the gastric and cardiac regions and extends obliquely forward on either side to separate the gastric region from the hepatic regions. The gastric region is swollen and well defined; the cardiac region is poorly defined laterally and posteriorly. The posterior branchial regions meet in the midline. The carapace is thin and semitransparent; except for the rostrum and the area near the cervical groove it is densely covered with thorn-shaped, forward-pointing spines. There are seven particularly prominent spines in the gastric region, one in each hepatic region, and one in the anterior branchial region at either side of the transverse portion of the cervical groove. On the posterior branchial regions the large spines tend to be arranged in uneven longitudinal rows, with the largest ones near the midline. Many spinules are interspersed with the large spines, especially on the posterior branchial regions. In the smaller specimens, fewer of these spinules are developed and they may nearly be absent on the gastric region.

The sides of the carapace are swollen laterally and visible in dorsal view; they are evenly and densely covered with small spines.

The rostrum is a slender, straight spine, broadened at its base; it is unarmed and sharply upturned.

The eyes are short, not reaching the tip of the rostrum.

The stylocerite of the antennules is a short, rounded, unarmed lobe.

The antennae are slender and nearly as long as the carapace. Their flagella extend beyond the flagella of the antennules.

The outer maxillipeds have a well-developed coxal spine; there is a small spine at the outer distal margin of the merus, and a subproximal and a distal spine on the outer margin of the carpus; the propodus is unarmed.

The sternite of the outer maxillipeds is very narrow and pointed anteriorly; on either side of it is a large, stout spine, placed just behind the margin at the base of the maxillipeds. The sternite of the chelipeds has four large spines, two on either side, along its anterior border; on the posterior portion of this sternite is a pair of large spines, one on either side of the midline; anterior to these spines and roughly in line with them are one or two pairs of well-developed tubercles or spinules. Two more pairs of barely perceptible tubercles are sometimes developed anterior to these, the most anterior pair being located on a line with the inner pair of large spines. The sternites of the walking legs are unarmed.

The chelipeds are very long and slender, approximately four to five times the length of the carapace; they tend to be proportionately longer in smaller individuals. The lower surface of the coxa is armed with a large inner distal spine and covered with a number of spinules. The basi-ischium has a spine at its upper distal margin and numerous spines, arranged in four irregular rows, on its outer and lower surfaces. The merus, carpus, and palm are armed on all sides with even, longi-

tudinal rows of close-set spines; between these rows the surface is flattened rather than convex. Interspersed with the rows of spines are long, scattered hairs. The palm is about one and a half to two times as long as the fingers, which are slightly curved and gaping, their inner edges with a row of blunt teeth and with many hairs; they are otherwise smooth except for a few minute spinules on their lateral and dorsal surfaces near the proximal end.

The walking legs are very long, reaching or surpassing the distal end of the carpus of the cheliped. The lower surface of the coxa has a large inner distal and inner subdistal spine; these spines are especially prominent on the first two pairs of walking legs. The basi-ischium, merus, and carpus are armed much like the corresponding articles of the chelipeds. The distal third of the propodus is compressed and slightly broadened, and the lower margin of the segment is armed with a row of slender, movable spines; the spines near the distal end are elongate. The dactyl is short, unarmed on its dorsal and lateral surfaces, and provided with a strong, slender terminal claw; its lower margin has a series of slender, movable spinules which increase in size distally.

The first abdominal segment has a transverse row of about 12 to 18 spines; it has no pleura but their position is marked by a stout, pointed tubercle on either side. The second segment has a transverse row of five to eight spines on its proximal margin; in larger individuals there is a transverse row of two to four small conical tubercles near the midline of the somite and about halfway between its proximal and distal margins. Segment 2 also has a small group of large, pointed conical tubercles (usually three to five in mature specimens) on either side at the junction with the pleura, and the latter have a row of small conical spines or teeth along their proximal margin and sometimes several more spines on the pleural surface. The third abdominal segment is unarmed except for one or two spines on either side at the junction with the pleura; in some small individuals these spines are wanting. The fourth segment is unarmed except for one to three spines on either side at the junction with the pleura. The fifth segment has a double longitudinal row of three or four spines on its surface, and a longitudinal row of two to four spines on either side at the junction with the pleura. The sixth segment has many strong spines over the entire surface, tending to form longitudinal rows; the distal margin has three spines which overhang the telson. The pleura of segments 3 through 6 have their surfaces armed with numerous spinules except in very small individuals (the pleura of segment 3 especially tend to lack or have a reduced number of these spinules). The portion of the telson proximal to the transverse fissure is covered with fine spinules; the distal portion is unarmed but covered with very fine, short setules.

Males have paired gonopods on abdominal segments 1 and 2, and rudimentary pleopods on segments 3 through 5. Females have paired pleopods on segments 2 through 5.

Measurements

The paratypes vary in size from 14.5 mm to 22.5 mm for males and 12.3 mm to 21.2 mm for females (length of the carapace including the

rostrum). Following are measurements of the holotype, expressed in millimeters.

Length of body when fully extended:		61.0	
Length of carapace, including rostrum:		26.0	
Greatest carapace width:		14.0	
Right cheliped:			
Coxa and basi-ischium:		7.0	
Merus:		41.0	
Carpus:		24.8	
Propodus:		24.8	
Propodus and pollex:		41.8	
Dactyl:		16.8	
Right walking legs:	*1*	*2*	*3*
Coxa and basi-ischium:	7.0	7.0	7.0
Merus:	35.8	37.0	38.1
Carpus:	18.4	20.2	19.0
Propodus:	23.3	23.0	26.0
Dactyl:	6.3	5.9	5.5

Color

The specimens were bright pink after a few weeks of preservation in alcohol, but soon faded to white.

Derivation of name

Latin *per*—well, very much, and *armatus*—armed; in reference to the numerous spines on the carapace, legs, and abdomen.

RELATIONSHIPS

Only two species of *Chirostylus* were previously reported from the eastern Pacific: *C. milneedwardsi* (Henderson) was collected in southern Chile by the *Challenger* Expedition, and *C. defensus* (Benedict) off the Galapagos Islands by the *Albatross*. *C. milneedwardsi* differs from *C. perarmatus* in having the propodus of the outer maxillipeds armed, and abdominal segments 2 through 6 completely covered with transverse rows of spines. *C. defensus* is more closely allied to the new species. It resembles *C. perarmatus* in the shape and proportions of the carapace, in the armature of the abdomen, and in the lack of armature on the propodus of the outer maxillipeds.

At my request Fenner A. Chace, Jr., U. S. National Museum, compared drawings of the new species against the two syntypes of *Ptychogaster defensa* Benedict in that institution. He concluded (pers. comm.), "Comparison of your figures with the syntypes of *Ptychogaster defensa* leaves me without doubt that your *Chirostylus* is distinct. In *C. defensus* all of the major spines on the carapace and legs are longer and less numerous, and there are fewer small spines interspersed among the larger ones. This is especially true of the chelipeds, which have the spination much more widely spaced and irregular than in your specimen. The pair of spines at the anterior end of the sternum in *C. defensus* are no more than sharp tubercles, and they are set well back from the margin at the bases of the maxillipeds. The two pairs of prominent tubercles that are lined up with the posterior pair of sternal spines in the California specimen are entirely lacking in *C. defensus*. The fingers of the chelae in the Galapagos species have a wider gap and a more prominent tooth near the base of each finger, but

the succeeding teeth (in the gape) are smaller and less numerous (more widely spaced)."

C. perarmatus appears to be most closely related to an Indian Ocean species, *C. investigatoris* (Alcock and Anderson). From the published illustrations and descriptive material, *C. investigatoris* appears to differ in details of the abdominal armature. In this species, the fifth segment is unarmed except laterally at the junction with the pleura, while *C. perarmatus* has a double row of spines on the fifth segment. Direct comparsion of the two species might reveal other distinguishing characters.

ACKNOWLEDGMENTS

I am grateful to John E. Fitch, California Department of Fish and Game, for providing the specimens on which the description of *Chirostylus perarmatus* is based, and for the information relating to their capture. I am also indebted to Fenner A. Chace, Jr., U. S. National Museum, for clarifying the distinctions between the new species and *C. defensus*. The illustrations were prepared by Timothy Wyatt.

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