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# 16.

## The Templeton Crocker Expedition. XI. Hermit Crabs from the Gulf of California and the West Coast of Lower California.<sup>1</sup>

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[Note: This is the eleventh of a series of papers dealing with the specimens collected on the Twenty-fourth or Templeton Crocker Expedition of the Department of Tropical Research of the New York Zoological Society; William Beebe, Director. For data on dredges, localities, dates, etc., concerning the capture of specimens treated in this paper, refer to the present volume of *Zoologica*, No. 2, pp. 33 to 46.]

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#### INTRODUCTION.

This collection of pagurids from the Gulf of California comprises 26 species in 9 genera. 8 new species are described, and 5 new combinations are noted. New locality records are given, some extending the known range nearly 20 degrees of North latitude. The type specimens for all the new species are deposited in the New York Zoological Society.

I wish to express my thanks to Dr. Knud Stephensen, of the Zoologisk Museum, Copenhagen, and Dr. Bruno Parisi, of the Museo Civico di Storia Naturale, Milan, for literature, and to Dr. Waldo L. Schmitt, of the U. S. National Museum, for the loan of comparative specimens, and photographs of some unpublished drawings in that institution. I wish also to acknowledge my indebtedness to the California Academy of Sciences in San Francisco, for the loan of material.

#### Family COENOBITIDAE.

##### Genus *Coenobita* Latreille.

#### ***Coenobita compressus* (Guérin).**

*Coenobita compressa* Guérin. Voy. autour du Monde sur la *Coquille* par Duperrey, *Zool.*, vol. 2, pt. 2, 1831, p. 29.

*Coenobita compressus* Faxon. *Mem. Mus. Comp. Zool.*, vol. 18, 1895, p. 52; Rathbun, *Proc. U. S. Nat. Mus.*, vol. 38, 1910, p. 596; Schmitt, *Zoologica*: N. Y. Zool. Soc., vol. 5, no. 15, 1924, p. 170; Boone, *Zoologica*: N. Y. Zool. Soc., vol. 14, no. 1, 1931, p. 25, fig. 7.

*General Range*: East Africa to Pacific shores of America.

*Local Distribution*: A single male specimen was taken at San Lucas Bay, inside Cape San Lucas, Baja California, Mexico (Station 135).

*Sex and Size*: This male specimen has the following dimensions: length from rostrum to telson 57 mm., of carapace 17 mm., of precervical portion of carapace 9 mm., width 6 mm., length of cheliped 28 mm., of merus 9 mm., of carpus 7 mm., of manus 10.5 mm., of dactyl 6 mm., width of manus 9.5 mm., length of eye-stalk 5.0 mm.

*Color*: In alcohol, carapace a cream; chelipeds and ambulatories a taupe; hands a brownish-yellow.

*Habitat*: For the most part these terrestrial hermit crabs inhabit the land bordering on the sea. They select heavy shells for their abode. They are, in the main, vegetarians, though they do not limit their diet and may at times act as scavengers, or become carnivorous. In the author's experience, they seem to have a strongly developed sense of smell, as they immediately gathered in large numbers on fresh burro droppings. They also proved a nuisance to the mammalogist in our party, who baited his traps with rolled oats. In addition they are good tree climbers.

*Remarks*: This is a widely distributed and variable species. Its range does not extend to the head of the Gulf of California.

#### Family PAGURIDAE.

#### Genus *Paguristes* Dana.

#### *Key to species of Paguristes collected on this expedition.*

- A. Hands broad, 1/5 longer than wide. Antennal flagellum reaching hand.
  - B. Chelipeds without heavy spines except on inner margins; carpus with 3, manus with 6 or 7. Flagellum nearly naked. *P. digueti*.
  - B'. Chelipeds with heavy spines on upper surface and inner margins; carpus with 6, manus with 4. Flagellum lightly ciliated. *P. bakeri*.
- A'. Hands twice or nearly twice as long as wide. Antennal flagellum reaching hand. Chelipeds spinulose.
  - B. Flagellum heavily ciliated beneath. Hands more than twice as long as wide. Inner margin of carpus with 4 spines; manus with 3 spines. *P. occator*.
  - C. Hands twice as long as wide. Inner margin of carpus with 6 spines; manus with 5 spines. *P. praedator*.
  - B'. Flagellum lightly ciliated. Inner margin of carpus with 5 spines; manus with 4 spines.
    - C. Rostral tooth short, equal in length to laterals. Hands 2/3 as wide as long. *P. holmesi*.
    - C'. Rostral tooth long, exceeding the length of laterals. Hands almost twice as long as wide. *P. oculiviolaceus*.
- A". Hands twice as long as wide. Antennal flagellum short, not reaching hand; lightly ciliated. Inner margin of carpus with 4 spines; manus with 3 spines. *P. aztatlanensis*.

#### ***Paguristes digueti* Bouvier.**

*Paguristes digueti* Bouvier. *Bull. Soc. Philom.*, Paris, vol. 8, no. 5, 1892-93, p. 18, figs. 1-4 (type-locality, Santa Rosalia, Baja California).

*General Range*: So far only recorded from the Gulf of California.

*Local Distribution*: A total of 5 specimens was taken from Arena Bank (Station 136), and Santa Inez Bay (Stations 141 and 143), between 7 and 33 fathoms.

The specimens were distributed as follows:

Station 136: D-5 (2 juvenile females); 33 fathoms.

Station 141: D-1 (1 male); 7 to 9 fathoms.

Station 143: D-1 (2 males); 29 fathoms.

*Sex and Size*: The collection numbers 3 adult males and 2 juvenile females. The largest specimen, a male from Station 141 D-1, has the follow-

ing measurements: length from rostrum to telson 80 mm., of carapace 20 mm., of precervical portion of carapace 11 mm., width of same 11 mm., length of cheliped 34 mm., of merus 10 mm., of carpus 7 mm., of manus 14 mm., of dactyl 10 mm., width of manus 11 mm., length of eye-stalk 9 mm.

*Color:* In alcohol, a pinkish-white, maculated with a rich red; hands a darker red. Cornea of eyes blue, on red stalks.

*Habits, Habitat:* This species usually occupies a shell with a narrow aperture, such as *Strombus*, which gives a distorted shape to the carapace, greatly distending the branchial regions. It is evidently not an inter-tidal form, but may be expected in depths ranging from 10 to 50 fathoms.

*Remarks:* These are new locality records for this species, extending the geographical range more than 4 degrees of latitude to the south.

### ***Paguristes bakeri* Holmes.**

*Paguristes bakeri* Holmes. *Occas. Papers Calif. Acad. Sci.*, vol. 7, 1900, p. 152 (type-locality, San Diego, California); Rathbun, *Harriman Alaska Expedition*, vol. 10, 1910, p. 162; Hilton, *Jour. Ent. Zool.*, Pomona Coll., vol. 8, no. 2, 1916, p. 65, figs. 11-12; Schmitt, *Univ. Cal. Pub. Zool.*, vol. 23, 1921, p. 124, pl. 18, figs. 2-6.

*General Range:* From San Francisco to San Diego, California, and the Gulf of California, to a depth of 116 fathoms. (Schmitt).

*Local Distribution:* A total of 7 specimens was taken east of Cedros Island (Station 128 D-1), at 39 fathoms; 1 male was taken east of Cedros Island (Station 126 D-3), at 40 fathoms.

*Sex and Size:* The series collected at both stations consists of 7 males and 1 female, all adults. A large male from Station 128 has the following measurements: length from rostrum to telson 90 mm., of carapace 26 mm., of precervical portion of carapace 14 mm., width of same 12 mm., length of cheliped 45 mm., of merus 14 mm., of carpus 12 mm., of manus 17 mm., of dactyl 9 mm., width of dactyl 13.5 mm., length of eye-stalk 11 mm.

*Color:* In alcohol, carapace a pinkish-white overlaid with an orange red. Eye-stalks red. Chelipeds and ambulatories a buff. Spines a corneous brown. Setae a straw yellow.

*Habits, Habitat:* This large, active pagurid occupies a heavy shell. In the shallower waters along the California coast it usually occupies the discarded shell of *Polinices lewisii* (Gould), or some such durable gastropod shell. When occupying the *Polinices* shell it is invariably accompanied by a polynoid worm, which seeks seclusion in the umbilicus.

*Remarks:* These more southern forms differ in no wise from those taken in more northern waters, and are similar in form, color and size, to those found off the California coast.

### ***Paguristes occator*, sp. nov.**

*Type:* Male, holotype; Cat. No. 361,119, Department of Tropical Research of the New York Zoological Society; Station 150, Dredge 2; from the Gulf of California, 23° 01' N. Lat., 109° 28' W. Long., off Gorda Point, Lower California, Mexico; 75 fathoms; bottom sandy; April 21, 1936; 4-foot Blake dredge; collected by William Beebe on Templeton Crocker's yacht *Zaca*.

*Diagnosis:* Median tooth extending past laterals and past the proximal end of eye-scales. Eye-stalks long, slender, and slightly curved outward. Chelipeds spinulose, margins subparallel; width and thickness of hands subequal. Flagellum of antennae heavily ciliated beneath, nearly nude on upper surface.

*Description:* Anterior portion of carapace slightly longer than wide; rostral tooth triangular, equilateral, sharp-pointed, extending past laterals and between the bases of the eye-stalks; laterals obtuse, armed with a minute, marginal spinule; surface punctate, with a few tufts of setae.

Eye-stalks long, slender and slightly curved outward; in length they equal the width of the carapace, and extend nearly as far as the distal end of the merus. Ophthalmic scales broad at base, inner margin entire, curving downward, tip triangular, trifid, with a prominent, conical spine, two lesser spines on outer margin.

Antennal acicle extends  $\frac{3}{5}$  the length of the eye-stalk; including spines, it is  $1\frac{1}{2}$  times longer than wide; six prominent, sharp, corneous-tipped spines on inner margin; two similar spines on outer distal margin, with basal margins of spines supporting tufts of long, pinnate-tipped setae. Distal end of 3rd peduncle of antennae does not reach cornea of eye; flagellum, heavy ciliated on under side, sparsely on upper surface, reaches past proximal end of hands.

The chelipeds are subequal, similar, spinulose, with tufts of pinnate-tipped setae originating at the anterior base of spines; merus trigonal, upper edge granular, distal and subdistal margins armed with a lateral row of spines; lower margins spinulose, the outer with short, the inner with 6 or 7 longer and more prominent spines increasing in length and size, distally; the carpus is short,  $\frac{1}{4}$  longer than wide, armed on inner margin with 4 upward- and forward-pointing corneous spines inside of which, on upper surface, is a row of smaller intermediate spines, while outer margin has a row of small spines; hands are long, narrow and thick, subequal, similar; width, subequal to thickness; 3 long, corneous-tipped spines on inner margin of palm; row of spines on outer margin of hand, the largest on pollex; few scattered similar spines on upper surface of hand and fingers; dactyl is subequal in length to carpus; pollices subequal in width to their dactyli, with tips corneous, acuminate; teeth are calcareous lobes.

The ambulatory legs slightly exceed the chelipeds in length, margined with setae; upper carpal and propodal crest of 1st pair, spinulose, of 2nd pair, rugose.

*Color:* In alcohol, a light pinkish tint, iridescent. Chelipeds splotched with pink and white. Dactyli of ambulatory legs banded with white. Setae a straw yellow.

*Measurements:* Male, holotype; length from rostrum to telson 36 mm., of anterior portion of carapace 6 mm., width 5 mm., length of cheliped 14.8 mm., of merus 5.7 mm., of carpus 4 mm., of manus 7 mm., of dactyl 4 mm., thickness of hand 3 mm., width 3 mm., length of eye-stalk 5 mm., of antennal acicle 2.5 mm., width 1 mm.

*Range:* Known only from type locality.

*Material Examined:* The holotype male (see *Type*).

*Remarks:* This proposed species is allied to *P. turgidus* (Stimpson), 1857, but differs in that the hands are twice as long as wide, instead of one-third, or more, longer than wide, by the eye-stalks being as long as the width of the carapace, instead of three-fourths as long as the width of the carapace, by the antennal flagellum being densely ciliated below, instead of sparsely haired, by the inner margin of the hand being armed with 3 spines, instead of armed with 4. It is also allied to *P. ulreyi* Schmitt, 1921, but differs in the shape and size of the hand, being straighter and narrower, and by there being fewer spines on the chelipeds.

### ***Paguristes praedator*, sp. nov.**

*Type:* Male, holotype; Cat. No. 36,782, Department of Tropical Research of the New York Zoological Society; Station 136, Dredge 27; from the Gulf

of California, 23° 28' N. Lat., 109° 24' W. Long., 3 miles northeast of Cape Pulmo, Lower California, Mexico; 50 fathoms; bottom sandy with rock; May 1, 1936; 4-foot Blake dredge; collected by William Beebe on Tempieton Crocker's yacht *Zaca*.

*Diagnosis*: Median tooth of carapace not extending past laterals, nor reaching base of eye-scales. Eye-stalks long, slender, straight. Chelipeds spined on inner margin; carpus with 6; manus with 5. Antennal flagellum heavily ciliated beneath.

*Description*: Anterior portion of carapace but slightly longer than wide, surface with few setae; median tooth subtruncate, short, not extending to the base of eye-scales, upper surface concave; lateral projections obtuse, extending past the median and tipped with a small marginal spine. The posterior margin of the carapace is but slightly concave.

Eye-stalks long, slender, slightly constricted in the middle, in length they are subequal to the length of the carpus or the dactyl of the chelipeds. Ophthalmic scales long, narrow, pointed, margins entire.

Antennal acicle nearly straight, with two spines on the inner margin, one median, the other subproximal; as a variation there may be three spines. The acicle does not reach the cornea of the eye. The 3rd peduncle of the antennae reaches past the eye by nearly  $\frac{1}{3}$  its length, while that of the antennule exceeds the eye by  $\frac{1}{2}$  its length.

The chelipeds are subequal, similar, with tufts of setae; merus trigonal, with an upper crest of setae, the upper distal end and the subdistal margin are each armed with a single tooth, the inner lower margin spinulose, the outer granulose; the carpus in a lateral cross-section forms a quadrant, with the upper face rounding from the inner margin to the lower outer margin, the inner margin is armed with 6 spines, the anterior the largest, the outer margin is armed with 4 or 5 much smaller teeth, the surface between these ridges is smooth, the outer lower distal end, or hinge joint of the hand is spinulose; the hand is twice as long as wide and slightly more than a third its length in thickness, a lateral cross-section forming a quadrant, the inner margin of the palm is armed with 5 upward- and inward-pointing teeth, the outer margin of the hand is armed with small pointed tubercles, more numerous and larger on the pollex, the upper surface of the hand has 3 longitudinal rows of small, bristle-bearing tubercles, the crest of the dactyl is spinulose as is its upper surface, the fingers gape from base to corneous apices, and are armed with small calcareous denticules, the bases of the spines and spinules are setaceous.

The ambulatory legs are slender, the length of the dactyli slightly exceeding their propodi, the 1st pair are crested with spines on the carpus and propodus, the 2nd pair with a spinule on the upper distal end of the carpus only, both legs are margined with setae.

The distal margin of the telson is smooth, unarmed.

*Color*: In alcohol, the ground color is an iridescent cream with dashes and splotches of crimson, this extends to the chelipeds and legs, the former are more highly colored on the inside, while the latter appear to be banded. The setae are a straw colored yellow.

*Measurements*: Male holotype; length from rostrum to telson 27 mm., of anterior portion of carapace 3.5 mm., width 3.4 mm., length of cheliped 12 mm., of merus 3.8 mm., of carpus 3 mm., of hand 5 mm., of dactyl 3 mm., width of hand 2.3 mm., thickness 1.8 mm., length of eye-stalk 3.1 mm.

*Range*: So far only known from the Gulf of California.

*Material Examined*: A series of 85 specimens of both sexes from Arena Bank off Punta Arena, Lower California, Mexico (Station 136); the types were selected from this series which were collected in April and May of 1936, in from 30 to 85 fathoms. A series of 16 specimens of both sexes was

taken from Santa Inez Bay, Lower California, Mexico (Station 142, Dredge 3); April 11, 1936; in 40 fathoms. A male specimen from Gorda Bank, off Gorda Point, Lower California, Mexico (Station 150, Dredge 3); in 58 fathoms; April 21, 1936.

*Remarks:* This proposed species is allied to *P. sayi* A. M. Edwards and Bouvier, 1893, in that the antennal peduncles in both species exceed the eye; they differ in that the eye-stalks in *P. sayi* are short and heavy, while in this proposed species they are long and slender. This species also somewhat resembles the Indo-Pacific species *P. incomitatus* Alcock, 1905, in the shape of the chelipeds and the number of spines on the margin of the hand, and that the fingers do not close; it differs in that the antennae are long, instead of short.

***Paguristes holmesi*, sp. nov.**

*Type:* Male, holotype; Cat. No. 36,1120, Department of Tropical Research of the New York Zoological Society; Station 150, Dredge 2; from the Gulf of California, 23° 01' N. Lat., 109° 28' W. Long., off Gorda Point, Lower California, Mexico; 75 fathoms; bottom sandy; April 21, 1936; 4-foot Blake dredge; collected by William Beebe on Templeton Crocker's yacht *Zaca*.

*Diagnosis:* Rostral tooth equal in length to laterals, just reaching bases of eye-scales. Chelipeds setaceous, spinose; hands more than  $2/3$  longer than wide; carpus with 5 marginal spines; hand with 4.

*Description:* Anterior portion of carapace longer than wide; front tridentate, rostral tooth triangular, not sharp, reaching to base of eye-scales; laterals obtuse, armed with a sharp marginal spine; rostral tooth subequal in length to laterals.

Eye-stalks long, slender, straight, not quite twice as long as the distance between the lateral spines of the carapace. Ophthalmic scales toothed on inner and outer margins, about 8 teeth in all. Third peduncle of antennule extends past cornea of eye about  $1/5$  its length.

Antennal acicle reaches  $5/6$  the length of the eye-stalk, is nearly straight and armed on both margins with spines, 3 on the proximal inner end, and 3 on the distal outer margin.

The chelipeds are subequal, similar, hairy and spinulose; merus spined on upper distal margin, behind which the subdistal margin is also spined, behind this latter margin are 2 or 3 smaller, lateral rows of spines, the inner and outer borders of the lower face are spinulose and tuberculate; carpus with 5 stout spines on upper inner edge, its upper surface, as is the hand, covered with upstanding, corneous-tipped spines, from the anterior bases of which are tufts of long yellow setae; the hands are widest at the base of the dactyli, about  $2/3$  as wide as long; inner edge of palm armed with 4 stout spines, with 3 much smaller ones below on inner face, and intermediate between them; the length of the dactyl equals the length of the palm, is spinulose like the upper surface of the palm and pollex, and is armed on its distal prehensile edge with a corneous, close set row of teeth, the median and proximal teeth are calcareous, as are those of the pollex, except for the corneous tip.

The ambulatory legs extend past the chelipeds by the length of their dactyli; the dactyli of the right side being slightly longer than those of the left; the carpus and propodus of the 1st pair of legs are crested with a row of stout spines; minute spines may or may not occur on the carpus of the 2nd legs, both pairs of legs and their dactyli are lined with tufts of yellow setae similar to that of the chelipeds.

*Color:* In alcohol, a light pinkish tint. Hands pinkish, flecked with red. Ambulatory legs iridescent on smooth surfaces; dactyli flecked with red. Eye-stalks white on upper surface, carmine on sides and beneath.

*Measurements:* Holotype, male; length from rostrum to telson 49 mm., of carapace 17 mm., of anterior portion of carapace 9.5 mm., width 8 mm., length of cheliped 25 mm., of hand 10.8 mm., width of hand 6.2 mm., length of dactyl 6.2 mm., of eye-stalk 6.8 mm., distance between laterals 3.8 mm., length of antennal flagellum 14.5 mm. An imperfect male paratype which is larger than the holotype has the following measurements: length from rostrum to telson 59 mm., of anterior portion of carapace 10.7 mm., width 9.8 mm., length of eye-stalk measured from base to tip of cornea 7.8 mm. In this specimen the rostral projection falls behind the laterals.

*Range:* Lower portion of the Gulf of California.

*Material Examined:* A series of 39 specimens, 27 males and 12 females, from Gorda Bank (Station 150), off Gorda Point, Lower California, Mexico; in from 50 to 85 fathoms; April 22 to May 3, 1936; the types were selected from this series. One male from Arena Bank (Station 136), Gulf of California, off Cape Pulmo, Lower California, and one male from Station 126, Dredge 1; from east of Cedros Island, west side of Lower California, in 28° 07' N. Lat., 115° 09' W. Long.; in 38 fathoms; March 27, 1936.

*Remarks:* This proposed species is allied to *P. ulreyi* Schmitt, 1921, but differs in that the antennae are not thickly haired, instead of being thickly haired underneath; by having 4 spines on the inner margin of the palm and 3 smaller ones below these, instead of having 3 spines on the margin with 2 beneath; by the ophthalmic scales being spinulose on both margins, instead of with 4 or 5 spines at the tip. This proposed species also closely resembles *P. bakeri* Holmes, 1900, in the size, shape, coloration and general disposition of the spines on the chelipeds, but differs in the contour of the hands, those of *P. bakeri* being much the wider of the two species.

This species is named for Dr. Samuel J. Holmes, of the University of California, in appreciation of his work in crustacea, and for the favors he has granted me.

### ***Paguristes oculiviolaceus*, sp. nov.**

*Type:* Male, holotype; Cat. No. 36,796, Department of Tropical Research of the New York Zoological Society; Station 150, Dredge 3; from Gorda Bank, Gulf of California, 23° 00' N. Lat., 109° 28' W. Long., off Gorda Point, Lower California, Mexico; 58 fathoms; bottom sandy; April 21, 1936; 4-foot Blake dredge; collected by William Beebe on Templeton Crocker's yacht *Zaca*.

*Diagnosis:* Median tooth extending past laterals, reaching well between the eye-scales, equilateral. Eye-stalks long, straight, slightly ciliated at cornea, violet colored. Chelipeds with heaviest spines on inner margins, 5 on carpus, 4 on manus. Antennal flagellum lightly ciliated.

*Description:* Anterior portion of carapace longer than wide, seminude; median tooth equilateral, extending past the laterals and well between the eye-scales; laterals obtuse, armed with a marginal spinule. The posterior margin of the carapace with a median concavity.

Eye-stalks long, straight, slightly dilated at the cornea, subequal in length to that of the dactyl of the chelipeds, and extends to the subdistal margin of the merus. Ophthalmic scales wide at base, with bifid tips; inner margin entire.

Antennal acicle nearly straight, armed on inner margin with 4 sharp teeth, outer margin with 1, tip bifid, it extends but little past half the length of the eye. The 3rd peduncle of the antennae reaches 2/3 the length of the eye, while that of the antennule reaches half its length past the eye. The antennal flagellum is sparsely ciliated and reaches the proximal end of the hand.

The chelipeds are subequal, similar, with tufts of setae; merus trigonal,

subequal in length to the width of the carapace, with a thin crest of setae, distal and subdistal margins armed with a few spines, lower inner margin with a few spines, the outer with setae and spinules; the carpus is armed on its inner margin with a row of 5 upward- and forward-pointing, corneous-tipped spines, a row of smaller similar spines parallel the marginal spines, the outer margin is outlined with still smaller spines, below which, on the outer surface, is a row of still lesser spinules, the anterior bases of the spines are tufted with short setae; the hand is spinulose on its upper surface, and rounded down to its outer margin, it is subequal in length to the length of the anterior portion of the carapace, the inner margin of the palm is armed with 4 teeth, similar to those on the carpus, the proximal two having a common base, the distal two are entire and separate, the outer margin, like the surface of the hand and fingers, is roughened with small setaceous spinules, the pollex is wider than the dactyl, corneous-tipped, the fingers gape evenly from base to corneous, spoon-shaped apices.

The ambulatory legs are slender, crested with short setae, and exceed the length of the chelipeds by half their dactyli; the dactyli being nearly as long as their carpus and propodus combined; the carpus and propodus of the first pair are crested with spines, those of the second pair are lightly rugose.

The distal margin of the telson is margined with corneous-tipped spines.

*Color:* In alcohol, the carapace and legs are buff with pinkish iridescence, the inner side of the merus of the chelipeds is a dull orange. The remarkable feature is the brilliant violet color of the eye peduncles and the antennules. The setae are a straw color.

*Measurements:* Male holotype; length from rostrum to telson 31 mm., of anterior portion of carapace 5.3 mm., width 4.5 mm., length of cheliped 13 mm., of merus 4.5 mm., of carpus 2.9 mm., of hand 5.5 mm., of dactyl 3.5 mm., width of hand 3 mm., thickness 2 mm., length of eye-stalk 3.5 mm.

*Material Examined:* The male holotype and the male paratype from the type locality.

*Remarks:* This proposed species is allied to *P. lymani* Milne Edwards and Bouvier, 1893, which it somewhat resembles in the number and disposition, but not in the shape, of the spines on the chelipeds. It differs also in the following respects: rostrum exceeding laterals, instead of not being so far advanced; eye-scales slender to the bifid tip, instead of stout; terminal margin of telson with a few well separated teeth, instead of with many close-set teeth. The shape of the chelipeds also somewhat resembles those of *P. puniceus* Henderson, 1896, an Indo-Pacific species.

### ***Paguristes aztatlanensis*, sp. nov.**

*Type:* Female, holotype; Cat. No. 36,788, Department of Tropical Research of the New York Zoological Society; Station 136, Dredge 27; from the Gulf of California, 23° 28' N. Lat., 109° 24' W. Long., 3 miles northeast of Cape Pulmo, Lower California, Mexico; 50 fathoms; sandy bottom with rock; April 30, 1936; 4-foot Blake dredge; collected by William Beebe on Templeton Crocker's yacht *Zaca*.

*Diagnosis:* Rostral tooth long, sharp, triangular, slightly exceeding laterals, extending between bases of eye-scales. Eye-stalks extending past merus. Flagellum short, lightly ciliated. Chelipeds densely spinulose, pubescent; carpus with 4 inner-marginal spines; palm of hand with 3; tips of fingers spooned.

*Description:* Anterior portion of carapace nearly 1/3 longer than wide, the width subequal to the length of the hands, with a few setae, rugose, and spinules on lateral regions. Median tooth forms an acute triangular

small marginal spine; between the median spine and the laterals the margin is concave and thickened. The gastric lobes are well defined anteriorly.

Eye-stalks straight, cylindrical, subequal in length to that of the merus, and extending past that member by nearly half their length. The ophthalmic scales are subquadrate at their base, with short equilateral apices, armed at the tip with one or more apical spines. The distal end of the antennular peduncle just exceeds the tip of the eye.

The antennal acicle is slender, short, extending but half the length of the eye-stalk, bifid at the tip, armed with 3 well-formed spines on inner margin, with 2 on the outer distal margin, and is lightly setose; the segment behind the base of the acicle has one or more well developed spines, its distal outer terminus is bifid, the outer margin spinulose. The distal end of the 3rd peduncle is but little advanced beyond the acicle. The flagellum is short, lightly ciliated and subequal in length to that of the merus.

The chelipeds are short, subsimilar, equal, the carpus and manus covered with short, black-tipped spines, the largest on the inner margins, these spines are nearly covered with pubescence, growing less thick at the base of the fingers; the merus is trigonal, smooth on the inner side, rugose on the outer, armed on the distal and subdistal margin with a few spines, the lower inner margin with spine-tipped tubercules; the carpus has 4 inner-marginal spines and a row of 5 smaller spines on the outer margin, and a prominent spine over the upper articulation with the hand; the hands are rounded over from the inner margin, which is armed with 3 spines, the surface having many short, sharp-tipped spines visible through the pubescence, the length of the dactyl is subequal to the width of the hand, its thickness is  $\frac{2}{3}$  its width, the fingers meet on the upper surface and are excavated beneath, with corneous semi-spoon-shaped tips.

The ambulatory legs are stout, setose and pubescent on their margins, and extend past the chelipeds by the length of their dactyli, the carpus, propodus and dactyls have numerous rows of small corneous-tipped spines. The rasps of the 3rd and 4th legs and also those of the uropods are composed of short, dark, corneous spinules. The terminal margin of the telson is armed with wide-spaced teeth.

*Variation:* Of the two female specimens taken, one, the holotype, had occupied a shell with a circular aperture, while its companion, a non-ovigerous female, had occupied a shell with a wide narrow slit, similar to that of a *Conus*. This opening vertically constricted the animal's carapace and distorted its appearance, as is the carapace of *P. digueti* Bouvier, 1892, which occupies the shell of a *Strombus*.

*Color:* In alcohol, a pinkish tint on an ivory ground.

*Measurements:* Female holotype; length from rostrum to telson 34 mm., of anterior portion of carapace 9 mm., width 5.3 mm., length of cheliped 16 mm., of merus 4.5 mm., of carpus 4 mm., of hand 5.5 mm., width of hand 3 mm., thickness 2 mm., length of eye-stalk 4.3 mm., length of flagellum of antennae 4.6 mm.

*Range:* Known only from type locality.

*Material Examined:* Two female specimens from the same dredge haul, the holotype the larger of the two.

*Remarks:* This proposed species is closely allied to *P. fecundus* Faxon, 1893, but differs in that the terminal lobes of the telson are distinctly toothed on their margins, instead of obscurely toothed, by the antennal acicle reaching  $\frac{2}{3}$  the distance of the eye peduncle, instead of nearly to the end of the peduncle, by the ischium of the outer maxillipeds being armed on its inner margins with a serrate row of short teeth, the merus instead of armed with 3 or 4 denticles on the lower margin.

Aztatlan is a name

Genus *Petrochirus* Stimpson.***Petrochirus californiensis* Bouvier.**

*Petrochirus californiensis* Bouvier. *Bull. Mus. d'Hist. Nat. Paris*, no. 1, 1895, p. 6 (type-locality, not given; Lower California); Nobili, *Boll. Mus. Zool. Anat. comp. R. Univ. Torino*, vol. 16, no. 415, 1901, p. 24.

*General Range*: Gulf of California to Ecuador. (Nobili).

*Local Distribution*: A single male specimen from Monument Beach, Santa Inez Bay, Baja California, Mexico; collected April 12, 1936.

*Sex and Size*: A male specimen with the following measurements: (the first figures given are for the specimen collected by this expedition; the second figures are for those of a normally large male collected by the author at Punta Penasco, Sonora, Mexico; May 3, 1935) length from rostrum to telson 98 mm.-128 mm., of carapace 29 mm.-38 mm., of precervical portion of carapace 12.6 mm.-17 mm., width of same 13.5 mm.-18 mm., length of major cheliped 62 mm.-74 mm., of merus 14 mm.-20 mm., of carpus 15 mm.-20 mm., of manus 28 mm.-38 mm., of dactyl 15 mm.-21 mm., width of manus 12 mm.-18 mm., thickness of manus 11 mm.-17.5 mm., length of eye-stalks 12.6 mm.-17 mm.

*Color in Alcohol*: A bluish-red. Chelipeds and ambulatories with blood-red maculations on inner and outer distal ends of meri; fingers of chelipeds white. Eye-stalks a taupe, with a deep red, inverted, V-shaped marking at distal upper end. Antennal flagellum banded red and white. Setae on dactyli of walking legs a red brown.

*Habits, Habitat*: This large pagurid is somewhat sluggish in its movements. Most of the specimens collected in the inter-tidal zone, in the Gulf of California, were occupying the shell of *Phyllonotus nigrinus* (Philippi), and were accompanied by a polynoid worm and commensal porcellanids.

*Remarks*: This is the first record of the finding of this common and conspicuous crab in the waters where it was first discovered by Diguët, since Bouvier wrote its all too brief description.

Genus *Dardanus* Paulson.***Dardanus sinistripes* (Stimpson).**

*Pagurus sinistripes* Stimpson. *Ann. Lyc. Nat. Hist.*, N. Y., vol. 7, 1859, p. 82 (type-locality, Panama); Bouvier, *Bull. Mus. d'Hist. Nat. Paris*, no. 1, 1895, p. 8; Nobili, *Boll. Mus. Zool. Anat. comp. R. Univ. Torino*, vol. 16, no. 415, 1901, p. 23 (Ecuador).

*Dardanus sinistripes* (Stimpson). Rathbun, *Proc. U. S. Nat. Mus.*, vol. 38, 1910, p. 556, pl. 49, fig. 2, and p. 597; Schmitt, *Proc. Calif. Acad. Sci.*, vol. 13, no. 24, p. 382.

*General Range*: From the Gulf of California to Peru (Rathbun).

*Local Distribution*: A total of 27 specimens was taken off Arena Bank (Station 136); 14 adults and several juveniles were taken in Santa Inez Bay (Stations 141, 142 and 143 respectively); 2 specimens were taken off Gorda Bank (Station 150 D-3). All of the above specimens were dredged in depths ranging from 10 to 60 fathoms. In addition to these specimens, a larval form was taken (Cat. No. 36,784) from off Arena Bank (Station 136).

*Sex and Size*: The entire series taken at the above stations is composed of 20 males, 23 females and 2 juveniles, and ranges in size from the first adult form to the largest yet to be recorded. The largest specimen, a male, has the following dimensions: length from rostrum to telson 110 mm., of

carapace 28 mm., of precervical portion 15 mm., width of same 14 mm., length of major cheliped 62 mm., of merus 14 mm., of carpus 13 mm., of manus 27 mm., width of manus 18 mm., length of eye-stalk 10 mm.

*Color:* In alcohol, the carapace is buff with red markings. The chelipeds, purple and red, with the interior margins of the meri white; the teeth of the fingers white, bordered with yellow. The ambulatory legs are purple, their dactyli with dark brown setae, their meri and carpi blotched on a light ground with red.

*Habits, Habitat:* The majority of the species of the genus *Dardanus* are inhabitants of the Indo-Pacific region, but 3 species are recorded from the Pacific coasts of North and South America. *D. sinistripes* is not an intertidal form, so far as the records show, but occupies the zone between 10 and 60 fathoms. It occupies any sort of shell from those having a large round opening to those with a narrow aperture, such as *Conus*.

*Remarks:* In the collection here assembled is a specimen of *Glaucothöe* H. M. Edwards, 1830, (Cat. No. 36,784) from off Arena Bank (Station 136).

Bouvier has ably pointed out that the genus *Glaucothöe*, is simply the larval stage of a pagurid, being without sex, and as such I regard it, and believe it is entitled to neither individual generic nor specific standing.

This specimen of larval form, or "*Glaucothöe*," I refer without hesitation to the genus *Dardanus*, and believe it to be the last larval stage of *Dardanus sinistripes* (Stimpson). In arriving at this conclusion, I have compared the larva with a series of juvenile specimens from this and other collections of *D. sinistripes*, among which were several specimens that exhibited the first adult form, in which the chelipeds are still quite similar, the abdomen still well segmented, though not calcareous or chitonous, the telson still much longer in proportion than that of the mature form. In comparing the larva with these juveniles, the following similarities of form become apparent: the eyes are similar in shape and size; the hands are similar in size, the fingers opening in the same plane; the 4th and 5th legs are similar, namely, subchelate and chelate; in both the abdomen is clearly segmented, though in the juvenile it is slightly coiled and not straight as in the larva; the telsons of both are long and subsimilar in shape.

#### Genus *Calcinus* Dana.

#### ***Calcinus californiensis* Bouvier.** ●

*Calcinus californiensis* Bouvier. *Bull. Mus. d'Hist. Nat. Paris*, no. 8, 1898, p. 380 (type-locality, San Jose Island, Gulf of California).

*General Range:* Gulf of California. Acapulco, Mexico.

*Local Distribution:* A total of 13 specimens (Cat. No. 36,815) was taken off Arena Bank (Station 136) in coral (*Pocillopora ligulata*) at a depth of 2½ fathoms.

*Sex and Size:* The series consists of 6 males and 7 females. The largest specimen, a male, has the following dimensions: length from rostrum to telson 25 mm., of carapace 8 mm., of precervical portion of carapace 4.2 mm., width of same 3.6 mm., length of major cheliped 14.5 mm., of merus 3.3 mm., of carpus 3 mm., of manus 6 mm., of dactyl 3.5 mm., width of manus 4 mm., length of eye-stalk 3.8 mm.

*Color in Alcohol:* Reddish with white spots showing through on carapace. Chelipeds a dark brown with small bluish spots; carpus and manus margined with red. Ambulatory legs and dactyli red. Tips of fingers white.

*Habits, Habitat:* This inter-tidal species occupies the lower half of the tidal zone, where it is very plentiful throughout its range. An active, gregarious little animal, utilizing any of the smaller shells for an abode.

*Remarks:* This is the first record of *C. californiensis* having been taken since Diguët's two specimens were described by Bouvier. Bouvier remarked that this species is closely allied to *C. obscurus* Stimpson, 1859, and like myself, had none of the latter species with which to compare his specimens. As a means of quick identification, I would say that this species, *C. californiensis*, may be distinguished from *C. obscurus* by the solid color of the ambulatory dactyli, as in the latter species the dactyli are banded.

Genus *Pylopagurus* M. Edw. and Bouvier.

***Pylopagurus varians* (Benedict), new combination.**

*Eupagurus varians* Benedict, *Proc. U. S. Nat. Mus.*, vol. 15, 1892, p. 24 (type-locality, Gulf of California); Bouvier, *Bull. Mus. Hist. Nat. Paris*, no. 8, 1898, p. 382.

*General Range:* So far only recorded from the Gulf of California.

*Local Distribution:* Two specimens, one from Arena Bank (Station 136 D-24), the other from Santa Inez Bay (Station 143 D-5), with a depth range of from 18 to 50 fathoms.

*Sex and Size:* Both specimens were males; the largest, from Santa Inez Bay, has the following measurements: length from rostrum to telson 34 mm., of carapace 8.3 mm. (carapace with a deep V-shaped notch in posterior margin), of precervical portion of carapace 5 mm., width of same 4.8 mm., length of major cheliped 38.4 mm., of merus 6.2 mm., of carpus 9 mm., of manus 13 mm., of dactyl 8.2 mm., width of manus 6.6 mm., length of eye-stalk 4 mm.

*Color in Alcohol:* Carapace a cream with a few red spots near cervical groove. Chelipeds a pinkish-buff, with deep red spots. Ambulatory legs banded with white and a yellow-red.

*Habits, Habitat:* This hermit crab is one of the few that does not have to change its abode as it grows larger, for the original shell which it occupies becomes incrustated with a bryozoan growth, which the crab is able to control at the aperture by using its large hand as an operculum; thus the aperture of the shell is always smooth, while the rest of the shell takes on varied and weird shapes. Not an inter-tidal form.

*Remarks:* It seems remarkable that Bouvier, who was the co-author of the genus *Pylopagurus*, retained Benedict's genus *Eupagurus* for this species, when he recorded Diguët's collection in 1898. The lack of a figure for this species is confusing.

***Pylopagurus cervicornis* (Benedict), new combination.**

*Eupagurus cervicornis* Benedict, *Proc. U. S. Nat. Mus.*, vol. 15, 1892, p. 25 (type-locality, Gulf of California).

*General Range:* The Gulf of California.

*Local Distribution:* A total of 21 adult specimens and 2 juveniles was taken on Arena Bank (Station 136) in different dredges, in from 30 to 50 fathoms.

*Sex and Size:* This series consists of 19 males, 2 of them juvenile, and 4 females, none of them very large. The largest male in this series has the following dimensions: length from rostrum to telson 22 mm., of carapace 6 mm. (carapace with a deep V-shaped notch in posterior margin), of precervical portion of carapace 3.6 mm., width of same 3.2 mm., length of major cheliped 23.2 mm., of merus 3.6 mm., of carpus 5 mm., of manus 7.6 mm., of dactyl 5 mm., width of hand 5 mm., length of eye-stalk 3 mm.

*Color in Alcohol:* Carapace a cream with a few spots of red near the cervical groove on the calcified portion. Chelipeds a pinkish-buff, with deep red spots. Ambulatory legs banded with white and a yellow-red.

*Habits, Habitat:* This species occupies the same sort of abode as that of *P. varians*. One small specimen (Cat. No. 36,361) occupied a hole in a small sponge.

*Remarks:* These two species, *P. varians* and *P. cervicornis*, may prove to be one and the same species, one a variety of the other, when it is possible to get a large series of adult forms, from both ends of the Gulf of California, together for comparison. There seems to be an intergradation which is difficult otherwise to explain.

***Pylopagurus coronatus* (Benedict), new combination.**

*Eupagurus coronatus* Benedict. *Proc. U. S. Nat. Mus.*, vol. 15, 1892, p. 24 (type-locality, Gulf of California).

*General Range:* Gulf of California.

*Local Distribution:* A single specimen was taken on Arena Bank (Station 136 D-24), in 50 fathoms.

*Sex and Size:* A male specimen with the following dimensions: length from rostrum to telson 15 mm., of carapace 4.5 mm., of precervical portion of carapace 3 mm., width of same 2.8 mm., length of major cheliped 11.4 mm., of merus 2.4 mm., of carpus 3 mm., of manus 5 mm., of dactyl 3.5 mm., width of manus 3.5 mm., length of eye-stalk 2.7 mm.

*Color in Alcohol:* Carapace, chelipeds and ambulatory legs have a whitish ground color, on which, in various patterns, is laid an orange-yellow and red. The pattern is sharp cut, distinctive, irregular, unblended.

*Habitat:* Little is known of the habits of this pagurid, as all specimens so far examined have been removed from their shell. It is not a shore form, but may be expected in depths of from 25 to 100 fathoms, within its range.

*Remarks:* This record, like several others, is the first, since the species was described nearly 45 years ago. From its scarcity in this and other dredgings examined, it appears to be a rare form.

***Pylopagurus guatemoci*, sp. nov.**

*Type:* Male, holotype; Cat. No. 36,801, Department of Tropical Research of the New York Zoological Society; Station 175, Dredge 1; from location 5 miles west of San Jose Point, Pacific side of Baja California, 31° 25' N. Lat., 116° 42' W. Long., 45 fathoms; bottom shaley; May 24, 1936; 4-foot Blake dredge; collected by William Beebe on Templeton Crocker's yacht *Zaca*.

*Diagnosis:* Calcified portion of carapace as broad as long, transversely convex, naked, polished, projections subequal. Major hand margined with large teeth, becoming smaller distally; minor hand heavily toothed on outer margin. Eyes long, slightly constricted in middle, cornea dilated.

*Description:* Anterior portion of carapace as broad as long, transversely convex, naked, polished; median projection obtuse, depressed, not extending past base of eye-scales, nor past the spinule-tipped, obtuse, lateral projections.

The eye-stalks are cylindrical, slightly constricted in the middle, and subequal in length to the merus of the major chela. The ophthalmic scales have broad bases and triangular apices, with margins entire; the sub-terminal spine is long, sharp, stout, and is situated just inside the point of

the scale. The distal end of the second peduncle of the antennule reaches the cornea.

The antennal acicle is slight, sharp-pointed, unarmed, except for a few hairs, and extends to the cornea of the eye. The third antennal peduncle extends half its length past the eye. The flagellum extends to the base of the major dactyl and is ciliated with occasional long and short hairs.

The chelipeds, as in the genus, are dissimilar and unequal. In the major cheliped the merus is trigonal, crested with a few short hairs; the distal lower tip of the ischium extends nearly to the distal lower margin of the merus; the carpus is widened distally, is subequal in length to the width of the carapace, is armed on its inner margin with two large, well formed teeth, one over the hinge of the hand, the other median, these are separated by a wide sinus, the median tooth is supported posteriorly by a ridge, there is no outer margin as the surface arches from the inner border to the lower outer margin, a few setae in tufts of three or four are on this surface, on the under surface the carpus is very narrow, almost a bridge, and deeply excavated on its forward surface for the reception of the hand; the hand, on its operculiform portion, is  $\frac{4}{5}$  as wide as long, the toothed proximal border is nearly straight, the rim of teeth is uneven in size, some teeth are double, others single with their tips bent inward, these tips are corneous spinules, the distal teeth of the dactyl and pollex are much smaller and more uniform than those of the palm; the excavated surface of the hand is microscopically set with minute corneous spine-tipped granules; the fingers are crossed at their corneous tips, joined on their upper surfaces and excavated beneath, armed on their cutting edges with calcareous lobes, the under side of the hand has a few scattered setae; the minor hand extends to the base of the major dactyl; the carpus is bicristate, with the spines of the outer margin more prominent; the hand is flattened on its upper surface, twice as long as wide, with a median row of spines to the gape, the outer margin with a raised crest of spines nearly to the corneous tip of the pollex, these spines are similar, though smaller, to those on the major hand, the inner margin is unarmed, lightly setose, as is the under side of the hand.

The ambulatory legs are unarmed on their upper crests, lightly setose, with a high polished surface, shorter than the major chela.

The terminal segment of the abdomen is a single, undivided, semioval plate, the distal margin unarmed, entire, and projecting equally on both sides.

*Color:* In alcohol, an ivory mottled with red. The spines of the chelipeds have a faint purple tint. The ambulatories are banded with red and a bluish-white, the latter color is distal on the joints.

*Measurements:* Length from rostrum to telson 19 mm., of carapace 5 mm., of anterior portion of carapace 3 mm., width 3 mm., length of major chela 12.5 mm., of merus 2.3 mm., of carpus 3 mm., of flat portion of manus 5 mm., width 3.8 mm., length of minor manus 3 mm., width 1.5 mm., length of eye-stalk 2.4 mm.

*Range:* Known only from type-locality.

*Remarks:* This proposed species is allied to *P. coronatus* (Benedict), 1892, but differs in that the merus of the major cheliped is lightly rugose, instead of with a thin subserrate crest; by the carpus being uncrested on the median line, instead of with a subserrate crest; by the spines bordering the hand being tipped with minute, corneous spinules, instead of being un-tipped with spinules; by the minor hand having its outer margin serrate with teeth, instead of having a subserrate ridge. In both species the ultimate segment of the telson is similar.

This species is named for Guatemotzin, or Guatemoc, the last Aztec sovereign in Mexico.

**Pylopagurus spinicarpus** Glassell, manuscript name.

*Material:* A total of 2 specimens was taken from Santa Inez Bay (Station 147), and Gorda Bank (Station 150), between 60 and 80 fathoms

The specimens were distributed as follows:

Station 147: D-2 (1 male); 60 fathoms.

Station 150: D-13 (1 male); 70 to 80 fathoms.

Genus *Pagurus* Fabricus.*Key to species of Pagurus collected on this expedition.*

- A. Eye-stalks short, stout; cornea dilated.
- B. Hand margined with spines, granulose. Antennal acicle extending past cornea. Rostrum not advanced past laterals.
- C. Hand about twice as long as wide. *P. smithi*, p. 259
- C'. Hand about as long as wide. *P. merimaculosus*, p. 259
- B'. Hand not margined with spines, granulose.
- C. Hand 3 times as long as wide. Antennal acicle extending past cornea. Rostrum advanced past laterals. *P. gladius*, p. 257
- C'. Hand about twice as long as wide. Antennal acicle not extending past cornea. Rostrum not advanced past laterals, or, but slightly advanced. *P. albus*, p. 258
- A'. Eye-stalks cylindrical, stout; cornea slightly dilated. Antennal acicle not extending past cornea.
- B. Hand margined with spines, spinulose, setaceous; about twice as long as wide. Rostrum advanced past laterals. Pollex deeply concave. *P. pollexcavus*, p. 261
- B'. Hand not margined with spines, granulose; about as long as wide. Rostrum not advanced past laterals. Pollex not concave. *P. californiensis*, p. 257
- A". Eye-stalks expanded at their base; cornea not dilated. Antennal acicle not extending past cornea. Hand margined with spines, spinulose, setaceous; about twice as long as wide. Rostrum advanced past laterals. *P. lepidus*, p. 256

***Pagurus lepidus*** (Bouvier), new combination.

*Eupagurus lepidus* Bouvier. *Bull. Mus. d'Hist. Nat. Paris*, no. 8, 1898, p. 381 (type-locality, La Paz Bay, Baja California).

*General Range:* Gulf of California.

*Local Distribution:* A total of 5 specimens was taken near shore at Santa Inez Bay (Station 144 D-1), at a depth of 1 fathom.

*Sex and Size:* This series contains 3 males and 2 ovigerous females. The largest specimen, a male, has the following dimensions: length from rostrum to telson 13.5 mm., of carapace 3.8 mm., of precervical portion of carapace 2.4 mm., width of same 2.2 mm., length of merus of major cheliped 1.8 mm., of carpus 1.6 mm., of manus 3 mm., width of same 1.5 mm., length of eye-stalk 1.6 mm.

*Color:* In alcohol, the carapace is a buff. The merus of the chelipeds is red-brown and buff, the hands and carpus yellow, the finger tips white. Ambulatory legs cream, with all joints striated with red-brown. Flagellum of antennae with 3 or more segments red-brown separated from the next series by a white segment.

*Habitat*: This little hermit crab frequents the lower tidal levels, seeking shelter among marine growths.

*Remarks*: This is the first record of this species having been taken in the Gulf of California in 40 years. It may be mentioned, however, that it is not a rare form, but obscure.

### ***Pagurus californiensis* (Benedict).**

*Eupagurus californiensis* Benedict. *Proc. U. S. Nat. Mus.*, vol. 15, 1892, p. 21 (type-locality, California); Faxon, *Mem. Mus. Comp. Zool. Harvard*, vol. 18, 1895, p. 55, pl. 11, figs. 2-2f; Bouvier, *Bull. Mus. d'Hist. Nat. Paris*, 1898, p. 382.

*Pagurus californiensis* (Benedict). Holmes, *Occas. Papers Calif. Acad. Sci.*, vol. 7, 1900, p. 149; Rathbun, *Harriman Alaska Expedition*, vol. 10, 1910, p. 161; Schmitt, *Univ. Cal. Pub. Zool.*, vol. 23, 1921, p. 143, text-fig. 93; Boone, *Zoologica*, N. Y. Zool. Soc., vol. 14, no. 1, 1932, p. 9, text-fig. 3.

*General Range*: From California to Panama. Galápagos Islands (Boone).

*Local Distribution*: A total of 14 specimens was taken from Arena Bank (Station 136) and Santa Inez Bay (Stations 142 and 143 respectively), at depths ranging from 25 to 50 fathoms.

*Sex and Size*: The collection numbers 6 males and 8 females. The largest male (Cat. No. 36,790) from Santa Inez Bay (Station 143 D-4) has the following measurements: length from rostrum to telson 40 mm., of carapace 10 mm., of precervical portion of carapace 6.1 mm., width of same 5.6 mm., length of major cheliped 29 mm., of merus 7.2 mm., of carpus 7 mm., of manus 12.5 mm., of dactyl 6.3 mm., width of manus 9.8 mm., length of eye-stalk 5 mm.

*Habits, Habitat*: In the Gulf of California, this species is only found in depths ranging from 15 to 50 fathoms, while along the California coast, in cooler waters, it is often taken at low tide. Faxon records his specimens at a depth of 66 fathoms, at Panama. Boone records her specimens as having been taken at a depth of 2½ fathoms, in the cooler waters of the Galápagos Islands.

*Remarks*: This species registers considerable variation in the smoothness of the upper surface of the hand, some specimens being quite tuberculate on the distal half, others smooth. The size and shape of the inner margin of the hand also shows considerable variation in different individuals, some being much larger than others, although the individuals may be of the same size.

### ***Pagurus gladius* (Benedict).**

*Eupagurus gladius* Benedict. *Proc. U. S. Nat. Mus.*, vol. 15, 1892, p. 7 (type-locality, Gulf of California); Nobili, *Boll. Mus. Zool. Anat. comp. R. Univ. Torino*, vol. 16, no. 415, 1901, p. 22.

*Pagurus gladius* (Benedict). Rathbun, *Proc. U. S. Nat. Mus.*, vol. 38, 1910, p. 597.

*General Range*: From the Gulf of California to Ecuador (Nobili).

*Local Distribution*: A total of 11 specimens was taken from Arena Bank (Station 136 D-14), and Santa Inez Bay (Station 143 D-2 and D-5), at depths ranging from 18 to 45 fathoms.

*Sex and Size*: The collection numbers 6 males and 5 females, the greater number of these being half grown. As the two largest specimens in this

series had lost their major chelipeds, it was thought best to give the measurements of a normal adult male, in the author's collection, taken off Carmen Island, in Salinas Bay, Gulf of California; December 19, 1931; in 30 fathoms. The above specimen has the following dimensions: length from rostrum to telson 28 mm., of carapace 10 mm., of precervical portion of carapace 4.8 mm., width of same 6 mm., length of major cheliped 41.5 mm., of merus 11 mm., of carpus 11 mm., of manus 16.5 mm., of dactyl 6.5 mm., width of manus 4.5 mm., length of eye-stalk 4 mm.

*Color:* In alcohol, the carapace is a dark cream maculated with red and purple. Chelipeds and ambulatories with a purple tinge and red spots; a dark purple stain on hand near dactyl; propodus and dactyli of ambulatories banded with purple. Eye-stalks mottled.

*Habits, Habitat:* This active pagurid apparently occupies the zone between the depths of 20 and 50 fathoms; at any rate it has not so far been reported from the tidal zone. It prefers a small, fragile shell, which only partly covers its carapace. This shell, like those favored by *P. splendescens* Owen, 1839, becomes partly disintegrated from the action of the polyps or bryozoans which cover the anterior portion of the shell.

*Remarks:* As it is not known at what part of the Gulf of California the type specimen was found, it is impossible to state an extension of range, even though it be a distance of several hundred miles, until specimens are collected outside of this area. It is possible also, that Nobili had a different species to work on, for he finds differences between his specimen and Benedict's description, which an examination of a series, such as this, from the Gulf of California, does not bear out.

### **Pagurus albus** (Benedict).

*Eupagurus albus* Benedict. *Proc. U. S. Nat. Mus.*, vol. 15, 1892, p. 6 (type-locality, Gulf of California).

Not *Pagurus albus* (Benedict). Boone, *Bull. Vanderbilt Marine Mus.*, vol. 3, 1930, pp. 34-36, pl. 5.

*General Range:* So far known only from the Gulf of California.

*Local Distribution:* A single specimen from Santa Inez Bay (Station 144 D-7), taken at a depth of 3 fathoms.

*Sex and Size:* A single, partly damaged, juvenile female. As this specimen may not be suitable for measurement, I will supply the dimensions of a normal male, collected by myself on Turner Island, Gulf of California; December 31, 1931; in the inter-tidal zone. The measurements are: length from rostrum to telson 26 mm., of carapace 9.5 mm., of precervical portion of carapace 5.5 mm., width of same 5.7 mm., length of major cheliped 23 mm., of merus 5.8 mm., of carpus 6.3 mm., of manus 8 mm., of dactyl 4.2 mm., width of manus 3 mm., length of eye-stalk 3.8 mm.

*Color in Life:* The conspicuous feature of this crab is the whiteness of the hands.

*Habits, Habitat:* This pagurid is a tidal form which may be taken at shallow depths. It is extremely active, a fast traveler, and is found racing along the bottom in a few inches of water at extreme low tide. At no collecting station, in spite of their conspicuous color, have they been observed to be very numerous.

*Remarks:* This species appears to be closely allied to *P. gladius* (Benedict), but while *P. gladius* occupies the lower zone in the same region, *P. albus* occupies the upper.

***Pagurus smithi* (Benedict), new combination.**

*Eupagurus smithi* Benedict. *Proc. U. S. Nat. Mus.*, vol. 15, 1892, p. 4 (type-locality, Gulf of California).

Not *Eupagurus smithii* Milne Edwards and Bouvier. *Mem. Mus. Comp. Zool.*, vol. 14, no. 3, 1893, p. 140, pl. 10, figs. 1-12 (type-locality, Sand Key, Florida), (= *Pagurus bouvieri* (Faxon), 1895).

*General Range*: So far only known from the Gulf of California.

*Local Distribution*: A total of 9 specimens was taken at Santa Inez Bay (Station 143 D-1, D-2, D-3 and D-5), at depths ranging from 18 to 35 fathoms.

*Sex and Size*: This series consists of 2 males and 7 females. The largest male (Cat. No. 36,291) has the following dimensions: length from rostrum to telson 58 mm., of carapace 17 mm., of precervical portion of carapace 7.6 mm., width of same 8.5 mm., length of major cheliped 33 mm., of merus 10 mm., of carpus 8.5 mm., of manus 13.1 mm., of dactyl 7.5 mm., width of manus 7.5 mm., length of eye-stalk 7 mm.

*Color in Alcohol*: Carapace and eye-stalks buff. Chelipeds with carpus and manus a light orange; inner margins of pollices and dactyli white. Ambulatory legs buff.

*Habitat*: Evidently not a shore form, as they were only found at depths ranging to 35 fathoms.

*Remarks*: Bottom conditions may have something to do with the apparently localized finding of this form, as they were taken at only one Station (143). The original description gives the type-locality as Gulf of California, so that we have little information on the original finding, as to depth or distribution. This is the first record of the taking of this pagurid in 45 years.

***Pagurus merimaculosus*, sp. nov.**

*Type*: Male, holotype; Cat. No. 361,126, Department of Tropical Research of the New York Zoological Society; Station 136, Dredge 14; from the Gulf of California, 23° 29' 30" N. Lat., 109° 25' W. Long., 3 miles northeast of Cape Pulmo, Lower California, Mexico; 45 fathoms; bottom muddy; April 20, 1936; 4-foot Blake dredge; collected by William Beebe on Templeton Crocker's yacht *Zaca*.

*Diagnosis*: Precervical portion of carapace about as long as wide, almost naked. Front obtuse, not extending past laterals. Eye-stalks stout, short; cornea dilated. Antennal acicle extending past eye. Carpus of major hand concave on inner side, margined with 9 or more conical spines; hand  $\frac{3}{5}$  as wide as long, heavily plated with short spined granulations. Inner and outer distal ends of meri of chelipeds and 1st and 2nd ambulatories with a distinctive blood-red spot.

*Description*: Calcified portion of carapace about as long as wide, almost naked, except for a few short setae. Rostral projection obtuse, not extending past the laterals, nor much more than reaching the bases of the eye-scales; lateral projections equilateral, armed with a minute subapical spine.

Eye-stalks stout, nearly  $\frac{2}{3}$  the length of the anterior portion of the carapace, cornea expanded. Ophthalmic scales distant, semioval at base, subacute, concave distally, margins entire; a small subterminal spine.

The antennal acicles are long, narrow, sharp-pointed, and extend past the eyes to a point near the base of the flagellum.

The major cheliped is large, strong, wide, well margined; merus extending well past the eyes, inner side straight, outer side rounding, the distal

posterior margins of both sides have a row of small teeth; the upper flattened carpal margin is armed with a row of horizontal, long, sharp spines; the carpus increases in width distally, where it is more than  $\frac{2}{3}$  as wide as long; the inner margin is armed with a row of forward- and upward-pointing spines, the outer margin is well defined, granulous, and with a row of setae; the upper surface is slightly convex, rugose and granulate, more prominent distally; the surface of the outer side of the carpus is vertical, that of the inner concave; the hand is rectangular,  $\frac{3}{5}$  as wide as long; the inner and outer margins are armed with a row of regularly spaced, outward- and upward-pointing, conical teeth; the proximal margin armed with 2 conical, vertical teeth, one near the inner hinge, the other median; the upper surface is slightly convex and densely pebbled or plated with irregular, sharp-tipped granules, continued onto the pollex and dactyl, these granules have distinct margins and do not coalesce; the dactyl is crested with spines, as is the hand, and is armed on its prehensile edge with calcareous blunt teeth, as is the pollex. The minor cheliped is slightly shorter than the major, the corneous tips of the fingers reaching to a point about midway on the major dactyl; the merus is compressed, rounded on top, and like the major merus is distally armed with spines on the upper carpal and outer distal margins, but is unarmed on the inner side; the lower surface of both meri is tuberculate; the carpus is of irregular shape, narrower proximally than distally, and wider ventrally than dorsally at the distal end; the outer upper margin has a crest of sharp-pointed, conical spines, those of the inner margin are much smaller; the surface between the crests is concave and lightly roughened; the hand is subcylindrical, oval in transverse cross-section and bends downward at the tip; the surface is similar to that of the major hand; the inner edge of the pollex is covered with a multitude of small conical teeth; the inner edge of the dactyl is unarmed except for a short pile of baleen-like material.

The 1st and 2nd ambulatory legs are slightly longer than the chelipeds, sparsely crested with short setae, almost smooth, shining; the distal upper end of the carpus of the 1st legs is armed with two spinules, those of the 2nd legs with one; the dactyli are compressed, slightly contorted, smooth and shining on the posterior side and lightly setaceous anteriorly; including their corneous tip, they are nearly equal in length to the two preceding joints combined.

*Color:* In alcohol, the eye-stalks and ambulatory legs appear to be banded with a light pink and ivory. The most distinctive markings are the blood-red spots on each side of the distal, inner and outer ends of the meri of the chelipeds and ambulatory legs; these spots persist undimmed for a long time in preservative.

*Measurements:* Male holotype: length from rostral projection to telson 45 mm., of calcified portion of carapace 7 mm., width 7.3 mm., length of eye-stalk and cornea 5.3 mm., width of cornea 2.4 mm., length of acicle 5.1 mm., of major cheliped 34 mm., length of merus 8 mm., carpus 9 mm., distal width 7 mm., proximal width 4.5 mm., length of hand 15 mm., width 9 mm., length of minor hand 11 mm., width 4.5 mm., length of dactyl 7.5 mm.

*Range:* So far known only from the lower end of the Gulf of California.

*Material Examined:* A series of 28 specimens, 12 males and 16 females, some ovigerous, from Arena Bank (Station 136), off Cape Pulmo, Lower California, Mexico; in from 35 to 45 fathoms; April 3 to 30, 1936. Also, a series of 16 specimens, 8 males and 8 females, from Santa Inez Bay (Station 143), Lower California, Mexico; in 40 fathoms; April 11, 1936. Both series collected by William Beebe. The types were selected from the first series.

*Remarks:* This proposed species is allied to *P. smithi* (Benedict), 1892, the major chelipeds being somewhat similar in conformation; the granules of the hands and the shape of the dorsal surface of the carpus in the two

species are much alike; however, they differ in the minor hands. In *P. smithi*, the minor hand is similar to that of the major hand, being flattened, instead of being unrelated and subcylindrical. In *P. merimaculosus*, the upper crest of the carpi of the ambulatory legs has only one or two spinules at their upper distal end, while in *P. smithi*, the entire crest of the carpal joints is spinulose. In addition, *P. smithi* would appear to be a smaller form.

***Pagurus pollexcavus*, sp. nov.**

*Type*: Male, holotype; Cat. No. 361,127, Department of Tropical Research of the New York Zoological Society; Station 150, Dredge 13; from the Gulf of California, 23° 02' N. Lat., 109° 27' 30" W. Long., off Gorda Point, Lower California, Mexico; 75-80 fathoms; bottom sandy; April 23, 1936; 4-foot Blake dredge; collected by William Beebe on Templeton Crocker's yacht *Zaca*.

*Diagnosis*: Precervical portion of carapace as long as wide; median tooth wide, triangular, slightly exceeding laterals. Eye-stalks stout, cylindrical; cornea slightly dilated. Antennal acicle not extending past cornea. Hands nearly twice as long as wide, margined with spines; upper surface on proximal half heavily spined and setose; pollex and dactyl concave, naked, smooth, paved with gear-edged, coalesced granules. Ambulatory legs unarmed except for upper distal carpal spinules. Distal margin of telson toothed.

*Description*: Calcified portion of carapace about as long as wide, naked, except for a few tufts of short setae. Posterior margin of carapace deeply indented. Rostral tooth broadly triangular, exceeding laterals and extending between bases of eye-scales; lateral projections obtuse, with a minute sub-apical spinule.

Eye-stalks stout, cylindrical, subequal in length to major dactyl; cornea slightly dilated. Ophthalmic scales distant, broad at base, apex triangular, surface slightly concave between margins; a strong subterminal spine. Distal end of 2nd antennular peduncle just reaches the cornea.

The antennal acicles are slightly arcuate, unarmed, with few setae, and extend well into the cornea. The 3rd peduncle of the antennae exceeds the cornea by 1/3 its length. The flagellum exceeds the length of the major cheliped and has a few short cilia.

The major cheliped is 2/3 the length of the body; the merus is armed on its distal upper edge with a single forward-pointing spine; the upper and outer surface is lightly rugose; the inner and outer lower margins are spinulose; the under surface tuberculate; the carpus is widest distally, where it is subequal in width to the hand, its inner margin armed with a row of 6 or more forward-pointing, conical spines, inside of which are several smaller spines; the outer margin is not defined with spines; the upper surface is lightly setose, with small, scattered, sharp-tipped granules; the manus is nearly twice as long as wide, heavily spined and setose on its proximal half; the pollex is deeply concave from its upward-pointing, spined outer margin to a median longitudinal row of spines from base to tip; the concave surfaces of the pollices and dactyli of both hands are paved with smooth, closely meshed, coalesced, gear-edged granulations; the fingers are armed with calcareous lobes, and gape slightly from base to apex. The minor cheliped reaches to the base of the dactyl of the major hand; the merus is compressed and deep, it is armed on its distal, outer ventral margin with a prominent row of spines; the carpus is narrow and deep, the thickness being nearly 2/3 the length, proximally the upper surface is bicrestate, unicrested distally on the outer margin; distally the lower outer margin is spined; the manus is somewhat similar to that of the major hand, except that the concave pavement extends, on the outer half, to a point near the proximal end; the

remainder of the upper surface of the hand is setose, with a median row of spines which margin the paved area.

The ambulatory legs are subequal in length to the major cheliped, lightly setose; the carpi armed at their distal upper ends with a single spinule; the dactyli are compressed and slightly longer than their propodi. The terminal lobes of the telson are armed on their inner margins with 4 or more well spaced, incurving spines.

*Color*: In alcohol, the ground color is an ivory, overlaid with pink and spotted with small blood-red spots. The under side of the eye-stalks is red, the upper part a cream. The propodi of the ambulatories have a median band of pink. The setae are a straw yellow.

*Measurements*: Male holotype: length from rostrum to telson 41 mm., of carapace 10 mm., of anterior portion of carapace 5.5 mm., width 5.5 mm., length of major cheliped 30 mm., of merus 5.8 mm., of carpus 6.5 mm., of manus 10 mm., of dactyl 5 mm., width of manus 6 mm., length of eye-stalk 4.5 mm., distance between laterals 3 mm.

*Material Examined*: A series of 10 males and 12 females, 1 ovigerous, from Gorda Bank (Station 150), off Gorda Point, Lower California, Mexico; in from 67 to 80 fathoms; April 21 to May 3, 1936. The types were selected from this series. Three specimens, 1 male and 2 females, 1 ovigerous, from Arena Bank (Station 136), 3 miles NE of Cape Pulmo, Lower California, Mexico; in from 42 to 50 fathoms; May 1-2, 1936. All collected by this expedition.

*Range*: So far only known from the lower end of the Gulf of California.

*Remarks*: This proposed species is distantly allied to *P. tanneri* (Benedict), 1892, which it somewhat resembles in the shape of the carapace and general contour of the chelipeds; it differs in that the median tooth of the carapace is not so far advanced, the eyes not so stout and dilated, the antennal acicle not so long; the merus and carpus of the chelipeds are somewhat similar, but the hands differ by being spined and setose on the proximal half, instead of tumid and spined in a regular pattern; the pollex is deeply concave and smoothly paved, instead of slightly concave and spinulose; by the ambulatory legs being unarmed, instead of armed on the crests of the carpus and propodus.

### ***Pagurus bunomanus* Glassell, manuscript name.**

*Material*: A total of 8 specimens was taken from Arena Bank (Station 136), and Clarion Island (Station 163 D-2), in the Revilla Gigedo Group, 3 miles off Pyramid Rock, in depths ranging to 50 fathoms.

The specimens were distributed as follows:

Station 136: (3 males, 1 female).

Station 163: D-2 (1 male, 3 females, 1 ovigerous); 50 fathoms.

Genus *Catapagurus* Milne Edwards.

### ***Catapagurus diomedeeae* Faxon.**

*Catapagurus diomedeeae* Faxon. *Bull. Mus. Comp. Zool. Harvard*, vol. 24, no. 7, 1893, p. 171 (type-locality, off Cocos Island); and, *Mem. Mus. Comp. Zool. Harvard*, vol. 18, 1895, p. 57, pl. 13, figs. 2-2d.

*General Range*: From the Gulf of California to the Bay of Panama.

*Local Distribution*: A total of 4 specimens was taken on Arena Bank (Station 136) and in Santa Inez Bay (Stations 146 D-1 and 147 D-2 respectively), at depths ranging from 35 to 60 fathoms.

*Sex and Size:* The entire series is composed of 2 males and 2 females, one a juvenile. The largest female specimen from Arena Bank, has the following measurements: length from rostrum to telson 23 mm., of carapace 7.6 mm., of precervical portion of carapace 4.5 mm., width of same 4 mm., length of cheliped 18 mm., of merus 4.8 mm., of carpus 4.8 mm., of manus 6.5 mm., of dactyl 2.7 mm., width of manus 2.1 mm., length of eye-stalk 3.4 mm.

*Color in Alcohol:* Carapace, chelipeds and eye-stalks, a cream with light red markings. Chelipeds and ambulatory legs with yellow setae, pollex with a purple banding. Walking legs with pink or purple banding.

*Remarks:* This record is not only an extension of range for this species, but it is also the first record of the species having been taken since Faxon described and figured it. Faxon's specimen was taken at a depth of 182 fathoms, while the above series was collected at a depth not to exceed 60 fathoms.

Genus *Spiropagurus* Stimpson.

***Spiropagurus occidentalis* Faxon.**

*Spiropagurus occidentalis* Faxon. *Bull. Mus. Comp. Zool. Harvard*, vol. 24, no. 7, 1893, p. 172 (type-locality, off Cocos Island); and, *Mem. Mus. Comp. Zool. Harvard*, vol. 18, 1895, p. 59, pl. 14, figs. 1-1d.

*General Range:* From the Gulf of California to the Bay of Panama.

*Local Distribution:* A total of 4 specimens was taken on Arena Bank (Station 136), and in Santa Inez Bay (Station 147 D-2), at depths ranging from 35 to 60 fathoms.

*Sex and Size:* This series consists of 2 males and 2 females, one ovigerous, all of small size. The largest male from Station 136 has the following dimensions: length from rostrum to telson 16.5 mm., of carapace 5.5 mm., of precervical portion of carapace 3.5 mm., width of same 3.2 mm., length of cheliped 12.7 mm., of merus 3.2 mm., of carpus 3 mm., of manus 5.5 mm., of dactyl 2.2 mm., width of manus 2.1 mm., length of eye-stalk 2.2 mm.

*Color in Alcohol:* Nearly all trace of color has disappeared in solution from the carapace and chelipeds, except for small purple markings along the margins of the hands and purple bands near the fingers; also there is purple on the spines of the carpus. The ambulatory legs appear to have been banded purple and white.

*Remarks:* This record extends the range for this species from Cocos Island, off Panama, to the Gulf of California. It is also the first record of the species having been taken since its discovery. The bathymetric ranges are very similar.