BULLETIN OF THE
VANDERBILT MARINE MUSEUM

VOLUME V

Scientific Results of the World Cruise of the Yacht "Alva", 1931, William K. Vanderbilt, Commanding.

CRUSTACEA: STOMATOPODA AND BRACHYURA

By LEE BOONE

Announcement

The Vanderbilt Marine Museum is the privately owned depository of the marine collections of William K. Vanderbilt, Esquire, and is located on his country estate, "Eagle's Nest," Huntington, Long Island, New York. It contains extensive collections of natural history and ethnological specimens, all of which were personally collected by Mr. Vanderbilt, in various parts of the world, during the past thirty-odd years.

The scientific publications of the museum consist of a series of Bulletins, designed to disseminate results of research based on the marine zoological collections, every specimen of which was personally collected by Mr. Vanderbilt, during a series of cruises in his yachts, "*Eagle,*" "*Ara*" and "*Alva.*" Volume I of the Bulletin series consists of reports on the fishes collected during these cruises, by Dr. N. A. Borodin. Volume II consists of a report on the Stomatopod and Brachyuran Crustacea of the cruises of the yachts "*Eagle*" and "*Ara,*" 1921–1928, by Lee Boone. Volume III consists of a report of the Crustacea: Anomura, Macrura, Schizopoda, Isopoda, Amphipoda, Mysidacea, Cirripedia and Copepoda of the "*Eagle*" and "*Ara*" cruises, also by Lee Boone. Volume IV consists of a report of the Echinodermata, Coelenterata and Mollusca of the cruises of the yachts "*Eagle*" and "*Ara,*" 1921–1928, by Lee Boone. Volume V, the present report, consists of a report of the Crustacea: Stomatopoda and Brachyura of the World Cruise of the yacht "*Alva,*" 1931, by Lee Boone.

These Bulletins are available for distribution to scientific establishments by purchase, or by exchange for equivalent research reports in related subjects. They may be obtained by addressing Mr. Vanderbilt, at the Vanderbilt Marine Museum, Huntington, Long Island, New York.

Other Bulletins will be issued from time to time, as made desirable by results of research on the Vanderbilt collections. Another volume is now in preparation.

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By LEE BOONE

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I dreamed a billion crabs had spun
The Sea, a mighty web to run
Around the world from sun to sun.

Their hosts drew out its silken strands
At dawn along the rocks and sands
And round the world between the lands.

Here was a regiment in grey
That spun the waves that broke
In spray on rocky islets far away;

And there a brightly patterned crew
That shaped the water that sucked through
Among the mangroves that I knew;

'Til spider crabs which I watched creep
Along the bottom, went so deep
And grew so large, I could but sleep.

By John T. Nichols.

In memory of "Ara"

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THE INDOPACIFIC CRUSTACEA STOMATOPODA AND BRACHYURA OF THE "ALVA" WORLD CRUISE, 1931, WILLIAM K. VANDERBILT, COMMANDING.

By Lee Boone.

Introduction.

The narrative of the "*Alva*" world cruise of 1931 has been delightfully told in "West Made East With the Loss of a Day," with numerous illustrations and a nautical map of the itinerary, by William K. Vanderbilt, Lt. Comdr., U. S. N. R. The present report treats of the Crustacea secured during this cruise and is restricted to the Brachyura and Stomatopoda from the IndoPacific region with the addition of a few specimens of the circumtropic gypsy, *Grapsus grapsus* Linné, from the Galapagos Archipelago. In bathymetrical distribution, the present collection is limited to the littoral fauna and largely to the inhabitants of the beauteous coral reefs, gaily caparisoned crabs whose coloring rivals some symbolic Eastern tapestry, each mimicry of seawrack, shadow or wave-line patterned by the pseudo-god, Evolution, mute palimpsest of their immemorial struggle for survival. They are almost invisibly a part of their environment, some with living bodies sea-sculptured like the dome of an orient temple, or squatting Buddha-like obeisant to the tides, others meticulously armored like an ancient Samurai warrior, guard the mysteries of some coral cavern. Beneath the unpromising mud of the tide-line Stomatopoda with carven bodies of living jade, curl around their amber eggs, fanning the sea in rhythmic current, until these globes of amber transform into wafer-thin, opalescent young and float off to sea. Centuries before a Macedonian merchant pioneered in primitive sailing vessel the sea-route so recently travelled by the "*Alva*," some of these crabs were exquisitely carven in ivory or jade for the pleasuring of the early emperors of the Chou dynasty and presented at the royal court in token that the emperor was overlord of the mighty "Dragon of the Waters." *Scylla serrata,* well represented in the present collection, is a "living fossil" of unusual interest, geologically preceding ancient man. It is one of the largest crabs surviving and is known also from the Miocene beds

of India and some of the South Sea Islands. The rare *Plagusia speciosa* Dana, known to science from only six records, most exquisitely sculptured and colored of the ocean-faring "log-riders," was an expert mariner centuries before Polynesian man appeared.

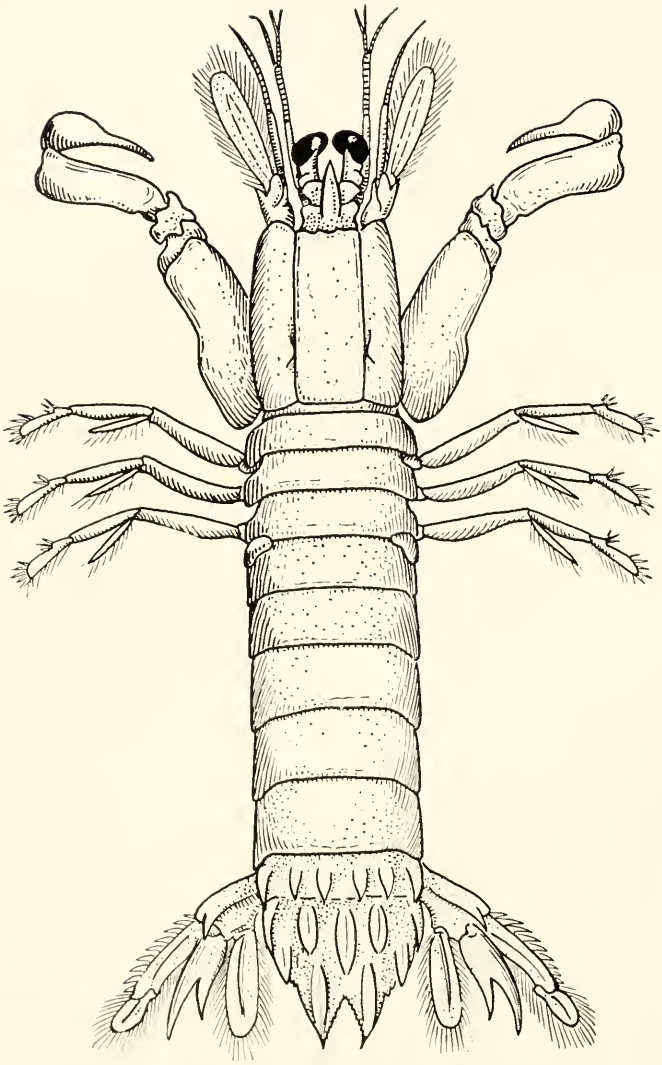
Three new species are Neptune's gift to his brother-in-fins, W. K. Vanderbilt. Of these *Actaeaomorpha alvae* Boone, is representative of a little-known genus, morphologically fascinating because it is a distinctive *Leucosid* which in general appearance resembles the *Cancroid* crabs of the genus *Actaea*. The second new species, *Actaea aphrodita* Boone, is a delicately sculptured specimen from the coral reefs of Bali. The third new species, *Lissocarcinus elegans* Boone, is representative of a little-known genus of swimming crab, interesting in that it connects the subfamily *Caphyrinae* with the *Lupinae*.

Valuable color plates and notes of several species were made during the cruise by Mr. W. E. Belanske, staff artist of the expedition, under the direction of Mr. Vanderbilt and are deposited in the Vanderbilt Marine Museum.

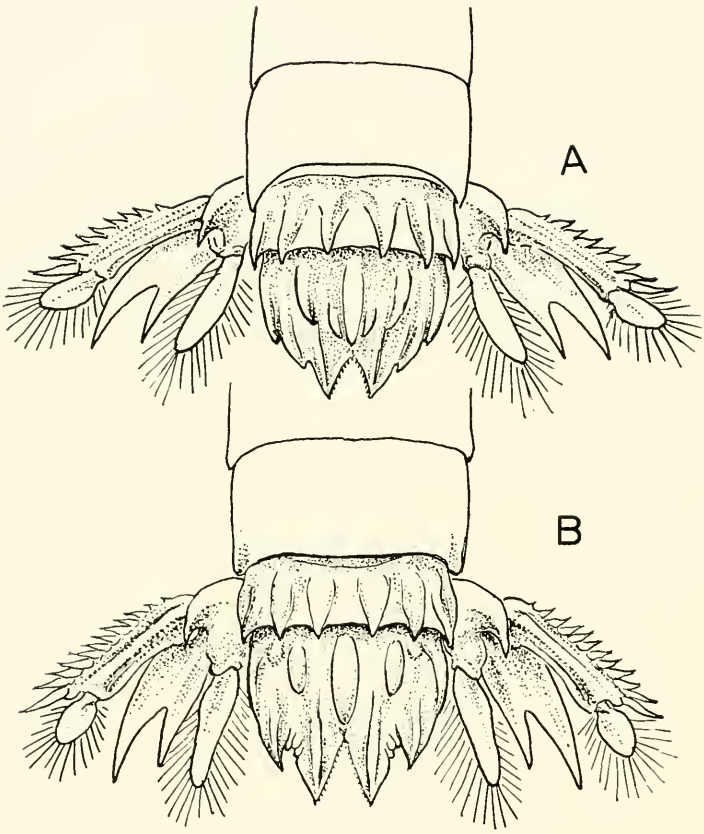
ACKNOWLEDGMENTS.

As during the preparation of the three preceding volumes of the Bulletin of the Vanderbilt Marine Museum, Mr. Vanderbilt has continued his gracious generosity in giving me every opportunity for the execution of this investigation. I am also indebted to Miss Ida Richardson Hood, curator of the library of the American Museum of Natural History, and her staff assistants, the Misses Hazel Gay, Ida Sledge, Elizabeth Ertel and Hope Ranslow for their unfailing patience in assisting me with the bibliographic research. The line drawings were done under my direction by Mrs. Elizabeth M. Fulda. The photographic illustrations were similarly retouched by Mrs. Fulda.

To my colleagues in the European and Asiatic museums and universities I acknowledge my deep indebtedness for their kind assistance, especially in locating many of the early types.



Gonodactylus chiragra variety *tumidus* Borradaile, × 2.



A.—*Gonodactylus chiragra* (Fabricius), typical form.
B.—*Gonodactylus chiragra tumidus* Borradaile, both × 2.

SYSTEMATIC DISCUSSION.

Order: STOMATOPODA.

Family: SQUILLIDAE.

Genus: GONODACTYLUS Latreille.

Gonodactylus chiragra (Fabricius).

Plates 1 and 2.

TYPE: Fabricius' type locality is cited: "*Habitat in Oceano Auftrali. Muf. Dom. Banks.*"

DISTRIBUTION: This species is very widely distributed in the Indo-Pacific region. It is abundant in Oceania and ranges as far east as the Marquesas Islands, from which group of islands the "*Alva*" specimen appears to be the first record. Northward it extends as far as Japan. On the Australian coast it has been recorded as far south as the Swan River in the west and Port Molle in the east. On the African coast it extends from Natal Point northward to the Red Sea and Gulf of Suez. In depth it ranges from the shore down to 50 fms.

MATERIAL EXAMINED: One specimen taken in coral at Teviatoa Reef, Raiatea Island, Society Islands, August 21, 1931. One, Muller's Reef, Bora Bora Id., Society Is., August 24, 1931. One specimen, 35.5 mm. long, taken on coral reef at Anaho Bay, Nuka Hiva Island, Marquesas Islands, August 10, 1931. One young specimen, about 25 mm. long, taken on Venus Point Reef, Tahiti, Society Islands, August 5, 1931. Another young specimen, 21 mm. long, was collected in coral, Temukus Roads, Bali, Dutch East Indies, 1931. All collected by the "*Alva.*"

Variety tumidus Borradaile.

DISCUSSION: One specimen in coral at Teviatoa Reef, Raiatea Island, Society Islands, August 21, 1931. This specimen has the sixth abdominal segment with six longitudinal, rounded tubercles that terminate posteriorly in acute spines all of which project over the telson. The telson has the proximal portion elevated and ornamented with three thick elongate tubercles, not carinated but not tumid, distally blunted. There is also a small roundish tubercle at the base and slightly outside of each of the long outer tubercles. The distal telsonic

margin is cut by a median V-shaped sinus, on either side of which there is a triangulate, acuminate tooth, emphasized by a median longitudinal carina; the inner lateral margin set with about twenty articulated teeth, another such tooth at the apex of the tooth; near the proximal end of the outer lateral margin of this large tooth is a small incision, in which is situated an articulated small tooth, and just beyond this at the extreme base of this tooth is another small sinus and an articulated spine; beyond this there is on either side a large acuminate tooth with a median longitudinal blunt carina that extends back three-fourths of the length of the telson; the proximal two-thirds of the outer lateral margin of this tooth is carinate, the carina widest proximally and tapering gradually without an acuminate apex.

Typical **chiragra** (Fabricius).

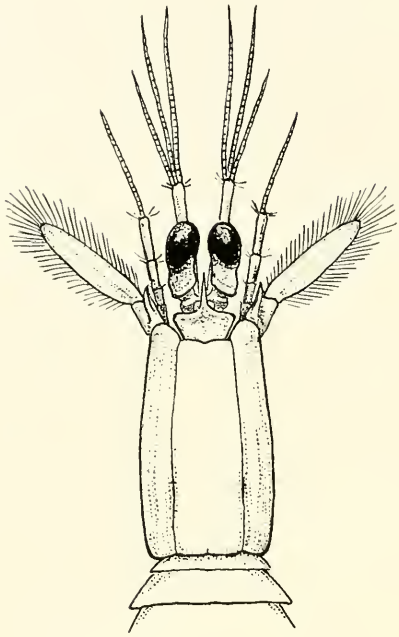
One specimen, 33.5 mm. long, taken on coral reef at Anaho Bay, Nuka Hiva Island, Marquesas Islands, August 10, 1931.

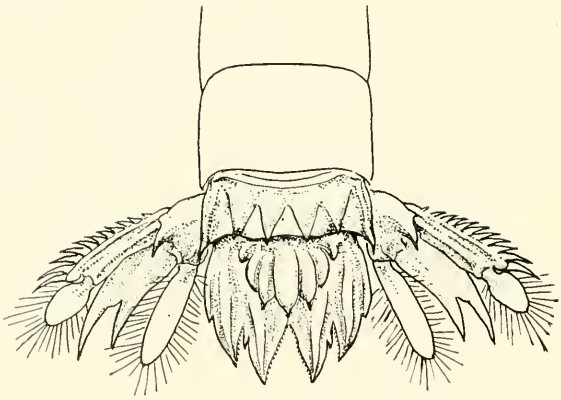
This specimen corresponds to the preceding specimen in ornamentation except that the Anaho Bay specimen has two short tubercles or carinae bordering the distal end of the median tubercle on the proximal elevated portion of the telson and the second big tooth of the telsonic margin is reduced in the present specimen to a rudimentary tooth consisting of the tip of the carina and has no sinuses or rounded process at its outer base; the third telsonic tooth is also very rudimentary, consisting of only a denticle-like tip of the lateral carina.

One difference is to be found on the sixth abdominal segment, namely: the outermost triangulate tubercle is dorsally cut by an oblique carina that terminates in a denticle about midway the outer lateral margin of the sixth tubercle, having the appearance of a smaller triangle superimposed upon the sixth tubercle. The rostrum is of the type having the outer angles rounded, but the frontal margin distinctly excavate on either side of the rostrum, thus emphasizing the outer angles.

Another young specimen, about 25 mm. long, taken on Venus Point Reef, Tahiti, Society Islands, August 5, 1931, differs as follows:

As is to be expected in a very young specimen, the six longitudinal tubercles of the sixth abdominal segment are less elevated and their respective tips more acuminate than is the case in larger specimens. The telson differs from the one described above in only two items: (a) On either side of the median carina and opposite its distal end





Gonodactylus glabrous Brooks, × 2.

there is a short, curved carina, about one-fourth as long as the median carina; (b) The carina of the lateral margin of the outer big tooth terminates in a separate small denticle.

Another young specimen, 21 mm. long, conforms to the above specimen in ornamentation, and was collected in coral, Temukus Roads, Bali, Dutch East Indies, October, 1931.

REFERENCES: *Squilla chiragra* FABRICIUS, Species Insectorum, vol. I, p. 515, 1781.

Gonodactylus chiragra LATREILLE, Encycl. Method. t. X, p. 473, atlas, pl. 325, fig. 2, 1825.—KEMP, S., Mem. Indian Mus., vol. IV, p. 155, pl. 9, fig. 107, 1913, (with full synonymy).—CALMAN, W. T., in Wood-Jones, Proc. Zool. Soc. London, 1909, pt. I, p. 159.—SUNIER, Contrib. Faune de Ind.-Néerland., vol. I, no. 4, p. 74, 1914–1918.—BOUVIER, Bull. Sci. France-Belg., t. 48, p. 312, 1914–1920.—KEMP, P. I. Journ. Sci., Manila, vol. X, sect. D, p. 179, 1915.—TATTERSALL, Journ. Linn. Soc. Zool., vol. 34, p. 359, 1918–1922.—GRAVIER, CH., Bull. Mus. Hist. Nat. Paris, t. 26, p. 377, 1920.—BALSS, H., Kungl. Sv. Vet. Akad. Handl. Bd. 61, art. 10, p. 5, 1920–1923, Stockholm.—ODHNER, Meddel. Gotesborgs Kungl. Vet. Vitterh. 4 folj, Bd. 27, p. 8, 1923.—HANSEN, H. J., Siboga Expeditie Monogr. 35, livr. 104, p. 33, 1926.—KOMAI, TAKU, Mem. Coll. Sci. Kyoto Imp. Univ. ser. B, vol. 3, p. 338, 1927.—HALE, H., Trans. and Proc. Roy. Soc. S. Austral., vol. 53, p. 34, 1929.—SCHMITT, W., Lingnan Journ. Sci. vol. 8, p. 147, 1929.—BIGELOW, R. P., Bull. Mus. Comp. Zool., vol. 72, art. no. 4, p. 113, 1931.

Gonodactylus glabrous Brooks.

Plate 3.

TYPE: Brooks' type came from Samboanga, Philippine Islands, where it was taken by the *"Challenger."* It is deposited in the British Museum of Natural History.

DISTRIBUTION: This species is found throughout the Indo-Pacific. Recorded localities are as follows: Lesina, Adriatic Sea, (Heller Coll., by Steuer); Red Sea, (Nobili); Dar-es Salaam, (Ortmann); Persian Gulf, (Nobili); Aden, (Henderson); Maldives; Laccadives, (Lanchester); Mergui Archipelago; Nicobars; Port Blair, Andamans; Galle, Ceylon; Cheval Par, Ceylon; Pearl Banks, Ceylon; Bombay, (Kemp); Trincomali, Ceylon, (Muller); Tuticorin; Rameswaram, (Henderson; Tattersall); Liu Kiu Islands, Japan, (Fukuda); Japan,

several localities, (Komai); Bonin Islands, (Odhner); Samboanga, P. I., (Brooks); Sulu Sea, (Henderson); Pulo Edam, Java, (de Man); British New Guinea, (Nobili); Ternate, (de Man); Owen Channel, 3 fm., (Hansen); Caroline Islands, (Komai); Apia, Samoa, (Bigelow); Dirk Hartog Islands, West Australia, (Hale); Sir C. Hardy's Island, N. E. Australia, (Henderson); Rotuma, (Borradaile); Mauritius: Grand Port, Chaland, Mapon, Port Louis, (Bouvier); Seychelles, (Jurich; Borradaile); Cargados Carajos, Seychelles, (Borradaile); British East Africa, (Borradaile); Zanzibar, (Lenz); Ibo Archipelago, Portuguese East Africa. (Kemp); Palm Islands, Queensland, (Boone).

Material examined: Two large specimens, taken on Falcon Island, reef, Palm Islands, Queensland, Australia, October 7, 1931. One young specimen, 20 mm. long, taken from coral, at Ingram Island, Queensland, October 12, 1931.

Technical description: This species differs from *G. chiragra* in the following major essentials:

(1) The rostrum is differently shaped, it being a subrectangular plate with the outer angles rounded, the frontal margin straight, not slightly concave, on either side of the median spine which is very acuminate, about one and one-half times as long as the basal plate. The dorsal process of the ophthalmic segment is composed of two small plates, each of which is rounded anteriorly, these being much narrower in *G. glabrous* than in *G. chiragra,* and much slenderer than in *G. demani.*

(2) In *G. glabrous* there is usually no small movable spine at the base of the upper margin of the propodus of the raptorial claw. In *G. chiragra* this spine is almost always present.

(3) In *glabrous* there is a rather prominent pit present on the lateral region of each of the third, fourth and fifth abdominal somites, near the anterior margin. In *G. chiragra* this pit is vague or absent.

(4) The telson of *G. glabrous* is perhaps the most conspicuous distinctive character of the species. The sixth abdominal segment has a distinct transverse flat carina which terminates on either side in a sort of tubercle at the inner basal angle of the outermost longitudinal triangulate tubercle. This carina is widest on the median region, its posterior margin being convex. The six longitudinal tubercles of this segment are in the form of elevated wide triangles, with the dorsal surface of the inner four tubercles slightly rounded toward the margins, the apex an acute spine, projecting posteriorly above the telson.

The outermost pair of tubercles is also triangulate but has the inner lateral margin elevated with a ridge-like carina and the apex is more acuminate. The telson has a narrow transverse carina across the proximal margin in the median area terminating in a wide triangulate node outside of and near the base of the outermost carina on the dome-like, proximal portion of the telson, this dome being further ornamented by five long, longitudinal carinae, the median one of which is the widest and most elevated and terminates posteriorly in an acute spine, the end of the carina below the base of this spine being excavate; the next, or submedian pair of carinae are thick, but not so thick as the median carinae and are shorter, terminating posteriorly in a similar distal spine, with a slight excavation below it; the next, or outer pair of carinae on the dome are subcarinate dorsally, curved a little and terminate distally at a point opposite the apex of the adjacent inner carinae, but do not have a distal spine. Beyond the third pair of carinae and completing the curvature of the dome distally are a pair of small, short, rounded nodes. The distal margin of the telson is deeply incised by a median triangulate sinus, on either side of which there is a long, triangulate tooth, emphasized by a strong median dorsal carina, throughout its length; the inner lateral margin of the tooth is set with articulate denticles and a larger articulated spine occurs at the apex of the tooth; the outer lateral margin is smooth and two incisions near its base define a small rounded tooth, that has an articulated spine at its apex; just outside of this there is another large triangulate tooth, with smooth, slightly sinuate convex lateral margins and an acute apex; a strong median longitudinal carina that extends backward, almost to the proximal margin of the telson. A slight incision on the outer side at the base of this tooth separates it from the acuminate tooth at the apex of the carina of the outer lateral margin, which extends back to and widens toward the proximal margin of the telson. On its ventral surface this telson has a median carina and a pair of submedian carinae the length of the large teeth.

The uropoda have a spine at the upper distal angle of the peduncular article above the base of the outer branch; the produced inner process curved inward, directed backward, bifurcate by a deep V-shaped sinus, on either side of which is an acuminate triangulate tooth, the inner one a trifle shorter than the outer, the outer extending about as far backward as does the apex of the longest teeth of the telsonic margin. The inner branch of the uropoda is as long as the telson, narrowly oval, with a heavy dorsal carina just above the nearly

straight outer lateral margin, the distal margin is rounded, and the inner lateral margin more convex than the outer; all of the margins are heavily fringed with setae. The outer branch of the uropoda is a little longer than the inner, and is irregularly shaped, the proximal article with the median dorsal and both upper lateral margins heavily carinate; the outer lateral margins also set with eleven acute, articulate spines, that noticeably increase in length from the proximal to the distal, the last one being about thrice as long as the first and projecting its apex beyond the margin of the distal article of the uropod. There is a twelfth immovable spine at the inner distal angle of this process, which is two-thirds as long as the eleventh spine and lies beneath the distal article; the latter arises from the upper distal angle of the proximal article and is oval, two-thirds as wide as long and with the entire margin very setose.

References: *Gonodactylus glabrous* Brooks, Rept. Voy. H. M. S. "*Challenger,*" Zool., vol. 16, art. Stomatopoda, p. 62, pl. 14, fig. 5, pl. 15, figs. 7, 9, 1886.—Kemp, Rec. Ind. Mus., vol. 4, p. 167, pl. 9, fig. 113, 1913; with full synonymy.—Bouvier, Bul. Sci. France-Belg., t. 48, p. 312, 1914–1920.—Odhner, Meddel. Goteborgs Kungl. Vet. Vitterh. Samh. 4 folj, Bd. 27, p. 18, 1923.—Hansen, H. J., Rept. "*Siboga*" Expeditie, Leiden, Monogr. 35, livr. 104, p. 29, 1926.—Hale, H., Trans. and Proc. Roy. Soc. S. Austral., vol. 53, p. 33, also p. 67, 1929.

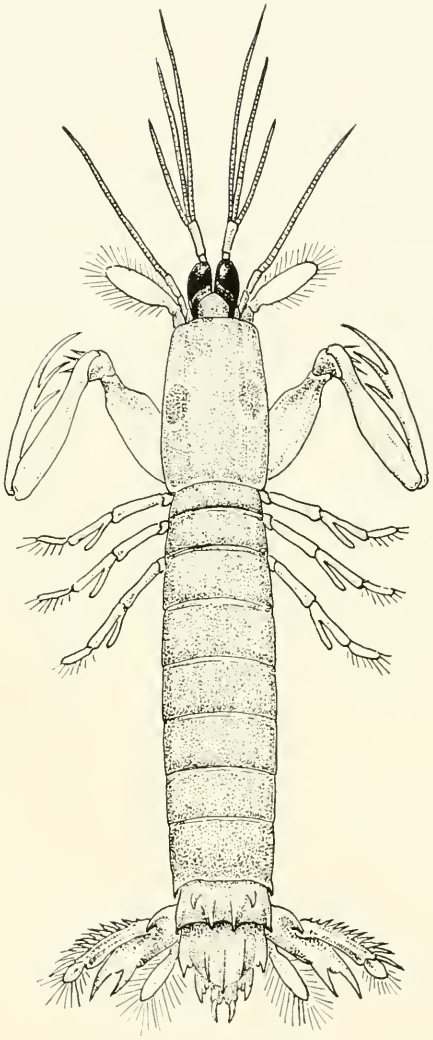
Genus: **PSEUDOSQUILLA** Guérin.

Pseudosquilla ciliata (Fabricius).

Plate 4.

Type: Fabricius' type came from the Indian Ocean and was originally in the Spengler Collection, most of which was later placed in the British Museum.

Distribution: This species, which has now been recognized as circumtropic, is known in the IndoPacific from the following stations: Ogasawara Islands, Japan; Iriomote, Yayeyama, Liu Kiu Islands, (Kemp), Misaki, Japan, (Komai), Formosa, (Schmitt), Hawaiian Islands, (Owen, Randall, Miers, Eydoux and Souleyet, Dana, Brooks, R. P. Bigelow, Edmondson), Solomon Islands, (Miers), Fiji Islands, (Miers, Dana), Loyalty Islands, New Britain and Ellice Islands, (Borradaile); Upolu, Samoa, (Kemp), Guam, Marquesas Islands, (Edmondson), Samoa, (Bigelow), Princess Charlotte Bay, North



Pseudosquilla ciliata (Fabricius), × 4.

Queensland, (Hale), Australia, (Miers, Kemp), Arafura Sea, (Pocock), New Guinea, (Miers, Thallwitz), Java: Remborg, Gonong Lasem, (Odhner), Amboina, (de Man), Celebes, (de Man), Sooloo Sea and Philippine Islands, (Miers), Port Galera, Mindoro, P. I., (Kemp), Aru Islands, Dutch East Indies, (Sunier), Sumatra, (Nobili), Timor, 30 fms.; Ceylon, (Muller, Tattersall), Andaman Islands, N. Cheval Paar, Ceylon, (Kemp), Minikoi, (Lanchester), Madras, (Henderson), Maldives, (Lanchester), Persian Gulf, (Kemp), Red Sea, (Nobili), Sudanese Red Sea, station 2, (Tattersall), Seychelles, (Borradaile), Mauritius, (Kemp, Richters, Clark), Port Louis and Grand Port, Mauritius, (Bouvier), Réunion, (A. Milne Edwards, Hoffman), Madagascar, (Lenz), Diego Garcia, Wazin Island and Zanzibar, (Borradaile).

In the tropic Atlantic Ocean the adult has been found as follows: Bermuda, (Bigelow), Bahama Islands, (Rankin, Bigelow), South Carolina, (von Martens), Florida Keys, Porto Rico and Culebra Islands, (Bigelow), St. Thomas, Virgin Islands, 20 to 23 fms., (Bigelow; same, 2 fms., Brooks), Siguanea Bay, Isle of Pines, Florida Keys, S.W. of Marquesas Keys, Fla., (Boone).

The larva of this species has been recorded from the Indian Equatorial current, (Jurich), from Ceylon, (Tattersall), from Chagos Archipelago, Alphonse Islands, Amirante group, Providence Islands, between Mauritius and Cargados, (Borradaile). In the Atlantic the larva is known from the Sargasso Sea and North Equatorial current, (Hansen).

Material examined: One young adult, taken at Pango Pango, Samoa, September 2, 1931, by the "*Alva.*"

Color: These notes are based on a small specimen that has been in alcohol for about two years, consequently the colors are not identical with those of the living specimen. The ground color of the body is a mottled greyish on a deep creamy yellow background; on the median lateral area of the carapace there is on each side a circular blackish grey "peacock aye," ringed by pure creamy yellow. The eyes are deep blackish. A transverse band composed of irregular shaped spots extends across the caudal fan.

Technical description: Rostrum widely heartshaped, wider than long, produced to a faint median point, the anterolateral margins convex. The carapace is convex, smooth except for the paired longitudinal lateral lines; the frontal margin very little excavate, appearing nearly straight in a dorsal view. The anterolateral angles evenly

rounded; the lateral margins rather widely rounded at the postlateral angle; the posterior margin nearly straight. The visible thoracic and first five abdominal segments have the lateral margins rounded but those of each segment slightly different. The first five abdominal segments are approximately subequal in length in the young specimen before me, with the lateral margins truncated; the first abdominal segment has a rounded pear-seed shaped, flap-like process at its anterolateral angle, projecting over the base of the last thoracic leg; and the postlateral angle slightly rounded; the postlateral angles of the second to fifth segments inclusive become slightly increasingly acute from the first to fifth segments, but only the fifth segment has a denticle like apex. The sixth segment is only one-half as long as the fifth, and has a pair of acute, submedian spines that arise from the posterior margin and in this young specimen these spines are two-thirds as long as the sixth segment, forming an elevation on the surface of the segment and projecting over the telson. A pair of short, acute, median lateral spines occur one on each side midway the length of the segment. The postlateral angle of the segment, above the base of the uropod is produced into a strong spine which causes an elevation of the surface of the segment; the outer postlateral angle is closely appressed to the base of the uropoda.

The telson is shield-shape with a distinct median dorsal flat triangulate carina, the median line of which is elevated in an erect carina; either side of this median carina, there is a flat triangulate carina, in the median lateral region that terminates a short distance from the posterior margin. The outer lateral margin is similarly carinate except that the carina terminates in a small spine. The distal margin of the telson bears a short, median, V-shaped sinus below the apex of the median carina, on either side of which there is a blunt tooth, tipped with a long, articulated, triangulate spine; on the outer side of this spine at its base is a small triangulate spine, separated by a linear incision from another smaller spine which occurs on the base of the next large spine which is triangulate, acuminate, extending as far backward as the front tip of the submedian tooth. Outside of this tooth is the shorter, broad, triangulate tooth of the carinate lateral margin, its apex in a line with the tip of the median lateral carina. The base of the uropoda has a short median carina, terminating in a spine on the upper surface above the base of the outer article; the produced process is curved, distally unequally bifurcate; the outer angle being an attenuated curved triangle that is slightly longer than

the outer branch of the uropoda, separated by a wide sinus from the inner angle which is a shorter, curved, attenuated triangle, about as long as the inner blade of the uropoda. The outer blade is very strong, with a decided median dorsal longitudinal carina, the outer lateral margin thickened and curved, with ten acute, articulated spines, that increase in length from the proximal to the distal one; this distal spine being twice as long as the next adjacent one. The distal article of the outer blade is small, not as long as the above-mentioned tenth spine, suboval, with the inner lateral margin convex, the inner lateral margin concave proximally distally confluent with rounded outer margin. The entire margin is crenulate and setose. The inner blade of the uropoda is narrowly elongate ovate with the entire margin crenulate and setose. These setae of the caudal fan are web-like.

The eyestalk is short rounded distally; the cornea is large spherical, of about the same diameter as the distal end of the stalk, set obliquely terminal with the inferior surface restricted.

The antennulae have the peduncular articles clavate, subequal, the distal article slender, extending almost its entire length beyond the eyes; the upper flagellum is slender, about three times as long as the distal peduncular article, composed of fine rings. The longer branch of the lower flagellum is subequal to the upper branch, the shorter branch is thicker and only half so long.

The antennae have the peduncular article short and wide, with a spine at the outer distal angle; the acicule is leaf-shaped, acuminate and has a distinct median dorsal carina; the second and third peduncular articles are slender, subequal, clavate, the flagellum quite tapered and long, consisting of 38 rings. The scaphocerite is about three-fifths as long as the carapace, narrowly oval, with the distal end evenly rounded, the margins fringed with long setae.

The first maxillipeds are leglike, slender, with the propodus laminate, suboval, the dactyl short, curved, acuminate, closing upon the ciliated convex margin of the propodus, claw-like.

The second maxillipeds form the retrochela; the ischium is strong, the merus is about as long as the carapace and quite thick, its upper margin is convex proximally, concave distally, the outer surface moderately rounded, the lower lateral margin nearly straight for the greater part of its length, and truncated distally; the carpus is small, the upper surface rounded; lateral profile triangulate, with the distal

angle acute; the propodus is quite slender, about a third longer than the merus, very compressed laterally and increasing in breadth distally, with the lower lateral margin convex, the upper outer margin laminate, and relatively straight, set with three acute spines on the proximal half; there are three cavities within the margin into which the three finger-like spines of the propodus are sheathed; the dactyl is fully as long as the propodus, greatly compressed laterally; the distal half is a slender, curved, rapier-like spine with acuminate tip and the inner margin roughened like a file; there are two slender, curved, acute teeth with file-like surfaces arising about midway the inner margin.

The third maxilliped and first and second pairs of thoracic legs are similar in structure, successively decreasing in size posteriorly, with the ischium elongated, narrowed but wider distally; the merus two-thirds as long as the ischium and excavate on its inferior margin for the reception of the reflexed propodus; the carpus is small, hinge-like, the propodus elongate-ovate, thickened, its inner margin abundantly set with bristles, the dactyl is short, curved, acuminate, fitting upon the inner margin of the propodus, claw-like.

The third, fourth and fifth pairs of legs are slender, stick-like, each with a slender, cane-like exopodite that is subequal to its related joint; the distal article is armed along its inferior lateral and distal margin with a series of acute spines.

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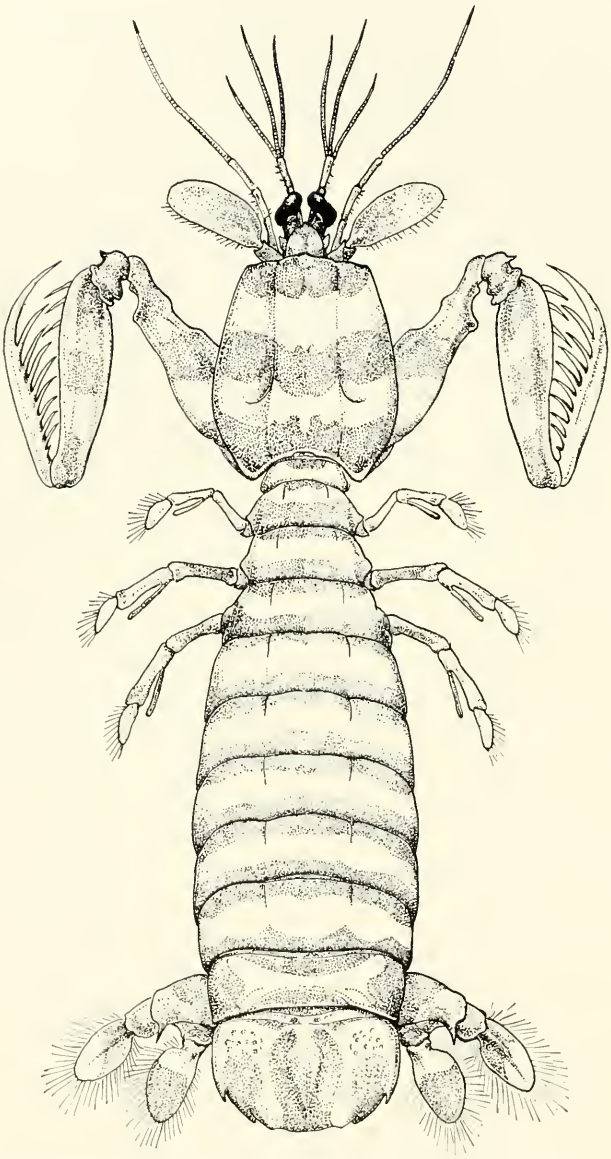
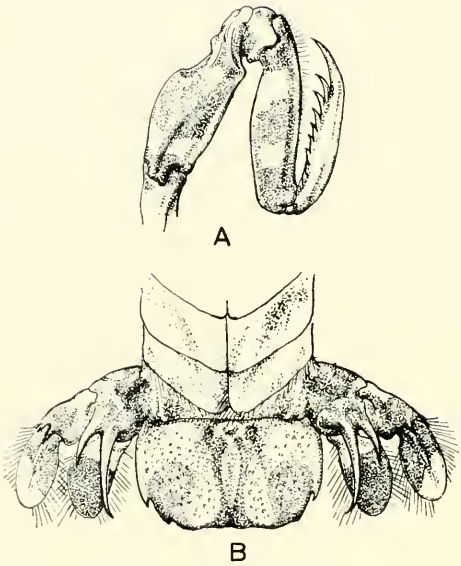


Lysiosquilla maculata (Fabricius), one half of natural size.



Lysiosquilla maculata (Fabricius), A.—Female retrochela; B.—Ventral view of the caudal fan, showing the telsonic teeth and carina, also, the major spines of the uropod peduncle; both figures one half of natural size.

Genus: **LYSIOSQUILLA** Dana.

Lysiosquilla maculata (Fabricius).

Plates 5 and 6.

TYPE: Rumphius first reported this species from Amboina, from specimens in his cabinet. Fabricius' type came from the East Indies and is deposited in the British Museum of Natural History.

DISTRIBUTION: This is a reef-dwelling species of the IndoPacific, widely distributed from Japan and Oceania to South Africa and the shores of tropical West America. It is known from the following localities: Japan, (De Haan, Fukuda); Hawaiian Islands, (Randall, Miers); Marquesas Islands, (Bigelow); Duke of York Island, (Miers); Samoa, (Miers, Thallwitz, Bigelow, Balss); Feejee Islands, (Miers, Kemp); Rotuma, (Borradaile); New Guinea, (Nobili, Thallwitz, Whitelegge, Kemp); Amboina, (Brooks, de Man, Ortmann, Nobili); Goram, (Miers); Batjau, (de Man); Flores, (Thallwitz); Celebes, (de Man); Philippine Islands, (Miers, Brooks); Penang, (Miers); Tuticorin and Madras, (Henderson); Mysore, (Thallwitz); Rodriguez, (Miers); Durban, (Stebbing); Christmas Island, (Kemp); Nicobars, (Kemp); Andamans, (Kemp); Madras, (Kemp); Coconada, (Kemp); Ceylon, (Kemp); La Paz, Lower California, (Boone); Honolulu, Hawaii, (Bigelow); Tahiti, (Boone); Poeloe Panggang, in the Thousand Islands, north of Batavia; Banda; Sulu Islands, east of Celebes; Batavia and Antjol, (Sunier); Taytay, Palawan, Philippines, (Kemp); Tahiti; Honolulu, (Edmondson); Honolulu; Apia, Samoa, (R. P. Bigelow); Gilbert Islands, (Odhner); Japan: Nango, Province of Huiga; Subusi, Province of Satuma; Ryukyu Islands; Boko Islands, Formosa; Palau, Caroline Islands, (Taku Komai); Formosa, (W. Schmitt).

MATERIAL EXAMINED: One large male, and two very large females from Papeete, Tahiti, Society Islands, August 15, 1931.

COLOR: The living specimens are transversely banded with alternate bands about one-fourth inch wide on large specimens, of deep slaty bluish black alternating with yellowish deep cream color. The scaphocerites are bluish black, so is the rostrum; there are three blue black bands, separated by two yellow bands on the carapace; the raptorial claw has two rounded black spots on the outer surface of the merus, which are in line with the first and second black bands of the carapace; the distal part of the merus, the entire carpus and the proximal border of the propodus are slaty black; there is also a large,

round slaty black spot on the outer surface of the propodus, nearly midway its length and about opposite the first black band of the carapace, when the claw is retracted; another large, roundish black spot occurs on the distal outer surface of the propodus, opposite the third black band of the carapace; the distal border of the ischium has also a black spot, in line with these; there are two blackish spots on the blade of the dactyl. The external maxillipeds and second and third legs are also marked with slaty grayish spots, that have the effect of transverse bands, when these appendages are retracted. On the first and second exposed thoracic segments there are two transverse narrow bands of blue black, that are closely adjacent to the posterior black bands of the carapace; on the anterior of the third free segment there is a narrow black band; behind this are eight broad black transverse bands, each of which occurs across the line of segmentation, partly on the posterior margin of one segment and partly on the anterior margin of the adjacent segment; three of these bands thus being on the third, fourth and fifth free thoracic segments; the remainder being on the abdominal segments. On the pretelsonic segment, in addition to this anterior transverse band, there is a posterior curved transverse band, that widens on either side into a black patch that entirely covers the lateral margin of the segment. Adjacent to this is another blackish band, across the proximal half of the peduncular joint of the uropod. On the telson there are three distinct black spots, a median and a pair of lateral spots, all of which are more widely rounded basally and nearly touching at this point, each tapering toward the telsonic margin. On the exopodites of the uropod, there is a big transverse band, a spot, on the distal half of the first joint and proximal half of the second joint and also on the spines; and distal two-thirds of the endopodite is blackish; these black spots of the uropoda are approximately in a transverse line with the spots of the telson when the tail-fan is expanded. The black spots of the telson and uropoda are also visible on the ventral surface. The last three thoracic legs have the upper surface of the meral joints blackish, in continuation of the black bands of the related thoracic segments. There are small touches of black on the distal end of the propodi, also of the related shorter rami of these last three pairs of thoracic legs. The antennae appear blackish.

Both of the large females here recorded from Tahiti, have the same coloring on the telson, consisting of a transverse band, produced in the median area as a black spot extending to the posterior margin

and on either side separated by a white ovate spot from the lateral black lobe.

TECHNICAL DESCRIPTION: The carapace is glabrous, polished, devoid of carinae, decidedly convex from side to side, the greatest width nearly equal to the length, exclusive of rostrum, the anterior width nearly equal to the posterior. The anterior margin is rounded, slightly sinuate, with a faint, rounded, median point; the lateral margins are rounded, with the anterolateral and posterolateral margins very rounded, the posterior margin is deeply concave; the gastric grooves are deep, extending almost the full length of the carapace; the cervical grooves are not so well defined, being indicated by short, curved depressions on either side and confluent with the gastric grooves.

The rostrum is cordiform, wider than long, this maximum width occurring in advance of the proximal border; produced to a median distal apex, which is very slightly deflected and thickened dorsally, a median carina on the distal third of the rostrum. The lateral margins are widely rounded and very slightly concave, anteriorly converging abruptly to the apex.

The third thoracic segment is exposed dorsally, filling in the concavity of the posterior margin of the carapace; the fourth thoracic segment is also exposed dorsally and is only one-half as long as the fifth segment which has its lateral margin transversely channelled by a wide, shallow groove, that separates the blunted anterior and posterior carinae, which converge toward the inferior region of the segment. The sixth and seventh segments are successively a trifle wider and have their lateral margin rounded anteriorly and subrectangular posteriorly; the fifth segment with a curved carina transversely above the margin, while the sixth segment has a recurved carina here. The first to fifth abdominal segments inclusive have the lateral margins concave, with the postlateral angles bluntly rounded; the sixth abdominal segment has a thickened lateral margin, defined inwardly by a curved longitudinal groove. On the inferior margin at the anterolateral angle is a small spine, directed posteriorly, over the base of the uropod. On the second to fifth abdominal segments inclusive, there is a short, definite longitudinal sulcus that divides the anterior portion of each segment in three subequal regions; sometimes there is also present a faint depression on either side of the median line, defining a shallow elevation.

The sixth segment has a distinct, large V-shaped groove, the outer side of which defines the inner margin of the thickened lateral border, the base of the V being near and subparallel to the posterior margin, while the inner side of the V runs forward and widens outwardly uniting with a short transverse groove that runs inward subparallel to the anterior margin of the segment.

The telson is almost twice as wide as long, with the outer margins widely rounded and, in very large adults, rather bluntly truncated distally and having a small faint median notch. There is a very distinctly defined median dorsal elevation, in the form of an elongate triangulate tooth, arising at the base of the telson and terminating subdistally, the lateral margins beginning to converge about at a point one-third of its length from the base, and being emphasized from this point to the apex by a distinct groove. On the median region of the ventral surface of the telson there is a similar, but smaller and not quite so elevated a triangulation. The proximal margin of the telson is emphasized by a thickened, transverse carina, and immediately below it is a distinct groove on the outer side that runs almost to the median line, vanishing on either side of the base of the median triangulation. The lateral margin is thickened, terminating in a sharp distal spine; a groove parallels the thickened lateral margin, in very young specimens and those up to about three and one half inches length, so far as observed, this carina extends almost to the distal tooth, but in the three large specimens, 6 to 8 inches long, this carina and groove vanish about midway the length of the segment. On either side of the median dorsal tooth there is a longitudinal bar that extends the length of the segment and terminates distally, bluntly. Outside of this, on either side, there is an oval part, which in young specimens, three to three and one-half inches long, is covered with low, blunt granules. On the very large adults these granules have entirely disappeared and are replaced by coarse punctae. There coarse pits also occur abundantly on the median lateral and outer lateral regions.

In the largest specimen a second spine occurs, on the distal margin, about one-third the distance between the first spine and the median notch. In the very large specimens, the median distal margin, inside this the second spine is blunt, thickened, with a slight but definite node, about two-fifths of the distance between the second tooth and median notch, which node represents what in the younger adults is two definite teeth closely related to each other. In these young speci-

mens, the median distal margin is coarsely crenulate and more convex than in the older specimens. The peduncle of the uropoda is thickened, with a distinct short, curved sulcus on the posterior half of the portion basal to the exopodite; a distinct wide longitudinal sulcus sets apart the portion basal to the endopodite. On the dorsal surface, there is a short, sharp spine, at the outer posterior angle above the base of the exopodite. On the inferior margin of the peduncle, there is a striking, bifurcate process, arising from the distal margin and consisting of two well separated spines, both of which are curved outwardly and backward, the anterior spine being the shorter, about one and one-third to one and one-half times the length of the peduncle, very tapered and acuminate, composed of three longitudinal carinae alternating with three grooves. The second, or posterior spine is about twice as long as the first, its apex, being almost on a line with the posterior margin of the telson. The proximal article of the endopodite bears a fixed short spine at the apex of its inferior margin; along its outer lateral margin there are eight to ten articulated spines, successively increasing in length a little from proximal to distal, the distal one extending above the base of the second article. This second article is ovate, about twice as wide as long, with finely crenulate margin and a fringe of web-like setae. The endopodite is unequally subovate, being longer and wider, with the outer lateral margin slopingly rounded and confluent with the inner lateral margin which is nearly straight; the entire margin is finely crenulate and setose.

The ophthalmic segment has its anterior margin acutely pointed, the dorsal processes consist of a pair of conspicuous wide lobes, each of which terminates in a small tooth or spine at the outer lateral angle, on either side of the rostrum. The eyes are very large, reniform, the stalk short and thick, compressed, its axis oblique; the cornea are very large, dorso-terminal, the long axis very oblique, slightly longer than the median length of the rostrum and two and one-third times the diameter of the cornea, cylindrical, with a median transverse constriction and both distal ends convex.

The inner antennae have the three peduncular articles subequal, elongate, compressed, cylindrical, each slightly enlarged distally, the inner whip of the flagella is about twice the length of the peduncle; the outer whip has its longer branch subequal to the inner branch, and its shorter branch three-fourths as long as the other branch. All three whips are very finely articulated.

The external antennae have the peduncular article stout, with the inner distal angle acute; the second and third articles elongate, cylindrical; the acicule is represented by a small process, distally acute; the scaphocerite is about two-thirds as long as the carapace, asymetrically oval, with the inner lateral margin widely convex, the outer slightly concave, the distal margin bluntly rounded, and with a delicate incomplete fringe of setae.

The first maxillipeds are slender, leg-like, terminating in a weakly subchelate claw, the propodus is widely suboval, laminate, with a fine brush of setae, across the margin, upon which the weak pointed dactylar article closes.

The second pair of maxillipeds are enormously developed, forming the large retrochela, which has its merus very strong, fitting beneath the free lateral margin of the carapace and having its upper margin rounded and convex on the upper three-fourths, then flattened to a lower plane on the distal forth, with a small, short carina on the distal lateral margin, terminating anteriorly in a small node. The lower margin is deeply grooved, especially anteriorly, for the reception of the retracted propodus; both edges of the groove are carinate, the outer one forming a rounded, laminate process distally. The carpus is short, with a large, rounded, node on the proximal part of the outer lateral margin, separated by a deep constriction from the narrower node of the thickened distal margin; on the anterior lateral surface the margin is subcarinate, terminating in a fixed, acute, subdistal spine. The propodus is one and one-fourth times as long as the carapace, very compressed laterally, sublaminate, the outer lateral margin subcarinate outside of the sheathlike apertures into which the dactylar spines fit. There are four articulated spines along the proximal third of the inner margin. The dactyl, (male), is as long as the propodus, very curved and acuminate distally, armed with eight curved, acuminate teeth, in addition to the distal, very long curved apical tooth, the series increasing in length from the proximal to the distal one, all fitting into the sheath-like apertures of the propodal margin.

The third maxillipeds and first and second pairs of thoracic legs are similar, subequal, with the proximal four joints slender, the propodus subovate, nearly subcircular, thickish, laminate, with the anterior margin ciliated, the dactyl is a slender, curved, very acuminate, folding across the ciliate propodal margin, claw-like.

The third pair of legs are typical of those of this genus.

The fourth, fifth and sixth pairs of legs are slender, sticklike, each with an epipod, as long as the related article but very slender and curved distally, acuminate, the dactyl has its anterior lateral margin, rounded and tapering distally, confluent with the nearly straight posterolateral margin and furnished with a heavy brush of thick-set setae along the anterior lateral and distal margins.

The male has a long, slender epipodite arising from the inner side of the proximal article of the sixth pair of legs. The inner ramus of the first pair of male pleopoda is specialized.

Remarks: In the collection of the American Museum of Natural History, there is a large male, collected at Palm Beach, Florida, of the species *Lysiosquilla glabriuscula* Lamarck, which is identical with the IndoPacific *L. maculata* (Lamarck), except in the following items:

The shape and proportions of the tail-fan are the same, and both have the same median dorsal triangular elevation, but the West Indian specimen lacks the corresponding ventral median triangular elevation, and the median lateral area on either side is much more coarsely punctate, showing under high magnification a wrinkled, or reticulated surface, in which the punctae are replaced by coarser concavities and the interstices are blunt, wave-like reticulae. There are also four marginal teeth on each side of the telson of the West Indian specimens, where in the present large IndoPacific specimens there are only two teeth and a blunted node representing a third obsolete tooth. However, Mr. Kemp (1913), figures the telsons of this species showing other variations.

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Genus: **SQUILLA** Fabricius.

Squilla interrupta WoodMason, Mss., Kemp.

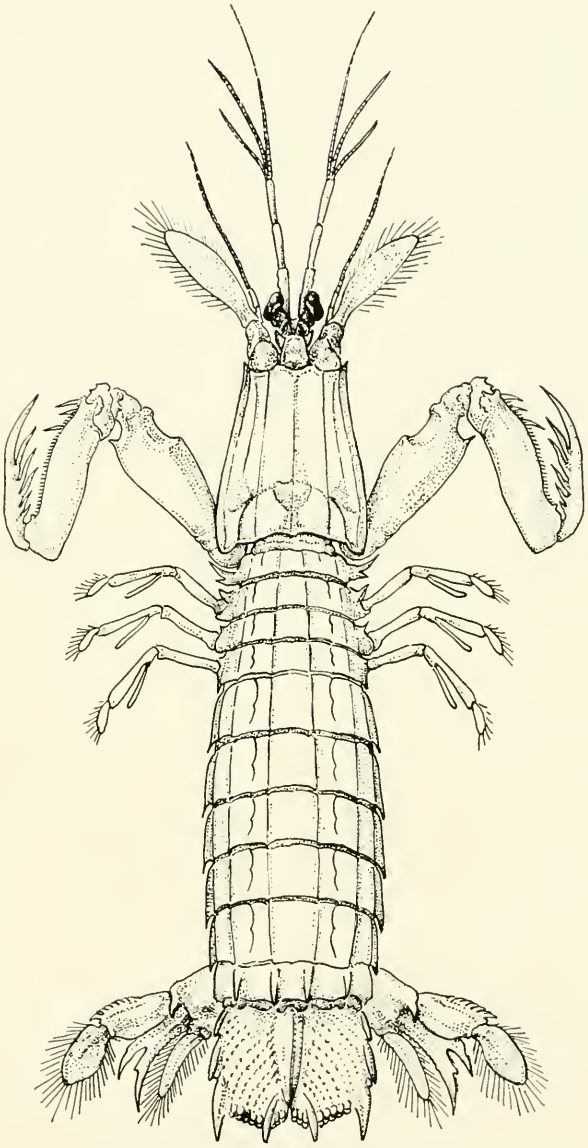
Plate 7.

TYPE: Mr. Kemp's type series, deposited in the Calcutta Museum, was taken in localities ranging from Hong Kong to the Persian Gulf.

DISTRIBUTION: Singapore, (Dana); Madras, Sunderbunds, Rameswaram, (Henderson); Hong Kong, Singapore, Camorta, Nicobars; Akyab, Arakan Coast; Sandheads, Hughli Delta; Ghappa Notla, Mutlah River, near Calcutta; mouth of the River Hughli, India; off Mutlah Light, Hughli River; Puri, Orissa coast; off Ganjam coast; Madras, 7½ fms.; off Vizagapatam coast, Madras, 7½ to 9 fms.; Bombay; Panvel Creek, Bombay; Karachi; Arabian Sea; Persian Gulf; from four localities, 13 to 25 fms.; Singapore, Sunderbunds, Ganges Delta; Buntol and Burong Islands, Borneo; (Stanley Kemp). Dorian Strait; Singapore; Southport, Queensland, (Boone). Four young, taken at the mouth of Tale Sap, a lake on the east coast of the Malay Peninsula, (Kemp); Java; Karachi, British India, (Odhner); Roko; Toseki; Ampin; Takao; Formosa, (Komai).

MATERIAL EXAMINED: One male, 71 mm. long, dredged at 14 fms., on muddy bottom, on the Equator to the south of South Brother's Island, south entrance of Dorian Strait, Lat. 29° N. by E., Long. 103° 47′ East, Pacific Ocean, Nov. 6, 1931. One male, 75 mm. long, Singapore, Malay Straits, Nov. 10, 1931. One large male 150 mm. long, Southport, Queensland, Australia, September 24, 1931; all collected by the "*Alva.*" (All above measurements taken from tip of rostrum to tip of telson.)

TECHNICAL DESCRIPTION: The rostrum is as wide basally as its median width, with the lateral margins straight, slightly convergent, the distal angles rounded, the frontal border between these straight. The carapace is three-fourths as wide proximally as it is long, but the



Squilla interrupta Wood-Mason, Mss., Kemp, × 0.6.

frontal width is only a little over half as wide as the proximal width. The frontal margin is truncate at the base of the rostrum and on either side is concave, the anterolateral angle being an acute spine. The postlateral angles are rounded, the posterior margin slightly concave. The median carina is bifurcate anteriorly for a short distance and is also slightly bifurcate posteriorly for a short distance from the cervical groove to almost the posterior margin where it unites in a small tubercle and terminates behind this in a small median spine, which in old adults is sometimes blunt, nearly obsolete. There are two longitudinal sulci, one on either side of the median carina and between each lateral sulcus and the lateral margin there are three carinae on each side, one about midway between the frontal margin and the cervical groove but not extending to either; outside this is a longer, somewhat sinuate longitudinal carina that curves inward from the anterolateral spine and runs backward to the posterior margin. The third carina, which is the strongest of the series, is short, extending from the cervical groove obliquely backward to the posterior margin. The "cervical" groove is sharply defined. The third thoracic segment is short, with the anterolateral angle produced to a sharp, procurved, acuminate spine, the postlateral angle is a smaller, outcurved, triangulate tooth; the fourth segment is one and one-half times as long as the first and has a sharp, procurved, outjutting anterolateral tooth which is only two-thirds as long as that of the preceding segment; the postlateral angle is triangulate, directed outward. The fifth thoracic segment is a little longer than the preceding segment, has its anterolateral angle a short, triangulate spine directed outward and its postlateral angle a longer bluntly triangulate angle, with its hinder lateral margin rounded; the sixth segment is about as much longer than the fifth as the fifth is than the fourth and has its anterolateral angle a stouter triangle than that of the preceding segment and the postlateral margin rounded and concealed beneath the overlapping flap that protrudes from the first five abdominal segments are subequal in length and have the lateral margins similarly truncate, carinate and terminating at the postlateral angle in a small acute spine. The first abdominal segment has the characteristic stomatopod rounded flap at the anterolateral angle, projecting over the base of the last thoracic leg; behind this flap on either side there is a short, transverse carina. The sixth abdominal segment is a little shorter than the fifth and not quite so wide, its lateral margin oblique above the base of the uropoda. In addition to the carinate, lateral margins there are three

pairs of longitudinal carinae. The pair of submedian longitudinal carinae extend from the third thoracic segment to the posterior margin of the sixth thoracic segment, these carinae being less emphasized but distinct on the first visible thoracic segments; and on the fifth and sixth abdominal segments the carinae terminate posteriorly in a small acute spine; the carinae of the sixth segment are much thicker than elsewhere. A second pair of carinae, the upper lateral carinae, extend from the third thoracic segment to the posterior margin of the sixth segment, subparallel to the median and lower lateral carinae, which latter begin on the rounded process of the first abdominal segment and extend to the hinder margin of the sixth segment, where they are in line with the heavily carinate outer lateral margin of the telson; these carinae are thicker than either of those above and terminate on the fourth to sixth segments inclusive in a small spine posteriorly. The telson is shield-shaped, nearly as wide distally as proximally, with a very strong, triangulate median carina, which has two small bosses proximally, one on either side; there is also an indentation on the surface of the carina near its base; the distal end of the carina is a small spine and below it there is a large round tubercle. The lateral margin of this triangulate carina is outlined on either side by a pair of large punctae and radiating out from this line there are ten or eleven curved lines of punctae, evenly spaced and extending to the marginal carinae. Similar lines of punctae ornament the ventral surface of the telson. The distal margin of the telson is shallowly incised by a linear sinus, on either side of which there are three crenulations or small teeth, followed by the short, thick, submedian carina, which is tipped by a strong spine. There are eight small denticles between this submedian carina and the distal lateral carina, which is short and thick, terminating in a very strong spine. At its base is a small denticle, followed by the median lateral carina, which is thick, terminating in a sharp spine and has immediately behind it the subequal proximal carina which also terminates in a short spine.

The uropoda have the peduncle strong with a small spine on the distal upper angle and two longitudinal carinae on the upper surface, the anterior one short and faint and the posterior one stronger and extending to the tip of the longer spine of the produced process. There is also a strong longitudinal carina on the ventral surface of this spine. This process is very strong and curved, its inner lateral margin being very concave and coarsely crenulate; the very acute

apex of the spine being intermediate in length between the submedian and distal lateral spines of the telson. On its inner lateral margin about two-fifths of its length from the base there is a rounded node, resembling a blunted tooth. The outer branch of the process is only about half as long as the inner spine but very acuminate and heavily carinate on the inferior margin, this carina continuing along its lateral margin to the base of the process. The inner branch of the uropoda is very narrow, suboval, with the inner lateral margin slightly concave, the outer slightly convex, and crenulate, the distal margin rounded, extending almost as far as the outer lateral spine of the telson; there is a definite longitudinal sulcus on the proximal dorsal surface. The outer branch of the uropoda has the proximal branch subrectangular, thick, with a strong median longitudinal carina on the upper surface; the outer lateral margin carinate and armed along its distal half with seven articulated sharp spines that increase in length from the proximal to the distal one, which is at the outer angle; midway the ventral surface of the distal margin there is an eighth spine, fixed, protruding over the base of the distal article. The distal article is unequally ovate, three-fifths as wide as long, with the inner margin very convex, the outer lateral margin nearly straight. This outer distal blade and the inner blade are both heavily fringed with setae.

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Order **DECAPODA.**

Suborder **Reptantia.**

Tribe **BRACHYURA.**

Subtribe **Oxystomata.**

Family **CALAPPIDAE.**

Subfamily **Calappinae.**

Genus: **CALAPPA** Fabricius.

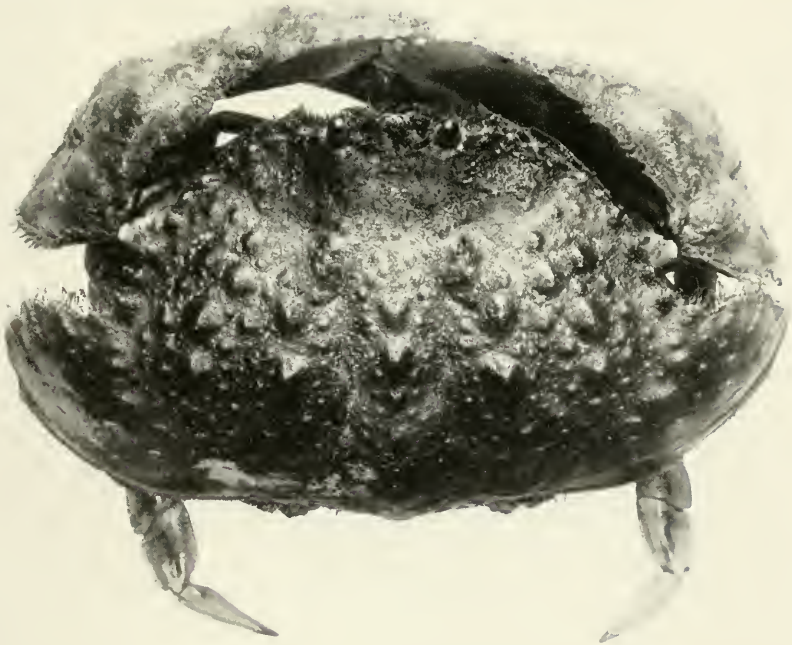
Calappa hepatica (Linne).

Plates 8, 9 and 10.

NAME: The Hawaiian native name of this species is "Papaki." (Owen).

TYPE: Linnaeus' type was collected in the Indies and was deposited in the "Museum Ludovicae Ulricae, No. 448."

DISTRIBUTION: The Indies, (Linné); Indian Archipelago, (H. M. Edwards); Pacific Ocean, (Herbst, Fabricius); South Seas, (Bosc); Eastern Seas, (Haswell); Japan, (DeHaan); Nagasaki, (Pesta); Takao, S. Formosa, Okinawa Island, Gasawara Island, Liu Kiu Islands, (Balss); Loo Choo Islands and "Gaspar," (Stimpson); China coast, (Miers); Ceylon, (Miers); Rameswaram, Gulf of Martaban; Trincomali, Ceylon (Muller); Ceylon, Tuticorin, (Henderson); Palau Islands, (Ortmann); Andamans, Nicobars, Maldives; Laccadives; Persian Gulf, (Alcock); Funafuti and Rotuma, (Borradaile); Hulule, Male Atoll; Minikoi, lagoon, (Borradaile); Krusadai Island, Gulf of Manaar, (Gravely); Cocos-Keeling, Atoll; Murray Island, Torres Strait, (Calman); Borepata, Hula, Irupara, Kalo, Katau, Amboina (Nobili); Kema, Makassar, Celebes, (Schenkel); Kuchang and Samarinda, Borneo, (Nobili); Marutea, lagoon, S. Marutea, Gatavake, Mangareva, Nobili); Tongatabu, Sooloo Sea, Fiji Archipelago, (Dana); Amboina; Pulo Edam; Noordwachter, Java (de Man); "*Siboga*" station 193, Sanana-Bucht, Sula Bessi, 22 m.; Sta. 225, Lucipara Islands, Riff; Sta. 258, Tual, Kei Islands, 22 m.; Sta. 261, Elat, Kei Islands, Riff, (Ihle); Loyalty Islands; Samoa, (Haswell, Miers); Tahiti, Society Islands, (Heller; Rathbun); Marquesas Islands, (Boone); Tongatabu, reefs; Amboina, 10 fms.; New Hebrides, (Miers): Northeast coast of Australia; Clairmont, Australia; Trinity Bay, N. E. Australia; Bramble Key; West Hill



Calappa hepatica (Linné), × 1.

Calappa hepatica (Linné), × 1.

Calappa hepatica (Linné), × 1.

and Sydney, Australia; Auckland, New Zealand, (Miers; Heller; Pesta); New Zealand, (Filhol); Oahu, Hawaii, (Owen); Honolulu, reef and market, (Rathbun); Sandwich Islands, (Dana, Pesta, Streets); Upolu, Samoa, (Pesta; Miers); Mauritius, (Ortmann, Richters); Foquets, Mauritius, (Lenz and Richters); Grand Port, reef, Mauritius, (Bouvier); Farquhar, atoll, lagoon, Seychelles, (Rathbun); New Caledonia, (A. M. Edwards); Nosse-Faly, Madagascar, (Hoffman); Madagascar, (Heller); Nosse-Be, Madagascar, (Gravier); Mozambique, beach, (Miers); East Africa, (Th. Monod); Zanzibar, (Lenz; Hilgendorf; A. M. Edwards); Natal Bay, South Africa, (Krauss); Durban Bay, collection, (Stebbing); Red Sea, (Heller; Kossman; Martens; de Man; Nobili, Pesta); Payta Assab, (Cano); Shadwin Island, Hanfela, Perim, Red Sea, (Balss); Stations 7 and 8, Sudanese Red Sea, (Laurie).

Material examined: Several small specimens, taken on coral reef, Anaho Bay, Nuka Hiva, Marquesas Islands, August 10, 1931, by the "*Alva.*"

Technical description: Carapace decidedly convex, rough with tubercles of varying sizes, with the fronto-lateral margin widely rounded, crenulate, cut into 10 to 12 shallow, triangulate teeth; the posterolateral angles produced into a winglike expansion, the anterior margin of which is cut into four or five shallow triangulate teeth, these increasing slightly in size from the anterior to posterior; on the posterior border there are no true teeth but two well-separated indentations of the margin occur. The entire margin of the winglike expansion is beaded by rounded granules, and a short crest formed of similar beads runs inward from the apex of each of the seven teeth of the expansion. The frontal margin is narrow, composed of two closely placed, tilted teeth, which together form a triangular process, slightly incised at the median point, from which a sulcus extends backward. The orbital margin is small, beaded, subcircular, with two closed sinuses on the outer half of the superior margin. The regions of the carapace are poorly defined, except that the urocardiac region is separated by a well defined, furrow-like, longitudinal depression on each side. There are also a pair of pitlike depressions, one on either side of the mesogastric region, just anterior to the large tubercle that marks the summit of this region. The anterior three-fourths of the carapace is roughened by many large and small granular tubercles. There are three large, rounded tubercles in longitudinal series on the median dorsal line, and approximately opposite these on the inner

branchial region there are three similar large tubercles, beyond which on the outer branchial region are a line of four coarse rounded tubercles. Interspersed among all these coarse tubercles are smaller, blunt tubercles of varying sizes. The entire dorsal surface is paved with rounded, flattish granules, these being coarser on the anterior region and diminishing posteriorly, except where certain short linear groups of beaded granules occur, forming much broken transverse lines on the posterior fourth of the carapace including the winglike expansions, where there are no tubercles. The pterygostomian region and anterolateral margins are densely hirsute. The sternal plastron is narrow, granulose. The male belt is triangulate, the third to fifth segments inclusive fused into one article; the apical segment a narrowed triangle.

The male chelipeds are about equal except that one has a large sub-basal node on each the upper and lower fingers. The merus is cut into three wide, shallow, triangular teeth that together form a winglike expansion; the anterior margin of the merus is subcarinate; the carpus has its upper surface roughened by numerous tubercles and its upper margin beaded and fringed with setae. The propodus is high, crested above, the fingers distinctly deflected and they and a small area of the lower part of the propodus are covered with coarse rough granules; the outer margin of both fingers and the lower margin of the palm each have a bead-like carina. Almost the entire outer surface of the palm and carpus are covered with coarse tubercles, interspersed with smaller tubercles and granules, as on the carapace. On the lower half of the palm these tubercles form approximately two longitudinal lines, while the tubercles on the upper half increase in size; the upper crest is cut into six distinct triangulate teeth, which in the young specimens show little difference in size.

The left male cheliped has a large rounded process on the margin of the palm, just above the base of the propodal finger. On the right cheliped there is a large sub-basal node or tooth and on the related upper finger there is a conspicuous, rounded, sub-basal node and a long basal tooth, which interfits upon that of the lower finger. There is a distinct gape between the fingers of the right male cheliped, while those of the left cheliped meet throughout their length and are finely dentate.

The ambulatories are slender, laterally compressed; the merus dilated and about as long as the dilated carpus and propodus considered together; the dactyl is slightly longer than the carpus, slender,

tapered with a sharp tip. When retracted the legs fold compactly beneath the winglike expansion of the carapace.

The orbit is small, the stalks slender, the cornea hemispherical, terminal-dorsal in position; the eyestalk extending an eighth of an inch or more above the carapace.

The antennae have the basal article situated in the orbital hiatus, with a peculiar enlarged process, directed obliquely inward, its margin beaded and completing the circle of the orbit; the second and third peduncular joints are flattish, nearly as wide as long; the flagellum is rudimentary.

The external maxillipeds have the ischium smooth, its inner margin with a series of broad, rounded, or triangular teeth, that interfit with those of the opposing article; the merus has its outer margin oblique and its outer surface and margins fringed with heavy, brushlike setae; the exopodite is slender and has similar long setae on its outer distal margins.

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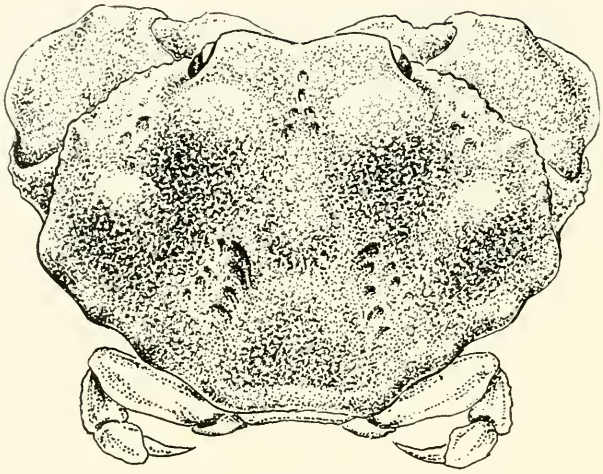
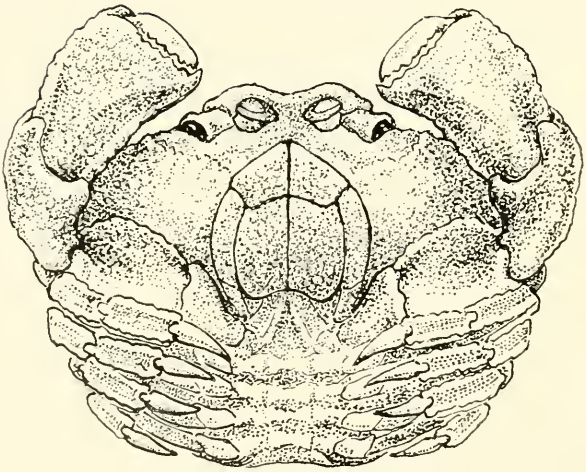




Actacomorpha alvae, type, × 8.

Notes Leyden Mus., vol. II, p. 184, 1880.—Archiv. fur Naturges., Bd. 53, pt. I, p. 388, 1887.—E. NAUCK, Zeits. Wiss. Zool., Bd. 34, p. 46, 1880, (Gastric teeth).—LENZ AND RICHTERS, Abh. Senck. Ges. Bd. XII, p. 425, 1881.—MULLER, Verh. Natur. Gesell. Basel, Bd. VIII, p. 473, 1886.

? *Calappa tuberculosa* GUÉRIN, MÉNEVILLE, Icon. Règne Anim. Crust. t. II, pl. 12, figs. 2, a–b, 1829.

? *Calappa sandwichien* (*Calappa tuberculata* variety) EYDOUX AND SOULEYET, Voy. "*Bonite,*" vol. I, Zool. p. 245, pl. 3, figs. 9, 10, 1841–52.

Family: LEUCOSIIDAE.

Subfamily: Leucosiinae.

Genus: ACTAEOMORPHA Miers.

Actaeomorpha alvae, new species.

Plate 11.

TYPE: One male, taken in coral at Teviatoa Reef, Raiatea Island, Society Islands, South Pacific Ocean, August 21, 1931, by the "*Alva.*" Deposited in the Vanderbilt Marine Museum.

DISTRIBUTION: So far known only from the holotype.

COLOR: Preserved specimen: old ivory.

TECHNICAL DESCRIPTION: Carapace cancroidal, octagonal, with the dorsal surface very nodulose; the frontal region is about one-third of the maximum width of the carapace and is deflected, composed of two widely rounded lobes separated by a median sulcus that extends backward on the gastric region. The superior orbital margin is small and unbroken; the anterolateral margin is wide, crenulate and consists of a depressed, slightly rounded anterior half that is united at an angle with the second or median half of the lateral margin, which is subparallel to the opposite side of the carapace and is united at a similar angle with the postlateral margin, which is crenulate and decidedly convergent posteriorly. The posterior margin of the carapace is straight, sublaminate and parallel to the frontal margin. The dorsal surface of the carapace is curiously sculptured, there being a pair of large, convex, submedian lobes on the gastric region, well separated from each other and from a second pair of similar slightly smaller lobes that lie one on each side of the mesobranchial region. The urogastric region is defined and the cardiac region is outlined by a series

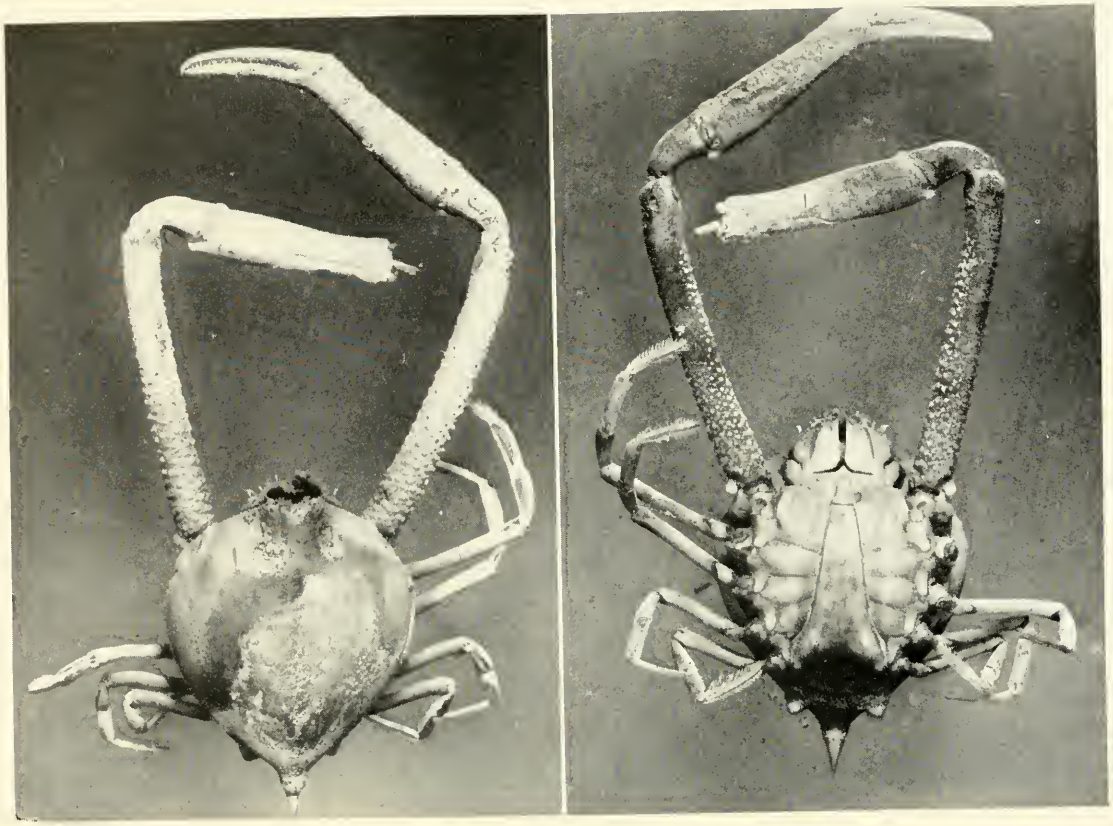
of odd-shaped, irregular small pittings that are separated from one another. Similar pittings occur sparsely on the hepatic region, on the branchial region between the two large lobes, and a few very small ones on the gastric region in the median line. The entire lateral margin is crenulate and the entire dorsal surface of the carapace is paved with microscopic, flattish, low granules. The male belt is narrowly ovate, triangulate, seven-segmented and it and the adjacent portion of the sternal plastron are transversed by alternate deep pittings and ridge-like granular areas.

The right cheliped, (the left one is missing), is of moderate size, closely appressed to the carapace, only the distal border of the merus being visible beyond the carapace; the carpus is large, very convex dorsally and paved with coarse rounded granules; the propodus is not visible dorsally and is short and high, the height being quite two-thirds of the length of the palm, which is greatly dilated on the outer surface, crested on the upper margin, this crest consisting of about three unequal, triangulate teeth; the upper portion of the convex outer surface of the palm is deeply pitted, the interstices being granulose, the lower portion is similarly but less deeply sculptured. The propodal finger is short, thick, deflected, with a sharp tip and serrate dentition. The hinged finger is much smaller and swings obliquely downward, fitting upon the propodal finger throughout its length and having a sharp tip and seven serrate teeth; there are two lines of granules on the outer face of the upper finger.

The ambulatories are small, closely appressed to each other and to the body, decreasing in length in the order 1, 2, 3, 4. Each has the merus wide, compressed, with a laminate margin; the carpus and propodus wide, compressed, with a double carinate upper margin and a similar double lower margin, giving the joints a four-sided aspect; the dactyl is similarly compressed, its margins carinate, its tip an acute curved claw. The exposed upper margins are bicarinate, with the interstices coarsely, irregularly granulose.

The antennulae are not very large and fold obliquely-transversely within the thick margined fossett that lies beneath the frontal margin and is divided by a thick medium septum.

The antennae appear to consist of two articles, a small basal article wider than long and arising above and near the apex of the epistome, and supporting a much larger second article that lies below the lower margin of the antennulary fossett and having its lower, or outer, lateral margin convex, its inner lateral margin moderately concave,



Myra fugax (Fabricius), × 1.

tapering distally to an acuminate tip that reaches the base of the exposed lower side of the eyestalk and closes the orbital sinus at this point.

The external maxillipeds are very close-fitting. The exopodite is rodlike, slightly longer than the ischium of the endopodite, with its outer lateral margin moderately convex, the inner one, straight; the apex, triangulate, adjacent to the outer proximal angle of the merus. The ischium is two-thirds as wide as long, with its proximal border obliquely truncate, its lateral margins parallel, the distal margin slightly excavate; the merus is triangulate and is bent upward, appressed to the margin of the epistome and has its proximal margin conforming to that of the ischium and of the exognath, and its inner lateral margin is straight, its outer lateral margin decidedly oblique; the palp is almost concealed and lies on the inner side of the maxilliped.

The eye is set on a short, thick, calcareous stalk, this calcareous margin terminating in two scallops on the dorsal margin of the small cornea, and one scallop ventrally. Only the tip end of the stalk is exposed dorsally but ventrally a wide section of practically the entire length of the stalk is visible, itself occupying the wide orbital sinus which is closed proximally by the antennal joint. The visual range is very limited, the cornea being small, not very convex, lunate in contour, the convex margin being dorsal. The visual range is chiefly directed toward the side of the crab.

Actaeomorpha alvae is distinguished from its nearest congener, *A. erosa* Miers,* by the fact that it has four large lobes or rounded elevations while *A. erosa* has five. *A. alvae,* type is about the same size as the type, *A. erosa* Miers and is a male also, but the cardiac region is flattish, not elevated.

Genus: MYRA Leach.

Myra fugax (Fabricius).

Plate 12.

TYPE: The first preLinnean record of the species is from Amboina, by George E. Rumphius. Fabricius' type came from the "East

* *Actaeomorpha erosa* Miers, Journ. Linn. Soc. London, Vol. XIII, p. 184, pl. 14, figs. 1–6, 1878. The type of *A. erosa* Miers was collected at Port Curtis, Australia, and is deposited in the British Museum of Natural History.

Indies" and was in the Daldorf collection. Present depository not known.

Distribution: Amboina (Rumphius); East Indies, (Herbst, Fabricius, Leach, Bell); Japan, (De Haan); Kagoshima; Sagami Bay; Maizuru, Tanageva, 25 fms., Japan, (Ortmann); Sagami Bay, Misaki, Haidashi, Nagasaki, Japan, (Balss); Inland Sea of Japan, deep water, (de Man); Hong Kong harbor, (Kellog); China Seas, boreal, in stones and shells, (Stimpson); Hong Kong, (Miers); Korean Channel, Masbate, Cebu, Philippine Islands, Eastern Seas, (Miers); Trincomali, Ceylon, (Muller); Rameswaram, Ceylon, Gulf of Martaban, (Henderson); Arapu coral reefs, Gulf of Manaar; Trincomalee; Galle; off Manaar Island, (Laurie); channels between the reefs, Murray Island, Torres Straits, (Calman); Indian Peninsula, Andamans, Persian Gulf, (Alcock); Red Sea, (Nobili); Sudanese Red Sea, (Laurie); Lake Timsah, Red Sea, (Calman); Kunfuda, Red Sea, (Balss); Beilul, (Cano); Singapore, (Walker); five localities in the Gulf of Siam, (Rathbun); Arafu Sea, south of New Guinea, 28 to 49 fms., (Miers); Macassar, Celebes, South Seas, (Miers); Onrust Island, Java coast between Batavia and Priok, (Sluiter); East Indies: "*Siboga*" station 2, Modura Strait, 56 m.; Sta. 33, Pidjot, Lombok, 22 m.; Sta. 47, Bima, 55 m.; Sta. 50, Badjo, west coast of Flores, 40 m.; Sta. 261, Elat, west coast of Island of Bai-Kei, 27 m. (Ihle); Flinders and Clairmont, N. E. Australia, 11 fms., (Miers); Cape Grenville, Australia, (Haswell); Piper Island, Queensland, (Boone); New Caledonia, (A. M. Edwards); Port Louis, Mauritius, (Bouvier); Caragados Caragos (Rathbun); Foquets, Mauritius, (Richters); Zanzibar, (Hilgendorf).

Material examined: One specimen, brought up on anchor chain, Piper Island, Queensland, October 13, 1931.

Technical description: Carapace, in the adult, ovoidal, moderately globose, distinctly longer than its greatest width, which is definitely anterior to the center; moderately convex, sloping on either side from the median longitudinal carina, which becomes less conspicuous in the larger adults. The frontal region is narrowed anteriorly and slightly produced and distinctly convex dorsally; the frontal margin is widely bidentate, but is so abrupt that the spiniform angles of the branchial channels and the tips of the external maxillipeds are visible dorsally. The preorbital angle is a blunt slightly ridged tooth; the superior orbital border has three closed sinuses, forming two rounded teeth; the postorbital angle is also rounded, less conspicuous than the

preorbital. The entire fronto-orbital region is finely hirsute, as is also the under frontal region. On the dorsal surface behind the hirsute area, the narrowed portion of the carapace is naked, smooth, for quite a distance, behind this the convex surface of the carapace is decorated with scattered, microscopic, pearly granules which are larger and more abundant along the margins and adjacent regions and on the three posterior spines. Immediately behind the tip of the front, the anterolateral region of the carapace is formed of the obliquely facetted sidewall of the subhepatic region, both the upper and lower margins of the facet being beaded lines, on each of which near the posterior end is a tubercle; the surface of the hepatic facet is smooth. Posterior to the hepatic facet and situated between it and the branchial region is a distinctly defined notch, coincident with a depression on the pterygostomian face, which is continuous with a well defined longitudinal groove, situated along the sidewall of the carapace just above the slightly thickened epimeral margin. Behind this notch the lateral border of the carapace is marked by a line of finely beaded granules, which, in young specimens, are said to be occasionally dentiform. On the posterior region of the carapace there is a strong conical, outward and slightly upward directed spine in the median line, and outside it on either side there is a blunt, triangular tooth which points outwards and slightly downwards. Each of these outer spines is as wide at the base as its median length, which length is only equal to two-fifths of the length of the median spine. These three spines form an obtuse angle; the median spine is not very high above the other two. The sternal plastron is wide, smooth. The male belt is narrow, triangular, with the first and second segments short and wide, hinge-like; the third, fourth, fifth and sixth segments are completely fused, with a terminal granule. The seventh segment is a long narrowed triangle with rounded tip. The female belt is wide, oval.

The eye is small, brown, closely surrounded by the orbital margin.

The antennulae are well developed and fold horizontally within the fossett beneath the frontal border.

The antennae are greatly reduced and are situated in the infraorbital sinus.

The external maxillipeds are long, close-fitting, with the distal half setigerous. The exognath has its ischium quite strong and small, its merus as long as the total length of the endognath, with its outer margin widely rounded on the proximal two-thirds, narrowed distally with its distal margin rounded; the endognath has its ischium com-

prising two-thirds of the total length; with its inner proximal angle rounded, its inner margins meeting, smooth; its greatest width slightly less than that of the exognath, its lateral margins converging slightly distally; the merus is long, narrow, tapered distally with the distal margin bluntly angled, almost rounded; the palp is not exposed.

The chelipeds are subequal in the male and very long; the merus being slender, subcylindrical, as long as the carapace and covered with small, pearly granules. The carpus is about one-fourth as long as the merus; the propodus and fingers considered together are about as long as the merus, but the propodus is more laterally compressed and tapers somewhat distally; the fingers are two-thirds as long as the palm and sharply deflected; they are slender, tapered, the tips crossing, the cutting edges set with conical teeth, that alternate with those of the opposite side and with numerous fine hairs in among the teeth. The carpus, palm and fingers are finely granulose, but distinctly less so than the merus.

The ambulatories are very delicate, slender, subsimilar, decreasing in length from the first to fourth pairs.

References: *Cancellus anatum terius* Rumphius, G. E., Amboin. Rariteitk., vol. I, p. 27, pl. 10, fig. C, 1741.

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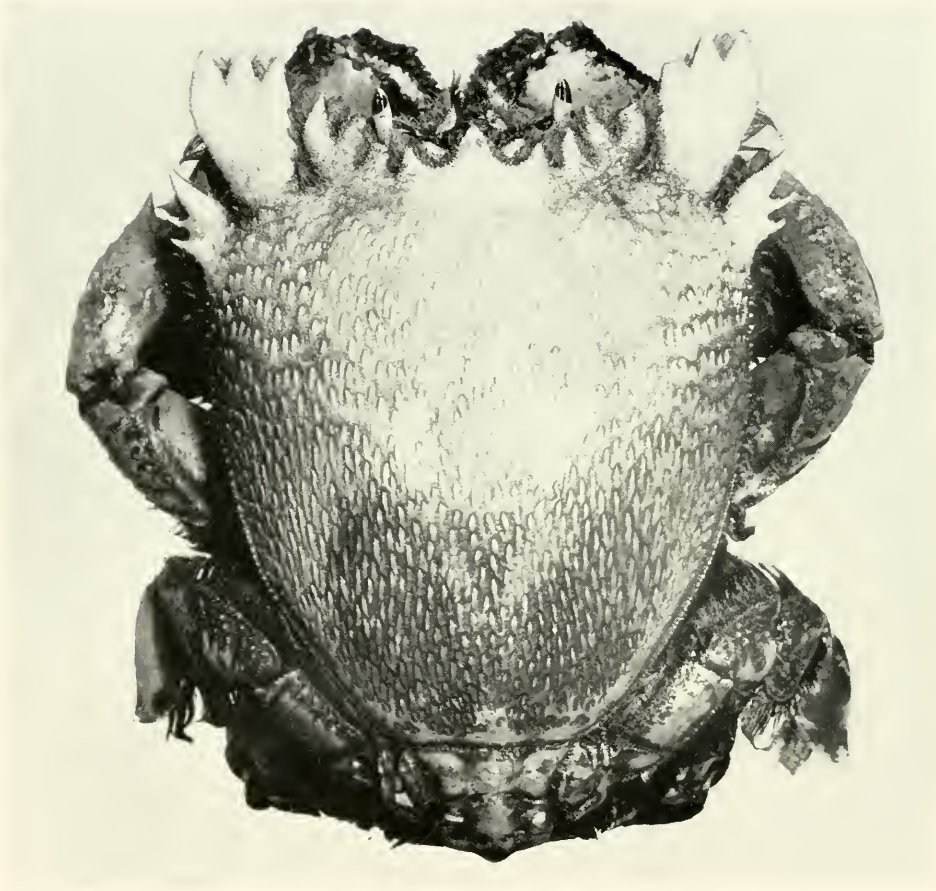

Ranina scabra (Fabricius), × 0.6.

Ranina scabra (Fabricius), × 0.6.

(Adult).—ALCOCK, Journ. Asiatic Soc. Bengal, vol. 67, pt. 2, p. 201, 1896.

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Myra fugax variety *coalita* ORTMANN, Zool. Jahrb. Syst. vol. VI, p. 582, 1892.

Persephona fugax RATHBUN, K. Danske Vid. Selsk. Skr. 7th raekke, Bd. 5, p. 308, 1910.—Trans. Linn. Soc. London, ser. 2, Zool. vol. 14, p. 201, 1911.—LAURIE, R. D., Journ. Linn. Soc. London Zool., vol. 31, p. 428, 1907–1915.

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Family: RANINIDAE.

Genus: RANINA Lamarck.

Ranina scabra (Fabricius).

Plates 13 and 14.

TYPE: Fabricius type came from the "Eastern Seas." Present depository unknown to the writer.

Distribution: Eastern Seas, (Fabricius); Indian Seas, (Linné); Indian Ocean, (Latreille); South Seas, (Herbst); Amboina, (Rumphius; Herbst; Latreille); Sandwich Isles, (Herbst; Dixon; Bosc); Japan, (De Haan); either Durban, South Africa, or Agulhas Bank, Cape Colony, (Stebbing); Port Louis, Mauritius, (Bouvier). Southport, Queensland, (Boone), "*Siboga*" station 248, Rumah, Tiur Island, East Indies, 36 meters depth, (Ihle). Mako, Pescadores Island; Fukura, Sagami Bay, Japan, (Balss); Misaki, Sagami, Nagasaki, Hizli, Japan, (Rathbun).

Material examined: One very large specimen, collected at Southport, Queensland, Australia, September 24, 1931, by the "*Alva.*"

Technical description: Carapace shield-shape, very convex from side to side and moderately so fore and aft, with the frontal margin deeply, irregularly serrate and three and two-fifths times as wide, from tip to tip of the anterolateral spine, as the posterior margin. The anterolateral width at this point is the maximum width of the carapace, being slightly in excess of the width across from tip to tip of the large tridentate frontal processes. The length of the carapace from the tip of the rostral spine to the posterior margin is about 3 mm. less than the maximum width. The maximum width is 133 mm.; the length in the median dorsal line is 130 mm.; the length of the carapace from the outer tip of the largest tridentate frontal process to the posterior lateral angle is 150 mm. in a straight line measurement. The entire dorsal surface is covered with elongate, squamose imbrications, whose triangulate or, in some instances rounded, apices are forward-directed; the posterior margin of these imbrications not being well defined; these imbrications are dorsally convex from side to side, the anterior region of the carapace having them abundantly, but more separated and usually of shorter length than those on the posterior half, which are very closely spaced and on the average are about three, or more than three times as long as wide. The frontal margin is divided into seven lobes, a median lobe, which measured across its base is equal to about one-fourth of the total width, and is produced to a median triangulate rostral point on either side by a concavity from the smaller, submedian triangulate tooth that marks the outer angle of the median lobe, which is separated by a narrow U-shaped sulcus from the next or innermost lobe, which basally is three-fifths as wide as the median lobe and is composed of a crest-like lobe consisting of three unequal, triangular teeth, the innermost and smallest of these being slightly longer than the adjacent tooth of the median

lobe and acuminate triangulate; the second tooth is not only stronger and longer but arises from a curved basal portion which places it in advance of the inner tooth; the third, outermost tooth, the largest one of this series, is at the outer curve of the crest, with its inner side relatively straight, its outer margin convex. The outer tooth of the median lobe and the inner two teeth of the adjacent lobe, converge their apices distally toward the eyestalk. The next or median lateral lobe, which is conspicuously the longest and largest of the series, is about as wide basally as the inner lateral lobe and is about twice as long as wide, widening gradually distally, with the outer lateral margin definitely convex, the distal margin cut into three unequal, triangulate teeth, the outer two of which are a trifle broader than the more acuminate inner one. The sinus between the inner and median lateral lobes is very narrow. The outermost lateral lobe is the smallest one of the series, separated by a fairly wide, V-shaped sinus, and consists of one strong, outward directed triangulate tooth, which bears on the proximal half of its outer lateral margin two small, slightly procurved, triangulate teeth. The lateral margins are carinate, the carina consisting of a series of spinule-like granules. The frontal margin, especially the interstices between the teeth and sinuses between the lobes, are fringed with thick brown setae. Similar brushes of setae occur on the upper margins of the chelipeds and on the inner margins of the fingers. The sidewalls of the carapace are also furnished with large patches of long setae. The lateral margins of the abdomen and of the fourth and fifth pairs of legs are also heavily fringed with setae.

The pterygostomian region is covered with small squamosities, similar to those of the upper surfaces, but much smaller, and decreasing in abundance posteriorly. The sternal plastron is free of these squamosities, smooth except for scattered small granules.

The male abdomen is narrowed triangulate and consists of seven articles, the proximal four of which are dorsal in position; the distal three being bent under the body. The first article is the widest of the series and is subequal in length to the second article, the third to sixth articles are nearly subequal in length, the seventh article is small, little more than half as long as the sixth, triangulate. The median third of each segment, from the first to sixth inclusive, is elevated in a wide, ridge-like longitudinal carina. The male organs consist of a pair of elongated curved jointed rods, arising from the second segment, thickened proximally and tapered distally.

The eyes are set on short, cylindrical stalks, proximally concealed by the carapace and partly visible in the concavity on either side of the rostrum; proximally there is a calcareous denticle; distally the stalks are tapered and directed forward and upward, with a narrowed calcareous process extending the length of the inner lateral surface and forming a tip at the apex; the cornea is brown and forms an elongated oval on the under surface but is obliquely a third shorter on the upper surface.

The antennulae are slender and fold almost vertically, when retracted, lying concealed beneath the setae fringes of the basal articles of the antennae.

The antennae have the basal article rounded distally; the second article greatly enlarged and bent inward, with a distinct carina terminating in a small point, defining the division between the lower and upper section, again bent inward before the orbit, with the outer margin rounded and produced distally to a rounded, subovate process; the third article is smaller and also bent, having a lower and upper area of the exposed surface; the flagellum is broken off. The lateral margins of the peduncle are quite setose.

The external maxillipeds are very close-fitting, about twice as long as wide, with the ischium of the exopodite short, triangular; the related merus a narrowed, tapered, slightly bowed or curved article, extending a very little distance beyond the base of the merus of the endopodite. The ischium of the endopodite is long and narrow, slightly wider distally, with the inner lateral margin thickened, straight, and setose, the outer lateral margin sinuate; the distal margin is produced into an elongate, rounded process at the inner angle and a smaller subacute process on the outer angle; the merus is seven-eighths as long as the ischium, substantially wider, with the distal margin obliquely truncated and setose, the apices of two halves forming a wide triangle; the inner meral margin is thickened and heavily setigerous.

The chelipeds are equal, of the shape typical in *Raninas*, in the male rather large and with the propodus and fingers greatly compressed. The ischial joint is stout and terminates in a blunt node at the inner distal angle; the merus is long and stout with the lower surface rounded and with three or more transverse curved carinae, consisting of denticles, on the outer half, extending up towards the carinate upper lateral margin, which terminates in a blunt triangulate tooth; there is also a series of scattered denticles on the distal half of the outer surface. The carpus is three-fourths as long on its upper

surface as the merus, with five or six unequal transverse carinae on the outer surface; these are replaced on the upper surface by numerous coarse denticles and with two large, distal, conical spines. The propodus is greatly compressed, one and two-thirds times as long as the merus, with a median and a distal spine on the upper lateral margin and below this numerous coarse flattish tubercles on the upper fourth of the outer surface, these being replaced on the remainder of the surface by transverse wave-like lines consisting of finer denticles; the inferior lateral margin has a wide flat carina on the curved basal section and five large, serrate, triangular spines, each one being unequal sided and forward-directed and with an oblique line of denticles running backward from the tip onto the outer surface of the palm. The fixed finger has its carinate lower margin almost at right angles to the palm; the upper margin is oblique, set with seven or eight unequal coarse, triangulate teeth, each tapered to an acuminate point. The inner side of the propodus and fixed finger, which are closely appressed to the body, are rough with wavy transverse, granulose rugae. The hinged finger fits across the distal end of the propodus, closing closely upon the propodal finger, the cutting edge with about five coarse teeth, the tip acuminate, the upper outer margin convex and armed with a series of spinelike teeth, the proximal two of which are quite prominent, the others small, semiconcealed by the thick brush of setae that forms a band along the outer half of the inner margin of the upper finger. Similar brushes of setae occur along the inner margins of the cutting edges of both fingers. The chelipeds in their normal resting position, closely appressed to the body, have the fingers above the maxillipeds and these brushes of setae on the fingers form accessory sieves.

The second, third, fourth and fifth pairs of legs are similar in structure. The first pair have a small spine on the anterior distal angle of the ischium; the merus is elongate, rounded on the lower surface; both lateral margins are setose; the carpus, propodus and dactyl are intimately articulated, forming a digging instrument. The carpus is suboval on its outer surface, with bladelike outer margin; the propodus is strong, short and wide, reinforcing the dactyl; the dactyl is lanceolate-acuminate. The second pair of legs are the smallest of the series; the third and fourth pairs of legs are subdorsal in position and are larger than the preceding pairs. The third pair of legs has the anterior lateral margin of the carpus and propodus expanded, laminate and the hinder lateral margin widely rounded. The dactyl also

differs in contour from that of the preceding legs, having the outer anterior lateral margin sinuate and concave and the opposite margin widely rounded with an acuminate tip. The merus has a double fringe of setae on the upper and under outer lateral margins and also on the hinder and distal propodal margins.

The fourth pair of legs differ from the others, having the three proximal articles modified to adapt to their subdorsal position; laminate, the carpus produced to an acute point anteriorly; the propodus narrowed, suboval, with rounded, beaded margins; the dactyl unequally lanceolate, laminate, as in the third pair of legs. The lateral margins of all the articles except the dactyl are heavily fringed, with long, close-set setae.

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Ranina scabra Stebbing, Hist. Crust., Internat. Sci. Ser. vol. 74, p. 140, 1893.—Ann. S. Afric. Mus. vol. VI, p. 16, 1908.—Bouvier, Bull. Sci. France–Belg. ser. 7, vol. V, p. 225, 1915.—Ihle, E. W., Rept. "*Siboga*" Expeditie, mon. 39B–2, p. 295, 1918.

Ranina ranina Rathbun, M. J., Proc. U. S. Nat. Mus., vol. 26, p. 31, 1903.—Balss, H., Archiv. fur Naturg., vol. 88, Abt. A, heft III, p. 122, 1922.

Dromidia unidentata (Ruppell), very young adult, ×5.

Subtribe: **Dromiacea.**

Family: **DROMIIDAE.**

Genus: **DROMIDIA** Stimpson.

Dromidia unidentata (Ruppell).

Plate 15.

TYPE: Ruppell's type was collected in Mozambique and deposited in the Museum of Frankfort-on-Main, Germany.

DISTRIBUTION: Mozambique (Ruppell); Red Sea, (Kossman); Gulf of Suez, (Calman); Red Sea, several records, Nobili; King Island Bay, Mergui Archipelago, where a local variety of the species is recorded, (de Man). Bali, (Boone); pearl banks, Gulf of Manaar, (Laurie); Koh Chuen, Koh Kram, Koh Kahdat, Gulf of Siam, (Rathbun).

MATERIAL EXAMINED: One young female, taken in coral, at Temukus Roads, Bali, Dutch East Indies, October 25, 1931, by the "Alva."

TECHNICAL DESCRIPTION: Carapace subcircular, 5.5 mm. long, 5.5 mm. wide, very convex with frontal margin produced to a deflexed triangulate point on either side of which there is a small tooth, placed about at the junction of the deflexed portion with the upper portion of the margin. The anterolateral margin is devoid of teeth and is confluent with the posterior margin, these together forming a wide arc. There is a minute single tooth on each side of the anterolateral margin above the orbit and on each side there is a fringe, composed of long fleshy multiplumose setae, the tips of which are bristly. The entire carapace has the upper surface and visible portions of the sidewalls covered with fine, close set, multiplumose setae, which occur also on the external maxillipeds, chelipeds and ambulatories. The specimen is a female with the proximal abdominal articles showing dorsally.

The chelipeds are equal, of moderate size, the lower fingers terminate in a split or double tooth, between which the downcurved tip of the upper fingers fit.

The second and third pairs of ambulatories are succesively longer and terminate in a long very curved dactyl.

The fourth and fifth pairs of legs are reflexed upon the back and are successively smaller, each terminating in a long, very curved dactyl, that interfits between two opposed short spines.

The antennulae are large with the basal article swollen, vase-like, with the outer distal angle produced; the second or third articles are short, bulbous, the flagellum biflagellate, the smaller whip of several

articulations, the larger one, multiarticulate and with a dense brush of long setae. The interantennal septum is very narrow.

The antennae are adjacent to the antennulae and have the basal article short and wide, the second article oblong, large and quite wide with its outer surface convex and its inner distal angle produced in a curved, hook-like process, that lies around the side of the third article which is quite short and bulbous; the flagellum is quite long and slender, about 3.2 mm. long.

The eye is fairly large, the stalk semi-concealed; the cornea black, terminal, hemispherical.

The external maxillipeds are very tomentose and have the distal meral margin nearly straight with the angles a little rounded.

References: *Dromia unidentata* Ruppell, Besch. und Abbild. von. Art. Krabben, p. 16, taf. 4, fig. 2, 1830.

Dromidia unidentata Kossman, Zool. Ergebn. Reise Kusten des Rothes Meers, Bd. II, heft 1, Lief., p. 67, 1877.—de Man, Journ. Linn. Soc. London, Zool., p. 207, 1887–88.—Nobili, G., Ann. Sci. Nat. 9 ser. t. IV, p. 145, 1906.—Rathbun, M. J., K. Danske Vid. Selsk. Skr. 7th raekke, Bd. 5, p. 867, 1910.—Laurie, R. D., Ceylon Rept. Pearl Oysters Fish. vol. V, p. 35, 1906.—Calman, W. T., Trans. Zool. Soc. London, vol. 22, p. 211, 1926–1929.

Subtribe: **Brachygnatha.**

Superfamily: **Brachyrhyncha.**

Family: **PORTUNIDAE.**

Subfamily: **Caphyrinae.**

Genus: **LISSOCARCINUS** White.

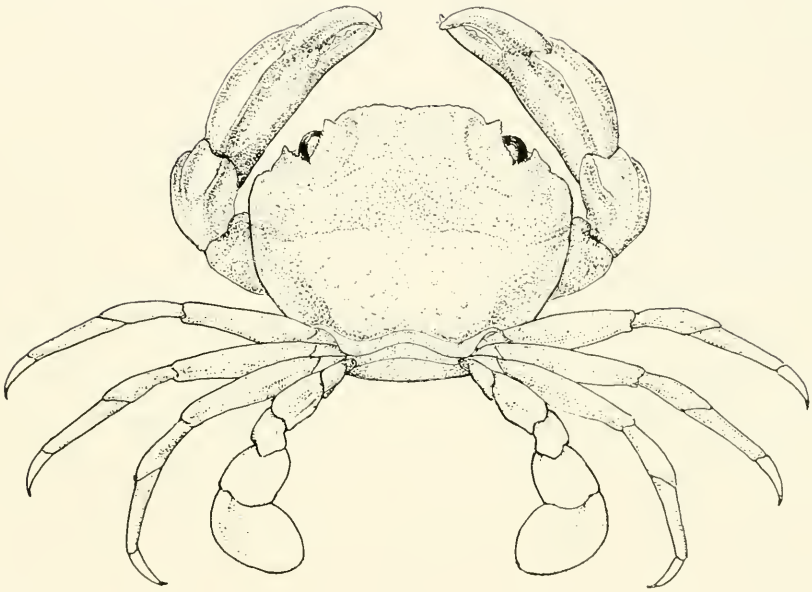
Lissocarcinus elegans, new species.

Plate 16.

Type: One male, taken at Teviatoa Reef, Raiatea, Society Islands, August 21, 1931, by the "*Alva.*" Deposited in the Vanderbilt Marine Museum.

Distribution: At present restricted to the type; member of a genus known from widely separated areas of the IndoPacific and westward including the Red Sea.

Color: The color of the living crab was unfortunately not recorded; the alcohol-preserved type is a deep old ivory.



Lissocarcinus elegans, type, × 5.

TECHNICAL DESCRIPTION: This species is most closely related to *Lissocarcinus orbicularis* Dana,* from which it differs in the following essentials:

(a) The frontal margin is not protuberant beyond the preorbital angle and is sharply defined from the orbital angle which is acute, triangulate.

(b) The anterolateral margin has only one incision, that separating the postorbital angle from the rounded first anterolateral tooth. The dorsal surface of the carapace has a recurved sulcus behind the orbit and across the hepatic and frontal regions not shown in *L. orbicularis* Dana.

(c) The antennal flagellum is quite long.

(d) The cheliped differs in that the carpus has *three* longitudinal carinae; the palm is devoid of the tubercle adjacent to the carpal joint; the upper surface of the palm has two longitudinal carinae, but these do not terminate in teeth, they are tapered and rounded distally; the outer surface of the palm has one longitudinal carina which is also devoid of a tooth distally. The palm is longer in proportion to the carpus than that of *L. orbicularis* as figured by Dana, and the fingers, while similar, are shorter in relation to the palm.

(e) The first to third pairs of ambulatories inclusive have the dactyli shorter in relation to their respective propodi and more curved, hooklike, as in *Caphyra*. However, the presence of natatory fifth legs is distinctive.

The carapace is subcircular, 7.5 mm. wide, 6.5 mm. long, the interorbital space 4.8 mm. wide, the frontal margin is wide, thin, laminate, slightly incised in the median line and set apart at the blunted outer angle by a distinct notch from the preorbital angle, which is a small triangle. The orbital margin is cut by two closed sinuses. The anterolateral margin is cut by a closed incision indicating a single closed tooth but not breaking the marginal contour. The margin is convex, laminate, continuous with the postlateral margin which is also convex, except where it is decidedly concavely excavate above the bases of the fifth pair of legs. The posterior margin is short, concavely excavate and emphasized by a flat carina. The dorsal surface of the carapace is convex, smooth, the regions not delineated, except for a very faint urogastric line. There is a curved, depressed sulcus behind each orbit

* *Lissocarcinus orbicularis* Dana, U. S. Explor. Exped., vol. XIII, pt. I, p. 288, Atlas, pl. 18, fig. 1a, 1852. This species was collected in the coral reefs of Ovalu, Feejee Archipelago.

that curves forward behind the frontal region. There is also a distinct carina on either side of the anterior branchial region, extending inward for about two-fifths of the width of the carapace, vanishing in the median region. The mesogastric, hepatic and outer portion of the branchial regions are finely granulose. The male belt is triangulate, consisting of five articles, the third, fourth and fifth being fused, the distal segment triangular.

The external maxillipeds are close-fitting, the merus with the distal margin slightly oblique and the inner distal angle truncated for the reception of the palp.

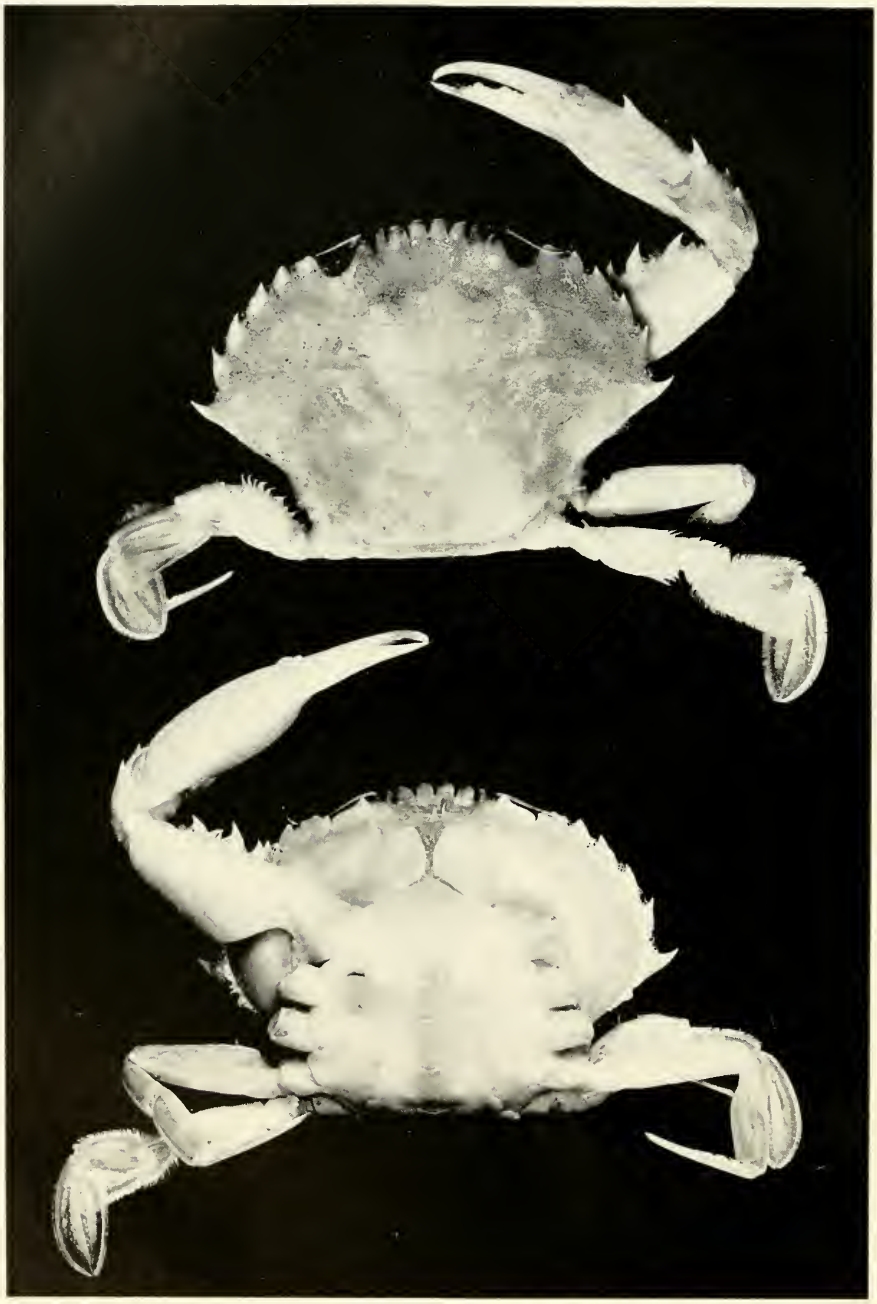
The eye is large, the stalk short, the cornea bulbous, terminal.

The antennulae are rather large and fold transversely beneath the frontal border.

The antennae have the basal article with its outer distal angle acute, it is situated in the orbital hiatus; the second and third articles small, the flagellum very fine, multiarticulate, about as long as the frontal margin.

The chelipeds are equal, the merus rounded on the hinder, distal end, the upper anterior lateral margin laminate, carinate and distally acute; the carpus accentuated by the three longitudinal, elevated, laminated carinae; the outermost of which extends along the outer lateral margin; the second carina is median, terminating distally in an acute point; the third and shortest carina extends the distal half of the inner lateral margin and terminates in an acute distal tooth; the propodus has the palm high, moderately inflated, the upper surface ornamented by an outer and an inner longitudinal carinae which are in line with the inner two carinae of the carpus and are separated from each other by a wide, concave trough; a third, less elevated longitudinal carina occurs on the outer face of the palm in line with the outermost carpal carina. The fingers are two-fifths as long as the palm, decidedly compressed laterally, with curved overlapping tips; the upper finger is the more curved and has its upper margin carinate; the cutting edges of both fingers meet and are set with small irregular teeth.

The ambulatories are quite long and slender, the first and second pairs of legs subequal; the third pair slightly shorter, all with the merus, carpus and propodus compressed, cylindrical, the dactyl strong, tapered, with an acuminate tip. The fifth pair of legs are subdorsal, shorter than the fourth and are natatory, the propodus and dactyl being subovate, laminate.



Charybdis crucifera (Fabricius), young adult taken from jelly fish, × 2.

Subfamily: **Thalamitrinae.**

Genus: **CHARYBDIS** DeHaan.

Charybdis crucifera (Fabricius).

Plate 17.

TYPE: This was secured in the East Indies and deposited in the Berlin Museum.

DISTRIBUTION: East Indies, (Herbst); Indian Ocean, (Latreille, H. M. Edwards, Paris Mus. coll.); Hong Kong, abundant in the reefs, (Stimpson, Miers, N. G. Gee, Chen); Foochow, (Gee); Bombay, Pondichery, (A. M. Edwards); Trincomali, Ceylon, (F. Muller); Akyab, Tuticorin, not uncommon at Madras, (Henderson); Singapore, (Dana, Walker, Cano; Ortmann: Nobili; Kemp); Trengganu, Malay Peninsula, Lanchester); Gulf of Siam, (Rathbun); Sumatra, Java, Philippines (A. M. Edwards); East Indies, (Dana); Amboina, King Island, Mergui Archipelago, (de Man); Java Sea, (de Man); Celebes, (Thallwitz); Makassar, Celebes, (Rathbun); Port Jackson, Australia, (Haswell); Sydney, N. S. Wales, (McNeill); Port Alfred, South Africa, (Stebbing).

MATERIAL EXAMINED: Three large males and eight small crabs, taken in large jellyfish, Muntok, Banka Island, Banka Straits, Dutch East Indies, Nov. 5, 1931, by the "*Alva.*"

TECHNICAL DESCRIPTION: Carapace oval, with the frontal and anterolateral margins widely rounded, three-fourths as long as wide; the dorsal surface is moderately convex, finely tomentose; the regions are poorly delineated; one granular curved line runs inward from the sixth or last postlateral tooth across the branchial region and converges toward the urogastric depression. Anteriorly there are two transverse broken lines across the mesogastric region. These lines are more conspicuous in the young crabs, frequently being obsolete or nearly so, on older specimens. The frontal border is about two-sevenths of the total width of carapace and is cut into six conspicuous, subequal, bluntly rounded teeth, in addition to the two smaller, preorbital teeth, which are set apart from the others by a slightly wider gape. The inner four frontal teeth are about equal, while the outer two are slightly narrower; the preorbital tooth is a blunt triangle directed forward and upward, but does not extend as far forward as the frontal teeth. The inferior inner orbital tooth is a broad triangle and is also visible in the dorsal view, lying below and a little outside the superior

inner orbital tooth. The superior orbital margin is wide, not especially elevated and cut by two closed sinuses on its outer half; there is a third closed sinus on the inferior margin below the outer tooth. The postorbital tooth is rather broad, blunt, rendered bifid by an obscure but constant incision. The rounded anterolateral border is cut into five acute, procurved teeth, besides the bifid postorbital tooth. These teeth decrease slightly in breadth and correspondingly increase slightly in acuteness, the fifth or last tooth of the series being only a trifle longer and sharper than the others. The postlateral margins are about as long as the anterolateral but are somewhat excavate and distinctly convergent; the posterior margin is definitely carinate, this carina continuing as a curve above the base of the natatory legs. The outer portion of the sidewalls of the carapace is finely tomentose, like the dorsal surface farther down towards the bases of the legs it is smooth with microscopic punctae. The sternal plastron is wide, smooth. The male belt is triangular, the first segment nearly concealed; the second and third articles short and wide, transversely carinated, hinge-like; the fourth and fifth articles are fused, with faint suture lines visible and with an incomplete transverse median ridge on the fourth segment; the sixth segment is somewhat longer than the fifth, with sharply convergent sides; the seventh segment is a small triangle with its proximal border curved and its tips rounded. The female belt is ovate, seven-segmented, with the second and third articles bluntly carinated.

The chelipeds are two to two and one-half times the length of the carapace, with the merus extending half or more than half its length beyond the carapace; three-sided, with the anterior lateral margin armed with three acute, outward directed spines, which increase slightly in size from proximal to distal. The carpus has a strong, acute, spinelike tooth at the inner distal angle; there is a small tooth at its outer distal angle and above this a still smaller tooth on the upper outer margin, with a brief carina running back. Behind and slightly above this is a second carina terminating anteriorly in a small tooth some distance back from the frontal margin of the carpus and with the carina running back along the outer border of the carapace. The palm is moderately high, ornamented with five costae as follows: one along the lower outer margin which continues clear to the tip of the lower finger; a second costa running midway the outer surface of the palm and terminating at a point between the bases of the fingers; the third costa marks the upper outer margin of the palm, and bears

proximally an acute large, forward-directed tooth and extends about three-fourths the length of the palm where it terminates in a second, acute tooth; the fourth costa defines the inner upper margin of the palm and bears a strong, acute, forward-directed spine placed a little anterior to midway its length and a second, similar strong spine distally. The fifth costa occurs midway the inner surface of the palm, giving it a swollen appearance and terminating at a point between the fingers. The fingers are almost as long as the palm, slender, curved, with the tips overlapping; the cutting edges of both are set with a series of alternating large and smaller triangular teeth which interfit with those of the opposing finger. The upper finger is deeply grooved, having six longitudinal costae, three being on the outer and three on the inner lateral surface, while the lower finger has four costae, two being on the outer and two on the inner lateral surfaces.

The second, third and fourth pairs of legs are slender with long tapered dactyli; the propodus of each leg being channelled with one longitudinal sulcus; the dactyl of each has two longitudinal sulci and three carinae on its inferior lateral face, while there are two carinae separated by one sulcus on the related upper face. Both propodi and dactyli have their lateral margins setose, the setae being longer on the inferior lateral margin. The fourth pair of legs are definitely smaller than the others.

The fifth pair of legs are natatory, the meral joint being stocky and having an acute spine at its posterior distal angle; the carpus is also thick; the propodus and dactyl are foliaceous, suboval with setose margins.

The eye is large with a short, granular stalk that is produced in a rounded process on the dorsal surface of the cornea; the cornea is large, rounded, black, filling the outer two-thirds of the orbit.

The antennulae are large and fold obliquely transversely within the fossett which is divided by an interantennulary septum.

The antennae have the basal article large and produced at its outer distal angle into a lobe that lies within the orbital sinus; the second and third peduncular articles are successively smaller; the flagellum is fine and threadlike, multiarticulate, about one and one-third times the length of the orbit.

The external maxilliped has the ischium large; with its inner lateral margins receding distally; the merus is about two-thirds as long as the ischium and has the inner lateral margin sinuate, receding

distally, the distal margin but little convex, with the outer distal angle produced as a rounded lobe; the palp is fleshy.

References: Rumphius, Amboinsch. Rareiteitk., pl. VI, fig. P. 1705.

Cancer sexdentatus Herbst, Krabben u. Krebse, Bd. II, p. 153, tab. 7, fig. 52, pl. 8, fig. 53, 1790.

Cancer cruciatus Herbst, *ibid.*, Bd. II, p. 155, pl. 38, fig. 1, 1790.

Portunus crucifera Fabricius, Ent. Syst. Suppl., p. 364, 1798.—Bosc, Hist. Nat. Crust., t. I, p. 218, 1830.—Latreille, Hist. Nat. Crust., t. VI, p. 14, Encyclop. Meth., t. X, p. 191, 1825, Paris.

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Oceanus crucifer DeHaan, Faun. Japon. Crust., p. 40, 1837.

Charybdis crucifera Dana, U. S. Explor. Exped., vol. XIII, Crust., pt. I, p. 286, pl. 17, fig. 11a–c, 1852.—Stimpson, Proc. Acad. Nat. Sci. Phila., vol. 10, p. 39, 1858.

Charybdis crucifera Rathbun, Bull. Mus. Comp. Zool., vol. 52, p. 313, 1910.—Rathbun, K., Danske Vid. Selsk. Skr., 7th raekke, Bd. 5, p. 363, 1910.—Kemp, S., Mem. Asiatic Soc. Bengal, vol. VI, p. 230, 1916–1825.

Goniosoma cruciferum A. Milne Edwards, Archiv. Nouv. du Mus. Hist. Nat. Paris, t. X, pp. 371, 385, 1861.—Tozzetti, T., Magenta Crust., p. 82, pl. 6, fig. 2a–8, 1877.—Nauck, Zeits. Wiss. Zool., Bd. 34, p. 61, pl. 1, fig. 27, (gastric teeth), 1880.—Muller, Ver. Naturf. Gesellsch. Basel, Bd. 8, p. 475, 1886.—Miers, Rept. Voy. H. M. S. "*Challenger,*" Zool., vol. 17, p. 191, 1886.—de Man, Archiv. fur Naturges., vol. 53, Abth. I, p. 334, 1887.—Journ. Linn. Soc. Lond. Zool., vol. 22, p. 79, pl. 5, fig. 1, 1887.—Zool. Jahrb. Syst., vol. 8, p. 559, 1895.—Cano, Boll. Soc. Nat. Napol., vol. III, p. 218, 1889.—Walker, Journ. Linn. Soc. Zool., vol. 20, p. 110, 1886–90.—Ortmann, Zool. Jahrb. Syst., Bd. VII, p. 81, 1893–94.—Henderson, J. R., Trans. Linn. Soc. Lond. Zool., ser. 2, vol. 5, p. 374, 1893.—Alcock, Journ. Asiatic Soc. Bengal, vol. 68, pt. 2, p. 51, 1899.

Goniosoma cruciferum Lanchester, Proc. Zool. Soc. London, 1901, pt. II, p. 545.

Charybdis cruciata Kellog, Lingnan Jour. Sci. Canton, vol. 5, p. 353, 1927–1928.—Lingnaam Agric. Review, Canton, vol. II, p. 161, 1925–1926.

Charybdis erythrodactyla (Lamarck), about one half of natural size.

Charybdis erythrodactyla (Lamarck), about one half of natural size.

Charybdis (*Goniosoma*) *cruciata* CHEN, Hong Kong Nat., III, March, 1932, p. 38, text fig. 6, pl. 8.—MCNEILL, Records Austral. Mus. Sydney, vol. 17, p. 149, pl. 37, fig. 5, 1929.

Charybdis (*Goniosoma*) *crucifera* NOBILI, G., Bull. Mus. Torino, vol. 18, art. 453, p. 31, 1903.

Charybdis cruciferus STEBBING, Ann. S. Afric. Mus., vol. VI, pt. 4, p. 306, 1910.

Charybdis erythrodactyla (Lamarck).

Plates 18 and 19.

TYPE: Lamarck's type is deposited in the Paris Museum. It came from Australasia.

DISTRIBUTION: Indian Ocean, (Lamarck; A. M. Edwards); Hawaiian Islands, (Randall); Hawaii: Puaho Bay; Honolulu, market; Waiawa, Kauai; Salomon Island, Amirante, (Rathbun); Red Sea, (Nobili); Sudanese Red Sea, station 7, (Laurie). Tahiti, (Boone).

MATERIAL EXAMINED: One large male, Venus Point Reef, Tahiti, Society Islands, August 15, 1931, collected by the "*Alva.*"

COLOR: See Rathbun, 1903, color plate.

TECHNICAL DESCRIPTION: Carapace slightly more than two-thirds as long as wide, with the frontal margin equal to about one-half of the maximum width of the carapace and cut into six strong, blunt, triangular teeth, which are well separated by wide, U-shaped sinuses. The innermost, or submedian pair of teeth are slightly longer and protrude a little farther forward than the next, or intermedian pair, and the median sinus is also slightly wider than the intermediate pair of sinuses. In each of the latter there is present a small blunt, rudimentary tooth adjacent to the base of the large intermediate tooth and only about one-fourth of its height. The third, or outer, pair of frontal teeth are distinctly the largest of the series, extending farther forward than any of the others and set apart on either side by a wider sinus, that between the third tooth and the inner orbital tooth being slightly the wider. The superior inner orbital tooth is strong, blunt, and does not extend as far forward as either the third frontal tooth, or the conspicuous, inferior inner orbital tooth. The superior orbital margin is thickened and is cut by two distinct, closed sinuses on the outer half and a third closed sinus occurs on the lower margin just beyond the strong outer orbital tooth. This outer orbital tooth is a strong, procurved triangle with thickened edges and with a small, secondary triangular tooth at its base.

The anterolateral margin is cut into four strong, procurved, triangulate primary teeth, in addition to the external orbital tooth. The first anterolateral tooth also has a small secondary triangular, frontal tooth at its base. There are no secondary teeth between the remaining three anterolateral teeth. The fourth, or hindmost, anterolateral tooth is smaller and more acute than any of the others and has a carina running inward from its apex, curving slightly forward on the outer portion of the carapace and then continuing as a nearly straight carina clear across the carapace. There is also an interrupted, transverse carina on the anterior portion of the gastric region and behind it on the posterior gastric region, another short, unbroken transverse carina, which is not quite as long as the interorbital space. The dorsal surface of the carapace is otherwise smooth, except for scattered coarse punctae, moderately convex, with no delineation of the regions except a faint impression of the urocardiac pittings. The postlateral margins are as long as the anterolateral margins, decidedly convergent, and are carinated; the posterior margin is also heavily carinated and curves on either side above the base of the fifth leg.

The sidewalls of the carapace are smooth, with a deep carina on either side, extending from the upper, outer angle of the buccal cavern to a point opposite the secondary tooth. The sternal plastron is wide and smooth. The male belt has the first segment very narrow, hinge-like, the second segment wider but also short and hinge-like, the third article is quite long, composed of three completely fused articles, the third, fourth and fifth segments, the next segment is nearly square with the anterior margin recurved, the terminal segment is small, triangular.

The eyes are well developed. On the upper surface of the eyestalk there is a calcareous plate that terminates in a thickened, rounded margin. The cornea is large, terminally placed, hemispherical, with a narrowed, tonguelike process extending outward upon its upper surface.

The antennulae are well developed and fold almost transversely within the chambers which are separated by a well developed septum.

The antennae have the peduncular article curiously produced into a prominent, rounded tooth which extends outward, and protrudes as far forward as the inferior inner orbital tooth, from which it is separated by a wide sinus. Beyond this antennal tooth the distal portion of the basal joint is produced into a curious, tonguelike proc-

ess that fills the orbital sinus and terminates distally in a tooth-like process that lies between the orbital teeth. The second antennal joint arises above the base of the antennal tooth and is quite small, the flagellum is fine and is about twice as long as the long diameter of the orbit.

The external maxillipeds are smooth, close-fitting, with a brush of fine setae along the inner margin of the ischium and merus. The distal margin of the merus is a little oblique.

The chelipeds are equal in the large male under discussion, with the merus triquetral, its anterior lateral margin armed with three coarse, well separated, triangular teeth, the series increasing in size from proximal to distal. The carpus has its inner angle produced to a very long acute, spine-like tooth, which points obliquely forward and is equal in length to one-half of the length of the carpus; the outer and upper carpal surfaces are channelled, a heavy carina bordering the outer margin and two toothlike carinae above this near the distal end. The palm is high, moderately rounded, with three well spaced, heavy longitudinal carinae, the lower and median of which extend upon the lower finger for the greater part of its length, while the upper carina terminates in a node at the base of the upper finger and above a larger node. Just above the base of this upper carina is a strong, pointed tooth. Midway between the upper carina and the upper margin there are two more strong pointed teeth, one at the distal border and the other well spaced behind it, about midway the length of the palm. The upper lateral margin of the palm has a blunt node proximally and a strong curved tooth midway its length and another similar tooth subdistal. The upper finger is strong, curved, its tip overlapping that of the lower finger, its cutting edge armed with a large molar and several smaller teeth, its upper and outer surfaces striated by three deep longitudinal grooves. The lower finger has its cutting edge armed with four large and several smaller teeth and its tip upcurved.

The second, third and fourth pair of legs are moderately slender, the carpus, propodus and dactyl of each having a longitudinal sulcus on both lateral surfaces. The fifth pair of legs are natatory, with a strong, subdistal spine on the outer lateral margin of the merus; the carpus is short, thick, the propodus and dactyl are widely expanded and rounded. There is one longitudinal sulcus on the propodus and two on the dactyl.

References: *Goniosoma erythrodactylum* A. Milne Edwards, Arch. Mus. Hist. Nat., Paris, ser. 1, t. X, p. 369, 1861. (With early synonymy.)

Thalamita pulchra Randall, Journ. Acad. Nat. Sci. Phila., vol. VIII, p. 117, 1839, issued 1840.

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Charybdis erythrodactyla Rathbun, M. J., Rept. U. S. Fish Comm. for 1903, Bull. 23, pt. 3, p. 872, pl. 4, color plate, 1906; Trans. Linn. Soc. London, ser. 2, vol. 14, pt. 2, p. 206, 1911.

Genus: NEPTUNUS De Haan.

Neptunus (Achelous) granulatus (H. Milne Edwards).

Plate 20.

Type: This was collected in L'ile de France and deposited in the Paris Museum, (H. M. Edwards).

Distribution: Red Sea, (Miers; A. M. Edwards); Djibouti, Aden, Red Sea, Beilul, (Nobili); Red Sea: Tor, Djedda, Rerum, Dahab, Mersa Scheikh, (Balss); Beilul, Reim, (Cano); Persian Gulf, (Alcock); Indian Ocean, Isles of Oceania, (A. M. Edwards); Japan (De Haan); China, Japan, (A. M. Edwards); Liu Kiu Islands, Amami-Oshima, (Richters) Fanning Island, N. Pacific, (Streets); Hawaii: south coast of Molokai Island, surface to 43 to 63 fms.; vicinity of Modu Manu, 20–31 fms.; Hilo; Oahu; Laysan, (Rathbun); Sandwich Islands, (Dana); Trincomali, Ceylon, (Miers); Ceylon, (Miers); Friday Island, Torres Straits, 13 fms., (Miers); Murray Island, Torres Straits, (Calman); Gulf of Manaar: off Ngombo and Mutval Island, (Laurie); Gulf of Martaban, (Henderson); Malabar coast; Andamans; Nicobars, Mergui Archipelago, (Alcock); Maldives: Funafuti, Hadumatti, Suvadiva, Felidu, South Nilander, Male; (Borradaile); Koh Kakdat, Gulf of Siam, (Rathbun); Samboanga, P. I., (Miers); Cebu, P. I., (Thallwitz); Amboina, Malacca, Celebes, (de Man); Java, Samarang, A. M. Edwards); Tahiti, (Richters); Society Islands, Gilbert Islands, Caroline Islands, Paumotu Islands, (Rathbun); Marquesas Islands, (Boone); Fee Jee Islands, (Dana); Fee Jee Islands, Loyalty Islands, Lifu, variety *unispinosus* from the Prince of Wales Channel, 7 fms.; Palm Island, Australia, Admiralty Islands, Rodriguez Island, (Miers); Samoa, (Ortmann) Upolu, Samoa, (Alcock);

Neptunus (Achelous) granulatus (H. Milne Edwards), × 1.

Cape Jaubert, N. W. Australia, 70 ft., (Rathbun); L'ile de France, (H. M. Edwards); Seychelles, (Miers); Cargados Caragos, (Rathbun); Mauritius, (Miers; Ortmann; Richters; Alcock); Réunion, (Hoffman); common on the coasts of New Caledonia, (A. M. Edwards); Dar-es-Salaam, Upanga-Riff, Nosse-Be, Madagascar, (Richters).

Material examined: One male on coral reef, Nuka Hiva Island, Marquesas Islands, August 10, 1931.

Technical description: Carapace about three-fourths as long as broad, depressed, with the surface granulose and finely setigerous. The regions are well separated by deep grooves which cut the surface into a number of well defined moderately convex areolations. The frontal margin is about one-third as wide as the carapace, well delineated, a little receding and protruding beyond the blunt inner superior orbital angles; it is cut into four teeth, the inner or submedian pair of which are quite small, separated from each other, by a deflected median point and from the larger, outer pair of teeth by a shallow sinus; the outer pair of teeth are unequally, widely triangular, protruding and set apart by a V-shaped sulcus from the blunt inner orbital angle. The orbital margin is circumscribed and is cut by two closed sinuses; the outer orbital angle is an uptilted triangulate tooth. The inferior orbital margin is visible dorsally and has one distinct suture near the base of the outer tooth; the inferior inner orbital angle is an uptilted blunt triangular tooth, more conspicuous than, and in advance of, the superior inner orbital angle. The anterolateral margin is slightly oblique and is cut into nine acute, procurved teeth, including the outer orbital tooth, the hindermost tooth being similar to and only a trifle stronger than the others. There is a thick fringe of setae in the spaces between the orbital teeth. The postlateral margins are shorter than the anterolateral, and are slightly excavate, forming a continuous curve with the short posterior margin. The cardiac region is completely circumscribed. The cervical groove runs forward around the gastric region and diverges, uniting with a decidedly curved groove that runs inward from the ninth postlateral tooth, delimiting the anterolateral border from the branchial region. The intestinal region is divided by grooves into a median and two submedian lobules. The sidewalls of the carapace and sternal plastron are smooth. The buccal cavern is squarish, wider than long; the efferent branchial channels are well defined. The male abdominal belt is composed of six articles; the third article having a strong sharp carina along its entire width; the fourth and fifth articles are fused

into one; the terminal article is a small triangle. The female belt is also sharply carinated on the third article.

The external maxillipeds have the outer surface tomentose, with a thicker brush of setae along the inner margins of the ischium and merus. The outer external angle of the merus is produced outwardly or laterally in a curious lobe that lies above the exposed end of the exognath.

The orbits are not fully dorsal; the eyes are of moderate size and have a "perked up" expression by virtue of the cornea being terminally placed and dorsally directed.

The antennules fold transversely within the fossett.

The basal antennal article is characteristically short with its antero-external angle produced into a rounded lobe that lies within the orbital hiatus and is nearly half as long as the second antennal joint; the flagellum is slender, about one and one-half times as long as the long diameter of the orbit.

The chelipeds are equal, about two and one-half times as long as the carapace; the merus projecting slightly more than half its length beyond the carapace, armed with three to five well spaced, acute spines on the anterior margin and with a submedian and a subdistal spine on the posterior border; the carpus has its outer border semicarinate and a distal spine at its outer border; the inner angle is armed with a very sharp spine; the palm is moderately developed, with four complete and one broken longitudinal carinae, the uppermost one forming the upper margin and terminating on a sharp subdistal spine. There is another spine on the palm, at its proximal margin just below the beginning of the second carina. The fingers are nearly as long as the palm, very slender, fluted, the cutting edges toothed throughout their length, the tips decidedly curved.

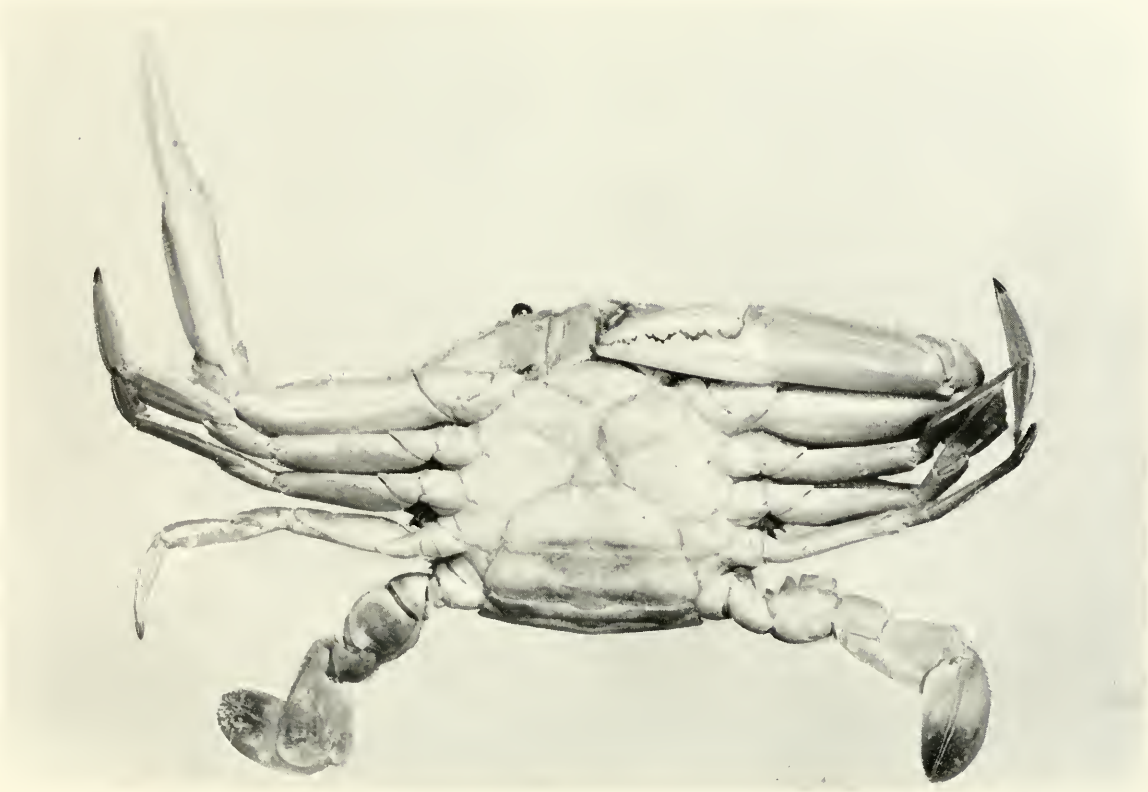
The second, third and fourth pairs of legs are very slender, with long, tapered, fluted dactyli. The fifth pair of legs are shorter with the three proximal articles stout, the propodus and dactyl widely expanded, suboval.

Lupea granulatus H. Milne Edwards, Hist. Nat. Crust., t. I, p. 454, 1834.

Amphitrite gladiator De Haan, Fauna Japon. Crust., p. 65, pl. 18, fig. 1, 1837.

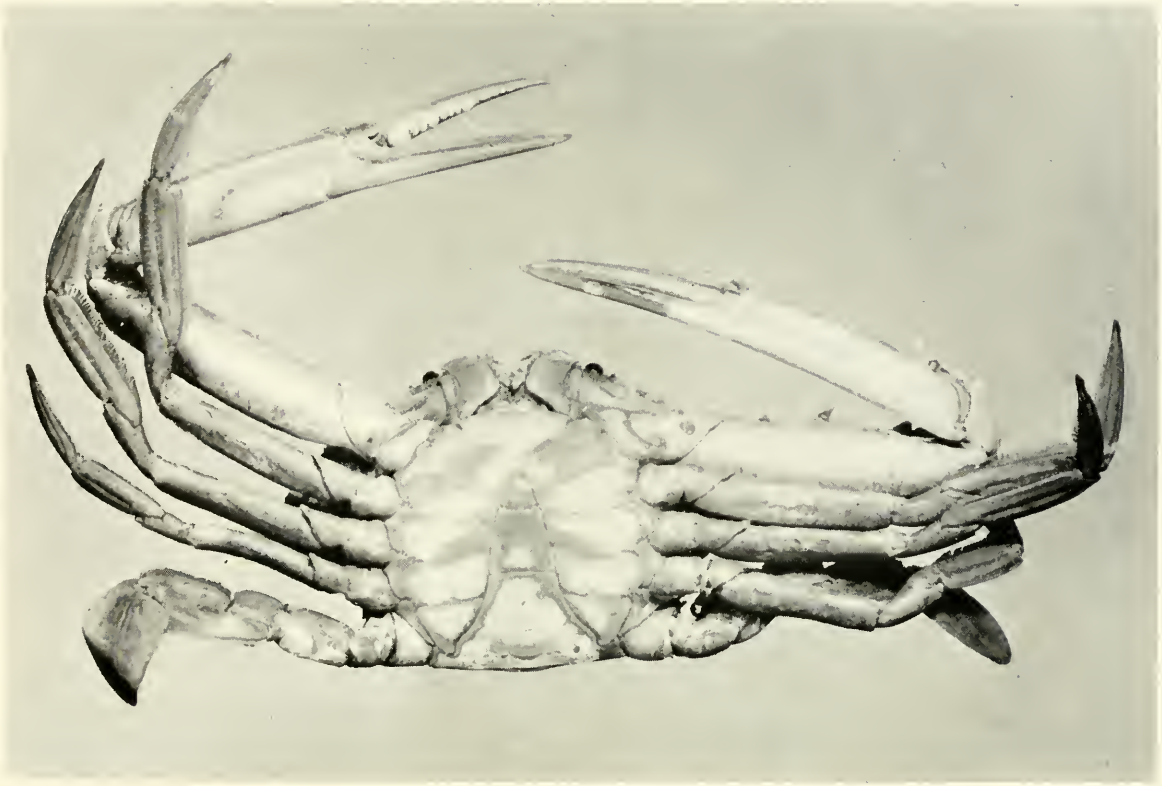
Amphitrite speciosa Dana, Proc. Acad. Nat. Sci. Phila., vol. 6, p. 84, 1852.—U. S. Explor. Exped., vol. XIII, Crust., pt. I, p. 276, pl. 17, fig. 1, 1852.

Neptunus pelagicus (Linné), female, about one half of natural size.



Neptunus pelagicus (Linné), female, about one half of natural size.

Neptunus pelagicus (Linné), male, about one half of natural size.



Neptunus pelagicus (Linné), male, about one half of natural size.

Achelous granulatus A. MILNE EDWARDS, Archiv. Nouv. du Mus. Hist. Nat. Paris, t. X, p. 344, 347, 1861. Also in Maillard's l'ile Réunion, Annexe F, p. 2, 1862; Nouv. Arch. Mus. Hist. Nat. Paris, ser. 2, t. IV, p. 70, 1868; *ibid.*, t. IX, p. 161, 1873.—STREETS, Bull. U. S. Nat. Mus., vol. 7, p. 109, 1877.—MIERS, Phil. Trans. Roy. Soc. Lond., vol. 168, p. 488, 1879.—Zool. Coll. H. M. S. "*Alert*," pp. 230, 538, 1884.—RICHTERS, in Mobius' Meeresf. Maurit. p. 152, 1877.—MULLER, Verh. Naturf. Gesell. Basel, VIII, p. 475, 1886.—DE MAN, Archiv. f. Naturges., Bd. 53, Abth. I, p. 331, 1887.—CANO, Boll. Soc. Nat. Napol., vol. III, p. 214, 1889.—HENDERSON, J. R., Trans. Soc. Zool. Lond., ser. 2, vol. V, p. 371, 1893.

Neptunus (*Achelous*) *granulatus* MIERS, Rept. Voy. H. M. S. "*Challenger*," vol. 17, p. 180, 1886.—THALLWITZ, Abh. Zool. Mus. Dresden, Bd. no. 3, p. 48, 1890–91.—ORTMANN, Zool. Jahrb. Syst., Bd. VII, p. 72, 1893–94.—In Semon's Zool. Forschungr. in Australien, (Jena Denk., vol. VIII), Crust., p. 45, 1894–1903.—DE MAN, Zool. Jahrb. Syst., vol. VIII, p. 558, 1894–95.—ALCOCK, Journ. Asiatic Soc. Bengal, vol. 68, pt. 2, p. 45, 1899.—BORRADAILE, Proc. Zool. Soc. London, pt. 2, 1900, p. 578; Faun. and Geogr. Maldive and Laccadive Arch., vol. I, pt. II, p. 208, 1902.—CALMAN, W. T., Trans. Linn. Soc. Lond. Zool., vol. 8, p. 21, 1900–1903.—NOBILI, Ann. Sci. Nat. 9 ser. Zool. t. X, p. 193, 1906.—LAURIE, R. D., Ceylon Rept. Pearl Oyster Fish., vol. V, p. 416, 1906, London.

Portunus (*Achelous*) *granulatus* RATHBUN, Rept. U. S. Fish Comm. for 1903, Bull. 23, pt. 3, p. —, 1906; Mem. Mus. Comp. Zool., vol. 35, p. 60, 1907; K. Danske Vid. Selsk. Skr., 7th raekke, Bd. 5, p. 362, 1910; Trans. Linn. Soc. London, ser. 2, Zool. Vol. 14, p. 205, 1911; Archiv. fur Zool. K. Svenska Vetensk. Bd. 16, p. 23, 1924.—EDMONDSON, Bull. B. P. Bishop Mus., vol. 5, p. 22, 1923.—BALSS, H., Denksch. Akad. Wissensch. Wien, Bd. 99, p. 3, 1924.

Neptunus pelagicus (Linné).

Plates 21, 22, 23 and 24.

TYPE: Linné's type came from the "Seawrack of the Ocean." Present depository not known.

DISTRIBUTION: This exquisite swimming crab is widely distributed in the Orient, having been reported from Japanese waters down through Oceania and the Australian coasts, the South African coast, the coasts of India, the Persian Gulf and even in the Red Sea.

"Seawrack of the Ocean," (Linné); Suez, (Forskal); East Indies, (Herbst); Oriental Indies, Pondichery, shores of New Holland, (Latreille); "all the Oceans," (Latreille); Egyptian Seas, (Savigny); Seas of the Indies, (Bosc); Red Sea, (Desmarest); Singapore, East Indies, (Dana); China Sea, (Stimpson); Bay of Karak, (Heller); Zanzibar, Madagascar, Red Sea, Isles of the Indian Ocean, New Caledonia, (A. Milne Edwards); Madras, Singapore, Java, Manila, Hongkong, Tahiti, (Heller); Gulf of Marseilles, (Brocchi); New Zealand, China, Japan, Celebes, Badjoa, Borneo, Baudjermasin, Shark Bay, West Australia, (Miers); Bombay, Moluccas, Macassar, Port Jackson, Australia, (Hess); Red Sea, (Kossman); Mozambique, (Hilgendorf); Djeddah, Arabia, (de Man); Red Sea, (Cano); Porto Cavite, Chonos, Chiloe, (off Chile); Tuticorin, Ceylon, Sind, Akyab, Malabar, (Henderson); Amboina, Thursday Island, (Ortmann); many specimens are in the Calcutta Museum, from all parts of the Indian Seas, from Penang to the Persian Gulf, also from Japan and China, (Alcock). Brisbane, Australia, Noumea, New Caledonia, Simbawa, Dutch East Indies, Penang, Malay Straits, (Boone); Amboina; Geelvink Bay; Pondichery; Mahe; Samarinda, Borneo; Singapore; Red Sea: Massaouah, Abdelkader, ile Scheik-Said, iles Dahlak; Obock; Suez; Assab and Aden, (Nobili); Natal Bay, (Stebbing); China Coast, (Kellogg); Gulf of Manaar, (Henderson; Gravely and Raj); "very abundant in the outer part of Tale Sap, a lake on the east coast of the peninsula of Siam; young taken in the channel opposite Singgora and around Koh Yaw, depth 3 to 4½ meters, usually among dead shells, (S. Kemp); Gulf of Siam: Lem Ngob, coast; Koh Kong, outside of mangroves; Koh Chang, (Rathbun); New channel, mouth of Brisbane River, Moreton Bay, Queensland, (McCulloch and Etheridge).

Material examined: Two very large males taken at Brisbane, Australia, September 23, 1931. Two very large males, Noumea, New Caledonia, September 19, 1931. One small male, Bima Village, Simbawa, Dutch East Indies, October 23, 1931. Two females, one ovigerous, Georgetown, Penang, Malay Straits, November 13, 1931. One large male, Bima Village, Simbawa, Dutch East Indies, October 23, 1931.

Technical description: Carapace ovate but little convex, about one-half as long as wide, with the lateral spines acute but not so greatly elongated. The true frontal margin is about one-fifth of the greatest width of carapace (exclusive of the lateral spines), and is cut into four shallow teeth, the inner or submedian pair of which are

slightly smaller and closer together, sometimes being confluent or obsolete; the outer pair are wide triangles and are separated by a distinct notch from the preorbital tooth which is also triangular and subequal to the outer frontal tooth; the superior orbital border has two closed sinuses, with the margins slightly dentiform at the points; the outer orbital spine is acute, triangular. The inferior orbital border has one sinus near the outer angle and is produced substantially in advance of the orbit, so that the latter has a dorsal inclination. The inferior inner orbital tooth is triangular, subequal to the outer orbital and very prominent dorsally, being far in advance of the superior tooth. The median, spinelike process of the epistome is also very strong and projects far in advance of the submedian frontal teeth and between them. The anterolateral margins are long, sloping obliquely, very little convex and cut into eight teeth in addition to the postorbital tooth; the first eight teeth are short, wide, triangulate, with acute tips, the posterior four being slightly larger than the anterior three teeth, while the last or lateral tooth is four or five times as long as the preceding one and quite acuminate; the posterolateral margins are about as long as the anterolateral margins, smooth, concave, forming a curve confluent with the posterior margin, which is smooth in young specimens, but finely carinate in very large ones. The interstices between the anterolateral teeth are filled with short, coarse setae. The regions of the carapace are not especially delineated, except the urogastric and cervical depressions. The entire dorsal surface of the carapace is covered with coarse miliary granules; there are two transverse lines of these granules on the gastric region, and on the branchial, there is, one on each side, a curved line of granules extending inward from the lateral tooth.

The epistome is quite linear, produced into the above described median spine. The buccal cavern is squarish, a trifle wider than long. The efferent branchial channels are sharply defined. The sternal plastron is smooth, the male belt is triangular, with the second and third segments transversely carinate; consisting of five articles, the second, third and fourth articles being fused. The female belt is seven-segmented, widely ovate.

The eye is dorsal in position, with a very short stalk and large hemispherical cornea, set obliquely terminal and possessing excellent peripheral vision.

The antennulae are very slender and fold obliquely within the fossett, which is well separated by the thick septum, immediately below which the spine of the epistome projects.

The antennae have the basal peduncular article very short, with its outer distal angle produced to form a spinule that closes the orbital sinus; the second peduncular article is substantial, wide and elongate, the third smaller; the flagellum is about one and two-thirds times the length of the long diameter of the orbit.

The external maxillipeds are squarish, close-fitting, with the exopodite rodlike, extending to midway the outer margin of the merus; the ischium has a longitudinal sulcus on the outer surface, the inner lateral margin setose, the distal margin sinuate; the merus is two-thirds as long as the ischium, with the inner distal margin rounded, and the outer distal margin rounded and sort of truncate; the palp is quite setigerous along the lateral margin; the basal article stout, the other two articles tapered.

The chelipeds of the large old males are three or more than three times as long as the carapace, while those of the females and younger males are about two and one-half times as long as the carapace; the ischium is armed with a spine at the inner distal angle; the merus is trigonal and there are three evenly spaced, acute, procurved spines along the anterior lateral margin; there is a spine at the outer distal angle of the merus and a blunt node at the upper distal angle and a larger blunt protuberance at the inferior distal angle. The carpus has a spine each at the outer and inner distal angles. The upper surface has three curved carinae and a fourth carina occurs along the outer lateral margin terminating in the above mentioned spine; the propodus has the palm about as long as the merus, and the pointed fingers almost as long as the palm; there are two longitudinal costae on the upper margin, each terminating in a sharp spine, the upper one of which is the larger. There is also a strong spine on the outer face proximally, adjacent to the median angle of the carpus and just above the third costa which terminates distally midway the base of the upper finger; below this and parallel to it is the fourth costa which terminates anteriorly between the bases of the fingers. A fifth costa extends along the lower margin, from near the base of the palm, to the tip of the propodal finger; on the inner surface of the palm there is a sixth carina, median in position. The fingers are tapered, slender, meeting throughout their length, with a series of teeth consisting of a large triangular tooth, flanked on either side by a similar small tooth, there being four or five large teeth on each finger and twice as many secondary teeth; the finger tips are curved, pointed, overlapping. These costae are all granulose.

The second, third and fourth pairs of legs are slender, decreasing in length in the order named; the carpus has near the distal end of its posterior lateral margin a small spine, on each the second and third legs but not on the fourth pair. The propodus has one longitudinal groove and the dactyl two grooves, on each lateral face; the inferior margins of both these articles are setose; the dactyli are long, very tapered, acuminate.

The natatory legs are very stout and a subdistal spine on the anterior lateral margin of the meral joint; the propodus and dactyl are laminate, subovate.

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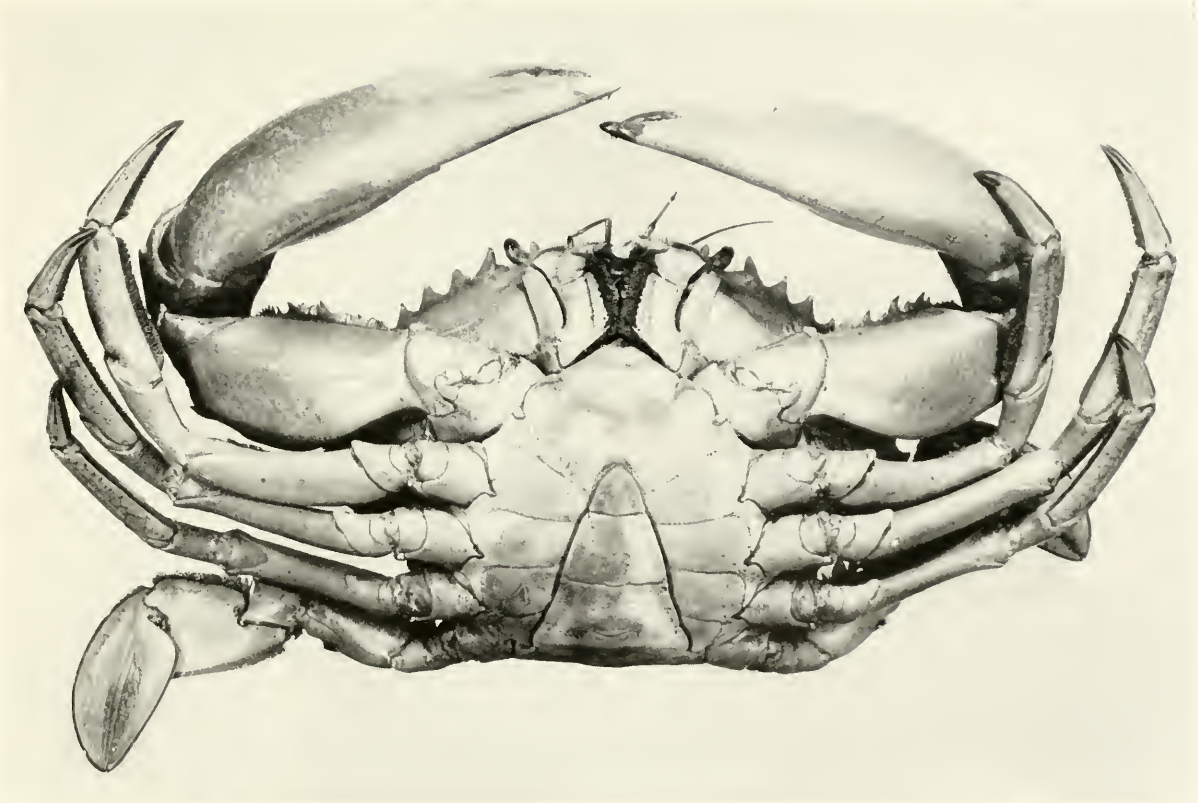
Genus: **SCYLLA** De Haan.

Scylla serrata Forskal.

Plates 25, 26, 27, 28, 29 and 30.

Type: This was collected in the Red Sea; the depository is believed to be the Copenhagen Museum.

Scylla serrata Forskal, male, about one third of natural size.

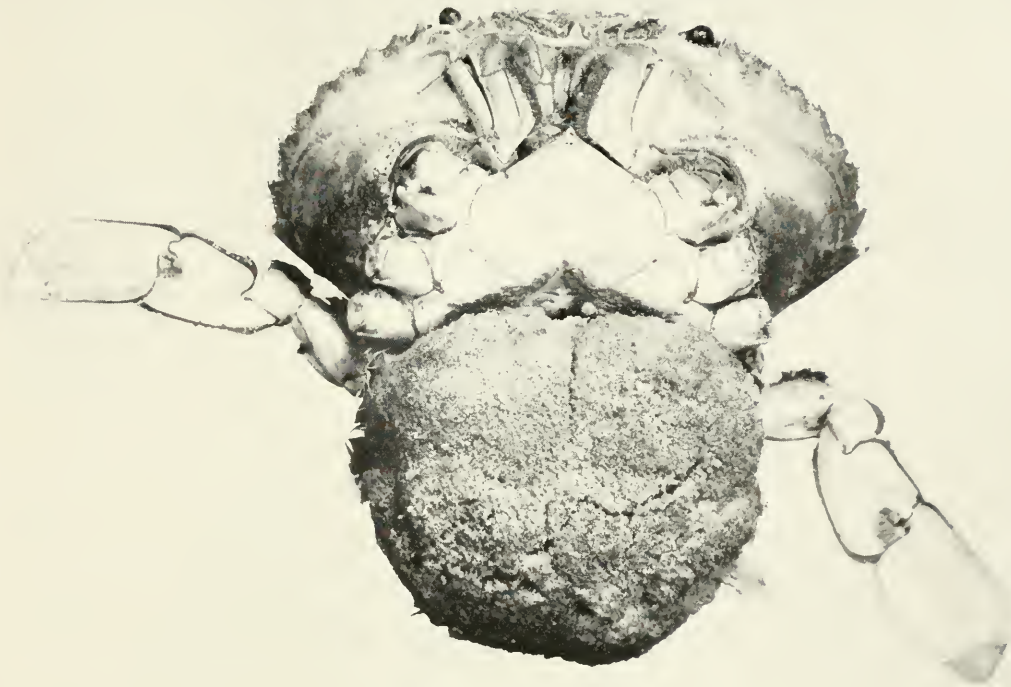


Scylla serrata Forskal, male, about one third of natural size.

Scylla serrata Forskal, female, about one third of natural size.

Scylla serrata Forskal, female, about one third of natural size.

Scylla serrata Forskal, ovigerous female, about one third of natural size.



Scylla serrata Forskal, ovigerous female, about one third of natural size.

Color: Blackish green with brown and white markings and spots, (Stebbing). Olive brown, (several writers).

Distribution: Red Sea, (Forskal, A. M. Edwards, Cano, Hess); Assab, Red Sea, (Nobili); seas of Asia and of Oceania, (H. M. Edwards); Indian Ocean, (Herbst; Fabricius); Ceylon, (Heller; Henderson); Madras, (Heller); abundant in the Indian backwaters, (Henderson); Bombay, Pondichery, (Hess); Krusadai Island, (Gravely and Raj); Pondichery, Mahe, Malabar coast, (Nobili); Port Canning, estuary of Matla River, Lower Bengal, (de Man); fossil in the upper Tertiary beds at Hathrab, Bhavanagar (Kathiawar), India, (Das Gupta); Nicobar Islands, (Heller); in brackish waters about Canton, China, Loo Choo Islands, (Stimpson); Hong Kong, China, (Miers); Amoy, Hankow and Shanghai, (Gee; Kellogg); Shanghai, Hankow, Manchurian and southeast Siberian coast, (Balss); Shanghai, (Doflein); Kochi, Japan, (Ortmann); Japan, (de Man); Singapore, (Dana; Cano; Nobili); abundant in the mangroves and on the coast at Lem Ngob, Gulf of Siam, (Rathbun); Tale Sap, a lake on the east coast of the Malay Peninsula; abundant; young found in ditches of brackish water and in mangrove swamps, (Kemp); Luzon, Philippines; Bali and West Borneo, (Miers); Merauke, New Guinea, (Roux); Java, Enkhuizen Island, Batavia Bay, Edam Island, Macassar Bay, Celebes, (de Man); Flores, Celebes, (Thallwitz); Amboina, (Nobili); Java; Macassar, (Hess); Fee Jee Islands, Vanua, Levu and Bau; Tahiti, Papeete, Society Islands, Dukhun, (Miers); Salanga Island, Upolu, Samoa, (Ortmann); Port Dennison, Port Jackson, etc., Australia, (Miers); subfossil, New Channel, mouth of Brisbane River, Moreton Bay, Australia; wharf at Derby, Fitzroy River, N. W. Australia, (Etheridge and McCulloch). Habits of the giant mangrove swimming crab of an Australian beach, (Whitely and Boardman); Auckland, New Zealand, (Heller); Auckland Bay, (de Man); New Zealand, (A. M. Edwards); New Holland, (Hess); Mayotte, Réunion Isle, (Hoffman); Mauritius, (Ortmann; Miers); common on the coasts of New Caledonia and frequents the marshes of Noumea, (A. M. Edwards); New Caledonia, (Miers; de Man); Mozambique, (Hilgendorf); Mozambique, between tidemarks, (Miers); Port Natal, South Africa, at the mouth of Swartkopf's River; Dukhun, (Miers). Macleay, 1849, states: "It has only been known as yet, (in South Africa), to occur in deep holes, which it makes in the mud islands, near the mouth of the Swartkopfs River, islands that are only visible at low water." Stebbing states: "At home at the mouths of

little brooks, Natal Bay, South Africa. Durban Bay, South Africa," (Stebbing); Natal, (Krauss).

MATERIAL EXAMINED: Three large males, taken at Tara Bay, Huahino, Society Islands, south Pacific Ocean, August 19, 1931. Another large male, taken at Venus Point Reef, Tahiti, Society Islands, August 15, 1931. Two medium size females, one of which is ovigerous, Bima Village, Sumbawa Islands, Dutch East Indies, October 23, 1931. One medium size female, Georgetown, Penang, Malay Straits, Nov. 13, 1931. Another female, slightly smaller, from the same locality. Two small specimens, Surabaya, Java, October 28, 1931, (male and female). Two small males from the same locality. One large male, Tara Bay, Society Islands, August 19, 1932. Another small male from the same locality, August 19, 1931. Another large male from the same locality, August 19, 1931. Another large male, taken at Venus Point Reef, Tahiti, Society Islands. One male, medium size, Georgetown, Penang, Malay Straits, November 13, 1931. Another medium size male, from the same locality, November 11, 1931. One male and one female, Noumea, New Caledonia, September 19, 1931.

REMARKS: This is the large edible crab of Asia and Oceania.

ADULT MALE: Carapace averaging between two-thirds and three-fourths as long as wide, moderately convex, regions scarcely delineated, except the paired depressions of the urogastric region. Surface smooth, except for a light granular ridge on each branchial region, extending obliquely inward from the ninth lateral tooth. There is also a light, granular arc with its ends directed forward, on the mesogastric region. This arc may be nearly obsolete on large old specimens. The frontal region, including the preorbital teeth, is scarcely one-fourth as wide as the greatest width of the carapace and is cut into four stout, subequal, triangular teeth, in addition to the two, similar, but a trifle blunter, upper, preorbital teeth. The lower preorbital tooth is quite prominent in a dorsal view of the crab, situated below and beyond the upper orbital tooth and extending farther forward than any of the upper orbital teeth. The upper orbital margin is cleft by two, conspicuous, nearly closed sutures. The anterolateral margin is oblique, widely curved, about a third longer than the postlateral margins, and including the postorbital tooth is cut into nine approximately equal stout, triangular teeth, each of which has the tip directed obliquely forward; the spaces between the teeth are widely excavate. The shorter posterolateral margins are confluent with the posterior border, forming a curve, and slightly thickened in

large crabs, where the postlateral and posterior margins join. The sidewalls of the carapace, near to the proximal joints of the legs, are covered with coarse setae. The epistome is wide, not sunken. The buccal cavern is squarish, wider than long, the efferent branchial channels are deep but are not emphasized by ridges. The external maxillipeds are close-fitting, the ischium with an oblique, longitudinal sulcus on the outer face and with its inner lateral margin bearing a dense brush of setae. The merus is oblique, but does not have its antero-external angle produced laterally. The sternal plastron is widely oval, smooth, with a few short setae along its lateral edges. The male belt is a wide, blunt tipped triangle, composed of five segments; the first of which is very short, hinge-like, nearly concealed beneath the margin of the carapace; the second segment is clearly defined, about three times as long as the first segment; the third, fourth and fifth segments are fused, with only two faint, transverse lines indicating their fusion; the sixth segment is about as long as wide; the tip is triangulate, blunt. The female belt is widely oval, with setose margins.

The antennulae are rather slender, when extended do not reach to the base of the cornea; they fold nearly transversely and are separated by a prominent interantennulary septum.

The antennae have the basal article short and broad, with its outer distal angle produced into a rounded lobe that extends into the orbit; the flagellum, which is about twice the length of the long diameter of the orbit, is situated in the orbital hiatus.

The chelipeds are very massive in the large males, being about 1.8 times as long as the carapace is wide; the merus three-sided, extending the distal half of its length beyond the carapace; its anterior lateral margin armed with three coarse spines and its posterior lateral margin armed with a distal spine and sometimes a spine further back; the carpus is rounded on the upper surface and has a strong acuminate tooth at the inner angle and two well spaced, short spines on the outer margin; the palm is massive, the outer surface moderately convex, its height equal to about two-thirds its length, neither prismatic nor costate, but with a single sharp spine at the upper proximal border and two, lesser, well spaced, subdistal spines on the upper margin near the base of the finger; there is a similar spine on the inner surface of the palm, about midway its height and above the base of the pollex. The fingers are stout, about two-thirds as long as the palm, with a wide gape, meeting only at the pointed tips. The upper finger

is quite curved and has a very large basal molar, followed by a series of three medium size and two very small teeth. The lower finger has three large teeth and four or five smaller ones. There is a faint, longitudinal groove on the outer surface of the upper finger.

The second, third and fourth pairs of legs are slender, smooth, the meral and carpal joints, compressed cylindrical; the propodus and dactyli much more compressed and having their lateral margins fringed with short setae; the dactyli are long, tapered, with two deep, longitudinal grooves on the lower surface and one on the upper surface. The fifth pair of legs have the proximal joints stout, the propodi and dactyli flattened into subovate, wide swimming paddles, margined by a dense fringe of setae.

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Thalamita prymna (Herbst), male, × 1.

Thalamita prymna (Herbst), male, ×1.

Thalamita prymna (Herbst), female, × 1.

Thalamita prymna (Herbst), ovigerous female, × 1.

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Genus: **THALAMITA** Latreille.

Thalamita prymna (Herbst).

Plates 31, 32, 33 and 34.

Type: Herbst's type was collected in the East Indies and is deposited in the Berlin Museum.

Distribution: In addition to the type locality, this species has been taken in the Red Sea, (Ortmann), Djeddah, Red Sea, (de Man); Tor, Djeddah, Cameran, Zebejir Island, Red Sea, (Balss); several places in the Red Sea, (Nobili); Elphinstone Island, Owen Island and King Island, Mergui Archipelago, (de Man); Rameswaram, common between tidemarks, Tuticorin, Madras, (Henderson); Mysore, (Thallwitz); Minikoi, reef, (Borradaile); Krusadai Island, Gulf of Manaar, (Gravely); Flinders Entrance, near Mer, 20 to 30 fms., channels between reef, Murray Island, 15 to 20 fms., Torres Straits, (Calman); Java, Sumatra, (A. M. Edwards); Pulo Edam and Onrust, Java, Batavia Bay, Palos Bay, west Celebes, Amboina, (de Man, Leyden coll.); Celebes and Timor, (Thallwitz); Makassar, Celebes, (Schenkel); Tjilatap, Java, (Pesta); Malay, Ternate, Tongatabu, on reefs, (Miers); Singapore, (Rathbun); Amboina, Tahiti, Samoa, (Ortmann); Fee Jee Islands, (Dana); Sarong, Dutch New Guinea, (Rathbun); Australia, (Haswell; Hess; A. M. Edwards); Norah Head, New South Wales, 32 fms., (Whitelegge); Mayotte, Réunion Isle, Mauritius, (A. M. Edwards); Chaland, Port Louis and Grand Port, Mauritius, (Bouvier); Egmont, reef, Cargados, reef, Seychelles, Coetivy, (Rathbun); Madagascar, (Pesta); Nosse Be and Nosse Faly, Madagascar (Hoffman); east coast of Madagascar, (Gravier); Delagoa Bay, Portuguese East Africa, (Barnard); Zanzibar, Kokotoni, Bawi, East Africa, (Balss); South Africa, (Stebbing); Hawaiian Islands, (A. M. Edwards); Palmyra Island, (Streets); Fanning Island, (Edmondson); Japan, China, Loo Choo Islands, Cochin China, (A. M. Edwards); Tokio Bay, Japan, (Ortmann); Sagami Bay, Japan, (Doflein); Formosa, (Pesta); Loo Choo Islands, (Stimpson).

Material examined: Fifteen specimens, including ovigerous females, non-ovigerous females and males, collected on coral reef, Falcon Island, Palm Islands, Queensland, Australia, October 7, 1931.

Color: Violet and green with brownish green spines.

Technical description: Carapace trapezoidal, about one and one-half times as wide as long, with the frontal margin very wide, equal to about 1.1 times the length of carapace and cut into six very shallow, blunted teeth, in addition to the well separated preorbital teeth, each of which is nearly twice as wide as the adjacent frontal tooth, and is produced to a slightly deflected right angle. The orbital margin is a wide arc incised by two closed sinuses. Including the postorbital tooth there are five acute teeth on the anterolateral margin, the post-

orbital tooth is slightly the largest of the series, the second and third teeth being almost as large, while the fourth tooth is conspicuously the smallest of the series; the fifth tooth being almost as large as the third and more acuminate, with a beaded carina running inward from its apex entirely across the carapace. The urogastric groove is deep and confluent on either side with the groove that defines the cardiac region and terminates anteriorly at the above-mentioned transverse ridge. Between the postorbital tooth and the second tooth there is a beaded line that curves inward to a point behind the preorbital tooth where it unites with a prominent transverse beaded carina that extends completely across the mesogastric region. Anterior to this there is an interrupted beaded carina that arises from the same point as does the preceding carina, but curves forward, forming a short arc with the ends directed backward and is interrupted for a distance equal to the width of the submedian pair of frontal teeth and then forms a similar arc on the other half of the carapace. Anterior to this and halfway between it and the frontal margin are a pair of short curved carinae, that somewhat resemble the submedian pair of teeth. Except for marginal bare spaces adjacent to the ridges, the entire dorsal surface of the carapace is finely tomentose, as are also the sidewalls of the carapace. The sternal plastron is smooth. The male belt is triangular, narrow, composed of five segments, the second to fifth segments inclusive being fused. The female belt is shield-shape, with the lateral margins a series of scallops, due to the curvature of the lateral margin of each segment; it is composed of seven segments, the first of which is nearly concealed; the second and third segments are hinge-like; the fourth, fifth and sixth segments successively increase in length; the seventh article is a small, shallow triangle. The eggs are very minute, a single female carrying 8000 to 10,000 in a clutch.

The eye has a short, calcareous stalk and a moderately large hemispherical cornea, set obliquely-terminal.

The antennulae fold almost transversely within the fossett; the interantennulary septum is wide. The outer, lower margin of the fossett forms a wide scallop, not unlike the frontal tooth above it.

The antennae arise beneath the sixth frontal tooth and lie within the sulcus between the preorbital tooth and the ridged granular process that arises from the first peduncular segment and completely fills the orbital hiatus; the second and third peduncular articles are short, bulbous; the flagellum is multiarticulate, about one and one-half times the long diameter of the orbit.

The external maxilliped has the merus with the inner dostal border oblique and the distal margin nearly transverse and the outer distal angle produced into a moderate rounded lobe.

The chelipeds are equal in both sexes. They are about twice the length of the carapace, with the merus extending beyond the carapace for the distal two-fifths, three-sided, armed along the inner lateral margin with a series of four or five acute spines, that increase in size towards the distal end of the joint; the exposed upper end of the merus is setose and also transversely ridged; the carpus has a very strong spine at its inner distal angle; the upper surface is broken by several beaded carinae, two of which run along the outer margin and terminate anteriorly in two small spines, one at the outer distal angle, the other above it, on the distal margin; a third spine occurs above the second but some distance back from the distal margin; the palm is sculptured by five longitudinal distal costae as follows: one, only lightly beaded, extending the length of the palm and lower finger, along the outer, lower margin; a second, stronger costa extending the length of the palm and terminating at a point opposite the base of the lower finger; a third definite, but less conspicuous costa above the second and more granulose, having proximally just above it, a strong spine; a fourth costa extends from just above this spine to the base of the upper finger and bears another spine about three-fifths of its length and terminates in a slightly smaller spine distally; the fifth costa extends along the upper margin of the palm as a ridge that terminates slightly in advance of the middle in an acute spine and is followed by another short ridge which terminates in a second acute spine subdistally. The sixth costa extends midway the length of the inner surface of the palm. The upper half of the outer surface of the palm is covered with coarse granules in between the costae. There is also a fine pilosity between the carinae on both carpus and propodus. The fingers are three-fourths as long as the palm, the tips overlapping; the upper finger being much down-curved; the fingers of the larger claw have a moderate gape; the upper finger bearing a very large, subbasal molar and a few small teeth on the distal half. This lower finger has a gape basally and several triangular teeth on the distal half. The fingers of the smaller cheliped meet throughout their length and have the cutting edges fitted with triangular teeth that interfit. Both fingers are grooved on both inner and outer surfaces.

The second, third and fourth pairs of legs are subequal, very slender, with the upper lateral margin of the merus fringed with

setae; the propodus with two longitudinal grooves on each lateral surface; the dactyl, which is very slender and acuminate, is almost as long as the merus, is fluted, having three carinae separated by two grooves on each lateral surface, and with both margins setose. The fifth pair of legs are fairly stocky; the merus with a strong, subdistal spine on its outer lateral margin; the propodus and dactyl are only moderately expanded, suboval, with setigerous margins.

REMARKS: It is of interest to note that of the fifteen specimens before me, ranging in size from less than one inch carapace width to two and a quarter inches, only three specimens have the fourth antero-lateral spine equally developed on opposite sides of the carapace. In two specimens this fourth spine is about as large on one side as the adjacent third spine, while on the opposite side, the fourth spine is a mere spinule. In four specimens, including one of the largest in the series, the fourth spine is so rudimentary on both sides that it appears obsolete, being concealed in the setae. In only four specimens is the fourth spine developed about equally on both sides of the carapace and visible as a distinct small spine. In the other five specimens the fourth spine is variously medium size on one side of the carapace to practically obsolete on the related opposite side.

Likewise there is much variation in the granulation of the ridge of the antennal process of the first peduncular segment. In some crabs this ridge is nothing more than a heavy blunt ridge; on the majority the ridge is beaded irregularly by coarse granules, while on a few the granules are produced into conical spinules.

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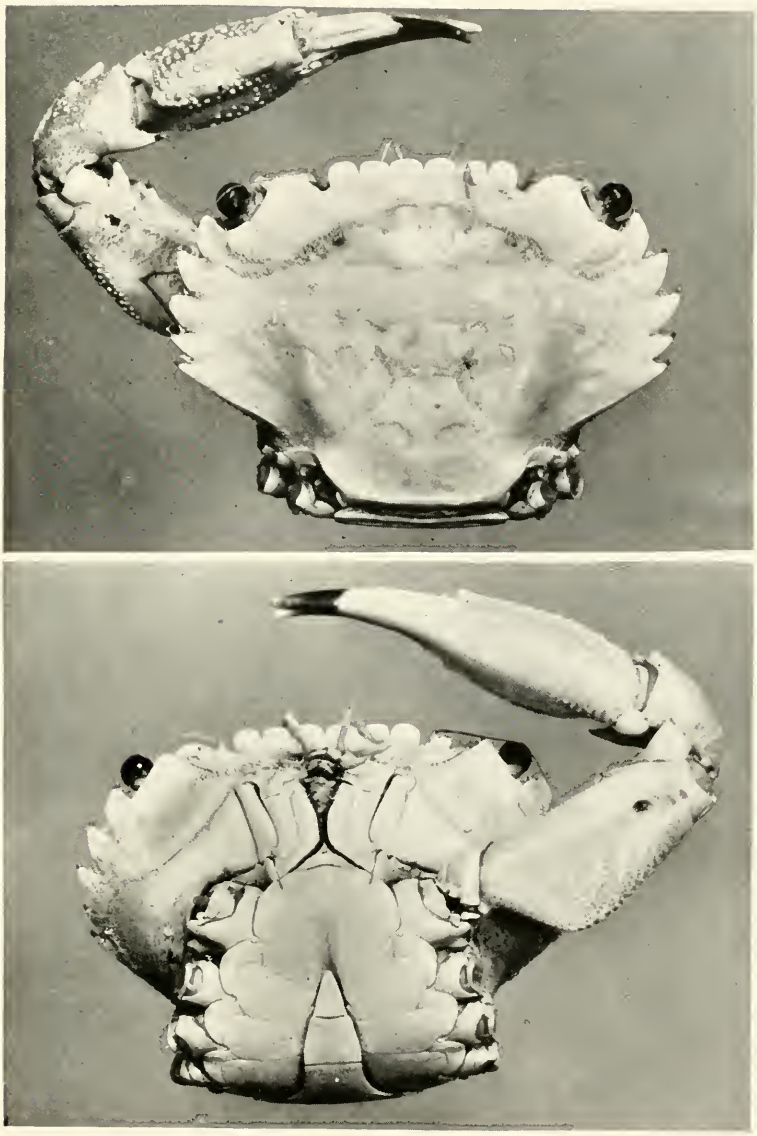
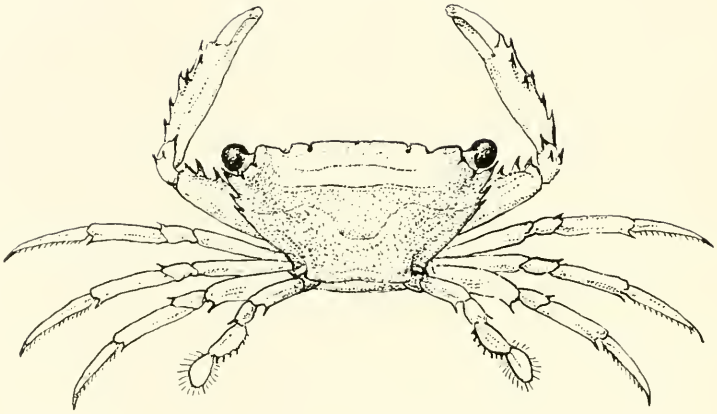
Thalamita coerulipes Jacquinot.

Plate 35.

TYPE: This was collected on the coasts of Mangavera Island, Pacific Ocean, by "*L'Astrolabe*" and "*Zélée*" and originally deposited



Thalamita coerulipes Jacquinot and Lucas, × 1.



Thalamita (Thalamitoides) tridens A. Milne Edwards, ×2.

in the Jardin des Plantes and now in the collections of the Paris Museum d'Histoire Naturelle.

DISTRIBUTION: Mangavera Island, South Pacific Ocean; Oahu, Hawaii (1864); Fakarava Island, Paumotus; Bora Bora, Society Islands; Kamaka, Mangareva.

MATERIAL EXAMINED: Two large males, collected on Muller's Reef, Bora Bora Island, Society Islands, August 24, 1931, by the "*Alva.*"

COLOR: Jacquinot's color plate shows the carapace and legs of this crab to be light olivaceous yellow with brownish vinaceous tinting. The legs are banded with deep blue; the outer surface of the chelipeds is deep blue with vinaceous tints on the spines; the claws are slaty black.

TECHNICAL DESCRIPTION: These specimens are identical with the above-described Australian specimens of *Thalamita prymna* (Herbst) except in the following points:

(a) The six frontal teeth are moderately incised and the preorbital tooth is also more incised and has its frontal border more rounded.

(b) The fourth tooth of the anterolateral margin is not smaller than the others of the series.

(c) The ridge on the process of the first peduncular article of the antenna has two spines each on the inner half.

REFERENCES: *Thalamita coerulipes* JACQUINOT, in Jacquinot and Lucas, Voyage au Pole Sud, "*L'Astrolabe*" et "*Zélée,*" 1837–1840, Zool. III, part Crustacea, p. 53, 1853; Atlas, pl. 5, fig. 6, 1842–53.—RATHBUN, M. J., Bull. U. S. Fish. Com. for 1903, p. 873, 1906; Mem. Mus. Comp. Zool. vol. 35, p. 63, 1907.—NOBILI, G., Torino, Mem. Acad. Sci. ser. 2, vol. 57, p. 383, 1907.

Thalamita (Thalamitoides) tridens A. Milne Edwards.

Plate 36.

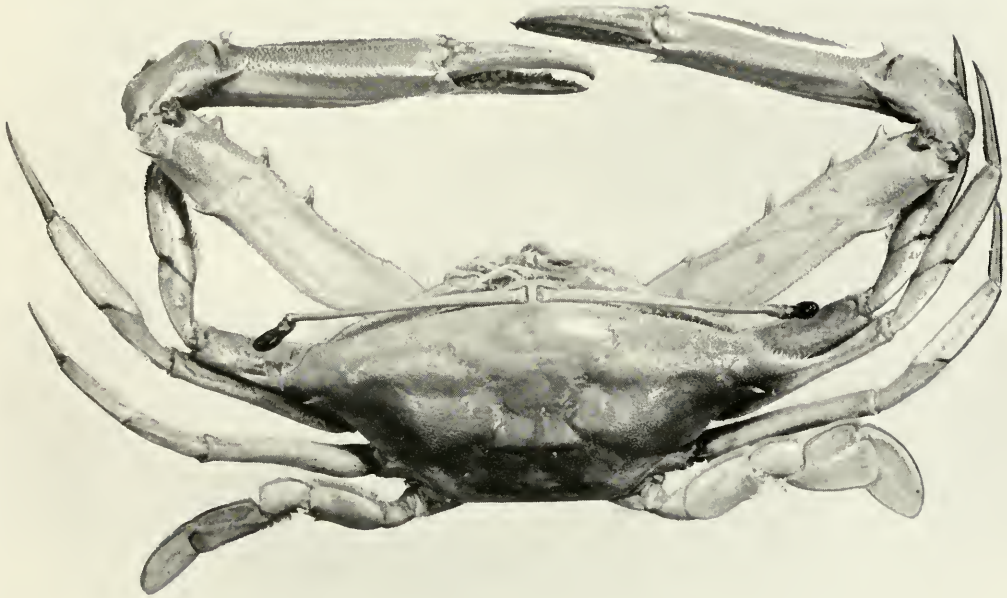
TYPE: Collected at Tullear, on the southeast coast of Madagascar; deposited in the Paris Museum. Dr. Milne Edwards also states that it is found in the seas of Oceania and at Upolu, Samoa, as evidenced by material deposited in the museum of M. Godeffroy, at Hamburg.

DISTRIBUTION: Seas of Oceania; Tullear, S. E. coast of Madagascar; (A. M. Edwards); Upolu, Samoa, (Alcock); Pago Pago, Samoa, (Boone); Red Sea, (de Man).

Material examined: One male, Pago Pago, Samoa, September 2, 1931, by the "*Alva.*"

Technical description: Carapace trapezoidal, very wide anteriorly, twice the length; the posterior width about equal to the length; the interorbital margin very wide, the orbits occupying the anterolateral angle. The true frontal margin is equal to slightly more than one-half the maximum width and is minutely bifid in the median line, consisting of two very wide truncated submedian teeth, separated by a narrow, button-hole like sinus from the outer pair of frontal teeth which are similarly truncated distally, with the outer lateral margin rounded, and separated by wide unequal-sided V-shape sinus from the preorbital angle which is about one and one-third times as wide as the adjacent frontal tooth, with its inner angle obliquely truncated, the distal margin truncate and not quite as far advanced as the frontal margin. The outer angle is slightly more than a right angle. The orbital margin is wide, cut by two shallow sinuses; the postorbital angle is an acute brown-tipped spine, which extends outward about two-thirds the depth of the cornea. The lateral margins are decidedly convergent and bear two additional acute spines, successively decreasing in size posteriorly. The posterior margin is notched above the bases of the fourth and fifth pairs of legs and very slightly sinuate in the median region. The dorsal surface is slightly convex fore and aft and has three transverse granulate ridges, the anterior of which is a slightly curved arc with the ends pointing backward across the anterior gastric region, and extending about as wide as the frontal margin; the second transverse ridge is a little longer, very slightly curved forward and extends across the median gastric region; the third ridge is sinuate, extending inward from the last lateral tooth, across the branchial region and becoming vaguely confluent with the curved urogastric groove. The regions of the carapace are not otherwise defined.

The chelipeds are equal in the male, about two and one-half times the length of the carapace, with the merus granulate along the upper half of its lateral margin and armed along the distal half with four acute, procurved, acute spines; the carpus is armed with an acute strong spine at the inner angle, and three shorter, acute, subdistal spines in transverse series across the upper and outer surface; the propodus has the palm slightly longer than the merus, with the upper surface elevated in a crest, consisting of a double series of spines in longitudinal series, the inner line consisting of five and the closely adjacent line consisting of three, one each opposite the distal three of the inner series. There is also a proximal spine on the outer surface



Podophthalmus vigil (Fabricius), about one half of natural size.

Podophthalmus vigil (Fabricius), about one half of natural size.

of the palm, opposite the outer carpal spine; the fingers are two-thirds as long as the palm, curved, with rounded, dentate tips, the cutting edges also dentate; interfitting and closed on the outer side, but with an elliptical gape when viewed from the inner side.

The first, second and third pairs of ambulatories are similar, quite long and slender, the first and second pairs nearly equal; the third pair shorter, each with an acute distal spine at the posterior lateral margin of each the meral and propodal joints, while there is a similar subdistal spine on the anterior lateral margin of the carpus; the dactyli are each slightly longer than the related propodus, slender, tapered, longitudinally fluted on the upper surface with a spiny curved tip and beset with a series of fine horn-color spines along the inner lateral margin and also the distal portion of the outer lateral margins. There are long solitary hairs arising from the lateral margin of the meral, carpal and propodal joints of these three pairs of legs.

The fourth pair of legs is natatory.

The eyes are large, the cornea terminal, nearly spherical, with excellent visual range in all directions.

The antennulae have the basal article enlarged; the second and third articles long, slenderer, subequal, the flagellum is short, two-branched, the smaller whip composed of about six articles; the thicker fleshy whip is about of the same length and has a dense tuft of setae. The antennulae lie within a small fossett beneath the frontal margin and this is divided by a thick septum.

The antennae have the characteristic basal article; the second and third articles small, cylindrical; the flagellum is quite long, consisting of about twenty rings and extending to the outer orbital angle.

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Subfamily: **Podophthalminae.**

Genus: **PODOPHTHALMUS** Lamarck.

Podophthalmus vigil (Fabricius).

Plates 37 and 38.

Type: Fabricius' specimen came from the Indian Ocean and was deposited in the collection of "Dom. Daldorff."

Distribution: Red Sea: Djibouti, (Nobili); Station 4, Sudanese Red Sea, (Laurie); Indian Ocean, (Fabricius; H. M. Edwards); Koh Chang and Koh Kong, Gulf of Siam, (Rathbun); Singapore, (Nobili); Geelvink Bay, (de Man); reefs, Hawaii, (Miers; Lenz); Hawaiian Islands, (Gibbes; Randall); Honolulu, Pearl Harbor, also lee coast of Oahu, Heeia; Mauna Loa beach, Hilo, Hawaii, (Rathbun); Fanning Island, (Streets; Edmondson); Southport, Queensland, (Boone); subfossil from Mauritius and from New Channel, mouth of the Brisbane River, Moreton Bay, Australia, (Etheridge and McCulloch).

Material examined: One male taken at Southport, Queensland, Australia, September 24, 1931, by the "*Alva.*"

Technical description: Carapace widely hexagonal, its greatest width being from tip to tip of the anterolateral spines, which is about two and a half times the median length; the true frontal margin projects forward as a narrow septum between the bases of the eyestalk and widens into a narrow process on each side, that tapers outwardly and extends to the upper distal angle of the antennular fossett, lying in the normal relation to the antennae and antennules.

The anterolateral borders extend the full width of the carapace, the upper margin as a finely beaded, oblique line, sloping gradually from the narrowed deflected frontal septum to the base of the lateral spine, from which point it continues as a concave curve to the tip of the spine. Below this lies the deep groove which is an extension of the true orbit and into which the fantastically long eyestalks fit, when retracted; the laminate upper margin of the concave curved region near the base of the spine being more produced than the rest of the margin, to protect the large cornea, when retracted. Below this lies the inferior orbital border, which is more prominent and more oblique and from the inner submedian angle decreasing outwardly is produced in advance of the superior border. The lateral spine is strong and is directed outward and forward with its anterior margin excavate by the continuation of the orbital groove. Behind the large spine and at its base there is a very small, acute, outward-directed spine and running inward from its apex there is a raised granular line which curves inward to the cervical sulcus. The postlateral margins are slightly sinuate, finely beaded, and decidedly convergent. The posterior margin is lightly carinated and this carina curves above the base of the fourth and fifth pairs of legs. Just anterior to the curved sulcus that extends inward from the second lateral spine, there is a definite shallow sulcus which is emphasized by a line of coarse pittings. The cer-

vical, urogastric and cardiac depressions are well defined. There is a slightly beaded, curved, granular line across the mesogastric region, just anterior to the heavy carina that extends inward from the second lateral spine. A similar transverse line runs across the middle of the cardiac region. The summit of the granular region is slightly tumid and very granulose. The male belt is triangular and is composed of five articles, the third, fourth and fifth segments being fused. The second and third segments are conspicuously carinated transversely. The sternal plastron is wide and is finely granular on its anterior half, less so, practically smooth posteriorly.

The excurrent channel forms a distinct wide groove, below and subparallel to the inferior orbital margin.

The eyestalks are very long, slender, slightly tapered distally, extending from the frontal septum to the base of the anterolateral spine, at which point the flexible joint unites with the large, black ovoid cornea, which is attached at one end obliquely distally.

The antennulae have the first peduncular article thick, situated within the fossett; the second and third articles are very slender, cylindrical, the flagellum is short, less than one-third the length of the preceding article, multiarticulate and tipped with a tuft of fine setae. When fully extended, the antennulae reach one-third of the length of the eyestalk.

The antennae are rudimentary with the basal article curiously thickened and produced, fitting into the orbital hiatus. The second and third articles are short, bulbous; the flagellum is composed of thirty or forty fine tapered thread-like annulations and when extended, is about half as long as the eyestalk.

The external maxillipeds are very close-fitting, the exognath a long, slender rod, with a multiarticulate whip. The ischium of the endognath is subrectangular with a longitudinal sulcus on the outer surface which is very granulose. The inner lateral margins of both ischium and merus have a dense fringe of golden setae; the merus has the inner distal angle obliquely truncated, for the reception of the palp and the outer distal angle evenly rounded not produced; the three-jointed palp is quite large, the distal article beset with golden setae. The margins of the buccal cavern also are fringed with setae.

The chelipeds are equal in the male and are very long and slender, being three and one-half times the length of the carapace; the ischium is rather well developed, trigonal; the merus also trigonal, is one and

one-half times as long as the carapace, armed on the outer lateral margin with a distal and a well-spaced, stronger subdistal, upcurved spine, and on the inner lateral margin with three well-spaced, upward and outward curved spines, the first of which is midway the margin, the third spine being subdistal, while the second is intermediate between the two. The proximal half of the upper surface of the merus is smooth except for a long V-shaped line; the distal portion of this upper surface is slightly rounded and very granulose, as are both lateral margins and also the lower frontal surface of the merus. The carpus is moderately rounded and lightly granulose on its upper surface, with its outer margin carinate, this carina terminating in a sharp short spine at the outer angle; the inner angle of the carpus is produced into a very long, curved spine; the palm is as long as the merus and the fingers are three-fifths of the length of the palm. The outer surface of the palm is ornamented by four costae and the inner surface by one which extends midway the length of the palm and terminates in a small acute, subdistal spine. On the outer surface of the palm a long, granulose costa extends along its lower margin and down to the tip of the lower finger; above this, a second, the most prominent costa of the series, extends to a point midway between the fingers; the third and least conspicuous costa is some distance above this and has an acute spine near its base and extends to a point above the base of the upper finger. The fourth costa extends along the upper margin of the palm and terminates in a sharp, subdistal spine. The two upper costae and the space between them is covered with coarse granules. The second costa is very granular and has above it a line of very coarse punctae. The space between the first and second costae, also the space between the second and third costae, are smooth. The upper finger is a little deflected with curved tip and moderate gape between the two fingers. The upper finger has a large basal tooth, followed by a series of triangular teeth which are themselves grouped to form triangles, consisting of a large tooth at the apex, with two to three small teeth on either side of the apical tooth. These interfit with similar groups of teeth in the opposing finger. The fingers of the right cheliped have almost no gape and there is no basal molar on the upper right finger.

The second, third and fourth pairs of legs are similar, slender, the second pair extending to the base of the palm of the cheliped; the third pair subequal to the second, while the fourth pair extends only

to midway the dactyl of the third pair. Each has the merus, carpus and propodus much compressed laterally, with the upper margin of the carpus and propodus subcarinate; the upper surface of the propodus with a longitudinal line of coarse punctae; the dactyl is very acuminate, tapered and thin, with a sharp tip and a longitudinal groove on each surface; the propodus and dactyl have both lateral margins fringed with short, golden brown setae.

The fifth pair of legs are short, extending only to the distal end of the carpal joint of the fourth pair of legs; the ischium, merus and carpus of the fifth pair of legs are rather thick, the merus having a subdistal spine on its outer lateral margin; the propodus and dactyl are foliaceous, subovate, fringed with short setae as is also the carpus and upper margin of the merus.

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Tribe: **CYCLOMETOPA.**

Family: **XANTHIDAE.**

Subfamily: **Xanthinae.**

Genus: **CARPILIUS** Leach.

Carpilius maculatus (Linné).

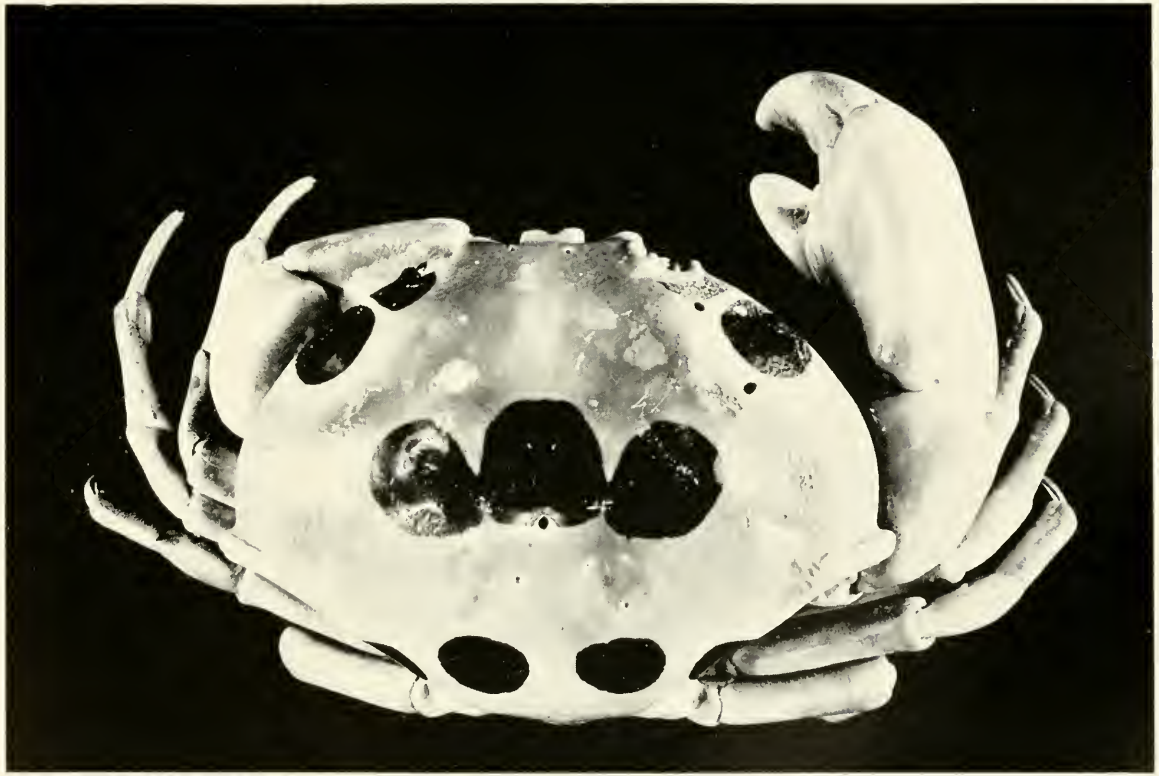
Plates 39, 40, 41 and 42.

TYPE: Linnaeus type came from Asia; if still extant it probably is in the collection of the British Museum.

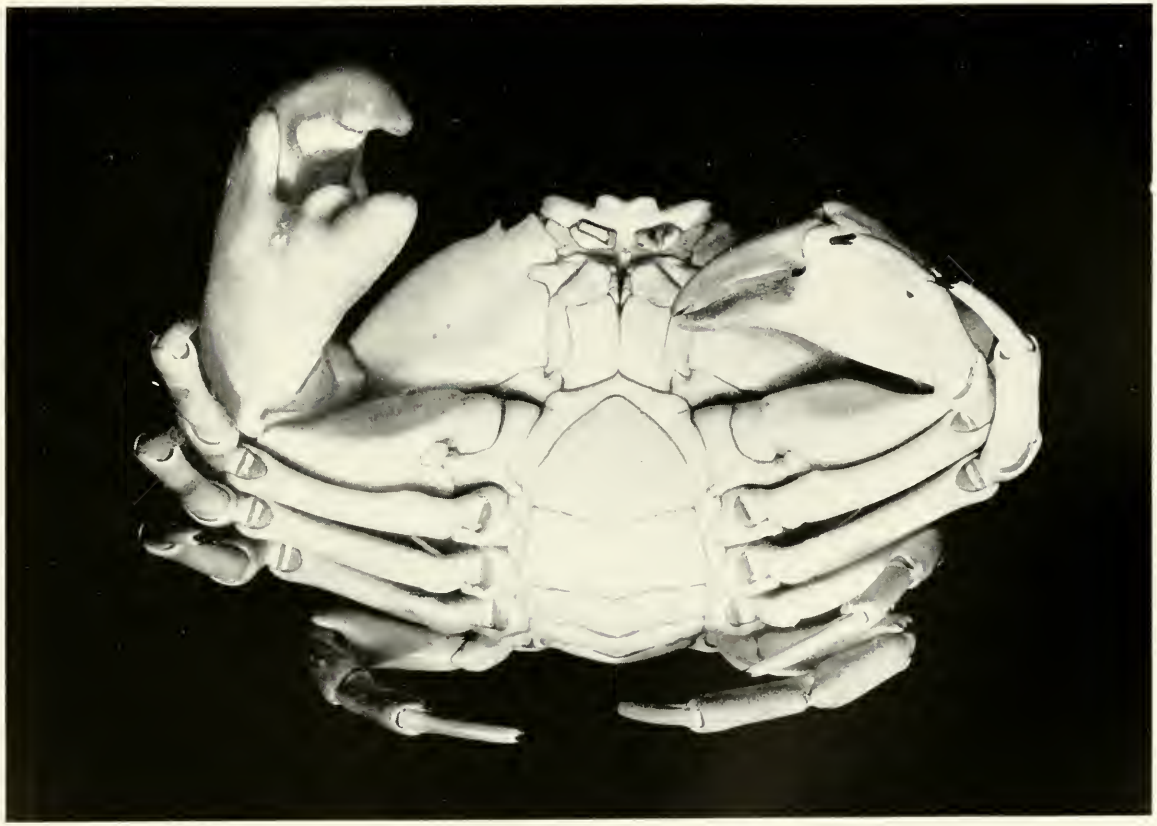
DISTRIBUTION: Amboina (Rumphius); Waighen Island, (Nobili); America, (Seba); Asia, (Linné); Malabar, (Herbst); Minikoi and Maldive Islands, Rotuma: "It may be found wedged into holes in the reef, just above low water mark, exposed to the full force of the surf." (Borradaile); Hao Island, Ohura, lagoon, (Nobili); Raraka, Paumotu Archipelago, (Dana); Paumotu Islands, reef, (Rathbun); Navigator Islands, Manila, P. I., (Dana); Tahiti, Society Islands, (Stimpson, Rathbun, Pesta); Sumatra, Samarang, (A. M. Edwards); Kema, Makassar, Celebes, (Schenkel); Tami Islands, New Guinea; Schiffer's Island, (de Man); Indian Ocean, (A.M. Edwards); Cocos-Keeling atoll, (Calman); Andaman Islands, Nicobar Islands, Palk Straits, (Alcock); Îsle de France, (A. M. Edwards); Réunion, New Caledonia, (A. M. Edwards); Mauritius, (Richters, Pesta); Port Louis, Mauritius, (Bouvier); Isle of Nosse-Faly, (Hoffman); Madagascar, (Ortmann); Honolulu, Hawaii, on the reefs, (Miers); Hawaii: Honolulu, market; Puako Bay; Hilo; Oahu; Laysan Island, (Rathbun, Lenz); Fanning Island, (Edmondson); Upolu, Samoa; Solomon Islands, (Pesta); Payta, (Cano); Holborn Island, off Port Dennison, Queensland, (McCulloch and McNeill).

MATERIAL EXAMINED: Two large females and one large male, from Papeete, Tahiti, Society Islands, August 15, 1931. One large male and one large female, taken on Venus Reef, Tahiti, Society Islands, August 15, 1931. All collected by the "*Alva.*"

TECHNICAL DESCRIPTION: Carapace oval, decidedly convex, in both directions, smooth except for some rather coarse punctae in the antero-lateral regions; there is no delineation of the regions except a faint indication of the urogastric line. The frontal margin is obliquely deflexed, with decidedly thickened edge, the median lobe definitely

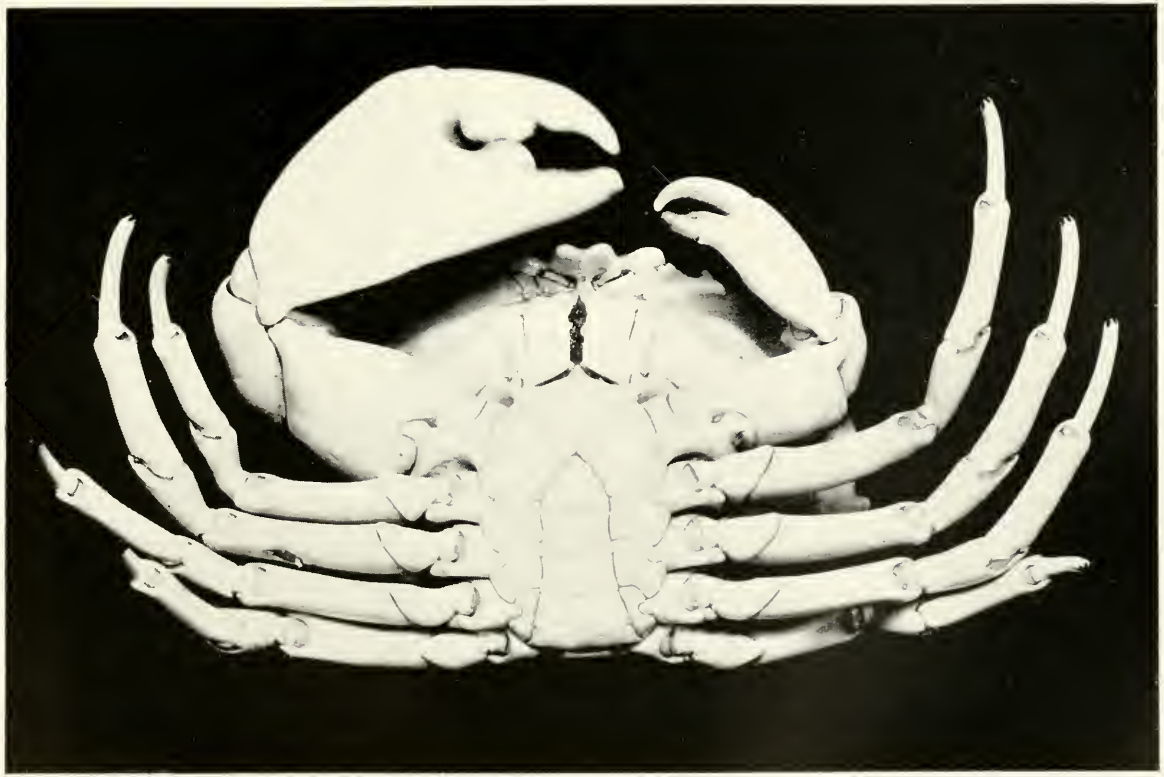


Carpilius maculatus (Linné), female, about two-thirds of natural size.



Carpilius maculatus (Linné), female, about two-thirds of natural size.

Carpilius maculatus (Linné), male, about two-thirds of natural size.



Carpilius maculatus (Linné), male, about two-thirds of natural size.

bilobate and extending farther forward than the lateral lobes which are separated from the median lobes by a deep notch. The orbital margin is thickened but less so than the frontal margin and the external orbital angle is bluntly rounded and but little in advance of the thickened anterolateral margin which is widely convex; there is a conspicuous blunt tooth at the lateral angle; the postlateral margins are decidedly convergent. The ground color of the carapace and upper surface of the legs is deep creamy and light orange red, marked with eleven or more vivid carmine, rounded spots, arranged two on either side, immediately behind the eye, along the anterolateral border, the smaller spot including the orbital angle; three large spots in transverse curved series across the middle of the carapace and a curved transverse series of four smaller spots across the hinder portion of the carapace, near the posterior margin. The orbital margin is entire. The cornea is set obliquely terminal, on a thick calcareous stalk.

The male belt is tapered and consists of six articles; the third and fourth segments being fused. The female belt is broadly oval, seven-segmented, the sixth and seventh segments each being much wider than those preceding.

The antennulae are separated by a broad septum; they fold obliquely, nearly transversely.

The antennae have the peduncle large, elongate, projecting into the cleft between the frontal margin and the infra-orbital plate; the flagellum is small, also situated in this cleft and extending less than a millimeter beyond.

The external maxillipeds are very close-fitting with the anterior margin decidedly oblique.

The chelipeds are conspicuously unequal in both males and females, in about the same degree of difference, as shown in plates 39 and 41. They are smooth, the carpus rounded; the propodus of the larger cheliped very massive, equal in height to slightly more than half of the length of the carapace; the fingers are curved; the upper and lower each having one powerful molar; the finger tips have bluntish points. The smaller cheliped has no gape but a fairly definite thickened cutting edge.

The ambulatories are long, slender, smooth, subcylindrical, with powerful, curved, tapered dactyli, each of which has a longitudinal groove on both the anterior and posterior surfaces and a sharp, strong, brown tip.

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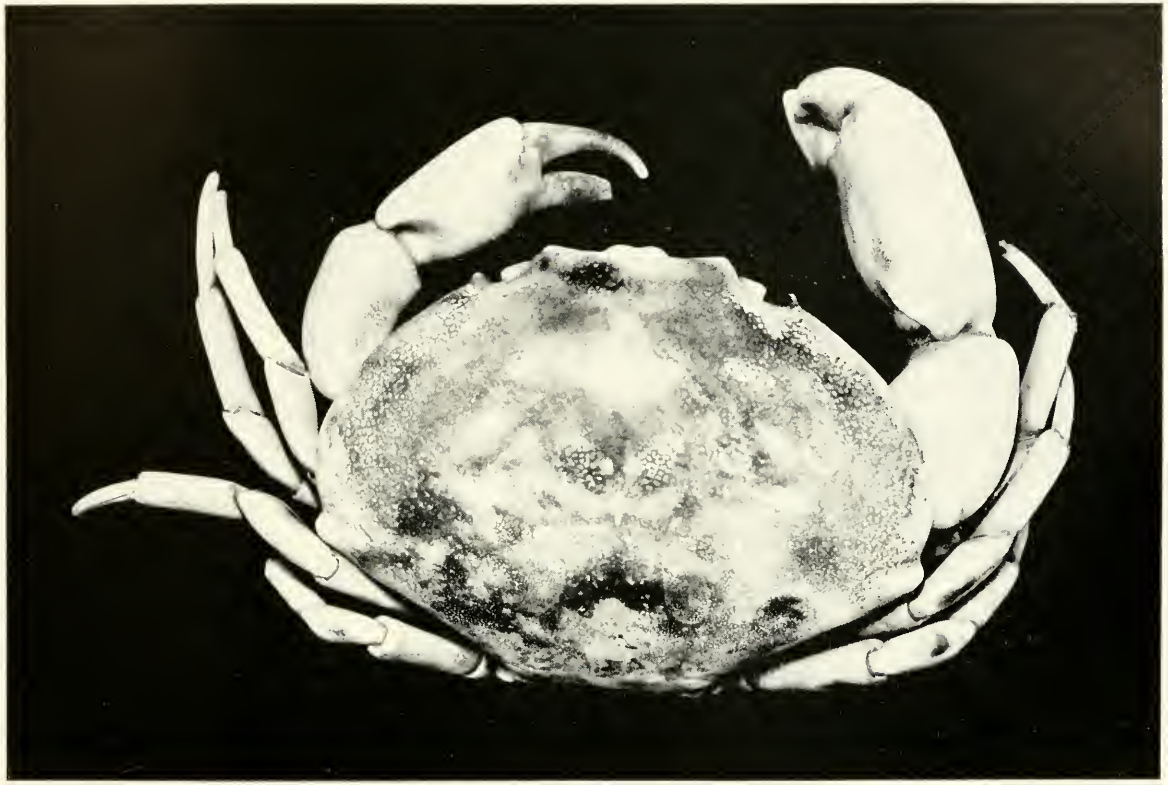
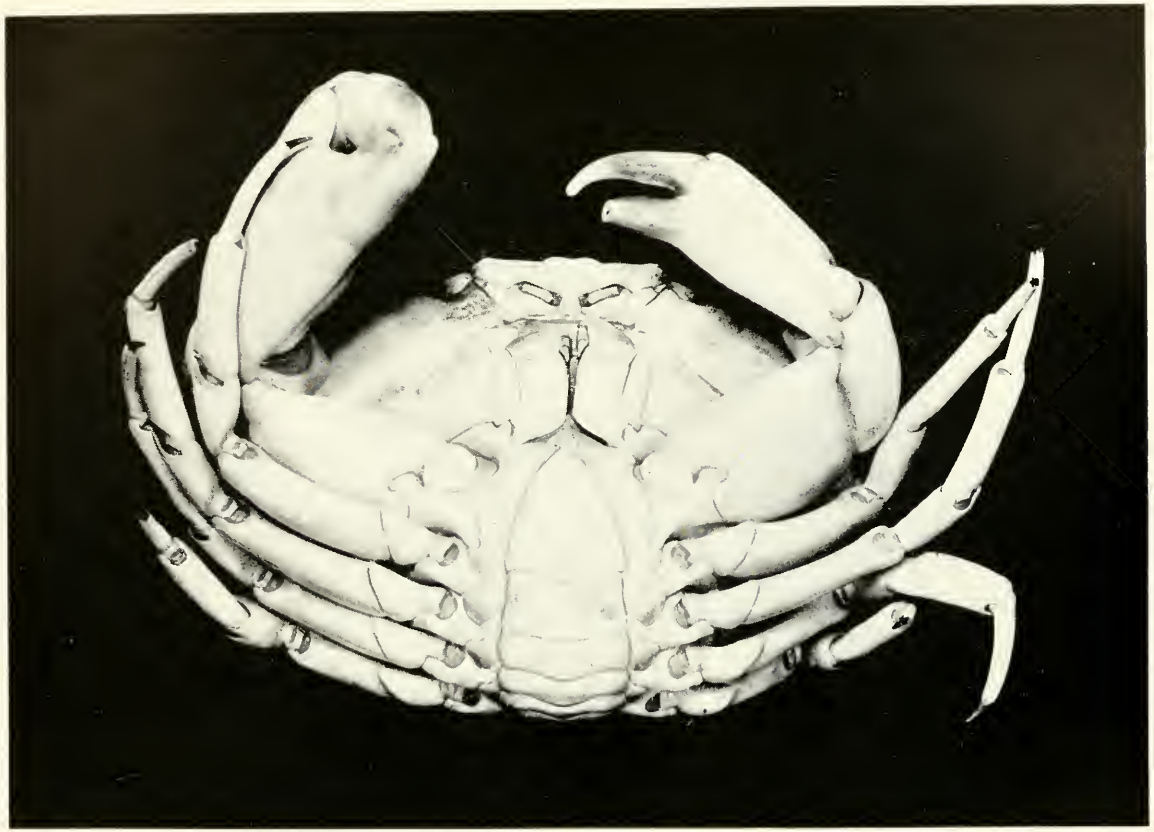
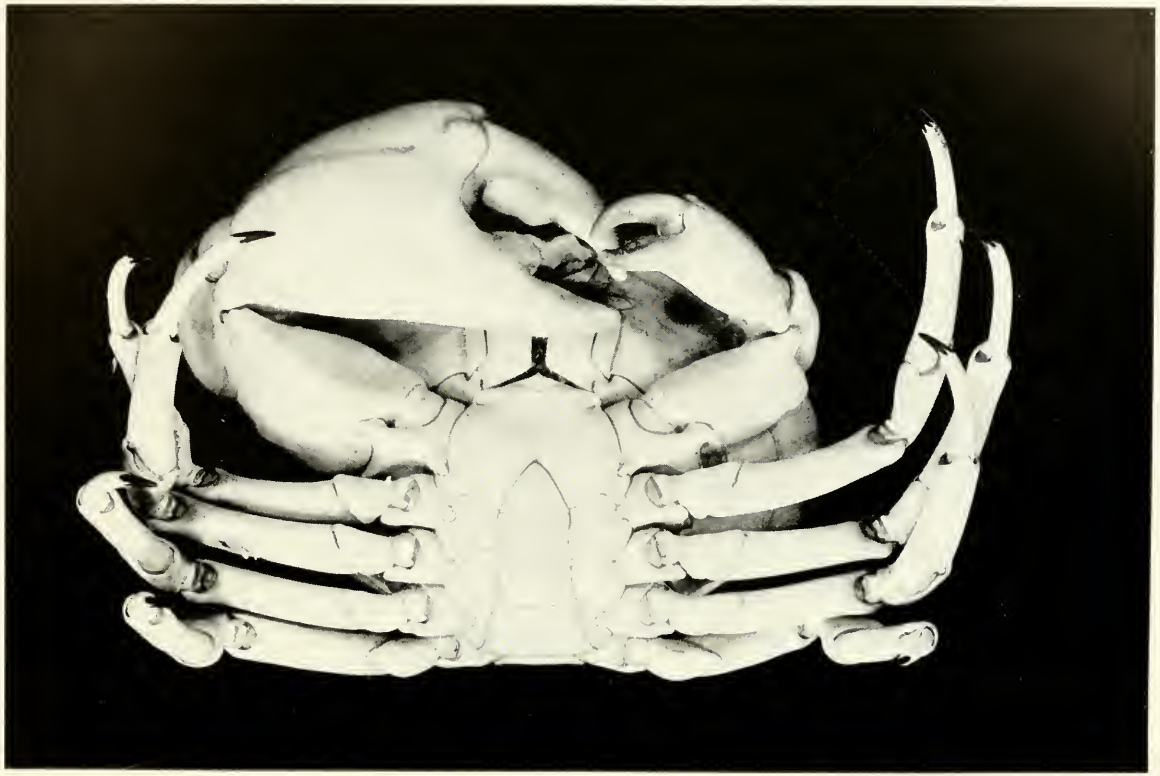


Carpilius convexus (Forskal), female, natural size.



Carpilius convexus (Forskal), female, natural size.



Carpilius convexus (Forskal), male, natural size.

Carpilius convexus (Forskal).

Plates 43, 44 and 45.

TYPE: Forskal's type came from the Red Sea. The present depository is not known.

DISTRIBUTION: Red Sea, (Forskal); Red Sea, several localities, (Nobili); Station 7, Sudanese Red Sea, (Laurie); Red Sea, (A. M. Edwards); Indo-Pacific region, (Miers); Andamans, (Nauck); Andamans and Nicobars, (Alcock); Maldive Archipelago: Malé, Fadifolu, North Malé, atolls, reef, lagoon and down to 35 fms.; Rotuma, (Borradaile); Borepata, (Nobili); Tahiti, (Ruppell); Ceylon, Flores, Timor, (Ortmann); Amboina, Moluccas, (Rathbun; de Man); Atjeh, Pontianak, West Borneo, (de Man); Schildes Islands, (Herbst); Fee Jee Islands, reefs and Sandwich Islands, (Dana); Hawaii: Honolulu, reef and market; Waikiki Beach; Hilo; Waiawa Kanai, Oahu, Laysan, (Rathbun); Makemo, Paumotu Islands, (Rathbun); Navigator Islands, Seychelles, Mauritius, New Caledonia, Réunion, (A. M. Edwards); Port Louis, Mauritius, (Bouvier); Amirante, Coetivy, (Rathbun); Madagascar, (Hoffman); Zanzibar and the jungle, (Hilgendorf); Akaba Gulf, East Africa, (Ortmann); Zanzibar, Kokotoni and Bawi, East Africa, (Lenz).

MATERIAL EXAMINED: Two males and one female collected at Poonarun Reef, Tahiti, Society Islands, August 17, 1931. Two females and one male, collected at Venus Point Reef, Tahiti, August 15, 1931.

COLOR: Carapace irregularly mottled with deep dark red on lighter red and creamy light ground color. Upper surface of legs also red.

TECHNICAL DESCRIPTION: The "*Alva*" specimens are all of medium size, having a carapace two and one half to three and one half inches wide. The species is reported to a size of six to seven inches carapace width. The entire carapace is smooth except for numerous coarse pores which are more abundant along the anterolateral and frontal margins. The frontal margin is vertically deflected, emphasized by a transverse groove, the medium lobe, not at all, or very slightly bilobed, and separated by only a shallow sinus from the lateral lobes. The superior orbital margin is entire though decidedly thickened, the external angle emphasized. In other aspects *C. convexus* does not differ from *C. maculatus*.

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Cancer marmarinus HERBST, *Ibid.*, Bd. III, pt. 4, pl. 60, fig. 1, 1782.

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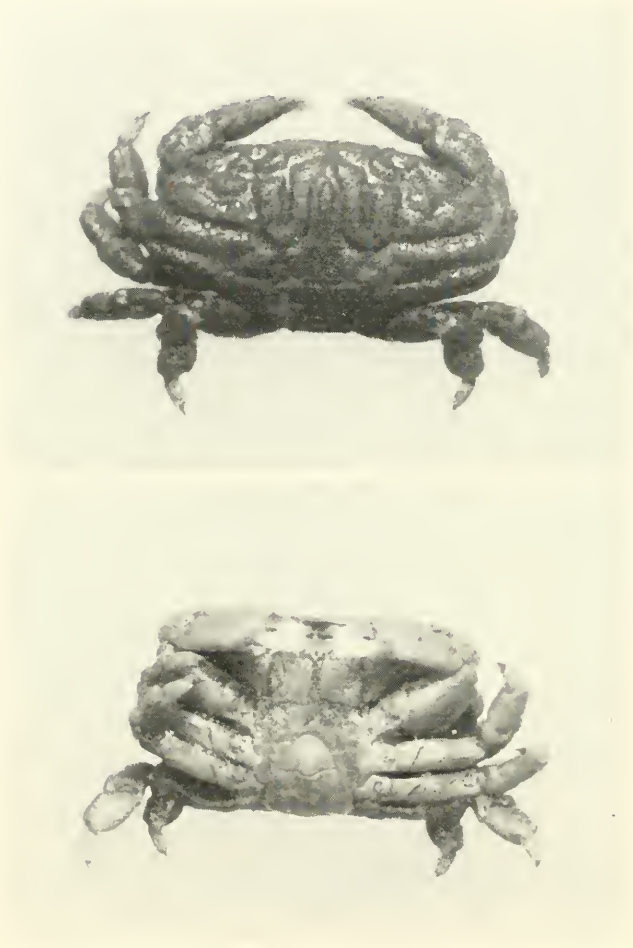

Carpilodes rugatus (Latreille), female, × 2.

Carpilius lividus GIBBES, Proc. Amer. Assoc. vol. III, p. 174, 1850; young adult.—MIERS, Ann. Mag. Nat. Hist. ser. 5, vol. II, p. 407, 1878; young adult.

Genus: **CARPILODES** Dana.

Carpilodes rugatus (Latreille).

Plate 46.

TYPE: The type of this species came from the Indian Ocean and is deposited in the Paris Museum.

DISTRIBUTION: Indian Ocean, (H. M. Edwards); China Sea; New Caledonia; seas of Asia and Oceania, very rare, (A. M. Edwards); Red Sea; Daedalus Shoal; Sudanese Red Sea, (Laurie); Red Sea, several stations, (Balss); Gallé and Ceylon, (Miers); Cocos Islands, Andamans group, (Alcock); Nuka Hiva, Marquesas Islands, (Boone).

MATERIAL EXAMINED: One female, taken from coral reef at Anaho Bay, Nuka Hiva Island, Marquesas Islands, August 10, 1931, by the "*Alva.*"

COLOR: Preserved specimen: deep raspberry red, with the tips of the chelipeds and dactyli of the ambulatories pearly white. The living specimen is reported to be an exquisite deep violet, with the fingers of the chelipeds and dactyli of ambulatories cream-tipped.

TECHNICAL DESCRIPTION: Carapace elongate oval, with the rounded sides but little narrowed, the maximum width, across the median center, about twice the length; the surface very convex fore and aft and also from side to side and entirely lobulated by deep wide channels. The frontal margin is very much deflected, so that its sinuate border is only visible from a ventral view. The margin consists of two wide, unevenly rounded, submedian lobes, whose outer angle is slightly accented and it is separated by a channel from the narrowed, preorbital angle, which is scarcely as wide as the channel and does not project so far forward as the outer frontal angle. The superior orbital border is tumid and is circumscribed by a channel and cut on the outer half by three closed sinuses, the outermost one being near the outer margin; the postorbital angle is a small, rounded lobe, defined by a channel. The anterolateral border is cut into four lobes separated from each other by deep channels. One of the channels runs transversely from the median rostral sulcus, behind the orbit and curving along the contour of the anterolateral border, uniting with the short sulcus between the first and second anterolateral lobes and terminat-

ing between the second and third lobes; thus separating the frontal lobe from those on the gastric region, defining the orbital border, and separating the first and second anterolateral lobes as small lobules. The gastric region is circumscribed and a slender lobe extends forward in the median line to the rostral sulcus. On either side of this median lobe there are two longitudinally placed lobes, which are united and rounded posteriorly; the inner lobe being the longer anteriorly. Outside of these, on the anterior branchial region, behind and separated from the first and second anterolateral lobes, there is a large, transversely placed, triangular lobe that is partially bifurcated; immediately behind this is a long, transverse lobe that includes the third lobe and extends across the branchial region, being delimited anteriorly by a deep transverse sulcus that extends from between the second and third anterolateral teeth inward to the cervical groove at which point it unites with a similar transverse groove that extends inward from between the third and fourth teeth. There is a small, heart-shaped lobe, lying behind the inner end of this lobe and near to the cervical sulcus. A short, transverse sulcus extends inward behind the fourth anterolateral tooth. The cardiac region is circumscribed and there is a shallower, transverse sulcus on the intestinal region. There are about twenty-two lobules in all on the dorsal surface, all are moderately convex, with surfaces paved with rounded red granules, arranged in a modified berry-like formation. Similar granules pave the wide channels between the lobules. The pterygostomian region is also granulose but except along the upper margin, the granules are smaller and flattish. The female belt is seven-segmented.

The orbit is broad-oval, nearly subcircular, its tumid upper margin rendering the eye inconspicuous in a dorsal view when the cornea is retracted.

The eyestalk is stocky, filling four-fifths of the exposed orbital space and being covered externally by a violet, granulose, calcareous coating, similar to the carapace. The cornea is small, black, hemispherical, terminal, so that its greater visual capacity is on the distal half.

The antennulae are small, folded horizontally in the well-hooded fossett beneath the frontal margin.

The antennae have the large, basal peduncular article triangulate, with its distal apex lying within the orbital sinus, closing it but not quite extending to the margin of the orbital angle; the second and

third articles are greatly reduced; the flagellum small, extending less than one-third the long diameter of the orbit.

The buccal cavern is rectangular, nearly squarish, wider than long. The ischium of the exognath is small, the related merus an elongated rod, tapered distally. The ischium of the endognath is rectangular, two-thirds as wide as long; the related merus is wider than long, with its distal margin oblique. The palp is stocky. The external surface of the maxilliped is smooth.

The female chelipeds are of moderate proportions, rather slender, the three-sided merus rather short, closely appressed to the carapace and not extending beyond the margin of the carapace; the carpus convex and very granulose and channelled by an irregular sulcus; the propodus scarcely longer than the carpus, rounded but not dilated on the outer surface, rather compressed laterally. The external surfaces are granulose and there are three longitudinal sulci on the outer surface of the palm, separated by granulose ridges; the fingers are sharply deflected, with the outer surfaces grooved, granulose proximally, the cutting edges with shallow teeth and moderate gape, the tips rounded, spoon-shape, meeting.

The ambulatories are not very large, but have the merus, carpus and propodus quite wide, laterally compressed, with the dorsal surface roughened with granules, like those of the carapace; the dactyli are stout, cylindrical, almost as long as the related propodus, but scarcely one-third as wide, with a stout curved horny tip, augmented on the inferior lateral margin by two or three horny spinules in longitudinal series, interspersed with stiff, solitary, long setae.

References: *Cancer rugatus* Latreille, Collection du Museum, Paris.

Zozimus rugatus H. Milne Edwards, Hist. Nat. Crust. vol. I, p. 385, 1834.

Zozimus canaliculatus Lucas, in Jacquinot's Voy. au Pole Sud et L'Oceanie "*L'Astrolabe*" et "*Zélée,*" Zool. III, Crust. p. 21, pl. 3, fig. 2, 1885.

Carpiloxanthus rugatus A. Milne Edwards, in Maillard's L'ile Réunion, Annexe F, p. 3, 1862.

Carpilodes rugatus A. Milne Edwards, Nouv. Archiv. Mus. Hist. Nat., T. I, p. 230, pl. XII, figs. 3, 3b, 1865; *ibid.*, T. IX, p. 180, 1873.—Richters, in Mobius Meeresf. Maurit., p. 146, 1880.—Miers, Zool. H. M. S. "*Alert,*" p. 517, p. 529, 1884.—Alcock, Journ. Asiatic Soc. Bengal, vol. 67, pt. 2, 84, 1898.—Laurie, R. D., Journ. Linn.

Soc. London, Zool. vol. 31, p. 443, 1907–1915.—Balss, H., Denksch. Akad. Wissensch. Wien, Bd. 99, p. 5, 1924.

Genus: **ATERGATIS** De Haan.

Atergatis floridus (Linne).

Plates 47 and 48.

Type: Linnaeus cites Carolina, (probably Caroline Islands?), and East Indian Seas as the localities from which this species was known to him. Amboina, Moluccas, was Rumphius' locality for the species.

Distribution: Asia, (Linnaeus); Amboina, (Rumphius); East Indies, (Herbst); Misaki and Sagami, Japan, (Rathbun); Oahu, Hawaiian Isles; Bora Bora, Society Islands, Amboina, Moluccas, (Rathbun); China, (Gee); LooChoo Islands, Gaspar Straits, (Stimpson); Cebu, P. I., on the reefs, (Miers); Ternate, Karangbollong, Java, (Miers); Pulo Edam, Noordwachter Island, Mergui Archipelago: Elphinstone, Owen and King Islands Bay, (de Man); Kaiser Wilhelm's Land, New Guinea; Mascarenes Bay, (Ortmann); Paumotu Archipelago, Society and Friendly Islands, (Dana); Fee Jee Islands, (Dana); Upolu, Samoa, (Miers); Indian Archipelago, Island of Poulo-Condore, (A. M. Edwards); Trincomali, Ceylon, (Muller); Ceylon, Andamans, Mergui, Laccadives, Karachi, (Alcock); reef, Male, Atoll, Hule, Maldives, (Borradaile); Pulau Berhala Island, Straits of Malacca, (de Man); Koh Kahdat and Koh Chang, Gulf of Siam, (Rathbun); Singapore, (Walker); Monte Bello Islands, (Rathbun); Port Dennison, Australia, (Haswell); Falcon Island, Palm Islands, Queensland, (Boone); New Australia, New Caledonia, East Africa, (Henderson); mouth of the Umlas River, Natal, and Cape of Good Hope, Africa, (Stebbing).

Color: Dana's color plate shows the living crab to be a deep green with creamy fine reticulations on the median region of the carapace.

Technical description: The largest of the "*Alva*" specimens is a male with the carapace 33 mm. long and 50 mm. wide. The entire carapace is convex, of quite smooth texture, but faintly lobuoled, the regions being scarcely delineated by very weak shallow cervical and hepatic grooves. The frontal and anterolateral margins together form a wide semi-circle. The frontal margin is crested, faintly bilaminate, not separated from the rounded orbital angle. The orbits are large, with the long diameter equal to about one-third the width of the frontal border. Three closed sinuses occur on the outer half of the

Atergatis floridus (Linné), upper figure, male; lower figure, female, × 1.

Atergatis floridus (Linné), upper figure, male; lower figure, female, × 1.

orbital border. The anterolateral margin is sharply crested with faint indications of three closed incisions, marking the margin into three successively broader teeth, with a distinct blunt ridged tooth at the postlateral angle. The sidewalls of the carapace are smooth, as is also the sternal plastron. The male belt is five-jointed. The female belt is wider, suboval.

The antennulae fold almost transversely and are separated by a strong intermedian septum.

The antennae have the basal article broad, the inner angle meeting the downbent frontal border and the outer angle not extending as far as the inferior orbital angle; the second and third antennal joints are cylindrical, successively smaller and lie within the orbital sinus; the flagellum is long and slender, about three-fourths as long as the long diameter of the orbit.

The external maxillipeds are close fitting, glabrous, devoid of setae except the brush on the inner lateral margin of the ischium.

The chelipeds are equal in both sexes; the merus compressed, with the upper lateral margin decidedly carinate, as is also that of the propodus; the carapace is smooth, convex; the palm is smooth on the outer surface, both fingers are longitudinally grooved externally, the cutting edges irregularly dentate; larger males have an inferior large molar, that is absent in females and small males.

The ambulatories have the merus, carpus and propodus flattened, and their upper lateral margins crested; the dactyl is tipped with a sharp tooth and is covered on the dorsal and ventral surface with imbricated chitinous scales interspersed with long spinose setae.

References: *Cancer floridus* Rumphius, Amboinsch. Rariteitk. p. 16, pl. 8, fig. 5, 1781.—Linné, Syst. Nat. Ed. 12, p. 1041, 1767.

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Atergatis floridus De Haan, Faun. Japon. Crust., p. 46, 1837.—Krauss, Sudafr. Crust. p. 27, 1843.—Dana, U. S. Explor. Exped. Crust. vol. XIII, pt. I, p. 159, 1852; atlas, pl. 7, fig. 4, 1855, issued 1861.—Stimpson, Proc. Acad. Nat. Sci. Phila., vol. X, p. 32, 1858.—Heller, Reise Osterreich. Fregatte "*Novara*" Zool. Bd. II, Abthl. III, p. 8, 1882.—A. Milne Edwards, Nouv. Archiv. Mus. Hist. Nat. Paris, t. I, p. 243, 1865.—*Ibid.*, t. IX, p. 186, 1873.—Tozzetti, T., R. Inst. di Studi Superior Magenta Crost., p. 24, 1877.—Miers, Proc. Zool. Soc. London, 1877, p. 183; Ann. Mag.

Nat. Hist. ser. 5, vol. V, p. 231, 1880; Zool. Coll. H. M. S. "*Alert,*" pp. 182, 207, 1884; Rept. Voy. H. M. S. "*Challenger,*" Zool. vol. 17, Brachyura, p. 112, 1886.—Haswell, Cat. Austral. Stalk and Sessile-eyed Crust., p. 41, 1882.—Muller, F., Verh. Ges. Basel, Bd. VIII, p. 474, 1890.—de Man, Arch. fur Naturges. Berlin Jahrb. Bd. 53, pt. 1, p. 245, 1887; Journ. Linn. Soc. London Zool. vol. 22, p. 24, 1888; also in Weber's Zool. Ergeb. Niederl. Ost.-Ind., II, p. 277, 1892.—Walker, A. O., Journ. Linn. Soc. London Zool., vol. 20, p. 109, 1890.—Henderson, J. R., Trans. Linn. Soc. London, Zool. ser. 2, vol. 5, p. 252, 1893.—Ortmann, Zool. Jahrb. Syst., Bd. VII, p. 460, 1894; also in Semon's Zool. Forschung. (Jena Denkschr. Bd. VIII) Crust. Bd. V, Heft I, Abhth. 4, p. 51, 1894–1903. —Alcock, Jrn. Asiatic Soc. Bengal, vol. 67, pt. 2, p. 98, 1898.—Borradaile, Faun. and Geog. Laccadive and Maldive Arch., vol. I, pt. III, p. 258, 1902.—Stebbing, Ann. S. Afric. Mus. vol. VI, pt. 4, p. 297, 1910.—de Man, Bidrag tot Dierkunde Zool. Genoots. Natur. 26E, Afl. p. 1, 1929.

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Genus: **PLATYPODIA** Bell.*

Platypodia anaglypta (Heller).

Plate 49.

Type: Heller's type was collected in the Red Sea and deposited in the Zoological Museum in Vienna.

Distribution: Red Sea, (Heller; A. M. Edwards; Ortmann; Nobili); Massouah, (Nobili); Persian Gulf; Galle, (Alcock); Gulf of Manaar, (Laurie); Atjeh, Borneo, (de Man); New Caledonia, (A. M. Edwards); Peros, Coin, Salomon; Coetivy, (Rathbun).

Material examined: One specimen taken from coral, at Temukus Roads, Bali, Dutch East Indies, October 25, 1931.

* For use of *Platypodia* Bell as a generic name in place of *Lophactaea* A. M. Edwards consult Rathbun, M. J., Proc. Biol. Soc. Wash., vol. XI, p. 159, 1897.

Platypodia anaglypta (Heller), natural size.

Color: Carapace violaceous brown with yellow markings on the legs.

Material examined: One specimen taken from coral, at Temukus Roads, Bali, Dutch East Indies, October 25, 1931.

Technical description: Carapace oval, 29 mm. long, 45 mm. wide, with the frontal and anterolateral margins widely rounded; the frontal margin is about one-fourth of the total width of the carapace, deflexed, arched or bowed, divided by a median sinus which runs back on the upper surface as a nearly closed suture and on the under surface this suture extends to the interantennulary septum. The anterolateral margin is rounded, crested, cut into four rounded, laminate lobes, none of which is dentate, the posterior lobe only being slightly protruberant. The orbital margin is only moderately tumid and is marked by three sutures, two being on the outer half of the upper margin and one at the lower, outer angle. The eyestalk is short, bulbous, constricted below the cornea, which is small, set obliquely-terminal. The regions and lobules of the carapace are well defined on the anterior three-fourths of the caparace; the deep furrows that separate them are filled with short bristles. The lobules are well defined, with a somewhat flattened, semi-imbricate appearance; the surface granulose, the outlines irregularly wavy. The posterior fourth of the carapace is but little broken, except by the circumscribed intestinal region. The slopes on either side toward the posterior sidewalls are paved with low, flattish, circular granules the spaces between being filled with short bristles. This same design covers the anterolateral sidewalls of the carapace. The male belt is five-jointed, the third, fourth and fifth segments being fused. The anterior part of the sternal plastron is paved with low, rounded granules, interspersed with short bristles.

The chelipeds of the male are approximately equal; the merus short, not extending beyond the carapace, and with the postlateral and distal margins cristate; the carpus is convex but with the upper and outer surfaces set with rounded granules and rugae, the channels separating these being rugged and filled with short, stiff setae. The propodus is well developed, the palm almost as high as long, with the external surface moderately tumid; the upper margin cristate, the upper portion of the palm covered by coarse irregular rugosities with small, rounded tubercles interspersed; the lower portion of the palm paved with rounded granules which decrease in size toward the in-

ferior margin, all the furrows and spaces between the rugosities are covered with bristly pilosities. The fingers are about two-thirds as long as the palm and are distinctly down-curved, the outer surfaces of both are longitudinally grooved, the proximal part of these grooves pilose; the finger tips are pointed, not spoon-shaped; the lower finger has one large molar and a smaller tooth; the upper finger has two blunt rounded teeth.

The ambulatories have the meral, carpal and propodal joints wide, with their upper margins cristate, their outer surfaces especially on the carpus and propodus are pitted and granulose, the interstices being setose; the postlateral margin of the propodus has a dense brush of setae, as also have both the inner and outer lateral margins of the slender, horn-tipped dactyl.

The antennulae fold transversely and have the basal articles quite granulose. The interantennulary septum is wide and strong.

The antennae have the basal peduncular article short and wide, with the inner distal angle produced to a blunt point touching the deflected frontal margin, and the outer distal angle produced to an acute point, touching the inferior orbital margin; the flagellum is short, extending into the orbital hiatus, but not equal in length to the diameter of the orbit.

The external maxillipeds have a dense brush of bristles along the inner lateral margin of the ischium. The distal margin of the merus is a little oblique.

References: *Atergatis anaglypta* Heller, Abhandl. Zool.-bot. Ges. Wien, p. 6, 1861; Sitz. Akad. Wiss. Wien, vol. 43, p. 312, pl. 2, figs. 11, 12, 1861.

Lophactaea anaglypta A. Milne Edwards, Nouv. Arch. Mus. Hist. Nat. t. I, p. 251, 1865; *ibid.*, t. IX, p. 190, 1873.—Ortmann, Zool. Jahrb. Syst. Vol. VII, p. 459, 1893.—de Man J. G., Zool. Jahrb. Syst. vol. IX, p. 498, 1895.—Alcock, Journ. Asiatic Soc. Bengal, vol. 67, pt. 2, p. 102, 1898.—Nobili, Ann. Mus. Napoli, vol. I, no. 3, p. 12, 1901.—Laurie, R. D., Ceylon Pearl Oyster Fish. Rept. vol. V, suppl. rept. 40, p. 395, 1906.—Nobili, Ann. Sci. Nat. Zool. 9 ser. t. IV, p. 233, 1906.

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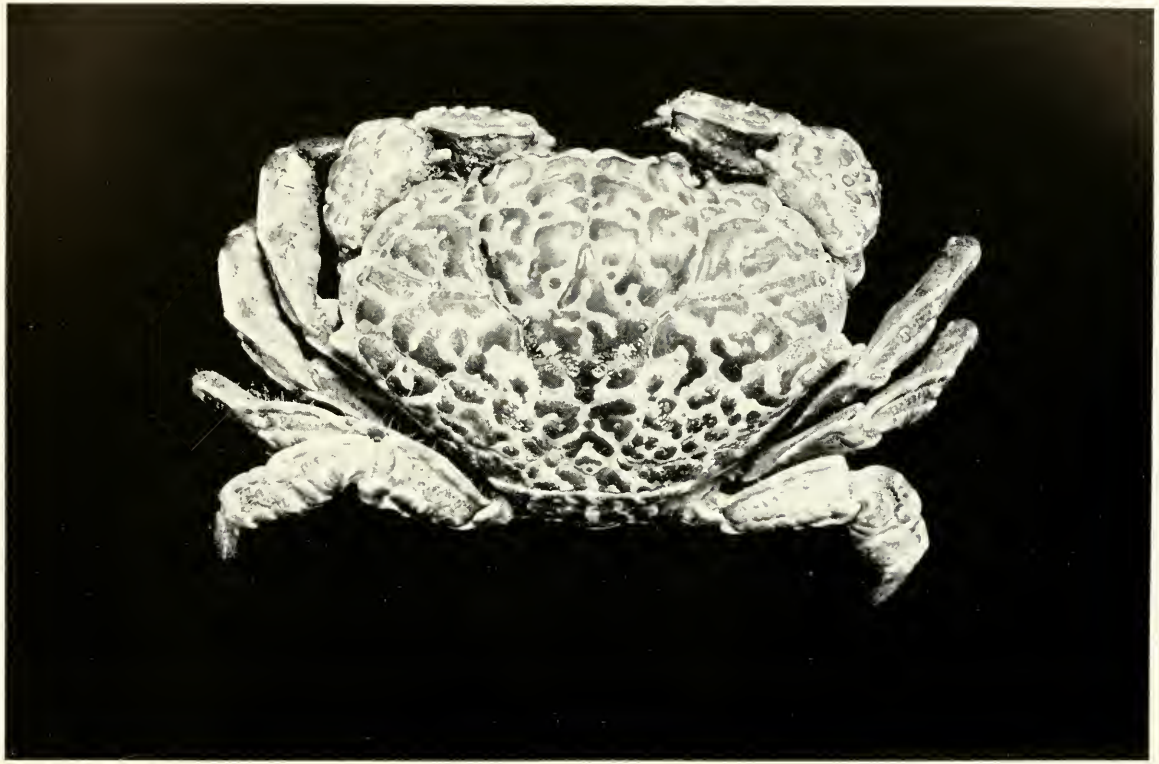
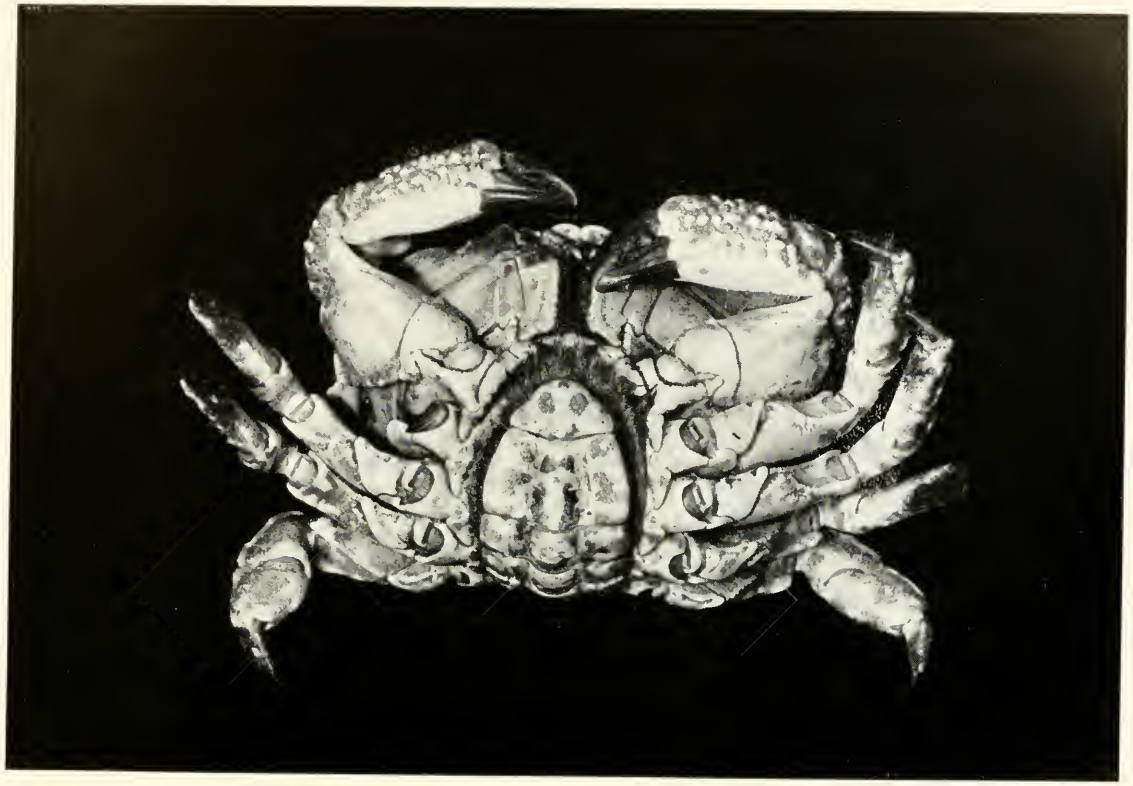
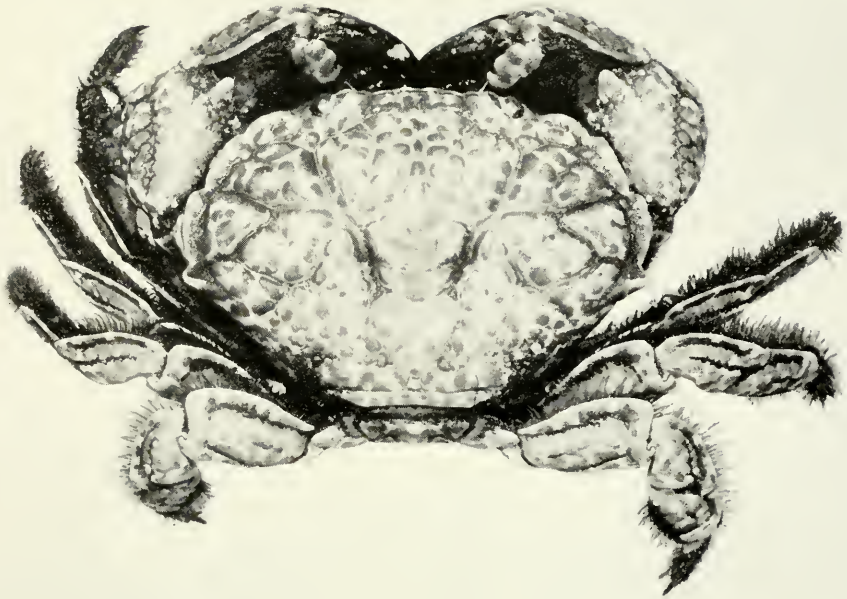


Zozimus aeneus (Linné), female, natural size.



Zozimus aeneus (Linné), female, natural size.



Zozimus aeneus (Linné), female, natural size.

Zozimus aeneus (Linné), male, natural size.

Genus: **ZOZIMUS** Leach.

Zozimus aeneus (Linné).

Plates 50, 51, 52 and 53.

TYPE: The type came from the Indies; the present depository is not known to the writer.

DISTRIBUTION: Red Sea, (Heller; Nobili, several stations); station 7, Sudanese Red Sea, (Laurie); Red Sea: Tor, Brother's Island, Mersa Scheikh, Hanfala, Mersa Dhiba, (Balss); Red Sea, (Pesta); Gulf of Akaba, (Ortmann); the Orient, (Seba); East Indies, (Linné); East Indian Seas and Carolina coast (error); Andamans and Laccadives, (Alcock); shore, Male, Minikoi Atolls, Rotuma, (Borradaile); Fakarina, (Nobili); Trincomali, Ceylon, (Muller); Ceylon, Java, (Ortmann); Kandavri, Pulo Edam, Celebes, Flores, Timor, New Guinea, (Miers); Seleo and Tami Island, New Guinea, (Nobili); Malay Archipelago, (de Man); Singapore, (Cano); Mascarenes, Australia and South Pacific, (Henderson); Woodlark Island, (Haswell); Funafuti Atoll, Ellice Islands, (Whitelegge); Samoa and Paumotu Archipelago, (Dana); Makemo, Paumotu Islands, (Rathbun); Tahiti; LooChoo Islands, (Stimpson); LiuKiu Islands, (Balss); Hawaiian Islands: Honolulu, reef; Waialua, Oahu; vicinity of Laysan Island, 10 to 14 fms., (Rathbun); New Caledonia, (de Man); Mauritius, (Ortmann); Mauritius: Port Louis, Grand Port, (Bouvier); Mauritius, (Pesta); Réunion Isle, (Ortmann); Seychelles, (Miers; Pesta; Rathbun); Peros, Coin, Salomon, Egmont, reef, Coetivy, (Rathbun); Madagascar, (Pesta); south pier, Durban, South Africa, (Stebbing); New Zealand, (Pesta).

COLOR: Dr. Alcock states that this crab is "beautifully spotted and ocellated with chocolate brown on a bluish grey ground."

MATERIAL EXAMINED: One, claws extensively marked with black, taken on coral reef at Anaho Bay, Nuka Hiva Island, Marquesas Islands, South Pacific, Aug. 10, 1931. Four (3 females and 1 male), Venus Point Reef, Tahiti, Society Islands, Aug. 15, 1931. One large male, Venus Point Reef, Tahiti, Society Islands, Aug. 15, 1931. Two males (large), one female, Poonarum Reef, Aug. 15, 1931.

TECHNICAL DESCRIPTION: Carapace three-fifths as wide as long, moderately convex, the regions sharply outlined by deep grooves, and cut into numerous lobules; the posterior half of the carapace especially is ornamented with conspicuous, smooth rounded tubercles, symmetrically distributed. The anterolateral margin is crestlike, cut into four

shallow teeth, the first three of which are wide and rounded, the fourth outjutting, dentiform. The postlateral margins are convergent, the posterior margin is thickened and emphasized by a nearly parallel groove. The orbital margins are tumid and marked by four suture lines, two superior and two inferior. The frontal margin is of moderate width, bilobate, not advanced beyond the orbital.

The antennulae are separated by a well defined septum and fold transversely. The antennae have the basal article short and broad, touching the front only at the inferior orbital angle; the flagellum is short and slender, situated in the hiatus, and about equal in length to two-thirds of the orbital diameter.

The external maxillipeds have the anterior margin of the merus a little oblique; a longitudinal groove in both the ischial and meral articles. The male abdomen is five jointed, the third to fifth articles being fused. The female abdomen is broadly oval and seven-segmented.

The chelipeds are equal in both sexes and are equal to each other. The merus trilobate, crested on the upper margin, with a rounded distal tooth; the carpus is rounded on the upper and outer surfaces and deeply rugose, being channelled by three or four transverse and one longitudinal groove, the outer surface with highly polished rounded beadlike-rugosities, the upper lateral margin crested, the crest emphasized by a submarginal parallel groove. Both fingers are black, the black on the propodal finger of the male extending conspicuously back and upward on the palm on the outer surface and on the inner surface of the palm to even greater extent, covering half or more than half of the surface and extending to the upper margin, with a slight band of the lighter body color along the anterior margin at the base of the finger. The fingers each have a distinct longitudinal groove and are curved, with rounded, hollowed tips. The propodal finger is armed with a single large molar.

The ambulatories are crested along the upper lateral margin, ornamented on the outer surface with longitudinal grooving; the dactyl strong, slender, furred, with sharp brown tips.

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Cancer amphitrite HERBST, Naturg. Krabben und Krebse, vol. III, pt. 2, p. 5, pl. 53, fig. 1, 1782.

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Cancer floridus FABRICIUS, *Ibid.*, p. 445, 1793; Suppl. Ent. Syst., p. 335, 338, 1798.

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Zozymus aeneus H. MILNE EDWARDS, Hist. Nat. Crust. t. I, p. 385, 1834. —DANA, U. S. Explor. Exped. vol. XIII, Crust., pt. I, p. 192, pl. 10, fig. 3, 1852.—STIMPSON, Proc. Acad. Nat. Sci. Phila. vol. 10, p. 32, 1858.—HELLER, Sitz. Akad. Wien, Jahrb. 43, p. 326, 1861.—A. MILNE EDWARDS, in Maillard's l'ile Réunion, Annexe F, p. 4, 1862;—Archiv. Mus. Hist. Nat., t. IX, p. 207, 1873.—MIERS, Ann. Mag. Nat. Hist. ser. 5, vol. II, p. 497, 1878; *ibid.*, ser. 5, vol. V, p. 234, 1880; Phil. Trans. London, vol. 168, p. 486, 1879; Rept. Voy. H. M. S. "*Challenger*" Zool., vol. 17, p. 134, 1886.—RICHTERS, in Mobius, Meeresfauna Mauritius, p. 146, 1880.—HASWELL, Cat. Austral. Stalk and Sessile-eyed Crust., p. 58, 1882.—MULLER, F., Verh. Natur. Ges. in Basel, Bd. VIII, p. 474, 1890.—DE MAN, Archiv. fur Naturges. vol. 53, pt. 1, p. 273, 1887.—CANO, Boll. Soc. Nat. Napoli, vol. III, ser. 1, p. 199, 1889.—HENDERSON, J. R., Trans. Linn. Soc. London, ser. 2, vol. V, p. 359, 1893.—ORTMANN, Zool. Jahrb. Syst. Bd. VII, p. 458, 1893–94; also in Semon's Forschung. (Jena Denksch. Bd. VIII), Crust., p. 50, 1894–1903. —WHITELEGGE, Mem. Austral. Mus., vol. III, p. 131, 1897.—ALCOCK, Jrn. Asiat. Soc. Bengal, vol. 67, pt. 2, p. 104, 1898.—BOUVIER, Bull. Sci. France-Belg. vol. 48, p. 289, 1914–1920.

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1917.—Balss, H., Denksch. Akad. Wiss. Wien, Bd. 99, p. 7, 1924; Archiv. fur Naturg. Bd. 90, Abt. A, heft 5, p. 70, 1924.

Genus: **LOPHOZOZYMUS** A. Milne Edwards.

Lophozozymus octodentatus (H. M. Edwards).

Plates 54 and 55.

Type: The type habitat was not stated; the type is deposited in the Paris Museum collections.

Distribution: Fee Jee Archipelago, (Lucas); Philippines, Java, (Miers); Java Sea, West coast of Borneo at Pontianak, (de Man); Singapore, (Walker, Alcock); northwest coast of Australia, Cape Grenville, Australia, (Haswell); Port Molle, New South Wales, Darnley Island, Nicol Bay, Northwest Australia, (Miers); Tahiti, Society Islands, (Boone).

Material examined: A large male and female taken on Venus Point Reef, Tahiti, Society Islands, South Ocean, August 15, 1931.

Technical description: Carapace three-fifths as long as wide, smooth, highly polished; gastric region circumscribed and partly divided by a median sulcus; hepatic and branchial regions also separated by wide, smooth shallow grooves. Frontal margin narrow, consists of paired, widely rounded submedian lobes, separated from the small blunt inner orbital tooth. The anterolateral margin is cut into four sharp teeth, the first of which is separated from the orbital angle by a distinct sulcus; the first tooth varies from blunt to moderately sharp, the second tooth is similar to the first. The third tooth is much stronger, and more acute, while the fourth tooth is the most prominent of the series. The hepatic region behind the first and second teeth is tumid, as is also the branchial region inside the third tooth, while a keel or ridge runs inward from the fourth tooth; the posterior margins are convergent, while the posterior margin is emphasized by a flat carina. Three closed sinuses occur on the orbital border near the outer angle. The antennules fold almost transversely, the inter-antennulary septum is broad. The basal antennal article is short and broad, touching the lower margin of the superior orbital border at the inner angle, and at the outer angle not reaching to the orbital tooth; the flagellum is minute, lies in the orbital sinus and does not extend beyond the orbital tooth. The external maxilliped is close fitting, smooth except for a longitudinal sulcus on the ischium; the median and anterior margins are closely setose. The eye is short, bulbous, with a thick, calcareous stalk, and a small subelliptical eye, set ob-

Lophozozymus octodentatus (H. M. Edwards), upper figure, male, lower figure, female, natural size.

Lophozozymus octodentatus (H. M. Edwards), upper figure, male, lower figure, female, natural size.

liquely on the outer surface of the tip of the stalk. The male belt is six-segmented, the third and fourth articles being fused. The female belt is widely oval, and seven-segmented.

The chelipeds are equal, but those of the male are substantially more massive than those of the female. Each has the merus triquetral, with the upper margin strongly crested, the crest distally expanded foliaceously and deeply cleft, the upper lateral margin shaggily setose; the carpus is smooth, convex dorsally, with a strong double tooth at the upper and inner angle; the propodus is smooth, rounded, with a longitudinal shallow groove, terminating distally near the base of the upper finger. The fingers meet throughout their length and are long, slender, down-curved, with the cutting edges shallowly serrate. Both fingers are black; the color terminating at the base of the fingers on the female, but on the males, (at least on the large males) extending on the palm three-fourths of its length along the base and upward on both inner and outer surfaces for a less distance, but quite prominently terminating in a conspicuous blotch on each surface behind the base of the lower finger.

The ambulatories are smooth, with the merus, carpus and propodus decidely crested on the upper surface, the inner surface of this crest covered with shaggy setae; dactyl coarsely villous up to the tip, which is a curved, highly polished claw.

References: *Cancer saxtalis* Rumphius, Amboinsch. Rariteitk. p. 9, pl. 5, fig. M, 1781.

Cancer rumphii Guérin, Icon. Règne Anim. pl. 2, fig. 1, (nec. Herbst).

Xantho octodentatus H. M. Edwards, Hist. Nat. Crust. t. I, p. 398, 1834.—Lucas, in Jacquinot's Voy. au Pole Sud et L'Océanie *"L'Astrolabe"* et *"Zélée"*, Zool. III, Crust. p. 25, pl. II, fig. 1, 1855.—Nauck, E., Zeits. Wissenschaft. Zool., vol. 34, p. 51, 1880.—Haswell, Cat. Austral. Stalk and Sessile-eyed Crust., p. 58, 1882.

Lophozozymus epheliticus Linné, Miers, Ann. Mag. Nat. His., ser. 5, vol. V, p. 231, 1880; Zool. H. M. S. *"Alert,"* Brit. Mus. publ., pp. 182, 207, 1884.—Walker, A. O., Journ. Linn. Soc. London, Zool., vol. 20, p. 109, 1890.—de Man, Zool. Jahrb. Syst., vol. VIII, p. 518, 1895.

Lophozozymus octodentatus Alcock, Journ. Asiatic Soc. Bengal, vol. 67, pt. 2, p. 106, 1898.—Calman, W. T., Trans. Linn. Soc. London, Zool., vol. 8, p. 6, 1900–1903.

Euxanthus melissa (Herbst).

Plate 56.

TYPE: The type locality was unknown to Herbst; the type specimen is deposited in the Berlin Museum.

DISTRIBUTION: Feejee Archipelago, Tongatabu, (Dana); Australia, coasts of Cochin China, l'ile Poulo-Condore, (A. M. Edwards); Gaspar Straits, (Stimpson); Tuticorin, Ceylon, (Henderson); Trincomali, Ceylon, (Muller); Darros Island, (Miers); Owen and Elphinstone Islands, Mergui Archipelago, (de Man); Bali, (Boone); rare at New Caledonia, (A. M. Edwards); Tamatave, Madagascar, (Miers).

MATERIAL EXAMINED: One male, in coral, Temukus Roads, Bali, Dutch East Indies, October 25, 1931.

TECHNICAL DESCRIPTION: Carapace oval, very convex in both directions and entirely lobulated, surface of lobules smooth, grooves wide and clear; length of carapace two-thirds of width; frontal margin one-fourth of total width, sinuate, deflected, consisting of two wide rounded lobes, separated by a median groove and set apart from the orbital border by a distinct notch from which a groove runs backward defining the terminal inner half of the orbital border, the outer half of the orbital border is a thickened ridge, as is also the inferior orbital border except for the inferior inner orbital tooth which is a conspicuous blunt triangle, visible dorsally. The frontal and anterolateral borders are widely rounded, the anterolateral border being cut into four teeth in addition to the inferior orbital tooth which is set apart by a shallow sulcus. The first anterolateral tooth is blunt and is circumscribed, immediately behind it is a small lobe and above this is a very small lobe behind the eye. The second tooth is wide with an oblique anterior border terminating in blunt angulation and a short posterior border; its upper surface is broken into two marginal lobules, the anterior one being quite small and not very convex. The third tooth is more conspicuously angulated with a short anterior margin and a longer posterior margin; the fourth tooth is the most conspicuous of the entire series and is situated at the point of union of the short concave postlateral margin which is only about half as long as the anterolateral margin, or about equal to the width of the heavily carinated posterior margin. There are a pair of small, wide lobules immediately above the posterior margin, and above these on either side, adjacent to the postlateral margin, there is a large irregular low lobule, with broken surface. The intestinal region is circumscribed as

Euxanthus melissa (Herbst), × 1.

a trilobed lobule and just anterior to it is the shield-shaped cardiac lobe, which has the anterior median area produced into a slender process that extends between the median lobes of the gastric region. On each side of the cardiac lobe there is a small lobe and outside and adjacent to this a much larger very convex lobe on the summit of the branchial region. On each side of the anterior point of the cardiac lobe there are four suboval convex lobes in transverse series across the gastric and branchial regions. There is a total of thirty lobules on the carapace, counting the small ones of the marginal areas. The male belt is triangular, composed of five articles, the third to fifth segments being fused. Both the sternal plastron and the belt have their surfaces much sculptured by deep irregular pittings between the elevated small lobes. The epistome is carinate and the adjacent side regions are paved with close-set rounded granules which also occur abundantly on the outer face of the external maxillipeds.

The eye is small, the cornea being restricted to the very tip of the stalk and with a portion of its dorsal surface covered by a calcareous process.

The antennulae are large with a rudimentary flagellum, semiconcealed in a large tuft of setae; they fold transversely within the fossett; the interantennulary septum is wide with a median sulcus on its outer face.

The antennae have the basal article greatly enlarged, filling the space between the deflected frontal border and the inferior orbital angle, with the distal end of the article produced and lying within the orbital sinus; the second and third peduncular articles are greatly reduced, as is also the threadlike ten-jointed flagellum which is less than one-third the long diameter of the orbit.

The external maxillipeds are squarish, close fitting, with the outer surface covered with coarse rounded granules and numerous bristles, especially along the inner lateral and distal margins. There is a deep median longitudinal sulcus on the outer face of the subrectangular ischium and a similar sulcus which widens distally on the face of the merus. The merus has its outer distal angle somewhat produced in a rounded process and the distal margin is slightly sinuate. The palp is very stocky and setose.

The chelipeds are equal in the male, and are stocky and closely appressed to the sides of the carapace. The merus is short and does not extend beyond the margin of the carapace; the carpus is large, lobulate,

with its outer margin divided into two protruberant lobes; the propodus is shorter on its cristate upper margin than is the carpus; the upper half of the outer face of the palm is rugose with two or three nodes, one of which occurs above the base of the upper finger; below these there are two longitudinal grooves alternating with two longitudinal thick carinae; the lower third of the palm is roughly pitted. The fingers are decidedly deflected, stocky, the cutting edges armed with a few low teeth, the tips spoon-shaped; the outer surface is longitudinally grooved. In the male the fingers are all black, this black patch extending a very short distance back on the outer face of the lower finger for a much greater distance, nearly half the palm, on the inner surface of the palm.

The ambulatories are rather delicate, distinctly decreasing in length from the first to fourth pairs; the meral joints are all decidedly compressed laterally and have the lower margin excavate for the reception of the related carpal joints when the legs are retracted; the carpus and propodus are subequal, the two considered together about as long as the related merus; each article is nearly as wide as long, with the outer lateral margins cristate, the upper surface lobulated and the inner lateral margin carinate; the dactyl is about as long as the propodus, stocky, with a curved strong horny tip and a dense fur-like setae on the distal two-thirds of its inner lateral margin.

References: *Cancer exsculptus* Herbst, Naturg. Krabben und Krebse, Bd. I, pt. II, p. 265, Atlas, pl. 21, fig. 121, 1798.

Cancer melissa Herbst, Naturg. Krabben und Krebse, Bd. III, pt. II, p. 7, pl. 51, fig. 1, 1798.

Euxanthus melissa Stimpson, Proc. Acad. Nat. Sci. Phila., vol. X, p. 33, 1858.—A. Milne Edwards, Nouv, Archiv. Mus. Hist. Nat., Paris, t. I, ser. 2, p. 293, 1865.—Tozzetti, T., Magenta Crost. p. 27, pl. 3, figs. 1–7, 1877.—Muller, F., Verh. Ges. Basel., vol. 8, p. 474, 1890.—Henderson, J. R., Trans. Linn. Soc. Zool. ser. 2, vol. 5, p. 359, 1893.—Ortmann, Zool. Jahrb. Syst., vol. VII, p. 466, pl. 17, fig. 9, 1893–94.—Alcock, Journ. Asiatic Soc. Bengal., vol. 67, pt. 2, p. 110, 1898.—Borradaile, Proc. Zool. Soc. London, 1900, pt. 2, p. 586.—de Man, Bidrag tot Dierkunde Zool. Genoot. Natur. 28e, Afl. p. 1, 1929.

Cancer mamillatus H. Milne Edwards, Hist. Nat. Crust. t. I, p. 376, 1834.

Melissa mamillata Strahl, Weigmann's Archiv. fur Naturges., vol. 27, I, p. 103, 1861.

Euxanthus sculptilis Dana, × 4.

Euxanthus mamillatus A. MILNE EDWARDS, Nouv. Archiv. Mus. Hist. Nat., Paris, t. I, p. 292, pl. 15, figs. 2–2b, 1865; *ibid.*, t. IX, p. 196, 1873.—HASWELL, Catal. Australian Stalk- and Sessile-eyed Crust., p. 48, 1882.—DE MAN, Journ. Linn. Soc. Zool., vol. 22, p. 30, 1887–88.

Euxanthus nitidus DANA, Proc. Acad. Nat. Sci. Phila., vol. 6, p. 75, 1852; U. S. Explor. Exped., vol. XIII, Crust. pt. I, p. 174, Atlas, pl. 8, figs. 9a–b (young), 1852.

Melissa nitida STRAHL, Wiegmann's Archiv. fur Naturges., vol. 27, I, p. 103, 1861.

Cancer exsculptus HOFFMAN, in Pollen and Van Dam, Recherches Faune de Madagascar et de Dependances, Crust. Pt. V, p. 38, 1877, Leide.

?Euxanthus exsculptus variety *rugosus* MIERS, Zool. H. M. S. "*Alert*," pp. 517, 527, 1884. (? young, Alcock *dixit.*).

Euxanthus sculptilis Dana.

Plate 57.

TYPE: Dana's type material was taken in the Feejee Archipelago and Tongatabu. Present depository Smithsonian.

DISTRIBUTION: Feejee Islands, and Tongatabu, (Dana); Samoan Islands, (Ortmann); Amboina, (de Man); Torres Straits, (Jacquinot); Queensland: Cape Grenville, (Haswell); Torres Straits, (A. M. Edwards, Lucas); north and northeast Australia (Miers); north, east and west Australia and the Moluccas, (de Man); Persian Gulf, Andamans; Samoa, (Alcock); Tahiti, (Boone).

MATERIAL EXAMINED: One female, Venus Point Reef, Tahiti, Society Island, August 15, 1931, collected by the "*Alva.*"

COLOR: Violaceous blue on the carapace and legs, with the fingers black.

TECHNICAL DESCRIPTION: Carapace widely oval, width about one and two-fifth times the length; convex in both directions; entire dorsal surface covered by convex, granulose lobules which are composed of rounded granules in berrylike formation. These lobules are separated by wide sulci which are paved with rounded granules. The frontal margin is one-third of the width of the body and appears to be slightly in advance of the anterolateral margin and is deflected, being composed of two wide lobes, separated by a slight median notch; the inner half of the margin of each lobe is convex, the outer half concave, except the

outer angle which is produced and deflected, bordering the antennulary fossett and touching the distal angle of the antennal peduncle. Immediately above the frontal margin are a pair of convex lobes, flanked on each side by the orbital lobe, which, in a dorsal view, appears to be the frontal margin; immediately behind the submedian pair of lobules is a second pair of similar lobules; those of the frontal region are low, rounded, in comparison with those of the transverse series across the gastric region and separated by a deep sulcus, which combine to give the carapace an odd sort of humped appearance. The orbital margin is thickened, circumscribed, cut on the outer half by two closed sinuses, the outer angle is a rounded small lobule closely related to the first anterolateral lobule, which is also a rounded lobule. The anterolateral margin is cut into four rounded convex lobules, which gives it a scalloped aspect. The second and third of these lobules are subequal, larger than the first and the fourth lobule is small, subequal to the first. Including and approximately in line with the second anterolateral lobe there are five lobes in transverse series on each side of the carapace, two lobules being on the epibranchial region and two, slightly larger, oval ones on the mesogastric region, separated by the pointed apex of the anterior lobe of the metagastric region, from the two similar lobes of the opposite half of the series. Three oval lobes, the anterior of which is the smallest, summit the mesogastric region; in a curved line with these across the mesobranchial region is a series of four lobules on each side, the inner two being subequal and much the larger; the outermost one being the third anterolateral lobule. On the circumscribed cardiac region there are two partially united lobules, which together have a heart-shaped contour and on either side of these in curved series along the postlateral margin are five small lobules, the second (from the center), of which is quite small, the outermost lobe being the fourth anterolateral lobule. Across the posterior region of the carapace is a transverse ridge, composed of three semiunited lobules. In all there are 44 lobules on the dorsal surface. The pterygostomian region is smooth. The female belt is oval, setae fringed, seven segmented. The sternal plastron is smooth.

The eye is small, the stalk calcareous, constricted medially and with its distal margin granulose; the cornea is rounded, set obliquely terminal with almost all of the dorsal surface covered by the calcareous stalk, the field of vision being principally from the distal and under surfaces.

The antennulae are folded transversely within the fossett and are separated by an interantennulary septum.

The antennae have the basal article very large, subrectangular, with the distal angle filling the orbital sinus; the second and third articles and flagellum are greatly reduced, subrectangular.

The external maxillipeds are wider than high, nearly square, close-fitting, externally smooth, the ischium is subrectangular with the proximal angle truncated, the inner margins setose; the merus is squarish with the distal margin sinuate, the outer distal angle being rounded; the inner distal angle truncated; the palp is three jointed.

The chelipeds are equal in the female and are of moderate size, closely appressed to the carapace and with the upper and outer surfaces of the merus, carpus and propodus covered with rounded, beaded lobules, like those of the carapace. There is one rounded, beaded lobule at the exposed distal margin of the merus, the carpus has two lobules on the upper surface and three lobules along the outer side, making five lobules in all on the carpus; these are well separated by deep channels; the propodus is very little longer than the carpus and is entirely lobulated externally. These are large, convex, beaded lobules along the upper margin; the outer face, which is not greatly dilated, is entirely covered by small and large lobules of granules, which decrease in size toward the lower beaded margin. The fingers are short, stubby, less than one-half the length of the carapace, black, granulose, their entire length moderately deflected, cutting edges shallowly dentate, meeting throughout their length, the tips pointed, sharp.

The ambulatories are short, slightly decreasing in length in the order 1, 2, 3, 4; each with the merus, carpus and propodus wide, laterally compressed, with the exposed upper surface of the merus, the carpus and propodus covered with convex, beaded lobules, separated by granular channels, as on the carapace; the dactyli are nearly as long as the related propodi, stout, tapered subcylindrical, with a curved, horny, sharp tip.

References: *Euxanthus sculptilis* Dana, Proc. Acad. Nat. Sci. Phila., vol. 6, p. 75, 1852; U. S. Explor. Exped., vol. XIII, Crust. pt. I, p. 173, pl. 8, figs. 8a–d, 1852.—A. Milne Edwards, Nouv. Archiv. Mus. Hist. Nat. Paris, t. I, ser. II, p. 291, 1865.—Ortmann, Zool. Jahrb. Syst., Bd. VII, p. 466, 1893–94.—Alcock, Jour. Asiatic Soc. Bengal, vol. 67, pt. 2, p. 111, 1898.

Cancer huonii LUCAS, in Jacquinot's Voy. au Pole Sud et L'Océanie "*Astrolabe*" et "*Zélée,*" Zool. III, Crust. p. 16, pl. 4, fig. 1, 1865.
Euxanthus huonii A. MILNE EDWARDS, Nouv. Arch. Mus. Hist. Nat., t. I, p. 290, pl. 15, figs. 1–1c, 1865.—HASWELL, Catal. Australian Stalk and Sessile-eyed Crust., p. 47, 1882.—MIERS, Zool. H. M. S. "*Alert,*" pp. 182, 204, 1884.—DE MAN, Archiv. fur Naturges., vol. 53, Bd. I, p. 263, 1887.

Genus: **LEPTODIUS** A. Milne Edwards.

Leptodius exaratus (H. Milne Edwards).

Plate 58.

TYPE: Dr. Henry Milne Edwards states that his type inhabits the coasts of India and was described from specimens in the collection of the Paris Museum.

DISTRIBUTION: Senegal, (Audoin and Savigny); Red Sea, (A. M. Edwards; Hilgendorf); Dar-es-Salaam, Red Sea, (Ortmann); several stations, Red Sea, (Nobili); Red Sea: Gulf of Suez, Shadwin, Senafir, Ras Garib, Mersa Haleib, Hansani, Mersa Dhiba, Habban, (Balss); Port Taufiq, Gulf of Suez; "commonest species found in the Red Sea" (Calman); Persian Gulf, sta. 20, (Nobili); Krusadai Island, Gulf of Manaar, (Gravely and Raj); Trincomalee, (Laurie); Trincomali, Ceylon, (Muller); Chokirbank, (Ortmann); Coasts of India, (H. M. Edwards); Akyab, Persian Gulf, Ceylon, Bombay, Penang, Karachi, Andamans, Mergui Archipelago, (Alcock); Pulau Bidan, Penang, (Lanchester); Tuticorin, Silavaturai Par, Sind; Rameswaram; Ceylon, (Henderson); Hoa Island, (Nobili); three localities, Gulf of Siam, (Rathbun); Macassar, Celebes, (Schenkel); Amboyna, Moluccas, (Rathbun); Noordwachter Island; Mergui Archipelago: Elphinstone Island Bay, Owen Island, King Island Bay; Batavia; Celebes: Pare-pare, (de Man); Cape Bonne-Esperance, Sonda Islands, (A. M. Edwards); Funafuti Atoll, Ellice Islands, under stones on the outer reef at low tide, (Whitelegge); Feejee Islands, Caroline Islands, Ponape, Upolu, Samoa, (Ortmann); Marquesas Islands, (Boone); Hawaiian Islands, (Stimpson); Hilo, Hawaii, (Rathbun); Fanning Island, (Edmondson); Bonin Islands, (Stimpson); Loo Choo Islands, Ousima Island, Simoda, Japan, Hong Kong, (Stimpson); Tokio Bay, Sagami Bay, Nagasaki, LiuKiu Islands, Amami-Oshima, Japan, (Ortmann); Enoshima, Japan, (Doflein); Sagami and Misaki, Japan, (Rathbun); Hankow, China, (Gee; Kellogg); Pacific, (Dana);

Leptodius exaratus (H. Milne Edwards,) × 1.25.

Haswell states "widely distributed," referring to this species in Australia. Shark Bay, west Australia, (Miers); Port Curtis, 7 to 11 fms.; Port Molle, beach between tidemarks, Australia. Rockhampton, Queensland; (Ortmann); Palm Islands, Queensland, (Boone); shore, Cockburn Island, north Queensland, (Calman); Pulo Satang, Borneo, (Nobili); Praslin, Saya de Malha, Seychelles, (Rathbun); Mauritius: Chaland, Grand Port, (Bouvier); New Caledonia, (Hilgendorf); Madagascar, Zanzibar, (A. M. Edwards).

Material examined: One large specimen, taken on coral reef, at Falcon Island, Palm Islands, Queensland, Australia, October 7, 1931. One young specimen taken in coral reef, at Anaho Bay, Nuka Hiva Island, Marquesas Islands, August 10, 1931.

Technical description: Carapace with frontal and anterolateral margins forming a wide oval, the posterior lateral margin concave and decidedly convergent; the anterior two-thirds is moderately convex for this genus and areolated; the posterior third nearly flat and not areolated. The frontal margin is narrow, about one-fourth of the total carapace width, bilaminate, a median groove running back onto the gastric region, the frontal margins of the lobes slightly concave, the outer angle bluntly rounded, separated by a notch from the inner orbital angle, which is less protuberant. The frontal margin projects somewhat beyond the orbital angle. The upper orbital margin is not very swollen and is marked by two closed sutures on the outer half and the lower margin has another just below the frontal margin. The external orbital angle is blunt and is well separated from the first tooth of the anterolateral margin; below the orbital angle is a small prominent denticle. There are four acuminate teeth on the anterolateral margin; the first, second and third teeth increasing in length and prominence in the order named, while the fourth tooth, situated at the postlateral angle is most acuminate. The gastric and cardiac regions are circumscribed. On the gastric region there are a pair of fairly prominent submedian lobes posteriorly and on either side of these, near the cervical groove there is a larger low lobe on each side. On the outer anterior portions of the carapace there are five low lobes on each side; three of these follow the contour of the anterolateral margin, the outer two being behind these. The furrows between the lobules are wide and clear. The surface of carapace is smooth, showing only fine punctae under the microscope. The sidewalls of the carapace have a dense brushlike coating of thick coarse setae as have also the upper lateral margins of the proximal joints of

the chelipeds and ambulatories, especially of the meral joints. The male abdomen is five-jointed, segments three to five being fused.

The chelipeds are distinctly unequal in both males and females. The merus fits closely under the carapace only the distal margin being visible dorsally. The carpus is convex but with one or two distinct furrows or depressions, and with a strong tooth at the inner angle; the palm is high, moderately convex on both outer and inner surfaces, moderately rounded, smooth, except that the outer surface has a series of wrinkles or depressions that form an almost longitudinal furrow below the upper margin. The fingers are black, this coloration extending very briefly and obliquely on the palm at the base of the lower finger; the tips are spoon-shaped, each with a subdistal tuft of bristles in the concavity. The fingers of the larger male cheliped have a moderate elliptical gape and a few small rough teeth. The fingers of the smaller cheliped meet and have each three or four small teeth; both fingers have rudimentary longitudinal grooves on their proximal portions.

The ambulatories are compressed, subcylindrical, the meral joints smooth, the carpus and propodus nearly smooth, each with a faint groove on the upper surface; the dactyl is slender, longitudinally grooved on each side, covered with coarse, squamose granules which are mostly concealed beneath dense furry setae, the tip of the dactyl is a strong curved horny claw with a groove on its under surface.

The eye stalk is short, calcareous, dilated proximally, tapered distally with none of the cornea visible dorsally; this being terminal and lateral.

The antennulae are short and stocky and fold nearly transversely; they are separated by a stout septum.

The antennae have the basal article oblong, touching the deflected frontal margin at the inner angle and produced slightly farther at the outer angle but not extending to the orbital angle; the flagellum is short, situated in the orbital hiatus and extending for only about two-thirds the length of the orbit.

The external maxillipeds have the distal margin of the merus nearly transverse with a small triangular notch followed by a small tooth near the anterior inner angle; also a distinct pit-like depression on the outer surface of the merus, near the base of the palp.

References: *Chlorodius exaratus* H. Milne Edwards, Hist. Nat. Crust., vol. I, p. 402, 1834; in Cuvier's Régne Anim., t. 17, p. 51,

t. 18, Atlas, pl. 11, fig. 3, Illustrated Edition, Paris.—DANA, Proc. Acad. Nat. Sci. Phila., vol. 6, p. 79, 1852.—U. S. Explor. Exped., vol. XIII, Crust. pt. I, p. 208, 1852.—STIMPSON, Proc. Acad. Nat. Sci., vol. 10, p. 34, 1858.

Leptodius exaratus A. MILNE EDWARDS, Nouv. Arch. Mus. Hist. Nat. Paris, vol. IV, p. 71, 1868; *ibid.*, vol. IX, p. 222, 1873.—KOSSMAN, Reise roth. Meer. Crust., p. 32, pl. 2, fig. 1–6, 1877.—HILGENDORF, Monatsb. Konig. Akad. Berlin, p. 790, 1878.—Richter's in Mobius Meeresfaun. Maurit., p. 148, 1880.—HASWELL, Catal. Austral. Stalkeyed and Sessile-eyed Crust., p. 60, 1882.—MIERS, Zool. H. M. S. *"Alert,"* pp. 183, 214, 1884.—DE MAN, Archiv. fur. Naturges., vol. 53, Bd. 1, p. 285, 1887; Journ. Linn. Soc. Lond. Zool., vol. 22, p. 33, 1887–88; also in Weber's Zool. Ergebn. Niederl. Ost.-Ind., vol. 2, p. 278, 1892.—Zool. Jahrb. Syst., vol. 8, p. 521, 1894–95.—CANO, Boll, Soc. Nat. Napoli, vol. III, p. 202, 1889.—HENDERSON, J. R., Trans. Linn. Soc. London Zool., ser. 2, vol. 5, p. 362, 1893.—WHITELEGGE, Mem. Austral. Mus., vol. III, p. 137, 1897.—LANCHESTER, Proc. Zool. Soc., pt. III, p. 540, 1901.—NOBILI, Boll. Mus. Torino, t. 18, art. 447, p. 13, 1902–03.—RATHBUN, Proc. U. S. Nat. Mus., vol. 26, p. 25, 1903.—RATHBUN, Rept. U. S. Fish. Comm. for 1903, Bull. 23, pt. 3, p. 847, 1906.—NOBILI, G., Ann. Sci. Nat. 9 ser. Zool. t. IV, p. 240, 1906; Bull. Sci. France-Belg. t. 40, p. 121, 1906; Mem. Acad. Sci. Torino, ser. 2, t. 57, p. 389, 1907.—RATHBUN, K. Danske Vid. Selsk. Skr. 7th raekke, Bd. 5, p. 350, 1910.—BOUVIER, Bull. Sci. France-Belg. t. 48, p. 284, 1914–1920.—BALSS, H., Denksch. Akad. Wiss. Wien, Bd. 99, p. 10, 1924.—GEE, N. G., Lingnaam Agric. Review, Canton, vol. III, p. 163, 1925–1926.—CALMAN, W. T., Trans. Zool. Soc. London, vol. 22, p. 213, 1926–1929.—KELLOGG, Lingnan Journ. Sci. Canton, vol. V, p. 354, 1927–1928.—DE MAN, Bidrag tot Dierkunke Zool. Genoot. Natur. 26 E, Afl. p. 1, 1929.

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Xantho lividus DE HAAN, *op. cit.*, pl. 13, fig. 6, 1837.—MIERS, Zool. H. M. S. *"Alert,"* Brit. Mus. Publ. pp. 183, 214, 1884.

Cancer inaequallis AUDOUIN AND SAVIGNY, Descrip. Egypte, Hist. Nat., t. 22, pl. 5, fig. 7, 1927; (*fide* A. M. Edwards).

Xantho exaratus variety *typica* ORTMANN, Zool. Jahrb. Syst. vol. VII, p. 445, 1893–94; also in Semon's Zool. Forschungsr. in Australien und Malay, (Jena Denk. VIII), Crust. p. 50, 1894–1903.

Leptodius exaratus variety RATHBUN, Trans. Linn. Soc. London, ser. 2, vol. 14, p. 215, 1911.

Leptodius exaratus variety *acutidens* RATHBUN, Bull. U. S. Nat. Mus., vol. 52, p. 310, 1910.—EDMONDSON, Bull. B. P. Bishop Mus., vol. 5, p. 14, 1923.

Xantho (*Leptodius*) *exaratus* ALCOCK, Journ. Asiatic Soc. Bengal, vol. 67, pt. 2, 118, 1898.—CALMAN, W. T., Trans. Linn. Soc. Lond. Zool. ser. 2, vol. 8, p. 6, 1900–1903.—LAURIE, R. D., Ceylon Rept. Pearl Oyster Fish., vol. V, p. 402, 1906.

Xantho exaratus DOFLEIN, Abh. Math.-Phys. K. B. Akab. Wiss. Bd. 21, p. 660, 1902.—SCHENKEL, Verh. Naturf. Ges. Basel, Bd. 13, p. 575, 1902.

Leptodius crassimanus A. Milne Edwards.

Plate 59.

TYPE: The type of this species was collected at New Caledonia and deposited in the Paris Museum.

DISTRIBUTION: New Caledonia, (A. M. Edwards); Port Denison, Port Molle, Port Curtis, Australia, (Haswell); Trincomali, Ceylon, (Muller); Noordwachter Island, Edam Island, Java; Pontianak, N. W. Coast of Borneo; Batavia Bay; Poeloe Samaoe, Malay Archipelago, (de Man); East Australia and Australia, (Ortmann); India: Andamans, Karachi, Galle, (Alcock); Apia, Samoa, (Boone); Hawaii: Honolulu, Waialau, Oahu, (Rathbun); Fanning Island, (Edmondson); Somerset, Malaysia, (Nobili); Massaua, Red Sea, (Balss).

MATERIAL EXAMINED: One male taken on the reef at Apia, Samoa, Sept. 3, 1931.

TECHNICAL DESCRIPTION: This species is easily distinguished by its very narrow quadridentate frontal margin from its near allies, *L. sanguineus* (H. Milne Edwards) and *L. exaratus* (H. Milne Edwards).

L. crassimanus is about the same size as the above mentioned species but has its carapace much more convex anteriorly; the well-defined regions are more convex and their fewer aerolae are also more convex. The frontal border is narrowed, bilaminate, with the frontal margin sinuous, the inner lobe well separated from the outer by a deep concavity; the outer lobe is in turn separated from the orbital angle by a deep notch. The superior orbital margin is circumscribed but not very tumid and is marked by two closed sutures on the upper margin and one below. The anterolateral margin is cut into four

Leptodius crassimanus (A. Milne Edwards), × 1.5.

teeth, the first of which is separated from the orbital angle by a decided concavity. The anterolateral teeth are sharply defined by separating grooves, the first to third teeth respectively increasing in width and acuteness while the fourth is shortest and most acute. There are four well separated quite convex lobules on the gastric region and about four more on either side of the carapace, arranged in series behind the anterolateral teeth. The male belt is five-jointed.

The chelipeds are unequal in the male; the carpus is rough, with a strong tooth at the inner angle; the propodus has the palm roughened and pitted; the fingers are curved with a moderate gape and have a rounded, hollowed tip, the concavity being entirely filled by a curious fan-shaped tuft of setae. The fingers are blackish brown with creamy tips.

The ambulatories are subcylindrical, the upper lateral margin of the merus and propodus with clusters of bristles; the dactyl stocky with a curved, horny tip.

The eyestalks are stocky, with a large cornea placed terminally.

The antennulae are stout, fold almost transversely beneath the frontal hood and are well separated by a thick interantennular septum.

The antennae have a close-fitting, obliquely placed basal article that does not reach to the orbital angle; the flagellum is quite small, situated in the orbital hiatus and not half so long as the orbit.

The external maxillipeds have the anterior margin of the merus notched but have this marginal contour slightly different from that of *L. exaratus.*

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Leptodius crassimanus A. M. Edwards, Nouv. Arch. Mus. Hist. Nat., ser. 2, t. IX, p. 226, pl. 11, fig. 4, 1873.—Haswell, Catal. Australian Stalk and Sessile-eyed Crust., p. 61, 1882.—Muller, Verh. Naturf. Ges. Basel, vol. 8, p. 474, 1886.—de Man, Archiv. fur. Naturges., vol. 53, Bd. I, p. 287, 1887; Notes Leyden Mus., vol. 15, p. 284, 1893; Zool. Jahrb. Syst., vol. VIII, p. 522, 1894–95.—Nobili, G., Ann. Mus. Genova, ser. 2, vol. 20, p. 257, 1899–1901.—Balss, H., Denksch. Akad. Wiss. Wien, Bd. 99, p. 10, 1924.

Xantho exaratus variety *crassimanus* Ortmann, Zool. Jahrb. Syst. vol. 7, 448, 1893–94.

Xantho (*Leptodius*) *crassimanus* ALCOCK, Journ. Asiatic Soc. Bengal, vol. 67, pt. 2, p. 120, 1898.

Leptodius sanguineus (H. Milne Edwards).

Plates 60 and 61.

TYPE: The type was collected in Mauritius and is deposited in the Paris Museum.

DISTRIBUTION: Red Sea, (Ortmann); Payta; Halmahera, (Cano); Indian Ocean, (A. M. Edwards); Persian Gulf, Andamans, Nicobars, Laccadives, Ceylon, (Alcock); shore, Goifurfehendu Atoll, Maldives, (Borradaile); Cocos Keeling Atoll, (Calman); Rikitea (Nobili); Koh Kahdat and Koh Chang, Gulf of Siam, (Rathbun); Ternate, (Cano); Society Islands, Gilbert Islands, Paumotu Islands, Marquesas Islands, (Rathbun); Marquesas Archipelago, (Boone); Sandwich Islands, (Randall); Hawaiian Islands: Honolulu, reef; Waialua, Oahu, Hilo, Puako Bay; Kealak Bay; Napili Harbor; Maui; Necker Island; Waikiki Beach; Waianae; Kailua, (Rathbun); Marcus Island, (Bryan); Palmyra and Fanning Island, (Edmondson); Upolu, Samoa, Savii, (Pesta); Seas of the Isles of France, (H. M. Edwards); Mauritius: Grand Port and Port Louis, (Bouvier); Peros, Coin, Salomon, Praslin, Seychelles, Coetivy, (Rathbun); Zanzibar, Kokotoni and Bawi, East Africa, (Lenz); Falcon Island, Palm Islands, Queensland, (Boone).

MATERIAL EXAMINED: Thirteen specimens (including specimens from one-half inch to one and one-half inches long diameter), from coral at Falcon, Palm Islands, Queensland, October 7, 1931. Eleven specimens of various sizes, collected on coral reef at Anaho Bay, Nuka Hiva, Marquesas Isles, South Pacific, August 10, 1931.

TECHNICAL DESCRIPTION: The largest of the "*Alva*" specimens is a male, having a long diameter of 35 mm., a length of 21.5 mm.

The carapace is quite convex anteriorly and on the branchial lobes, posteriorly less convex. The frontal margin is consistently narrower than that of its near congener, *Leptodius exaratus* (H. Milne Edwards), and consists of two submedian lobes, with truncated but slightly concave margins, and separated from the inner orbital angle by a distinct notch; the median lobes being projected farther forward than orbital tooth. Three closed sinuses occur and pucker the outer half of the superior orbital margin. The external orbital angle is a blunt tooth separated from the first anterolateral tooth by a wide con-

Leptodius sanguineus (H. Milne Edwards), upper figure, male, lower figure, female, × 1.3.

Leptodius sanguineus (H. Milne Edwards), upper figure, male, lower figure, female, × 1.3.

cavity on which there is a prominent, submargined nodule. The anterolateral margin is widely rounded and cut into five prominent nodular teeth. The dorsal surface of the carapace is conspicuously areolated, the convex gastric lobes are circumscribed and separated from each other by a median nulcus; the branchial region of the carapace on either side of the gastric lobes is divided by deep, anastomosing sulci into about six distinct lobes, each of these, the four outer lobes are inside of, and separated from the first to fourth anterolateral teeth respectively, while the fifth and sixth lobes occur on the inner branchial region. There is a deep, slightly irregular, transverse sulcus, arising between the fourth and fifth anterolateral teeth and extending entirely across the carapace, and emphasized by the urogastric pits. The posterior region of the carapace has the intestinal region faintly outlined, emphasized posteriorly by a submedian pit on either side, and with posterior margin a flat carina. The lateral walls of the carapace adjacent to the legs are nearly covered with coarse shaggy setae. The male belt is very narrow and consists of five segments; the third, fourth, and fifth being fused. The female belt is seven segmented, oval, moderately wide, with very setose margins.

The chelipeds are conspicuously unequal in both sexes, with the upper and outer surface of the wrist convex but roughened and pitted, and with a distinct tooth at the inner angle. The hand is smooth on the outer surface but with a definite submarginal, longitudinal groove below the upper surface and with this upper surface roughened by pittings and fine, irregular, low wrinkles.

The fingers are black in both sexes, this black extending obliquely backward for a short distance on the hands in the larger males. The fingers of the larger male cheliped are widely gaping, meeting only at the hollowed tips and armed with several feeble teeth. In the smaller cheliped the gape is less, the entire cutting edges of both fingers serrate with teeth only the tips of which scarcely touch. In the female, the fingers of both chelipeds have almost no gape, both cutting edges being regularly serrate.

The ambulatories are smaller, with the merus subcylindrical and grooved; the carpus short and grooved, and the propodus short, granulose; the dactyl covered with rounded coarse tubercles, beneath the thick coating of furry setae, and tipped with a sharp claw.

References: *Chlorodius sanguineus* H. Milne Edwards, Hist. Nat. Crust. t. I, p. 402, 1834.—Dana, Proc. Acad. Nat. Sci. Phila.,

vol. 8, p. 79, 1852; U. S. Explor. Exped. Crust. vol. XIII, pt. I, p. 207, pl. 11, figs. 11a–d, 1852.—HELLER, Reise Osterreich. Fregatte "*Novara*" Crust. Zool. Bd. II, Abh. III, p. 18, 1868.—STREETS, T. H., Bull. U. S. Nat. Mus. Bull. VII, p. 105, 1877.

Leptodius sanguineus A. MILNE EDWARDS, Nouv. Archiv. Mus. Hist. Nat. t. IV, p. 71, 1868; *ibid,* t. IX, p. 224, 1873.—RICHTERS, in Mobius, Meeresfauna Mauritius, p. 147, 1880.—HASWELL, Catal. Austral. Stalk and Sessile-eyed Crust., p. 60, 1882.—MULLER, F., Verh. Ges. Basel, Bd. VIII, p. 474, 1886.—DE MAN, Zool. Jahrb. Syst. Bd. VIII, p. 521, 1894–1895.—WHITELEGGE, Mem. Austral. Mus. vol. III, p. 137, 1897.—BORRADAILE, Fauna and Geogr. Laccadive and Maldive Arch., vol. I, pt. III, p. 252, 1902.—BRYAN, Occas. Papers B. P. Bishop Mus., vol. II, p. 119, 1903–1907.—LENZ, Abh. Senckenb.Naturf. Ges. Bd. 27, p. 352, 1905.—RATHBUN, Rept. U. S. Comm. Fish. for 1903, Bull. 23, pt. 3, p. 847, 1906.—NOBILI, G., Ann. Sci. Nat. 9 ser. Zool. t. IV, p. 240, 1906; Torino Mem. Acad. Sci. ser. 2, vol. 57, p. 390, 1907.—RATHBUN, Mem. Mus. Comp. Zool. vol. 35, p. 39, 1907.—CALMAN, W. T., in Wood-Jones, Proc. Zool. Soc. London, pt. I, p. 159, 1909.—RATHBUN, K. Danske Vid. Selsk. Skr. 7th raekke, Bd. 5, p. 350, 1910.—RATHBUN, Trans. Linn. Soc. London, ser. 2, vol. 14, p. 216, 1911.—BOUVIER, Bull. Sci. France-Belg. t. 48, p. 284, 1914–1920.—EDMONDSON, Bull. B. P. Bishop Mus. Bull. V, p. 14, 1923.

Xantho (*Leptodius*) *sanguineus* PESTA, Wien Denksch. Akad. Wiss. Bd. 88, p. 43, 1911.

Leptodius exaratus variety *sanguineus* MIERS, Proc. Zool. Soc. London, 1877, p. 134.—Ann. Mag. Nat. Hist. ser. 5, vol. V, p. 234, 1880; Rept. Voy. H. M. S. "*Challenger,*" vol. 17, Brachyura, p. 138, 1886.—CANO, Boll. Sci. Nat. Napoli, t. III, p. 203, 1889.

Lagostoma nodosa RANDALL, Journ. Acad. Nat. Sci. Phil. vol. 8, p. 111, 1839.

Chlorodius nodosus DANA, Proc. Acad. Nat. Sci. Phila. vol. 6, p. 79, 1852; U. S. Explor. Exped. Crust. vol. XIII, pt. I, p. 210, pl. 11, figs. 14a–g, 1852.

Chlorodius edwardsi HELLER, Abh. Zool.-Bot. Ges. Wien, p. 10, 1861; Sitzb. Akad. Wien, Bd. 43, heft I, p. 336, 1861.—HILGENDORF, in von der Decken's Reis. Ost.-Afric. Bd. III, heft I, p. 74, 1869.

Xantho exaratus variety *sanguinea* ORTMANN, Zool. Jahrb. Syst. Bd. VII, p. 447, 1893–1894.

Etisus dentatus (Herbst), male, about one half of natural size.

Etisus dentatus (Herbst), about one half of natural size.

Genus: **ETISUS** H. Milne Edwards.

Etisus dentatus (Herbst).

Plates 62 and 63.

TYPE: Type locality unknown to Herbst; depository the Berlin Museum.

DESCRIPTION: Indian Archipelago, (H. M. Edwards); Andamans: Port Blair, Great Coco Island and East Island, (Alcock); Balabac Passage north of Borneo, also Feejee Archipelago, (Dana); Tahiti, Society Islands, (Boone); Torres Straits, (Miers); Hawaii: Oahu, (Rathbun); New Caledonia and Mauritius, (Miers); Port Louis, Mauritius, (Bouvier); Madagascar, (Lenz); Coetivy (Rathbun); Natal, South Africa, (Stebbing).

MATERIAL EXAMINED: One large male, collected by the "*Alva,*" at Papeete, Tahiti, Society Islands, August 15, 1931.

COLOR: The carapace and legs are vivid scarlet, except that the fingers of the chelipeds are ebony tipped with creamy white; hairs of the legs golden.

TECHNICAL DESCRIPTION: Carapace 140 mm. wide, 90 mm. long; frontal margin lamellar, with the frontal margin very slightly and angularly excavate; divided in the median line by a distinct linear groove which extends back on the gastric region. In some specimens this groove is not entirely closed, having a narrow, elliptical, buttonhole like sinus, but this is obviously an individual variation. The inner orbital angle is well separated from the frontal margin and is bluntly angulated. The orbital margin has three strong conical teeth, separated by sinuses, on this outer half and the inferior orbital tooth, which is slightly stronger completes the orbital margin. The anterolateral margin is widely rounded and is produced into seven or eight strong, acute, forward-curved teeth, in addition to the orbital tooth. The teeth are strong but are uneven and unequal as to size some of them, usually the third and fourth of the series are unequally bifid, or even trifid, as shown in the plate. The dorsal surface of the carapace is smooth but pitted with many coarse punctae and has the regions well defined. The gastric region is circumscribed, its separation from the cardiac region being weakly indicated, the hepatic and branchial regions are also defined and all three regions have their surfaces uneven but not clearly lobulated. The sidewalls of the carapace are smooth and the region of the carapace adjacent to the proximal joints of the legs bears a heavy fringe of setae. The male belt is com-

posed of five articles, the third, fourth and fifth segments being fused. The lateral margins of the belt are fringed with dense, felt-like setae.

The male chelipeds are massive and are approximately equal. The merus is trigonal, with both inner and outer lateral margins roughened, the outer lateral margin has three or four sharp denticles. The carpus is smooth and convex on the upper surface and with a very prominent, acute tooth at the inner distal angle and a much smaller, relatively inconspicuous denticle on the inner carpal margin; the propodus is massive, the palm smooth, except for two or three wart-like tubercles, thick, with the outer surface slightly convex. The fingers are curved, meeting only at the hollowed, spoon-like tips; the gape is a wide oval; only the lower finger has a single tooth, bluntly conical and subdistal in position. Both fingers are longitudinally grooved and the upper finger bears a double row, each composed of five or six well separated tubercles.

The ambulatories successively decrease in length from the first to fourth pairs. Each leg has the merus, carpus and propodus somewhat compressed laterally, the upper surfaces slightly rounded, the merus smooth except for a few denticles along the lateral margins, particularly the upper lateral margin; on the upper half of the carpus there are approximately two well separated rows of these denticles, while the entire upper surface of the carpus is covered with these denticles as is also the more slender dactyl, where the tubercles become larger; the tip of the dactyl is a brown, horny claw. Both lateral margins of the ambulatories are fringed with long bushy setae.

References: *Cancer dentatus* Herbst, Naturg. Krabben und Krebse, Bd. I, pt. II, p. 186, 1796, atlas pl. XI, fig. 66, 1798.

Etisus dentatus H. Milne Edwards, Hist. Nat. Crust., t. I, p. 411, 1834.—Nouv. Archiv. Mus. Hist. Nat., T. IX, p. 233, 1873.—Lenz and Richters, Beitrage zur Krustaceenfauna von Madagascar, ges. XII, p. 421, 1881.—Dana, U. S. Explor. Exped. Crust., vol. XIII, pt. I, p. 185, pl. 10, figs. 2a–b, 1852.—Miers, Proc. Zool. Soc. London, p. 134, 1877.—Richters, in Mobius Meeresfaun. Mauritius, vol. II, 17, p. 146, 1880.—Haswell, Cat. Australian Stalk and Sessile-Eyed Crust., p. 53, 1882.—Alcock, Journ. Asiat. Soc. Bengal, vol. 67, pt. 2, p. 129, 1898.—Rathbun, Rept. U. S. Fish Comm. for 1903, Bull. 23, pt. 3, p. 850, 1906.—Stebbing, Ann. S. Afric. Mus., vol. VI, pt. 4, p. 298, 1910.—Rathbun, Trans. Linn.

Etisus laevimanus Randall, × 1.

Etisus laevimanus Randall, × 1.

Soc. London, ser. 2, vol. 14, p. 217, 1911.—Bouvier, Bull. Sci. France.-Belg. t. 48, p. 285, 1914–1920.

Etisodes dentatus Ortmann, Zool. Jahrb. Syst., vol. VII, p. 472, 1894.

Etisus laevimanus Randall.

Plates 64 and 65.

Type: "Two males brought by Mr. Nuttall from the Sandwich Islands." Randall. These were deposited in the Philadelphia Academy of Natural Sciences, 1839.

Distribution: Red Sea, (Hilgendorf, Kossman, Heller, Nobili); Station 7, Sudanese Red Sea, (Laurie); Red Sea: near Djeddah, (de Man); Red Sea: Djeddah, Harmel, Massaua, St. John Island, (Balss); stations 53 and 56, Persian Gulf, (Nobili); Persian Gulf, Karachi, Bombay, Laccadives, Andamans, (Alcock); reef, Hulule, Male Atoll, Maldives, (Borradaile); Trincomali, Ceylon, (Muller); Tuticorin, Ceylon, common on the reefs at Rameswaram, (Henderson); Simoda, Japan, littoral, (Stimpson); Philippines, Salawati, (Hilgendorf); coasts of Japan and Cochin China, (A. M. Edwards); Singapore, (Miers, Alcock); Padang, Sumatra, Timor, Moluccas, Edam Island, Noordwachter Island, Java, Java Sea, Pontianak, west coast of Borneo, (de Man); New Guinea, (Nobili); fringing reef at Mabuiag, Torres Straits, (Calman); Makassar, Celebes, (Schenkel); Torres Straits, New Hebrides, Feejee Archipelago, Vanua-Levu, Bau, Tonga Islands, Tongatabu, reefs, (Miers); Feejee Islands, (Dana); Mangareva, Paumotu Islands, (Lucas); Society Islands, (Rathbun); Rikitea, Mangareva, (Nobili); Palau Islands, (Ortmann); Hawaiian Islands, (Randall, Streets, Rathbun); Honolulu, reefs, (Miers, Rathbun); Samoa, (Miers); North and East Australia: Holborn Islands, near Port Denison, reefs, Port Molle, Trinity Bay, Facing Island, Port Curtis, Moreton Bay, Blackwood Bay, (Miers); Palm Islands, Queensland, (Boone); Mauritius, (Ortmann, Richters, Alcock); common at New Caledonia, (A. M. Edwards; Ortmann); Diego Garcia, Seychelles, (Rathbun); east coast of Africa, (A. M. Edwards, Lenz); Mozambique, (Hilgendorf); Nosse-Faly, Madagascar, Sula Bessy, (de Man).

Material examined: One male; taken on the coral reef at Falcon Island, Palm Islands, Queensland, Australia, October 7, 1931, by the "*Alva.*"

Technical description: Carapace, one and one-half times as wide as long, with the frontal margin bow-shaped, cleft by a median groove,

which latter extends backward, onto the gastric region; the frontal margin is bluntly rounded at the distal angles, and separated by a sulcus from the blunt superior inner orbital angle. There are two closed sinuses on the outer half of the upper orbital margin, and one on the outer half of the lower orbital margin, these causing three lobular convolutions in the orbital margin. The inferior inner orbital angle is blunt, and is in contact with the deflected margin of the superior orbital angle, excluding the tip of the antennal peduncle from the orbital sinus.

The dorsal surface of the carapace is moderately convex, with the regions well defined, the entire gastric region circumscribed and distinctly lobulated anteriorly; the anterolateral margins are rather widely rounded, and are cut into four distinct teeth, in addition to the postorbital angle; the first and second teeth are bluntly lobulated, the third and fourth are sharper and distinctly forward-curved. The hepatic and branchial regions have three lobules, corresponding to the curves of the anterolateral margin.

The eye is set on a short bulbous, calcareous stalk, which is constricted just below the cornea, which is terminal, hemispherical, shining black.

The antennae have a large, obliquely placed peduncular article, excluded from the orbital sinus, and a slender multiarticulate whip.

The external maxillipeds are close fitting, with external surface finely granulose, the inner ischial margin fringed with brushlike setae.

The male belt is narrow, five-jointed, the third, fourth and fifth articles being fused.

The right and left chelipeds are about equal in both sexes. Those of the large males are about two and one-half times as long as the related carapace, while in the females the chelipeds are about one and three-fourths as long as the carapace. Both chelipeds have the carpus smooth, convex on the upper and outer surfaces, with a prominent nodular tooth at the inner angle, the propodus is smooth and high, the fingers blackish, this color extending backward behind the lower finger, as a short irregular patch, on both inner and outer surfaces of the palm. The fingers in the male have an elongate oval gape, meeting only at the spoon-shaped tips. There are three or four very rudimentary teeth on the lower finger and two or three denticles on the upper finger.

The ambulatories have the meral, carpal and propodal joints fringed with setae along both upper and lower lateral margins, the

dactyl is laterally tomentose, with a curved horny tip, the upper margin of both propodus and dactyl are coarsely granulose.

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Etisus macrodactylus LUCAS, in Jacquinot's Voy. au Pole Sud et dans L'Océanie, "*L'Astrolabe*" et "*Zélée,*" Zool. t. III, Crust., p. 30, atlas, pl. IX, fig. 2, 1855.

Etisus convexus STIMPSON, Proc. Acad. Nat. Sci. Phila., vol. 10, p. 31, 1858.

Etisus maculatus HELLER, Abh. Zool-bot. Ges. Wein, vol. XI, p. 9, 1861; Sitzbericht. Mat. Natur. K. Akad. Wiss. Wien, Bd. 43, Abth. 332, 1861.—DE MAN, Notes Leyden Mus., vol. II, p. 173, 1880.

Subfamily: **Actaeinae.**

Genus: **ACTAEA** De Haan.

Actaea hirsutissima Ruppell.

Plate 66.

TYPE: The Red Sea is the type locality of this species; the depository is the Zoological Museum, Frankfort-on-Main.

DISTRIBUTION: Red Sea, (Ruppell; H. M. Edwards: Nobili; Odhner); Bitter Lakes, Red Sea, (Calman); Stations 5 A, B, C, and E, Sudanese Red Sea, (Laurie); Red Sea, near Djeddah, (de Man); Payta, (Cano); Oceania, Indian Ocean, (Heller); Andamans and Nicobars, (Alcock); Beagle Bay, Wolverine Pass, (Nobili); Rotuma, (Borradaile); Tahiti, Society Islands, (Heller; Rathbun; Raiatea Island, Society Islands, (Boone); Upolu, Samoa, (Dana); Samoa, (Ortmann, Alcock); Hawaii: Puako Bay, Penguin Bank, 14 to 28 fms., near Modu Manu, 26 to 33 fms., (Rathbun); Palmyra Island, (Edmondson); Seychelles and Mauritius, (Richters); Salomon, Egmont, Seychelles, Coetivy, (Rathbun); Grand Port and Chaland, Mauritius, (Bouvier); South Africa, (Stebbing); Palm Islands, Queensland, (Boone).

MATERIAL EXAMINED: One large male and one female, taken in coral at Falcon Island Reef, Palm Islands, Queensland, Australia, October 7, 1931. Two small males and one female from the same locality. One specimen, taken in coral at Teviatoa Reef, Raiatea Island, Society Islands, South Pacific Ocean, August 2, 1931.

TECHNICAL DESCRIPTION: Large male: Carapace ovoid, five-sevenths as long as wide, 20 mm. long, 28 mm. wide, convex on the anterior two-thirds; the frontal and anterolateral margins are widely and exquisitely arched, more convex than are those of *A. tomentosa* (H. M. Edwards), and with the posterolateral margins a trifle less concave. The entire carapace is completely areolated in bold relief, the furrows separating the lobules being deep and smooth, the lobules numerous, elevated and very convex, and entirely covered by closely packed, pearly convex granules, which give the lobules a berry-like formation, between and around the bases of the granules, but not in the furrows, are numerous short stiff coarse bristles that of themselves do not form a coating, or conceal the ornamentation of the carapace, but which serve to catch and hold detritus and minute organisms that do conceal the texture of the carapace. There are about 32 to 34 lobules,

Actaea hirsutissima (Ruppell), × 1.

most of these being oval or subcircular in contour. The largest lobules of the series are the four found in transverse series on the mesogastric region. The front is vertically deflexed, cut into four lobes, the inner or submedian pair of which are the wider, the outer pair being formed by the supraorbital border. There are four shallow lobes along the anterolateral margin, separated by grooves which are continued on the under side of the carapace. In addition to these furrows the under surface is granulose and very setose. The external maxillipeds, sternal plate and abominal belt are also very setose. The male belt is narrow.

The chelipeds are equal, and have only the tip of the merus extending beyond the carapace; this distal portion of the carapace, the upper surfaces of the carpus and propodus are covered with pearly granules like those of the carapace; those on the carpus and upper half of the propodus form lobules, while on the lower half of the palm they tend to form longitudinal rows; the fingers are also covered with granules and bristles on the proximal two-thirds of their length and in addition are each longitudinally grooved on the distal portion. The fingers are short, slightly down-curved with pointed tips (not spoon-shaped), meeting along the full length of their dentate cutting edges.

The ambulatories are short, with the meral, carpal and propodal joints wide and having their dorsal surfaces covered with granules and bristles like those of the carapace the granules in some instances forming faintly defined lobules. The dactyl is stout, subcylindrical, with a curved horny tip and with all surfaces granulose and setose.

References: *Xantho hirsutissimus* Ruppell, Beschreib. Abbild. 24 Krabben Roth. Meer., p. 26, pl. 5, fig. 6, 1830.—H. M. Edwards, Hist. Nat. Crust., t. I, p. 389, 1834.

Actaea hirsutissima De Haan, Fauna Japon. Crust., p. 18, 1833–50.—Dana, U. S. Explor. Exped., vol. XIII, Crust. pt. 1, p. 164, 1852.—Heller, Sitzb. Akad. Wien., vol. 43, p. 314, 1861.—Reise der Osterreich. Fregatte "*Novara*" Zool., Bd. II, Abth. III, Crust., p. 9, 1860.—A. Milne Edwards, Nouv. Arch. Mus. Hist. Nat. Paris, t. I, ser. 2, p. 263, 1865; *Ibid.*, t. IX, p. 191, 1873.—Kossman, Reise Roth. Meer. Crust., p. 23, 1877.—Tozzetti, T., Magenta Crost. p. 37, pl. 3, fig. 26, 1877.—Richters, in Mobius Beitrage zur Meeresfaun. Maurit. und Seychelles, pt. III, Decapoda, p. 145, 1880.—de Man, Notes Leyden Mus., vol. II, p. 173, 1880; *ibid.*, vol. III, p. 96, 1881.—Cano, Boll. Soc. Nat. Napoli, vol. III, p. 189, 1889.—Ortmann, Zool. Jahrb. Syst. p. 453, 1893–94.—Alcock,

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Actaea aphrodita new species.

Plate 67.

Type: One male, collected in Temukus Roads, Bali, Dutch East Indies, October 25, 1931, by the "*Alva.*"

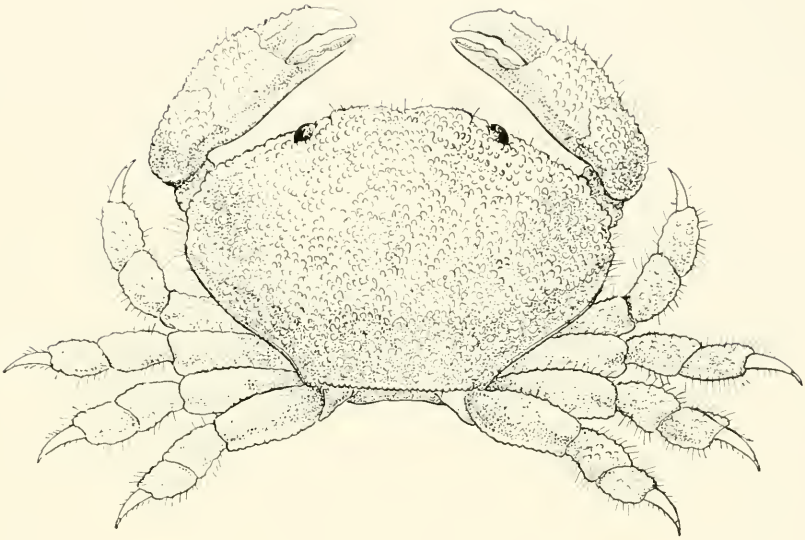
Distribution: known only from the type locality.

Material examined: Holotype.

Color: Carmine dorsally, with many brown and golden setae.

Technical description: This species reminds one more of the West Indian *Actaea setigera* (Milne Edwards) than of any other tropical *Actaea* but is less distinctly lobulated. Among the IndoPacific *Actaeas* it is to be associated with *Actaea nodulosa* and *A. echinus* but is distinct from these.

The carapace is widely oval, the postlateral borders but little excavate, quite convex fore and aft in the anterior region, less so from side to side; two-thirds as long in the median line as wide. The interorbital region is about one-third of the total width of the carapace, faintly bilobed, with the frontal margins deflexed, slightly sinuate, the preorbital angle nearly right-angled, only faintly differentiated from the frontal lobe. The superior orbital margin is beaded with numerous coarse, conical granules and bears an indication of two closed sutures on the outer half; the inferior orbital margin is also beaded with coarse granules, which are abundant on the adjacent sidewalls of the carapace. The inferior inner orbital angle is obscure. The antero-



Actaea aphrodita, new species, × 5.5.

lateral border is widely rounded, much longer than the postlateral margin and appears to be unbroken, but microscopic examination proves it to be cut into four wide truncate lobes, indicated by shallow suture lines. The entire dorsal surface is covered by numerous solitary, upstanding bristles and beneath these with numerous coarse rounded or conical granules, of unequal sizes, which are more abundant on the outer margins and especially so on the anterior region of the carapace, where they increase in size and become more sharply conical. These tubercles are arranged in small oval groups, the group not elevated as a lobule and a bit irregular, well separated by wide nongranular channels, which are not depressed grooves but are clearly defined and are devoid of setae. The male belt is triangular, composed of five articles, the third, fourth and fifth articles being fused.

The eye is small, with restricted visual range.

The antennulae are stocky and fold transversely within the fossett, the interantennulary septum is wide.

The antennae have the basal peduncular article short and wide, almost squarish, with the inner distal angle slightly produced, touching the deflected frontal border; the outer distal angle not quite reaching the orbital angle; the second and third articles are greatly reduced, the flagellum fine, extending scarcely one-third the long diameter of the orbit.

The external maxilliped are closefitting, smooth, the merus squarish with the distal margin nearly straight, except for the truncated inner angle.

The chelipeds are about equal in this male specimen, with only the tip of the merus showing beyond the carapace; this small meral surface and the entire upper and outer surfaces of the rounded carpus and propodus are covered with numerous coarse conical granules interspersed with long bristles; on the outer surface of the palm they tend to form approximate longitudinal rows. The fingers are not over two-thirds as long as the palm, blackish brown, the upper finger granulose for the proximal half of its length; both fingers longitudinally grooved, with the rounded tips meeting.

The ambulatories are short, each with the meral, carpal, and propodal joints wide, laterally compressed, coarsely granulose on the setose upper surfaces, especially so along the upper lateral margins; the dactyli are stocky, compressed, cylindrical, setose and granulose with sharp, curved tips.

Actaea cavipes (Dana).

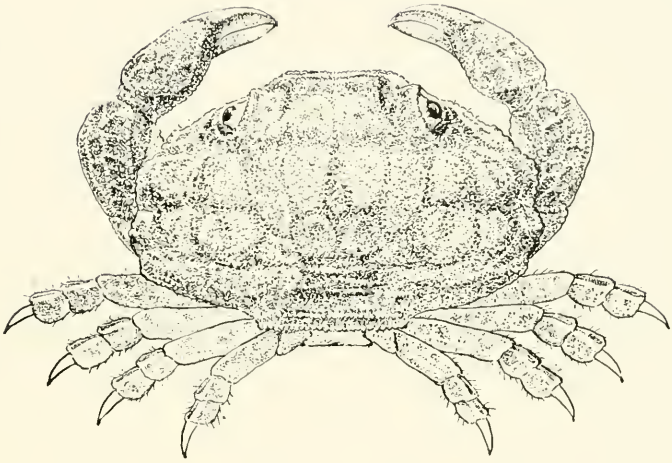
Plate 68.

TYPE: The type material was collected in the Feejee Islands and the Samoan Islands and is deposited in the National Museum at Washington (these probably no longer extent), and in the Philadelphia Academy of Natural Sciences.

DISTRIBUTION: Upolu, Samoa, Feejee Islands, (Dana); Pago Pago, Samoa, (Boone); Upolu, Samoa, (Alcock); Society Islands, (Boone); Paumotu Islands, Ellice Islands, Society Islands, several records, (Rathbun); Rikitea, Mangareva, Taku, (Nobili); Palmyra Island, (Edmondson); LiuKiu Islands, Kagoshima, Amami Oshima, Japan, Chokirbank, in coral, (Ortmann); Andamans, Mékran coast, India, Persian Gulf, (Alcock); Dar-es-Salaam, (Ortmann); rare at New Caledonia, (A. M. Edwards); Mauritius, (Alcock); Port Louis and Chaland, Mauritius, (Bouvier); Seychelles, Salomon, lagoon, Egmont, reef, Amirante, 30 fms., (Rathbun); Dirk Hartog Island, West Australia, (Hale).

MATERIAL EXAMINED: One male, taken at Pago Pago, Samoa, Sept. 2, 1931, by the "*Alva.*" Three males, taken on Venus Point Reef, Tahiti, Society Islands, August 15, 1931. Another smaller male, from Venus Point Reef, Tahiti, Society Islands, August 15, 1931.

TECHNICAL DESCRIPTION: Carapace with the anterior three-fifths widely rounded, oval, the postlateral margins short and decidedly convergent; the posterior margin short, straight; the greatest median width is one and one-half times the length; the frontal margin is little more than one-third the total width and is deflected, composed of two wide beaded laminate lobes, separated by a median sulcus, with the outer angle nearly right-angled and set apart from the tumid superior orbital border by a small notch; viewed ventrally the margin of each frontal lobe is slightly sinuate, viewed dorsally the contour of the frontal border appears to be a trifle in advance of the anterolateral margin and the inferior orbital margin visible. The orbit is subcircular with the inner half thickened, granulose, cut by two closed sutures, the inferior margin similarly thickened, the outer angle obsolete but set apart by a sulcus from the first anterolateral tooth. The anterolateral margin is much longer than the postlateral and is widely rounded and cut into four teeth, the first and second of which are wide and blunt, the third and fourth being more acuminate; the margins and apices being emphasized by clusters of rounded, large,



Actaea cavipes (Dana), × 5.

Diara perlata (Herbst), × 1.

pearly tubercles. The entire dorsal surface of the carpus and propodus are each short, nearly as wide as long, with their upper and outer surfaces rough with deep corrugations formed of large concave pits margined by a rim of pearly granules; the dactyl is strong, but much slenderer than the propodus and about one-third longer, with its lateral margins roughly granulose and beset with setae and its tip a horny curved claw.

REFERENCES: *Actaeodea cavipes* DANA, Proc. Acad. Nat. Sci. Phila., vol. VI, p. 78, 1852; U. S. Explor. Exped., vol. XIII, Crust. pt. I, p. 199, pl. XI, figs. 5a–b, 1852.

Actaea cavipes A. MILNE EDWARDS, Nouv. Arch. Mus. Hist. Nat. Paris, vol. I, p. 280, 1865; *ibid.*, vol. IX, p. 193, 1873.—ORTMANN, Zool. Jahrb. Syst., vol. VII, p. 456, 1893–94; in Semon's Zool. Forschungsr. in Australien und Malay Archip., (Jena Denk., vol. VIII) Crust. p. 50, 1894–1903.—ALCOCK, Journ. Asiatic Soc. Bengal, vol. 67, pt. 2, p. 147, 1898.—NOBILI, G., Torino Mem. Acad. Sci. ser. 2, vol. 57, p. 390, 1927.—RATHBUN, M. J., Mem. Mus. Comp. Zool., vol. 35, p. 44, 1907; Trans. Linn. Soc. London, ser. 2, vol. 14, p. 223, 1911.—BOUVIER, Bull. Sci. France-Belg., vol. 48, p. 287, 1914–1920.—EDMONDSON, Bull. B. P. Bishop Mus., vol. 5, p. 16, 1923.—ODHNER, Handl. Gotteborgs K. Vet. Vitterh. Samh. 4 folj, Bd. 29, no. 1, p. 69, 1925.—HALE, H., Trans. and Proc. Roy. Soc. S. Austral., vol. 53, p. 67, 1929; Mr. Hale considers *Actaea fossulata* (Girard) and *Actaea schmardae* Heller to be synonyms of *Actaea cavipes* (Dana).

Genus: DAIRA De Haan.

Daira perlata (Herbst).

Plate 69.

TYPE: The origin of this type was unknown to Herbst. The depository is the Berlin Museum.

DISTRIBUTION: "Oceano," (Fabricius); Atlantic Ocean and coasts of Brittany, (H. M. Edwards), erroneous; "*ad insulas 'Amakerrima',*" (Stimpson); northeastern extremity of Macclesfield Bank and Lizard Bank, China Seas, (Pocock); LooChoo Islands, (Ortmann); Japan, Philippines, honeycomb crevices, outer reef of Funafuti Atoll, Maldives, (Whitelegge); Australian Seas, Minerva Reef, (Miers); Auckland, New Zealand, (Heller); Flores, Timor, New Guinea, (Ortmann); Hao Island, (Nobili); Pleasant Island, Gilbert Islands,

(Whitelegge); Society Islands, (Boone); Palmyra Island, Fanning Islands, (Edmondson); Mauritius, (Miers); Salomon, Coetivy, (Rathbun); lagoons, bays and shores of New Caledonia, (A. M. Edwards).

MATERIAL EXAMINED: One female taken on Venus Point Reef, Tahiti, Society Islands, August 15, 1931. One male and one female taken from coral reef, Teviatoa Reef, Raiatea Island, Society Islands, August 21, 1931.

TECHNICAL DESCRIPTION: Carapace broadly oval, one-third wider than long, decidedly convex in both directions; regions of carapace well delineated, and subdivided into numerous suboval and rounded lobules, which have their surfaces finely pitted, and are rather regularly spaced, those on the outer branchial region being the largest, while toward the postlateral region they become noticeably smaller. The anterolateral border is widely rounded, consisting of eleven or twelve coarse crenulations; the posterolateral margins are concave. The frontal margin is moderately wide, deflexed with two prominent rounded, submedian tubercles on the outer side of these, it is concave toward the superior orbital angle which consists of a small rounded tubercle. The orbital margin is beaded by eleven or twelve small rounded tubercles, the inferior angle not touching the superior. The sidewalls of the carapace are smooth.

The external maxillipeds are smooth externally, devoid of setae except for the brush along the inner lateral margin of the ischium. The merus has a conspicuous deep notch in the anterior margin.

The chelipeds are unequal in both sexes; the merus is smooth except for a tubercular crenulation along the superior lateral margin, and outer distal surface which is paved with flat granules and fringed with setae. The carpus is convex on the upper surface, and covered with coarse rounded tubercles, similar to those on the carapace; the propodus is almost as high as long, with the outer surface covered with coarse rounded tubercles; which along the upper margin become sharp conical tubercles; on the inner surface, there is a mosaic design made up of flattened tubercles; the fingers are short, blunt, with hollowed out tips, the cutting edges meeting in the females and furnished with a series of coarse blunt teeth. The upper surface of the hinged finger is covered for the proximal half of its length with a series of coarse conical tubercles, the basal two of which are much higher than the others.

The ambulatories are of moderate size, the merus with the lower margin deeply excavated distally for the reception of the carpus when reflexed. The carpus and propodus are short and wide, the dactyl is

Xanthias lamarcki (H. Milne Edwards), × 3.

slender and very curved with a sharp horny tip. The exposed portions of the upper surface, the merus and practically all of the upper surfaces of the carpus, propodus and dactyl are paved with a mosaic of flattened or slightly elevated tubercles; on their upper lateral margin these tubercles become serrate, spinose tubercles, as they do also on the dactyl. On the meral and carpal joints these spinose tubercles are concealed beneath a dense brush of setae. There are two thick tufts of bristles on the horny curved tips.

REFERENCES: *Cancer perlata* HERBST, Naturg. Krabben und Krebse, Bd. I, pt. II, p. 265, pl. 21, fig. 122, 1792.

Cancer daira HERBST, *ibid.*, Bd. III, heft 2, p. 6, pl. 53, fig. 2, 1798.

Cancer variololus FABRICIUS, Ent. Syst. Suppl. p. 338, 1798.

Lagostoma perlata H. MILNE EDWARDS, Hist. Nat. Crust. t. I, p. 387, 1834.

Daira variolosa DANA, U. S. Explor. Exped. Crust. vol. XIII, pt. 1, p. 202, pl. 10, figs. 4 a–d, 1852.

Daira perlata DE HAAN, Faun. Japon. Crust. p. 18, 1837.—STIMPSON, Proc. Acad. Nat. Sci. Phila. vol. 10, p. 32, 1858.—A. MILNE EDWARDS, Nouv. Archiv. Mus. Hist. Nat. t. I, p. 298, 1865; *ibid.*, t. IX, p. 196, 1873.—HELLER, Reise Osterreich. Fregatte "*Novara*," Bd. II, abh. III, p. 18, 1868.—MIERS, Cat. Crust. New Zealand, p. 18, 1876; Roy. Phil. Trans. London, vol. 168, p. 487, 1879.—RICHTERS, in Mobius, Meeresfauna der Insel Mauritius und der Seychellen, p. 147, 1880.—FILHOL, Crust. of New Zealand, p. 374, 1876.—POCOCK, R. I., Ann. Mag. Nat. Hist. ser. VI, vol. V, p. 74, 1890.—ORTMANN, Zool. Jahrb. Syst. Bd. VII, p. 474, 1894; in Semon's Zool. Forschungr. in Austral. Bd. 51, p. 52, 1894–1903.—WHITELEGGE, Mem. Austral. Mus. vol. III, p. 131, 1896.—ALCOCK, Journ. Asiat. Soc. Bengal, vol. 67, pt. 2, p. 155, 1898.—WHITELEGGE, Rec. Austral. Mus. vol. V, p. 8, 1903.—NOBILI, G., Torino Mem. Acad. Sci. ser. 2, vol. 57, 1907.—RATHBUN, M. J., Trans. Linn. Soc. London, ser. 2, vol. 14, p. 223, 1911.—EDMONDSON, Bull. B. P. Bishop Mus. vol. V, p. 16, 1926.

Subfamily: **Chlorodinae.**

Genus: **XANTHIAS** Rathbun.

Xanthias lamarcki (Henry Milne Edwards).

Plate 70.

TYPE: Dr. Milne Edwards' type locality is cited as Île-de-France; the type is deposited in the Paris Museum.

Distribution: Eastern Seas, Philippines, Galle, Ceylon, Tamatave, (Miers); Ceylon, (Muller); Ceylon, Madras coast of India, Andaman Islands, (Alcock); Nicobars, (Heller; Pesta); shore in Male, Miladumadulu, Fadifolu, South Mahlos, Minikoi Atolls; (Borradaile); Philippines (Adams and White); Kaiser Wilhelm's Land, New Guinea, (Ortmann); Java, Edam and Noordwachter Islands, Malay Archipelago; Enkhiuzen, Batavia; West Celebes, Atjeh, (de Man); Samoan Islands, Navigator Islands, Paumotu Islands and Tahiti, Society Islands, (Dana); Society Islands and Paumotu Islands, (Rathbun); Tahiti, Society Islands and Pango Pango, Samoa, (Boone); Palmyra Island, Fanning Islands, (Edmondson); Torres Straits, (Calman); Rotuma, Funafuti (Borradaile); Funafuti Atoll, (Whitelegge); Hikueru, Timoe Island, (Nobili); Savaii, Pulo Edam, Sumatra, (Pesta); Dirk Hartog Island, West Australia, (Hale); Darros Island, (Miers); Peros, Coin, Salomon, Egmont, reef, Praslin Island, Seychelles, Coetivy, (Rathbun); New Caledonia, (A. M. Edwards); Madagascar, (Miers); Mozambique, (de Man); Zanzibar, Bawi, East Africa, (Lenz); Île de France, (H. M. Edwards).

Material examined: One large and one small male, taken in coral at Teviatoa Reef, Raiatea Island, Society Islands, August 21, 1931. Two males, Venus Point Reef, Tahiti, Society Islands, August 15, 1931. One small female, taken at Pago Pago, Samoa, September 2, 1931.

Color: Carapace and claws violaceous brown with shades of yellow; pincers brownish black. See color plate in Alphonse Milne Edwards, Nouv. Archiv. Mus., t. XI, pl. 7, fig. 3, 1873.

Technical description: Carapace oval, one and one-half times as wide as long, widest anteriorly; frontal margin equal to about one-third of the total width, consisting of two broad, rounded lobes, separated by a deep median notch from which a sulcus extends backward, and separated by a notch from the short triangulate preorbital tooth; the orbital margin is circumscribed, with closed sutures indicating two sinuses on the outer half of the margin; the postorbital tooth is obsolete; the inferior inner orbital angle is a triangulate tooth, so protuberant that it is visible dorsally; the anterolateral border is cut into four broad blunt teeth that are emphasized by having their dorsal surface coarsely granulose, and in the case of the second, third and fourth teeth elevated into conical points; each tooth is set apart by a sulcus from the adjacent tooth. The sulci from between the second and third teeth and that from between the third and fourth teeth together cir-

cumscribe an elevated, oval lobe on the anterior part of the branchial region. The cervical groove is sharply delineated, the other regions faintly outlined. The anterior half of the carapace is rough with coarse granules, especially along the outer portion where these granules are coarser and more abundant. The posterior half of the carapace is nearly smooth. The sidewalls of the carapace, especially the region adjacent to the eyes and buccal cavern, is very granulose. The male belt is composed of five articles, the third, fourth and fifth joints being fused.

The chelipeds, which are subequal in the male, have the merus short, closely appressed to the carapace, only the upper distal end visible and very roughened; the carpus is rounded, very coarsely granulose, as are also the outer and upper surfaces of the palm; the propodus, including the fingers, is about twice as long as the merus and has the palm three-fourths as high as long with the outer surface swollen, granulose, and channelled by three longitudinal sulci, one in the median line and the other, midway between this and the upper margin and the third sulcus along the upper margin; the spaces between the sulci being rendered ridgelike by the presence of abundant large granules; the fingers are nearly as long as the palm, sharply deflected, slender, the pointed tips, overlapping, the outer surfaces black, coarsely granulose on the proximal half, longitudinally grooved, the cutting edges meeting, each set with a few low, broad teeth.

The ambulatories are of moderate size, decreasing slightly in length from the anterior to the posterior pairs; each with the merus, carpus and propodus stocky, laterally compressed, the distal two-thirds of the propodus roughened with granules, the dactyl stocky, tapered, with a series of setae on each lateral margin; the tip long, curved, golden yellow.

The eyestalk is short, thick, calcareous, constricted below the cornea and with a rounded calcareous process on the dorsal surface of the cornea. The cornea is hemispherical, terminal, with a fairly large orbit.

The antennulae are large and fold transversely within the fossett; the interantennulary septum is slender.

The antennae have the basal peduncular article rectangular, its distal end reaching to the orbital hiatus; the second and third peduncular articles are greatly reduced; the flagellum short, tapered, slightly over half the length of the long diameter of the orbit.

The external maxillipeds have the distal margin oblique with a small triangular projection above the base of the palp.

It is of interest to note that the younger specimens appear to be much more granulose than do the older ones; this is due largely to the fact that the coarse granules appear larger in proportion to the small carapace and especially to the small joints of the legs.

REFERENCES: *Xantho lamarckii* H. MILNE EDWARDS, Hist. Nat. Crust. vol. I, p. 391, 1834.—A. MILNE EDWARDS, in Maillard's l'ile Réunion, Faune Carcinologique, Annexe F, p. 4, 1862.—HELLER, Reise Osterreich. Fregatte *"Novara"* Zool., Bd. II, Abth. III, Crust. p. 10, 1868.—ORTMANN, Zool. Jahrb. Syst. vol. VII, pp. 444, 448, 1893–94.

Xanthodes lamarckii A. MILNE EDWARDS, Nouv. Archiv. Mus. Hist. Nat. Paris, t. IX, p. 200, pl. 7, fig. 3, 1873.—HILGENDORF, Monatsb. der Konigl. Akad. Berlin, Bd. I, p. 789, 1878.—MIERS, Zool. H. M. S. *"Alert,"* pp. 517, 529, 1884.—F. MULLER, Verh. Natur. Gesell. Basel, vol. VIII, p. 474, 1886.—DE MAN, Archiv. fur Naturges., vol. 53, Bd. I, p. 263, 1887; also in Weber's Zool. Ergebn. Niederl. Ost.-Ind., vol. II, p. 278, 1892.—Zool. Jahrb. Syst., vol. VIII, p. 513, 1894–95.—WHITELEGGE, Mem. Austral. Mus., vol. III, p. 130, 1897.—ALCOCK, Journ. Asiatic Soc. Bengal, vol. 67, pt. 2, p. 157, 1898.—CALMAN, Trans. Linn. Soc. Lond. Zool. n. s., vol. 8, p. 11, 1900–1903.—LENZ, Ahb. Senckenb. Naturf. Ges. Bd. 27, p. 350, 1905.

Xanthodes granosomanus DANA, Proc. Acad. Nat. Sci. Phila., vol. 6, p. 75, 1852.—U. S. Explor. Exped., vol. XIII, Crust. pt. I, p. 175, pl. 8, figs. 10a–c, 1852.

Xantho granosomanus HELLER, Reise Osterreich. Fregatte *"Novara"* Zool. Bd. II, Abth. III, p. 11, 1868, Wien.

Xanthias lamarcki BORRADAILE, Faun. and Geogr. Laccadive and Maldive Arch., vol. I, pt. III, p. 251, 1902; Proc. Zool. Soc. London, 1900, pt. 2, p. 582.—NOBILI, G. Bull. Sci. France-Belg. t. 40, p. 405, 1906; Torino Mem. Acad. Sci. ser. 2, vol. 57, p. 393, 1907.—RATHBUN, Mem. Mus. Comp. Zool. vol. 35, p. 44, 1907.—PESTA, Wien, Denkschr. Akad. Wiss. Bd. 88, p. 44, 1911.—RATHBUN, Trans. Linn. Soc. London, ser. 2, vol. 14, p. 223, 1911.—EDMONDSON, Bull. B. P. Bishop Mus. vol. V, p. 16, 1923.—HALE, H., Trans. and Proc. Roy. Soc. S. Austral. vol. 53, p. 69, 1929.

Chlorodiella niger (Forskal), × 3.

Genus: **CHLORODIELLA** Rathbun.

Chlorodiella niger (Forskal).

Plate 71.

TYPE: Forskal's type came from the Red Sea; the present depository is probably the Copenhagen Museum.

DISTRIBUTION: Red Sea, (Forskal; Heller; de Man: Nobili; Pesta); Red Sea: Gulf of Suez, Tor, Ras-el-Millan, Senafir, Koseir, Berenice, Djeddah, Lidth, Dahalak, Massaua, Daedalus-Riff, Hanfela, Zebejir, Sarso, Akek Segir, Mersa Haleib, Perim, St. John's Island, Mersa Scheikh, Kavaya, (Balss); Gulf of Suez, (Calman); Egypt; Gulf of Suez, El Tor, Daedalus Shoal, Red Sea, (Miers); Sudanese Red Sea, several locations, (Laurie); Dar-es-Salaam, (Ortmann), Chokirbank, (Ortmann); Indo-Pacific, several localities; Mékran coast, India, Andamans, Nicobars, Mergui Archipelago, (Alcock); Tuticorin, Muttuwartu Par, Rameswaram, one of the commonest species on the reefs, (Henderson); Trincomalee, Palk Bay, (Laurie); Maldive group: Male, Fadifolu, Goifurfehendu, Filidu, North Malé, also Minikoi Atoll, on reefs and in lagoons, down to 25 fms. Krusadai Island, Gulf of Manaar, (Gravely); Ceylon, Cocos-Keeling Island, Philippines, Guimaras, Balabac Straits, Java (Miers); LiuKiu Island, (Balss); Philippine Islands, (Adams and White); fringing reef and shore, Sooloo Sea, Mangsi Island, (Dana); Rotuma, Funafuti, (Borradaile); Thursday Island, Wyer, Torres Straits, (Calman); Halmhera Seas, Java, Timor Sea, Pulo Edam; Amboina; Elphinstone Island, Mergui Archipelago; West Celebes; (de Man); New Guinea, (Miers); Hao Island, lagoon; Tikahan, lagoon; Marutea, Gatavake, (Nobili); Beagle Bay, (Nobili); Kilantan, Malay Peninsula, (Lanchester); Koh Kahdat, coral reef, Gulf of Siam; Feejee Islands, Tongatabu, Wake's Island; Upolu, Samoa, Paumotu Archipelago, Tahiti, Society Islands, and Hawaii, (Dana); Upolu Samoa, Sandwich Islands, (Miers); Paumotu Archipelago, Society Islands, Ellice Islands and Caroline Islands, (Rathbun); Hawaii: south coast of Molokai: Honolulu reefs. Laysan Island, (Rathbun); Palmyra Island; Fanning Island, (Edmondson); Darnley Island; Port Jackson, Australia, (Haswell); Port Denison, Australia; North, Northeast and East Australia, (Miers); Falcon Island, Queensland, (Boone); Dirk Hartog Island, West Australia, (Hale); Mauritius: Grand Port and Chaland, (Bouvier); Seychelles: Salomon, Diego Garcia, lagoon, Praslin Island, Coetivy, (Rathbun); Seychelles,

(Miers); New Caledonia; Madagascar, (A. M. Edwards); Zanzibar, (Hilgendorf).

MATERIAL EXAMINED: One male, taken on the reefs of Falcon Island, Palm Island, Queensland, Australia, October 7, 1931. One female from the same locality.

TECHNICAL DESCRIPTION: The carapace is hexagonal, depressed, with the frontal border equal to more than half the greatest width of the carapace; frontal margin nearly straight, faintly bevelled, with a very faint median emargination, and set apart by a groove from the median orbital angle. The orbital border is so circumscribed by a groove and incised by two closed suture lines; a third suture occurs on the inferior margin just below the outer angle; the surface of the carapace is glabrous; the gastric region is defined by a light groove and subdivided by light gastric grooves into three to five areolations; near the anterolateral margin the surface of the carapace is transversely wrinkled with two wrinkles on each side, terminating outwardly beneath the lateral teeth; there are four distinct, blunted teeth on the anterolateral margin, in addition to the orbital tooth; the first tooth is small and separated from the orbital tooth by a short wrinkle or groove; the second and third teeth are the largest of the series and are separated by the two large, transverse wrinkles; the fourth tooth is the smallest of the series and is set apart by a very brief groove. The postlateral margins are sloping, short, convergent; the posterior margin is about as wide as the frontal margin and is emphasized by a flat carina and there is a faint transverse groove not far above this carina. The sidewalls of the carapace are smooth except for a faint groove outlining the orbital border and another between the first and second anterolateral teeth. The female abdomen is seven-segmented, wide oval with its margins heavily fringed with setae; it covers almost the entire sternal plastron. The male belt is narrow, consisting of five segments, the third to fifth segments being fused.

The eye has a short stalk and an unusually large, bulbous cornea.

The antennulae fold transversely within the fossett and are separated from each other by a short wide bar.

The antennae have the basal article large, subrectangular, extending into the orbital fissure, touching the deflexed frontal border on the inner distal angle and the orbital margin on the outer. The flagellum is small and slender, extending about three-fifths of the long diameter of the border.

The external maxillipeds have the distal border of the merus nearly straight.

The chelipeds are unequal in both sexes and form a distinguishing field character, by their length. The merus is long and projected from half to two-thirds its length beyond the carapace, with a few crenulations on its posterior surface. The carpus is rounded on its outer surface and produced to a high, conspicuous triangulate tooth on its inner lateral margin; the propodus is short, smooth, as long as the propodus, curved, with faint longitudinal grooves, black except for a cream line margining the spoonshaped, concave tips.

The ambulatories are of moderate size, with the carpus, propodus and dactyl bearing numerous long hairs interspersed with stiff bristles, on the upper surfaces, and in addition there are on the dactyl, several longitudinal rows of sharp, amber-colored, chitin-like spinules.

References: *Cancer niger* Forskal, Descrip. Anim. p. 89, 1775.

Chlorodius niger Ruppell, 24 Krabben Roth. Meer., p. 20, pl. 4, fig. 7, and pl. 6, fig. 14, 1830.—H. Milne Edwards, Hist. Nat. Crust. t. I, p. 401, 1834.—Dana, U. S. Explor. Exped., vol. XIII, Crust. pt. I, p. 216, pl. 12, figs. 5a–c, 1852.—Stimpson, Proc. Acad. Nat. Sci. Phila., vol. 10, p. 33, 1858.—Heller, Sitzb. Akad. Wien, vol. 43, pt. I, p. 335, 1861.—Reise Osterreich. Fregatte "*Novara*" Crust. Zool., Bd. II, Abh. III, p. 18, 1868.—A. Milne Edwards, Nouv. Archiv. Mus. Hist. Nat. Paris, t. IV, p. 71, 1868; *ibid.*, t. IX, p. 214, 1873.—Kossman, Reise Roth. Meer. Crust., p. 34, 1877.—Miers, Ann. Mag. Nat. Hist., ser. 5, vol. V, p. 234, 1880.—Proc. Zool. Soc. London, vol., p. 10, 11, 1884.—Zool. H. M. S. "*Alert,*" pp. 183, 215, 517, 531, 1884.—de Man, Notes Leyden Mus., vol. II, p. 174, 1880. —*Ibid.*, vol. III, p. 98, 1881.—Archiv. fur Naturges., vol. 53, I, p. 279, 1887.—Journ. Linn. Soc. London Zool., vol. XXII, p. 32, 1887–88.—Zool. Jahrb. Syst., vol. VIII, p. 519, 1894–95.—Richters, in Mobius Meeresf. Maurit., p. 147, 1880.—Haswell, Catal. Austral. Stalk and Sessile-eyed Crust., p. 62, 1882.—Henderson, J. R., Trans. Linn. Soc. Zool., ser. 2, vol. V, p. 361, 1893.—Ortmann, Zool. Jahrb. Syst., vol. VII, p. 465, 1893–94.—In Semon's Zool. Forschungsr., (Jena Denksch. Bd. VIII, p. 51, 18).—Alcock, Journ. Asiatic Soc. Bengal, vol. 67, pt. 2, p. 160, 1898.—Nobili, Ann. Mus. Genova, ser. 2, vol. 20, p. 258, 1899–1901.—Borradaile, Proc. Zool. Soc., London, 1900, pt. p. 586.—Lanchester, Proc. Zool. Soc. London, 1901, pt. 2, p. 539; Calman, W. T., Trans. Linn.

Soc. London Zool., vol. 8, p. 11, 1900–1903.—Borradaile, Fauna and Geogr. Maldive and Laccadive Archipelagoes, vol. I, pt. III, p. 59, 1902.—Laurie, R. D., Ceylon Rept. Pearl Oyster Fish., vol. V, p. 405, 1906.—Nobili, Ann. Sci. Nat. 9 ser. Zool. t. IV, p. 262, 1906.—Nobili, Torino Mem. Acad. Sci. ser. 2, vol. 57, 1907.—Bouvier, Bull. Sci. France-Belg. t. 48, p. 274, 1914–1920.—Balss, H., Denksch. Akad. Wiss. Wien, Bd. 99, p. 10, 1924.—Odhner, Handl. Gotteborgs K. Vet. Vitterh. Samh. Handl. 4 folj. Bd. 29, no. 1, p. 85, 1925.—Calman, Trans. Zool. Soc. London, vol. 22, p. 213, 1926–1929.—Gravely, F. H., Bull. Madras Govt. Mus., n.s., Nat. Hist. Sect., vol. 1, no. 1, p. 145, 1927.

Chlorodiella niger Rathbun, M. J., Rept. U. S. Fish. Comm., for 1903, Bull. 23, pt. 3, p. 857, 1906; Mem. Mus. Comp. Zool. vol. 35, p. 46, 1907; K. Danske Vid. Selsk. Skr., 7th Raekke, Bd. V, p. 351, 1910; Trans. Linn. Soc. London, ser. 2, vol. 14, p. 225, 1911.—Edmondson, Bull. B. P. Bishop Mus., vol. 5, p. 17, 1923.—Balss, Archiv. fur Naturg. Bd. 90, Abt. A, heft 5, p. 69, 1925.—Hale, H., Trans. and Proc. Roy. Soc. S. Austral., vol. 53, p. 70, 1929.

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Chlorodius cythera Dana, Proc. Acad. Nat. Sci. Phila., vol. II, p. 79, 1852.—U. S. Explor. Exped., vol. XIII, Crust. pt. I, p. 213, pl. 12, figs. 2a–c, 1852.—Stimpson, Proc. Acad. Nat. Sci. Phila., vol. 10, p. 33, 1858.

Chlorodius nebulosus Dana, Proc. Acad. Nat. Sci. Phila., vol. 6, p. 80, 1852.—U. S. Explor. Exped., vol. XIII, Crust. pt. I, p. 214, pl. 12, fig. 3, 1852.

Chlorodius depressus Heller, Abh. Zool. Bot. Ges. Wien, Bd. XI, p. 11, 1861.—Sitzb. Mat. Natur. K. Akad. Wiss. Wien, vol. 43, p. 338, 1861.—Hilgendorf, in von der Decken's Reisen Ost.-Afric., III, I, p. 74, 1869.

Chlorodiella laevissimus Dana.

Plate 72.

Type: The type material was secured in the Hawaiian Islands by the United States Exploring Expedition and this material was divided between the Smithsonian Institution and the Philadelphia Academy of Sciences.

Chlorodiella laevissimus Dana, × 3.

DISTRIBUTION: Hawaiian Islands, "probably the same from Tutuila, Samoa, and Straits of Balabac" (Dana). Hawaii: Waikiki Beach, south coast of Molokai, 23 to 73 fms., Penguin Bank, 28 to 14 fms.; vicinity of Kauai, 68 to 99 fms.; Modu Manu, 24 to 46 fms. Society Islands, Ellice Islands, Paumotu Islands, atolls, and 22 to 25 fms. (Rathbun); Marquesas Islands, Society Islands and Samoa, (Boone); Gatavake, Ohura, Rikitea, Mangareva Island, (Nobili); Ceylon; Andaman Islands, (Alcock); Maldives: reef in Goidu, Fadifolu, atolls, dredged in South Nilander and Mahlos atolls in 22 to 25 fms., (Borradaile); Mauritius, (Alcock); Seychelles: Salomon, Cargados Carajos, Saya de Malha, 55 fms., Amirante, 29 to 80 fms., Coetivy, by diver, 32 ft., (Rathbun).

MATERIAL EXAMINED: Six male specimens, taken from coral reef at Anaho Bay, Nuka Hiva, Marquesas Islands, South Pacific Ocean, August 10, 1931, by the "*Alva.*" Three males, three females, two being ovigerous, taken on Venus Point Reef, Tahiti, Society Islands, August 15, 1931. One male taken at Pago Pago, American Samoa Islands, September 2, 1931.

TECHNICAL DESCRIPTION: All the "*Alva*" specimens are small, the largest, a male, having the carapace 9 mm. wide and 6 mm. long, hexagonal, with the frontal border equal to half the total width of carapace; with a distinct median emargination, the lobes being slightly convex on either side of the median sulcus, and with their outer angles set apart by a distinct notch from the orbital angle. The orbital margin is not circumscribed; the anterolateral margins, which are shorter than the postlateral margins, are cut into four teeth, in addition to the orbital tooth. The first tooth is quite small, nearly obsolete, while the second and third are conspicuously larger, the third being the largest of the series and usually distinctly procurved. The fourth tooth is quite small. The surface of the carapace is smooth with very moderate convexity, none of the regions are delineated and there are no areolations. However, the next to the largest specimen has on the outer branchial region a small tubercle behind each the second and third anterolateral teeth, but there are no grooves or wrinkles of the carapace such as occur in *C. niger* (Ruppell). On the largest specimen these tubercles are absent on the right side of the carapace and only one occurs on the left side of the carapace and this one is faint.

The chelipeds are markedly unequal, the merus in some specimens being without a spine, but in most specimens having a spine on the anterior margin, the carpus with a prominent tooth at the inner angle

and the palm smooth; high, somewhat longer than the very curved fingers, which are spoonshaped at the tip. It is this distinct arching or curvature of the fingers which serve to distinguish this species from the young of the closely related *C. niger*.

The ambulatories are moderately slender, with long hook-tipped dactyli, which have also a series of horny spinules along the inferior lateral margin.

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Chlorodiella laevissimus RATHBUN, M. J., Rept. U. S. Fish. Comm., for 1903, Bull. 23, pt. 3, p. 857, 1906; Trans. Linn. Soc. London, ser. 2, vol. 14, p. 225, 1911.

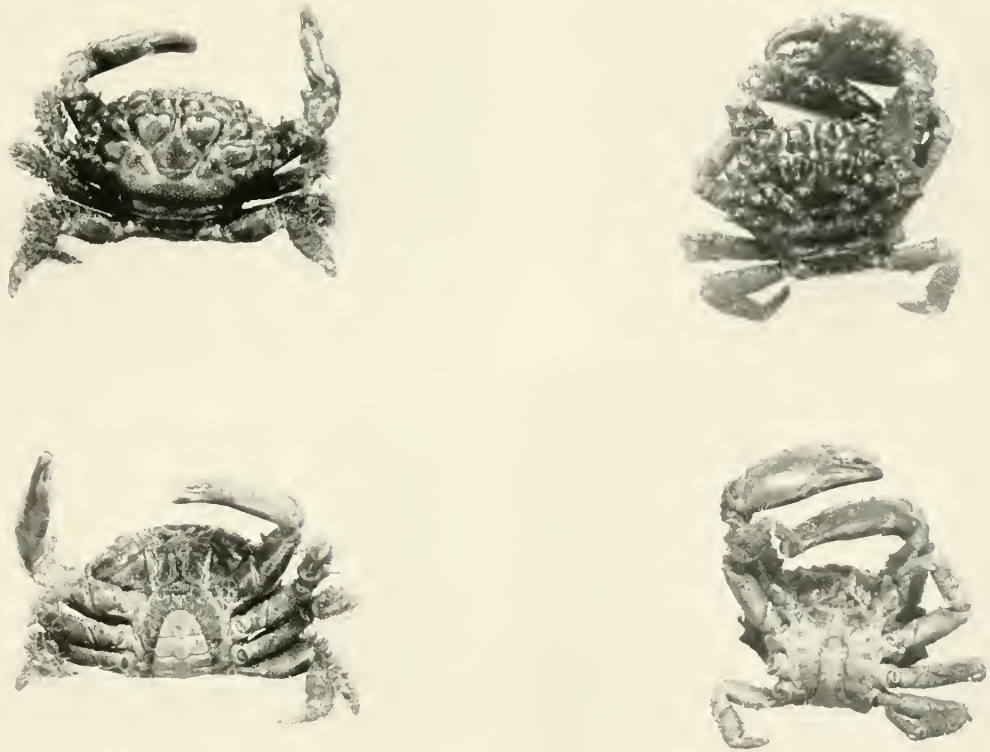
Genus: **PHYMODIUS** A. Milne Edwards.

Phymodius ungulatus (H. Milne Edwards).

Plate 73.

TYPE: The type came from Australasia and is deposited in the Paris Museum.

DISTRIBUTION: Red Sea, (Nobili; Hess; Kossman); Sudanese Red Sea, Station 8, (Laurie); Dschidda, (Pesta); Red Sea: Tor, Senafir, Abu Somer, Kosier, Berenice, Jambo, Haleib, Djeddah, Zukur, Dahab, Masaua, Ravoya, Mersa Scheikh, (Balss); Ceylon, (Henderson; Alcock); Andaman Islands, (Alcock); Maldives: reef, Hulule, Giofurfehendu, atolls, in lagoons, 3 to 7 fms., Minikoi, Miladumadulu atolls, in coral and under stones, (Borradaile); coral reef, Galle, Gulf of Manaar, (Laurie); Philippines, (Adams and White); N.E. off Singapore, (Cano); Mangsi Island, Balabac Passage, Navigator Islands and Tahiti, Society Islands, (Dana); Tahiti, (Heller); Java Sea and Celebes, (de Man); Society Islands, (Boone); Upolu, Samoa. (Ortmann; Pesta); Samoa, (Alcock; Boone); Caroline Islands, Society Islands, Paumotu Islands, (Rathbun); Rikitea, Mangareva, (Nobili); Rotuma, (Borradaile); Hawaiian Islands, (Streets); Honolulu, reef, (Rathbun); Palmyra Island and Fanning Island, (Edmondson); Torres Straits, (Calman); Port Denison, Australia, (Has-



Phymodius ungulatus (H. Milne Edwards), × 1.

well); Mauritius, (Alcock; Pesta); in coral, Port Louis, Grand Port, Chaland, Mauritius, (Bouvier); in coral, New Caledonia, (A. M. Edwards); Seychelles: Salomon, Egmont, reef, Diego Garcia, lagoon, 10 fms., 12 fms., Cargados Carajos, reef, (Rathbun); Australasia, (H. M. Edwards); tidal zone, Zanzibar, Bawi, East Africa, (Lenz); rare in rock crannies at Natal Point, South Africa, (Stebbing.).

Material examined: One male, taken at Pango Pango, American Samoa, Sept. 2, 1931. Nine smaller adults, including two ovigerous females, taken in coral at Teviatoa reef, Raiatea Island, Society Islands, August 21, 1931. One smaller female, Venus Point, Reef, Tahiti, Society Islands, August 15, 1931.

Technical description: Carapace 14 mm. wide, 8 mm. long, hexagonal, with the regions and their subdivisions sharply defined by distinct grooves; the elevations or lobules are all convex, with a finely granulated surface. The interorbital space is about one-third the width of the carapace, with the frontal border bilobed and slightly bowed, the outer angle of each lobe forming a distinct little lobule. The orbital region is circumscribed, the immediate orbital margin is lined with three closed sinuses, two of which are on the outer half of the upper margin, and the third is at the extreme outer angle. The anterolateral margin is convex and is divided into four well separated, sharply conical teeth, the third and fourth of which are longer, procurved and more acute. There are three denticle-like, conical small lobules, one each, behind the second, third, and fourth teeth. The postlateral margins are quite as long as the anterolateral margins and are sharply convergent. The sculpturing of the carapace, as shown in plate 73, consists of two lobules on the mesogastric region; behind these four separated lobules in transverse series; the cardiac region circumscribed, with a separate transverse elevation immediately posterior to the urogastric lobe, and behind this a separated, transverse elevation on the posterior region of the carapace. Behind the four lateral teeth are the three above-mentioned conical elevations, and behind these are three more conspicuous lobules, the anterior of which is in line with the series of four metagastric lobules, while the other two fill in the remaining anterior branchial space; behind this series are two more lobules on the branchial region, the inner one being adjacent to the cardiac region. The sidewalls of the carapace are quite granular.

The antennulae are well separated by the median septum, and fold almost transversely.

The antennae have the basal article quite large, extending obliquely outward and upward into the space between the frontal and orbital angle. The flagellum is slender and is situated in the orbital hiatus. The external maxillipeds are smooth, except for a prominent longitudinal groove on the ischium; the anterior margin of the merus is almost transverse; the tip of the palp is finely setigerous.

The chelipeds are moderately unequal; the merus elongate, extending one-half its length beyond the margin; triquetral, with both inner and upper lateral margins irregularly denticulate, and both upper surfaces coarsely granular, the more conspicuous granules being arranged in a roughly longitudinal series. The carpus is rounded and broken by about ten to twelve conical lobules, and with the inner angle conspicuously produced and with a bifid tip. The palm widens distally and has the upper half of the inner surface, and practically all of the outer surface covered with numerous coarse conical granules, those on the outer surface being well-spaced longitudinal rows, the upper two rows being much larger than those lower down on the palm. The fingers are black, this color forming a conspicuous patch on the inner surface of the palm, behind the upper half of the lower finger. The fingers are curved with deeply hollowed tips and moderately toothed cutting edges.

The ambulatories are well developed, the merus has one row of sharp, curved spines on the upper margin. The carpus has three rows of similar spines and the propodus has two rows of acute spinules; the dactyl is strong with a curved tip. The male belt is five-segmented.

The ten young adults, at first glance would appear to be a different species, owing to the fact that they have the spines of the antero-lateral margin more conspicuous in proportion to the size of the carapace, and the three hepatic branchial, conical lobules of the larger specimens are represented by three long acute spines. On the chelipeds, the granules of larger adults, on the merus, carpus, and propodus, are represented on these young specimens by coarse pointed curved, or straight, conical spines, arranged as are the granules on the larger specimens. The spinules along the upper margin of the merus, carpus, and propodus are also longer in proportion to the related legs than is true of other specimens; but the serial arrangement of the respective joints is the same. The setae of the legs are much longer, also as is customary in young crabs.

Two of the above described young adults measure as follows: Male: —Carapace, 7 mm. wide, 5 mm. long; Female, carapace, 6.5 mm. wide,

4.8 mm. long; ovigerous, carrying about seventy-five embryos. These are small, spherical, with two black eye-spots showing.

References: *Chlorodius ungulatus* H. Milne Edwards, Hist. Nat. Crust., t. I, p. 400, pl. 16, figs. 6–8, 1834.—Dana, U. S. Explor. Exped., vol. XIII, Crust., pt. I, p. 205, pl. 11, figs. 8a–b, 1852.—Hess, in Wiegmann's Archiv. fur Naturges., vol. 31, pt. I, pp. 135, 171, 1865.—Streets, T. H., Bull. U. S. Nat. Mus., vol. VII, p. 115, 1877.

Phymodius ungulatus A. Milne Edwards, Nouv. Archiv. Mus. Hist. Nat., vol. IX, p. 218, 1873.—Hilgendorf, Monatsb. K. Akad. Berlin, p. 790, 1878.—Kossman, Reise Roth Meer. Crust., p. 34, 1877.—Haswell, Cat. Austral. Stalk and Sessile-eyed Crust., p. 59, 1882.—Miers, Rept. H. M. S. "*Challenger,*" Zool., vol. 17, p. 139, 1886, (misprinted *angulatus*).—Cano, Boll. Soc. Nat. Napoli, vol. III, p. 201, 1889.—Henderson, J. R., Trans. Linn. Soc. Zool., ser. 2, vol. 5, p. 362, 1893.—Ortmann, Zool. Jahrb. Syst., vol. VII, p. 464, 1893–94.—de Man, Zool. Jahrb. Syst., vol. VIII, p. 524, 1894–95.—Alcock, Journ. Asiatic Soc. Bengal, vol. 67, pt. 2, p. 162, 1898.—Calman, W. T., Trans. Linn. Soc. London, Zool., ser. 2, vol. 8, p. 12, 1900–1903.—Borradaile, Proc. Zool. Soc. London, 1900, pt. 2, p. 587; Fauna and Geogr. Maldive and Laccadive Arch., vol. I, pt. III, p. 259, 1902.—Lenz, Abh. Senckenb. Naturf. Ges., Bd. 27, p. 254, 1905.—Rathbun, M. J., Rept. U. S. Fish Comm. for 1903, Bull. 23, pt. 3, p. 857, 1906.—Nobili, G., Ann. Sci. Nat. 9 ser. Zool., t. IV, p. 264, 1906.—Laurie, R. D., Ceylon Rept. Pearl Oyster Fish., vol. V, p. 405, 1906.—Nobili, G., Torino Mem. Acad. Sci., ser. 2, vol. 57, p. 393, 1907.—Rathbun, M. J., Mem. Mus. Comp. Zool., vol, 35, p. 46, 1907.—Stebbing, Ann. S. Afric. Mus., vol. VI, pt. 4, p. 299, 1910.—Pesta, O., Wien Densch. Akad. Wiss., Bd. 88, p. 45, 1911.—Rathbun, M. J., Trans. Linn. Soc. London, ser. 2, vol. 14, p. 225, 1914.—Bouvier, Bull. Sci. France-Belg., vol. 48, p. 275, 1914–1920.—Edmondson, Bull. B. P. Bishop Mus., vol. V, p. 17, 1923.—Balss, H., Denksch. Akad. Wiss. Wien, Bd. 99, p. 10, 1924.

Xantho deHaanii Kauss, Sudafric. Crust., p. 29, pl. 1, fig. 2, 1843.—Heller, Sitzb. der Mat.-Natur. Akad. Wiss. Wien, vol. 43, p. 337, 1861; Reise. Fregatte "*Novara*" Zool., Bd. II, Abthl. III, p. 19, 1868.

Chlorodius areolatus Adams and White, Zool. Voy. H. M. S. "*Samarang,*" Crust., p. 41, pl. XI, fig. 3, 1848, London.

Genus: **CYMO** De Haan.

Cymo melanodactylus De Haan.

Plate 74.

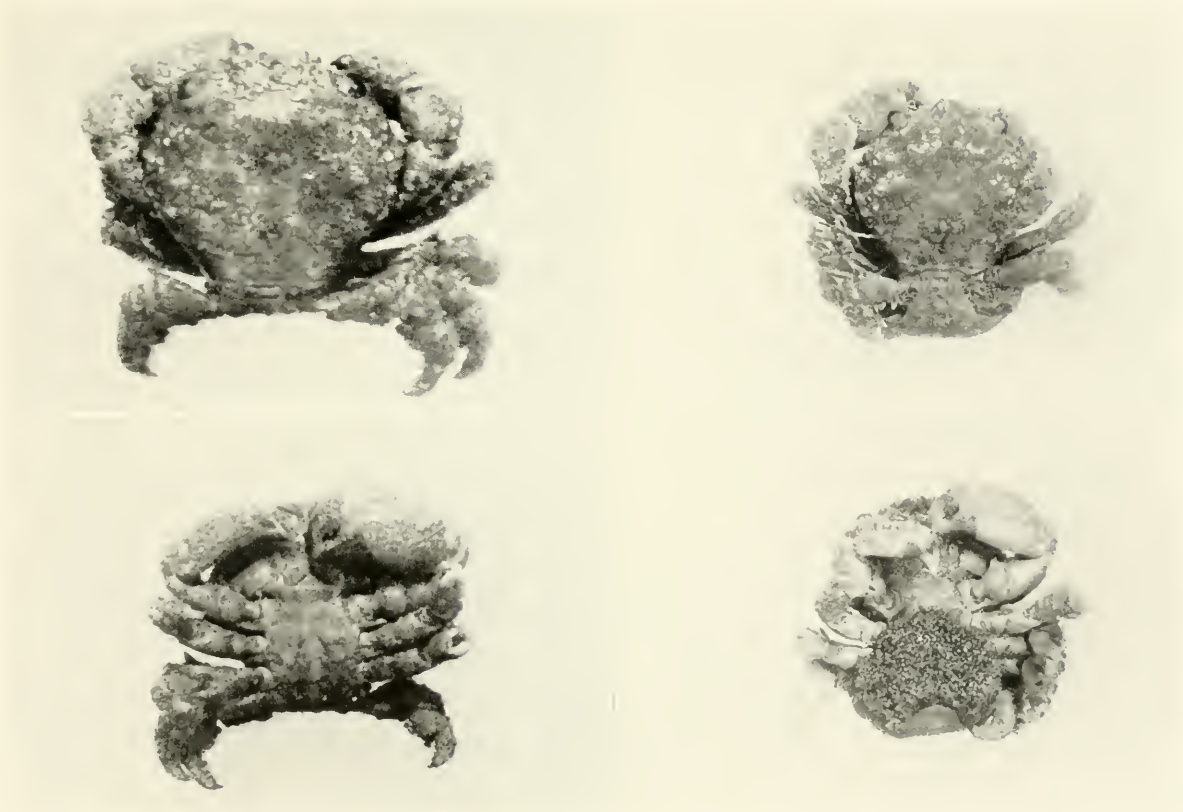
TYPE: This came from Japan and was deposited in the Berlin Museum.

DISTRIBUTION: Japan, (De Haan); Liu Kiu Islands, Amami Oshima, Japan, (Ortmann); Liu Kiu Islands, (Balss); Hong Kong and Bonin Islands, in corals, (Stimpson); Hongkong, (Gee); Indo-Pacific, two stations, Andamans, Mergui, Ceylon, (Alcock); Sullivan Island, Mergui Archipelago, (de Man); Maldives: shore in Minikoi and Goifurfehendu atolls, (Borradaile); Feejee Islands, (Dana); Koh Kahdat, Gulf of Siam, (Rathbun); Samoa, (Ortmann; Miers, Pesta); Tahiti, (Pesta); Society Islands, (Boone); Funafuti, Rotuma, (Borradaile); Paumotu Islands, and Society Islands, (Rathbun); Palmyra Island, Fanning Island, (Edmondson); Torres Straits, (Calman); Ingram Island, reef, Queensland, Australia, (Boone); Seychelles, (Miers); Coetivy Island, (Rathbun); New Caledonia, (A. M. Edwards); Chaland, Mauritius, (Bouvier); Red Sea, El Tor and Gulf of Suez, (Miers); Red Sea, (Nobili; Pesta).

MATERIAL EXAMINED: Five specimens, three male, and two female, taken on Venus Point Reef, Tahiti, South Pacific Ocean, August 15, 1931. One larger specimen taken in coral, on Ingram Island Reef, Queensland, Australia, October 12, 1931. This specimen is less spinose than those from Tahiti.

TECHNICAL DESCRIPTION: This is a small species, specimens only a half inch in diameter being the largest so far recorded. The "*Alva*" specimens are not quite that large.

The carapace is subcircular, moderately convex, with the regions scarcely delineated, with the frontal and anterolateral margins widely rounded, the postlateral margins not separated from the anterolateral, but convergent posteriorly, giving the posterior portion a narrowed aspect. The frontal margin is equal to about half the diameter of the carapace, and has six rather equal, small, spinelike teeth and in addition there is a smaller similar spinelike tooth, on each side at the inner orbital angle. On the anterolateral margin, there are two or three similar smaller spines, and in addition, one or more coarse, rounded granules on the hepatic region. There are also some of these granules scattered on the mesogastric and other branchial regions, semiconcealed by the bushy pubescence. There are also some of these tubercles on



Cymo melanodactylus De Haan, upper and lower left figures, male, × 2; upper and lower right figures, ovigerous female × 2.

the anterior lateral walls of the carapace, and a larger tubercle each, at the outer and inner inferior orbital angles. The antennulae fold almost transversely and are well separated by a wide interantennular fossett. The antennae have the basal article elongated, touching the deflected frontal margin at the inner distal angle, and the outer orbital angle; the flagellum is small, less than half the length of the orbit.

The external maxillipeds are close fitting, the distal meral margin nearly straight, the outer surface of the maxillipeds is covered with a fine thick pubescence, as is the adjacent underside of the carapace.

The eye stalk is thick, and encased in a calcareous cover, which terminates in a rounded projection on the upper surface of the eye; the cornea is large, set obliquely terminal.

The male belt is five-jointed, the female belt, seven-jointed.

The chelipeds are decidedly unequal in the male, with a short merus, closely oppressed to the body. The upper anterior meral margin has a thick fringe of setae; the outer surface of the merus is rounded, and granulose towards the distal end. The carpus is rounded on the upper surface and covered with a series of coarse, spinose granules, semi-concealed in dense pubescence; the propodus is similarly covered with coarse spinose granules and pubescence, on the upper and outer surface, these tubercles being larger, and arranged in approximately longitudinal series, on the upper half of the palm; the fingers are short, down-curved, spoon-shaped, those of the larger claw with a slight gape, those of the smaller claw meeting throughout their length. Both upper fingers have the proximal half rough, with coarse granules; the fingers are brownish black, except for the creamy margin at the tip.

The ambulatories are short and stout, with the merus, carpus and propodus flattened, nearly as wide as long; their upper lateral margin, and in less degree, upper surface roughened with spinose granules; the dactyl is stout, with a curved, horny tip. All the ambulatories are covered on their upper surface with a coarse shaggy pubescence. The above described specimens are from Bali, Dutch East Indies. Specimens from Tahiti have less pubescence, and more and larger spinose granules on the ambulatories. The Tahiti specimens are twenty to fifty percentum smaller than those from Bali. One large specimen, a female, from Ingram Reef, Queensland, Australia, has shaggy ambulatories with very few spinules along their lateral margin. However the great cheliped has more and larger granules, than any of the other specimens, and the fingers are curiously totally lacking in

the black coloration of this species. This may be due to discolorization. It was taken on the same expedition, as the other specimens, and identically preserved.

References: *Cymo melanodactylus* De Haan, in Siebold's Fauna Japon. Crust., p. 22, 1837.—Dana, U. S. Explor. Exped. vol. XIII, Crust. pt. I, p. 225, pl. 13, fig. 1, 1852.—Stimpson, Proc. Acad. Nat. Sci. Phila. vol. 10, p. 34, 1858.—A. Milne Edwards, Nouv. Archiv. Mus. Hist. Nat., t. IX, p. 252, 1873.—Ortmann, Zool. Jahrb. Syst. vol. VII, p. 442, 1893–94.—Alcock, Journ, Asiatic Soc. Bengal, vol. 67, p. 174, 1898.—Calman, W. T., Trans. Linn. Soc. London, Zool., ser. 2, vol. 8, p. 13, 1900–1903.—Rathbun, M. J., Mem. Mus. Comp. Zool. vol. 35, p. 53, 1907.—K. Danske, Vid. Selsk. Skr. 7th raekke, Bd. 5, p. 349, 1910; Trans. Linn. Soc. London, Zool., ser. 2, vol. 14, p. 227, 1911.—Pesta, O., Wien Denkschr. Akad. Wiss. Bd. 88, p. 46, 1911.—Bouvier, Bull. Sci. France-Belg. t. 48, p. 281, 1914–1920.—Edmondson, Bull. B. P. Bishop Mus., vol. 5, p. 18, 1923.—Gee, N. G., Lingnaam Agric. Review, Canton, vol. III, p. 162, 1925–1926.

Cymo melanodactyla Balss, H., Archiv. fur Naturg. Bd. 90, Abt. A, heft 5, p. 69, 1924.

Cymo andreossyi variety *melanodactylus* (Miers), Zool. H. M. S. "*Alert*," p. 532, 1884.—de Man, Journ. Linn. Soc. London, vol. 22, p. 35, 1887–1888.—Borradaile, Proc. Zool. Soc. London, 1900, pt. 2, p. 581; Faun. and Geogr. Laccadive and Maldive Arch., vol. I, pt. III, p. 251, 1902.—Nobili, Ann. Sci. Nat. 9 ser. Zool. t. IV, p. 271, 1906.

Subfamily: **Menippinae.**

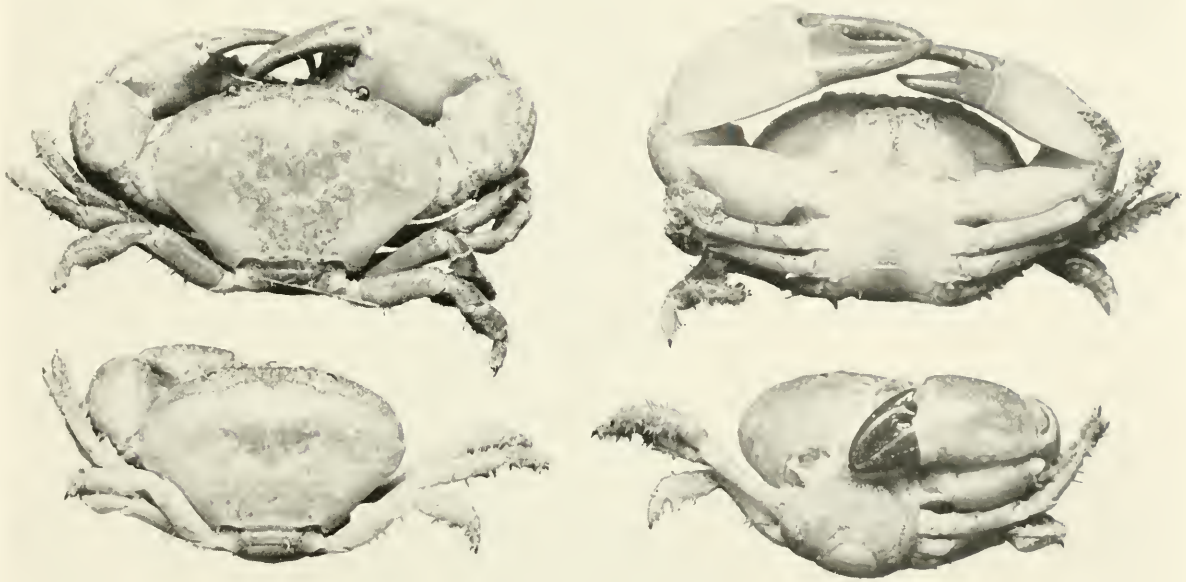
Genus: **PSEUDOZIUS** Dana.

Pseudozius caystrus (Adams and White).

Plate 75.

Type: This species was first taken in Mauritius and Samoa and deposited in the British Museum.

Distribution: Mauritius; Samoa, (Adams and White); Bonin Isles, Wake Island, Loo Choo Islands, Paumotu, Islands, Raraka, (Dana; Stimpson); Japan Seas, (Ortmann); Apia, Samoa, (Boone); Hawaiian Islands, (Streets; Rathbun); Palmyra Island, Fanning Island, (Edmondson); Bonin Islands, (Balss); Taboga Island, Pan-



Pseudozius caystrus (Adams and White), × 1.5.

ama, also Colon, East Panama, (Finnegan); Rotuma; Funafuti, (Borradaile); Kamaka, (Nobili); Savaii, (Pesta); Cocos-Keeling Atoll, (Calman); Male, Maldives, Minikoi, (Borradaile); Andamans, Mekran (Baluchistan) coast, Laccadvies, Bombay, Aden, Samoa, Bantam, (Alcock); Red Sea, (Nobili); lagoon, Diego Garcia, Seychelles, Coetivy Island, (Rathbun); Bonin Islands, (Balss).

MATERIAL EXAMINED: two males and one ovigerous female, taken on the reef at Apia, Samoa, September, 5, 1931, by the "*Alva.*" One smaller male, one larger female from the same locality.

TECHNICAL DESCRIPTION: Carapace oval, one and one-third times as wide as long, depressed, flattish except the finely granular, deflexed frontal-orbital region; the regions of the carapace are not delineated except a slight urogastric line. The frontal margin is deflexed, cut into two shallow, widely rounded submedian lobes, which are distinct from the bluntly triangular outer lobes, which latter are separated from the rounded superior inner orbital tooth by a rounded sinus. The orbital border is smooth, slightly thickened, unbroken; the inferior orbital tooth is thickened almost right-angled, not meeting the superior tooth. The anterolateral border is widely rounded, arched, obscurely cut into four very shallow lobes, the first and second lobes being rounded and nearly confluent. The sidewalls of the carapace are smooth, the buccal cavern is definitely narrower anteriorly, than posteriorly. The male belt has seven segments. The external maxillipeds are smooth except for a longitudinal groove on the ischium. The anterior border of the merus is notched to complete the formation of an expiratory aperture, in conjunction with the sharply defined crests of the endostome.

The antennules fold almost transversely, the median septum is firm, and well developed.

The antennae have the basal joint short; the second peduncular joint shorter, cylindrical, but touching the frontal margin. The flagellum very slender, not quite equal in length to the long diameter of the orbit, and situated in the angle between the front and the orbital wall. The chelipeds are large and unequal in both sexes, but are especially massive in the male, smooth to the unaided eye, but under the microscope showing rough pittings on the palm; the carpus is convex on the upper and outer surfaces, with a double tooth on the inner angle; the palm is massive, the fingers, slender, curved, in the female nearly meeting along the cutting edge and bearing several teeth on the lower finger; on the male the fingers are widely gaping, meeting only at the

tips, the lower fingers of the larger claw having only one double molar, while the smaller lower finger has a double molar followed by a few weak denticles.

The ambulatories are small, smooth except the dactyli, which are furred with numerous stiff bristles; also a few scattered bristles occur on the propodus.

References: *Panopeus caystrus* Adams and White, Zool. Voy. H. M. S. "*Samarang,*" Crust., p. 42, tab. 9, fig. 2, 1848.

Pseudozius planus Dana, U. S. Explor. Exped., Crust., vol. XIII, pt. I, p. 233, 1852; atlas, pl. 13, fig. 6.

Pseudozius microphthalmus (Stimpson), Proc. Acad. Nat. Sci. Phila., vol. X, p. 35, 1858.

Pseudozius caystrus Ortmann, Zool. Jahrb. Syst., Bd. VII, p. 434, 1894.—Alcock, Journ. Asiatic Soc. Bengal, vol. 67, pt. 2, p. 181, 1898.—Borradaile, Proc. Zool. Soc. London, 1900, pt. 2, p. 580; Fauna and Geogr. Maldive and Laccadive Arch., vol. I, pt. III, p. 241, 1902.—Rathbun, Rept. U. S. Comm. Fish. for 1903, Bull. 23, pt. 3, p. 861, 1906.—Nobili, G., Ann. Sci. Nat. 9 ser. Zool., t. IV, p. 272, 1906; Torino Mem. Acad. Sci., ser. 2, vol. 57, p. 397, 1907.—Calman, in Wood-Jones, Proc. Zool. Soc. London, 1909, pt. 1, p. 159.—Pesta, Wien Denksch. Akad. Wiss., Bd. 88, p. 46, 1911.—Rathbun, M. J., Trans. Linn. Soc. London, ser. 2, vol. 14, p. 227, 1911.—Edmondson, Bull. B. P. Bishop Mus. Bull., vol. V, p. 18, 1923.—Balss, H., Archiv. für Naturg., Bd. 90, Abt. A, heft 5, p. 70, 1924.—Finnegan, S., Journ. Linn. Soc. London Zool., vol. 37, p. 645, 1930–1932.

Subfamily: **Oziinae.**

Genus: **OZIUS** Leach.

Ozius truncatus H. Milne Edwards.

Plate 76.

Type: This was collected in Australia and is deposited in the Paris Museum.

Distribution: Australia, (H. M. Edwards); Bay of Islands, New Zealand, Illawarra and Sydney, New South Wales, (Miers); Port Jackson, Australia, littoral, (Stimpson); Garden Island and Sydney, (White); common at Norfolk Island, Australia, (Grant and McCulloch); Port Adelaide, South Australia, (Rathbun); Bear's Point and

Ozius truncatus H. Milne Edwards, × 1.

Vivonne Bay, Kangaroo Island, South Australia, (Hale); Apia, Samoa, (Boone).

MATERIAL EXAMINED: One large male, taken at Apia, Samoa, September 5, 1931, by the "*Alva.*"

TECHNICAL DESCRIPTION: Carapace about three-fourths as long as wide, with the frontal margin equal to about one-third of the total width, the anterolateral margins very short, the postlateral margins decidedly convergent. The frontal margin is thick, sinuate, weakly four-lobed, the submedian pair of lobes being much the wider, the outer pair small, separated by a small concavity from the blunted preorbital angle; a small sinuate sulcus occurs faintly behind the frontal margin. The orbital margin is thickened, without sinuses. The anterolateral margin is short, cut into four teeth, the first of which is wide, blunt, and confluent with the postorbital tooth; the second tooth is also wide and blunt; the third and fourth teeth are more angulated and elevated; this lateral region is decidedly rugose, pitted. The postlateral margins are long and decidedly convergent. The dorsal surface is flattish with the small, paired frontal areolates gently defined; the gastric region is circumscribed by a distinct groove; the mesogastric lobes being prominent anteriorly, obsolete posteriorly; there is a distinct, shallow sulcus curving inward from between the second and third anterolateral teeth in an arc which has the inner end united with the cervical groove and confluent with the small sulcus that borders the anterior lobes. Running inward from the base of the fourth anterolateral tooth is a deeper, curved sulcus uniting with the posterior curve of the cervical groove. This posterior sulcus is an arc with the ends directed anteriorly, while the anterior arc has the ends directed backward. The pterygostomian region is granulose.

The chelipeds are distinctly unequal in both sexes, as shown in the plate; the carpus is convex with a decided transverse sulcus on the upper surface. The palm is moderately convex; the fingers are black, curved and pointed; those of the great chela have a wide gape; each finger is armed with a large sub-basal molar and two or three rudimentary teeth, finger tips meeting. The fingers of the smaller chela have but little gape and each has several rudimentary teeth. The lower fingers have each a longitudinal groove on the outer face.

The ambulatories are slender, subcylindrical, granulose, hirsute; the dactyl velvety-pilose, firm-tipped.

The eye is small, typically *Ozius.*

The antennulae are stocky and fold transversely within the fossett which is short and deep-cut and divided by a definite median septum.

The antennae have the basal article very oblique, the flagellum rudimentary.

The external maxillipeds are close fitting with the distal meral margin slightly notched.

References: *Ozius truncatus* H. Milne Edwards, Hist. Nat. Crust., t. I, p. 406, 1934.—Dana, U. S. Explor. Exped., vol. XIII, Crust., pt. I, p. 230, pl. 13, fig. 4, 1852.—Stimpson, Proc. Phila. Acad. Nat. Sci., vol. 10, p. 34, 1858.—Hess, Archiv. fur Naturges., vol. 31, p. 137, 1865.—Haswell, Catal. Austral. Stalk and Sessile-eyed Crust., p. 63, 1882.—Miers, E. J., Catal. Crust. New Zealand, p. 21, 1876.—Grant and McCulloch, Proc. Linn. Soc. New South Wales, vol. 32, p. 153, 1907.—Rathbun, Rec. Austral. Mus., vol. 15, p. 177, 1926–1927.—Hale, H., Trans. and Proc. Roy. Soc. S. Austral., vol. 51, p. 307, 1927.

Xantho deplanatus White, Adam, in Juke's Voy. H. M. S. "*Fly,*" Appendix, art. 8, p. 237, 1847.

Ozius tuberculosus H. Milne Edwards.

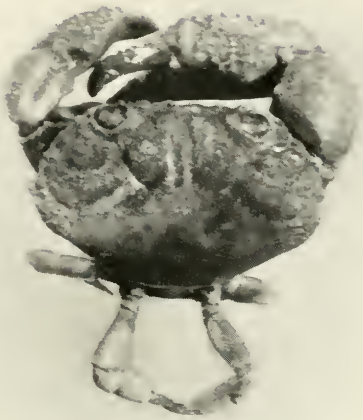
Plate 77.

Type: Dr. Henry Milne Edwards' type came from the East Indies and is deposited in the Paris Museum.

Distribution: East Indies, (H. M. Edwards: Trincomali, Ceylon, (Muller; Laurie); Sullivan Island, Mergui Archipelago, (de Man); Nicobars, (de Man); Marquesas Islands, Samoa, (Boone); Mauritius; rare at New Caledonia, (A. M. Edwards).

Material examined: One male, taken in coral at reef of Anaho Bay, Nuka Hiva, Marquesas Islands, August 10, 1931. Two smaller males, taken at Apia, Samoa, by the "*Alva.*"

Technical description: Carapace moderately convex anteriorly and flattish on the posterior half with the frontal and anterolateral margins widely rounded, the postlateral margins sharply convergent. Length of carapace equal to two-thirds or slightly more of the greatest width, frontal margin equal to almost one-half the total width of carapace, slightly deflected, sinuate, cut into four rounded teeth in addition to the preorbital angle which is set apart. The inner or submedian pair of teeth are slightly the wider and more conspicuous; immediately behind these there is a brief transverse miniature lobule, which is separated posteriorly by a transverse sulcus from the paired



Ozius tuberculosus H. Milne Edwards, × 1.

suboval lobules of the frontal region. The orbital margin is entirely closed, the superior inner orbital margin being deflected and touching the tooth of the inferior orbital angle. The entire dorsal orbital margin is circumscribed and thickened and the inner dorsal half being wider than the outer; a slightly thicker node occurs as the postorbital tooth; the anterolateral margin is widely rounded and cut into five teeth besides the postorbital. These teeth incise the margin only slightly but jut upward dorsally as blunted apices; the first, second and third teeth each have a secondary conical elevation immediately inside of the apex; the fourth tooth lacks this and is smaller and the fifth tooth is quite rudimentary. There is a short sulcus running inward on the anterior side of each tooth. The first sulcus is the one that circumscribes the orbit; the second and third sulci are short and confluent immediately behind the teeth; the fourth sulcus is much longer, extending across the branchial region and uniting with the cervical groove; anteriorly it, together with the above mentioned sulci circumscribe a small, suboval lobe the summit of which is bifid. A thickened ridge occurs immediately behind the sulcus and parallel to it. The sulcus from the fifth tooth is fainter yet distinct, and it and the fourth sulcus circumscribe a large, sublunate flattish area on the anterior of the branchial region. The gastric region is divided into two low lobes by the groove that runs backward between the submedian frontal tooth; posteriorly this groove bifurcates with a shallow longitudinal ridge between the bifurcation. The urogastric groove is faintly delineated, otherwise the posterior region of the carapace is smooth, except for a faint carina along the short posterior margin. The entire carapace and legs have a roughened pitted texture. The male belt is composed of five articles, the third, fourth and fifth segments being fused but with the segment lines clearly delineated.

The eye is small, entirely hooded, the stalk short and thick, with a rounded, calcareous process extending a large portion of the terminal hemispherical cornea.

The antennulae are not very large and fold transversely within the fossett which lies beneath the frontal margin and has a very thick border with a thick interantennulary septum.

The antennae have the basal article oblong, apparently fused to the adjacent epistome and above to the lower margin of the outer frontal tooth; the second and third articles and flagellum are abortive, situated in the notch between the outer frontal tooth and orbital angle and not extending into the orbital hiatus, which is entirely closed by the meeting orbital angles.

The external maxilliped is rectangular, very close fitting, smooth externally, the merus which is wider than long, has both its inner and outer distal angles obliquely truncate and the median distal margin concavely excavate as is also the adjacent margin of the epistome, together forming an aperture for the excurrent channel.

The chelipeds are decidedly unequal in the male, the right one being very much larger and its fingers having a slight gape, while those of the left cheliped are more decisively deflected, slenderer and meet throughout their length. The merus is short and does not extend beyond the margin of the carapace; the carpus rounded, with its inner angle produced to a sharp ridge; the propodus and related fingers of of the larger cheliped are one and two-fifths times the length of the carapace; with the palm high and thick, very convex on its outer and upper surfaces, the upper surface and outer two-thirds being rugose, roughened with wrinkles and coarse pittings; the lower outer surface is smooth; both fingers are short, curved, with pointed tips; the upper finger has one large molar. The palm of the smaller cheliped is paved with coarse round granules on its upper and outer surfaces. Both upper fingers are black-tipped for half their length; the lower fingers are creamy color.

The ambulatories are small, successively decreasing in length from the first to fourth pair. All have the meral, carpal and propodal joints laterally compressed, the dactyl stout, hary-tipped and encased in velvety pilosity throughout their entire dactyli.

References: *Ozius tuberculosus* Henry Milne Edwards, Hist. Nat. Crust., t. I, p. 405, 1834.—Heller, Reise Osterreich. Fregatte "*Novara*" Zool. Crust., 23, 1868.—A. Milne Edwards, Nouv. Archiv. Mus. Hist. Nat., t. IX, p. 238, pl. 11, fig. 2, 1873.—Hoffman, in Pollen and Van Dam, Recherches sur Faune de Madagascar, Ins. et Crust., Pt. V, p. 39, 1877.—Muller, Verh. Naturf. Gesellsch. Basel, vol. VIII, p. 747, 1890.—de Man, Journ. Linn. Soc. London, Zool., vol. 22, p. 45, 1888.—Laurie, R. D., Ceylon, Rept. Pearl Oyster Fish., vol. V, p. 407, 1906.

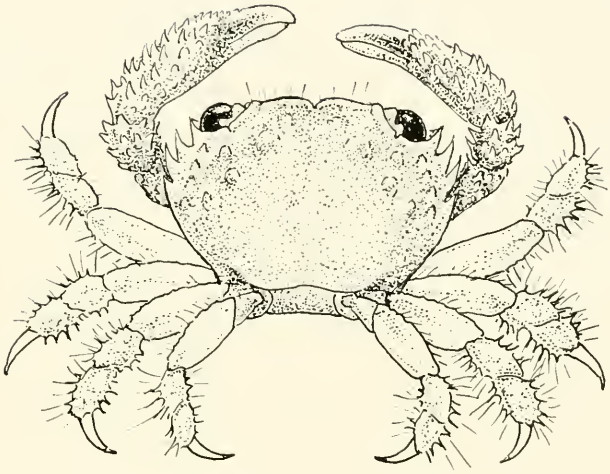
Subfamily: **Piluminae.**

Genus: **PILUMNUS** Leach.

Pilumnus globosus Dana.

Plate 78.

Type: Dana's type series was taken by the United States Exploring Expedition at Waterland and Raraka, Paumotu Islands and Ta-



Pilumnus globosus de Man × 8.

hiti, Society Islands, and was deposited in the Smithsonian Institute and the Philadelphia Academy of Natural Sciences.

DISTRIBUTION: As cited above, Paumotus and Tahiti, (Dana); Tahiti, (Rathbun); Mergui Archipelago, (de Man); Tahiti, (Boone); Japanese Seas, (Miers).

MATERIAL EXAMINED: One specimen, taken on Venus Point Reef, Tahiti, Society Islands, August 15, 1931.

TECHNICAL DESCRIPTION: Carapace oval, frontal margin very wide, sinuate, the submedian lobes very wide, slightly convex, the outer pair minute, acute, scarcely as large as the notch separating it from the deflected, nearly right-angled preorbital angle; there are two closed sinuses on the orbital margin, one of which is very obscure; the postorbital angle is an acute spine; the anterolateral margin is short, convex, cut into three sharp, procurved, uptilted spines, in addition to the postorbital spine; the first of these spines is widest basally, the second is narrower but equally high, while the third spine is definitely the smallest of the series; behind the last lateral tooth the postlateral margins are moderately but definitely convergent. The postlateral margin is wide, weakly carinate in the median area. The dorsal surface is moderately tumid with the cardiac region circumscribed and continuous with it is a tonguelike process extending forward between the gastric lobes. The cervical groove is deep and confluent with a sulcus that nearly circumscribes the orbit. A slight median sulcus runs back from the median notch. There are a pair of small, anteriorly truncated lobes behind the frontal border and separated posteriorly from the larger gastric lobes, which are moderately tumid. Inside the anterolateral margin on the outer branchial and hepatic regions there is a line of five acute spines, the anterior one of which is on the orbital margin, and the posterior one the opposite the last lateral spine. There are also a few granules behind the orbit on the branchial area.

The pterygostomian region is granular. The chelipeds are about equal in the male, the short trigonal merus thick, coarsely spinulose on both upper lateral margins; the small exposed upper surface and distal margin also spinose; the carpus is entirely covered on its upper and outer surface with sharp procurved spines, two of which, one below the other, are on the inner angle; the palm and fingers are two and one-third times as long as the carpus, the palm being a trifle over half of this length; the palm is moderately dilated, with the entire upper and outer surfaces covered with sharp, thorny spines, the longest of which are curved distally; these spines diminish in size slightly

but not in abundance towards the lower margin; the inner surface of the palm is granulose, moderately dilated, with approximately a half dozen spines on the median region; the fingers are black, down-curved, pointed, the tips meeting; there are several spines on the proximal upper surface of the upper finger and some on the surface of the lower finger.

The ambulatories are slender, with the meral joint flattened, its upper lateral margin armed with a line of sharp procurved spines, set among long setae, as is also that of the carpus and propodus; the lower lateral margin of the merus is also rough, granulose; the dactyl is stout with a horny tip.

The eye is large, the stalk short, the cornea subspherical.

The antennulae fold transversely within the fossett.

The antennae are greatly reduced, the basal article placed obliquely, partly within the orbital hiatus.

The external maxillipeds have the distal meral margin slightly sinuate, with the inner angle truncate for the palp attachment.

References: *Pilumnus globosus* Dana, Proc. Acad. Nat. Sci. Phila. vol. VI, p. 236, 1852; U. S. Explor. Exped. vol. XIII, Crust. pt. I, p. 236, 1852.—de Man, Notes Leyden Mus. vol. 12, p. 59, pl. 3, 1890.—Rathbun, M. J., Mem. Mus. Comp. Zool. vol. 35, p. 56, 1907.

Subfamily: Actumninae Dana.

Genus: ACTUMNUS Dana.

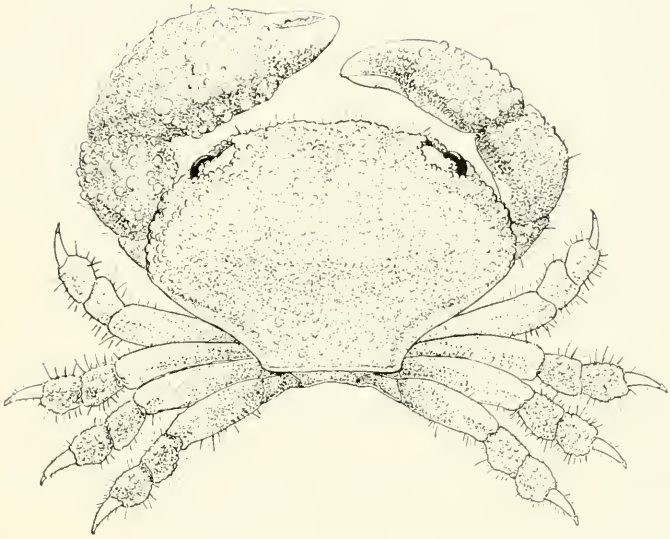
Actumnus obesus (Dana).

Plate 79.

Type: Dredged at Lahaina, Island of Maui, Hawaiian Islands, by the United States Exploring Expedition; depository Smithsonian Institution; the type is believed to be no longer extant.

Distribution: Lahaina, Maui, Hawaiian Islands, (Dana); south coast of Molokai, Hawaiian Islands, 43 to 73 fms. (Rathbun). Temukus Roads, Bali, Dutch East Indies, Tahiti, Society Islands, (Boone). Amirante, (Rathbun); Red Sea, (Nobili).

Material examined: One specimen, from coral, Temukus Roads, Bali, Dutch East Indies, October 25, 1931, collected by the "*Alva.*" One taken at Venus Point Reef, Tahiti, Society Islands, August 15, 1931, also by the "*Alva.*"



Actumnus obesus (Dana), × 3.3.

TECHNICAL DESCRIPTION: Carapace oval, moderately convex lengthwise also from side to side; greatest width not quite one and one-half times the length; frontal margin equal to two-fifths of the total width of carapace, moderately deflected, cut into four lobes, the inner or submedian pair of which are the wider and slightly in advance of the preorbital pair, from which they are separated by a rounded sulcus of greater depth than the shallow median notch. The orbit is rather large, elliptical, with the entire margin finely crenulated; two closed sinuses on the outer half of the upper margin and with the lower margin partially visible in a dorsal view. The anterolateral margin is much shorter than the postlateral margin, rounded and crenulate and bearing four minute spines which are not much larger than the adjacent granules. The postlateral margin is slightly concave and moderately convergent posteriorly; the posterior margin being nearly as wide as the frontal margin and straight. The regions are scarcely delineated, but the median sulcus between the frontal lobes is clearly defined and there are a pair of very low rounded lobes behind the frontal margin and between the orbits. On the epibranchial region, behind and following the curvature of the anterolateral margin and extending inward behind the orbit as far as the inner sinus, there is an elevated, arc-like, granulated ridge that defines the anterior border of a low flattish lobe, and behind this and more inward in position, there is a second similar low lobe and ridge, the outer end of which is about opposite the union of the antero- and posterolateral margins. Along the anterolateral margin and more abundantly along the inferior orbital margin each, there are a series of stiff, upstanding solitary setae. The male belt is narrow, seven-segmented, with a triangulate tip.

The chelipeds are very large in the male and definitely unequal, with the merus short, closely appressed to and not extending beyond the carapace; the carpus large, convex, and covered with 18 to 20 large, conical, procurved spines or rounded tubercles; the palm is high, the upper margin set with four or five large spines similar to those of the carpus; the outer face of the palm is swollen, very convex and entirely covered with these large rounded or conical tubercles, which for the greater part are set regularly in longitudinal series in about eight rows, with a very few tubercles between these; the size of the tubercles diminishes in the two or three rows nearest the lower margin. The fingers are brown (preserved specimen), short and decidedly deflected, meeting throughout their length, the tips pointed. The lower finger is especially stubby and has several blunt teeth; the larger, lower finger

also has a big basal molar; the upper finger is more curved and the teeth are vague. There is a row of rounded tubercles on the outer surface of the lower finger and the proximal half of the outer surface of the upper finger has three rows of rounded tubercles.

The ambulatories are quite slender, the series decreasing in length in the order 1, 2, 3, 4. Each has the merus, carpus and propodus laterally compressed, the propodus having a reinforced articulation with the dactyl; the dactyl is powerful, long, slender, tapered, with an acuminate horny tip.

The eyestalk is short and thick, with a calcareous covering and a rounded tonguelike process that extends upon the dorsal surface of the cornea and nearly conceals it; the cornea is large, nearly as long as the stalk, hemiovoid, set terminally with excellent visual range in all directions except dorsally.

The antennulae are large and fold transversely within the fossett.

The antennae have a not very large, squarish, basal article, the distal margin of which does not reach the orbital angle; the second and third peduncular articles are short, cylindrical and lie within the orbital sinus; the flagellum is slender and when extended is about two-thirds the length of the long diameter of the orbit.

The external maxillipeds are nearly square, a little wider than high, close-fitting; the exognath is rodlike; the ischium of the endognath is subrectangular with its proximal margin oblique; the inner lateral margins meeting. The merus is squarish, its distal margin nearly straight, its inner lateral margins slightly truncate at the base of the palp and visible, rounded below this, including the lower inner angle; the palp is short, three-jointed and very tapered.

References: *Actumnus obesus* Dana, U. S. Explor. Exped., vol. XIII, Crust., Pt. I, p. 244, 1852, Atlas, pl. 14, fig. 3a, 1852.—Rathbun, M. J., Rept. U. S. Comm. Fish and Fisheries for 1903, pt. 3, p. 865, issued 1906.—Nobili, G., Ann. Sci. Nat. 9 ser., Zool., t. IV, p. 285, 1906.—Rathbun, M. J., Trans. Linn. Soc. London, ser. 2, vol. 14, p. 232, 1911.

Subfamily: **Eriphiinae.**

Genus: **ERIPHIA** Latreille.

Eriphia scabricula Dana.

Plate 80.

Type: Dana's type material was collected by the United States Exploring Expedition, at several stations, as follows: The Andamans, the

Eriphia scabricula Dana, young adult male, × 1.

Laccadives, Ceylon, Samoa, Tahiti, Society Islands, Feejee Islands, Sooloo Sea; the depository is the Philadelphia Academy of Science and Smithsonian Institution.

DISTRIBUTION: Red Sea, Djibouti, (Nobili); Laccadives, Andamans, Ceylon, (Dana; Alcock); Reef, Minikoi, Addu Atoll, under stones and in coral stocks, (Borradaile); Ousima, Japan, (Stimpson); Amami-Oshima, (Ortmann); Sooloo Sea, (Dana); Amboina, (Rathbun); Savaii, (Pesta); Java Sea, (de Man); Bali, (Boone); Foquets, (Richters); Darros Island, (Miers); Rotuma; Funafuti, (Borradaile); Funafuti Atoll, (Whitelegge); Feejee Islands, Tahiti, Society Islands, Samoa, (Dana); Paumotu Islands, (Rathbun); Palmyra Island, Fanning Island, (Edmondson); Gilbert Islands, (Whitelegge); Liu Kiu Islands, (Balss); Seychelles: Salomon, Peros, Coin, Egmont, lagoon, Praslin Island, reef, (Rathbun); Mauritius, New Caledonia, (A. M. Edwards); Mozambique, (Hilgendorf); Madagascar, Natal, (Lenz and Richters); South Africa; Vetch's Pier, Durban, in stone, (Stebbing).

MATERIAL EXAMINED: One male, taken from coral at Temukus Roads, Bali, Dutch East Indies, October 24, 1931, by the "*Alva.*"

TECHNICAL DESCRIPTION: Carapace widest anteriorly, three-fourths as long as wide; the regions clearly defined. The frontal border is wide, equal to about two-thirds of the greatest width of the carapace, cut into two lobes with the frontal margin slightly rounded and set apart from the orbital angle by a distinct wide sulcus; the preorbital angle is deflected and touches upon the inferior orbital angle, completely closing the orbital hiatus. The superior orbital margin is elliptical with indications of two brief closed sinuses; the postlateral tooth is acute, spinelike and in addition to this there are four similar but successively smaller spines on the anterolateral border. The regions of the carapace are distinctly defined. The frontal region, also the hepatic and outer anterior branchial regions bear numerous coarse spinose granules and interspersed among these are many solitary stiff setae. Similar spinose granules are abundant. The sidewalls of the carapace and especially the region adjacent to the epistome also bear numerous coarse spinose granules. The male belt is triangular, seven-segmented.

The eye is large with a very flexible articulation of the stalk; the cornea terminal, set obliquely.

The antennulae are not very large and fold transversely within the thick margined fossett; the interantennulary septum is wide.

The antennae are rather rudimentary; with the basal peduncular article small, situated at the outer angle of the antennular fossett; the second and third articles very short; the flagellum multiarticulate, very slender; when extended, scarcely reaching to the base of the cornea.

The external maxillipeds are rectangular, close-fitting, the merus is moderately indented on the external surface and its inner distal angle obliquely truncated for the attachment of the stocky palp and the outer distal margin a little oblique. Just above the merus are the two rounded apertures of the excurrent channel, one in each outer angle of the epistome.

The chelipeds are distinctly unequal in the male; the merus not extending beyond the carapace with the upper inner lateral margin spinose; the carpus is rounded, coarse, granulose and beset with numerous solitary setae; these granules become spinose toward the distal end and there is a strong spine at the inner carpal angle. The palm of the larger chelipeds is dilated, with its height equal to two-thirds of its length; the outer and upper surface convex and covered with coarse, conical granules, which become abruptly smaller on the immediate lower margin and are present in less degree on the inner surface of the palm; there is one larger node at the upper proximal margin; the fingers are sharply deflected, black, faintly grooved, the upper finger of the larger cheliped with a coarse basal molar; the cutting edges of both fingers meeting; the tips are sharp. The smaller cheliped is like the larger except that it is little more than half so high.

The ambulatories are all slender, beset with solitary bristles; the merus, carpus and propodus are laterally compressed, subcylindrical, the dactyl is very slender, long, acuminate, longitudinally grooved and with two lines of short brown fur in addition to the longer bristles.

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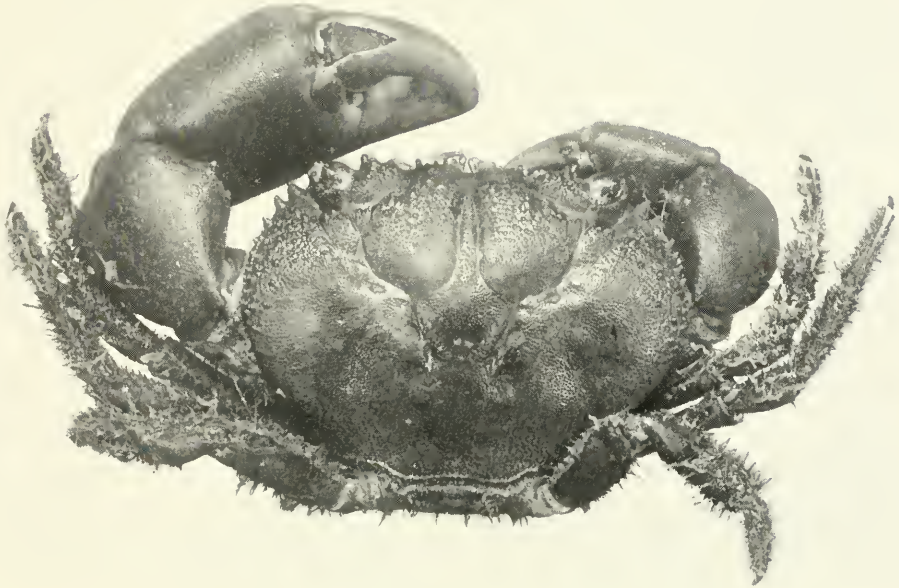

Eriphia sebana (Shaw), male, × 1.

Eriphia sebana (Shaw), male, × 1.

Eriphia sebana (Shaw), female, × 1.

Eriphia sebana (Shaw), ovigerous female, ×1.

Mem. Austral. Mus. vol. III, p. 137, 1897.—ALCOCK, Journ. Asiatic Soc. Bengal, vol. 67, pt. 2, p. 216, 1898.—BORRADAILE, Proc. Zool. Soc. Lond. 1900, pt. 2, p. 589; Fauna. and Geogr. Maldive and Laccadive Arch., vol. I, pt. III, p. 263, 1902.—DOFLEIN, Abh. Math-Phys. K. B. Akad. Wiss., Bd. 21, p. 359, 1902.—WHITELEGGE, Rec. Austral. Mus. vol. V, p. 9, 1903.—NOBILI, G., Ann. Sci. Nat. ser. 9, Zool., t. IV, p. 292, 1906.—RATHBUN, M. J., Mem. Mus. Comp. Zool. vol. 35, p. 57, 1907; Bull. Mus. Comp. Zool. vol. 52, p. 310, 1910; Trans. Linn. Soc. London, ser. 2, vol. 14, p. 233, 1911. —PESTA, O., Wien Denkschr. Akad. Wiss. Bd. 88, p. 49, 1911.—EDMONDSON, Bull. B. P. Bishop Mus., vol. V, p. 19, 1923.—BALSS, H., Archiv. fur Naturg. Bd. 90, Abt. A, Heft 5, p. 69, 1925.

Eriphia scabriculus STEBBING, T. H. H., Ann. S. Afric. Mus., vol. IV, pt. 4, p. 303, 1910; Ann. Durban Mus. vol. II, p. 53, 1917–1920.

Eriphia gonagra KRAUSS, Sudafric. Crust., p. 36, 1843.

Eriphia sebana (Shaw).

Plates 81, 82, 83 and 84.

TYPE: Shaw gives America as the type locality of his species and presents a good figure of the Indo-Pacific *Eriphia* which is far better known as *laevimana.* Dr. Henry Milne Edwards described *E. laevimana* from a specimen from Île-de-France, (Réunion Isle), accrediting the name *laevimana* to Latreille from his notes in the collection of the Paris Museum, where the type of *laevimana* is deposited.

DISTRIBUTION: Île-de-France or Mauritius, (H. M. Edwards; Latreille); Réunion, New Caledonia, Zanzibar, (A. M. Edwards); Natal; Zanzibar, (Henderson); Mauritius, Seychelles, Madagascar, (Miers); Mozambique; Mauritius, (Hilgendorf); Grand Port, Mauritius and Port Louis, (Bouvier); Foquets and Grand Bay, Mauritius, (Richters); Mauritius, (Ortmann); Seychelles, (Rathbun); Kaiser Wilhelm's Land, New Guinea; Samoa, (Ortmann); Moluccas, Amoy, Padang, Timor, Zulla-Bessy, Gebeh, Amboina, Noordwachter Island; Halmahera, Atjeh, (de Man); Funafuti Atoll, (Whitelegge); Funafuti and Rotuma, (Borradaile); Amboina, (Zehntner); Tonga Islands, (Hilgendorf); Paumotu Islands, Gilbert Islands, Tonga Islands, Caroline Islands, (Rathbun); Paumotu Archipelago, Society Islands, Feejee Islands and Samoan Islands, (Dana); Gatavake, Taraouroa, Tauere; Amboina; New Guinea, (Nobili); Palmyra and Fanning Islands, (Edmondson); Savaii, Samoa, Solomon Islands, Nicobars,

Sumatra, (Pesta); Port Darwin and Port Dennison, Australia, (Haswell); Moreton Bay, West Hill, Queensland, Duke of York Island, Admiralty Group; Darros Island; Glorioso Island, Tamatave; Fiji Islands; Samoan Islands; Malaysia; Bengal, India; Canton River, China, (Miers, citing B. M. coll.); Nicobars, (Heller); Trincomali, Ceylon, (Muller); Krusadai Islands, Gulf of Manaar, (Gravely); Cocos-Keeling Atoll, (Calman); Singapore, (Hilgendorf); Mahé, Maldives, (Pesta); Maldives, (Borradaile); Laccadvies, Ceylon, Arakan coast, India, Mergui Archipelago, Samoa, (Alcock); Pulo Sambu, Singapore, (Miers); Rameswaram, Tuticorin, Ceylon, New Guinea, (Henderson); Loo Choo Islands, Kikaisima, (Stimpson); Apia, Samoa, (Boone).

Material examined: Nine specimens, of assorted sizes, including both sexes, and egg-laden female, taken at Apia, Samoa, September 5, 1931.

Technical description: Carapace three-fourths as long as wide; frontal margin with a median notch on either side of which are three to four small, sharp denticles of uneven size; the rounded anterolateral margin has four small acute teeth, the orbital tooth being the largest of the series; the others decreasing in size posteriorly. There are numerous coarse granules along the frontal and anterolateral margin; some of these granules are spinulose. There are also a cluster of spinulose granules below the infero-orbital angle, also across the inferior margin of the antennal fossett and the margin of the buccal cavern above the merus. The dorsal surface of the carapace has the regions clearly delineated by well defined grooves. The posterior two-thirds of the carapace is smooth. The external maxillipeds are very setose, especially along the inner margin, and there are numerous tufts of coarse setae on the sternal plastron. The male belt is seven segmented with triangular tip. The female belt is broadly oval, seven segmented, with a very setose margin.

The chelipeds are conspicuously unequal in both sexes; with the upper and external surfaces smooth except for irregularly distributed coarse punctae; there is a single tooth at the inner carpal angle. There is a large basal molar followed by two smaller teeth on the upper claw, and a basal molar and one small tooth on the lower finger.

The ambulatories each have a well developed dactyl with a sharp corneous tip; the remainder of the dactyl is covered with approximately longitudinal series of coarse setae, which are also found along the propodus, carpus and along the lateral margins of the merus.

REFERENCES: *Cancer sebana* SHAW, in Shaw and Nodder, Nat. Misc. vol. XV, p. 591, 1803.

Eriphia laevimana GUÉRIN, Ménéville, Icon. Régne Anim. Crust. pl. 3, fig. 1.—H. MILNE EDWARDS, Hist. Nat. Crust. t. I, p. 427, 1834.—DANA, U. S. Explor. Exped. Vol. XIII, Crust., pt. 1, p. 249, pl. 14, figs. 7a–c, 1852.—STIMPSON, Proc. Acad. Nat. Sci. Phila. vol. 10, p. 37, 1858.—A. MILNE EDWARDS, in Maillard's L'ile Réunion, Annexe F, p. 5, 1862; Nouv. Archiv. Mus. Hist. Nat. t. IV, p. 71, 1868; *ibid.*, t. IX, p. 255, 1873.—HELLER, Reise Osterreich. Fregatte "*Novara,*" Zool. Crust., Bd. II, Abth. III, p. 24, 1868.—HILGENDORF, in von der Decken's Reisen Ost.-Afrik., Bd. III, Abth. I, p. 75, 1869; also in Monatsb. Kongl. Akad. Berlin, Bd. I, p. 797, 1878.—MIERS, Proc. Zool. Soc., p. 135, 1877; Ann. Mag. Nat. Hist. ser. 5, vol. V, p. 237, 1880; Zool. H. M. S. "*Alert,*" p. 517, p. 534, 1884; Rept. Voy. H. M. S. "*Challenger*" Zool., vol. 17, Brachyura, p. 162, 1886.—TOZZETTI, T., Magenta Crost. p. 60, pl. 5, fig. 1a–c, 1877.—NAUCK, E., Zeits. Wiss. Zool., Bd. 34, p. 58, 1880.—RICHTERS, in Mobius, Meeresfaun. Mauritius und Seychelles, p. 151, 1880.—HASWELL, Catal. Austral. Crust. p. 75, 1882.—MULLER, Verh. Ges. Basel, Bd. VIII, p. 475, 1886.—DE MAN, Journ. Linn. Soc. Zool., vol. 22, p. 68, 1887–1888; Archiv. fur Naturges., Bd. 53, I, p. 327, 1887; Zool. Jahrb. Syst. Bd. VIII, p. 555, 1894–1895.—HENDERSON, Trans. Linn. Soc. London Zool. ser. 2, vol. V, p. 367, 1893.—ORTMANN, Zool. Jahrb. Syst., Bd. VII, p. 480, 1893, 1894; also in Semon's Zool. Forschunger., (Jena Denk. Bd. VIII), Crust., p. 54, 1903.—ZEHNTNER, Rev. Suisse Zool., t. II, p. 161, 1894.—WHITELEGGE, Mem. Austral. Mus., vol. III, p. 137, 1897.—ALCOCK, Journ. Asiatic Soc. Bengal, vol. 67, pt. 2, p. 214, 1898.—BORRADAILE, Proc. Zool. Soc. London, 1900, pt. 2, p. 588; Faun. and Geogr. Laccadive and Maldive Arch., vol. I, pt. 3, p. 263, 1902.—NOBILI, G., Ann. Mus. Nat. Hungari, t. III, p. 490, 1905; Ann. Mus. Genova, ser. 2, vol. 20, p. 260, 1899–1901.—CALMAN, W. T., in Wood-Jones, Proc. Zool. Soc., 1909, pt. I, p. 159.—PESTA, O., Wien Denksch. Akad. Wiss., vol. 88, p. 49, 1911.—BOUVIER, Bull. Sci. France–Belg. vol. 48, p. 263, 1914–1920.

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Eriphia trapeziformis HESS, Archiv. fur Naturges., Bd. 31, I, p. 135, p. 171, 1865.

Eriphia sebana RATHBUN, Rept. U. S. Comm. Fish. for 1903, Bull. 23, pt. 3, p. 865, 1906.—RATHBUN, Mem. Mus. Comp. Zool. vol. 35, p. 57, 1907; Trans. Soc. London, Zool. ser. 2, vol. 14, p. 232, 1911.—EDMONDSON, Bull. B. P. Bishop Mus. vol. 5, p. 19, 1923.

Genus: **DOMECIA** Eydoux and Souleyet.

Domecia hispida Eydoux and Souleyet.

Plate 85.

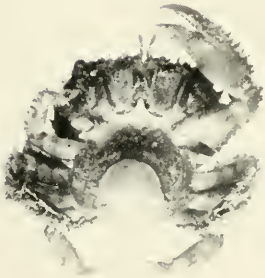
TYPE: The type was collected during the world cruise of the "*Bonite*" and is deposited in the Paris Museum.

DISTRIBUTION: Circumtropic in the Pacific, Indian and Atlantic Oceans. Red Sea: Senafir, Djeddah, Abu Somer-Hamfela, Koseir, Haleib, Jambo-Habban, Brother's Island, St. John's Island, Dahab, (Balss); Indian Archipelago, Noordwachter Island, Java (de Man); off Little Andaman Island, 10 fms., Great Coco Island, (Alcock); Maldives: This crab lives in branches of living coral, in the reefs at Goidu, Goifurfehendu Atoll and in Minikoi, (Borradaile); Liu Kiu Islands, (Balss); Hao Island, (Nobili); Mangareva Island, (Lucas); Tahiti, Society Islands, (Dana); Marquesas Islands, (Boone); Hawaiian Islands, (Eydoux and Souleyet; de Man); Hawaii: Honolulu, vicinity of Kauai, 18 to 41 fms., Penguin Bank, 27 to 29 fms., vicinity Laysan, 10 to 19 fms., (Rathbun); Palmyra Island, (Edmondson); rare at New Caledonia, (A. M. Edwards); Seychelles: Diego Garcia, Cargados Carajos, Amirante, Coetivy, (Rathbun); in the Atlantic from: Antilles, Florida Reefs, Cruz de la Padre, Cuba, Eastern Dry Docks, Guadeloupe, (A. M. Edwards; Desbonne and Schramm); Key West, Florida, (Kingsley).

MATERIAL EXAMINED: One ovigerous female, taken on coral at Anaho Bay, Nuka Hiva Island, Marquesas Islands, Pacific Ocean, August 10, 1931, by the "*Alva.*"

COLOR: The color of the carapace varies, being variously brownish, yellow clouded with brown, or deep maroon brown.

TECHNICAL DESCRIPTION: Carapace very broad oval, one and two-fifths times as wide as long, with the interorbital margin wide, slightly more than one-half of the maximum width of the carapace, armed with three pairs of teeth, each of which is multispinose. The innermost or submedian pair of teeth are the smallest and are separated from each other by a U-shaped sinus, each tooth has its distal margin cut into four sharp, conical spines, one of which is shorter and more



Domecia hispida Eydoux and Souleyet, × 1.5.

lateral than the others. The second pair of frontal teeth are separated by a U-shaped sinus from the inner pair of teeth and by another similar sinus from the outer, or preorbital pair of teeth. The second pair of teeth are wider than the submedian pair and each one is distally cut into eight sharp spinules, the inner six being quite small and clustered together, and two much stronger spinules on the outer side; the outermost, or preorbital tooth is about as wide as the second tooth and has its distal margin cut into three strong spinules, the innermost of which is the largest of the entire frontal series. The superior orbital angle is finely spinulose; the postorbital angle is a five-spined tooth and the inferior orbital margin has six rather coarse spines, the innermost two of which form the inferior inner orbital angle, and are partially visible in a dorsal view, lying below the superior inner orbital angle. The anterolateral margin is rounded and bears seven sharp procurved spines, besides the postorbital tooth, the first, third and fifth of these are much longer and occasionally bifid while the other four are quite small. The anterolateral and postlateral margins are confluent, the postlateral margins being convergent posteriorly. The posterior margin is short, only two-thirds as wide as the frontal margin. The dorsal surface of the carapace is flattish, very little convex, the regions not defined except for a lightly impressed urogastric sulcus. There are three or four small spinules in the transverse series across the mesogastric region. There are two spines in curved series on the epibranchial region in line with the second anterolateral spine and about the same size. Another solitary spine occurs on the mesobranchial region, in line with the four anterolateral teeth but much smaller than these. The entire dorsal surface of the carapace is furnished with numerous, rather regularly spaced, upstanding setae, set about a millimeter apart. The pterygostomian region is smooth except for the excurrent ridge. The upper margin of the buccal cavern is set with a series of eight clusters of spinules, each cluster consisting of two to six spinules. The female belt is oval, setae-fringed, seven-segmented. The egg-mass of the present specimen consists of approximately 800 to 1,000 small, spherical eggs.

The present specimen has only one full-size cheliped, the other being in process of regeneration. The cheliped has the merus short, trigonal, with the exposed upper distal end spinose; the carpus is rounded and covered with sharp procurved spines; the propodus is rather slender, laterally compressed with the outer surface moderately rounded, the lower half smooth, the upper half of the outer surface

and the upper surface covered with sharp procurved spines set in longitudinal series, those along the upper margin being the largest and crest-like. The fingers are slightly deflected with pointed tips, the cutting edges meeting, set with rudimentary denticles; the outer surfaces are brownish black. The upper finger is curved with a crest-like row of sharp spinules on its dorsal edge.

The ambulatories are moderate in size, quite shaggy, with long setae along the upper lateral margins and have a series of obliquely outward directed sharp spines along the upper lateral margin of the merus, carpus and propodus. The merus is expanded with its distal angles bluntly rounded; the carpus and propodus are stocky, subcylindrical, as is also the dactyl, which is short, tapered, setose on both upper and lower lateral margins and with the interior distal angle of the proximal margin produced in an angular thick process, extending upon the propodal margin to reinforce the strength of the joint. There are a series of horny spines along the inferior lateral margin among the setae. The tip of the dactyl is a curved strong claw and above it in triangulation arrangement are three horny spines on the distal upper lateral margin.

The eye is rather large, with a fleshy stalk and hemispherical cornea, set terminally and having a good range of vision in all directions.

The antennulae fold transversely in the small, rather open fossett beneath the frontal border. The interantennulary septum is short; the basal peduncular article of the antennulae has a sharp brown calcareous spine on its outer lateral margin, the remainder of the exposed surface being soft and light cream color; the second article is also light and flesh colored; the flagellum is multiannulate, short, with a thick brush of setae on its upper lateral margin.

The antennae have the basal peduncular article set obliquely between the frontal margin and epistome forming the outer border of the antennulary fossett and having the distal external angle produced into a large lanceolate-acuminate process that lies within the orbital sinus and fills it; the second and third peduncular articles are reduced, cylindrical, and the slender flagellum consists of about ten articles and is no longer than the antennulae.

The external maxillipeds are rectangular, much wider than long, the exognath long and narrow, its outer lateral margin being rounded and tapered distally. The endognath has the ischium somewhat sub-

rectangular but with the proximal margin and inferior inner lateral angle much rounded and separated by the projected triangular apex of the sternal plastron, the inner and outer lateral margins are slightly divergent distally; the distal margin is slightly oblique and beset with seven or eight conical brown spines, the inner distal angle a blunted brown-tipped triangular tooth; the merus is small, much wider than long but not so wide as the ischium; the proximal meral margin is curved convex, fitting into the concavity of the ischial margin; the inner meral margin, which is short, is also rounded; the distal margin forms a wide angle, the outer two-fifths being obliquely narrowed toward the outer angle, while the inner two-fifths is obliquely narrowed in the opposite direction and has a single sharp spinule at its inner distal angle; the surface of the merus is bent and is ornamented with a transverse series of seven or eight sharp brown spines and a few coarse granules; the palp is small and stocky; the basal article has one large and a smaller spinule on its outer lateral margin; the distal article is conical and bears a heavy brush of long setae.

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?*Neleus acanthophous* Desbonne and Schramm, Crust. Guadeloupe, p. 35, 1867.

? *Eupilumnus websteri* Kingsley, Proc. Acad. Nat. Sci. Phila., vol. 31, p. 397, pl. 14, fig. 3, 1879.

Genus: **TRAPEZIA** Latreille.

Trapezia rufopunctata (Herbst).

Plate 86.

TYPE: The type locality of this species was unknown to Herbst; the type is deposited in the Berlin Museum.

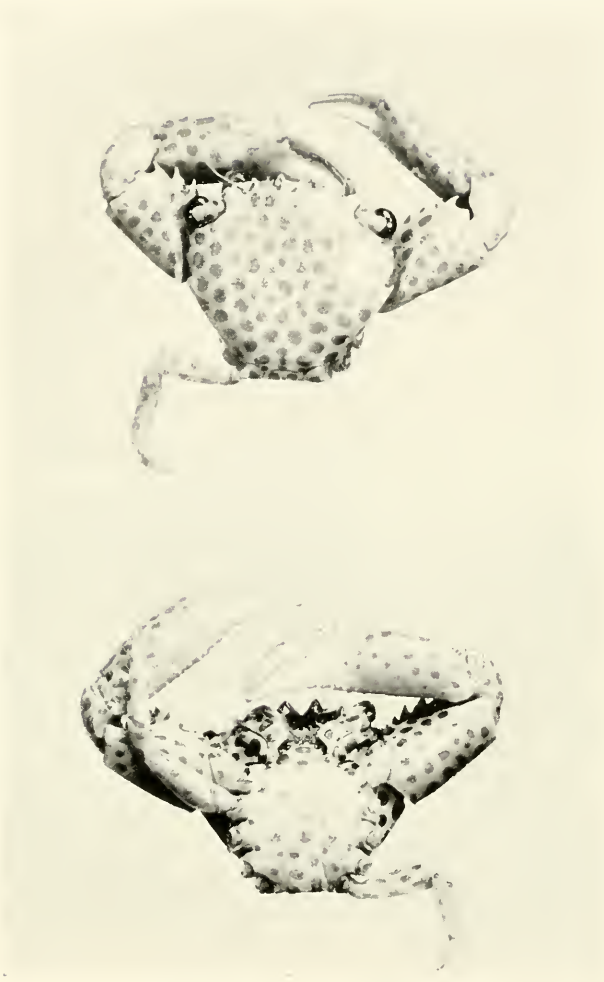
DISTRIBUTION: Red Sea (Heller); Djeddah, Red Sea, (Lucas; de Man); Dar-es-Salaam, Ras Ndege, (Ortmann); Andamans, Nicobars and Ceylon, (Alcock); Tuticorin, Ceylon, (Henderson); Jokkenpiddi Paar, Gulf of Manaar, (Laurie); Maldives: Malé, Fadifolu, atolls, 19 fms., South Nilander, lagoon, (Borradaile); Edam Island and Riffs, Java, Malay Archipelago, (de Man); Amboina, (Ortmann; Zehntner); Marquesas Islands, (de Man; Lucas; Gerstaecker); Raiatea Island, Society Islands, (Boone); Paumotu, reefs, Ellice Islands, (Rathbun); Hawaii, (A. M. Edwards; Rathbun); Palmyra Island, (Edmondson); Upolo, Samoa, (Ortmann); Secora Isle, off the west coast of tropical America, (A. M. Edwards); Africa: coast of Zanzibar, (Lucas; A. M. Edwards); East and South Africa, (Gerstaecker); Madagascar, New Caledonia, (A. M. Edwards); Grand Port, Mauritius, (Bouvier); Egmont, lagoon, Seychelles, (Rathbun).

MATERIAL EXAMINED: One large male, taken in coral, at Teviatoa Reef, Raiatea Island, Society Islands, south Pacific Ocean, August 21, 1931.

COLOR: The ground color of this species is creamy-yellowish, everywhere abundantly covered with large, roundish crimson spots.

TECHNICAL DESCRIPTION: This species differs from *T. cymodoce* in the following characters: *T. rufopunctata* has the carapace of about the same proportions, but the interorbital margin is distinctly more prominent, with the inner, or submedian pair of teeth each a long triangle with the separating incisions more angular, the outer pair of frontal teeth very triangular, with their apices extending as far forward as do the median teeth; the preorbital angle also has its inner border definitely oblique, a slight subdistal angulation; the outer border of the preorbital tooth is rounded. The inferior inner orbital tooth is very acute and long. The postorbital tooth is very acute with a distinct outward flare.

In the present specimen the epibranchial spine on the right side is acute, as in *cymodoce,* but on the left side is blunted as in *ferruginea,* the variation in the one specimen showing the unimportance of this character as a specific valuation.



Trapezia rufopunctata (Herbst), × 1.5.

The carpus of the chelipeds is convex with a strong acuminate tooth at its inner angle than occurs in *cymodoce,* and the palm is more nearly cylindrical with the upper surface and the lower surface somewhat compressed and serrulate with rough bluntish granules.

The regions of the dactyl adjacent to the tips are furnished with six to ten strong horny spines, much more so than in any of the extensive series of *cymodoce* and *ferruginea* examined by the present writer, but unfortunately only one specimen of *rufopunctata* is available.

The color pattern of conspicuous round reddish spots on a creamy yellow background is different from that of all the other species except *maculata.*

REFERENCES: *Cancer rufopunctata* HERBST, Naturg. Krabben u. Krebse, vol. III, pt. I, p. 54, pl. 47, fig. 6, 1799.

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Trapezia acutifrons A. MILNE EDWARDS, Ann. Soc. Entom. France, ser. 4, vol. 7, p. 281, 1867.

Grapsillus rufopunctatus RATHBUN, M. J., Rept. U. S. Fish Com. for 1903, Bull. 23, pt. 3, p. 866, 1906.

Trapezia cymodoce (Herbst).

Plate 87.

TYPE: Herbst's type came from the East Indies and is deposited in the Berlin Museum.

DISTRIBUTION: East Indies, (Herbst); low tide to 22 fms., all over the IndoPacific region, (Ortmann); Australasia, (Latreille); Gulf of Siam: Koh Kahdat, coral, (Rathbun); Philippine Islands, Ceylon, (Miers); Andamans, Nicobars, Mergui Archipelago, Palk Straits, Mékran (Baluchistian) coast, (Alcock); Bombay (Nobili); Muttuvaratu Paar, Jokkenpiddi Paar, coral reef, Galle, Pearl Banks, Gulf of Manaar, (Laurie); Krusadai Island, Gulf of Manaar, (Gravely); Maldives: On reefs and in lagoons, down to 35 fms., in Malé, Goifurfehendu, Fadifolu, South Nilander, Suvadiva, Felidu Atolls, (Borradaile); Mergui Archipelago: Elphinstone and King Islands; Amboina, Manipa, and Xulla-Bessy in the Indian Seas, (de Man); Beagle Bay, Amboina, (Nobili); Murray Island, channels between reefs, 15 to 20 fms., Torres Straits, (Calman); Rotuma and Funafuti, (Borradaile); Feejee Islands, (Miers); Nuka Hiva Island, Marquesas Islands, (Lucas); Palmyra Island, (Edmondson); Hawaiian Islands, (Rathbun); Ingram Reef, Queensland, (Boone); New Caledonia, (A. M. Edwards); Mauritius: Grand Port, Chaland, Port Louis, (Bouvier); Seychelles: Salomon, Peros, Coin, Egmont, Diego Garcia, Cargados Carajos, 30 fms., Saya de Malha, 26 fms., Amirante, 29 to 80 fms., Praslin, reef, Coetivy, (Rathbun); East Africa: Zanzibar, Kokotoni, Bawi, Aldabra, Mozambique, (Lenz). It is also abundant in the Red Sea having been recorded there repeatedly. Red Sea, (de Man, Nobili, Gulf of Akaba, Daedalus, Red Sea, Gulf of Suez, (Miers); Egypt, (Savigny); numerous stations in the Sudanese Red Sea, (Laurie); Red Sea: Senafir, Abu Somer, Daedalus Riff, Berenice, Jambo, Mersa Haleib, Djeddah, Sarso, Massaua, Djebel, Zuckur, Perim, Nauiba, St. John Island, Mersa Scheikh, Ravaya, Dahab, Habban, (Balss); eastward in the Persian Gulf, (Nobili); thence through the Indian Seas and northward as far as the Liu-Kiu Islands, (Balss).

MATERIAL EXAMINED: Three males and four ovigerous females taken in Ingram Island, Reef, Queensland, Australia, Oct. 12, 1931.

Trapezia cymodoce (Herbst), × 1.3.

Color: Vivid orange red, with the tips of the chelipeds usually blackish brown.

Technical description: Carapace lenticular, approaching the quadrilateral, moderately convex in the males, the surface smooth, shining, with no definition of the regions. The interorbital region is equal to over half the greatest width of the carapace; the frontal margin projects in advance of the preorbital angle and is cut into a pair of submedian, small, triangular teeth, separated from each other by a triangular sinus, subequal to one of the teeth, and from the outer pair of teeth by a wider, uneven sulcus; this outer pair of teeth are each about twice as wide basally as each submedian tooth and are blunted distally with the margin finely denticulate or in some specimens smooth, not quite as far advanced as the inner pair of teeth; the outer angle nearly right-angled, separated by a wide, V-shaped incision from the blunted, or sometimes rounded, dentiform, preorbital tooth. The orbital margin is smooth, unbroken; the postorbital angle acute; the inferior orbital margin is also smooth and terminates in an acute, conical spine at the inner angle. The lateral margins of the carapace are convex, with an acute spine or tooth at the union of the anterior and postlateral areas, and convergent posteriorly. The posterior margin is short, slightly sinuate. The pterygostomian region is smooth.

The chelipeds are subequal in young males and females, moderately unequal in large males; about two and one-half times as long as the carapace in females and two and three-fourths to three times as long as the carapace in the large males. The ischium is strong; the merus trigonal, with an acute tooth at the inferior anterior distal angle, and the upper surface foliaceous with a laminate, rounded elbow proximally at the upper posterior margin; the anterior lateral margin serrate with five, sometimes six teeth, the distal margin with one triangulate tooth in addition to the distal marginal tooth; the carpus is rounded and bears one tooth at the inner angle; the palm is three-fourths as high as long, very compressed, with the outer surface slightly convex; the upper half with abundant, thick, short setae, the lower margin cristate. The lower finger is triangular with curved tip, about one-half as long as the palm, with rudimentary dentition; the upper finger is very curved, fitting closely upon the lower finger, also has rudimentary dentition; the curved tips of the two fingers cross.

The ambulatories are slender, decreasing in length in the order 1, 2, 3, 4, each having the propodal-dactylar joint reinforced by a rounded process, projecting from the posterior side of the distal margin of the

propodus and interfitting with a node on the posterior side of the dactyl; the dactyl is stocky, quite setigerous, especially on the under side; the distal end of the dactyl is curved and is fluted or bevelled, on the outer side into four to six rounded ridges in pairs of unequal length, these being blunted distally, thus giving the tip a series of denticle-like rasps. These rasps are much stronger on the fourth pair of legs.

The eyes are large, set on a short calcareous stalk that projects only a very small rounded process on the dorsal surface of the cornea; the cornea is large, hemispherical, set obliquely dorso-terminal, with good visual range in all directions.

The antennulae are slender and fold transversely within the fossett which is divided into two well separated chambers by a strong median process.

The antennae have the peduncular articles small, fitted in between the outer side of the antennular fossett and the inner side of the inferior orbital angle; but not extending in the orbital sinus, which is closed by the meeting of the upper and inferior orbital angles; the flagellum is very fine, about equal in length to the long diameter of the orbit.

The external maxilliped is about one and one-half times as wide as long, subrectangular. The exognath extends to the distal angle of the endognath and is not quite half as wide as long; the ischium of the endognath is two-thirds as wide as long, with the inner margin rounded; the merus is squarish, but has the inner distal angle truncate and the remainder of the distal margin a little oblique; the three-jointed palp is very thick and has numerous brushes of long setae.

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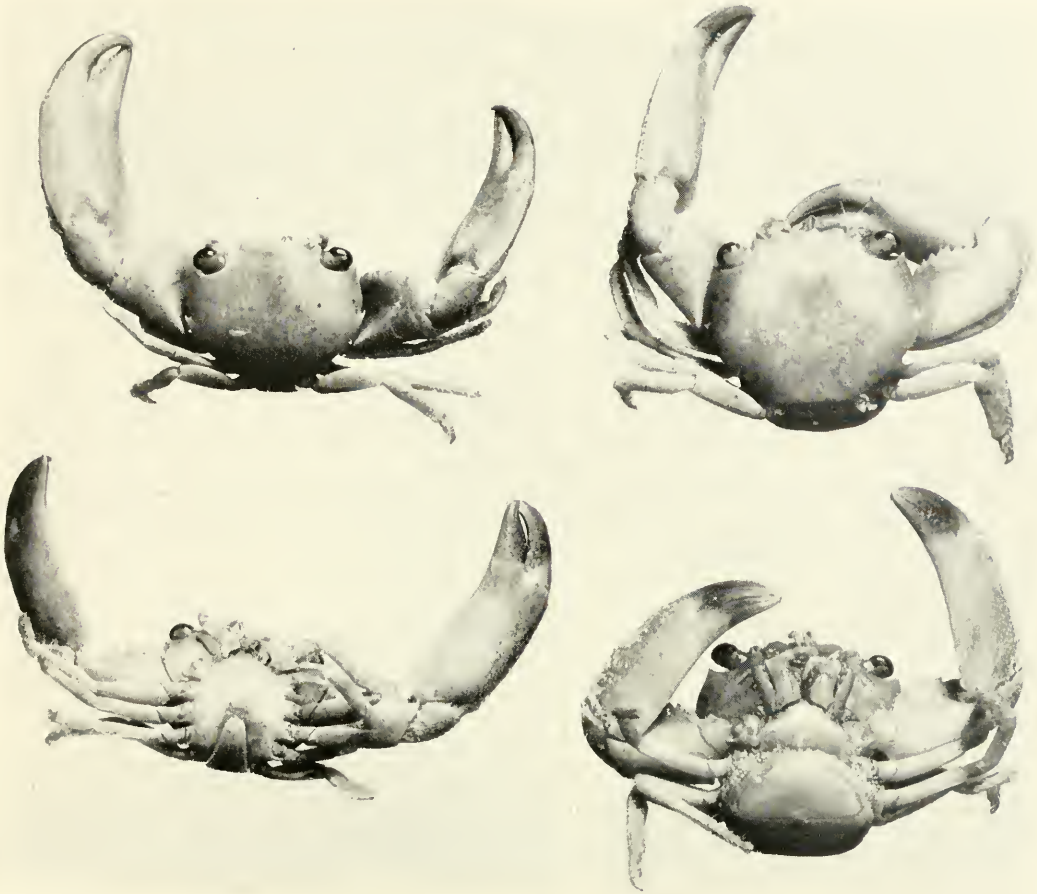

Trapezia ferruginea Latreille, upper and lower left figures, male; upper and lower right figures, female with eggs, × 1.5.

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Trapezia caerulea Heller, Sitzb. Akad Wien, vol. 53, p. 348, 1861.

Trapezia dentata A. Milne Edwards, Nouv. Archiv. Mus. Hist. Nat. t. IX, p. 261, 1873.

Trapezia ferruginea Latreille.

Plate 88.

Type: This was collected in the Red Sea and is deposited in the Paris Museum.

Distribution: Red Sea, (Latreille, H. M. Edwards, Heller, Gerstaecker, Nobili, Pesta); Gulf of Akaba, northernmost extremity of the Red Sea, (Miers); Gulf of Suez, (Miers); Djeddah, Red Sea, (de Man); Ras el Millan, Tor, Senafir, Brother's Island, Koseir, Daedalus-Riff, Berenice, Habban, Jambo, Mersa Haleib, Djeddah, Lidth, Massaua Nairibi, St. John Island, Sherm Sheikh, Habban, No Man's Land, Dahab, Red Sea, (Balss); Persian Gulf, station 7, (Nobili); Ceylon, (Miers, Alcock); Andamans, Nicobars, (Alcock); Maldives: on reefs and lagoons, down to 35 fms., in Goifurfehendu, Malé, Fadifolu, Addu, Minikoi, S. Nilander, Suvadiva and South Male Atolls, (Borradaile); Nicobars, (Pesta); New Guinea, Seleo, (Nobili); Funafuti and Rotuma, (Borradaile); Marquesas Islands, coasts of Nuka Hiva Island, (Lucas; Boone); Paumotus and Society Islands, (Rathbun); Society Islands, (Boone); Tres Marias Islands, (Pesta); Tahiti, (Dana);

Sandwich Islands, (Dana, Randall, Rathbun); Palmyra Island, (Edmondson); Upolu, Samoa, (Pesta); Darwin Bay, Galapagos Archipelago, (Boone); Acapulco, Mexico, (Faxon); Pearl Islands, Bay of Panama, (S. I. Smith; Faxon; A. M. Edwards; Boone); Peru, (Rathbun); Colon, Panama, (Finnegan); Oceania, (A. M. Edwards); Reefs at Grand Port, reefs at Chaland and Port Louis, Mauritius, (Bouvier); Seychelles Islands, 4 to 12 fms., (Miers); Praslin, Salomon and Egmont, Seychelles, Coetivy, (Rathbun); New Caledonia, (A. M. Edwards; de Man); Zanzibar, (Hilgendorf); South Africa, (Stebbing); Cape of Good Hope, (Macleay).

Material examined: Two ovigerous and one young female and one male taken in coral at Teviatoa Reef, Raiatea Island, Society Islands, August 21, 1931. Two males, four females (one ovigerous), taken on Venus Point Reef, Tahiti, Society Islands, August 15, 1931. One small female, Muller's Reef, Bora Bora Island, Society Islands, August 24, 1931. One male, one large ovigerous female, from coral at Anaho Bay, Nuka Hiva Island, Marquesas Islands, August 10, 1931. One male, from coral at Temukus Roads, Dutch East Indies, October 25, 1931. Two specimens from Temukus Roads, Bali, Oct. 25, 1931.

Color: The living crab has a highly polished shining surface of bright orange red, with brownish black eyes and wood brown fingers.

Diagnostic characters: The very slight and not absolutely constant small characters that differentiate this subspecies from *T. cymodoce* are:

(a) The frontal emargination is less prominent and the four frontal and two preorbital teeth are much shallower as are their separating incisions. The tooth at the inferior inner orbital angle is frequently, but not always less acuminate and less conspicuous.

(b) The postorbital angle and the epibranchial spine are usually much less acuminate in adults. However some large adults possessing the shallow frontal margin typical of *ferruginea* also have the very acuminate postorbital spine and epibranchial spines typical of *cymodoce*.

Is it not quite probable that such variation in the degree of spine is due to ecdysis or to the age of the carapace? It is well known, that in species studied, the old blunt spines or nodules of a discarded carapace are nearly always replaced by acuminate spines in the new carapace. Then too the health of the individual crab and food supply and environment are important factors.

(c) The third difference is to be found in the chelipeds and is apparently more constant. The palm of *ferruginea* is more rounded, not approaching a carina on the upper surface and the entire upper and outer surface is smooth, polished and entirely devoid of setae.

For full description of *T. ferruginea,* refer to p. 240, "Galapagos Brachyura" (Boone).

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Grapsillus subinteger MACLEAY, in Smith's Illus. Zool. South Africa, Annulosa, p. 67, vol. V, 1838.

Trapezium cymodoce RANDALL, Journ. Acad. Nat. Sci. Phila., vol. VIII, p. 117, 1839.

Trapezia cymodoce DANA, U. S. Explor. Exped. vol. XIII, Crust., pt. I, p. 257, pl. 15, fig. 2, 1852.—SMITH, S. I., Proc. Boston Soc. Nat. Hist., vol. 12, p. 287, 1869.—A. MILNE EDWARDS, Nouv. Archiv. Mus. Hist. Nat. Paris, t. IX, p. 260, 1873.—HILGENDORF, in von der Decken's Reise. Ost-Afrika, vol. 3, p. 76, tab. 2, figs. 4 and 5,

1869.—LOCKINGTON, Proc. Calif. Acad. Sci., vol. VII, p. 105, 1876. —A. MILNE EDWARDS, Miss. Sci. Méx. t. V, p. 342, 1880.—FAXON, Mem. Mus. Comp. Zool., vol. 18, p. 22, 1876.

Trapezia miniata LUCAS, in Jacquinot's Voy. au Pole Sud et L'Océanie, "*Astrolabe*" et "*Zélée,*" Zool. III, Crust., p. 43, pl. 4, fig. 10, 1855.

Trapezia subdentata GERSTAECKER, Archiv. fur Naturges. Jahr. XXII, Bd. I, p. 127, pl. 4, fig. 10, 1856.

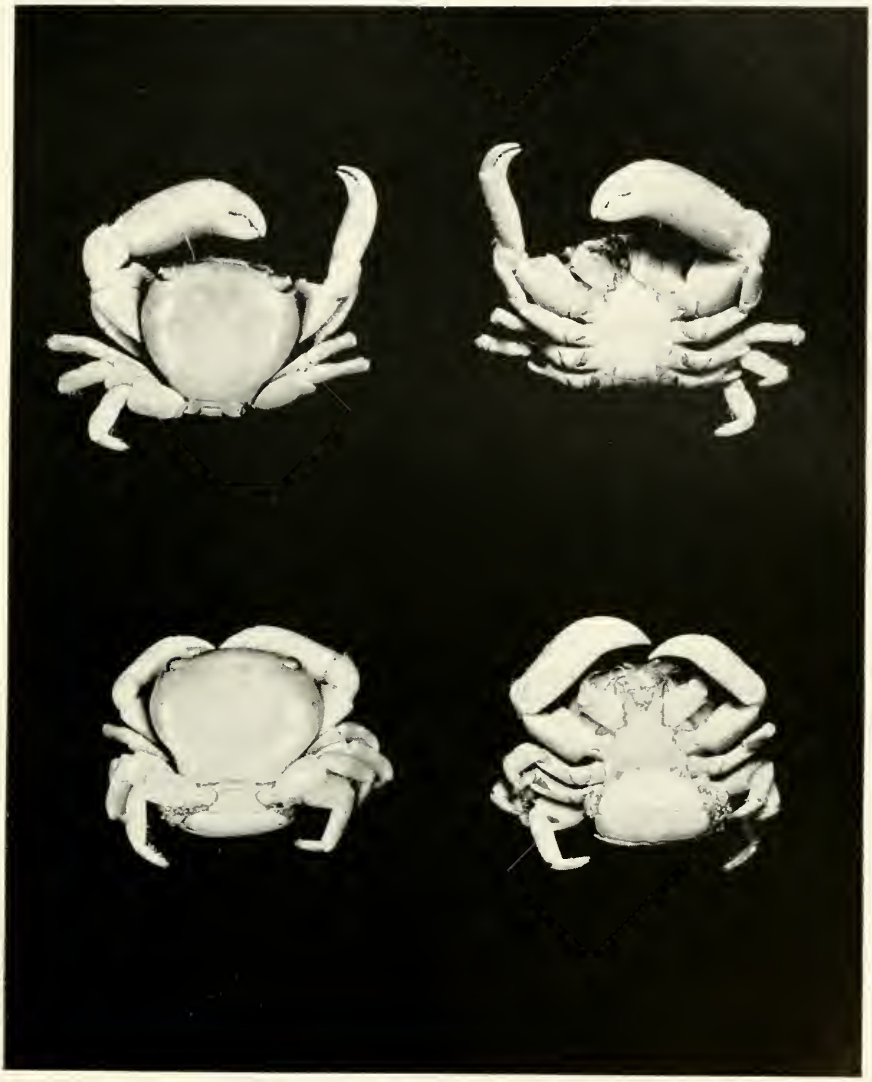
Genus: **TETRALIA** Dana.

Tetralia glaberrima (Herbst).

Plate 89.

TYPE: Herbst states that his type locality was unknown to him; the type is deposited in the Berlin Museum.

DISTRIBUTION: Red Sea, (Kossman); near the Djeddah Harbor, Red Sea, (de Man); Red Sea: Gulf of Suez, Daedalus Shoal, (Miers); Red Sea, (Nobili; Heller); Sudanese Red Sea, stations 3, 5 and 7, (Laurie); Red Sea: Senafir, Tor, Abu Somer, Koseir, Berenice, Mersa Haleib, Jambo, Djeddah, Kunfuda, Mersa Scheikh, Ravaya, Dahab, Habban, Sherm Sheikh, St. John's Island, (Balss); station 53, Persian Gulf, (Nobili); Dar-es-Salaam, Upanga Riff, (Ortmann); Andamans, Mergui Archipelago, Ceylon, (Alcock); Tuticorin, Muttuwartu Paar, Rameswaram, (Henderson); Mékran coast, Asia, Maldives, (Alcock); Galle, pearl banks, Navakaddu Paar, Muttuvaratu Paar, off Mutwal Island, Gulf of Manaar, (Laurie); Maldives: on reefs and in lagoons, down to 35 fms., Goifurfehendu, Fadifolu, Malé, Melidu, Minikoi, Atolls, (Borradaile); Marutea Island, (Nobili); Hong Kong and Ousima Island, Japan, (Stimpson); Amami-Oshima, Japan, Liu Kiu Islands, (Ortmann); Mace Island, China Sea, (Pocock); Hong Kong, (Gee); Liu Kiu Islands, (Balss); Gulf of Siam, (Calman; Rathbun); Malay Archipelago, Java: Edam Island and Noordwachter Island, (de Man); Amboina, Malay Archipelago, (Zehntner); Mascarenes, (Henderson); Bali, Dutch East Indies, (Boone); Paumotus, Honden Island, reefs of Tahiti, also of Tongatabu, Carlshoff Island, (Dana); Tahiti, (Heller); Nuka Hiva, Marquesas Islands, (Lucas); Feejee Islands, Ovalau Totoya, (Miers); Raiatea Island, Society Islands, (Boone); reef, Wyer, Torres Straits, (Calman); Funafuti and Rotuma, (Borradaile); Funafuti Atoll, (Whitelegge); Ingram Reef, Queensland, (Boone); rare at New Caledonia, (A. M. Edwards); Sey-



Tetralia glaberrima (Herbst), upper figures, male; lower figures, female; × 1.5.

chelles, Etiole Island, 13 fms., Rodriguez Island, (Miers); Seychelles: Salomon, Carjados Carajos, 28 fms., Saya de Malha, 26 fms. to 29 fms., Coetivy, (Rathbun); Nosse Be, Madagascar, (Lenz and Richters); Mozambique, (Stebbing); Natal, (Krauss); Natal coast, (Stebbing); Zanzibar, (Pfeffer).

Material examined: One male, Temukus Roads, Bali, Dutch East Indies, October 25, 1931. One female, with the one side of the carapace much more convex than the other side, Temukus Roads, Bali, Dutch East Indies, Oct. 25, 1931. Five males and four ovigerous females, taken in coral at Teviatoa Reef, Raiatea Islands, Society Islands, August 21, 1931. One ovigerous female, Teviatoa Reef, Society Islands, August 21, 1931. (Broken specimen.) Eleven males and ten ovigerous females, taken on Venus Point Reef, Tahiti, Society Islands, August 15, 1931. Three ovigerous females and three males, Ingram Reef, Queensland, Australia, October 12, 1931.

Color: "Carapace chestnut brown, excepting sometimes a border along the front and behind the eyes, which is often pale green, white or greyish white. Legs brown, also pale yellow, approaching pale flesh red, with the front margin sometimes brown." (Dana).

Technical description: Carapace lenticular, smooth, shiny, slightly convex, very rarely with sparse fine pubescence near the frontal and lateral borders; with the regions not at all defined; length equal to about five-sixths of the maximum width. The frontal margin is wide, equal to about three-fifths of the maximum width of the carapace, very slightly bowed, microscopically dentate with fine, brown saw-teeth, and in the majority of the specimens before me, is usually set apart by a slightly shallow emargination from the equally denticulate preorbital angle. The orbital margin is smooth, unbroken, the postorbital angle obtuse; the lateral margins are widely convex; the anterolateral and postlateral margins confluent without any indication of separation; no lateral spine present; the posterior margin is a trifle concave, almost straight; the pterygostomian region is smooth. The female belt is seven-segmented, widely oval, subcircular, the seventh segment being the largest of the series, and widely rounded on the distal margin. The brood pouch is capacious, a specimen of average size carrying two to three hundred eggs. The male belt is narrow, seven segmented, triangular, with the tip broadly rounded.

Chelipeds distinctly unequal in both sexes, the right one being much the larger; the merus is short, compressed, with the inner distal margin finely serrate; the carpus is rounded, smooth; the propodus is two

and one-half times as long as the merus, with the fingers comprising a little over one-third of this length; the outer surface of the palm is smooth, convex. The fingers of both claws are slender, both very much deflected, forming a decided curve. The cutting edges meet throughout their length and are furnished with a few shallow teeth, the finger tips are pointed.

The ambulatories are rather short, and very strong, successively decreasing in length in the order 1, 2, 3, 4. Each has the merus short and expanded, two-thirds as wide as long with the outer inferior distal margin forming a rounded laminate process; the carpus is short, produced to a curved, strong, acuminate process at its outer distal angle, strengthening the joint with propodus; the latter is about one and one-half times as long as the carpus of the same width, compressed cylindrical, with the lateral margins finely setose; the dactyl is stocky, almost as long as the related propodus, slightly tapered, with the lateral margins setose and a strong blunt horny tip, that is divided into four teeth or claws of graduated lengths, and lying side by side across the end of the dactyl; in addition to these there are a series of five or six horny, small spinules along both the lower and upper lateral margins of the dactyl.

The eye is set upon a short, stout stalk that has a rounded process projecting on the dorsal surface of the cornea; the cornea is large, black, hemiovoid, set obliquely, with an excellent visual range in all directions.

The antennulae are large and fold transversely within the rather open fossett which lies beneath the frontal margin and is divided by a median septum.

The antennae have the basal peduncular article small and bulbous and situated outside the orbital sinus at the distal end of the antennulary fossett; the second and third peduncular articles are small, the flagellum is very slender and when extended is a little longer than the long diameter of the orbit.

The external maxilliped has the exognath narrow, rodlike, tapered distally; the ischium of the endognath is nearly twice as long on the outer margin as wide on the slightly bowed outer margin; the proximal margin is obliquely truncated with the inner angle rounded; the inner lateral margin is subparallel to the outer; the distal margin is not quite straight, slightly excavate; the merus is scarcely wider than long, with its inner and outer lateral margins convex and its distal margin also rounded and slightly truncated at the base of the palp, which is composed of three, stocky, tapered articles.

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Trapezia integra Latreille, Encycl. Meth., vol. X, p. 696.

Trapezia glaberrima Krauss, Sudafrik. Crust., p. 35, 1843.

Tetralia glaberrima Dana, U. S. Explor. Exped., vol. XIII, pt. 1, Crust., p. 263, pl. 16, fig. 3, 1852.—Stimpson, Proc. Acad. Nat. Sci. Phila., vol. 10, p. 38, 1858.—A. Milne Edwards, Nouv. Archiv. du Mus. Hist. Nat. Paris, vol. IX, p. 262, 1873.—Kossman, Reise Roth Meer. Crust., p. 46, 1877.—Lenz and Richters, Abh. Senck. Ges., vol. XII, p. 422, 1881.—de Man, Archiv. fur Naturges., vol. 53, pt. 1, p. 321, 1887.—Henderson, J. R., Trans. Linn. Soc. London, Zool., ser. 2, vol. V, p. 366, 1893.—Ortmann, Zool. Jahrb. Syst., vol. VII, p. 485, 1893–94; *ibid.*, vol. IX, p. 209, 1897; in Semon's Zool. Forschungsr. in Australien und Malay (Jena Denk. VIII), Crust., Bd. V, Heft 1, Abhth. 4, p. 55, 1894–1903.—Zehntner, Rev. Suisse Zool., II, p. 157, 1894.—Alcock, Journ. Asiatic Soc. Bengal, vol. 67, p. 223, 1898.—Calman, W. T., Trans. Linn. Soc. London, Zool., vol. 8, p. 20, 1900–1903.—Borradaile, Proc. Zool. Soc. 1900, pt. 2, p. 591; Fauna and Geogr. Laccadive and Maldive Arch., vol. I, pt. III, p. 265, 1902.—Nobili, G., Ann. Sci. Nat., 9 ser. Zool., t. IV, p. 294, 1906; Bull. Sci. France-Belg., t. 40, p. 143, 1906; Torino Mem. Acad. Sci., ser. 2, vol. 57, p. 404, 1907.—Laurie, R. D., Rept. Ceylon Pearl Oysters Fish., vol. V, p. 411, 1906; Journ. Linn. Soc. London, Zool., vol. 31, p. 463, 1907–1915.—Stebbing, Ann. S. Afric. Mus., vol. VI, pt. 4, p. 305, 1910. —Rathbun, K. Danske Vid. Selsk. Skh., 7th raekke, Bd. 5, p. 359, 1910; Trans. Linn. Soc. London, ser. 2, vol. 14, p. 235, 1911.—Stebbing, Ann. S. Afric. Mus., vol. 19, p. 235, 1923–1925.—Gee, N. G., Lingnaam Agric. Review, Canton, vol. III, p. 164, 1925–1926.—Balss, H., Archiv. fur Naturg., Bd. 90, Abt. A, heft 5, p. 70, 1924.—Calman, W. T., Trans. Zool. Soc. London, vol. 22, p. 24, 1926–1929.

Tetralia nigrifrons Dana, Proc. Acad. Nat. Sci. Phila., vol. 6, p. 83, 1852; U. S. Explor. Exped., XIII, Crust., pt. 1, p. 262, pl. 18, figs. 2a–d, 1852.—A. Milne Edwards, Nouv. Archiv. Mus. Hist. Nat., vol. IX, p. 262, 1873.—Hilgendorf, Monatsbericht. K. Wiss. Akad. Berlin, p. 798, 1878.

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Tetralia laevissima STIMPSON, Proc. Acad. Nat. Phila., vol. X, p. 38, 1858.

Tetralia cavimana HELLER, Verh. K. K. Zool. Zool.-Bot. Gessellsch. Wien, XI, p. 14, 1861.—Sitz-Ber. Mat.-Natur. K. Wiss. Wien, vol. 43, p. 353, pl. 3, fig. 24, 1861.—Reise Osterreich. Fregatte "*Novara*" Zool., Crust., Bd. II, Abhthl. III, p. 268, 1868.—MIERS, Phil. Trans. London, vol. 168, p. 488, 1879.—Zool. H. M. S. "*Alert*," pp. 518, 537, 1884, B. M. Publ.—DE MAN, Notes Leyden Mus., vol. II, p. 180, 1880.—POCOCK, R. I., Ann. Mag. Nat. Hist., ser. 6, vol. 5, p. 73, 1890.—WHITELEGGE, Mem. Austral. Mus., vol. III, p. 138, 1890.

Tetralia heterodactyla HELLER, Abh. Zool. Bot. Ges. Wien, vol. XI, p. 14, 1861; Sitzb. Mat. Natur. K. Wiss. Wien, vol. 43, p. 354, 1861.

Family: GRAPSIDAE.

Subfamily: Grapsinae.

Genus: GRAPSUS Lamarck.

Grapsus grapsus Linné.

Plate 90.

REMARKS: For full description of the species consult: Volume II, Bulletin of the Vanderbilt Marine Museum, p. 203, 1930. For discussion of the IndoPacific varieties and distribution, consult: Col. Alcock, in Journal of the Asiatic Society of Bengal, vol. 69, part 2, 1900.

DISTRIBUTION: This brilliantly colored species is a well-known inhabitant of the tropical and subtropical shores of America from Miami, Florida, southward through the West Indies and Bermudas to Pernambuco, Brazil, on the East Coast, and on the West Coast from San Benito Island, Lower California, southward, including the Galapagos Islands, down to Chile; it is also known from the tropical eastern Atlantic, including the Azores and the west coast of Africa. It is very widely distributed in the IndoPacific region, as pointed out by Col. Alcock (*op. cit.*, p. 393). Since the publication of his report, the following localities have been established: Tami Island, New Guinea, (Nobili); Annobon, New Guinea, (Balss); Marcus Island, (Bryan); Tres Marias Islands, (Rathbun); Zanzibar and Bawi, East Africa, (Lenz); Persian Gulf, station 7, (Nobili); Red Sea, (Nobili); Red Sea: Ras Muhamel, South Sinai, Brother's Island, Shadwin, Habban, Bir al Mashiya, Gulf of Akabah, (Balss).

Grapsus grapsus Linné, slightly reduced.

MATERIAL EXAMINED: Six males and three females, ovigerous, collected in Tagus Cove, Albemarle Island, Galapagos Islands, July 29, 1931. One small female taken at Apia, Samoa, September 5, 1931. One small male and one medium size female, taken on the rocks, at Anaho Bay, Nuka Hiva, Marquesas Islands, August, 1931.

DISCUSSION: The specimens taken in the Galapagos by the "*Alva*" are identical with those secured by the "*Ara,*" the "*Arcturus*" and the "*Nourmahal*" in this same Archipelago and by the "*Pawnee*" in the Pearl Islands and the Gulf of Lower California. It is quite interesting to note that one of the large males of the present series is a "pealer," the new soft shell showing the perfection of detail characteristic of the species, where the hard shell has been accidentally broken off.

The three IndoPacific specimens of the present series afford an interesting commentary on the variation due to age. The two small specimens, male and female, are identical with many Galapagan and West Indian specimens that I have examined in the collections of the Beebe, Bingham, Astor and Vanderbilt expeditions. The third specimen, a medium size female from Nuka Hiva Island, Marquesas, shows in moderate degree the more acute carpal spine, which is considered by some writers to be a valid character of the closely related species, *G. tenuicrustatus* (Herbst).

REFERENCES: *Cancer grapsus* LINNÉ, Syst. Nat. ed. X, vol. 1, p. 630, 1758.

Grapsus grapsus ALCOCK, Journ. Asiatic Soc. Bengal, vol. 69, pt. 2, p. 393, 1900. With full synonymy of Indo-Pacific records.—BOONE, Bull. Vanderbilt Marine Museum, vol. II, p. 203, pl. 69, 1930; with description, illustration, American distribution and recent synonymy.—RATHBUN, M. J., U. S. Dept. Agric. N. Amer. Fauna, no. 14, p. 74, 1899.—LENZ, Abh. Senkenb. Naturf. Ges. Bd. 27, p. 368, 1905.—NOBILI, G., Ann. Mus. Nat. Hist. ser. 9, Zool. t. IV, p. 319, 1906; NOBILI, Bull. Sci. France-Belg., t. 40, p. 550, 1906; Torino Mem. Acad. Sci. ser. 2, vol. 57, p. 414, 1907.—BRYAN, Occas. Papers B. F. Bishop Mus. vol. II, p. 119, 1903–1907.—BALSS, H., Ergeb. Zweiten. Deutsch. Zentral Afrik. Exped., 1910–1911; Bd. I, Zool., p. 105, 1913–1917; Denksch. Akad. Wiss. Wien, Bd. 99, p. 15, 1924.

Genus: **PACHYGRAPSUS** Randall.

Pachygrapsus minutus A. Milne Edwards.

Plate 91.

TYPE: Randall's type came from the Sandwich Islands, and was deposited in the Philadelphia Academy of Natural Sciences.

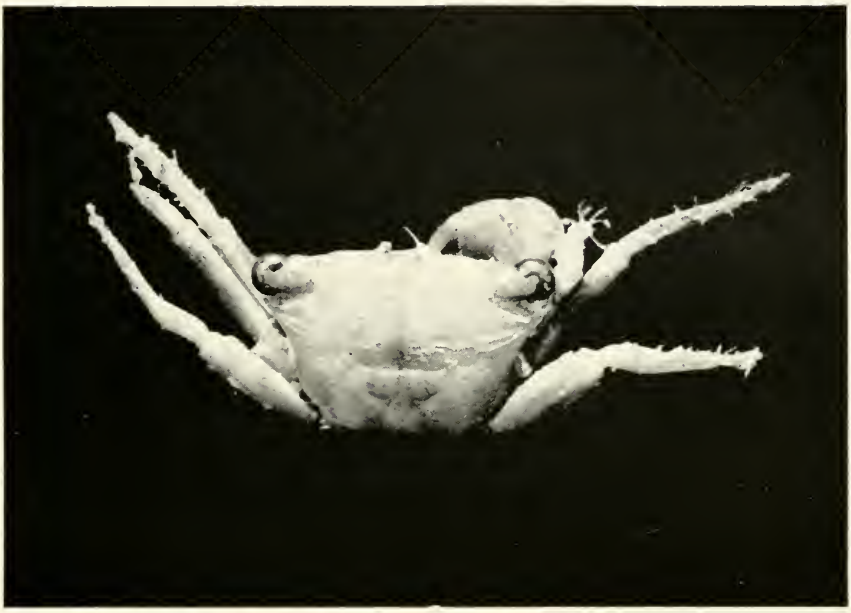
DISTRIBUTION: Hawaiian Islands, (Randall); Palmyra and Fanning Islands, (Edmondson); Rotuma, (Borradaile); Ponape, Caroline Islands, reef, (Rathbun); Praslin, Seychelles, Coetivy, (Rathbun); Zanzibar, Bawi, East Africa, (Lenz); Maldives, (Borradaile); Mergui Archipelago, (Alcock); Samoa, (Boone). Shadwin, Red Sea, (Balss); New Caledonia, (A. M. Edwards); Banda Sea, Owen Island, Mergui Archipelago, Pulo Edam and Noordwachter Islands; Bay of Bengal, (de Man); Honolulu, (Cano); Laysan Island, (Rathbun).

MATERIAL EXAMINED: Three males and two ovigerous females taken on the reef at Apia, Samoa, September 5, 1931.

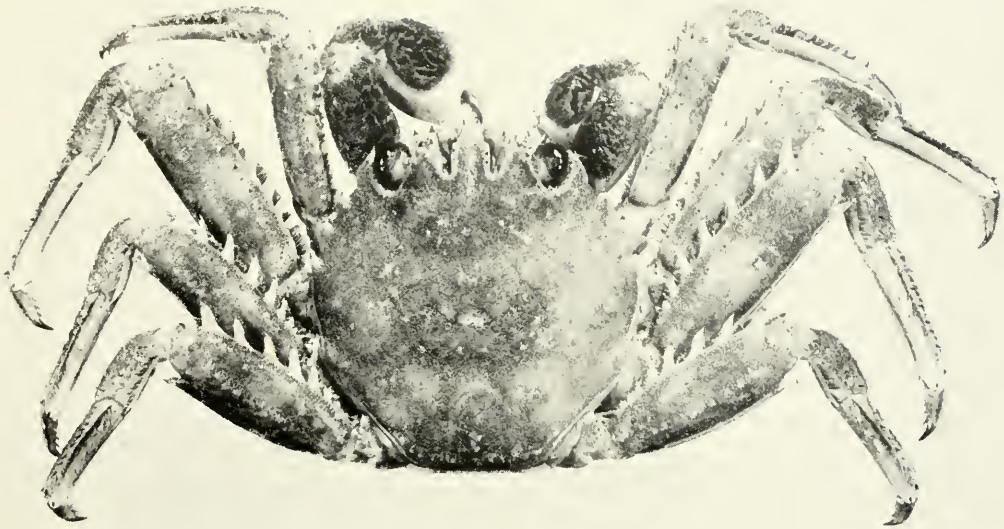
TECHNICAL DESCRIPTION: Carapace about one-fiifth wider anteriorly than long, with the frontal margin deflected, slightly sinuous; the postorbital angle acute, the lateral margins are sharply convergent posteriorly and have no spine except the postorbital spine. The orbits are oblique, their long diameter about two-fifths of the width of the frontal border; the orbital margins are smooth. The dorsal surface of all five specimens is glabrous, devoid of transverse and oblique lines.

The chelipeds are equal in both sexes but are more massive in the males; the carpus has an acute spine at the inner angle; the palm is short, stout and high, with the outer surface very convex, smooth, the lower finger is about one-third of the total propodal length, thick, with the cutting edge regularly serrate; the tip rounded and hollowed inwardly and fringed with bristles; the upper finger is decidedly downcurved, its hollowed, rounded tip meeting upon that of the lower finger; the cutting edge finely serrulate; a slight elliptical gape occurs between the two fingers.

The ambulatories are quite long, increasing in length from the first to the third pairs, the fourth pair being subequal to the second pair; each has the meral joint widened, with both lateral margins with a small, acute, subdistal spine; the dorsal meral surface is transversed by numerous fine wavy ridges; the carpus and propodus are less wide and thicker, while the dactyl is stout, about two-thirds as long as the related propodus and sharp-tipped. There are numerous solitary, sharp slender spines on the inferior lateral margin of the propodus and



Pachygrapsus minutus A. Milne Edwards, × 4.



Percnon pilimanus (A. Milne Edwards), male, × 1.

Percnon pilimanus (A. Milne Edwards), male, × 1.

Perenon pilimanus (A. Milne Edwards), cast "shed" of female, × 1.

dactyl, also some long, solitary bristles, mostly on the upper lateral margin.

The eye is very large, the stalk short, fleshy, the hemiovoidal cornea set obliquely terminal, possessing excellent visual range.

The antennulae are well separated by a wide spetum and have an enlarged basal article, the second and third articles clavate; the flagellum fleshy, short, tapered and the antennulae fold transversely.

The antennae have the basal article much enlarged, with the outer distal angle produced in a large, lobate, acute tooth that lies in the orbital hiatus; the second and third articles reduced; the flagellum short, extending merely to the base of the cornea.

The external maxillipeds are squarish, close-fitting, with the distal meral margin slightly rounded.

References: *Pachygrapsus minutus* A. Milne Edwards, Nouv. Archiv. Mus. Hist. Nat. Paris, t. IX, p. 292, pl. 14, fig. 2, 1873.—Kingsley, Proc. Acad. Nat. Sci. Phila., vol. 32, p. 201, 1880.—de Man, Notes Leyden Mus. vol. V, p. 158, 1883; Archiv. f. Naturges., Bd. 53, heft 1, p. 368, 1887; Journ. Linn. Soc. Zool., vol. 22, p. 148, 1888.—Cano, Boll. Soc. Nat. Napol. vol. III, p. 240, 1889.—Alcock, Journ. Asiatic Soc. Bengal, vol. 69, pt. 2, p. 399, 1900.—Borradaile, Proc. Zool. Soc. London, 1900, pt. 2, p. 592; Fauna and Geogr. Maldive and Laccadive Arch., vol. I, pt. 4, p. 432, 1902.—Lenz, Schenkenb. Naturf. Ges. Bd. 27, p. 370, 1905.—Rathbun, Bull. 23, pt. 3, U. S. Fish Comm. p. 840, 1906; Mem. Mus. Comp. Zool. vol. 35, p. 30, 1907; Trans. Linn. Soc. London, ser. 2, vol. 14, p. 242, 1911.—Edmondson, Bull. B. P. Bishop Mus. Bull. V, p. 10, 1923.—Balss, H., Denksh. Akad. Wien, Bd. 99, p. 16, 1924.

Subfamily: **Plagusiinae.**

Genus: **PERCNON** Gistle.

Percnon pilimanus (A. Milne Edwards).

Plates 92, 93 and 94.

Type: This species was first reported from New Caledonia by M. Balansa and the type is deposited in the Paris Museum.

Distribution: New Caledonia, (A. M. Edwards, Miers, Boone); Marquesas, (A. M. Edwards); Sandwich Islands, (A. M. Edwards; M. J. Rathbun lists this species in her Report on Hawaiian Crustacea, without citing any locality).

Material examined: One large male from Papeete, Tahiti, Society Islands, August 16, 1931. A smaller female taken on Venus Point Reef, Tahiti, Society Islands, August 15, 1931, both collected by the "*Alva.*"

Technical description: Carapace oval, nearly circular, thin, flattish, disk-like, about 2 mm. longer than wide; regions imperfectly delineated; the dorsal surface finely punctate and with a velvety fine coating of minute setae; a few, widely scattered, low, rounded, tubercles are present; some of these form an incomplete circle around the central portion of the carapace; others form an irregular line along the posterior margin of the carapace. The front, antennular and preorbital angles and epistome all are deeply sharply spinose. The frontal region between the antennae is narrow, approximately twice as long as wide proximally, armed with three or four forward-directed spinules proximally along each margin, followed by a pair of prominent acute forward-directed spines, one on each side, midway the lateral margin, beyond which the rostrum narrows and is deflected, terminating in a pair of acute, forward and upward-pointing spines, separated by a V-shaped space. The preorbital angles also terminate in a sharp upcurved spine, equal to and in line with the distal rostral spines. Behind this are a pair of smaller acute, upward-pointing spines, one on the inner margin and the other on the outer or preorbital margin, both in line with the subdistal spine of the rostrum; a third small spine occurs behind the second outer spine on the preorbital margin. The outer half of the superior orbital margin is serrate, with seven or eight acute spines; the postorbital angle is a larger, acute tooth; behind it on the anterolateral margin there are three subequally spaced, acute teeth, decreasing slightly in size from the first to third. The postlateral and posterior margins are slightly carinate. The epistome is armed with five acute spines, the outermost pair being slightly larger than the median spine, while the submedian pair are subequal to the median spine; the outermost pair are visible dorsally; the median spine would also be except that it lies beneath the rostral spines. The side walls of the carapace and sternal plastron are smooth. The male belt is triangular with rounded tip. The first and second articles are narrow, hinge-like, the third, fourth and fifth articles are completely fused into one long article; the sixth article is nearly as long as wide; the seventh segment is broadly rounded distally. The female belt is widely oval, smooth, nearly subcircular, with the first and second segments short, hinge-like, the third, fourth and fifth segments completely

fused and forming about three-fifths of the broad oval, which is completed by the successively narrowed sixth and seventh segments.

The eyes are large, the cornea set obliquely terminal; the eyestalk with a calcareous covering that projects slightly upon the cornea dorsally.

The antennulae are strong and fold almost vertically within the sulcus; the distal end of the peduncular joint and adjacent proximal end of the second joint are curiously flattened and have the margins rounded and fringed with setae; the remaining joints are fleshy.

The antennae have the basal joint flattish, wider than long, each distal angle produced into a prominent tonguelike lobe; the outer one tipped with two spines and the inner lobe with one spine; the second article is stocky, twice as long as wide, with its inferior face deeply channeled and outer distal margin with a spine and the inner lateral margin with three or four spines, one of which is distal, also a distal brush of setae; the third article is small, the flagellum of about fifteen tapered articles, with a total length about equal to the length of the second peduncular article.

The external maxillipeds are large, close fitting, with the ischium quite large, subrectangular, its distal angle nearly right-angled; its width scarcely two-thirds its length; the merus is small, distinctly narrower than the ischium and set obliquely upon it; the palp is rather long, slender, tapering and furnished with spinose setae, as is also the inner lateral margin of the ischium and merus.

The chelipeds are of moderately unequal size in the large male, but are equal in the female; the merus is three-sided, projecting about three-fourths of its length beyond the carapace, armed along the upper lateral margin with a series of acute spines and with a strong subdistal spine at the outer lateral angle, a single acute, subdistal spine at each the upper and inner distal angles; the carpus is rounded and has a strong, acute spine proximally and another subdistally at its outer margin, between these and on the upper surface of the carpus; there are eight or ten acute, upward pointing spines, some of which are concealed beneath the dense pilosity that covers the upper outer surface; the palm is smooth, suboval, three-fourths as high as long with the outer and inner surfaces each slightly convex, the inner margin lightly carinated, the fingers are short, deflected, with horny, spoon-shaped tips. There is a dense pilosity on the entire surface of the exposed portion of the inner face of the merus, carpus, and a longer oval patch on the upper proximal portion of the inner surface of the palm.

The ambulatories are well developed; the third pair of legs are the longest of the series, while the third and fourth pairs are about equal in length, the first pair of legs being the shortest. All four pairs have the merus widened; the merus of the first pair of legs is not conspicuously widened, being one-fifth narrower than those of the other pairs; the merus of each the second, third and fourth pairs of ambulatories has a width equal to about one-third of its length; the anterior lateral margin of each merus is set with a series of about nine acute, outward and forward directed spines which slightly diminish in size toward the proximal end of the series, the distal one being at the tip of the joint; the posterior margin of the merus is carinate, the carina terminating in a subdistal spine; a fine short fringe of setae arises from the anterior side of the carina and extends upon the dorsal surface of the merus; a secondary line of spinules approximately parallels those of the anterior margin, increasing in size from proximal to distal and terminating in an acute subdistal tooth. There are two distinct longitudinal flat carinae separated by a wide shallow sulcus, on the dorsal surface of the merus. The anterior carina bears the row of secondary spinules; on the other carina there are a few flat granules. The carpus is one-half as long as the merus and only about half as wide, with both upper margins carinate and fringed with short setae and with a subdistal spine on the posterior margin; the propodus is two-thirds as long as the merus, narrow, slightly tapered, with a conspicuous longitudinal fringe of setae on the upper surface and less conspicuous fringes each on the carinate anterior and posterior lateral margins and other tufts of long setae set between these; the dactyl is strong, scarcely one-half the length of the propodus, curved and with a strong, claw-like tip; besides this there are a series of four or five sharp, obliquely set spines along the inferior lateral margin.

References: *Acanthopus pilimanus* A. Milne Edwards, Nouv. Archiv. Mus. Hist. Nat. t. IX, p. 300, pl. 14, fig. 5, 1873.

?*Leilophus pilimanus* Miers, Ann. Mag. Nat. Hist. ser. 5, vol. I, p. 154, 1878.

?*Acanthopus affinis* A. Milne Edwards, Ann. Sci. Nat., ser. 3, Zool. XX, p. 180, 1853.

?*Acanthopus tenuifrons* A. Milne Edwards, *ibid.*, vol. XX, p. 180, 1853.

Percnon pilimanus M. J. Rathbun, Bull. U. S. Fish Comm., vol. 23, pt. 3, p. 842, for 1903, issued 1906.

Plagusia speciosa Dana, × 1.

Plagusia speciosa Dana, × 1.

Genus: **PLAGUSIA** Latreille.

Plagusia speciosa Dana.

Plates 95 and 96.

TYPE: Dana's type was a beachworn carapace from Waterland Island, Paumotu Archipelago, deposited in the Philadelphia Academy of Sciences.

DISTRIBUTION: Waterland Island, Paumotus, (Dana), recited by de Man, Miers and Ortmann); Makemo Island, Paumotus, (Rathbun); Tahiti, Society Islands, (Kingsley; Boone); Hao Island, Mergui, (Nobili); Funafuti Atoll, Rotuma, (Borradaile).

MATERIAL EXAMINED: One female, taken on Venus Point Reef, Tahiti, Society Islands, August 15, 1931, by the "*Alva.*" This is an exceptionally fine specimen of this very rare species.

COLOR: The preserved specimen which has been in alcohol about two years, has a creamy ground color with a large crimson shield on the gastric-cardiac region, two large crimson spots on each side, one being on the hepatic region and the other on the outer lateral margin. The ambulatory legs are alternately banded with crimson and cream.

TECHNICAL DESCRIPTION: The carapace is subcircular, seven-eighths as long as wide, decidedly convex in both directions; the entire dorsal surface covered with very beautiful squamae; the regions clearly delineated. The frontal margin is deflected, rather broadly triangulate, with a blunt, bifid tip; the margin carinate; this carina continuous with that of the preorbital tooth. The dorsal surface is traversed by a median groove and there are a pair of prominent curved squamae, one on either side of the sulcus, where the frontal margin bends downward. The antennal septum is deep cut, triangulate, situated on either side of the frontal margin, the deep-cut apex of the septum extending upward on the dorsal surface and forming the sulcus between the frontal margin and preorbital angle. The latter is triangulate, about two-thirds as wide basally as one-half of the frontal margin, similarly deflected with carinate margin, emphasized at the outer subdistal side by a squama. The orbital margin is subcircular, unbroken, the postorbital angle is an acute, unbroken spine. There are two additional, slightly smaller, similar spines, one behind the preorbital spine, on each lateral margin. The inferior orbital margin is laminate, slightly denticulate at the inner angle and together with the rather prominent laminate epistome, forms a distinct linear margin to the face. Below the orbital margin the excurrent channel is sharply defined as a ridge, fringed by

short setae. The external maxillipeds are squarish, close fitting. The female belt is widely oval, composed of five articles, the third, fourth and fifth segments being fused; the distal article triangulate. The outer surface of it is carved by a series of transverse grooves.

The female chelipeds are equal, rather small, the ischium strong, with a small sharp spine at the upper distal angle, almost fused with a similar spine on the proximal border of the merus. The merus is very short, three-sided, widening distally, armed on the upper surface with a median subdistal and two distal spines in triangulate arrangement; the carpus is squamose on the upper surface with the upper margin carinate, the inner angle a sharp tooth; the propodus is moderately inflated, the palm two-thirds as high as long, the upper margin carinate with a distal small spine above the finger; the upper and outer surface of the palm is sculptured by eight narrow longitudinal grooves, defining nine longitudinal bands. The fingers which are short, curved, with a wide ovate gape and rounded, spoon-shaped tips, are similarly grooved.

The first, second, third and fourth pairs of legs are very strong; the second and third pair being the longest of the series and nearly subequal. The first and fourth pairs of legs are also subequal to each other, and shorter than the others by about the length of a dactyl. The ischial and meral joints are transversely sculptured by fine grooves, defining wide bands on the lower surfaces, and on the upper surface, covered with transverse squamae which towards the upper lateral margin become coarsened. The lower and upper lateral margins of the merus are each fringed with short, close-set setae and there is a strong subdistal spine at the upper lateral margin and two shorter spinose nodules on the upper distal margin; the carpus and propodus are elongate, cylindrical, longitudinally channelled by linear grooves, separating wider bands, and with a strong fringe of setae along the postlateral margin and anterior to this a second, shorter fringe of setae, along one of the upper ridges. The dactyli are very strong, prehensile, with a reinforced articulation with the propodus, the outer lateral margin setose, the inner later margin armed with a series of curved sharp spines, the tip a strong, curved spine; the upper lateral surface longitudinally grooved.

References: *Plagusia speciosa* Dana, Proc. Acad. Nat. Sci. Phila. vol. 5, p. 252, 1851.—U. S. Explor. Exped., vol. XIII, Crust., pt. I, p. 369, atlas, pl. 23, fig. 9, 1852.—Miers, Ann. Mag. Nat. Hist., vol. I, p. 151, 1878.—Kingsley, Proc. Acad. Nat. Sci.

Cardisoma carnifex (Herbst), male, reduced about one half.

Cardisoma carnifex (Herbst), male, reduced about one half.

Phila., vol. 32, p. 223, 1880.—DE MAN, Notes Leyden Mus., vol. 12, p. 89, 1890.—ORTMANN, Zool. Jahrb. Syst., vol. VII, p. 731, 1894.—BORRADAILE, Proc. Zool. Soc. London, 1900, pt. 2, p. 591; Fauna and Geogr. Laccadive and Maldive Arch., vol. I, pt. 2, p. 591, 1902.—NOBILI, Torino Mem. Acad. Sci., ser. 2, vol. 57, p. 406, 1907.—RATHBUN, M. J., Mem. Mus. Comp., vol. 35, p. 36, 1907.

Family: GECARCINIDAE.

Genus: CARDISOMA Latreille.

Cardisoma carnifex (Herbst).

Plates 97 and 98.

TYPE: Herbst's type material came from Trankenbar and was deposited in the Berlin Museum.

DISTRIBUTION: Trankenbar, (Herbst); Antilles, (Guérin); Madeira, (Dana); very common in the south Indian backwaters; Tuticorin, Ceylon, (Henderson); Andamans, Coromandel coast, India, (Alcock); Pondichery, (H. M. Edwards); Nicobars, (Heller); Pondichery, Nicobars, Philippines, (Miers, B. M. Coll.); Koh Kahdat, Lem Ngob, Gulf of Siam, (Rathbun); Amboina, (Nobili); Pare-Pare, Celebes, Macassar, Flores, Maumeri, Sumatra, Moluccas, (de Man); Java, Xulla-Bessy, (de Man); Hao Island (Nobili); Duke of York Island, Tracy Island, Nares Harbor, Admiralty Islands; Rodriguez Island, Fiji Islands, Kandavu; Papeete, Tahiti, burrowing in sandy ground of streams; (Miers); Tahiti, (Alcock); Society Islands, (Boone); Paumotus; Peacock Island, (Dana); South Seas, Samoa, (Ortmann); Rotuma, (Borradaile); Fanning Island, (Streets; Edmondson); Palmyra Island, (Edmondson); New Guinea; Makalia Valley, Persian Gulf, (Nobili); Mauritius; New Caledonia, (Miers); Nosse-Faly, Madagascar, (Hoffman); Madagascar, (Miers; Alcock; Lenz and Richters); Foquets, (Richters); Mozambique, (Hilgendorf); Zanzibar, (Miers); Zanzibar, Kokotoni, in mangroves, East Africa, (Lenz); Gazi, South Mombasi, East Africa, (Bouvier); Durban Bay shore, S. Africa, (Stebbing); Coetivy; Mahe, Praslin, Chagos, Seychelles, (Borradaile).

MATERIAL EXAMINED: One large specimen, male, from Muller's Reef, Bora Bora, Society Islands, South Pacific Ocean, August 24, 1931, collected by the "*Alva.*"

TECHNICAL DESCRIPTION: Carapace transversely cordate, decidedly convex from front to back; greatest width across the mesogastric re-

gion, equal to about one and one-sixth times the length; the lateral borders tumid. The interorbital region is equal to about two-fifths of the frontal width of the carapace and is not quite straight, having a sinuous carinate border that is continuous with the sinuous superior orbital margin, which is very oblique, running backward to the post-orbital denticle and below this, is continuous with the sinuate, carinate, inferior orbital margin. The greatest width and height of the orbit is equal to about one-half its long diameter. There is a rounded, coarse, tooth-like process, within the orbit chamber, below the base of the stalk. The anterolateral margins are defined by a carinate line that originates just behind the postlateral angle and curves backward. This line vanishes with age, being very faint, or even invisible in large old specimens. The sides of the front are oblique. The regions of the carapace are less emphasized in the present species than in *Cardisoma hirtipes,* which also inhabits the IndoPacific region. However, *C. carnifex* has the regions indicated by unequal levels; the metagastric and cardio-intestinal regions are defined by wrinkly grooves; also the cervical groove is partially defined, separating the mesogastric and branchial grooves. The areolations of the metagastric region are slightly tumid.

The antennulae are very small, fold obliquely, being almost entirely concealed by the frontal margin.

The antennae have the basal article wider than high, filling the orbital hiatus and touching the frontal margin.

The eyestalk is clavate with a tapered, rounded calcareous process, extending to the tip of the cornea; the cornea is elliptical, terminal, fronto-lateral in position, with the visual range thus limited.

The buccal cavern is squarish, its length in the median line being equivalent to its median width. The exopodite is very slender, tapered, extending to about midway the length of the merus of the endopodite. This merus is about as long as the related ischium with its inner lateral margin thickened and rounded, its distal margin slightly sinuate; the ischial margin slightly sinuate; the ischial margin is also rounded so that there is an aperture between the opposing halves of the outermost maxillipeds.

The male belt is triangulate with fine black bristles along its lateral margins; the third article is the widest of the series and the sixth article is the longest, being slightly longer than wide with the lateral margins convergent, their proximal two-thirds slightly rounded; the seventh article is small, only half as long as the sixth, with the lateral margins convergent, the tip bluntly rounded.

The chelipeds are unequal in both sexes; but more conspicuously so in the large old males. They are smooth, except for denticles and wrinkles along the margins of some of the joints; especially the ischial and meral joints; the ischial joint projects very little beyond the carapace; the merus is about three-fifths as wide as the carapace, trigonal and has an enlarged nodule at the inferior distal angle; the carpus is slightly convex, with a triangular tooth at the inner angle; the palm (of the larger male claw) is nearly one and one-half times higher than the length of its upper margin; its outer surface smooth, with two irregular depressions; one at the base of the lower finger and the other behind the base of the upper finger. The fingers are short, gape widely, meeting only at the tip; the lower finger with one submedian low tooth and several denticles; the upper finger with only very rudimentary denticles. In the smaller cheliped, the gape is much narrower, like a large buttonhole.

The ambulatories decrease in length in the order 1, 2, 3, 4, the first and second pairs being subequal; the third pair being shorter than the second by almost the length of the dactyl; the fourth pair are shorter than the third by the length of the dactyl and half the length of the propodus; all have the merus long, subcarinate, on its upper lateral margin; the carpus and propodus also carinate dorsally, subequal; the propodus with a longitudinal sulcus on its outer lateral face; the dactyl is slightly longer than the related propodus, curved, with the dorsolateral edge bicarinate and armed on each carina with a series of spine-like denticles. There are numerous small tufts of coarse spines, rather sparsely scattered on the distal end of the merus and the lateral margins of the carpus and propodus.

Remarks: Col. Alcock notes that Ortmann considers *C. carnifex* to be a variety of the West Indian species, *C. gaunhumi,* and concurs in this view so far as he can judge from a single specimen. The present writer has had many hundreds of *C. guanhumi* for study, but only one dead specimen of *C. carnifex,* which seems anatomically identical.

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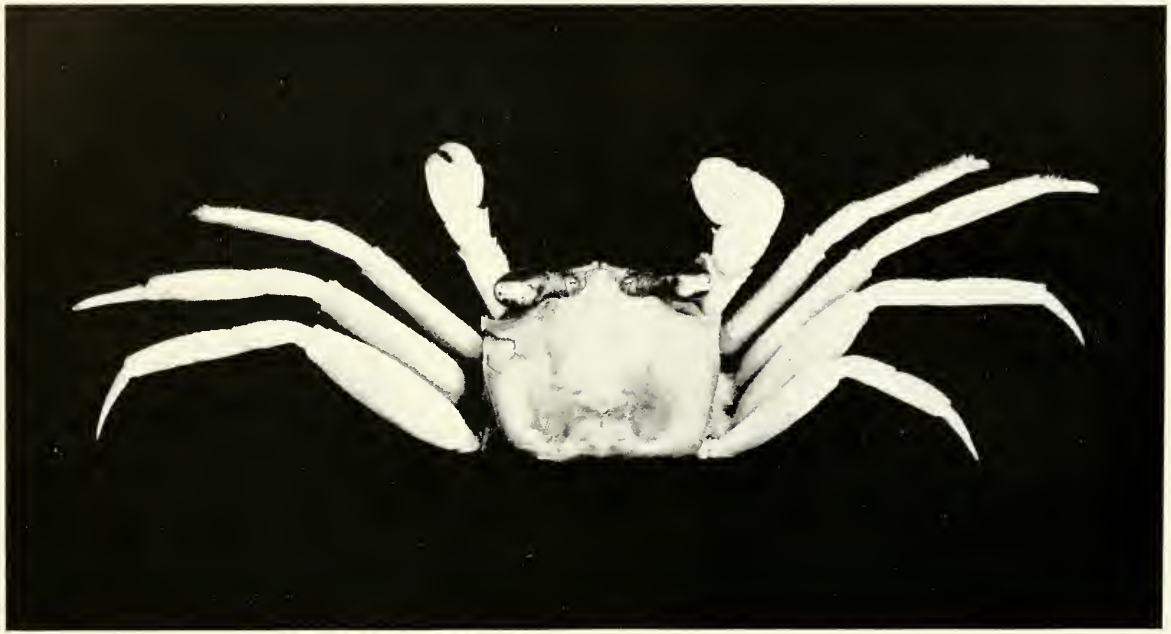
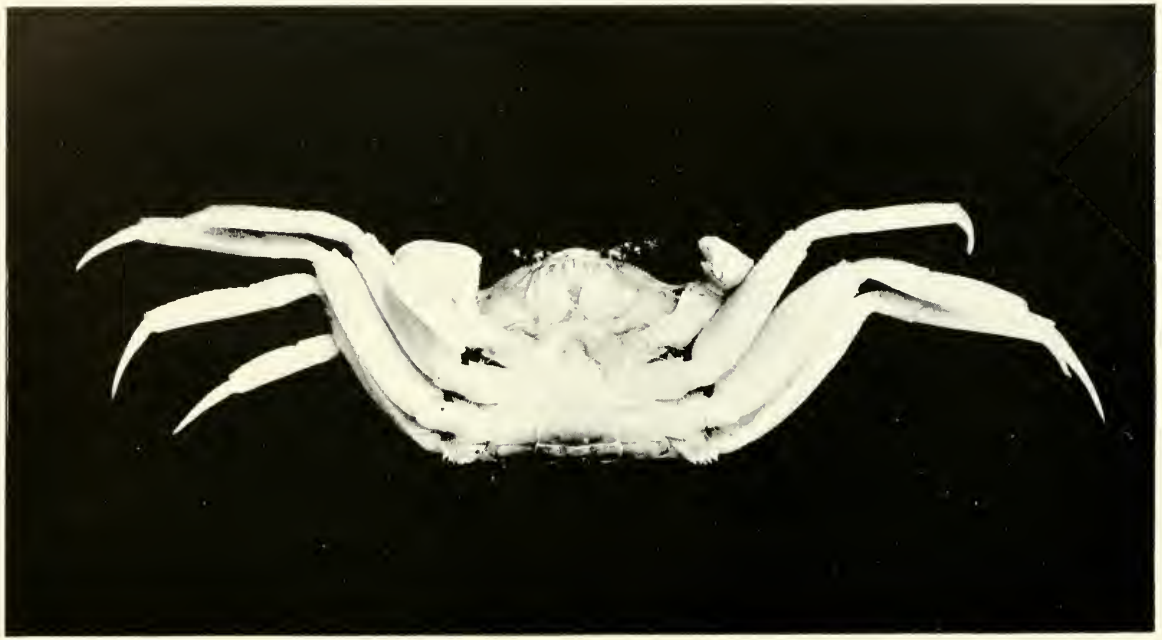


Ocypode cordimana Desmarest, × 1.



Ocypode cordimana Desmarest, × 1.

Family: **OCYPODIDAE.**

Subfamily: **Ocypodinae.**

Genus: **OCYPODE** Bosc.

Ocypode cordimana Desmarest.

Plates 99 and 100.

TYPE: The type was collected in Île de France, (Mauritius), and is deposited in the Paris Museum.

DISTRIBUTION: Red Sea, (Nobili; Heller, Kossman); seas of Asia, Japan, (H. M. Edwards); Liu Kiu Islands, Hong Kong, (Balss); Foo Chow, Chin Bey, China, (Gee); Foo Chow, (Kellogg); Indian Seas, Ceylon, (Miers); Colombo, Ceylon, (Doflein); Minikoi, (Borradaile); Mahe, (Nobili); Krusadai Island, Gulf of Manaar, (Gravely); Tuticorin, Ceylon and Madras; this is a terrestrial crab and lives at some distance from the sea, (Henderson); Ceylon, Madras coast, Laccadives, Mergui, Tavoy, Andamans, Nicobars, (Alcock); Sullivan Island, Mergui Archipelago; Amboina, (Zehntner); Trengganu, Kilantan, Malay Peninsula, (Lanchester); Atjeh, Sumatra; Bezoeki Island; Amoy; Island of Xulla-Bessy, Noordwachter Island, Java, (de Man); Koo Keang San, Borneo, (Miers); Kaiser Wilhelm's Land, New Guinea, (Ortmann); Simbang, New Guinea, (Nobili); New Hebrides; coast of Australia, (Miers); tropical Australia, shores, (Haswell); New Zealand, (Miers); Botany Bay, (Whitelegge); Sandgate, Queensland, (Rathbun); Sandwich Islands, Tahiti, (Kingsley); Fiji Islands, Ovalu and Totoya, (Miers); Society Islands, (Boone); Gilbert Islands, Paumotus, Ladrones, Tonga Islands, (Rathbun); (Whitelegge); Sandwich Islands, (Dana); South Seas; Mauritius, (Ortmann); Mauritius, Rodriguez Island, Bird Island, interior of island, African Island, Providence Island, Île des Roches, (Miers); Mauritius; Réunion, (Hoffman); New Caledonia, (A. M. Edwards); Seychelles: Praslin, Salomon, atoll, Chagos, (Borradaile); Mozambique, Zanzibar, (Hilgendorf); Mombasi, Gazi, British East Africa, (Bouvier); sandy coast, Natal, (Stebbing); Île-de-France, (H. M. Edwards).

MATERIAL EXAMINED: One male and one female, on the reef at Muller's Reef, Bora Bora Island, Society Islands, collected by the "*Alva.*"

TECHNICAL DESCRIPTION: Carapace deep, box-like, rectangular; length in the median line seven-eighths of the maximum width, which is from tip to tip of the anterolateral angles. Frontal margin narrow, tongue-like process, rounded distally and greatly deflexed. The orbits

are deep. The superior orbital margin is widely sinuate but not oblique; the inferior orbital margin is curved, with a distinct excavation near the middle of the lower border and a deeper gape at the outer angle; a small toothlike tubercle occurs above the inner angle. The anterolateral angle is acute, forward directed and identical with the external orbital angles. The lateral borders of the carapace are subparallel and the dorsal line of the posterior portion of the border is but little convergent; the postlateral margin is relatively straight in the median part, curving above the fifth leg on each side; the dorsal surface of the carapace is very convex from front to back, finely granulose, with the anterior margin lightly carinate; the regions scarcely defined; except for the H-like depression of the urogastric region. The sidewalls are high, the pterygostomian region moderately rounded. The male belt is seven-segmented, with the lateral margins slightly bowed, convergent distally. The sixth segment is the longest of the series; the seventh segment is abruptly smaller and narrower, forming a little triangle with the apex bluntly rounded.

The external maxillipeds are about as wide as high with the lateral margins convergent distally but not curved outwardly.

The eyes are quite large, the stalk short basally and only visible as a very narrow sinuate line on the dorsal surface terminating in a blunt, rounded spot at the apex; no true stylet is present. The cornea is black, convex, with excellent visual range in all directions.

The antennulae have the basal article greatly enlarged, oval in contour and convex externally, situated one on either side of the rostrum above the outer portion of the epistome and touching the inner margin of the orbital sinus; the remaining articles are greatly reduced and usually concealed.

The antennae are greatly reduced, situated in the small space between the inferior orbital angle and the epistome, with the basal article bent, the second and third articles stout, cylindrical; the flagellum is short, only one and one-half times as long as the second article and not acute, reaching to the base of the cornea.

The chelipeds are distinctly unequal, the merus being trigonal, very compressed, with its outer and inferior lateral margins angulate; the carpus is rounded dorsally, with a sharp tooth at the inner distal angle of the propodus has the palm almost as high as long, rather compressed but with the upper outer portion decidedly rounded, the lower outer portion moderately inflated, both the inferior margin and outer surface of the palm covered with squamose granules. The lower finger

is carinate and serrate with coarse granules. The fingers are deflected and the outer surfaces are greatly incurved; the lower finger is the larger, triangulate, with the cutting edge shallow serrate and tip incurved. The upper finger is more diagonal in position, slenderer, the cutting edge entirely serrate, meeting throughout its length upon the lower finger; the upper margin emphasized by rough granules and a secondary row of granules below this on the outer surface. The smaller cheliped is similar but much slenderer, the palm being not so high, the fingers longer in proportion and the fluted effect on the outer surface of the upper finger is distinct.

The ambulatories are all very long and slender, their length decreasing in the order 2, 3, 1, 4, the second and third pairs being almost equal. The meral, carpal and propodal joints are coarsely granulose on the upper portion; the propodi have a shallow, median longitudinal groove on the outer surface and the dactyli, which are very long, slender and delicately tapered are also fluted.

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I, p. 159, 1899–1907.—Lanchester, Proc. Zool. Soc. London, 1901, pt. 2, p. 548.—Doflein, Abh. Math. Phys. K. B. Akad. Wiss., Bd. 21, p. 668, 1902.—Borradaile, Fauna and Geogr. Laccadive and Maldive Arch., vol. I, pt. 1, p. 67, 1902.—Nobili, G., Boll. Mus. Torino, vol. 18, art. 455, p. 20, 1903.—Whitelegge, Rec. Austral. Mus., vol. V, p. 10, 1903.—Nobili, Ann. Sci. Nat. 9 ser. Zool., t. IV, p. 310, 1906.—Rathbun, Mem. Mus. Comp. Zool., vol. 35, p. 26, 1907.—Borradaile, Trans. Linn. Soc. London, ser. 2, vol. 12, p. 65, 1909.—Stebbing, Ann. S. Afric. Mus., t. VI, p. 326, 1910.—Bouvier, Voy. de Alluaud et Jeannel, Res. Sci. Afric. Orient, 1911–12, Crust., III, Decap., Paris, p. 58, 1921.—Balss, H., Archiv. fur Naturg., Bd. 90, Abt. A, heft. 5, p. 69, 1924.—Gee, N. G., Lingnaam Agric. Review, Canton, vol. III, p. 165, 1925–1926.—Rathbun, Rec. Austral. Mus., vol. 15, p. 177, 1926–1927.—Gravely, F. H., Bull. Madras Govt. Mus., n. s., Nat. Hist. Sect., vol. I, no. I, p. 148, 1927.—Kellogg, Lingnan Journ. Sci., vol. V, p. 355, 1927–1928.

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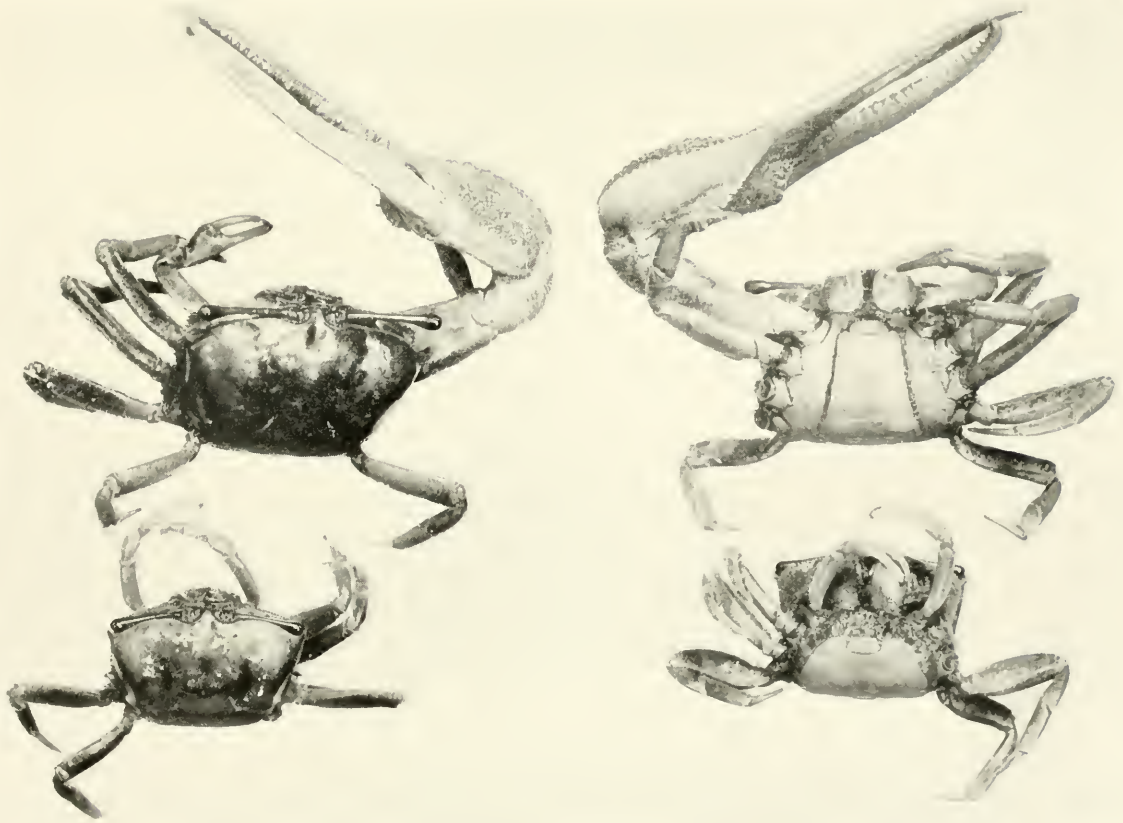
Genus: **uca** Leach.

Uca annulipes (Latreille).

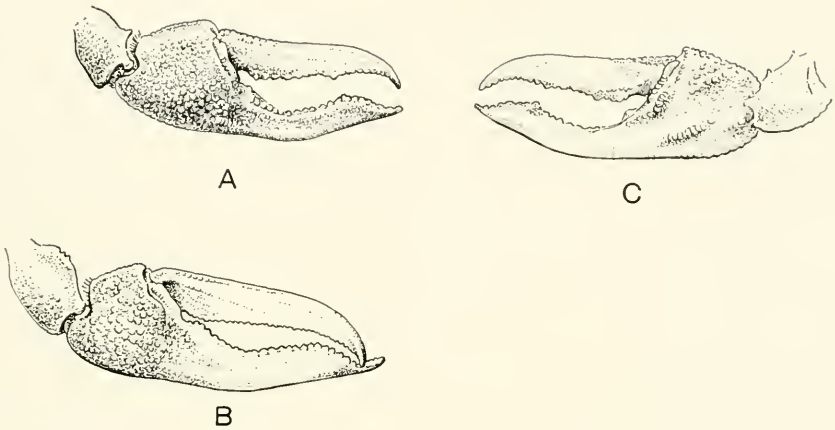
Plates 101 and 102.

Type: Latreille's type locality is designated as the "seas of India." The type is deposited in the Paris Museum.

Distribution: Red Sea, (Kossman; Nobili); Persian Gulf, (Nobili); Karachi, the Andamans, (Alcock); Nicobars; Madras, (Alcock); Trincomali, Ceylon, (Muller); Rameswaram, Tuticorin; abundant on the margins of the southern Indian backwaters, burrowing in sand or mud, (Henderson); Seas of India, (Latreille; H. M. Edwards; Doflein); Ceylon; Nicobars, (Heller); Maldives: mangrove swamp, Furnardu, Miladumadulu Atoll, (Borradaile); Pondichery; Mahe; Malabar, (Nobili); off Mutwal Island, Gulf of Manaar, (Laurie); mangrove swamp, Lem Ngob, river and stony coast of Koh Chang, Gulf of Siam, (Rathbun); Singgora, Trengganu, Malay Peninsula, (Lanchester); Singapore, (Kingsley; Dana); East Indies, (Dana); Samboanga, Philippine Islands, 10 fms., (Alcock); Borneo, (White; Adams and White); Pontianak, west coast of Borneo; Island of Morotai; Penang; Atjeh, Sumatra, (de Man); Siari, New Guinea, (Roux); Makassar,



Uca annulipes (Latreille), × 1.5; upper figures, male; lower figures, female.



Uca annulipes (Latreille), A.—Outer surface of truncated tip style of cheliped; B.—Outer surface of pointed tip style of cheliped; C.—Inner surface of truncated tip style of cheliped. All natural size.

Celebes, (Schenkel; Rathbun; Alcock); Andai, (Nobili); Malacca, (de Man); Amboina, (Zehntner); Mahe Island; Batjan Timor Laut, (Alcock); Fiji Islands, Kandavu, Matuku, (Alcock); Fiji Islands, (de Man); Tahiti, (Stimpson; Ortmann); Samoa, (de Man); common at Fanning Island, less so at Palmyra Island, (Edmondson); Mascarenes, (Hoffman); Australia, (Kingsley); Grand Port, Mauritius, (Bouvier); Mauritius, (Richters); mangrove swamp, Praslin, Seychelles, (Borradaile); New Caledonia, (Alcock); Noumea, New Caledonia, (Boone); Rodriguez Island, Nosse-Faly, Nosse-Be, Madagascar, (Alcock); Madagascar, (Hoffman); Mozambique, (Hilgendorf); Gazi, south of Mombasi, British East Africa, (Bouvier); Zanzibar, (Hilgendorf; Kingsley); Zanzibar, Kokotoni, ebb-tide on sand beach, (Lenz); River Zambesi, Durban Bay, Port Natal, (Alcock); many at Durban Bay, South Africa, (Stebbing).

Material examined: Several specimens of both sexes collected at Noumea, New Caledonia, September 19, 1931, by the "*Alva.*"

Technical description: Carapace box-like, length equal to three-fifths of its greatest width, which occurs from tip to tip of the acute, procurved anterolateral angles; lateral margins of the dorsum of carapace are defined by a fine line for about three-fifths of their length and are moderately convergent; the sidewalls of carapace are high; the posterior margin of the carapace is about one-half as wide as the anterior margin and has a flat carina. The dorsal surface is tumid, glabrous, convex in both directions; the cervical and urogastric grooves deep; a groove curving posteriorly and outward from the urogastric bar, vanishing near the lateral margin at a point above the base of the fifth leg. The interorbital border is a very narrow process, tapered distally with the frontal margin rounded, lightly carinate, this carina continuing on the lateral margin of the process and as a very fine double line along the superior orbital margin, which is quite oblique and sinuous, being gently convex almost to the anterolateral angle, there becoming briefly concave and confluent with the anterolateral tooth. The inferior orbital border is considerably in advance of the superior and is also oblique, convex and very beautifully and regularly dentate, these teeth graduatingly increasing in size toward the outer margin. The male belt is seven-segmented, the first and second segments very short, fringe-like, the seventh segment is abruptly narrower than the sixth and has its distal margin quite bluntly truncated. The female belt is very wide, subcircular, seven-segmented, the seventh segment abruptly narrower than any of the others.

The chelipeds are characteristically very unequal in the male, in large adults being two and one-half to three and one-half times the length of the carapace. The merus is unequally trigonal, the postlateral surface convex, terminating in an acute tooth at the distal angle, from which point two carina-like margins diverge, one sharply defining the postlateral face and the other defining the anterolateral face of the merus. A distinct constriction occurs dorsally between this tooth and a distal tooth, from which a light carina runs transversely across the postlateral face of the merus; the carpus is convex, with its anterior lateral margin finely granulose; the hand, including the fingers, is two to two and one-half times as long as the carapace, the palm being as high as its proximal portion is long, with the outer surface moderately rounded and coarsely granulose on the outer lower two-thirds, finely so above; the upper proximal border forms a distinct elbow; the lower margin of the palm is continuous with that of the lower finger, moderately curved, very slightly sinuate and emphasized for the distal three-fourths of its length by a flat carina defined above by coarse punctae. On the inner surface of the palm there are two conspicuous crests, the anterior of which is deeply grooved and nearly vertical, anteriorly becoming confluent with the cutting edge of the lower finger. The second crest is even more conspicuous and is oblique, running from midway the palm down to the lower border. The fixed finger is distinctly compressed where it arises from the palm, and continues flat throughout its length with the upper margin very sinuate, proximally touching the opposite finger, thence very concave, followed by an enlarged tooth near the tip, which causes the tip to have a notched-truncate aspect. The entire cutting edge is regularly, finely dentate. Noteworthy variations occur in the degree of development of the large subdistal tooth, which of course affect the notch-truncate aspect. In one large male in the "*Alva*" series, this subdistal tooth is reduced and the related truncate area is longer, the tip of the fixed finger extending about 2 mm. beyond that of the upper one. In all others the tips of the fingers meet. The upper finger is also laterally compressed, smooth, much more curved than the upper, acute tip, the cutting edge is regularly dentate and has two or three longer teeth, subbasally, and one larger tooth opposite the large tooth of the lower finger. The gape between the fingers is a wide ellipse in the greater extent of its length, abruptly, irregularly narrowed at either end.

The small cheliped of the male is greatly reduced, laterally compressed; the fingers incurved, spoon-shape-tipped with a curious, funnel-like brush of bristles on the inner distal margin.

The female chelipeds are very weak and small, not longer than the width of the carapace; with the palm small, much compressed laterally, not much longer than the carpus, the finger slender, one and one-half times as long as the palm, curved inward and with spoon-shaped tips. The fingers have a narrowed gape, meeting only at the hollowed, rounded tips; with a brush of sieve-like setae on the inner distal margin.

The ambulatories are similar except that the first, second and third pairs have the meral joints foliaceous, while the merus of the smaller fourth pair of legs is not. All of the legs have acute, fluted dactyli.

The eyes are set upon slender, cylindrical stalks, each of which extends to the outer angle of the carapace, the stalk dilating slightly at the immediate base of the cornea and continued as a narrow line on the frontal side of the cornea, and terminating distally in a rounded node. The cornea is of greater diameter than the stalk and is set obliquely terminal, longer on the posterior than on the anterior side.

The antennulae are greatly reduced and lie semi-concealed in the fossett below the frontal border.

The antennae are small and occupy the normal position between the angle of the inferior orbital margin and eyestalk; the basal antennal article is enlarged and externally flattened and bent obliquely inward, its distal border touching the base of the eyestalk; the second and third articles are slenderer, cylindrical, the third being only half so long as the second; the flagellum is short, composed of about twenty rings and does not extend one-fourth of the length of the eyestalk.

The external maxillipeds are wider than high, with the lateral margins curved, convergent anteriorly. The ischium is subrectangular with its distal margin oblique; it has the inner lateral margin much thickened, this ridge being paralleled by a longitudinal sulcus that is continuous distally with a much wider median depression on the merus. The merus is much wider than long, with its distal margin truncate and slightly sinuate; the palp is large and swings from the outer distal angle of the merus, across and partly beneath its distal margin and along the inner lateral margin of the merus and ischium. The lateral margins of the palp are setae fringed as are also the inner lateral margins of the merus and ischium.

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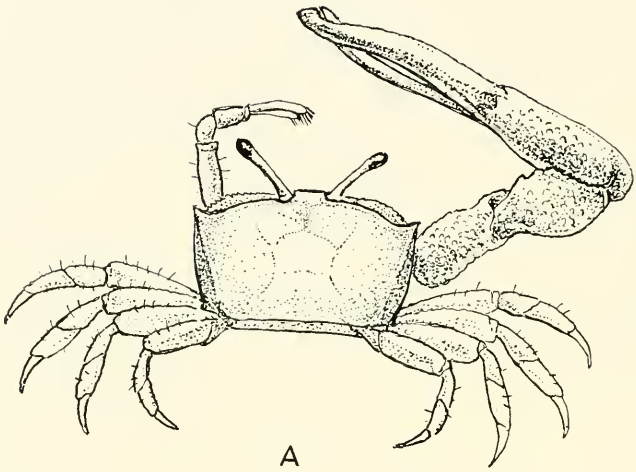

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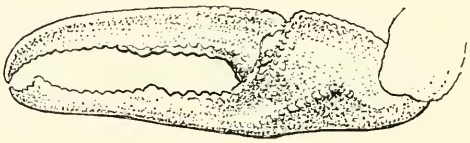

B

A.—*Uca lactea* (De Haan), male, × 2; B.—Inner surface of cheliped of male, showing ridges; × 2.

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Uca lactea (De Haan).

Plate 103.

TYPE: De Haan's type material came from Japan and China and was originally deposited in the Berlin Museum.

DISTRIBUTION: Japan, (De Haan; Kingsley; Alcock); Macao, China, littoral in the limestone crevices, (Stimpson); Amoy, (Cano); Hong Kong, Chin Bey, Amoy, (Gee; Kellogg); China, India, Karachi and the Andamans, (Alcock); Pondichery, (Kingsley); South Seas; Upolu, Samoa; Kais, New Guinea, Wilhelm's Land, (Ortmann); Kema, Makassar, Celebes, (Schenkel); Noumea, New Caledonia, (Boone); Durban Bay, shores, South Africa, (Stebbing).

Material examined: Five males and three females, collected in Noumea, New Caledonia, September 19, 1931, by the "*Alva.*" This apparently establishes the first record of this species from New Caledonia.

Color: The color of the living species is not recorded.

Technical description: This species, in so far as represented in the "*Alva*" collection, is quite small; the largest specimen of the present series measuring 16 mm. width of carapace. It is most closely related to the preceding described species, *Uca annulipes* (Latreille), and is not infrequently taken in the same localities.

It is readily distinguished from *Uca annulipes* by the following characters: (a) The carapace is distinctly more rectangular, box-like, with the true lateral margins parallel, while the lateral margins of the dorsum are almost parallel. The posterior margin of the carapace is equivalent to two-thirds to three-fifths of the subparallel anterior margin; (b) In the male, the larger cheliped has the upper meral margins and inner carpal margin distinctly denticulate; the fingers are both acuminate, the upper finger being less hooked than is that of typical *U. annulipes* (Latreille), while the lower finger of *U. lactea* (De Haan) is acuminate, curved, never with a bifid, or notched-truncate tip as in *U. annulipes* (Latreille). The ridge on the inner surface of the palm is also distinctive.

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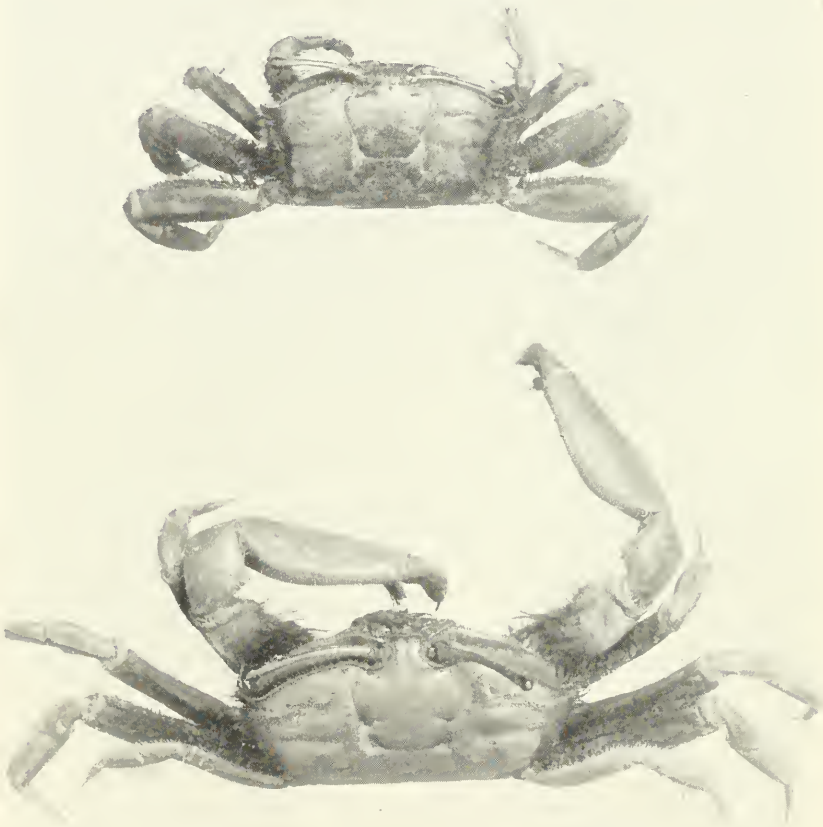
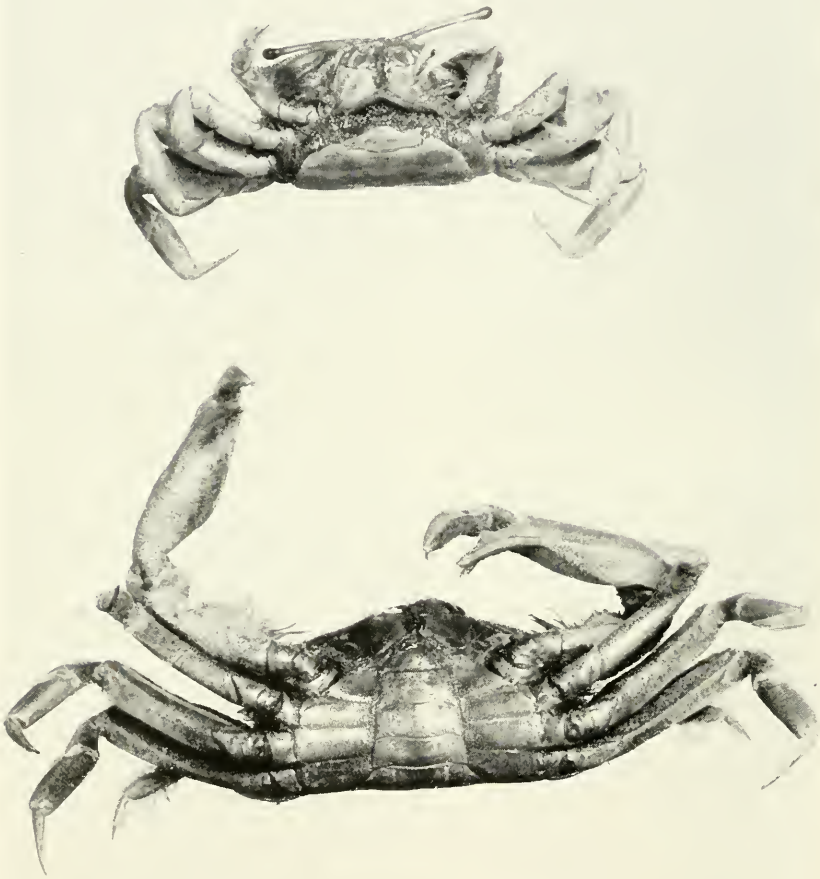
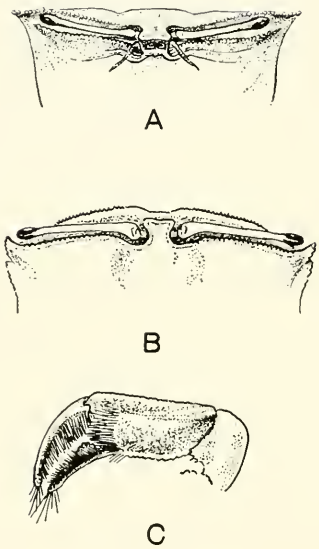


Macrophthalmus convexus Stimpson, upper figure female; lower figure male, × 1.5.



Macrophthalmus convexus Stimpson, upper figure female; lower figure male; × 1.5.



Macrophthalmus convexus Stimpson, A.—Frontal view of rostrum and orbit; B.—Dorsal view of same; both × 1.5; C.—Inner surface of male cheliped, showing hairy brush; × 1.

Subfamily: **Macrophthalminae.**

Genus: **MACROPHTHALMUS** Latreille.

Macrophthalmus convexus Stimpson.

Plates 104, 105 and 106.

TYPE: Mr. Stimpson's type came from the Loo Choo Islands, and was originally deposited in the museum of the Smithsonian Institute but is believed to be no longer extant.

Dr. A. Milne Edwards's type of *M. inermis* was from New Caledonia and he also stated in his original description that this species is also found in the Sandwich Islands. His specimens are deposited in the Paris Museum.

DISTRIBUTION: Loo Choo Islands, (Stimpson); Penang, Singapore, Indo-Malay Seas, (Miers); Koh Chang, Gulf of Siam, (Rathbun); Amboina, (de Man); Mergui Archipelago, Gulf of Manaar, (Kemp); Andamans, (Alcock); Kaiser Wilhelm's Land, New Guinea, Caroline Islands, Fiji Islands, Tahiti, Society Islands, Samoa, (Kemp); Hawaiian Islands, (A. M. Edwards); Australia, (Haswell; Miers); Mauritius, (Miers); New Caledonia, (A. M. Edwards; Boone).

MATERIAL EXAMINED: Eleven males and one ovigerous female taken by the "*Alva,*" at Noumea, New Caledonia, September 19, 1931.

TECHNICAL DESCRIPTION: Carapace high, rectangular, greatest width from tip to tip of the anterolateral spines; median length including the rostrum a trifle over one-half of this width, or exactly one-half without the rostrum. The rostrum is a short median process, constricted between the bases of the eyes and deflected, its frontal margin wider and truncate, the outer angles widely rounded. The orbital sinus extends the entire length of the carapace, with the inferior orbital margin projecting in advance of the superior margin, the wide orbital concavity also dorsally exposed; this inferior margin is moderately oblique for the greater part of its length, then curving concavely wider toward the anterolateral angle; the upper orbital margin is slightly sinuate, the distal anterolateral angle acute, procurved; both orbital margins are beaded with regularly spaced, rounded tubercles which diminish in size toward the center; on the upper orbital margin the carina is confluent with that of the rostral margin, which is devoid of denticles. At the base of the anterolateral tooth on the outer margin separated by an acute sinus there is a smaller tooth. The lateral margins are beaded, setose, moderately convergent, curved above the bases of the fifth pair of legs, continuous with the posterior margin

which is lightly carinate. The carapace has its dorsal surface moderately convex in both directions, tumid, the urogastric and cervical grooves deep and on either side of it two transverse depressions, the anterior of which is short and oblique; the second, longer one extends obliquely outward toward the lateral margin; the region between these sulci is quite tumid and emphasized on its outer portion by a concentration of large granules. The circumscribed gastric region is polished, smooth, except for a few small granules sparsely scattered toward the outer margins; the cardiac and intestinal regions are similarly nearly smooth; the outer postlateral margin and the branchial and hepatic regions are very nearly covered with coarse tubercles, these concentrating to form two clusters on the outer branchial region, beyond which the branchial area slopes abruptly to the margin. The sidewalls and more conspicuously the pterygostomian region are covered with rounded coarse granules. The excurrent channel is very sharply defined. The epistome is short, wide, sinuate, with carinate margins. The sternal plastron is smooth, except for microscopic granules. It is composed of five fused plates, corresponding to the five legs. The male belt is triangulate, seven-segmented, the first and especially the second article, being quite short, the seventh a blunt triangle. The female belt is widely oval, covering the entire sternal plastron; it is composed of seven segments. The eggs are quite minute; the female here illustrated has several thousand.

The external maxillipeds are close-fitting, nearly twice as wide as long, subrectangular. The exognath is linear, rodlike, its inner margin fitting beneath the endognath. The ischium of the endognath has its greatest width equal to the length of its straight outer lateral margin; the basal margin is very oblique, tapering inward; the inner lateral margin retreats obliquely toward the meral joint. The distal ischial margin is slightly oblique, the outer angle obtuse. The merus is bent upward and is wider than long, with its inner margin rounded and bordered by a wide, flat carina; the distal margin is concave and narrow and the outer lateral margin is convex, widening toward its proximal angle. The three-jointed palp has its basal article produced into a thickened, rimlike, outer lateral margin, the upper side of which fits closely under the epistome; the lower portion of the article is laminate, with the rounded lateral margin fitting beneath the merus; the second article is nearly as wide as long, rather fleshy; the third article is short, thick, conical; the lower lateral and outer distal margin of the peduncle is heavily fringed with thick-set setae; the outer lateral and distal margins of the other two segments are also heavily fringed.

The inner lateral margins of the merus and ischium also have heavy, close brushes of short, reddish brown setae.

The orifice above the base of the chelipeds has a very dense brush of thick long setae on its lower edge and a thinner fringe above on the upper edge.

The chelipeds of the male are subequal, two and one-third times as long as the carapace, with the three-sided merus projecting more than half of its length beyond the carpus, its anterior lateral margin setose and rough with coarse granules, which also emphasize the hinder lateral margin; both lower surfaces are covered with granules, the upper surface being comparatively smooth; the carpus is rounded on the upper surface, denticulate with a cluster of larger, spinose granules at the inner angle; the propodus is high and is twice as long as high, thickish, but laterally compressed, the upper margin subcarinate; the inner lateral surface curved; the upper outer surface convex, flattish; the lower distal portion deflected as are also the very curved fingers; the lower propodal margin is carinate, this carina extending to the tip of the finger; the lower surface is very granulose; the fingers are remarkably downbent, with a narrow, buttonhole-like gape; the tips are subacuminate, meeting. The lower finger has one, large, rounded, subbasal molar, the upper surface of which is cut into ten or twelve small denticles; the distal portion of the cutting edge is set with ten or twelve small, blunt teeth, semi-concealed beneath the fringe of setae along the *outer* margin; the upper finger is decidedly more curved than the lower one and has a small basal molar, beyond which the entire cutting edge is set with low, small, blunt teeth, also obscured by the *outer* fringe of setae. The entire inner lateral surface of both fingers and related distal end of the propodus are covered with densely set short setae and in addition there are at the tips of the fingers longer, reddish setae. In life, when the chelipeds are pressed against the carapace, these fingers are in position above the maxillipeds and the heavy setae may possibly serve as extra sieves for the muddy water.

The female chelipeds are equal to each other, but much weaker than those of a male of the same size, being only about as long as the carapace and quite fragile; the fingers lack the large molars and the inner setose patches of the male are only represented by a fringe of long reddish setae.

The ambulatories are quite slender, longish, increasing slightly in length in the order 1, 2, 3, the fourth pair being decidedly shorter and smaller than the first pair.

Each has the meral article laterally compressed, the upper lateral margin granulose and fringed with long setae. The carpus and propodus are shorter, thicker, the upper carpal margin terminating in a tooth that interfits with the proximal end of the propodus. The dactyl is long, acuminate, dorso-ventrally compressed, fluted on its upper and lower surfaces, which are widely triangulate.

The eyes are set upon very long, slender, cylindrical stalks, that have their jointed bases one on either side of the rostrum; the cornea is distal, lying beneath the anterolateral angle when retracted. The cornea has its dorsal surface interrupted by a linear continuation of the stalk which terminates in a blunt, rounded nodule distally. The lower surface of the cornea is a large, elongate oval that tapers to a short oval on the inner and upper surfaces.

The antennulae are fleshy, short and fold transversely within the fossett which is rather open and lies beneath the rostral margin.

The antennae also are quite short, the basal article distinctly bent and having the normal relation to the orbital sinus; the flagellum is composed of about eight short rings, the free portion of the antennae being about as long as the rostral margin.

References: *Macrophthalmus convexus* Stimpson, Proc. Acad. Nat. Sci. Phila., vol. 10, p. 97, 1858.—Miers, Ann. Mag. Nat. Hist., ser. 5, vol. V, p. 307, 1880.—Haswell, Catal. Austral. Stalk and Sessile-eyed Crust., p. 89, 1882.—de Man, Archiv. fur Naturges., Bd. 53, Abt. I, p. 354, pl. 15, fig. 4, 1887.—Ortmann, Zool. Jahrb. Syst., Bd. VII, p. 745, 1893–1894; Bd. X, p. 342, 1897–1898.—Rathbun, K. Danske Vid. Selsk. Skr., 7th raekke, Bd. 5, p. 323, 1911.—Kemp, Records Indian Museum, Calcutta, vol. 16, pl. 24, fig. 2, 1919.

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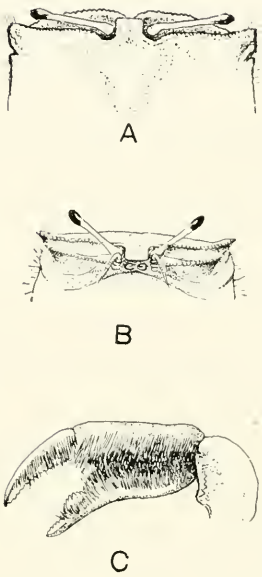
Macrophthalmus quadratus A. Milne Edwards.

Plates 107, 108 and 109.

Type: The type specimens were secured at New Caledonia and deposited in the Paris Museum d'Histoire Naturelle.

Macrophthalmus quadratus A. Milne Edwards, ×2; upper figure female; lower figure male.

Macrophthalmus quadratus A. Milne Edwards, × 2; upper figure female; lower figure male.



Macrophthalmus quadratus A. Milne Edwards, enlarged; A.—Dorsal view of frontal border of carapace; B.—Frontal view of same; C.—Inner surface of cheliped, showing hairy brush.

DISTRIBUTION: New Caledonia.

MATERIAL EXAMINED: Ten males and fourteen females (thirteen with eggs), collected at Noumea, New Caledonia, September 19, 1931, by the "*Alva.*"

COLOR: Violaceous brown.

TECHNICAL DESCRIPTION: This species is readily distinguished from the foregoing, *M. convexus,* by the fact that the carapace is more squarish, the length being four-fifths of the width; the sides are less convergent posteriorly, nearly parallel, up to the point where they curve above the fifth legs. The true frontal margin is also different, being squarish, scarcely at all constricted between the orbits, dorsally divided into two lobes by a distinct median longitudinal sulcus. The superior orbital margin is slightly sinuate and terminates distally in a blunt right-angled tooth; behind this, on the lateral margin and separated from it by a wider sinus than exists in *M. convexus,* is the first lateral tooth, also blunt right angled. The inferior orbital margin is dorsally visible, oblique, a little bowed, curving backward under the anterolateral angle. While the dorsal surface of the carapace is convex in both directions, it is less sloping toward the lateral margins than is that of *M. convexus.* The regions are more decisively defined in the present species. The gastric region is circumscribed and radiating from the cervical groove on either side is a curved sulcus extending to between the lateral teeth of the margin. Behind this is a second sulcus branching from the cervical groove and vanishing near the lateral branchial margin. The cardiac region is circumscribed and the intestinal region is defined clearly. There are very few dorsal granules in the present species, those present being in the hepatic and outer branchial regions. There is abundant fine pubescence which is especially thick on the lateral and posterior portions of the dorsal surface. The sidewalls are high, pubescent, granulose. The male belt is seven-segmented, but differs from that of *M. convexus* in that it has the seventh segment abruptly much narrower than the sixth and quite small, subtriangulate, with the apex rounded.

The eyestalks of the present species are shorter, conforming to the more compact body, but they do extend the entire length of the carapace; the cornea is large, terminal, with a small rounded process of the stalk at its outer tip.

The antennulae and antennae afford no specific characters.

The external maxillipeds are similar to those of *M. convexus.*

The chelipeds of the male are quite massive, subequal, about twice as long as the carapace; the merus is trigonal, stocky, much shorter than that of *convexus;* the carpus of *quadratus* is rounded, with a distinct inner angle, but less emphasized than that of *convexus;* the palm is similar in shape, very much deflected, laterally compressed with the upper portion bent over toward the carapace; the outer surface convex, smooth; the lower lateral edge is more compressed and there is no carina present, only a few rough, blunt granules on the lower inner surface; the lower finger is short, with a large subbasal molar and several shallow small teeth. The upper finger curves downward and has a rudimentary molar and similar small teeth. On the inner surface both fingers have the heavy brush of setae which in this species extends upon the palm to a much greater extent than in *convexus,* running back obliquely on the upper half to near the proximal border.

The ambulatories are of the same proportion and kind as in *convexus,* but *quadratus* has the dorsal margin of the merus, carpus and propodus much more setigerous.

References: *Macrophthalmus quadratus* A. Milne Edwards, Nouv. Archiv. Mus. Hist. Nat., t. IX, p. 280, pl. 12, fig. 6, 1873.

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