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INTRODUCTION

The following account of new and rarely observed decapod crustaceans is a result of collections taken by various field workers in widely separated parts of Polynesia ranging from Hawaii through the equatorial islands to Fiji, including the Lau Archipelago, and Tongatabu.

Interesting records of the study include the occurrence of *Hymenocera elegans* Heller and *Portunus vocans* (A. Milne Edwards) in Hawaiian waters, the latter previously known only from the Atlantic Ocean. A distribution of the little-known genus *Lioxanthodes* into the Pacific Ocean is also reported. Two new genera are created one, *Mesocaris*, to accommodate a cave-dwelling Atyid from Lau and one, *Nullicrinis*, for a Xanthid with atrophied antennae from Christmas Island (North Pacific Ocean).

ORDER DECAPODA

SUBORDER NATANTIA

TRIBE CARIDES

FAMILY LYSMATIDAE

Genus PROCESSA

Processa steinii, new species (fig. 1).

Rostrum shorter than the basal segments of the eye-stalk, slightly bent upward, smooth without spines or hairs. Anterior margin of carapace sinuose, a short sharp spine below the orbit, the pterygostomial border rounded. Antennular peduncle exceeding in length the scale of the antenna; basal segment long, narrower in the middle than at the extremities, deeply concave dorsally for the reception of the eyes; the slender flagellum about five times the length of the thicker one. Scale of antenna narrow, slightly overreaching the peduncle.

Endopodite of third maxilliped stout, exceeding in length the peduncle of the antennule by the last two segments. First leg on the right side chelate, smooth and unarmed except for bristles which sparsely fringe the borders; fingers sharp pointed, slightly more than half as long as palm. First leg on the left side non-chelate equal to the cheliped of the opposite side in length but less than one-half its volume and only slightly stouter than the following walking legs, its borders bearing stiff hairs. Second leg on right side very long, carpus with 52 segments; merus which is half as long as carpus and hand together also showing evidences of segmentation. Carpus of second leg on left side with

22 segments. Last three pairs of legs long and slender, the dactylus about one-fifth the length of the propodus; tufts of bristles borne on the dactylus, propodus and carpus.

Telson becoming abruptly narrowed in distal third; bearing two pairs of spines on dorsal border and numerous stout hairs; posterior border bearing a

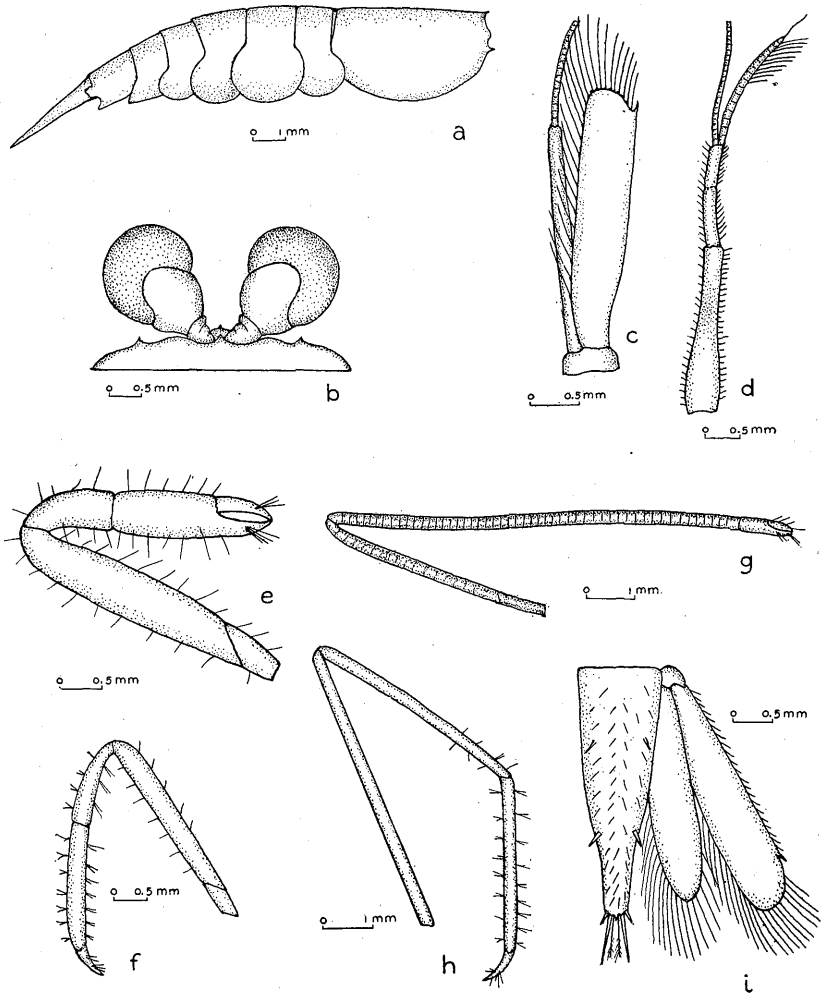


FIGURE 1.—*Processa steinii*, new species: a, lateral view of carapace and abdomen; b, front border of carapace and the eyes; c, peduncle and scale of antenna; d, antennule; e, first leg on right side; f, first leg on left side; g, second leg on right side; h, third leg; i, telson and uropod.

short median spine and one at each lateral angle and a much longer intermediate one on each side; a median pair of feathered setae are slightly shorter than the intermediate spines. Uropods narrow, the exopodites longer than the telson, margins fringed with hairs.

Color of type specimen preserved in alcohol white, the pigmented areas of the eyes black.

Type specimen a male, total length from tip of rostrum to posterior extremity of telson 17 mm. Type locality a shoal water reef of Maui, in a coral head. Bishop Museum collections no. 3918.

Three species of the genus *Processa* have previously been recorded from Hawaii (4, 8, 9).¹ In one of these, *P. processa* (Bate), a widely distributed form, the rostrum is as long as the eyes and the carpus of the second leg on the right side has about 65 segments. In the species *P. hawaiiensis* (Dana) the rostrum is shorter than the eyes and the carpus of the second leg on each side has 11 segments. The third species, *P. paucirostris* Edmondson, described from the island of Maui, has a straight rostrum shorter than the eyes and the carpus of the second leg on the right side has 18 segments.

This new species, *Processa steinii*, is named in honor of Mr. Harold Stein, an enthusiastic student of natural history who collected the specimen and presented it to the Bishop Museum. In length of rostrum *P. steinii* is close to *P. paucirostris* but differs from that species in the antennular peduncle, cheliped, carpus of the second leg on the right side and in the telson.

Other members of the genus having Indo-Pacific or general distribution and which might be expected to range into the central Pacific area include *Processa japonica* (de Haan), *Processa canaliculata* Leach, and *Processa jacobsoni* de Man. In each of these the rostrum is at least one-half as long as the eye-stalks.

FAMILY PONTONIIDAE

Genus PONTONIA

Up to the present time but one species of *Pontonia* has been reported from Hawaiian waters. This small form, *Pontonia quadratophthalma* Balss (3), was described from the northwest shore of Australia. It is about 10 mm long and may be recognized by the quadrate form of the eye-stalks. About Hawaii it is abundant in tubular sponges attached to the under surface of stones near shore. Several other species of the genus have been recorded from the Indo-

¹ Numbers in parentheses refer to Literature Cited, pp. 37-38.

Pacific area including such widely separated localities as the Seychelles, South Australia, the coasts of India and Japan.

In a small collection of marine crustaceans sent to the Bishop Museum during July 1934 from Midway Island, leeward Hawaii, were three specimens which I have assigned to the genus *Pontonia* and which apparently represent a new species. The species is a thick bodied form slightly depressed having the general appearance of a member of the genus *Conchodytes* but excluded from it by the absence of a basal protuberance on the dactylus of the walking legs. From the genus *Coralliocaris* it is separated by the character of the rostrum, external maxillipeds and dactyli of the walking legs.

Previously recorded species of *Pontonia*, where information is available, are known to be associated with clams, ascidians and sponges. The association of the new species from Midway is unknown.

***Pontonia medipacifica*, new species (fig. 2).**

Body of type specimen heavy, somewhat depressed. Rostrum short, reaching slightly beyond the base of the first segment of the antennular peduncle, without teeth, broad at the base, sharp at the apex, keeled above and below; an oval depressed area on either side of the base of the rostrum. Front margin of carapace bearing a small antennal spine and marked by a slight furrow extending posteriorly from about the middle of the orbit; antero-ventral border rounded.

Eye-stalk bulbous with cornea narrower than the stalk, no ocular spot present. Antennular peduncle a little shorter than the scale of the antenna; first segment broadly expanded, its median tooth extending to the middle of the segment and the distal tooth to the middle of the second segment which is longer than broad; third segment broader than long. No visible subdivision of the thicker branch of the antennular flagellum, but it bears long hairs in its middle section. Scale of antenna slightly longer than the peduncle of the antennule, its outer margin straight and bearing a sharp spine at its distal extremity; flagellum long, its peduncle shorter than the scale. Mandible without palp; the curved incisor branch terminating in four sharp teeth; the mandibular process shorter and thicker than the incisor branch. Third maxilliped with the two distal segments narrower than the preceding one and their surface plane placed at an angle with it; exopodite slender; all segments fringed with hairs.

First pair of chelipeds slender, extending beyond the scale of the antenna by the length of the manus and half the length of the carpus; merus and carpus subequal, manus slightly shorter than carpus; fingers sharp pointed bearing hairs at the tips; dactylus subequal in length with palm. Second chelipeds larger than first, similar to each other in form and size; merus and carpus cylindrical, smooth, the former slightly longer than the latter; palm and fingers slightly compressed; dactylus, which is slightly shorter than palm, bears a tooth near the

proximal end of the cutting edge; immovable finger with two teeth on basal half of cutting edge; fingers crossed when closed.

Walking legs slender, cylindrical; propodus five times the length of the dactylus, which is oval, biunguiculate, without basal protuberance and without

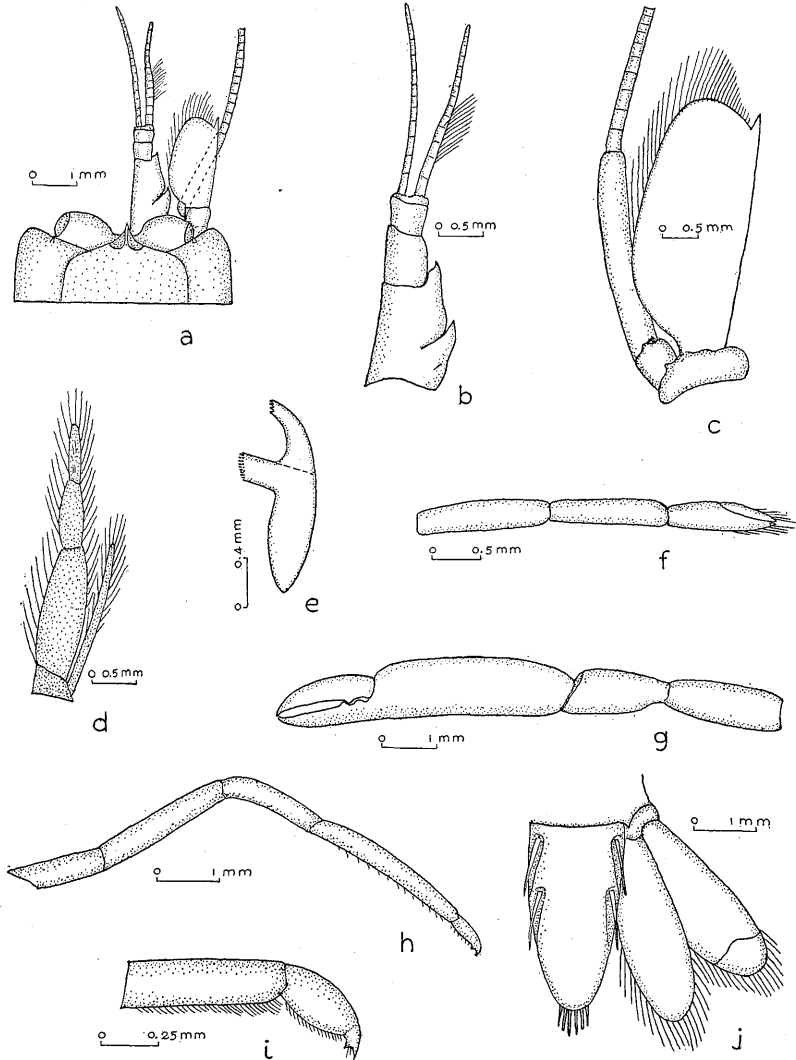


FIGURE 2.—*Pontonia medipacifica*, new species: a, dorsal view of anterior margin of carapace with appendages; b, antennule; c, antenna; d, third maxilliped; e, mandible; f, first cheliped; g, second cheliped; h, first walking leg; i, dactylus and part of propodus of walking leg; j, telson and uropod.

spines except the accessory tooth near the tip; lower border of dactylus and of propodus fringed with hairs.

Telson slightly more than two times as long as broad at base and bears two pairs of large movable spines on the dorsal surface, both pairs on the basal half, the first pair near the suture with the sixth abdominal segment. Of the three pairs of terminal spines of telson the median ones are the longest, the intermediate next in length and the lateral ones the shortest. The intermediate spines are thicker and blunter than the others. Outer branch of the uropod is shorter than the inner and no tooth is borne on its lateral border.

Apparent color of recently preserved specimens bright red with a deeper red spot in the middle of the dorsal surface of the carapace. Under high magnification dots of pale yellow or white are visible on the larger chelipeds. The red color gradually fades in alcohol.

Type specimen an ovigerous female; length from tip of rostrum to extremity of telson 21 mm. Type locality, Midway Island, in shallow water, association unknown. Bishop Museum collections no. 3845.

This new species bears considerable likeness to a *Conchodytes* in the form of the body and the toothless rostrum, but I consider it a representative of the genus *Pontonia* by reason of the character of the dactyli of the walking legs. From the other recorded Hawaiian species *Pontonia quadratophthalma* (3), it is easily distinguished by the form of the eyes and chelipeds as well as by size. It is separated from *Pontonia minuta* Baker (1), type locality South Australia, by the short rostrum. In the Australian species the rostrum outreaches the antennular peduncle.

In form of rostrum *Pontonia brevirostris* Miers, described from the Seychelles, closely resembles the species under consideration but in the Indian Ocean form the fingers of the large cheliped lack teeth and the dactyli of the walking legs are styliform. In *Pontonia ascidicola* Borradaile (5), recorded from New Britain, the rostrum reaches the middle of the first antennular segment and the dactyli of the walking legs bear numerous spines. Two species described by Kemp, *Pontonia oki* (16, p. 261, figs. 89-92) from the coast of Burma and *Pontonia anachoreta* (16, p. 264, figs. 93-95) from off Madras, differ from the Midway Island form in that both bear numerous spines on the dactyli of the walking legs. The only *Pontonia* known from the west coast of America, *Pontonia californiensis* Rathbun (23), was dredged near Santa Cruz Island in 30 fathoms of water. In this species the rostrum is very long, about one-third the length of the carapace.

Genus PERICLIMENES

There are a number of well known genera of marine shrimps of the tribe Carides each of which includes one or more species habitually associated with other animals such as sponges, coelenterates, echinoderms, mollusks or ascidians. Many of these small commensal decapods are brightly colored harmonizing with the color of the animal on which they live. Taxonomists variously assign them to the subfamily *Pontoniinae*, family *Palaemonidae* or families *Pontoniidae* and *Palaemonidae*.

In Hawaii certain associations of this nature are well known and of common observation, others are rarely seen. The species *Harpilius depressus* Stimpson is a typical commensal on living corals of the genus *Pocillopora*. A small and locally abundant form, *Pontonia quadratophthalma* Balss, is found concealed in tubular sponges on the under surface of stones in shallow water. A larger representative of the group, *Conchodytes meleagrinae* Peters, lives within the mantle of the large pearl oyster, and *Coralliocaris mammillata* Edmondson was discovered on the spines of the large red sea urchin, *Heterocentrotus mammillatus* (Linnaeus). Other species of *Harpilius*, *Coralliocaris*, *Palaemonella* and *Periclimenes* have been recorded from Hawaiian waters but their commensal relationship with other local organisms has not been observed.

Recently a brightly colored and apparently undescribed form was found living on the reddish-brown starfish, *Linckia multifora* (Lamarck), abundant in Kaneohe Bay, Oahu. It is here described as a new species of *Periclimenes*.

The genus *Periclimenes*, as defined by Kemp (16, pp. 118-288) includes three subgenera and more than 60 species about a dozen of which are commensals on coelenterates and echinoderms. Although it is not easy to point out specific generic characters where many variable forms are concerned, the genus *Periclimenes* may be recognized by the following positive and negative features: Carapace not depressed; rostrum laterally compressed and bearing teeth; no mandibular palp and no basal protuberance on the dactylus of the last three pairs of legs; carpus of the first leg unsegmented and all the maxillipeds bearing exopods.

Periclimenes bicolor, new species (fig. 3).

Body slender, antennal and hepatic spines present but no supraorbital spine. Rostrum laterally compressed, deep, approximately as long as carapace; upper border bearing 15 teeth, lower border entire. Antennular peduncle stout, basal spine not reaching to the extremity of the first segment; basal segment bearing 3 stout teeth on the distal free border; outer thicker branch of antennule shorter than the inner branch and bearing stout hairs but showing no appearance of being bifid. Antennal scale extending beyond the distal extremity of antennular peduncle, the tooth on its outer border being on a level with the tip of the rostrum; scale fringed with long hairs on the inner and distal borders.

Incisor branch of mandible terminating in 4 teeth the medial one small; molar branch as long as incisor, its blunt end bearing short stiff hairs. Eye-stalks large, quadrangular, slightly compressed.

First pair of legs chelate, slender, smooth, reaching to the tip of rostrum when extended forward; manus and carpus equal in length, each slightly shorter than merus; fingers equal to palm in length, broadly spatulate with the inner border of each pectinate. Second pair of legs chelate, slender, smooth, similar in form but, in the type specimen, unequal in size the right one being the longer and larger, reaching to the tip of the scale of the antenna when extended forward; left leg reaching the tip of the rostrum. Right of second pair of legs with segments cylindrical, unarmed; manus more than four times the length of the carpus and nearly three times the length of the merus; palm a little more than three and one-half times the length of the fingers which equal the length of the carpus. Dactylus with a sharp cutting edge but without teeth; pollex with three teeth on the cutting edge, the two proximal ones being small.

The three posterior pairs of legs long slender and unarmed except for the dactylus which is provided with an accessory tooth; propodus seven times the length of the dactylus and twice the length of the carpus.

Telson typical in form for members of the genus, with two pairs of dorsal spines and three pairs of terminal ones, the lateral ones being the shortest and the adjoining ones the longest. Uropods extending slightly beyond the tip of the telson.

Living type specimen sharply differentiated into two color areas, hence the specific name *bicolor*. Below a horizontal line on either side extending from the tip of the rostrum backward through the carapace gradually sloping to the lower border of the sixth abdominal segment the surface is heavily pigmented, the ground color being violet-red with minute white spots thickly interspersed. Above this line, including the upper half of the rostrum, carapace and increasingly larger amounts of the abdominal segments, the surface is whitish interspersed with minute dots appearing under high magnification whiter than the general surface background. The telson, uropods, legs (except basal segments), flagella of antennules and antenna are transparent. Eye-stalks, peduncles of antennule, scale of antenna are pigmented as the lower half of the carapace except the ground color of these appendages is white interspersed with minute spots of violet-red. From a dorsal view the animal presents a broad longitudinal band of white bordered on either side by red.

Type specimen a female, length from tip of rostrum to distal extremity of telson 11 mm. Type locality, Kaneohe Bay, Oahu, on

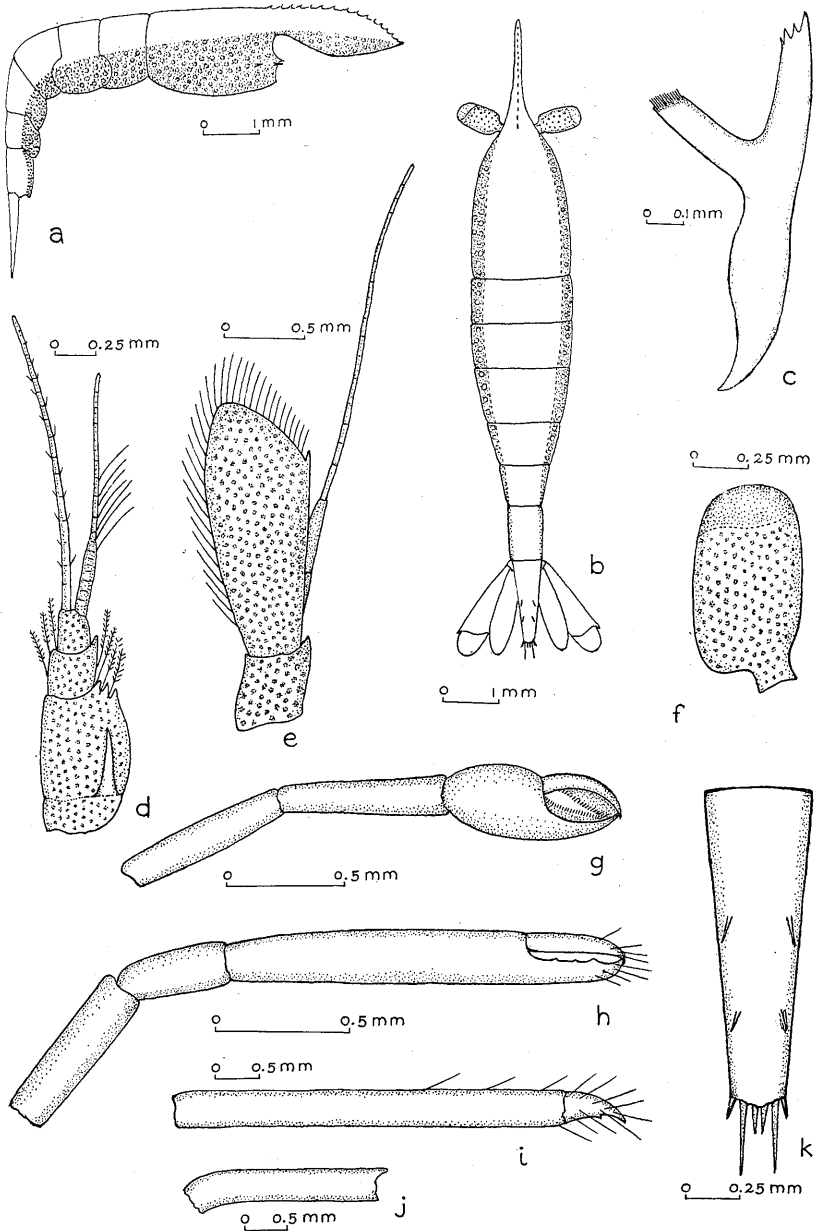


FIGURE 3.—*Periclimenes bicolor*, new species: *a*, lateral view of rostrum, carapace and abdomen, lower portion heavily pigmented; *b*, dorsal view of the same; *c*, mandible, greatly enlarged; *d*, antennule; *e*, antenna; *f*, eye-stalk; *g*, merus, carpus, and manus of first cheliped; *h*, carpus and manus of second cheliped; *i*, propodus and dactylus of third leg; *j*, carpus of the same; *k*, telson, dorsal view.

Linckia multifora in shallow water. Bishop Museum collections no. 3756.

This form, which differs from the numerous species of the genus previously described both in structural features and color, is near *Periclimenes soror* Nobili (19) and *Periclimenes noverca* Kemp (16, p. 162, figs. 28-30) in the pectinate margin of the spatulate chela of the first leg. It differs from both, however, in the form and armament of the rostrum and in the relatively shorter fingers of the second leg compared with the length of the palm. The form of the rostrum including its extreme depth in side view and the absence of teeth on the lower border resembles that of *Periclimenes rex* Kemp but the number and disposition of the teeth on the upper border of the rostrum, as well as structural features of the chelipeds and other appendages, separate that species from the Hawaiian form.

It is pointed out by Kemp (16, p. 136) that the extent to which the outer antennular flagellum is cleft varies greatly within this genus, ranging from species having a deeply cleft flagellum to those in which there is scarcely a division at all. The new Hawaiian species is unique in that there is no perceptible cleft of the outer branch of the antennular flagellum.

From collections made by the Albatross Rathbun (20, p. 921) described 2 species, *Periclimenes pusillus* from the surface off the south coast of Oahu and *Periclimenes* sp. (damaged specimens) from the south coast of Molokai, 23 to 24 fathoms, and near Kauai, 68 to 179 fathoms. These species are assumed to be free-living, without commensal habits, and neither of them closely resembles the form from Kaneohe Bay here described.

FAMILY ATYIDAE

Among a collection of crustaceans taken in the southern Lau Islands, Fiji, by Harry S. Ladd during 1934 and sent to the Bishop Museum were two lots, one from a cave containing brackish water on the island of Namuka and one from a salty lake on the island of Wangava. On examination the specimens from the two sources were found to be identical, representing a very primitive type of Atyid with well-developed exopodites on all the legs and presenting other characteristics which would seem to require the establishment of a new genus for their accommodation.

Genus **MESOCARIS**, new genus

Carapace without supraorbital but with suborbital and pterygostomian spines. Rostrum stout, without spines. Chelae with tufts of hairs at tips. Well-developed exopodites on all legs. Epipodites on third maxillipeds and all legs but the last pair. A single uropodal spine. Gills seven pairs. Eye-stalks subnormal with a small amount of pigment.

Mesocaris lauensis, new species (fig. 4).

Body stout, not depressed. Carapace with well-developed suborbital and pterygostomian spines. Rostrum triangular when viewed from above, reaching beyond the middle of the second segment of the antennal peduncle, without spines, upper border rounded, lower border sharp. Eye-stalks short and broad, slightly flattened, the inner angle bluntly pointed, the pigment confined to a small area at the outer angle and directed laterally.

Basal segment of antennular peduncle a little shorter than the combined length of the other two, its spine reaching beyond its distal extremity; flagellum very long. Scale of antenna oval, overreaching the peduncle of the antennule, a small spine on the lateral border; flagellum approximately ten times the length of the carapace and a little longer than the flagella of the antennule. Mandible with a strong, curved incisor process terminating in a number of small teeth; molar process longer than incisor, the hollowed out tip rimmed with chitin. Exopodite of second maxilla short, rounded and fringed with short hairs. Third maxilliped narrow, foot-like, a long slender spine on the basal segment. First cheliped shorter than second, merus and carpus subequal, ischium shorter than merus, the distal extremity of the carpus deeply excavated; exopodite overreaching the distal end of the merus. Carpus of second cheliped longer than merus also deeply excavated at distal end; ischium and merus subequal in length; exopodite reaching the distal extremity of the merus.

Walking legs slender, approximately of equal length but differing in proportionate length of segments. In first walking leg combined length of ischium and merus greater than in last leg but both propodus and dactylus of last leg exceed in length corresponding segments of first leg. Exopodite of last leg relatively longer than in the first leg in proportion to the length of combined ischium and merus. Dactyli long, slightly curved, a row of spinules on the posterior border, the last spinule being stout giving the dactylus a biunguiculate appearance. Several spines on the lower border of the ischium and merus of the first walking leg, a lesser number on the last leg. Epipodites on the basal segment of the third maxilliped and all the legs except the last. In broad view the epipodite presents a constriction near the free end, in edge view it is seen to terminate in a strong hook.

Telson slightly longer than the sixth segment of the abdomen, its distal border bearing, in addition to a short spine at each angle, 6 longer ones, the lateral pair exceeding the others in length. The exopodite of the uropod is longer and broader than the endopodite and bears a single uropodal spine on its lateral border. The branchial system includes 7 pairs of gills the one at the base of the second maxilliped being very small and those at the base of the third maxilliped and last leg are smaller than the intervening ones.

Color bright red in living state. Gradually fading to white in alcohol.

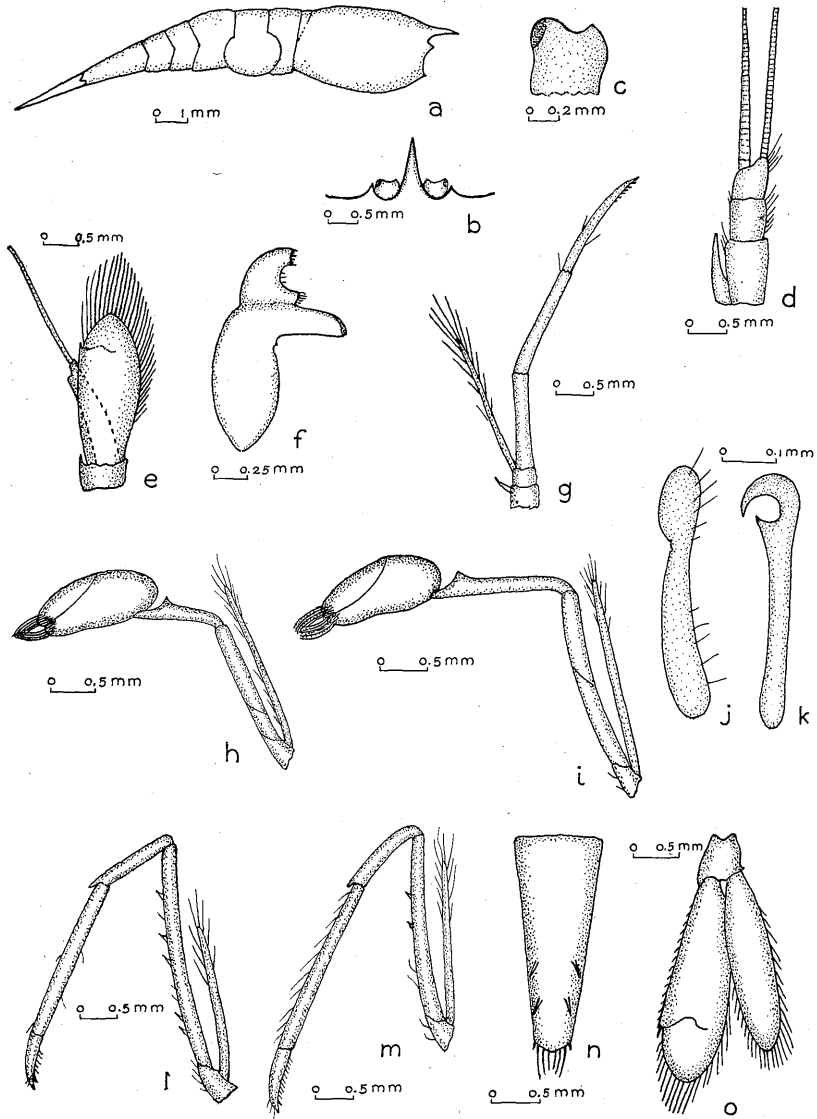


FIGURE 4.—*Mesocaris lauensis*, new species: a, side view of carapace and abdomen; b, anterior border of carapace with rostrum and eyes; c, eye-stalk with remnant of pigment; d, antennule; e, antenna, with scale; f, mandible; g, third maxilliped; h, first cheliped; i, second cheliped; j, broad view of epipodite; k, edge view of epipodite; l, first walking leg; m, last walking leg; n, telson; o, uropod.

Type specimen a female, total length from tip of rostrum to posterior end of telson 15.5 mm. Type locality a cave containing brackish water, island of Namuka, Lau Islands, Fiji, Bishop Museum collections no. 3898.

Although more than a dozen species of decapod crustaceans are known to have become adapted to life in caverns, grottoes and other subterranean habitations few representatives of the family Atyidae have been reported as showing adaptations to a cavernicolous existence in the form of atrophied eyes. In 1853 the first of these, *Troglocaris schmidti* was described by Dormitzer, from the caves of Carniola, recorded by Bouvier (6) and in May 1901 Hay recorded a blind Atyid, *Palaemonias ganteri* (13), from the Mammoth Cave of Kentucky.

In a recent reexamination of *Palaemonias* Fage (11) calls attention to its similarity to *Troglocaris* in that the exopodite of the second maxilla is short, rounded and lacks a brush of long hairs typical of most other members of the family. Another character common to these two forms is the excavation of the distal ends of the carpi of both pairs of chelipeds. In *Troglocaris*, however, there are 8 pairs of gills and the exopodites of the last pair of walking legs have disappeared. In *Palaemonias* the gills are reduced to 4 and a rudiment on each side but all walking legs retain exopodites although those of the last pair are rudimentary. As Fage points out *Palaemonias* occupies a peculiar position among the Atyidae in that it shows a marked degree of specialization in the gills while it retains some of the most primitive characters of the family.

In addition to the type specimen 11 cotypes were taken from the Namuka cave and 14 other specimens from the Wangava salty lake. In these prawns the adaptation to a subterranean life is expressed by a modification of the eye-stalk and a reduction in the amount of ocular pigment. The unusual length of the flagella is probably correlated with diminished vision. In general form and reduction of pigment the eye-stalk of this Atyid closely resembles that of *Palaemon cavernicola* described by Kemp (15) from the Siju Cave, Assam. According to Kemp the Assam species was the only decapod crustacean showing such adaptations to a subterranean existence then known (1924) in the Orient. The discovery of the Lau species seems to be the first such record for the islands of the Pacific Ocean.

Red color is not an unusual one among animals living under conditions of weak light. Even in cave-dwelling crustaceans which appear quite transparent or translucent a considerable amount of scattered red pigment may be found, as both Kemp and Rathbun report. There are other species of Atyidae inhabiting brackish water in which the red color persists. In Hawaii a small form tentatively determined by Rathbun as *Caridina brevirostris* (20) is bright crimson in color when living. It inhabits caverns in the coral plains near the seashore and has been found in old wells close to the sea. Both sea water and fresh water are fatal to the species, which requires an intermediate degree of salinity.

In character of the exopodite of the second maxilla this form from Lau resembles *Troglocaris* and *Palaemonias* but presents more primitive characters than either in the well-developed exopodites on all the legs. In *Mesocaris* a slight amount of ocular pigment has been retained while in *Troglocaris* and *Palaemonias* it has entirely disappeared, which may possibly be correlated with a longer or more perfect subterranean existence.

Concerning the habitat of the prawns on the island of Namuka Dr. H. S. Ladd in a personal communication has the following to say:

Numbu (deep) cave lies almost in the geographical center of the island of Namuka. As mapped the cave lies 1550 feet north of the Mbulis house in Namuka's single village. The cave is 65 feet high, the lowest 10 feet being filled with brackish water. The pool is 30 by 50 feet, its surface lying at sea level. The temperature of the water at the surface is 23.1 degrees Centigrade. In this pool the red prawns appear by the hundreds.

While it is obvious that a cave such as that of the island of Namuka may represent conditions conducive of diminution of eyesight among its inhabitants it is not so clear why these crustaceans living in an exposed lake as that of the island of Wangava should equally show reduction of ocular pigment. This salt lake is, according to a personal communication from Dr. Ladd, of considerable size and while somewhat remote from the sea is connected with it by subterranean channels. It is probable that underground caverns and passages connected with the lake have for a long period of time offered habitats encouraging adaptation to a cavernicolous existence.

The origin of the brackish water Atyid of Lau is problematic. At least two species of *Atya* and numerous ones of *Caridina* are

present in the fresh waters of the larger islands of Fiji but the very primitive Atyidae do not seem to include this archipelago within their range. Among previously known Atyidae having exopodites on all the legs only representatives of the genus *Paratya* (*Xiphocaridina*) have extended themselves, in any degree, into the southwest Pacific area. This genus has been recorded from Japan, Upper Assam, India, Australia, New Zealand, Chatham Islands, Lord Howe Island, and Norfolk Island. If the divergence of the Lau Atyid was from some *Paratya*-like form it came about by a modification of external features such as rostrum, spines of carapace, carpi of chelipeds, etc., rather than internal branchial changes, as the number of gills is identical in the two genera.

Key to the genera of Atyidae with exopodites on all legs

- No tufts of hairs at tips of chelae and no excavation of carpi of chelipeds **Xiphicaris**
 Tufts of hairs at tips of chelae and carpi of at least one pair of chelipeds excavated.
 Supraorbital spines present.
 Excavation of carpi of first pair of chelipeds only; eyes normal.....
 **Paratya** (*Xiphicaridina*)
 Excavation of carpi of both pairs of chelipeds; eyes without pigment....
 **Palaemonias**
 Supraorbital spines absent; carpi of both pairs of chelipeds excavated;
 eyes with little pigment **Mesocaris**, new genus

FAMILY GNATHOPHYLLIDAE

Genus HYMENOCERA

Hymenocera elegans Heller.

The first observation of this remarkable crustacean in Hawaii was in August 1934 when a specimen 32 mm long was collected on a shallow reef in Kaneohe Bay, Oahu, among the branches of a *Porites* coral head. Since sufficient descriptions of the structural features have been given by several authors it will suffice here to say that the species may be recognized by the winglike expansions of the hand of the cheliped, flagellum of the antennule and the third maxilliped.

Apparently few investigators, however, have seen the species alive as scant mention has been made of the unusual color markings exhibited, rivaling or even exceeding in vividness that of the

"bandana shrimp", *Stenopus hispidus*. In *Stenopus* the color pattern consists of red bands encircling the body and appendages while in *Hymenocera* it includes bands, saddle-patches and ocular spots involving a diversity of colors.

Gravier (12) in 1921 described somewhat in detail the coloration of a living specimen of *Hymenocera* taken off the east coast of Africa. This observer noted the spots and other color markings to consist chiefly of tints of yellow, blue, salmon and brown. Since there seems to be considerable variation in the color of this species it would appear worth while to record the color of the Hawaiian specimen as it was when alive.

Color Markings of *Hymenocera elegans* from Oahu

Carapace. A band of reddish-purple from orbit to antero-ventral angle, 1 mm wide at lower end, narrower above. Saddle-patch of the same color at the base of the first rostral tooth extending one-fourth the distance toward the ventral border. An irregular patch of this color near the postero-ventral margin.

Abdomen. A reddish-purple patch on either side of the mid-dorsal line beginning at the anterior border of the first segment becoming narrower as it extends ventrally and posteriorly over the second segment. The color is deeper toward the ventral margin of this area. A transversely elongated saddle-patch of reddish-purple with dull orange center extending over the mid-dorsal line of the second segment. A circular reddish-purple spot on the third segment in the mid-dorsal line on the summit of the angle of the abdomen. On the fourth segment a saddle-patch of the same color, narrower in the midline, extends half way down on the sides of the segment. Fifth segment without color markings. Sixth segment with a dorsal and a ventral reddish-purple patch, the two almost meeting laterally. Parts of the ventral margins of the first four segments are also marked by a similar color. Telson without color markings.

Appendages. Lateral one third of long eye-stalks reddish-purple, remainder without color. Basal segment of antennules and scale of antenna marked by transverse, narrow, irregular bands of golden brown color. Expanded flagellum of antennule with three reddish-purple spots toward the distal extremity. Merus of cheliped with two broad bands of the same color. Carpus with a faint ring of color about the proximal end and on ventral surface. The expanded wing-like propodus marked by several splotches of purple with lighter centers. A patch of purple saddles over the dorsal border of the palm near the middle. The fingers are banded with purple at the base and tips. The winglike expansions of the third maxilliped are marked by circular rings of reddish-purple.

Segments of the walking legs, except the dactylus, are marked by a broad band of reddish-purple. The exopodite of the uropod is colored near the basal end like the scale of the antenna and the endopodite has a large circular spot of purple at the distal extremity.

SUBORDER REPTANTIA

TRIBE BRACHYURA

FAMILY LEUCOSIIDAE

Genus ACTAEOMORPHA

The family Leucosiidae includes small crabs the carapace of which is roughened by elevations and depressions exhibiting some degree of protective resemblance to stones, bits of coral or shells in their natural environment.

In 1878 Miers established the genus *Actaeomorpha* to accommodate the species *Actaeomorpha erosa* described by him at that time. The genus differs from a closely allied one, *Oreophorus* (Tlos), in that the walking legs are not concealed in flexion by an extension of the postero-lateral margins of the carapace and the segments of the abdomen are distinct.

The species *Actaeomorpha erosa* was described from Port Curtis, Australia, and has since been reported from such widely separated localities as Mauritius, Bay of Durban, South Africa, the Kermadec Islands and Hawaii. The success of this minute crab may be due, in part at least, to the character of the carapace and legs which are deeply pitted resulting in a close similarity to an eroded pebble or limestone fragment. In Hawaii the species has frequently been taken at Black Point, Oahu, where it is found concealed in crevices of dead coral blocks. It has also been collected on Waikiki reef. Locally the species has been observed only in shoal water near shore. The type specimen was from a depth of 7 fathoms and the South African record from 24 fathoms.

Early in 1934 a small crab was collected at Black Point, Oahu, associated with *Actaeomorpha erosa* which, while obviously of the same genus cannot be confused with that species. A specimen now recognized to be of similar form was secured at Kure Island in 1923 by the Tanager Expedition and one at Christmas Island, North Pacific Ocean, in 1924 by the Whippoorwill Expedition. Both these specimens were immature but present the same general features as the type specimen described here under the name *Actaeomorpha punctata*.

Key to known species of Actaeomorpha

- A Carapace deeply pitted and eroded.....**Ac. erosa** Miers
Actaeomorpha erosa Miers, Linn. Soc., Jour., vol. 13, p. 183, fig. 1-6, 1878, Port Curtis, Australia, 1 specimen, 7 fathoms; Chilton, New Zealand Inst., Trans. and Proc., vol. 43, p. 555, 1910, Kermadec Islands, several specimens on coral; Bouvier, Bull. Sc. de la France et de la Belgique (7), p. 48, 1915, Mauritius; Stebbing, Ann. Durban Mus., vol. 2, p. 273, pl. 32, 1920, Bay of Durban, South Africa, 1 specimen, 24 fathoms; Edmondson, B. P. Bishop Mus., Special Publ. 22, p. 234, fig. 143 b, 1933, Oahu, several specimens, shoal water.
- AA Carapace not deeply pitted and eroded.
- B A groove encircling the carapace parallel with the lateral border; areas defined by furrows.
- a The groove encircling the carapace separated from the border by a wide margin; second of four rounded lobes of the lateral border bifid**Ac. sculpta** (Haswell)
Lithadia sculpta Haswell, Linn. Soc. N. S. W., vol. 4, p. 57, pl. 6, fig. 5, 1879, Fitzroy Islands; Laurie, Ceylon Pearl Oyster Report, vol. 5, p. 359, 1906, Arafura Sea, 1 specimen, Eastern Seas, 1 specimen.
- aa The groove encircling the carapace close to the border; none of the lobes of the lateral border bifid.
- b Furrows extending forward from cardiac region parallel and terminating about the middle of the carapace.
- c The groove encircling the carapace not angular in its course.....**Ac. aglypha** (Laurie)
Lithadia sculpta variety *aglypha* Laurie, Ceylon Pearl Oyster Report, vol. 5, p. 358, fig. 2, 1906, Gulf of Manaar, 1 specimen, coral reefs.
- cc The groove encircling the carapace angular in its course.....**Ac. aglypha** variety *angulata* Ihle
Actaeomorpha aglypha variety *angulata* Ihle, Siboga Expedition Mono., 39 b2, p. 209, fig. 120, 1918, Banda, 9-36 meters, 1 specimen.
- bb Furrows extending forward from cardiac region not parallel and not terminating about the middle of the carapace.
- d Four angular lobes on the lateral margin; regions separated by deep cut grooves.....**Ac. morum** Alcock
Actaeomorpha morum Alcock, Asiatic Soc. Bengal, Jour., vol. 65, p. 172, 1896, off Ganjam Coast, 28-30 fathoms, 2 specimens.
- dd Three angular lobes on the lateral margin; regions separated by shallow grooves**Ac. lapillulus** Alcock
Actaeomorpha lapillulus Alcock, Asiatic Soc. Bengal, Jour., vol. 65, p. 172, 1896, off Ceylon, 32-34 fathoms, 4 specimens.
- BB No groove encircling the carapace parallel with the lateral margin; areas not defined by furrows.....**Ac. punctata**, new species

Actaeomorpha punctata, new species (pl. 1, A; fig. 5).

Carapace oval, slightly broader than long; surface irregular, marked by elevations and depressions but not distinctly grooved. Front protruding, a deep notch separating the two prominent lobes which terminate posteriorly in dome-

like elevations. Gastric area depressed and flattened; cardiac area slightly elevated; branchial region prominent; hepatic area, posterior and lateral to the orbit greatly depressed. Entire dorsal surface closely set with smooth and slightly elevated tubercles of nearly uniform size. Under high magnification the tubercles are seen to be surrounded by minute punctae hence the specific name *punctata*. The tubercles are somewhat more prominent about the margins of the carapace and over its posterior half. Lateral border nearly entire; a minute tubercle marking the junction of the anterior and posterior lateral borders and two additional, inconspicuous ones on the posterior lateral border. The lateral border is rimmed by tubercles like those of the surface of the carapace but more prominent, there being a double row along the postero-lateral border. Orbits small and almost concealed in a dorsal view by the prominent frontal lobes.

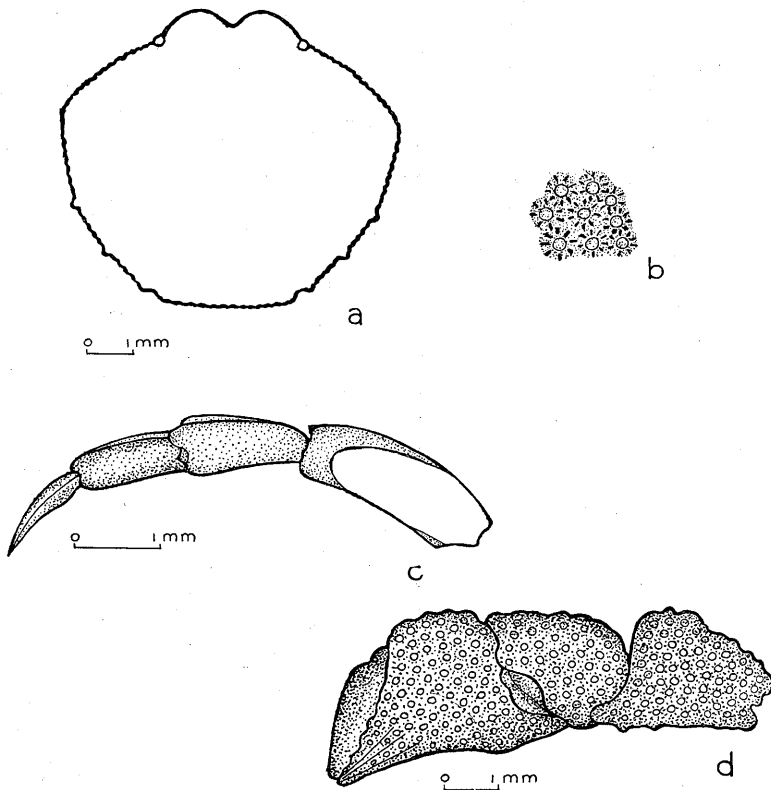


FIGURE 5.—*Actaeomorpha punctata*, new species: a, outline of carapace; b, detail of surface ornamentation, greatly enlarged; c, third walking leg; d, left cheliped.

Under surface of the carapace smoother than the upper surface. Buccal cavity completely closed by the stout external maxillipeds; exopodite of outer maxillipeds slightly curved, bearing a short flagellum. Basal segments of antennae fused with the orbit and antennules folded obliquely as in other members of the genus.

Chelipeds short and stout; surface of arm, outer surface of wrist and of hand covered with tubercles like those of the carapace and punctate in the same manner. Slightly more prominent tubercles form irregularities on the lower border of the arm and the upper border of the palm. Fingers stout, especially the immovable one, the sharp tips crossed when closed; the cutting edge of each bearing 5 blunt teeth. The walking legs are similar in form and surface ornamentation. Surfaces of legs smooth, finely punctate but tubercles are indistinct except on the upper borders. Upper border of carpus and propodus grooved longitudinally, the carpus provided with two grooves, the propodus with one. Dactylus long, sharp, longitudinally grooved on the surface.

Last segment of abdomen (male specimen) triangular, longer than broad, smooth except at the base. Other segments bearing large, rounded transverse ridges.

Type specimen a male, length of carapace 7 mm, breadth 7.5 mm. Type locality, Black Point, Oahu, in a crevice in a dead coral block, near shore. Bishop Museum collections no. 3738. Other specimens in the Bishop Museum are from Kure Island and Christmas Island, North Pacific Ocean.

Up to the present time apparently 5 species and 1 variety of the genus have been recorded in the literature. The new Hawaiian species is clearly distinct from each of the previously described forms. From the widely distributed species, *A. erosa*, it is distinguished by the absence of deep pits in the carapace and appendages. From the other recorded forms the one here described differs in the absence of a groove encircling the carapace, of clear cut furrows bounding the areas and of distinctly lobulated lateral borders.

FAMILY PORTUNIDAE

Genus CAPHYRA

Among the swimming crabs, family Portunidae, subfamily *Caphyrinae*, about a dozen species of the genus *Caphyra* have been described, mostly from the Red Sea and Indian Ocean. They are all small in size with the flagellum of the antenna excluded from the orbit, the antero-lateral border of the carapace toothed and the last pair of legs subdorsal in position, not much flattened and the dactylus hooklike as in the preceding walking legs.

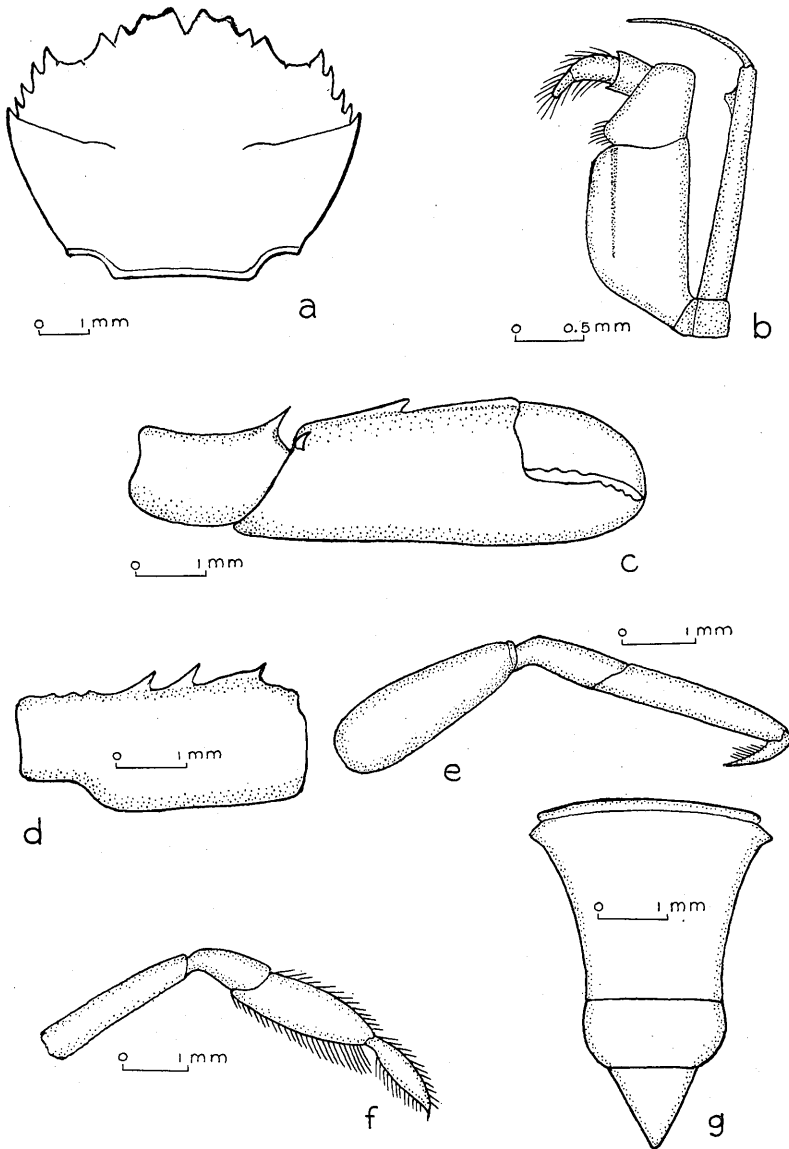


FIGURE 6.—*Caphyra suvaensis*, new species: a, outline of carapace; b, third maxilliped; c, carpus and hand of cheliped; d, merus of cheliped; e, first walking leg; f, last walking leg; g, telson of male.

***Caphyra suvaensis*, new species (fig. 6).**

Carapace broader than long, slightly convex, smooth and shining, marked only by a line beginning lateral to the gastric region extending outward and terminating on the last antero-lateral tooth. Front thin, advanced, deeply notched in the middle and cut into six teeth. Median tooth on each side more prominent than others, triangular, separated from the broader intermedial one by a shallow groove less than half the depth of the median notch. Lateral tooth of front narrower than either of the others, separated from the sharp supraorbital angle by a triangular notch. The line of the front curves backward on each side from the median pair of teeth to the supraorbital angles.

Supraorbital border with two faint notches; lower orbital border with a stout tooth at the inner angle visible from above. Antero-lateral border of carapace shorter than postero-lateral, bearing five sharp teeth, including the outer orbital angle, of which the fourth is the smallest. Outer maxillipeds with ischium longer than broad; merus as long as broad with median border diagonal.

Chelipeds long, stout and smooth, the right slightly larger than the left. Merus abruptly narrowed proximally, three teeth on the inner border, outer border smooth. Carpus with stout, sharp tooth at the inner distal angle. Manus compressed, increasing in height distally; upper border of palm crested bearing a sharp tooth about the middle and a short tooth on the outer border at the articulation with the carpus. Fingers compressed, slightly curved inward, crossed at tips when closed. Basal half of movable finger with low teeth on the cutting edge, immovable finger with similar teeth on the distal half of the cutting edge.

Walking legs long, slender, smooth, segments nearly cylindrical; dactylus hooklike fringed with hairs on lower border. Last leg subdorsal in position, propodus and dactylus somewhat flattened, both segments fringed with hairs. Abdomen of male with segments from two to five, inclusive, fused and lateral borders concave; sixth segment with lateral borders convex, seventh segment a narrow triangle.

Type specimen a male, breadth of carapace 8 mm, length 6 mm. Type locality, Fiji, on outer reef off Suva, in a dead coral head. Bishop Museum collections no. 3920.

Other known members of the genus apparently differ from this species either in the character of the front, the antero-lateral teeth, the chelipeds, or the abdomen. It seems to be near *Caphyra laevis* A. Milne Edwards (10), described from New Caledonia, but in that species the line of the front is straighter and there are but two teeth on the anterior border of the arm. In the specimen from Fiji the dactylus of the last leg is slightly broader than the corresponding segment in other species.

Genus PORTUNUS

It is of some interest to discover in the shoal waters of Oahu a small swimming crab apparently representing a species hitherto considered to be confined to the Atlantic Ocean. The type locality

is the Cape Verde Islands and, in addition, the previously known range included the West Indies and Ascension Island.

Portunus (Portunus) vocans (A. Milne Edwards) ? (fig. 7).

Neptunus vocans A. Milne Edwards, Soc. Philom. Paris, Bull., (7) vol. 2, p. 225, 1878.

Portunus (Portunus) vocans Rathbun, U. S. Mus., Bull. 152, p. 60, pl. 25, text figs. 8, 9, 1930.

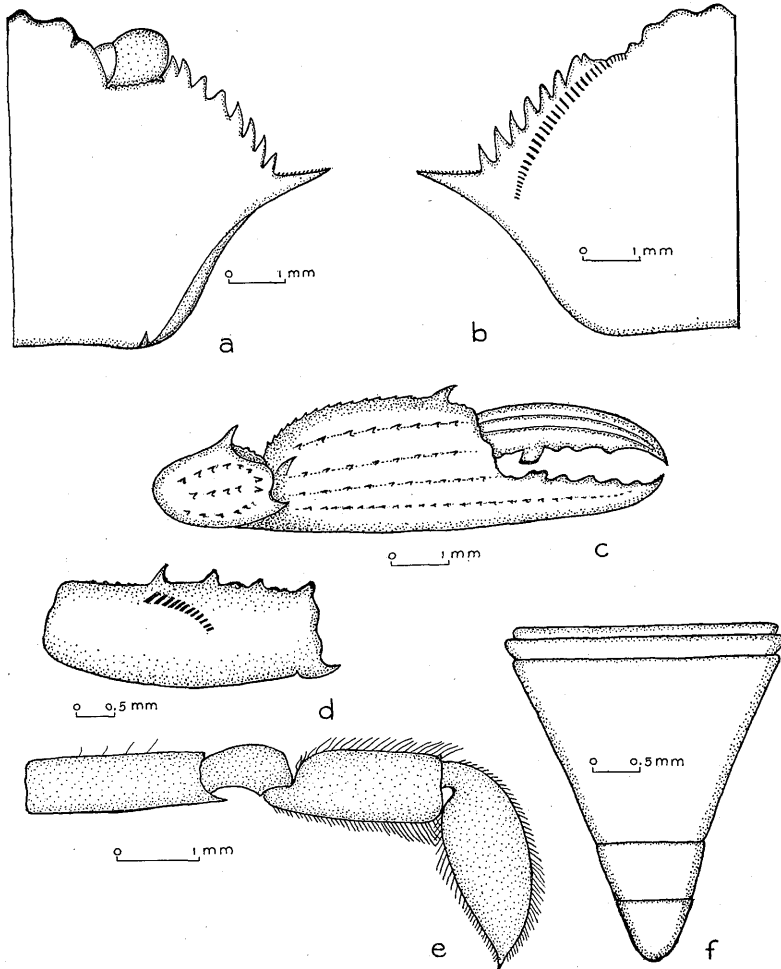


FIGURE 7.—*Portunus (Portunus) vocans* (?): a, outline of right half of carapace; b, lower surface of carapace showing stridulating organ; c, outer surface of carpus and hand; d, upper surface of merus of cheliped with stridulating organ of this segment; e, swimming leg; f, telson of male.

Characters of the Hawaiian specimen

Carapace broad, upper surface tuberculate; four tubercles in a curved transverse line across the gastric area, the concavity of the curve directed forward; behind these tubercles a granulated line extending transversely across the carapace curving backward to traverse the long lateral spine; an elevated ridge extending transversely across the cardiac region with a tubercle at either end. Front with 4 lobes, the median ones more tooth-like and more advanced than the lateral ones. A sharp tooth at the postero-lateral angle of the carapace is curved upward and forward. A stridulating organ consists of two portions, first, a row of short striae close to the lateral margin of the carapace on the under surface curving backward from the orbit, the striae becoming shorter as they recede from the margin, second a curved row of striae on the upper surface of the merus of the cheliped. Merus of cheliped with inner border serrated and spinous, a small sharp spine at the distal end of the outer border; carpus with a strong spine at the inner angle; outer and upper borders strongly serrated; palm with a tooth in front of the articulation with the carpus and one on the upper border near the distal end; upper border of palm serrated and four other longitudinal rows of serrations on the outer surface; fingers nearly as long as palm. Walking legs long, slender; merus of last leg with a tooth at the lower distal end. Telson of male triangular, segments 3 to 5 fused.

The presence of a stridulating organ distinguishes this species from others of the genus. For the most part the Hawaiian form, which is probably a young specimen, agrees with the typical species. In outline of the carapace, the distribution of the tubercles, in arrangement of the stridulating apparatus and in the general form of the appendages and telson the specimen from Oahu closely corresponds with previous descriptions of the species. The narrower median lobes of the front are, in the Hawaiian specimen, on a little lower level than the broader lateral ones, and the anterior border of the merus of the cheliped bears 4 spines instead of 2 and a tubercle as in the typical species.

When alive the Hawaiian form is conspicuous by color bands of red which encircle the chelipeds and walking legs. Except in the last leg the dactylus and carpus are each encircled by one red band and the propodus and merus by two such bands. The merus of the last leg has but one color band.

Size of the type specimen is recorded as 22 mm long and 43 mm broad. The length of the carapace of the Hawaiian specimen is 6 mm and the breadth 11 mm. Collected at Maile Point, Oahu. Bishop Museum collections no. 3772.

Should this small specimen prove to be identical with *Portunus vocans* it would not represent the first appearance in Hawaiian

waters of marine forms typical of the Atlantic Ocean. In Pearl Harbor, Oahu, the barnacle, *Balanus eburneus* Gould, has become definitely established. This species is typical of the Atlantic seaboard, in harbors and migrating up the rivers for some distance. A hydroid, apparently identical with *Pennaria tiarella* McCrady of the Atlantic Coast, flourishes in Kaneohe Bay, Oahu. The introduction of these and other invertebrates into the Central Pacific area may have been accomplished by way of the hulls of ships or, in case of the barnacle, by shells of transplanted oysters. It is quite probable that swimming crabs also may be carried long distances among sponges or ascidians which frequently accumulate on the bottoms of ships.

Portunus sp. (fig. 8).

A small specimen of the genus *Portunus*, subgenus *Achelous*, having a narrow carapace with an advanced front, was collected on the shallow reef at Black Point, Oahu. The small size, width of carapace 6 mm, length 4.5 mm, would support the view that it represents an immature form but the characteristics presented do not seem to correspond to those of any previously described species.

Following Rathbun's monograph the specimen seems to be near *Portunus floridanus* Rathbun (22, p. 82, pl. 40) and *Portunus depressifrons* (Stimpson) (22, p. 84, pl. 41) but differs from each of those species in the character of the front, the chelipeds and the abdomen of the male. Following the older key of A. Milne Edwards the specimen is near *Portunus ordwayi* (Stimpson) (22, p. 71, pl. 33), (*Neptunus cruentatus* A. Milne Edwards), but differs in the front, chelipeds and merus of the swimming legs. In general contour and convexity of the carapace this small specimen bears some resemblance to *Portunus pubescens* (Dana), a species common in Hawaii, but differs from it in the form of the front and in the absence of spines on the posterior border of the merus of the cheliped.

Without designating a specific name for this minute specimen a brief description follows.

Carapace slightly broader than long, upper surface convex, smooth, marked by a faint line extending transversely across the gastric region and behind this another more conspicuous one which continues laterally curving backward and traversing the posterior tooth of the lateral margin. Front advanced, consisting of four rounded lobes, the median pair more toothlike and more prominent than the lateral ones from which they are separated by a shallow groove; lateral lobes separated from the rounded, salient supraorbital border by a

shallow depression. Posterolateral corners of the carapace smooth and rounded. Supraorbital border with two faint notches, the outer angle being a stout tooth. Anterolateral border of carapace bearing 9 teeth (including outer angle of orbit) of which the last is somewhat larger than the others.

Outer maxilliped with ischium slightly longer than broad; merus about as long as broad; exopodite and flagellum stout. Left cheliped only developed, right one in process of regeneration; merus stout, thicker in the middle, inner margin serrated and bearing three spines which increase in size distally; pos-

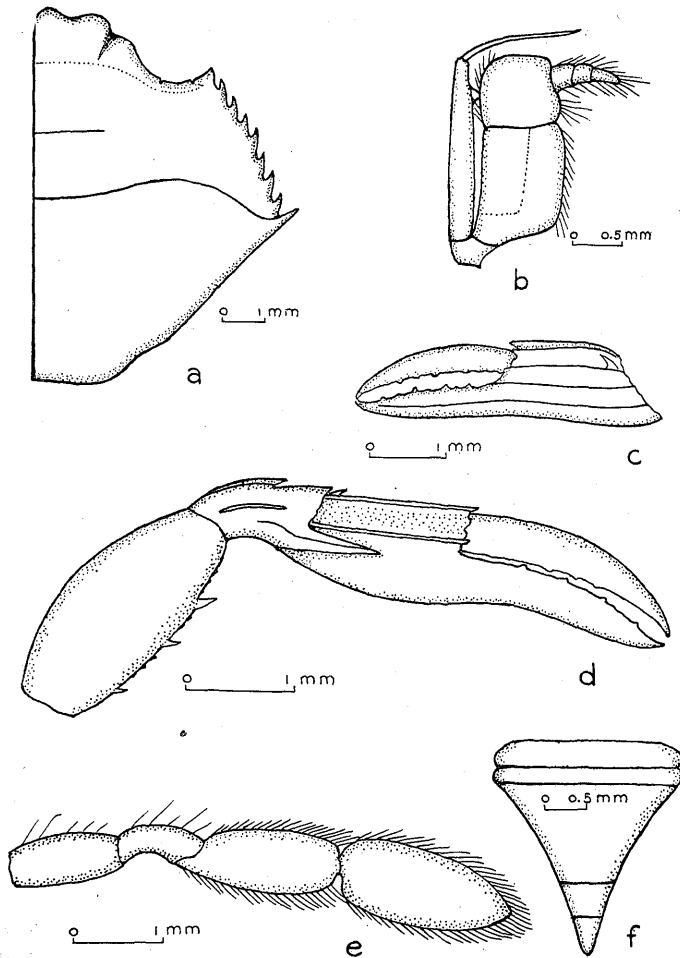


FIGURE 8.—*Portunus* sp.: a, outline of right half of carapace; b, third maxilliped; c, hand of left cheliped; d, medial view of left cheliped; e, swimming leg; f, telson of male.

terior border unarmed. Inner angle of carpus bearing a stout tooth about one-half as long as the palm of the hand, outer and upper surface with low carinae, the outer one terminating in a sharp spine. Manus of hand with five carinae on upper and outer borders, the two upper ones terminating distally in sharp points; a sharp spine on outer border on front of articulation with carpus; inner border of manus smooth, lower border rounded and smooth. Fingers longer than upper border of palm, slender, the cutting edges with a few low teeth.

Fifth leg unarmed, propodus and dactylus with margins densely haired. Abdomen of male with lateral borders of segments 3 to 5 concave; seventh segment a narrow triangle. Bishop Museum collections no. 3855.

FAMILY XANTHIDAE

Genus ACTAEA

Actaea dentata, new species (pl. 1, B; fig. 9).

A species of the *Banareia* type with fingers of the chelipeds thin and sharp and the surface of the carapace and legs almost completely concealed by tufts of hairs some of which are longer than others giving especially the front, lateral borders, and legs a shaggy appearance.

Carapace three-fourths as long as broad; upper surface when denuded presenting a smooth appearance, flattened transversely, anterior half convex longitudinally. Areas of surface separated by smooth shallow grooves, the deepest furrow being at the posterolateral border of the cardiac region.

Surface of carapace bearing sparsely scattered tubercles which near the antero-lateral borders are combined into raised groups of from three to five of unequal size; on the posterior half of the carapace the tubercles become smaller and more numerous. The tubercles are surrounded by areas of shallow pits which bear tufts of hairs of two lengths; some tubercles are pitted and bear hairs. Many slightly elevated areas also bear hairs but are without tubercles.

Front deeply notched in the middle with two broadly rounded medial lobes more prominent than the toothlike lateral ones which are separated from the inner supraorbital angles by slight depressions. Median lobes edged by a few granules and densely haired on the margin. Upper orbital border with two broad notches and bearing small tubercles and a thick coat of hair. Close behind the frontal margin and parallel with it is a shallow furrow, smooth and free from hairs but concealed until the surface is denuded. A similar but narrower furrow parallels the posterior border of the carapace. Lower orbital border granular and haired with a deep notch at the lateral and a broad tooth at the medial extremity.

Antero-lateral border of the carapace with four stout teeth, the first at the outer orbital angle; the three following are conical, tipped with pearly tubercles and directed forward and upward. Each bears tubercles on the upper and posterior border and is covered with long hairs concealing the margin of the carapace. The first and second teeth are separated by a wide space. Of the four teeth the second is the smallest.

Third maxilliped with ischium slightly longer than broad; merus broader than long with a medially directed lobe; exopodite and flagellum stout.

Chelipeds stout, in type specimen the right slightly larger than the left; arm shorter than wrist, surface smooth except for a few tubercles on upper and lower borders near the distal end; a short tooth behind a deep notch near the distal extremity of the upper border. Carpus with a stout tooth at inner angle, outer surface bearing tubercles arranged in groups, a furrow near the anterior border and parallel with it. Larger hand two-thirds as high as long, palm with a few groups of tubercles on upper border; outer border, for the most part, covered with tubercles, those toward the upper border arranged in groups; antero-ventral border including the immovable finger and the medial surface of the palm smooth. Dactylus with tubercles on upper and lateral borders of basal half; fingers laterally compressed, slightly curved inward and bearing low teeth on the cutting edges. Hand of larger cheliped densely clothed with long hairs except the antero-ventral and inner borders and the distal half of the dactylus. Outer face of palm of smaller hand granulated and haired throughout.

Merus of walking legs smooth except for a few tubercles on upper and lower borders, a shallow notch near the distal end of the upper margin; carpus and propodus bearing tubercles on upper and outer borders, carpus longitudinally grooved near the upper margin, dactylus long and slender. Legs clothed with long hairs except dactylus. Abdomen of male elongate, triangular with all segments distinct, first segment long, third one the broadest.

Type locality specimen a male, width of carapace 24 mm, length 18 mm. Type locality Tongatabu, in shallow water. Bishop Museum collections no. 3847. Other specimens in the Bishop Museum are from the shoal waters of Vitilevu and Oahu besides cotypes from Tongatabu.

Several previously described species bear some resemblance to the one here recorded but each seems to differ from it in certain specific characteristics. In *Actaea kraussi* Heller (14), of which Odhner considers *Banareia inconspicua* Miers from north Australia a synonym, the carapace is marked by raised lobules covered with granules, the front consisting of four equal lobes and the antero-lateral borders are cut into blunt granulated lobes. In *Actaea armata* (A. Milne Edwards) (10) the carapace which is closely covered with pearly granules has the median lobes of the front feebly developed and the antero-lateral border bears four granulated lobes. The species *Actaea villosa* (Rathbun) (20, p. 854, pl. 9, fig. 15), dredged by the Albatross near Laysan Island, has the carapace covered with granules of irregular size and bears about 13 large red granules scattered regularly over the surface. The front is deeply four lobed and the antero-lateral border consists of 4 thick, narrow

granulated lobes the last interspace being the greatest. In character of the front and surface of the carapace *Actaea banareias* Rathbun (24) seems near to the species here described but has irregular granulated lobes on the antero-lateral border instead of distinctly conical teeth.

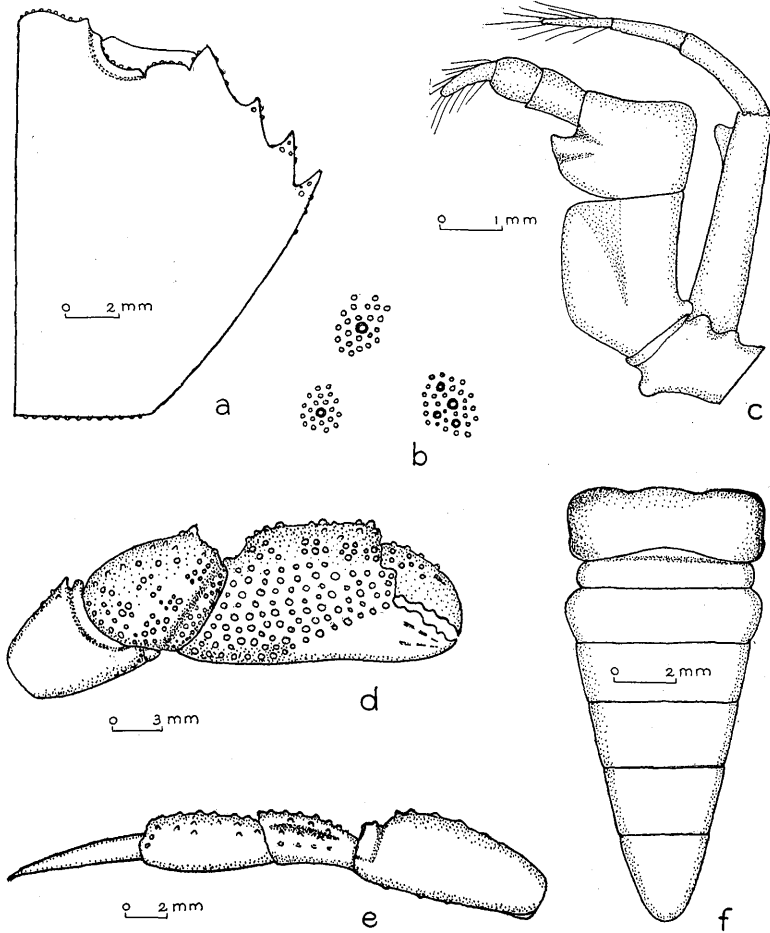


FIGURE 9.—*Actaea dentata*, new species: a, outline of right half of carapace; b, groups of tubercles near lateral border of carapace (enlarged); c, third maxilliped; d, right cheliped; e, first walking leg; f, telson of male.

Genus NULLICRINIS, new genus

Carapace broader than long; front strongly curved down; frontal margin concave; orbits large, border entire, situated far apart and remote from the epistomal region. Basal antennal joint fused with subfrontal area, flagellum wanting. Carapace and chelipeds ornamented by tubercles and covered with a short pile.

Nullicrinis amplifrons, new species (pl. 2, *A*; fig. 10, *a-e*).

Carapace broader than long, strongly convex longitudinally, and the front curved down in front of the eyes; true frontal margin concave, granulated. Areas faintly outlined; surface covered with smooth round tubercles and a dense yellow pile which does not completely conceal the tubercles. Antero-lateral border rounded, bearing four slightly differentiated lobes from the last of which a row of large granules extends obliquely inward. Carapace rapidly converging behind the fourth antero-lateral lobe to a narrow posterior border. Portion of carapace curved down in front of the eyes, including epistomal area, expansive; antennules folded transversely; basal antennal segment fused with subfrontal area and flagellum wanting. Third maxilliped with ischium a little longer than broad; merus broader than long; exopodite stout. Orbits large, oval, directed upward, situated far apart and remotely separated from the angle of the epistome; orbital border but slightly elevated, entire.

Chelipeds similar except right one, in type specimen, is slightly larger than left; arm short, thick, triangular in cross section, outer surface granular; wrist larger and stouter than arm, outer convex surface granular and tubercular, inner distal angle blunt, bearing a few short spines. Hand short and thick, height of palm equal to its length, upper border and outer surface granular and tubercular, the tubercles round and smooth as those of the carapace and scattered over the entire surface including base of the fingers. Upper margin of palm sharp, lower border broad and rounded; inner face inflated, upper half roughened by tubercles; fingers short, stout, strongly toothed and somewhat hollowed out at the tips. Cheliped covered with short pile like the carapace.

Walking legs compressed, upper and lower borders bearing granules, some of which are sharp; dactylus large, stout, slightly shorter than propodus; segments of legs with a few yellow bristles.

Color of preserved specimen yellowish-white; pigment of eyes and base of fingers of chelipeds black, tips of the latter pale brown. In a smaller cotype specimen the fingers are white.

Type specimen an ovigerous female, width of carapace 6.5 mm, length 5 mm. Type locality, Christmas Island, North Pacific Ocean. Bishop Museum collections no. 3922.

This small Xanthid is obviously near *Euriphides* Rathbun (22), having a very wide fronto-orbital border and the antenna excluded from the orbit. It differs, however, from that genus in the frontal margin, in the complete fusion of the basal segment of the antenna and the absence of its flagellum.

Genus LIOXANTHODES

Lioxanthodes pacificus, new species (pl. 2, B; fig. 10, f-i).

Carapace broader than long, anterior half strongly convex longitudinally, surface smooth with little demarcation of areas; from the greatest width a short distance behind the eyes the carapace rapidly converges to a narrow pos-

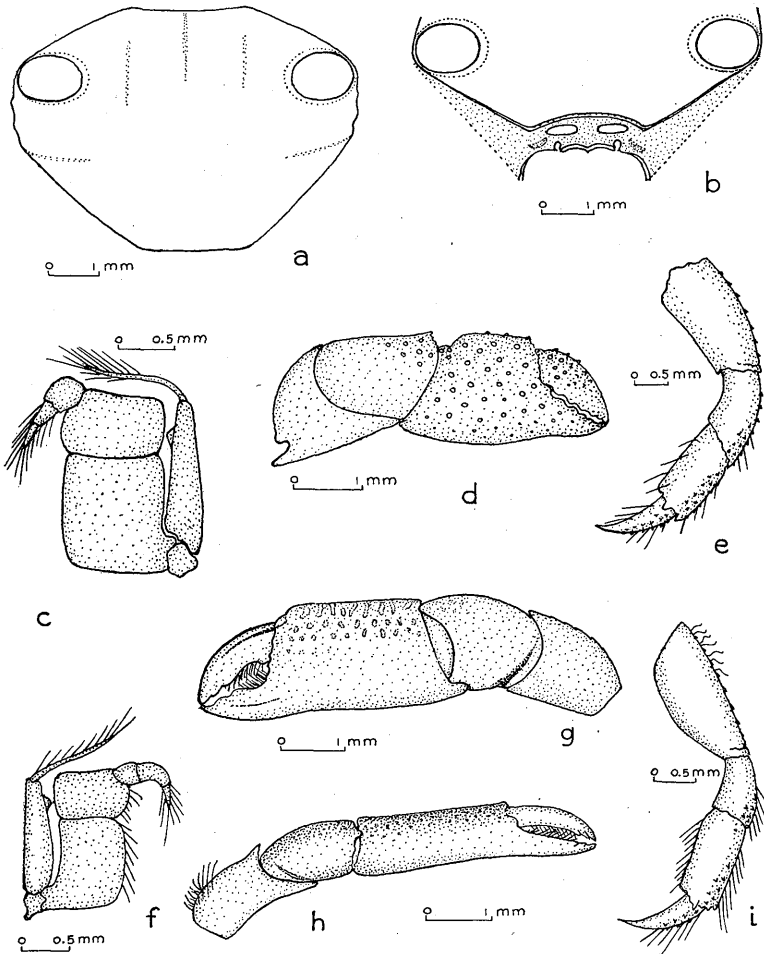


FIGURE 10.—*Nullicrinis amplifrons*, new species: a, outline of dorsal surface of carapace; b, front view of carapace; c, third maxilliped; d, right cheliped, lateral surface; e, walking leg.

Lioxanthodes pacificus, new species: f, third maxilliped; g, left cheliped; h, right cheliped; i, first walking leg.

terior border. Front greatly deflexed, its margin with a shallow depression in the middle, the lateral lobes merging with the inner orbital angles. From the frontal depression a shallow groove extends backward to the gastric region; another shallow groove parallels the inner half of the supraorbital border then curves medially toward the gastric area.

Antero-lateral borders thick and rounded with traces of three lobes. Orbits large, the transverse diameter the greater; border entire except for a medial hiatus in which the flagellum of the antenna rests. Eye-stalks thick, filling the orbit when contracted. Basal antennal segment short and stout, meeting the inner suborbital angle and the front with the flagellum which is a little longer than the greatest diameter of the orbit resting in the hiatus.

Outer maxilliped with ischium little longer than broad, merus broader than long with medial border entire; in width the exopodite more than one-third that of the ischium.

Chelipeds long and stout, unequal in size; the larger one, the left in the type specimen, with a short thick merus, the surfaces of which are smooth, upper sharp border serrate, terminating in a blunt point. Height of carpus subequal with its length, thick, smooth, but having a minutely pitted appearance under high magnification; inner surface drawn into an obtuse point about the middle.

Palm of hand thick, longer than high, upper and lower borders rounded; upper border and upper outer surface marked by transverse folds and wrinkles; lower down and on outer face are numerous low, smooth tubercles irregularly distributed; lower outer surface under lens has appearance of being irregularly pitted; inner surface of palm slightly swollen and smooth. Fingers stout, grooved and toothed, sharp pointed, with a mass of hair at the base.

Small cheliped as long as the larger one but less than one-half its volume, surface smooth; hand long and slender, having a minutely pitted appearance under a lens. Fingers grooved, toothed and hollowed out at the tip; hair fills the space at the base.

Walking legs slightly compressed, the upper border with sharp granules and hairs, both of which are more numerous on propodus and dactylus. Color of preserved specimens pale brown.

Type specimen a female, breadth of carapace 5 mm, length 3 mm. Type locality Washington Island. Bishop Museum collections no. 3919.

This minute crab, collected by the Whippoorwill Expedition in 1924 at Washington Island (type locality) and Howland Island, is close structurally to *Lioxanthodes alcocki* Calman (7), collected by Andrews at Christmas Island (Indian Ocean). The Indian Ocean species was the type of the genus and apparently the only species recorded up to the present time. From it the species here recorded seems to differ chiefly in the sculpture of the chelipeds. In *L. alcocki* the merus of each cheliped has smooth borders and the external surface of the palm of the larger hand is marked by longitudinal rows of low smooth tubercles. The fingers of both hands are sharp pointed. Also the medial border of the merus of the external maxilliped in

L. alcocki presents a notch in addition to the depression in which the palp rests, while in the species from the Pacific Ocean the medial border of this segment is entire.

The two specimens collected by Andrews at Christmas Island were ovigerous females. Seven specimens in the Bishop Museum from Washington and Howland islands are all females.

Genus ETISODES

Etisodes bifrontalis, new species (pl. 2, C; fig. 11).

Carapace twice as broad as long, anterior two-thirds of upper surface well areolated, convex in both directions, posterior third flattened and but slightly grooved. Front prominent, separated in the middle by a deep notch; median lobes with distinct dorsal and ventral margins, granulated, sloping obliquely from the middle notch to the knoblike lateral lobes which are separated by a deep wide notch from the prominent inner orbital angles.

Lobules of carapace closely covered by microscopic granules, tending to become scabrous on post-frontal and branchial areas, some of the lobules being bordered anteriorly by large granules. Superior orbital border tumid, granular, with two distinct notches; inferior border visible from above, a blunt lobe at both outer and inner extremities, the median one the larger, intervening border bearing large granules. Outer orbital angle a blunt tooth followed by four granulated antero-lateral teeth all directed forward, the first and second blunt lobes, the third and fourth narrower and more pointed, the last being sharp. There is an additional blunt tooth between the outer orbital angle and the first antero-lateral tooth, but at a lower level. Margin between base of last three teeth bearing strong conical granules. A narrow transverse groove just in front of the posterior border of the carapace, its posterior margin finely granulated. Postero-lateral margin and lower side walls of carapace covered with long hairs.

Merus of third maxilliped quadrangular, anterior border nearly straight, a deep notch on median border and a smaller one at antero-medial angle.

Chelipeds stout, unequal in type specimen, left one the larger; merus with anterior margin armed with strong granules which become stout conical teeth proximally; posterior margin granular. Wrist with a blunt tooth at inner angle, outer surface finely rugose above, a prominent rounded eminence near articulation with hand. Tufts of long hair are borne on the anterior and posterior borders of the merus and the inner surface of the carpus. Palm of large hand increasing in height distally, upper margin bearing a large tubercle near proximal end and a slight swelling near the middle. A broad, shallow furrow extends longitudinally on the outer face near the upper margin; upper three-fourths of outer surface of palm faintly rugose by irregular transverse lines of granules; lower portion and broadly rounded ventral border smooth.

Palm of smaller hand with an elongated eminence at the proximal end of the upper border and lateral to this four less prominent elevations in a longitudinal row. A longitudinal depression similar to that of the larger hand on the upper outer face of the palm and similar rugosities which, however, are more pronounced and extend lower down.

Fingers of both hands, in type specimen, smooth and rounded, in contact only at the broadly hollowed out tips; dactyli with three slightly elevated lobes on the dorsal border close to the articulation with depressions between; dactylus of larger hand with three teeth on cutting edge, the largest one distal of the middle; immovable finger with three small teeth, the largest one more distal in position; dactylus of smaller hand with three small teeth on the cutting border, the immovable finger with two. Tufts of bristles occupy the hollowed tips of the fingers.

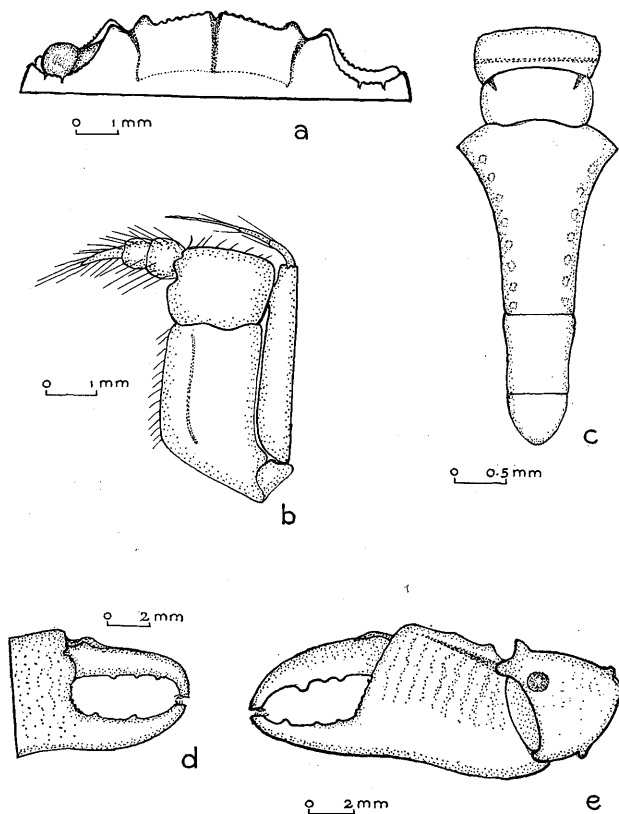


FIGURE 11.—*Etisodes bifrontalis*, new species: *a*, dorsal view of anterior region of carapace including orbits; *b*, third maxilliped; *c*, telson of male; *d*, distal extremity of manus of smaller cheliped; *e*, carpus and manus of larger cheliped.

Merus and carpus of walking legs smooth on anterior and posterior surfaces, with a row of short sharp granules on dorsal border; propodus with two rows of spines above; dactylus slightly longer than propodus and longitudinally grooved, armed with rows of strong spines. All segments bear long hairs.

Abdomen of type specimen (male) with first and second segments much narrower than the third, a transverse furrow traversing the first near its distal border; third, fourth and fifth segments united, a row of slight depressions near each lateral margin; sixth segment longer than broad; seventh shorter than breadth of base.

Type specimen a male, breadth of carapace 22 mm, length 11 mm. Type locality Pearl and Hermes Reef. Bishop Museum collections no. 3921.

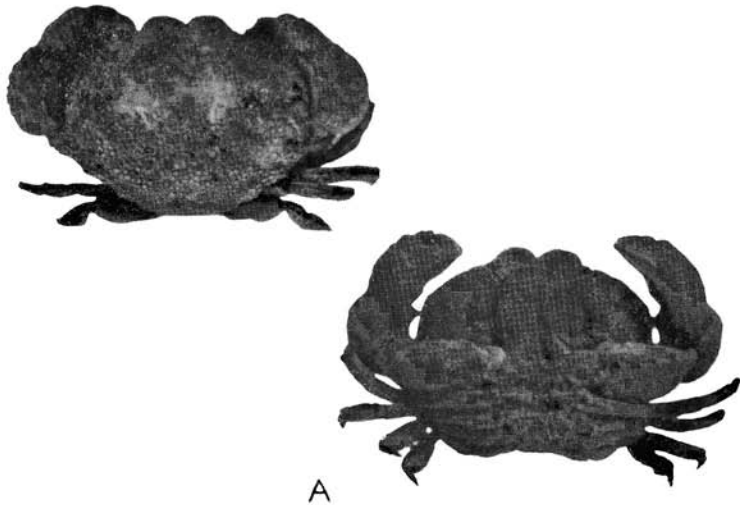
This species which is very near *Etisodes frontalis* as described by de Man (17) apparently differs from that species in the following features: The carapace is not so broad in proportion to its length and the surface is not so completely or so deeply furrowed. The inner frontal lobes are more oblique than in *E. frontalis* and the lateral frontal lobes are more prominent. There is no transverse groove separating the cardiac from the intestinal region. The inner angle of the wrist bears a single blunt tooth instead of two and there is no tooth at the base of the cutting edge of the dactylus of the larger hand. The smoothness of the dactyli seems to be an age characteristic, as in younger specimens these segments are longitudinally grooved.

The present known range of this form is from Palmyra Island through the Hawaiian Archipelago as far as Pearl and Hermes Reef.

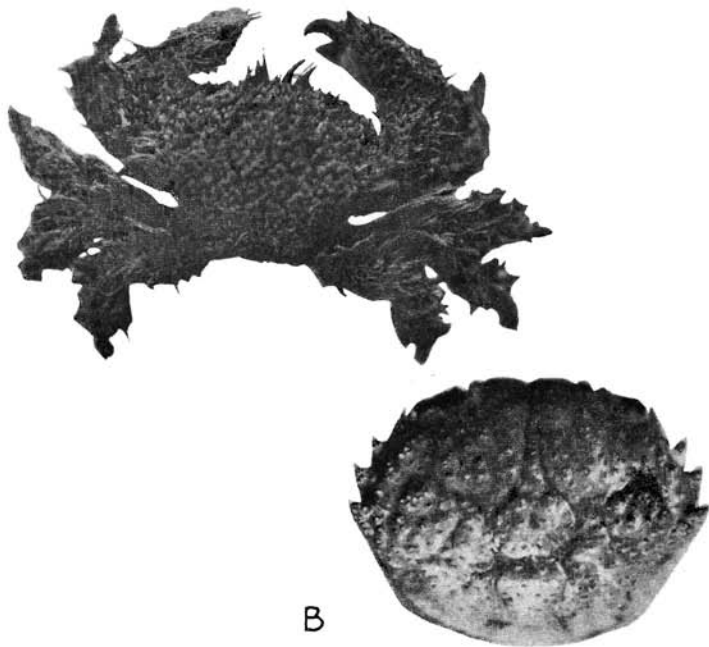
LITERATURE CITED

1. BAKER, W. H., Notes on South Australian decapod crustacea, pt. 5: Royal Soc. So. Australia, Trans., vol. 31, p. 189, 1907.
2. BAKER, W. H., Notes on South Australian decapod crustaceans, pt. 5: Royal Soc. So. Australia, Trans., vol. 31, p. 185, pl. 25, figs. 2-2e, 1907.
3. BALSS, HEINRICH, Results of Dr. E. Mjöberg's Swedish Scientific Expeditions to Australia, 1910-13. 29. Stomatopoda, Macrura, Paguridea und Galatheidea: K. Svenska Vet. Akad. Handl., vol. 61, no. 10, p. 15, fig. 7, 1921.
4. BATE, C. SPENCE, Report on the Crustacea Macrura collected by H. M. S. Challenger during the years 1873-76, p. 527, pl. 95, 1888.
5. BORRADAILE, L. A., On the Stomatopoda and Macrura brought by Dr. Willey from the South Seas. Willey's Zoological Results, vol. 4, p. 409, pl. 1, fig. 6, 1899: Ann. Mag. Nat. Hist. (7) 2, p. 389, 1898.
6. BOUVIER, E. L., Recherches sur la morphologie les variations, la distribution géographique des Crevettes de la famille des Atyides: Encyclopedie Entomologique, ser. A, LV, p. 81, figs. 148-158, 1925.

7. CALMAN, W. T., On Decapod Crustacea from Christmas Island, collected by Dr. C. W. Andrews, Zool. Soc. London, Proc., vol. 2, pp. 703-713, pl. 72, 1909.
 8. DANA, J. D., Crustacea: U. S. Expl. Exped. (Wilkes), vol. 13, pt. 1, p. 538, 1852; pl. 33, fig. 7, a-h, 1855.
 9. EDMONDSON, C. H., New Hawaiian Crustacea: B. P. Bishop Mus., Occ. Papers, vol. 9, no. 10, p. 3, fig. 1, 1930.
 10. EDWARDS, A. MILNE, Recherches sur la faune Carcinologique de la Nouvelle-Caledonie: Nouv. Archiv. Nat. Hist., Paris, vol. 9, 1873.
 11. FAGE, LOUIS, Sur la position systematique du Palaemonias ganteri Hay: Arch. Zool. Torino, vol. 16, pp. 646-649, 1931.
 12. GRAVIER, CHARLES, Sur un Decapode Macroure des mers Indo-Pacifiques (Hymenocera elegans Heller): Mus d'Hist. Nat., Bull., p. 424, 1921.
 13. HAY, W. P., Two new subterranean crustaceans from the United States: Biol. Soc. Wash., Proc., vol. 14, p. 180, 1901; Observations on the Crustacean fauna of the region about Mammoth Cave, Kentucky: U. S. Nat. Mus., Proc., vol. 25, p. 226, text figs. a-k, 1903.
 14. HELLER, CAMIL, Synopsis der im rothen Meere vorkommenden Crustaceen. B. Akad. Wien, Sitz., vol. 43, p. 7, 1861.
 15. KEMP, STANLEY, Crustacea Decapoda of the Siju Cave, Garo Hills, Assam: Indian Mus., Rec., vol. 26, pt. 1, p. 42, pl. 3, figs. 1-4, 1924.
 16. KEMP, STANLEY, Notes on Crustacea Decapoda in the Indian Museum. XV. Pontoniinae: Indian Mus. Rec., vol. 24, 1922.
 17. MAN, J. G. DE, Carcinological studies: Notes from the Leiden Museum, vol. 13, p. 8, pl. 1, figs. 2, 2a, 1891.
 18. MAN, J. G. DE, The Decapoda of the Siboga Expedition, pt. 4, Mon. 39a³, p. 208, pl. 18, fig. 53-53k, 1920.
 19. NOBILI, G., Diagnoses préliminaires de vingt-huit espèces nouvelles de Stomatopodes et Décapodes Macroures de la mer Rouge: Mus. d'Hist. Nat., Bull., vol. 10, p. 232, 1904.
 20. RATHBUN, M. J., The Brachyura and Macrura of the Hawaiian islands. U. S. Fish Comm., Bull. for 1903, vol. 23, pt. 3, 1906.
 21. RATHBUN, M. J., The Brachyura and Macrura of Porto Rico: U. S. Fish Comm. Bull. for 1900, vol. 20, p. 104, 1902.
 22. RATHBUN, M. J., The Cancroid crabs of America of the families Euryalidae, Portunidae, Atelecyclidae, Cancridae and Xanthidae: U. S. Nat. Mus., Mus., Bull. 152, 1930.
 23. RATHBUN, M. J., Descriptions of new Decapod Crustaceans from the west coast of North America. U. S. Nat. Mus., Proc., vol. 24, p. 902, 1902.
 24. RATHBUN, M. J., The Percy Sladen Trust Exped., No. 11, Marine Brachyura. Linn. Soc. London, Trans., vol. 14, p. 223, pl. 18, figs. 7, 8, 1910-1912.
- SPENCE-BATE, C. (See Bate.)

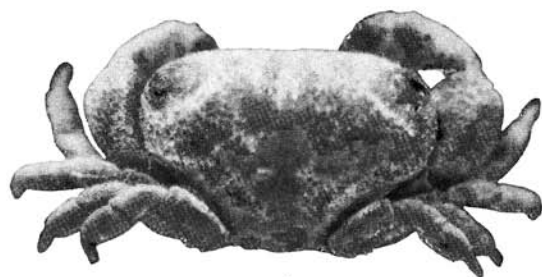


A



B

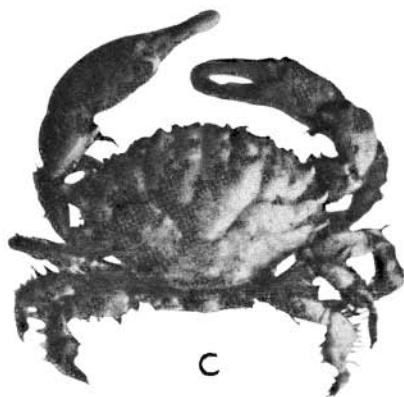
PLATE 1.—A, *Actacomorpha punctata*, new species, dorsal and ventral view, $\times 4$; B, *Actaca dentata*, new species, dorsal surface and dorsal surface of denuded carapace, $\times 2$.



A



B



C

PLATE 2.—A, *Nullierinis amplifrons*, new species $\times 6$; B, *Lioanthodes pacificus*, new species, $\times 6$; C, *Etisodes bifrons*, $\times 1.5$.