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NEW CRUSTACEANS FROM KAUAI, OAHU
AND MAUI

By

CHARLES HOWARD EDMONDSON

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ISOPOD

In August, 1931, numerous specimens of an apparently undescribed isopod were collected under the lava stones that border the shore of Kalihiwai Bay, Kauai.

Ligyda kauaiensis, new species (fig. 1).

Body oblong-ovate, a little more than twice as long as broad. Head twice as broad as long. Eyes large, compound, occupying the lateral margins of the head and separated in front by a distance equal to about three-fourths the length of an eye. First antenna minute; second pair long, the first two segments of the peduncle short, equal, the third as long as the first and second together, the fourth three times as long as the third, and fifth four times as long as the third; flagellum with 33 segments and terminating in a sharp point.

Mandible (fig. 1, *b*), triangular in shape with five teeth grouped together and an oval, flat, molar process. Outer maxilliped (fig. 1, *c*), with palp consisting of five segments, the distal medial border of each of the last four being somewhat produced and tipped with short, stiff hairs.

First segment of thorax the longest, each of the following six being slightly shorter than the preceding one. Lateral margins of thoracic segments produced backward into sharp points and indistinctly marked off from the dorsal portion by faint lines. The six segments of the abdomen distinct, the first two covered laterally by the seventh thoracic segment. Terminal segment (fig. 1, *d*), a little less than twice as broad as long, its posterior margin bluntly pointed in the middle and bearing two small lobes medial to the sharp, lateral angles.

First pair of legs in the male (fig. 1, *e*) with a bluntly pointed process at the distal end of the propodus, and carpus and merus thickened with sharp ventral borders. The thickening gradually diminishes with successive pairs of legs disappearing with the third pair. First leg of female (fig. 1, *f*) without process at the distal end of the propodus, and carpus and merus not much larger than the propodus. In both sexes the dactyli of all legs are biunguiculate.

Uropods (fig. 1, *a*) long, the basal segment about four times as long as its greatest breadth; branches subequal in length and slightly less than twice as long as the basal segment.

Color of specimens dark green with irregular dashes and specks of pale yellow and white. Surface of thorax and abdomen sparsely covered with minute granules and the terminal segment of the abdomen bears a few fine, short hairs.

Type specimen a male: length of body 16 mm.; length of uropods 15 mm.; length of second antennae 16 mm. Type locality, shore of Kalihiwai Bay, Kauai, under lava stones near the edge of the water. B. P. Bishop Museum No. 3438.

This species which falls within the group of isopods with long antennae and uropods differs from *Ligyda olfersii* (Brandt) and *Ligyda budiniana* (Milne Edwards) in having the distal end of the propodus of the first leg of the male armed with a bluntly pointed

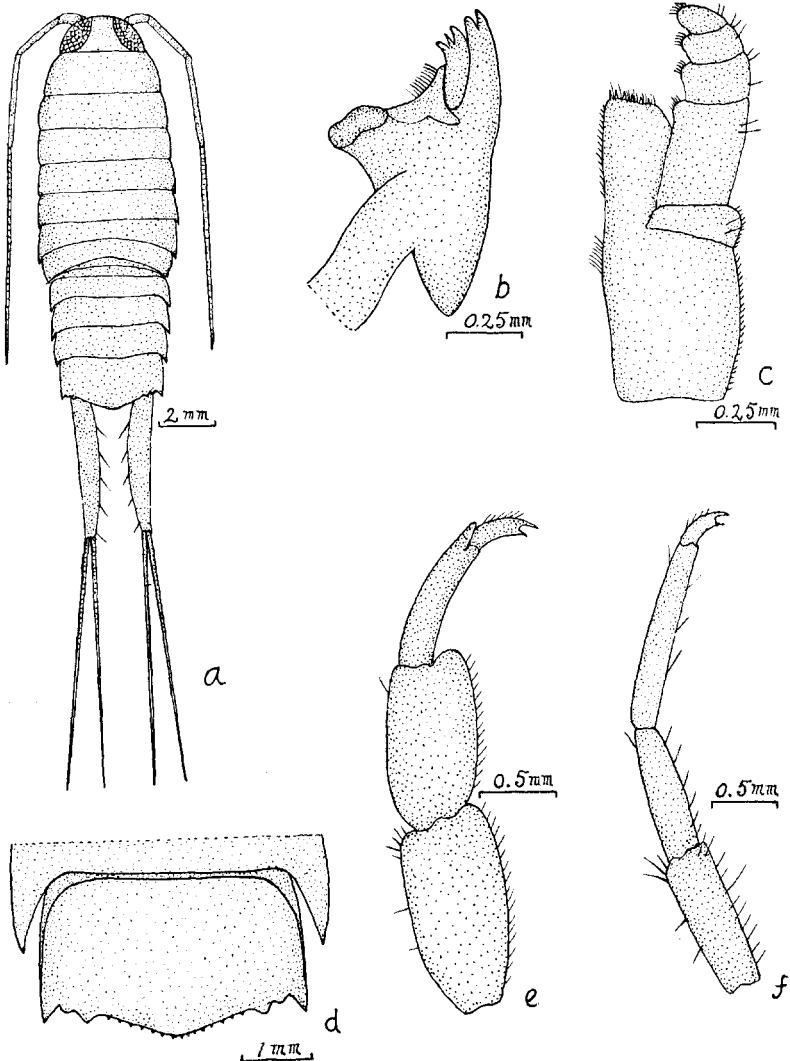


FIGURE 1.—Structural features of *Ligyda kauaiensis*, new species: a, dorsal view of type specimen; b, mandible; c, outer maxilliped; d, terminal segment of abdomen; e, first leg of male; f, first leg of female.

process, and from *Ligyda exotica* (Roux) in the form of the body, the structure of the appendages, and in color. The species *exotica*, which also occurs in Hawaii, is black in color, has a more cylindrical body, and the flagellum of the antenna is composed of more than 50 segments.

In *Ligyda hawaiiensis* (Dana), recorded from both Oahu and Kauai, the eyes are separated by a space less than one-half the length of an eye and the flagellum of the antenna is composed of but 27 or 28 segments. The posterior margin of the sixth abdominal segment in *L. hawaiiensis* seems to be slightly more pointed than in *L. kauaiensis* and Dana does not mention a blunt process on the side of the distal extremity of the propodus, typical, however, of males only. Dana's type specimen and that of *L. kauaiensis* closely correspond in size, but the largest co-type of *kauaiensis* has a body length of 25 mm. and uropods 19 mm. long.

SPECIES OF CORALLIOCARIS

Two specimens of an apparently new species, tentatively included in the genus *Coralliocaris*, were taken on Waikiki reef, Oahu, associated with the echinoid *Heterocentrotus mammillatus* to the spines of which they were clinging.

Coralliocaris mammillata, new species (Pl. I: fig. 2).

Body of type specimen somewhat depressed, stout, antennal spine present, but no hepatic spine. Rostrum broad, sharp pointed, concave above with a slight median crest bearing four minute spines; lower border smooth. (See fig. 2, *a*.) Antennular peduncle stout, extending slightly beyond the tip of rostrum; inner branch of antennule simple, outer branch bearing a fringe of long hairs and subdivided near the tip. (See fig. 2, *b*.) Antennal scale large, extending beyond the antennular peduncle and fringed with hairs on the inner margin and on the outer from the distal extremity to the tooth on the lateral border. (See fig. 2, *b*, *c*.) Eye pyriform in shape, bluntly pointed anteriorly; outer border flattened and almost wholly occupied by the ocular area. (See fig. 2, *f*.)

Second maxilliped long, slender, folded on itself; last two segments short, plate-like, the terminal one bordered by a fringe of short, stiff hairs. (See fig. 2, *d*.) Third maxilliped with endopod broad at the base tapering to a narrowly rounded extremity, the terminal segment twice the length of the preceding one; exopod nearly as long as endopod, its distal one-third faintly segmented and the extremity bearing a tuft of long hairs. (See fig. 2, *c*.)

First pair of legs short, slender, chelate, the dactylus shorter than the palm. (See fig. 2, *g*.) Second legs long, stout, equal; fingers slightly more than one-half the length of the palm; carpus short, about one-half as long as merus, which slightly exceeds the ischium in length. (See fig. 2, *h*.) The three

posterior pairs of legs short, the dactylus with a single claw and a large, quadrangular basal protuberance which bears sharp and blunt spines. (See fig. 2, i, j.) Telson bordered posteriorly by three pairs of short spines, and

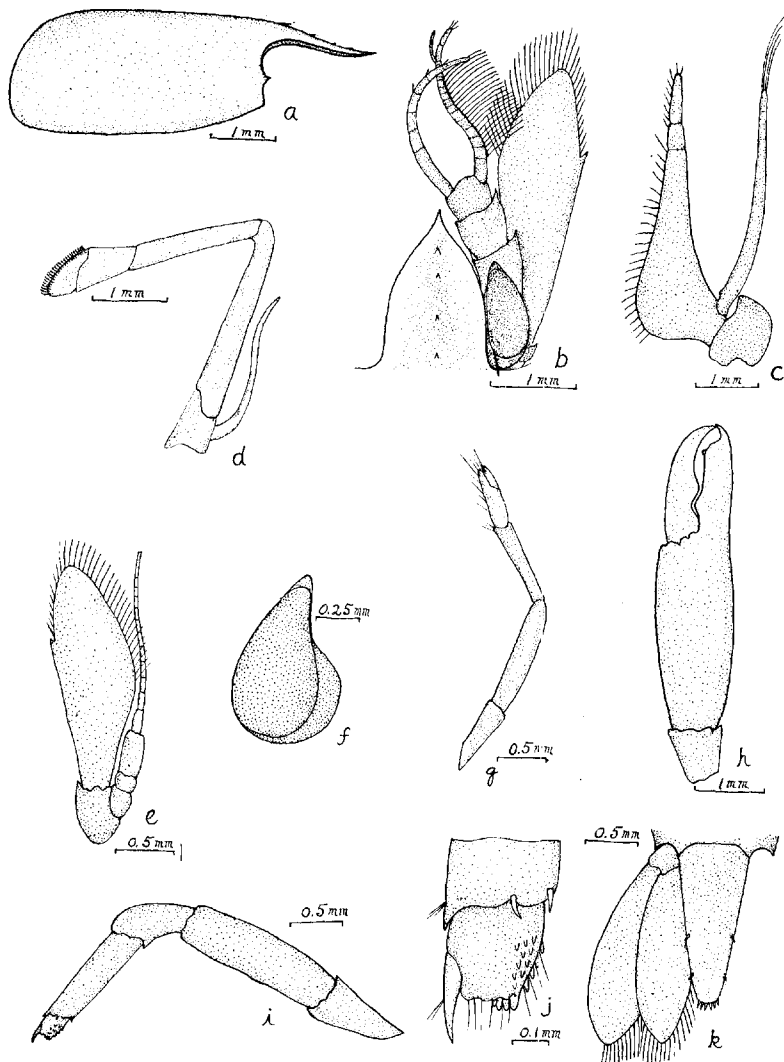


FIGURE 2.—Structural features of *Coralliocaris mammillata*, new species: a, lateral view of carapace; b, dorsal view of rostrum, eye, antennule, and scale of antenna; c, outer maxilliped; d, second maxilliped; e, basal part of antenna and scale; f, eye; g, first leg; h, wrist and hand of second leg; i, third leg; j, dactylus of third leg; k, telson and uropod.

bearing two pairs of spinules on the dorsal surface. Uropods longer than telson. (See fig. 2, *k*.)

General color pale red, intensified by minute deep crimson pigment spots arranged on carapace and abdomen in more or less regular, longitudinal lines close together; pigment irregularly scattered on large chelipeds. Three posterior pairs of walking legs, telson and uropods less highly colored than carapace.

Type specimen an ovigerous female; length from tip of rostrum to extremity of telson, 12 mm. B. P. Bishop Museum No. 3436.

The color of this crustacean harmonizes perfectly with the color of the spines of the echinoid to which it clings. When at rest it is disposed longitudinally on a spine with the large chelipeds extended straight in front and close together.

If the species here described is rightly included under *Coralliocaris* it apparently is the first of the genus to have been observed associated with an echinoid. Previously described species of shallow water have been found in corals. Other related genera, *Periclemenes* and *Stegopontonia*, include species recorded from echinoids. The Waikiki species is excluded from *Periclemenes* in having a basal protuberance on the dactyli of the last three legs, and from *Stegopontonia* in that the basal protuberance is single instead of paired.

SPECIES OF PILUMNUS

Associated with masses of sponges, tunicates and barnacles which are attached to buoys, floats, and piling in Pearl Harbor, Oahu, is a small form of *Pilumnus* apparently representing a new species.

Pilumnus oahuensis, new species (Pl. II; fig. 3, *a*, *b*).

Carapace convex in both directions, more strongly so antero-posteriorly, smooth, with little indications of areas, the deepest groove being that extending backward from the median incision of the front. Surface of carapace more or less covered with short and long hairs, some of the latter being in tufts. Front prominent, consisting of two rounded lobes, deeply separated, each of which is subdivided by a shallow notch into a large rounded inner, and a small, tooth-like outer division, the latter being fused with the inner orbital angle.

Antero-lateral border of carapace bearing three sharp teeth besides the outer orbital angle, which may be prominent but is not acutely pointed. Upper border of orbit granular with two faint notches. Lower border notched below the outer orbital angle and dentate, but without a prominent suborbital tooth.

Ischium of outer maxilliped a little longer than broad, surface smooth with a longitudinal furrow; merus broader than long, its surface granular. (See fig. 3, *a*.)

Abdomen of type specimen (male) consisting of seven separate segments, the terminal one longer than broad. (See fig. 3, *b*.)

Chelipeds unequal, a row of teeth on upper and lower borders of arm; outer surface of wrist granular, a sharp tooth at the inner angle. Palm of large cheliped smooth except for a few granules near the articulation with the wrist and along the upper border; fingers stout, toothed. Outer and upper surfaces of palm of small cheliped ornamented with longitudinal rows of minute, conical tubercles; fingers toothed and grooved longitudinally. Hairs similar to those of the carapace cover the outer surfaces of both chelipeds except the palm of the larger one, which is but sparsely coated with hairs along the posterior border. Walking legs smooth, covered with long hairs.

Type specimen a male: breadth of carapace 11 mm.; length 8 mm. Type locality, Pearl Harbor, Oahu. Bernice P. Bishop Museum No. 3432.

In this species considerable variation is seen in the extent of granulation and coating of hairs on the outer surface of the large cheliped. Male specimens usually have the palm quite free of granules and hairs. In females granules and hairs may cover one-third the outer surface. Variation is also observed in the outer orbital angle. In some specimens it is merely a blunt elevation, in others it is a tooth-like process, but never spiniform.

In *Pilumnus hirsutus* Stimpson, which somewhat resembles this species, the coating of hairs is more dense, the outer angle of the orbit is spiniform like the other teeth of the lateral border, and the outer surface of the palm of the larger hand, even in males, is more fully covered with hairs and granules, some of the latter being spine-like.

The Pearl Harbor species differs from *Pilumnus andersoni* de Man in having a less flattened carapace posteriorly and a more prominent front; the granules of the wrist and large hand are not spiniform and occupy less area in males.

A new and clearly defined species of *Pilumnus* has been collected at various localities about the shores of Oahu and Maui. It occurs at Waikiki, Kahala, and Hanauma Bay, Oahu, and is known from Hana and Maalaea bays, Maui. Its typical habitat seems to be the shore line, where it lives under stones and is often associated with species of *Pseudosquilla*.

***Pilumnus planus*, new species (Pl. III; fig. 3, c, d).**

Carapace slightly broader than long, very flat, smooth and quite free from arecolations posteriorly, where it is covered with microscopic granules which are slightly elongated in a transverse direction. Front half of carapace distinctly arecolated and frontal, hepatic, and antero-lateral regions thickened and sharply declivitous. These regions roughened by prominent elevations

separated by deep grooves and covered with tubercles which become blunt spines on the summit of the elevations, their apices being directed forward. A coating of short, stiff hairs is borne on the anterior and lateral regions of the carapace, being denser on the declivitous borders.

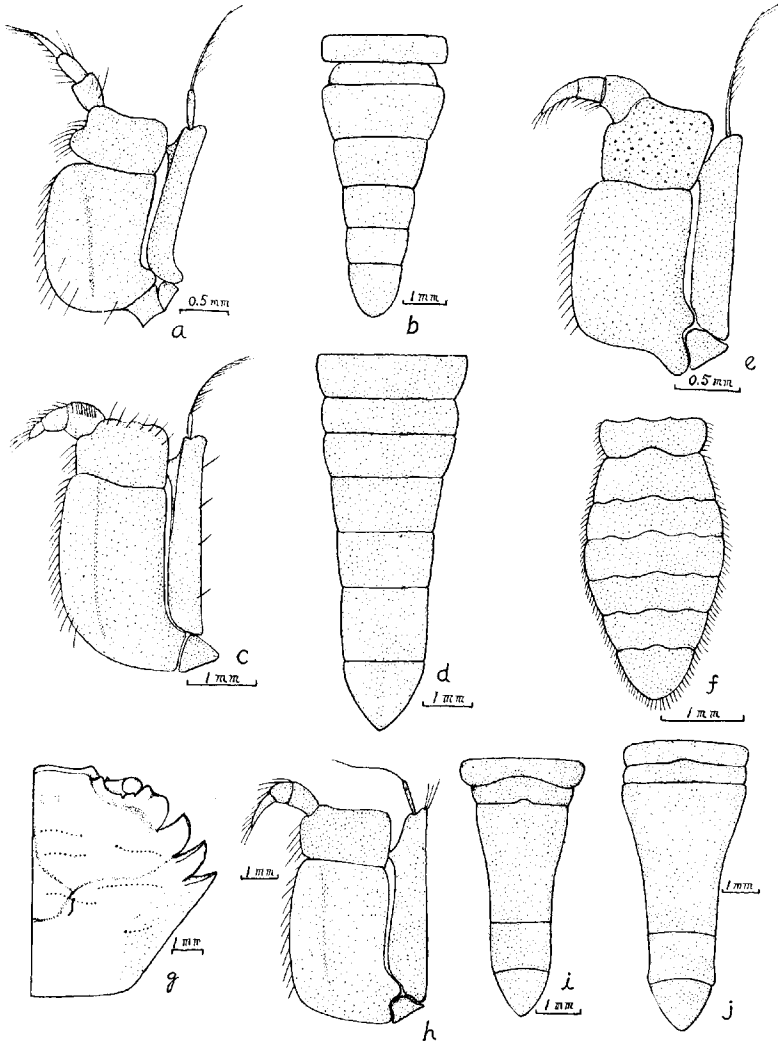


FIGURE 3.—Structural features of new Hawaiian crabs: *a*, third maxilliped; *b*, abdomen (male) of *Pilumnus oahuensis*; *c*, third maxilliped; *d*, abdomen (male) of *Pilumnus planus*; *e*, third maxilliped; *f*, abdomen (female) of *Megametope sulcatus*; *g*, right half of carapace; *h*, third maxilliped; *i*, abdomen (male) of *Panopeus pacificus*; *j*, abdomen (male) of *Neopanope* sp. (?).

Front divided into two lobes by a broad, deep fissure. Each lobe, which is more prominent medially, recedes laterally, terminating in a strong spine. Margin of front spinous.

Besides the outer orbital angle, which is a small sharp tooth, four strong, spine-like teeth with smaller ones about their bases are borne on the antero-lateral border, which is directed downward toward the lower margin of the orbit, and is not sharply defined because of the declivity of this region. Orbital borders spinous, the superior one with two notches, the inferior one with a v-shaped incision. Under surface of carapace granular and hairy.

Ischium of outer maxilliped smooth, with a faint longitudinal groove; merus quadrangular, the three following segments short and thick. (See fig. 3, c.) Abdomen of male with seven distinct segments, the sixth being the longest, the terminal one triangular. (See fig. 3, d.)

Chelipeds subequal; outer, and to some extent inner borders of wrists and palms covered with conical tubercles and stiff hairs. Fingers toothed, tubercles and hairs extending over the dorsal border of the movable one for half its length. (See Pl. III, c, d.) Merus of walking legs with a row of blunt tubercles on the narrow upper border; segments of legs, especially carpus, propodus, and dactylus well coated with stiff hairs.

Type specimen a male: breadth of carapace 24 mm.; length 18 mm. Color, reddish-brown. Type locality, Maalaea Bay, Maui, under stones at the edge of the water. B. P. Bishop Museum No. 3440.

This species seems to differ from *Pilumnus scabriusculus* Adams and White in the character of the surface of the carapace and the antero-lateral borders. In *Pilumnus scabriusculus* the granules of the surface each bear several stiff setae; the antero-lateral border is provided with three wide denticulated teeth and the upper border of the orbit with one rounded indentation.

The distinctive features by which the Hawaiian species is easily recognized are the flat, smooth, posterior half of the carapace, from which comes the specific name *planus*, and the thickened, declivitous front, and antero-lateral borders which are densely covered with granules, spines and hairs.

SPECIES OF MEGAMETOPE

Of the genus *Megametope* but three species have been recognized up to this time, all of them from the south and southeast coasts of Australia and one of them also from Cook Strait and Foveaux Strait, New Zealand. The status of the genus is discussed and a key to the known species presented in a recent paper by McNeill.¹

¹McNeill, F. A., Studies in Australian carcinology, no. 2: Rec. Australian Mus., vol. 1, no. 1, p. 131, 1926.

It is interesting now to find a representative of the genus in the shallow waters of Hawaii, quite distinct, however, from those of the colder latitudes of the Southern Hemisphere.

Megametope sulcatus, new species (Pl. IV, *A*; fig. 3, *c*, *f*).

Carapace slightly broader than long, marked by broad, shallow grooves and covered by granules of microscopic size. Front prominent, broad, more than one-third the width of the carapace, strongly turned down; front margin sinuose, slightly indented in the middle, the two lobes separated laterally from the salient orbital borders by shallow notches.

A broad, shallow groove beginning behind the frontal margin extends in the median line to the gastric area; a parallel groove on each side of the median one divides at the anterior border of the protogastric area, one branch continuing almost through this area, the other bounding it laterally. A broad shallow depression extends from the posterior border of the orbit to beyond the level of the third antero-lateral tooth.

Antero-lateral border of carapace thin and sharp, bearing four teeth besides the antero-lateral angle, which is not strongly developed. First of four teeth smallest, second, third, and fourth about equally developed, being blunt, granular points. From the fourth and fifth antero-lateral teeth there extend medially ridges, bounding shallow grooves which are directed toward the gastric and cardiac areas.

Anterior portion of superior border of orbit a thickened ridge; posterior portion of superior border low, with two minute notches. Inferior border of orbit concave, granular. Basal segment of antenna touching the frontal process, the short flagellum resting in the orbit. Granules cover the surface of the outer maxilliped, being larger on the quadrangular merus. (See fig. 3 *c*.) Abdomen of female (type specimen) of seven segments, the fourth being the widest; surface smooth. (See fig. 3. *f*.)

Chelipeds unequal in both sexes, surface closely and finely granulated as the carapace. Arms without spines or teeth, upper and lower borders beaded; outer and upper surfaces of wrist reticulated by ridges and raised lines of granules with depressions between. Upper and superior half of outer surface of palm of large cheliped sculptured as the wrist, there being in addition five well-defined longitudinal ridges, the stronger ones above. The margin of the most superior ridge is formed into three blunt teeth. Lower half of outer surface of palm, inferior border, and inner surface smooth, but finely granulated. Fingers about one-half as long as palm and strongly toothed.

Palm of small cheliped marked in a manner similar to the large one, but the granules are larger and the ridges more numerous, being disposed over almost the whole of the outer surface; fingers relatively longer than in the large hand, thinner and less strongly toothed. (See Pl. IV, *A*, *b*, *c*.)

Walking legs of smooth appearance, but closely covered with fine granules; upper border of merus sharp, that of carpus, propodus, and dactylus grooved.

Type specimen a female: breadth of carapace 8 mm.; length 6 mm. Color, white. Type locality, Makena, Maui. Collected by Mrs. J. K. Skinner among dead coral blocks near shore. B. P. Bishop Museum No. 2588.

This species, which has been collected in shallow water on the shores of both Maui and Oahu, is clearly distinguished from either of the three species previously described from Australia. Instead of the carapace being pitted, as in the Australian forms, the Hawaiian species is recognized by the broad shallow furrows which traverse the dorsal surface both antero-posteriorly and transversely. It also differs from *Megametope rotundifrons* (Milne Edwards) and *Megametope punctatus* (Haswell) in having the antero-lateral margins of the carapace thin, and resembles those species in that the front is strongly bent down.

The Hawaiian species conforms to *Megametope carinata* (Baker) in that both have thin antero-lateral borders and show evidences of a notch at the inner orbital angle. In *Megametope carinata*, however, the front is nearly horizontal.

SPECIES OF *PANOPEUS*

The "mud crabs" of the genus *Panopeus* are represented on the east and west shores of North and South America and adjacent islands in the Atlantic Ocean by about a dozen species. Two species have been recorded from the west coast of Africa. The discovery of a representative of this genus in Hawaii is, therefore, of considerable interest from a distributional point of view.

Associated with sponges, barnacles and tunicates attached to buoys and floats in Pearl Harbor, Oahu, is a small form of an apparently new species of *Panopeus*. The barnacle (*Balanus cburneus* Gould), among which the crab is found, is a typical species of the east coast of the United States, which is suggestive of the view that both crabs and barnacles may have been transported to Hawaii through shipments of oysters or on the bottoms of ships. The crab, however, seems to be unlike any previously described species.

Panopeus pacificus, new species (Pl. IV, *B*; fig. 3, *g-i*).

Carapace somewhat convex, with areas defined by shallow grooves; surface smooth except for granules scattered along the lateral borders and disposed in a few interrupted raised lines in a transverse direction. Although the granular lines vary somewhat in length and position in different specimens there are usually two crossing the protogastric area and one the gastric area. Two cross the branchial area in line with the third and fifth antero-lateral teeth, and there is a shorter one about the middle of the postero-lateral border. This latter line is but a row of prominent granules among those thickly covering this area. (See fig. 3, *g*.)

Front approximately one-third the breadth of the carapace, consisting of two lobes separated in the middle by a notch, and terminating laterally in a raised process separated from the blunt inner orbital angle by a broad groove. Margin of front thick, beaded above and below. Upper border of orbit granular with two notches.

Antero-lateral border bearing five teeth, the first and second separated by a shallow groove; third and fourth about equally developed; fifth straight, and narrower than the fourth at the base, its posterior border sloping into the postero-lateral border of the carapace, which is shorter than the antero-lateral border. Inferior border of orbit notched below the outer orbital angle, concave in the middle and terminating medially in a prominent suborbital tooth which is visible from above. Flagellum of antenna longer than the orbit in which it rests. Outer maxilliped with ischium about twice the length of the merus, granulated and marked by a longitudinal groove. (See fig. 3, *h*.)

Chelipeds unequal, finely granulated; upper border of arm sharp and entire except for a subterminal notch. Outer surface of wrist roughened by a few granular tubercles and impressed by a deep groove near the distal border parallel with the articulation of the hand; a strong blunt spine at inner angle of wrist. Inner and outer surfaces of palm with granules tending to be disposed in transverse lines especially on lower half where they are smaller and not so crowded. Lower border of palm rounded, smooth. Palm increasing in height distally, slightly longer than greatest height; upper border traversed by a shallow, longitudinal furrow.

Fingers of larger hand short and stout, furrowed longitudinally and strongly toothed; dactylus with a large rounded basal tooth. Fingers of smaller hand relatively longer, thinner and less strongly toothed. Color of fingers of both hands dark brown with lighter tips, the color not extending back on the palm. A few hairs are borne on the chelipeds, mostly fringing the arm and articulations. (See Pl. IV, *B, b, c*.)

Upper borders of walking legs somewhat granular, that of merus narrow but not sharp; a short, blunt tooth at the upper distal extremity of the carpus. Long yellow hairs border the segments and together with shorter ones form a dense coating on propodus and dactylus.

Abdomen of male with third, fourth, and fifth segments fused, the sixth approximately as long as broad and the terminal one triangular. (See fig. 3, *i*.)

Type specimen a male: breadth of carapace 12 mm.; length 9 mm. Color yellowish-brown. Type locality Pearl Harbor, Oahu, among sponges, tunicates, and barnacles which are attached to buoys. B. P. Bishop Museum No. 3435.

The Pearl Harbor form shows relationship with the American species *Panopeus convexus* A. M. Edwards and *Panopeus occidentalis* Saussure in the following features: a nearly smooth carapace, depressed granules, broadly coalesced antero-lateral teeth (first and second), and the smooth outer surface of the chelipeds without the dark color of the immovable finger extending on the palm. It also resembles *P. occidentalis* in the distal depression of the carpus parallel with the articulation with the hand. It differs

from both of these species in a relatively broader front and the longitudinal groove traversing the superior border of each cheliped. It is also smaller than either of these species. The species *P. convexus* is known from Chile only; *P. occidentalis* ranges from South Carolina through the Gulf of Mexico to Brazil and is also recorded from Bermuda.

Neopanope, sp. ?, (Pl. IV, C; fig. 3, j).

Another form associated with *Panopeus pacificus* closely resembles it in general appearance, but presents some differences in the chelipeds and the abdomen of male specimens. The outer surfaces of the palms of the hands are not so granular; the fingers are longer, more slender, and less strongly toothed. The dactylus of the large hand is without a stout basal tooth and the immovable finger is more deflexed, its color continuing somewhat on the surface of the palm. (See Plate IV, C.) In the abdomen of the male the lateral borders of the sixth segment are slightly concave and the terminal segment is equal in length to that of the sixth. (See fig. 3, j.)

In features of the carapace, including areolation, disposition of granules, front, orbit, and antero-lateral border, this form seems to be identical with *Panopeus pacificus*. The absence of a large basal tooth on the dactylus of the larger hand, the slender, acute fingers with the color of the immovable one slightly extended on the palm, and the contour of the lateral margins of the abdomen are, however, features tending to exclude the form from *Panopeus*. It is tentatively placed within the genus *Neopanope*. The largest specimen observed, a male, is 18 mm. in breadth of carapace, and 12 mm. long. B. P. Bishop Museum No. 3437.

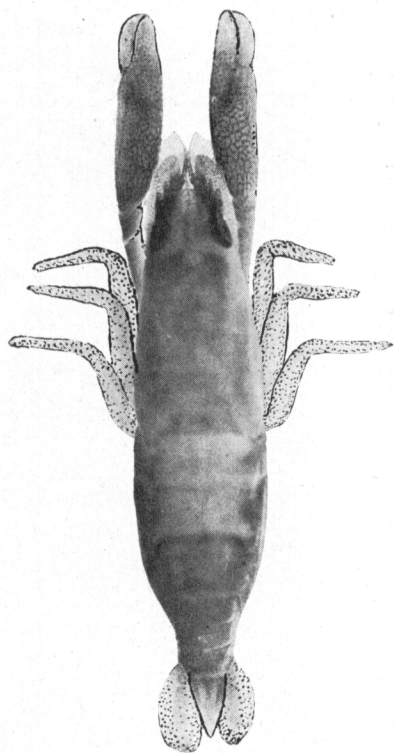


PLATE I.—*Coralliocaris mammillata*, new species, $\times 6.2$.

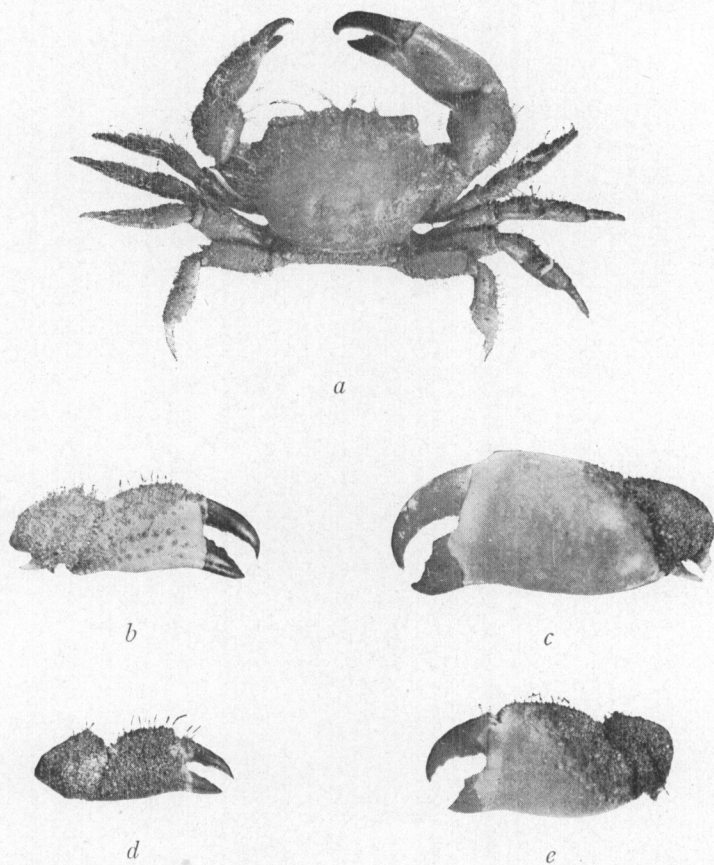


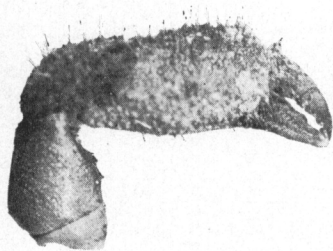
PLATE II.—*Pilumnus oahuensis*, new species: *a*, dorsal view, $\times 2.5$; *b*, *c*, right and left chelipeds of male, $\times 3.5$; *d*, *e*, right and left chelipeds of female, $\times 3$.



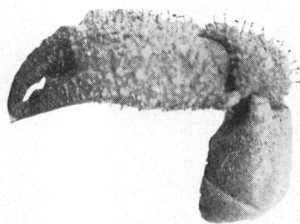
a



b



c



d

PLATE III.—*Pilumnus planus*, new species: *a*, dorsal view, $\times 1.5$; *b*, ventral view, $\times 1.5$; *c*, *d*, right and left chelipeds, $\times 3$.

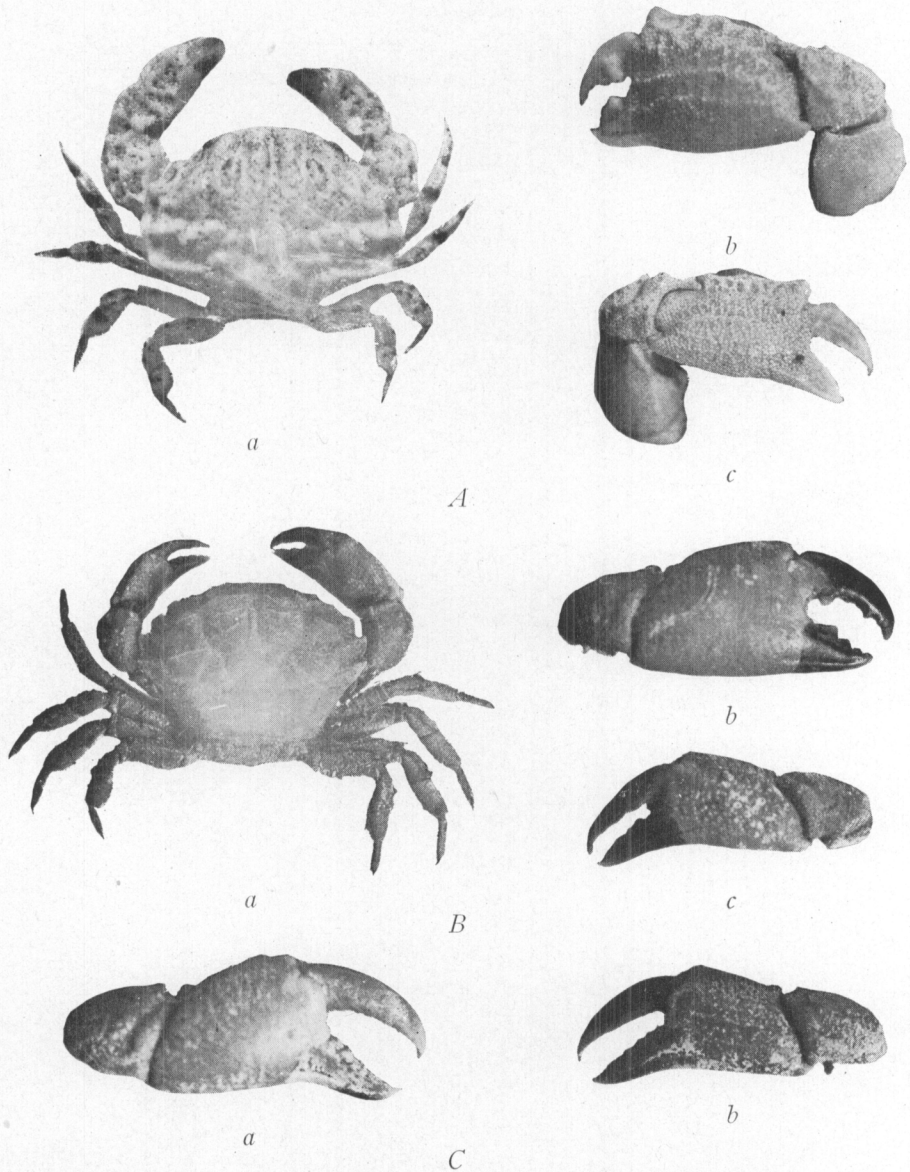


PLATE IV.—A, *Megametope sulcatus*: a, dorsal view, $\times 4.5$; b, c, left and right chelipeds, $\times 10$; B, *Panopeus pacificus*: a, dorsal view, $\times 2.5$; b, c, right and left chelipeds, $\times 4.3$; C, *Neopanope* sp. (?): a, b, right and left chelipeds, $\times 4.3$.