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**Hawaiian Portunidae**

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INTRODUCTION

This account of the swimming crabs of the Hawaiian Island region is the result of a critical study of material in Bishop Museum and in other collections. These collections have been assembled through the efforts of many individuals and by various means over a period of more than a half century. Shoal water forms have been taken by ardent collectors who carefully searched the shallow reefs and near-shore areas. Specimens from deeper water have been procured by divers; from fish traps; by small boats fitted for dredging at moderate depths; and by special expeditions.

During 1916 and 1917 Daniel Kuhns, by means of a small hand dredge, was able to collect numerous portunids off Waikiki, Oahu, at depths of 30 to 50 fathoms. Swimming crabs are also represented in material taken among the leeward islands of the Hawaiian Archipelago by the Tanager Expedition in 1923. In 1949 extensive dredging operations in off-shore waters of Oahu and nearby islands by the *Makua*, a boat of the Fish and Game Division of the Territorial Board of Agriculture and Forestry, brought in numerous portunids not represented in shoal water or on the reefs.

The most extensive single collection of Hawaiian Portunidae, however, was taken in 1902 by the U. S. S. *Albatross* which was capable of exploring the deeper waters about the islands. Twenty-six species of portunids were collected by that expedition, at least six of which have not been reported from this area in more recent years. The *Albatross* collection, now in the U. S. National Museum, Washington,

D. C., included in a report by Mary J. Rathbun (24), forms an important basis for the present paper.

In Miss Rathbun's report, five species of portunids were accredited to the Hawaiian area on the authority of earlier records, though they were not taken by the *Albatross*. I mention these five species in this paper, on the strength of the earlier reports and on the chance that they may again appear in local waters. Such a reappearance, although unlikely, is not altogether impossible, even with respect to near-shore dwelling portunids. Furthermore, I propose to show that new forms may yet be discovered in local waters, and that well-known species long overlooked about our shores have only recently been recognized as established representatives of the fauna.

The objectives of this paper are to bring together an account of the recognized Hawaiian portunids, to announce new forms, and to correct the record regarding others. Keys and illustrations are included to assist collectors in the identification of species. Most of the descriptions and illustrations are from preserved material in Bishop Museum. However, several species of portunids which have been recognized among Hawaiian fauna are not represented in the collections of Bishop Museum. Most of these I have examined in the U. S. National Museum; and I have prepared figures of them and consulted the original descriptions. The only species included in the report which I have not examined is *Libystes nitidus* A. Milne Edwards, the treatment of which has been drawn from authoritative sources.

Frequently, characters of the carapace, its surface, and its front and anterolateral border, along with the basal segment of the antenna, are sufficient to place swimming crabs in their proper taxonomic position. However, appendages, especially chelipeds, are valuable structures for the determination of species and are quite essential for the identification of some crabs. (See figure 1.) Moreover, the male pleopods are considered useful in the proper classification of species; and for that reason, the anterior male pleopods are figured in this paper for as many species of portunids as possible. It will be noted that there are remarkable differences in pleopods of closely related forms.

Some portunids may be collected in large numbers about the islands. Two species of *Thalamita* (*T. edwardsi* and *T. integra*) are especially abundant in shoal water. They are found under stones near the shoreline, sometimes together. However, *T. integra*, more than *T. edwardsi*, favors harbors, shallow bays, and mud flats. Portunids often move

swiftly when disturbed and show considerable hostility when cornered. Care should be exercised in picking up the larger forms, as they are capable of inflicting a severe pinch with their sharp chelae. Blocks of dead coral, when broken to pieces, may yield some of the more unusual forms of swimming crabs, which hide in crevices of the coral.

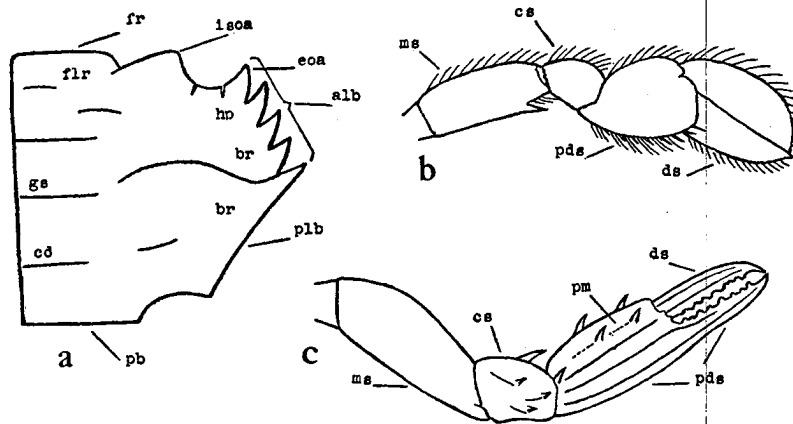


FIGURE 1.—Some typical features of a portunid crab. a, carapace (one half): *alb*, anterolateral border; *br*, branchial region; *cd*, cardiac region; *eoa*, external orbital angle; *flr*, frontal region; *fr*, front; *ga*, gastric region; *hp*, hepatic region; *isoa*, inner supraorbital angle; *pb*, posterior border; *plb*, posterolateral border. b, c, fifth leg and cheliped: *cs*, carpus (wrist); *ds*, dactylus (movable finger); *ms*, merus (arm); *pds*, propodus (palm and immovable finger if present); *pm*, palm.

The soft sand of the reef also shelters some species of portunids, especially the smaller forms with colors that harmonize with the environment in which they conceal themselves. When disturbed, a crab moves swiftly over the sand patch and suddenly disappears beneath the surface. It may be caught by quickly scooping up the sand. Only one Hawaiian portunid is known to lead a commensal existence, the small *Lissocarcinus orbicularis* which lives among the tentacles of holothurians, especially those of *Holothuria atra*, a large black form common on the reefs.

Such larger swimming crabs as *Portunus sanguinolentus*, *Podophthalmus vigil*, and *Scylla serrata*—which frequent bays, harbors, and sheltered situations about the islands—are often taken in traps and

baited nets. These larger forms are valued as food, and quantities of them are sold at the fish markets.

The swimming crabs receive the scientific designation of portunids from the name of the ancient Greek mythological god of ports and harbors, Portunus. Although the family Portunidae comprises an apparently homogeneous group of crabs, there is some difficulty in specifying characters embracing every known swimming crab. There are certain features, however, which, for all general purposes, cover the group and, with the keys appearing in this paper, should enable one to recognize a portunid and to place in proper position most of the species found in local waters.

The general characters of the family are as follows: The carapace is usually broader than long, depressed or slightly convex; the regions of the carapace are seldom well-defined; the front is generally broad, toothed, or lobed; the anterolateral borders are usually cut into teeth or lobes, ranging up to nine in number; and the fifth legs are typically modified for swimming, their last two segments usually flattened and more or less paddle-like. As pointed out by Tesch (31), in addition to these general features, other characters typical of portunids include elongated chelipeds, a broadly triangular abdomen in the male with all but the last two segments fused, and two membranous expansions on the inner side of the endopodite of the first maxilliped.

For nearly all of the preceding characters applicable to the family Portunidae there are possible exceptions. For this reason, characteristics of the family should be considered with the features of the lesser groups, which are keyed and are more specific. Even the flattened fifth leg which, it would seem, should be an inclusive feature of all swimming crabs, fails as a means of identification in some portunids. In these, the last leg is narrow and adapted for running (gressorial), instead of being flattened and adapted for swimming (natatorial). To this last character, however, there are few exceptions among the swimming crabs, and the more or less expanded condition of the propodus and dactylus of the fifth leg remains a good criterion for a hasty recognition of most portunid crabs.

Special attention should be called to the genera *Catoptrus* and *Libystes*, the taxonomic positions of which have been considered by various authorities, not all of whom have been in agreement. In this paper I have accepted the opinion of Tesch (31) who, although he discusses the two genera under the family Goneplacidae, expresses

the belief that *Catoptrus* rightly belongs in the family Portunidae and that *Libystes*, though closely related to *Carcinoplax* of the family Goneplacidae, shows even greater resemblance to the true swimming crabs. Furthermore, Tesch suggests that there is no special difference between the genera *Catoptrus* and *Libystes*. Although I am treating these genera as Portunidae, they are regarded in this paper as distinct from each other and are placed close to *Carupa*.

Furthermore, a difference of opinion persists among writers with respect to which generic term, *Portunus* or *Neptunus*, should properly designate an important group of swimming crabs. Rathbun (23) supports the use of the generic name *Portunus* Weber, 1795, over that of *Neptunus* de Haan, 1833, and consistently follows that nomenclature in her systematic papers. In this paper I have accepted the view of Rathbun, but many writers consider *Neptunus* preferable.

Neither the brief characterization of well-known forms reported in this account nor the accompanying figures are meant to supply complete descriptions of the species, but are given primarily to guide the collector in the identification of specimens. The references cited should be consulted for fuller consideration of the species.

Since the carapace of a crab is typically bilaterally symmetrical, features of the carapace are, in most instances in the following report, illustrated by a sketch of but one-half its area.

In the keys and descriptions of groups or species of portunids which follow, wherever the frontal lobes or teeth are enumerated the number stated is exclusive of the inner supraorbital angle, which is usually lobe-like. But with respect to the anterolateral teeth or lobes, the number indicated includes the outer orbital angle which represents the first tooth or lobe.

## FAMILY PORTUNIDAE

### Key to Hawaiian subfamilies of Portunidae

- A. Front typically broad; eyes on short stalks.
1. Carapace broadly elliptical, smooth and glabrous; front of two or four lobes; anterolateral border toothed or entire; dactylus of fifth leg styliform..... **Catoptrinae.**
  2. Carapace not elliptical, little broader than long; anterolateral border lobed or toothed; dactylus of fifth leg clawlike, lanceolate, or broadened for swimming.
    - a. Antennal flagellum resting in orbital hiatus; front of three or four lobes or teeth; anterolateral teeth five or six; dactylus of fifth leg variable.

- b. Front consisting of three lobes; anterolateral teeth five in number; dactylus of fifth leg lanceolate.....**Carcininae.**
- bb. Front consisting of four teeth; anterolateral teeth five or six in number; dactylus of fifth leg broadened for swimming .....**Portuninae.**
- aa. Antennal flagellum excluded from orbital hiatus; front not toothed; anterolateral lobes or teeth four or five in number; dactylus of fifth leg clawlike or broadened for swimming .....**Caphyrinae.**
- 3. Carapace typically broader than long; front consisting of two to six lobes or teeth; anterolateral teeth four to nine in number; dactylus of fifth leg broadened for swimming.....**Lupinae.**
- B. True front very narrow; eyes on long stalks.....**Podophthalminae.**

SUBFAMILY CATOPTRINAE

Key to Hawaiian genera of Catoptrinae

- A. Front consists of two broad lobes; anterolateral border of carapace bearing six teeth or entire.
  - 1. Anterolateral teeth six in number; fifth leg slender, not adapted for swimming .....**Catoptrus.**
  - 2. Anterolateral border entire, granular, or toothed; dactylus of fifth leg narrow or broadened for swimming.....**Libystes.**
- B. Front consists of four rounded lobes; anterolateral teeth seven in number, the sixth the largest; fifth leg slightly flattened.....**Carupa.**

Genus **Catoptrus**

Key to Hawaiian species of Catoptrus

- A. Anterolateral teeth minute, the last the largest; lower orbital margin without denticles.....**Catoptrus inaequalis.**
- B. Fifth anterolateral tooth the smallest, the last the longest; lower orbital margin bearing three denticles.....**Catoptrus nitidus.**

**Catoptrus inaequalis** (Rathbun), U. S. Fish Comm., Bull. 23 (3): 870, 1903 (1906).—Tesch, Siboga-Exped., Monogr, 39c<sup>1</sup>: 180, 1918.—Edmondson, B. P. Bishop Mus., Sp. Pub. 22: 277, 1946. (See figures 2, *a-d*; 3, *a*.)

Front consists of two broad, straight lobes which merge directly into orbital margin; six minute teeth borne on anterolateral border, the last being largest. Chelipeds larger than walking legs, all long, slender, and smooth; dactylus of last leg not adapted for swimming.

This smooth, white crab, usually less than 0.5 inch in breadth of carapace, may readily be distinguished from the next species (*C. nitidus*) by the absence of denticles on the lower orbital margin and by the simple cylindrical eyestalks, which are without tubercles or

enlargements. Rathbun (24) describes the species under the name *Goniocaphyra inaequalis*. It is not uncommon about the islands, in shallow water as well as at moderate depths. Bishop Museum has examples from several localities about Oahu at depths down to about 50 fathoms. The *Albatross* dredged the species at numerous stations in the vicinity of Kauai, and between Molokai and Maui. It was abundant in the latter area, which is the type locality. Near Kauai, the species ranged to a depth of 179 fathoms. Numerous specimens were taken by the Tanager Expedition at Johnston Island, concealed in dead coral heads in shallow water.

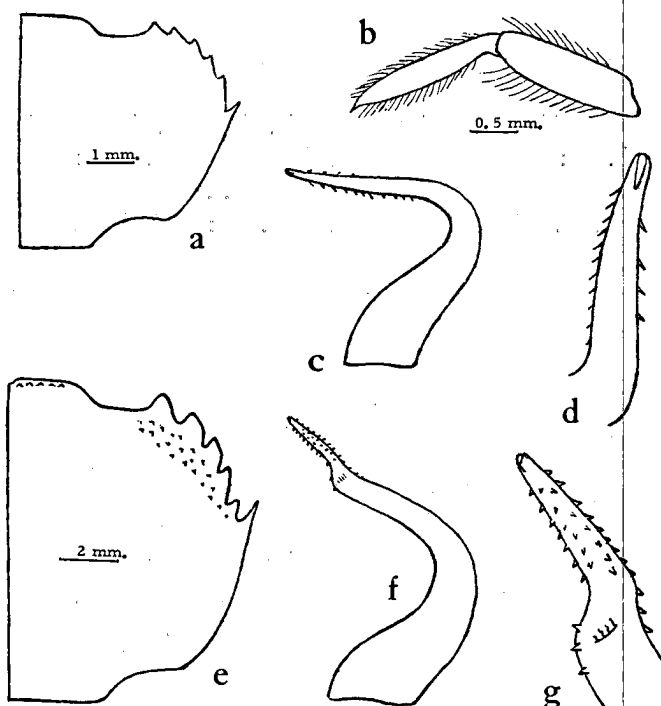


FIGURE 2.—a-d, *Catoptrus inaequalis*: a, outline of half-carapace; b, tip of fifth leg; c, first pleopod, male; d, tip of c. e-g, *C. nitidus*: e, outline of half-carapace; f, first pleopod, male; g, tip of f.

The general distribution of the species covers a wide area. It is known from the vicinity of the Seychelles, in the Indian Ocean, and from the coast of Celebes, as well as from the central Pacific Ocean.

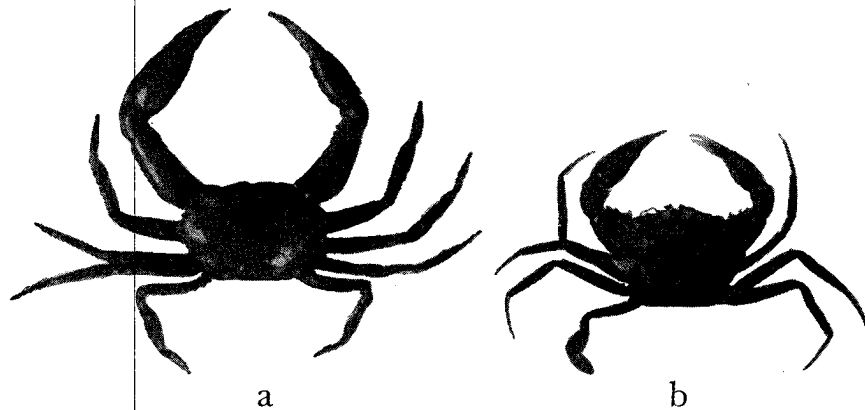


FIGURE 3.—a, *Catoptrus inaequalis*; b, *Carupa laeviuscula*.

*Catoptrus nitidus* A. Milne Edwards, de Man, Archiv für Naturgesch. 53: 339, 1888.—Tesch, Siboga-Exped. 39c<sup>1</sup>: 179, 1918.—Sakai, Studies on crabs of Japan, IV . . ., 372, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. 22: 277, 1946. (See figure 2, e-g.)

Carapace smooth and glabrous, as in *C. inaequalis*, but a larger species; carapace sometimes reaching about 1 inch in breadth. Front straight, without a notch at junction with orbital margin. Anterolateral border of carapace with six teeth, the fifth often small and the sixth longest of all. Chelipeds unequal, fingers of smaller hand longer than those of larger one. Fifth leg not adapted for swimming.

Apparently this species, known to some authors as *Goniocaphyra truncatifrons*, has a very wide distribution. There are records from Indian Ocean localities; from Japanese waters; from the Marshall, Gilbert, and Ellice Islands; from Fiji; and from Samoa, as well as from Hawaii. The *Albatross* took none during 1902, and Bishop Museum has few specimens from local waters. One bright orange-colored specimen was taken from shallow water in Kaneohe Bay, Oahu, and another was taken on an Oahu coral reef. A third specimen in the Museum collection was dredged by the *Makua* off Virginia Head, Kauai, in 16 fathoms of water. The carapace of the largest specimen I have examined is 17 mm. in breadth.

Features other than size which readily distinguish this species from *C. inaequalis* include three prominent denticles borne on the lower orbital margin and a basal thickening of the eyestalk, as well as a slight enlargement on its anterior border near the cornea.



Genus *Libystes*Key to Hawaiian species of *Libystes*

- A. Borders of carapace and legs without hair.....*L. nitidus*.  
 B. Borders of carapace and legs densely haired.....*L. villosus*.

*Libystes nitidus* A. Milne Edwards, Nouv. Arch. Mus. d'Hist. Nat. Paris, Bull. 4: 83, 1868.—Alcock, Asiatic Soc. Bengal, Jour. 68 (2): 307, 1899 (1900).—Rathbun, U. S. Fish Comm., Bull. 23 (3): 834, 1903 (1906).—Tesch, Siboga-Exped., Monogr. 39c<sup>1</sup>: 177, 1918. (See figure 4, *a, b*.)

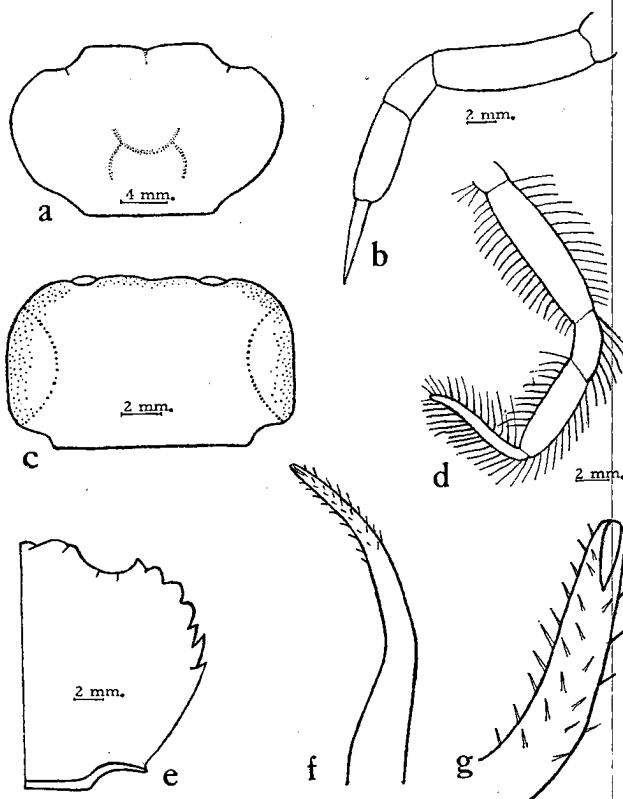


FIGURE 4.—*a, b*, *Libystes nitidus*: *a*, outline of carapace; *b*, fifth leg. *c, d*, *L. villosus*: *c*, outline of carapace; *d*, fifth leg. *e-g*, *Carupa laeviuscula*: *e*, outline of half-carapace; *f*, first pleopod, male; *g*, tip of *f*. (*a, b*, after Edwards.)

Carapace broad, smooth and glabrous; front consists of two broad lobes with a slight depression in middle. Anterolateral borders smooth and entire. Chelipeds and walking legs smooth, unarmed and without hair; dactylus of fifth leg styliform.

Specimens are about 1 inch in breadth of carapace.

This species is reported from the Red Sea, Djibuti, Zanzibar, Formosa, and Hawaii. It is accredited to Hawaii by Rathbun on the authority of Cano (5). However, no specimens were taken by the *Albatross*, and apparently the species has not been observed in Hawaiian waters in recent years.

The species *L. alphonsi* Alcock is very close to, if not identical with, *L. nitidus*.

**Libystes villosus** Rathbun, Biol. Soc. Washington, Proc. 37: 127, 1924.—Edmondson, B. P. Bishop Mus., Occ. Papers 20 (13): 223, 1951. (See figure 4, *c, d.*)

Carapace broad, strongly convex anteroposteriorly, smooth, with tufts of shaggy hair on anterior and anterolateral borders, which are entire. Surface of chelipeds and margins of walking legs also densely haired. Dactylus of fifth leg not flattened for swimming, but slightly falcate.

This species, apparently rare in Hawaiian waters, as it is elsewhere, may be recognized by the shape of the carapace and the hairy carapace and legs. It is described by Rathbun from Apia, Samoa; and few other records of the form are known. Bishop Museum has a specimen collected in shallow water at Wake Island and three specimens which were dredged by the *Makua* from two localities about Oahu at depths of 30 and 40 fathoms.

One known species of the genus, *Libystes edwardsi* Alcock, taken from the Persian Gulf and the Andaman Islands, differs from others, in that the last leg is distinctly flattened and paddle-like, apparently adapted for swimming. Furthermore, the anterolateral border of this species is toothed, much like *Catoptrus nitidus*.

#### Genus *Carupa*

**Carupa laeviuscula** Heller, Alcock, Asiatic Soc. Bengal, Jour. 68 (2): 26, 1899 (1900).—Rathbun, U. S. Fish Comm., Bull. 23 (3): 870, 1903 (1906).—Sakai, Studies on crabs of Japan IV . . . , 373, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. 22: 278, 1946. (See figures 3 *b*; 4, *e-g.*)

A small, smooth crab, about 1 inch in breadth of carapace. Front consists of four convex lobes, the median pair being the smaller; lateral frontal lobe separated from narrow, rounded supraorbital angle by a slight notch. Antero-lateral border of carapace bears seven teeth, the first four of which are often obtuse, the last three dentiform; fifth and seventh teeth small, sixth large. Chelipeds usually unequal in size; anterior border of arm with three teeth, and a stout spine at the inner angle of the carpus. Walking legs smooth, the last one flattened for swimming.

This species, which has a wide distribution through the Indian and Pacific Oceans, is the only species of the genus recorded from the Hawaiian Islands. Bishop Museum has many specimens from the Hawaiian area, taken on the reefs and from depths of a few fathoms.

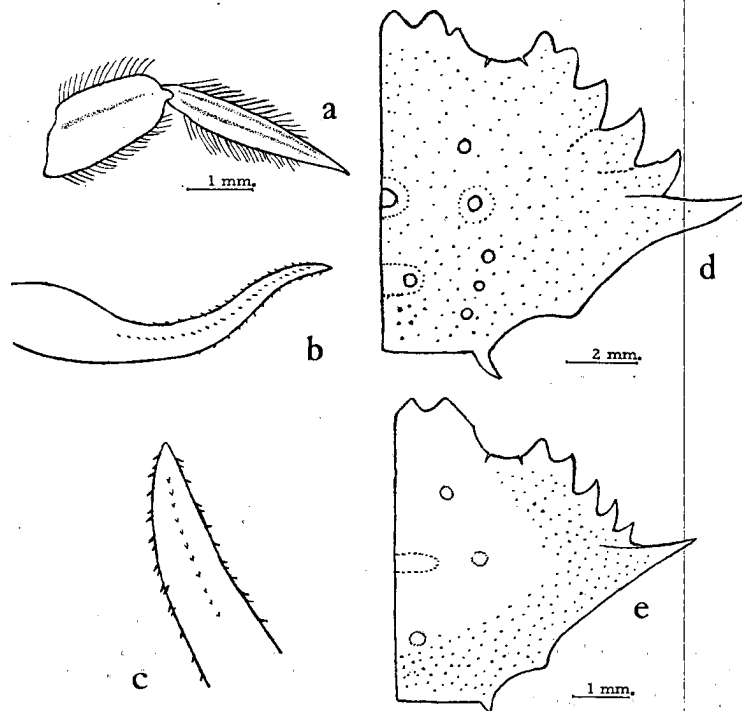


FIGURE 5.—a-c, *Carcinides maenas*: a, tip of fifth leg; b, first pleopod, male; c, tip of b. d, *Parathranites hexagonum*, outline of half-carapace. e, *P. latibrachium*, outline of half-carapace.

SUBFAMILY CARCININAE

Genus **Carcinides**

**Carcinides maenas** (Linnaeus), Streets, U. S. Nat. Mus., Bull. 7: 189, 1877.—Alcock, Asiatic Soc. Bengal, Jour. 68 (2): 13, 1899 (1900).—Rathbun, U. S. Fish Comm. Bull. 23 (3): 867, 1903 (1906). (See figures 5, *a-c*; 6, *a*.)

Carapace a little broader than long, somewhat convex, areas outlined by broad, shallow grooves; minute granules scattered over frontal and lateral areas. Front consists of three lobes; the median one the most acute. Anterolateral border of carapace bears five teeth, the first four broad, the fifth narrower and sharper. Chelipeds unequal, smooth; walking legs smooth, with some hair on the margins; dactylus of fifth leg lanceolate.

Only one species of the genus is recognized. This medium-sized shore crab, which is almost cosmopolitan in its distribution, is mentioned here on the authority of Streets (29), who records it from Hawaii. So far as I can determine, there is no other record of the species from Hawaii, and its presence here now is very doubtful. I have not seen living examples of the species.

The specimen illustrated (fig. 6, *a*) is from Point Phillips, Australia. Its carapace is 46 mm. broad.

SUBFAMILY PORTUNINAE

Genus **Parathranites**

Genus *Parathranites*.

Front with four teeth; six anterolateral teeth in known Hawaiian forms; dactylus of fifth leg broadly oval; an upturned spine at either extremity of posterior border of carapace.

Only the one genus is reported from Hawaii.

Key to Hawaiian species of *Parathranites*

- A. First two anterolateral teeth blunt, the sixth a long spine; spines of posterior border of carapace large.....**P. hexagonum.**
- B. First of the anterolateral teeth blunt, the sixth a long spine; spines of posterior border of carapace small.....**P. latibrachium.**

**Parathranites hexagonum** Rathbun, U. S. Fish Comm., Bull. 23 (3): 867, 1903 (1906). (See figure 5, *d*.)

Carapace broader than long, overall breadth 21.5 mm. Front of four blunt teeth, the medians a little narrower than the laterals, which are separated from

the small inner supraorbital angles by a shallow notch. Of the six anterolateral teeth, first and second are blunt, and separated by a slight notch; the three following are broad, acutely pointed; the last is a long spine. Uprturned spines of posterior border of carapace are large. Upper surface of carapace somewhat irregular with tuberculate elevations, and small tubercles scattered over entire area.

Surface of chelipeds granular. Arm with a sharp spine about middle of anterior border. Anterior border of carpus bears a long, stout spine; outer border granular with three or four tubercles, one or two of which are sharp. Upper border of palm with two granular crests, the inner one bearing a distal tooth, the outer one with two teeth. Two indistinct ridges on outer surface of palm, the lower one extending on the immovable finger. Fingers long, slender, slightly curved inward. Propodus of fifth leg without spinules on posterior border.

The type specimen was dredged by the *Albatross* south of Molokai at 92 to 212 fathoms. Another small specimen was taken during the same survey near Kauai at 233 to 40 fathoms. No other records of the species are known. Both specimens are in the U. S. National Museum, Washington, D. C.

**Parathranites latibrachium** Rathbun, U. S. Fish Comm., Bull. 23 (3): 868, 1903 (1906). (See figure 5, *e*.)

Type specimen carapace has overall width of 10.8 mm. Front consists of four blunt, triangular teeth, the medians narrower than the laterals, which slope down to a very inconspicuous inner supraorbital angle. Of the six anterolateral teeth, the first is blunt, the next four are sharp, decreasing in size, and the sixth is a long straight spine. Uprturned spines of posterior border of carapace small.

Upper surface of carapace with tuberculate elevations less prominent than those of *P. hexagonum*, and microscopic tubercles chiefly confined to cardiac and brachial regions.

Arm of cheliped with three spines on anterior border and one minute one on posterior distal border. Carpus with a very long spine on inner border and a smaller one on outer border. Palm with two crests on upper border, inner one terminating distally in a prominent spine; a sharp tooth at junction of palm with carpus; outer surface of palm granular and pilose, bearing three crests. Propodus of fifth leg without spinules.

The only known specimen (the type) was dredged by the *Albatross* near Nihoa Island at 20 to 30 fathoms. It is in the U. S. National Museum.

#### SUBFAMILY CAPHRINAE

##### Key to Hawaiian genera of Caphrinae

- A. Front not greatly produced in middle; propodus and dactylus of fifth leg not circular segments.....**Lissocarcinus.**  
 B. Front produced into a blunt lobe in middle; propodus and dactylus of fifth leg both circular segments.....**Coelocarcinus.**

Key to Hawaiian species of *Lissocarcinus*

- A. Front slightly produced in middle; anterolateral lobes blunt, confluent.....*L. orbicularis*.  
B. Front not produced in middle; anterolateral teeth well-defined.....*L. laevis*.

*Lissocarcinus orbicularis* Dana, U. S. Exploring Exped., Crustacea 13: 288, 1852 (pls., 1855).—Alcock, Asiatic Soc. Bengal, Jour. 68 (2): 20, 1899 (1900).—Rathbun, U. S. Fish Comm., Bull. 23 (3): 868, 1903 (1906).—Sakai, Studies on the crabs of Japan IV . . ., 378, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. 22: 278, 1946. (See figures 6, *b*; 7, *a-c*.)

Carapace almost circular, with a prominent front and thin, anterolateral borders, which are cut into five very shallow lobes, the last of which is small. Carapace and legs spotted with black. Full-grown specimens about 0.5 inch in breadth of carapace.

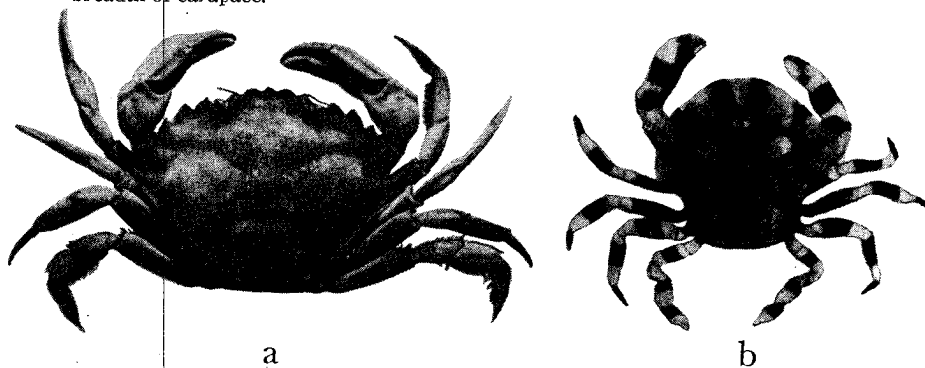


FIGURE 6.—*a*, *Carcinides maenas*; *b*, *Lissocarcinus orbicularis*.

This small crab represents a typical commensal living among the tentacles of certain holothurians of the shallow reefs. In Hawaii, the host of the crab is commonly *Holothuria atra*. As the tentacles of the holothurian are contracted, the crab clinging to them may be drawn into the mouth of the sea cucumber and wholly concealed.

This crab has a very wide distribution in the Indian and Pacific Oceans, following the dispersal of the holothurians with which it associates. Bishop Museum has many specimens from the Hawaiian area and examples from Wake and Fanning Islands.

*Lissocarcinus laevis* Miers, Challenger Repts., Zool. 17 (49): xlvii, 1886.—Rathbun, U. S. Fish Comm., Bull. 23 (3): 869, 1903 (1906).—Sakai, Studies on the crabs of Japan IV . . ., 379,

380, 1939.—Edmondson, B. P. Bishop Mus., Occ. Papers 20 (13); 220, 1951. (See figure 7, *d-f*.)

Carapace less than 0.5 inch across, a little broader than long, surface convex, microscopically granular. Front advanced, consisting of two broad lobes, each slightly concave in middle. Anterolateral border bears five teeth, the first and fifth smaller than the others; the last one the smallest and sharpest of all. Chelipeds and walking legs smooth; dactylus of fifth leg flattened for swimming.

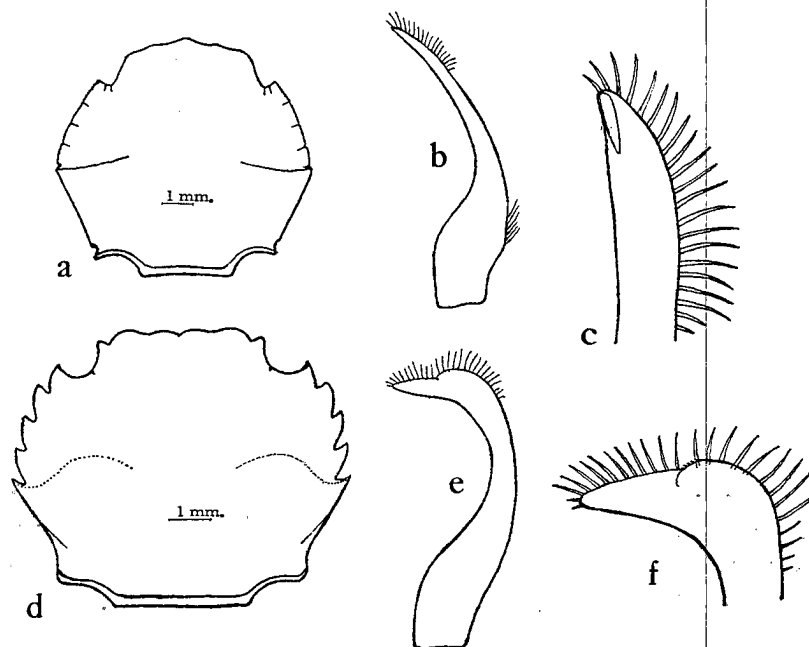


FIGURE 7.—*a-c*, *Lissocarcinus orbicularis*: *a*, outline of carapace; *b*, first pleopod, male; *c*, tip of *b*. *d-f*, *L. laevis*: *d*, outline of carapace; *e*, first pleopod, male; *f*, tip of *e*.

This species, apparently without commensal relationship, has not been observed on the reefs, but is taken from moderate depths. The *Albatross* procured one specimen from off the northeast coast of the island of Hawaii at 77 to 75 fathoms. Bishop Museum has specimens from six localities in the Hawaiian area, all dredged by the *Makua* at depths down to about 50 fathoms. In some living specimens, bilaterally symmetrical color patterns of dark purple mark the white carapace.

Genus **Coelocarcinus**

**Coelocarcinus foliatus** Edmondson, B. P. Bishop Mus., Occ. Papers 9 (10) : 13, 1930. (See figures 8; 9, *a-c*.)

Carapace subcircular, about 9 mm. in both length and breadth, produced into a blunt lobe in front. Anterolateral border consists of four blunt, confluent lobes. Both propodus and dactylus of fifth leg are circular segments.

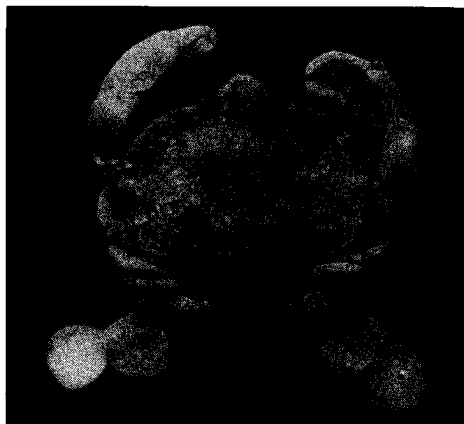


FIGURE 8.—*Coelocarcinus foliatus*.

This is the only known species of the genus. A new genus and species are established to accommodate this unique portunid, of which a single specimen was taken from a dead coral block in shallow water on Waikiki reef, Oahu. The specimen is in Bishop Museum.

SUBFAMILY LUPINAE

Key to Hawaiian genera of Lupinae

- A. Flagellum of antenna resting in the orbit.
  - 1. Anterolateral teeth typically nine in number, alternately large and small ..... **Lupocyclus**.
  - 2. Anterolateral teeth nine or less in number, never alternately large and small.
    - a. Anterolateral teeth nine in number, all large..... **Scylla**.
    - aa. Anterolateral teeth nine or less, the last the largest or the smallest ..... **Portunus**.
- B. Flagellum of antenna excluded from orbit.
  - 1. Front moderately broad; anterolateral border strongly or moderately oblique and arched, cut into five to seven teeth.
    - a. Anterolateral border strongly oblique and arched, cut into six or seven teeth..... **Charybdis**.



- aa. Anterolateral border moderately oblique and arched, cut into five teeth ..... **Thalamonyx.**
2. Front very broad; anterolateral border little oblique or arched.
- a. Lateral border of carapace typically cut into five or four teeth anteriorly, not strongly converging posteriorly from second tooth ..... **Thalamita.**
- aa. Lateral border of carapace cut into four or three teeth anteriorly, strongly converging posteriorly from second tooth....  
..... **Thalamitoides.**

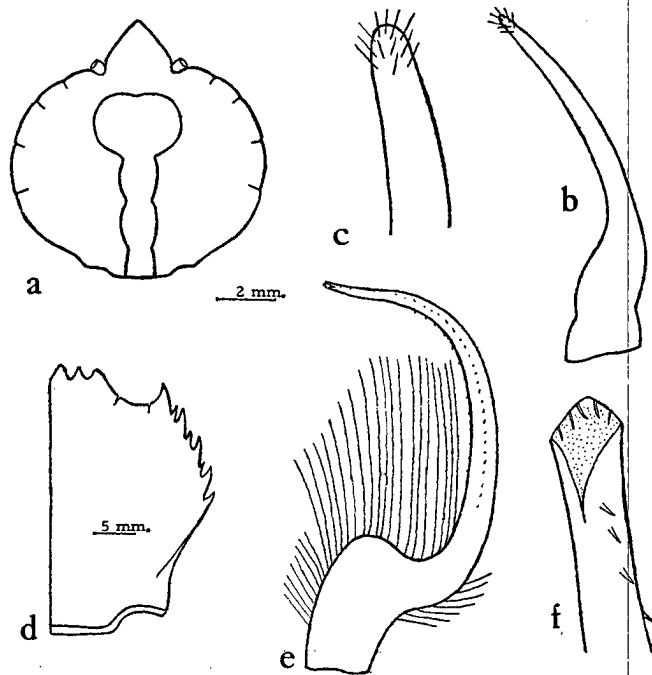


FIGURE 9.—a-c, *Coelocarcinus foliatus*: a, outline of carapace; b, first pleopod, male; c, tip of b. d-f, *Lupocyclus quinquedentatus*: d, outline of half-carapace; e, first pleopod, male; f, tip of e.

#### Genus *Lupocyclus*

*Lupocyclus quinquedentatus* Rathbun, U. S. Fish Comm., Bull. 23 (3): 869, 1903 (1906). (See figures 9, d-f; 10, a.)

Carapace a little broader than long; front consists of four teeth, the median pair the stouter. Of the five larger anterolateral teeth the first, or orbital, is the strongest. A minute tooth occupies each of the first three sinuses.

*L. quinquedentatus*, the only species of the genus reported from the Hawaiian Islands, is not likely to be found in shoal water or on the

reefs. The *Albatross* took specimens at a number of stations about the islands in depths down to 83 fathoms. Daniel Kuhns, in 1916, dredged a specimen from off Waikiki, Oahu, at a depth of 50 fathoms; and 17 specimens were taken by the *Makua* at one station, and in one haul, southwest of Oahu, at 58 fathoms. Of these specimens, 16 were juveniles. The carapace of the largest specimen measured 40 mm. in breadth. There is no appearance of a small tooth in the last antero-lateral sinus. The species has not been reported outside of the Hawaiian area.

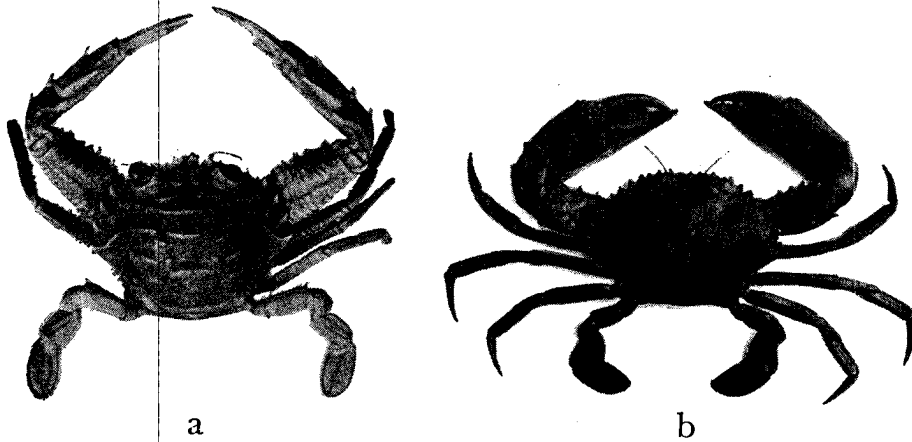


FIGURE 10.—a, *Lupocyclus quinquedentatus*; b, *Scylla serrata*.

#### Genus *Scylla*

*Scylla serrata* de Man, Alcock, Asiatic Soc. Bengal, Jour. 68 (2): 27, 1899 (1900).—Sakai, Studies on the crabs of Japan IV . . . , 384, 1939.—Leene, Siboga-Exped., Monogr. 39c<sup>3</sup>: 14, 1938.—Edmondson, B. P. Bishop Mus., Sp. Pub. 22: 278, 1946. (See figures 10, b; 11, a-c.)

Carapace broader than long, quite smooth, moderately convex. Front consists of four blunt teeth of about equal size; inner supraorbital angle resembles a frontal tooth; a prominent tooth at median angle of suborbital border; antero-lateral border bears nine strong, sharp teeth. Chelipeds of male huge and powerful.

Only one species of the genus is recognized. This largest portunid of local waters was introduced into Hawaii from the south seas many years ago and has become well-established. It thrives in bays and

estuaries and in the brackish water of rivers. Large specimens may exceed 8 inches in breadth of carapace and weigh several pounds. This crab, known locally as the "Samoan" crab, is valued as food and brings a fancy retail price at the Honolulu fish markets.

This species has a wide distribution from the Red Sea through the Indian and Pacific Ocean to Japan, Tahiti, and Hawaii. It has long been an important food crab of India and probably has been dispersed largely by man because of its economic value.

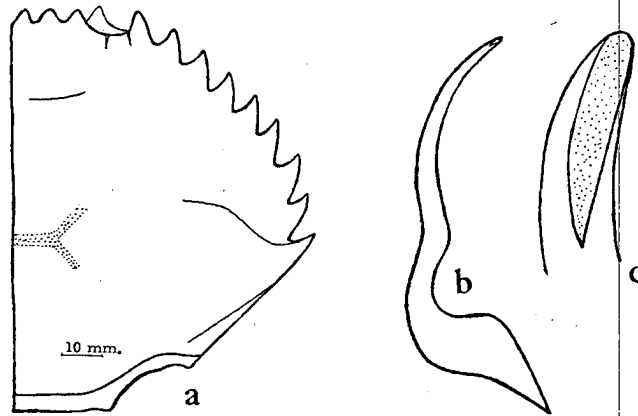


FIGURE 11.—*Scylla serrata*: a, outline of half-carapace; b, first pleopod, male; c, tip of b.

### Genus *Portunus*

#### Key to Hawaiian species of *Portunus*

- A. Without an evident stridulating apparatus.
  - 1. Anterolateral teeth nine in number.
    - a. Last anterolateral tooth largest.
      - b. No tooth on posterior border of carapace.
        - c. Carapace more or less convex, not granular.
          - d. Carapace slightly convex, without pubescence  
.....*P. sanguinolentus*.
          - dd. Carapace moderately convex, with pubescence  
.....*P. pubescens*.
        - cc. Carapace depressed, more or less granular.
          - d. Surface of carapace with granular pustules;  
last anterolateral tooth much the strongest.....  
.....*P. (Achelous) argentatus*.
          - dd. Surface of carapace without pustules; granules  
scattered; last anterolateral tooth slightly the  
strongest.....*P. (Achelous) granulatus*.

- bb. A tooth at each extremity of the posterior border of carapace; last anterolateral tooth very long.....*P. (Xiphonectes) longispinosus*.  
 aa. Last anterolateral spine the smallest.....*P. (Achelous) orbicularis*.  
 2. Anterolateral teeth less than nine in number.....*P. (Xiphonectes) macrophthalmus*.  
 AA. With evident stridulating apparatus.....*P. (Portunus) oahuensis*.

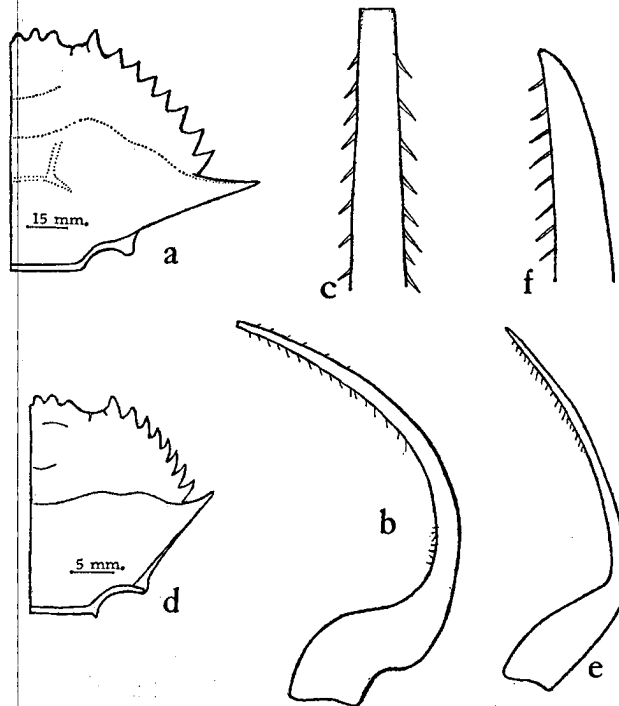


FIGURE 12.—a-c, *Portunus sanguinolentus*: a, outline of half-carapace; b, first pleopod, male; c, tip of b. d-f, *P. pubescens*: d, outline of half-carapace; e, first pleopod, male; f, tip of e.

***Portunus sanguinolentus*** (Herbst) Alcock, Asiatic Soc. Bengal, Jour. 68 (2); 32, 1899 (1900).—Rathbun, U. S. Fish Comm., Bull. 23 (3): 876, 1903 (1906).—Sakai, Studies on the crabs of Japan IV . . ., 385, 387, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. 22: 280, 1946. (See figures 12, a-c; 13, a.)

Carapace smooth; front bears four teeth, median pair the smaller. Nine sharp teeth on anterolateral border, the last one large and projecting straight out. Three large red spots in a transverse line mark posterior portion of carapace.

Large specimens may reach 7 inches in transverse measurement of the carapace, between the bases of the long spines.

This species is preeminently the market crab of Hawaii. It is abundant in bays, where it is taken in large numbers by net fishermen. Although the chelipeds and walking legs of this portunid are very slender and supply little edible muscle compared with the huge appendages of *Scylla serrata*, *Portunus sanguinolentus* is more plentiful and the larger numbers help make up for the difference in size of the edible parts.

This species is widely dispersed through the Indian and Pacific Oceans.

**Portunus pubescens** (Dana), U. S. Exploring Exped., Crustacea 13: 274, 1852 (pls., 1855).—Rathbun, U. S. Fish Comm., Bull. 23 (3): 870, 1903 (1906).—Sakai, Studies on the crabs of Japan IV . . ., 388, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. 22: 280, 1946. (See figures 12, *d-f*; 13, *b*.)

Carapace smaller (about 2 inches broad in large specimen) and more convex than that of *P. sanguinolentus*. The four teeth of the front are nearly equal in size. Of the nine anterolateral teeth, the last is the largest. Surface of carapace and appendages covered with soft, short hairs (pubescence).

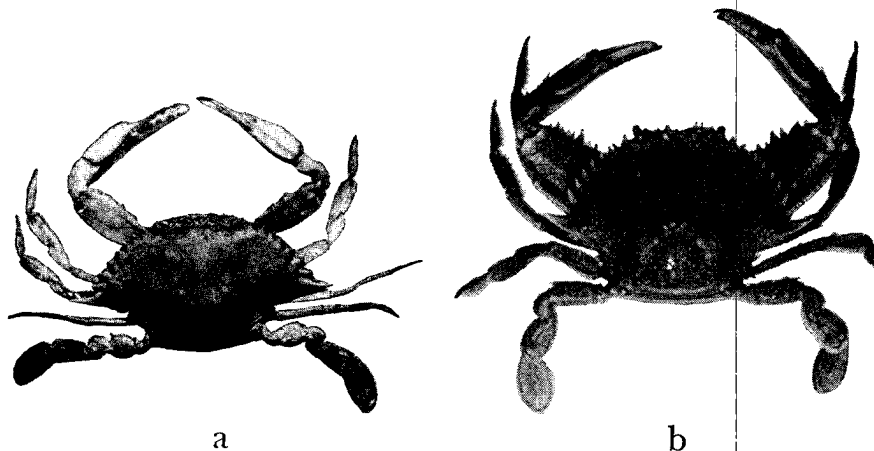


FIGURE 13.—a, *Portunus sanguinolentus*; b, *P. pubescens*.

This portunid is not uncommon on the reefs about the Hawaiian Islands where it conceals itself in the sand. Bishop Museum has specimens from Oahu, from the leeward islands of the Hawaiian chain, and from Palmyra Island. *P. pubescens* is also reported from Japanese waters, but no other records of its occurrence are known.

In 1935 I described (9) a minute portunid taken on an Oahu reef without specific designation. Its small size (6 mm. broad) precluded exact determination; but, on reexamination, I believe the form may represent a juvenile *P. pubescens*.

**Portunus (Achelous) argentatus** (A. Milne Edwards), Rathbun, U. S. Fish Comm., Bull. 23 (3): 871, 1903 (1906).—Sakai, Studies on the crabs of Japan IV . . . , 391, 1939. (See figures 14, *a-d*; 15.)

Numerous low elevations (pustules) of depressed surface of carapace are crowned by granules. Median pair of the four frontal teeth are smaller than laterals. Last tooth (ninth) of the anterolateral border the largest; the eighth, the smallest. First anterolateral tooth stronger than any of the following seven.

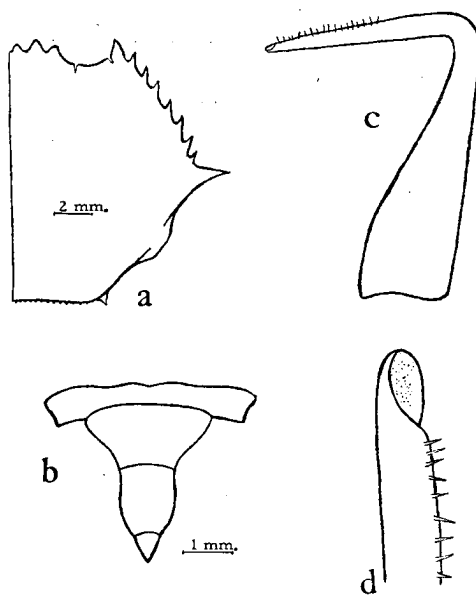


FIGURE 14.—*Portunus argentatus*: a, outline of half-carapace; b, abdomen, male; c, first pleopod, male; d, tip of c.

Two juvenile specimens taken by the *Albatross* from the surface on the north coast of Molokai are reported by Rathbun (24) as possible representatives of this species, but they were too small for certain determination. The species was recorded from Honolulu by Cano in 1889 (5), but I have not seen the species in Hawaii and have no recent report of its occurrence here. The species, however, has a wide distri-

bution through the Indian and Pacific Oceans, and its appearance again in Hawaiian waters would not be surprising.

A specimen in Bishop Museum (fig. 15) is from the Andaman Islands. Its carapace is 20 mm. broad between the bases of the long spines.

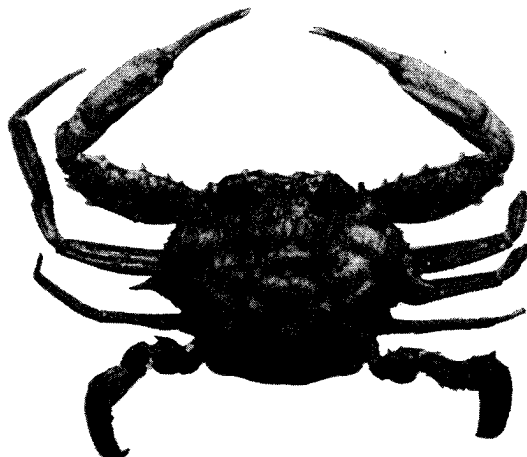


FIGURE 15.—*Portunus argentatus*.

**Portunus (Achelous) granulatus** (A. Milne Edwards), Alcock, Asiatic Soc. Bengal, Jour. 68 (2): 45, 1899 (1900).—Rathbun, U. S. Fish Comm., Bull. 23 (3): 871, 1903 (1906).—Sakai, Studies on the crabs of Japan IV. . . , 397, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. 22: 280, 1946. (See figures 16, *a, b*; 17, *a*.)

Carapace suborbicular, flattened; front consists of four teeth, median pair the smaller. Last anterolateral tooth slightly larger than either of others.

Bishop Museum has numerous specimens of this small portunid (less than 1 inch in breadth of carapace), taken from the reefs of Oahu where the crab conceals itself in the sand. The *Albatross* dredged the species at several stations about the islands at depths of 66 fathoms or less.

Records of *P. granulatus* range from the Red Sea through the Indian and Pacific Oceans to Japan and Tahiti.

**Portunus (Achelous) orbicularis** (Richters), Alcock, Asiatic Soc. Bengal, Jour. 68 (2): 47, 1899 (1900).—Rathbun, U. S. Fish Comm., Bull. 23 (3): 871, 1903 (1906).—Edmondson, B. P. Bishop Mus., Sp. Pub. 22: 280, 1946. (See figures 16, *c-e*; 17 *b*.)

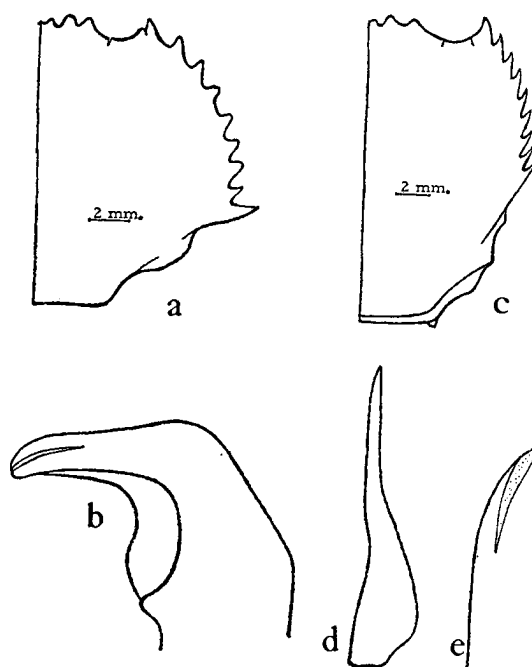


FIGURE 16.—a, b, *Portunus granulatulus*: a, outline of half-carapace; b, tip of first pleopod, male. c-e, *P. orbicularis*: c, outline of half-carapace; d, first pleopod, male; e, tip of d.

This species resembles *P. granulatulus* in size, form, and color of carapace. A distinctive feature, however, is that the nine teeth of the anterolateral border diminish in size from front to back.



FIGURE 17.—a, *Portunus granulatulus*; b, *P. orbicularis*.



The *Albatross* procured one specimen of this portunid near Laysan Island at 16 fathoms. About the Hawaiian Islands, the species is either much less abundant than *P. granulatus* or is more secretive and more adept in escaping capture. Bishop Museum has few specimens.

*P. orbicularis* is reported from a number of localities in the Indian Ocean and from the Andaman Islands.

**Portunus (Xiphonectes) longispinosus** (Dana), U. S. Exploring Exped., Crustacea 13: 277, 1852 (pls., 1855).—Rathbun, U. S. Fish Comm., Bull. 23 (3): 871, 1903 (1906).—Sakai, Studies on the crabs of Japan IV. . . , 392, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. 22: 280, 1946. (See figures 18, *a-c*; 19, *a*.)

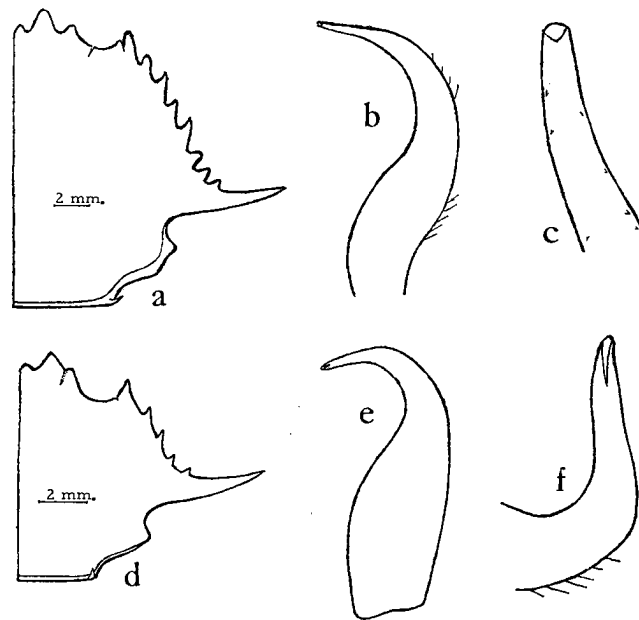


FIGURE 18.—*a-c*, *Portunus longispinosus*: *a*, outline of half-carapace; *b*, first pleopod, male; *c*, tip of *b*. *d-f*, *P. macrophthalmus*: *d*, outline of half-carapace; *e*, first pleopod, male; *f*, tip of *e*.

Front of carapace consists of four teeth, the lateral pair much larger than the median; last tooth of anterolateral border a large, strong spine extending straight out laterally.

Large specimens may exceed 1 inch in breadth of carapace between bases of large spines.

The habits of this species are similar to those of *P. orbicularis* and *P. granulatus*. By quickly burrowing in the soft sand, the crab can conceal itself and thus increase its chance of survival. Bishop Museum has a number of specimens taken from the reefs of Oahu, from Laysan and Johnston Islands, and from Samoa.

There are numerous records of the species from the Indian Ocean and from such widely separated localities in the Pacific as Japan, New Caledonia, and Hawaii.

**Portunus (Xiphonectes) macrophthalmus** Rathbun, U. S. Fish Comm., Bull. 23 (3): 871, 1903 (1906).—Edmondson, B. P. Bishop Mus., Occ. Papers 20 (13): 222, 1951. (See figures 18, *d-f*; 19 *b*.)

Closely resembles *P. longispinosus* as to frontal teeth and, to a lesser degree, those of the anterolateral border. Anterolateral teeth usually reduced in number to six, of which the last is a long stout spine extending straight out laterally. As in the preceding species, there is a tooth at either extremity of posterior border of carapace.

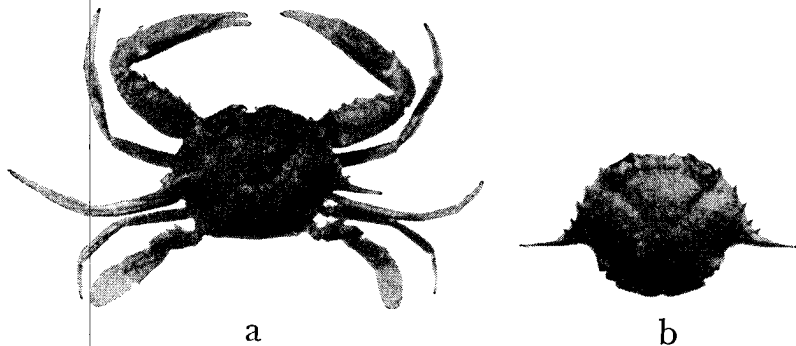


FIGURE 19.—a, *Portunus longispinosus*; b, carapace of *P. macrophthalmus*.

Apparently this species is unknown outside of the Hawaiian area, where most specimens have been taken at depths beyond 20 fathoms. The *Albatross* collected the species at a number of stations about the islands, and the *Makua* obtained it at three localities about Oahu. Numerous specimens were dredged by Daniel Kuhns off Waikiki, Oahu, at 30 to 50 fathoms. One specimen was taken from the stomach of a bottom-feeding fish (the surmullet).

The largest specimen in Bishop Museum is slightly less than 1 inch in breadth of carapace, between tips of the last anterolateral spines.

**Portunus (Portunus) oahuensis**, new species (fig. 20).

*Portunus (Portunus) vocans* ? Edmondson, B. P. Bishop Mus.,  
Occ. Papers 10 (24) : 25, 1935.

Holotype a male, length of carapace 6 mm., breadth between tips of last anterolateral teeth 10 mm. Orbitofrontal breadth 6 mm., breadth of front 3 mm. Front consists of four rounded lobes, median pair narrower and on a lower level than the lateral ones, which are separated from the inner supraorbital angles by a slight notch. Superior orbital margin finely dentate, marked by two narrow fissures.

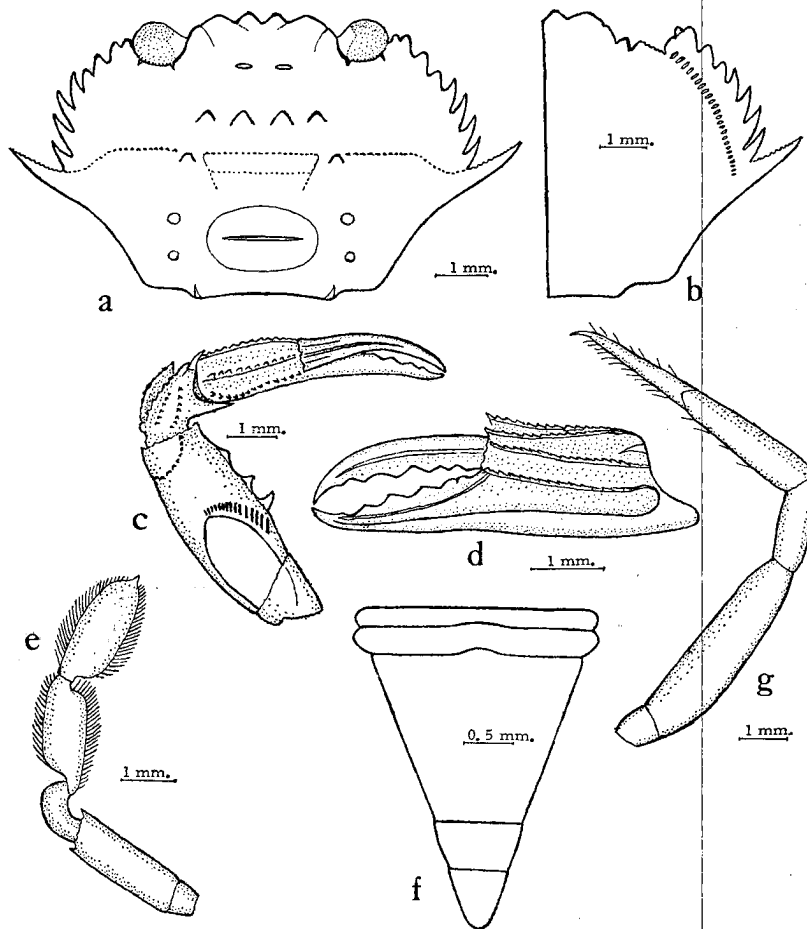


FIGURE 20.—*Portunus oahuensis*: a, outline of carapace, dorsal surface; b, outline of half-carapace, ventral surface, showing stridulating apparatus; c, left cheliped, viewed from above; d, left chela, outer surface; e, fifth leg; f, abdomen, male; g, third leg.

Upper surface of carapace bears microscopic granules and is sparsely coated with short, fine hairs. Surface of carapace ornamented by tubercles and denticulated lines symmetrically arranged as follows: a minute postfrontal tubercle on either side of the midline; four strong tubercles in a slightly curved line (concavity anteriorly) across gastric area. Posterior of these tubercles is a transverse denticulated line broken laterally on each side by a tubercle, then continuing toward margin of carapace and bending backward toward base of long lateral tooth. Cardiac area marked by a transversely disposed elevation crowned by a narrow ridge. Lateral of elevation on each side is a pair of tubercles.

Of the nine anterolateral teeth, first two are rounded and partially fused, separated by a shallow notch. The two following teeth are bluntly pointed, the fourth smaller than the third. Teeth 5 to 8 inclusive are acutely pointed and directed forward, the eighth slightly smaller than the seventh. The ninth tooth, about twice as long as the preceding one, is acutely pointed, directed outward, upward, and forward.

Suborbital margin includes a small median tooth, lateral of which is a lobe with denticulated border directed diagonally toward anterior extremity of stridulating apparatus. This apparatus consists of a row of about 24 short ridges, the units becoming progressively shorter as they curve backward toward base of ninth anterolateral tooth.

Chelipeds short, stout, the right slightly the larger. Anterior border of merus bears three teeth, the posterior one the largest. Stridulating apparatus of merus consists of a row of about 15 ridges curving across middle of upper surface. Occupying most of the posterior half of the upper surface of the segment is a smooth membranous area. Upper and outer borders of carpus bear denticulated carinae; inner angle with a strong spine. Manus with five longitudinal carinae on upper and outer borders, the four upper ones denticulate, and a sharp proximal spine at junction with carpus. Fingers long, longitudinally furrowed, the cutting edges bearing low, broad teeth. Walking legs long, slender, dactylus a little shorter than propodus, a few hairs on last two segments. Dactylus of fifth leg terminates in a spine. Third to seventh segments of male abdomen form a triangle.

The Hawaiian specimen (possibly immature) is near *P. (Portunus) vocans* (A. Milne Edwards), an Atlantic Ocean species (see Rathbun, 27), and also near *Neptunus (Hellenus) nipponensis* Sakai (28) of Japanese waters; but it differs from each in certain features. In the Hawaiian form, the median frontal teeth are more rounded and the lateral frontals are broader than in *P. vocans*. Also, the first four anterolateral teeth are bluntly rounded in the Hawaiian specimen and the fourth is smaller than the third; whereas in *P. vocans* the anterolateral teeth increase in size and sharpness from the first to the eighth. In the Atlantic species, the ninth tooth extends straight out and upward; but in the new species, it has a forward direction as well as an outward and upward one. In features of the surface of the carapace, the appendages and the stridulating apparatus, the Hawaiian species corresponds closely with *P. vocans*. In the Japa-

nese species, the frontal teeth are sharper and the anterolateral teeth broader than in the Hawaiian specimen. Also the chelipeds are smoother in *N. nipponensis*, and the ridges of the stridulating apparatus of the merus of the arm are subdivided instead of being solid units.

The known distribution of *Portunus vocans* includes the West Indies, the Cape Verde Islands, and Ascension Island. All specimens were dredged, at depths ranging from 20 to 169 fathoms. A single specimen of *Neptunus nipponensis* was taken at Kii Peninsula, habitat unknown. The Hawaiian specimen was taken on the shallow reef at Maili Point, Oahu (Bishop Museum collection, no. 3772).

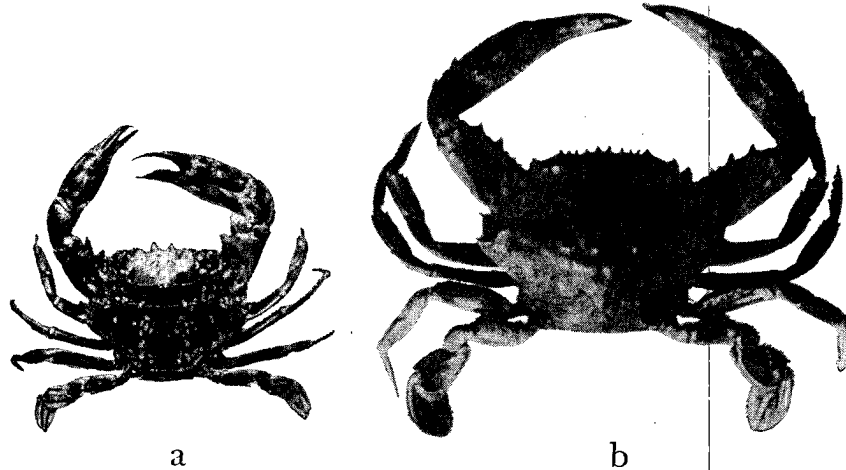


FIGURE 21.—a, *Charybdis erythroductyla*; b, *C. japonica* (from Japan).

### Genus *Charybdis*

#### Key to Hawaiian species of *Charybdis*

- A. Front consists of six blunt teeth, about equal in size.
  - 1. Anterolateral teeth seven in number, two very small....*C. erythroductyla*.
  - 2. Anterolateral teeth six in number.
    - a. Anterolateral teeth about equal in size.....*C. hellerii*.
    - aa. Anterolateral teeth unequal in size, one very small....*C. hawaiiensis*.
- B. Front consists of six acutely pointed teeth, about equal in size....*C. japonica*.

***Charybdis erythroductyla*** (Lamarck), Randall, Acad. Nat. Sci. Philadelphia, Jour. 8: 118, 1839 (1840).—Rathbun, U. S. Fish Comm., Bull. 23 (3): 872, 1903 (1906).—Leene, Siboga-Exped., Monogr. 39c<sup>3</sup>: 134, 1938.—Sakai, Studies on the crabs of Japan IV. . . , 398, 408, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. 22: 281, 1946. (See figures 21, a; 22, a-c.)

Front consists of six blunt teeth, about equal in size, besides supraorbital angles which resemble the teeth. Anterolateral border bears five large teeth, in addition to a small one in each of the first two sinuses. Irregular spots of blue on carapace and vivid colors of legs are distinctive features.

Large specimens are known to exceed 7 inches in breadth of carapace.

This strikingly colored portunid has been adequately described and figured by numerous authors and should not, therefore, be confused with any other known species of the genus.

Bishop Museum has specimens from Oahu, Wake, and Fanning Islands.

The species is widely distributed, being known from the Red Sea, through the Indian and Pacific Oceans to Japan, and eastward as far as Tahiti and the Marquesas Islands.

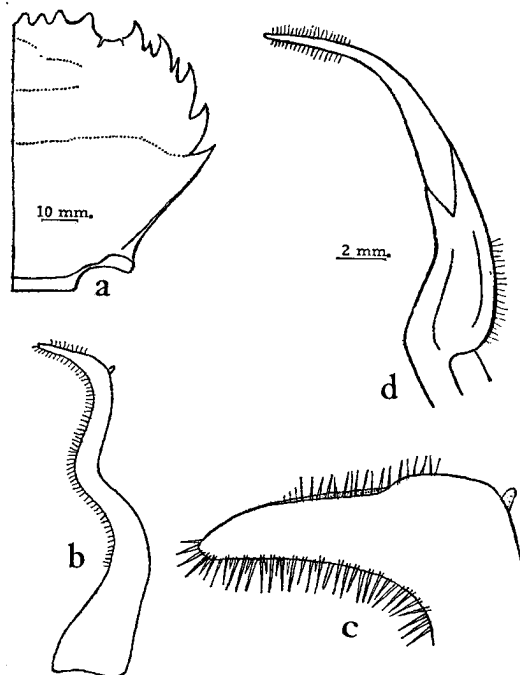


FIGURE 22.—a-c, *Charybdis erthroactyla*: a, outline of half-carapace; b, first pleopod, male; c, tip of b. d, *C. japonica*, first pleopod, male.

***Charybdis japonica*** (A. Milne Edwards), Rathbun, U. S. Fish Comm., Bull. 23 (3): 872, 1903 (1906).—Leene, Siboga-Exped., Monogr. 39c<sup>3</sup>: 30, 1938.—Sakai, Studies on the crabs of Japan IV . . . , 398, 400, 1939. (See figures 21, b; 22, d.)

Carapace usually at least partially coated with fine hair. Transverse ridges of carapace are strong, but there is none across cardiac region. Front with six acutely pointed teeth, the laterals being slightly narrower than the others. The narrow, sharp-pointed supraorbital angle resembles a tooth. Anterolateral border bears six stout teeth, the last being the smallest. Chelipeds more or less coated with fine hair, as is carapace. Upper border of palm with four teeth in two rows, in addition to basal one; outer surface traversed longitudinally by three strong ridges, the upper two usually tuberculate; inner surface inflated, a longitudinal ridge about middle, often tuberculate.

Early reports include Hawaii in the distribution of this species, but the *Albatross* did not take it and there are no recent records from this area. Both Leene (16) and Sakai (28) describe and figure the species, and Rathbun (24) figures a specimen from Japan. I illustrate (fig. 21, *b*) one of three specimens in Bishop Museum from Japan, presented by Sakai. The largest of these is a male with a carapace 100 mm. broad.

***Charybdis hellerii*** (A. Milne Edwards), Leene, Siboga-Exped. Monogr. 39c<sup>3</sup>: 44, 1938. (See figure 23, *a-f*.)

Carapace and appendages covered by a short pile. Front consists of six teeth, rounded at tips; median pair of teeth directed straight forward, submedians slightly directed outward; laterals a little narrower than submedians or inner supraorbital angles. First and second anterolateral teeth are a little closer together and the notch between them slightly more shallow than is the case with any of the four following teeth.

Features of the legs, including chelipeds, conform closely in most particulars with the description of the type specimen. Three ridges on the outer face of the palm have the edges microscopically granular; the upper ridge turns upward distally and the lower one extends the length of the immovable finger. There is a smooth longitudinal ridge on the inner face of the palm near the middle. The upper border of the hand bears five spines. The posterior border of the carpus of the fifth leg bears a strong spine, and the merus of this leg carries a distinct tooth on the posterodistal border. This last feature more closely resembles *C. acuta* (A. Milne Edwards) than *C. hellerii*. The second pleopod of the Hawaiian specimen is in accord with that of *C. hellerii*, as figured by Leene (16).

There is no evidence that this species is established in Hawaii. The Hawaiian form, a male with a carapace 55 mm. in breadth, was taken from among the fouling on the hull of a ship in dry dock in Pearl Harbor Navy Yard. The ship had seen service in Guam sometime

previous to its defouling and may have transported the portunid to Pearl Harbor as a juvenile.

The known distribution of *Charybdis hellerii* is from the Gulf of Aden and Madagascar through the Indian seas to Queensland, New Caledonia, and perhaps Formosa. There is also a record from the Mediterranean Sea.

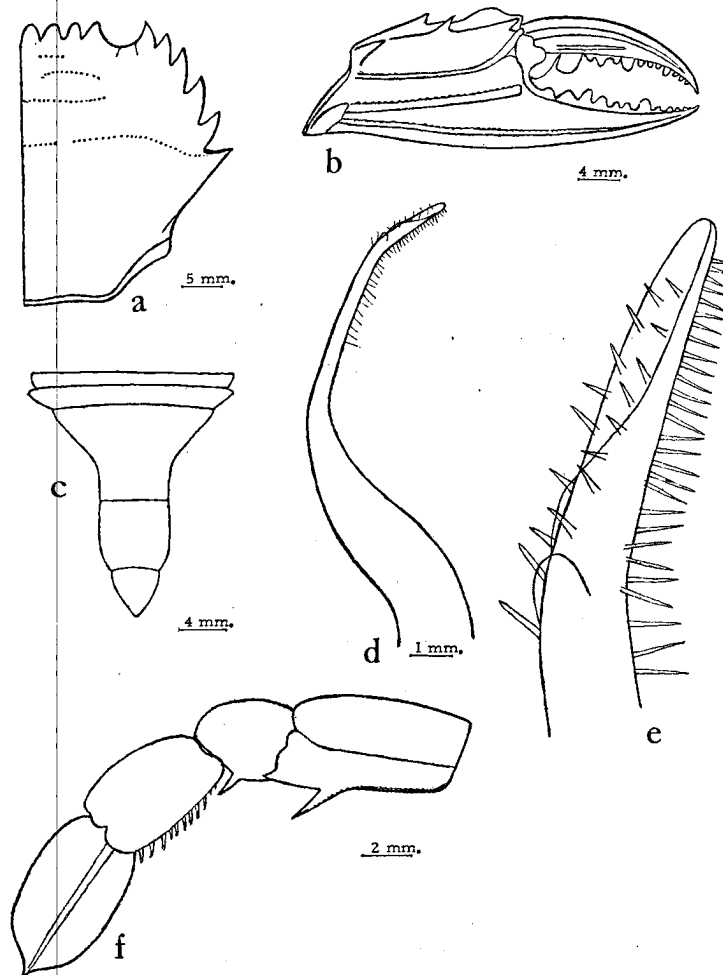


FIGURE 23.—*Charybdis hellerii*: a, outline of half-carapace; b, hand of cheliped, outer surface; c, abdomen, male; d, first pleopod, male; e, tip of *d*; f, fifth leg.



***Charybdis hawaiiensis***, new name (figs. 24, *a-c*; 25, *a-d*).

*Charybdis orientalis* Rathbun, U. S. Fish Comm., Bull. 23 (3): 872, 1903 (1906).—Edmondson, B. P. Bishop Mus., Sp. Pub. 22: 281, 1946.

Carapace covered with a short, fine pile; four broken, granulated lines cross anterior half of carapace, anterior one short, posterior one connecting last teeth on anterolateral borders. Front consists of six bluntly rounded teeth of about equal size. Inner supraorbital angles narrow, steeply inclined. Five large, sharp anterolateral teeth directed forward; an additional one immediately behind the first; last tooth smaller than preceding one. A smooth, blunt lobule at either extremity of posterior margin of carapace.

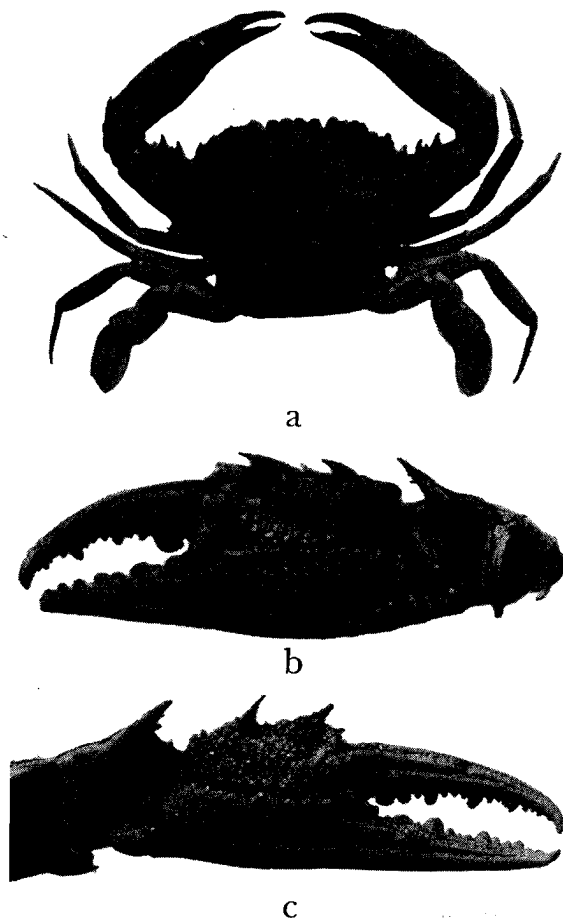


FIGURE 24.—*a-c*, *Charybdis hawaiiensis*: *b*, inner surface of large chela; *c*, inner surface of small chela.

Chelipeds unequal, the right usually the larger; three sharp teeth on anterior border of merus (exclusive of a minute distal one); a minute distal one on posterior border. Carpus with a strong spine at inner angle and three smaller teeth on outer border. Palm swollen, granular; four granulated crests on outer surface; five strong teeth on upper border; inner face granular, having two longitudinal crests, the upper one about the middle. Fingers long, sharp, deeply grooved; cutting edges bear numerous rounded teeth of unequal size.

Fenner A. Chace, Jr. has pointed out significant differences between *C. orientalis* Dana (6) and the Hawaiian form described under that name by Rathbun (24). (See also Leene, 16, p. 69.) Among the differences are the strongly granular inner surface of the palm of the cheliped of the Hawaiian species and the relatively short merus of the fifth leg. In *C. orientalis*, the inner surface of the palm is smooth and the merus of the fifth leg is proportionately longer. Leene (16) also indicates differences between the two forms in the character of the front. In view of these distinctions, it would seem desirable to desig-

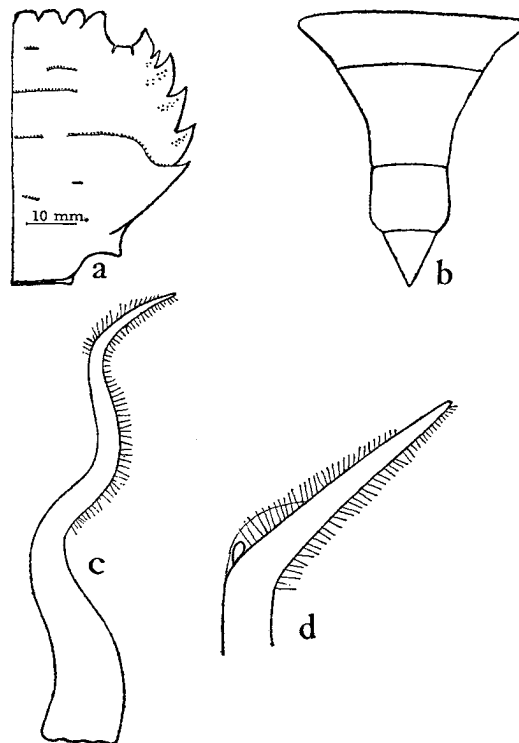


FIGURE 25.—*Charybdis hawaiiensis*: a, outline of half-carapace; b, abdomen, male; c, first pleopod, male; d, tip of c.

nate the Hawaiian species under a new name, *C. hawaiiensis*. This form is apparently known only from the Hawaiian area. The *Albatross* procured the specimen which Rathbun (24) determined and figured as *C. orientalis* Dana from Honolulu. Bishop Museum has specimens taken from the reefs of Oahu and Maui, and also a number obtained from the Honolulu fish markets, the latter probably taken locally in fish traps.

#### Genus *Thalamonyx*

*Thalamonyx gracilipes* A. Milne Edwards, Nouv. Arch. Mus. d'Hist. Nat. Paris, Bull. 9: 169, 1873.—Alcock, Asiatic Soc. Bengal, Jour. 68 (2): 71, 1899 (1900).—Rathbun, U. S. Fish Comm., Bull. 23 (3): 873, 1903 (1906). (See figure 26, *a-b*.)

Carapace granular, sparsely covered with fine hairs; indistinct transverse lines crossing gastric, cardiac, and postbranchial regions. Front consists of two broad, convex lobes with a slight notch in middle, each lobe itself being slightly concave; inner supraorbital angles narrow. Anterolateral teeth sharp, subequal. Chelipeds granular; a short, stout spine on inner border of carpus; upper border of palm with two ridges, each bearing a short spine; outer surface of palm with small tubercles some of which are arranged in longitudinal rows. Posterior border of propodus of fifth leg without spinules.

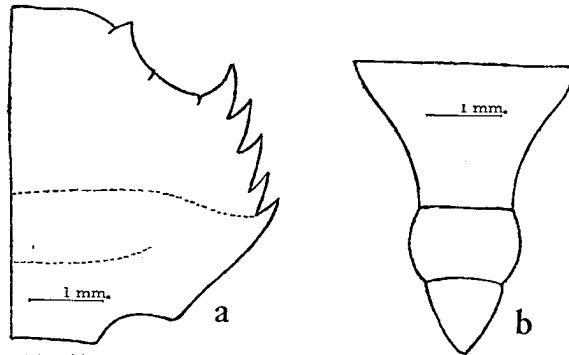


FIGURE 26.—*Thalamonyx gracilipes*: a, outline of half-carapace; b, abdomen, male.

The only species of the genus reported from Hawaii is apparently not widely known. The *Albatross* took specimens at three stations between Molokai and Maui at varying depths down to 43 fathoms, and there are a few records from localities in the East Indian seas. Alcock reports a female specimen with a carapace 9 mm. in breadth. There are no examples of the species in Bishop Museum, but I have examined

and figured an *Albatross* specimen 6 mm. broad in the U. S. National Museum (fig. 26), the front of which does not appear to be so convex as that illustrated by Edwards (14).

Some authors regard *Thalamonyx* as a subgenus of *Charybdis*, and others would include it within the genus *Thalamita*. Whether treated as a distinct genus or not, it should be looked upon as a link between *Charybdis* and *Thalamita*.

### Genus *Thalamita*

#### Key to Hawaiian species of *Thalamita*

- A. Front consists of two broad lobes.
1. Anterolateral teeth typically five in number, of which the fourth may be absent.
    - a. Frontal lobes straight; inner supraorbital angle broad.
      - b. Palm of cheliped smooth, spines not well-developed; crest of basal segment of antenna smooth.....**T. integra.**
      - bb. Palm of cheliped granular, at least on upper border, spines well-developed; crest of basal segment of antenna not smooth.
        - c. Carapace without ridge on cardiac region; ridges on outer surface of palm of cheliped not well-developed, or obsolete; crest of basal segment of antenna bears a row of small tubercles.....**T. edwardsi.**
        - cc. Carapace with ridge on cardiac and postbranchial regions well-developed; ridges on outer surface of palm of cheliped well-developed; crest of basal segment of antenna tuberculate.
          - d. Granulation on outer surface of palm does not extend on lower and inner surfaces.....**T. admete.**
          - dd. Granulation of outer surface of palm extends on lower border and portion of inner surface.....**T. auauensis.**
      - aa. Frontal lobes slightly convex; inner supraorbital angle narrow .....**T. sima.**
    2. Anterolateral teeth typically four in number, of which one may be absent .....**T. spiceri.**

B. Front consists of four lobes, the laterals very narrow.....**T. medipacifica.**

C. Front consists of six lobes or teeth.

    1. Anterolateral teeth not more than five in number.
      - a. Carapace more or less pilose.
        - b. Basal segment of antenna with crest smooth or finely serrated.
          - c. Frontal median and submedian teeth subequal in size, almost confluent, medians overlapped by submedians; crest of basal segment of antenna serrated....**T. wakensis.**
        - cc. Frontal median and submedian teeth unequal in size, not confluent, medians not overlapped by broader submedians; front border of submedians slope inward.

- d. Crest of basal segment of antenna arched and smooth ..... *T. picta*.  
 dd. Crest of basal segment of antenna straight and very finely serrated, almost smooth..... *T. alcocki*.  
 bb. Basal segment of antenna with tuberculate or spinous crest.  
 c. Crest of basal segment of antenna bears six or seven sharpish tubercles ..... *T. kükenthali*.  
 cc. Crest of basal segment of antenna bears two sharp spines on a raised base..... *T. coeruleipes*.  
 aa. Carapace not pilose; crest of basal segment of antenna low, bearing a row of small tubercles..... *T. crenata*.  
 2. Anterolateral teeth six in number, including a small supplementary one behind the first..... *T. spinifera*.

*Thalamita integra* Dana, U. S. Exploring Exped., Crustacea 13: 282, 1852 (pls., 1855).—Rathbun, U. S. Fish Comm., Bull. 23 (3): 873, 1903 (1906).—Sakai, Studies on the crabs of Japan IV . . . , 414, 420, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. 22: 283, 1946. (See figures 27, *a-e*; 28 *a*.)

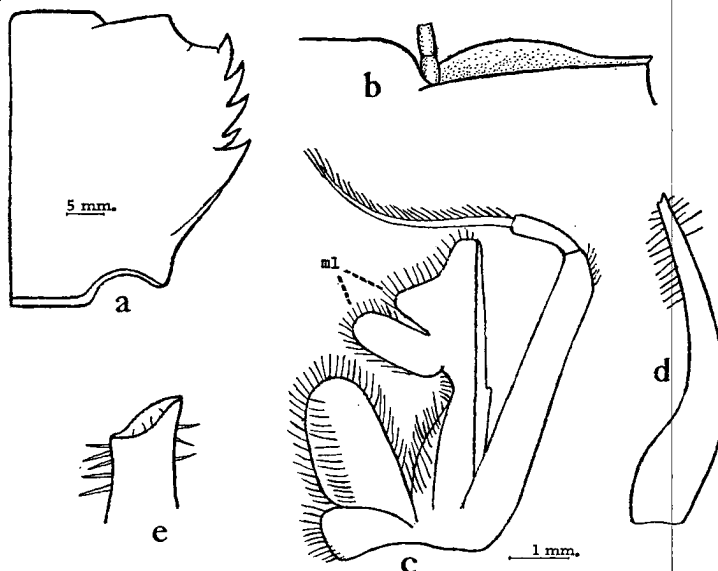


FIGURE 27.—*Thalamita integra*: a, outline of half-carapace; b, crest of basal segment of antenna; c, endopodite of first maxilla, showing membranous lobes (*ml*); d, first pleopod, male; e, tip of *d*.

Carapace smooth, somewhat convex, no ridge on cardiac or postbranchial regions. Front with broad, straight lobes, resembling those of *T. edwardsi* Borradaile. Crest of basal segment of antenna sharp and smooth. Fourth tooth of anterolateral border of carapace small or rudimentary. Both outer and inner

surfaces of palm smooth and glabrous; spines of upper crests of palm not well-developed. Sixth segment of male abdomen with sides converging distally; last segment with concave sides. Posterior border of propodus of fifth leg bears six or seven minute spinules, increasing in length distally.

Large specimens may reach 2 inches in breadth of carapace.

This species is very common in the Hawaiian Islands, especially in bays and harbors; and it is abundant under stones on the flats of Moanalua Bay, Oahu. It is sometimes associated with *T. edwardsi*, from which it is readily distinguished by the smooth crest of the basal segment of the antenna and the glabrous character of the palm of the cheliped. *T. integra* is widely distributed in the Indian and Pacific Oceans.

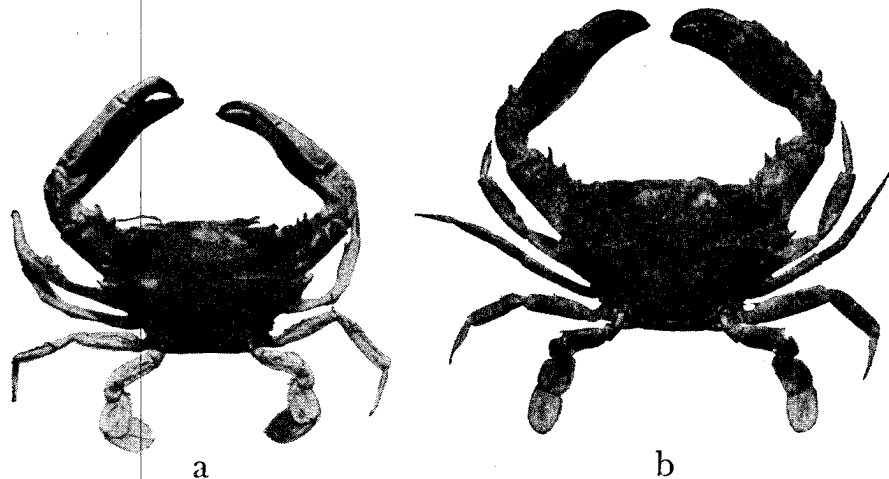


FIGURE 28.—a, *Thalamita integra*; b, *T. edwardsi*.

*Thalamita edwardsi* Borradaile, Zool. Soc. London, Proc., 568, 579, 1900.—Rathbun, U. S. Fish Comm., Bull. 23 (3): 873, 1903 (1906).—Edmondson, B. P. Bishop Mus., Sp. Pub. 22: 283, 1946. (See figures 28, b; 29, a-d.)

Carapace smooth, without a ridge across cardiac and postbranchial regions. Front similar to that of *T. integra*. Crest of basal segment of antenna provided with a row of minute tubercles. Upper border of hand with five spines, granular, the granules extending a little way down on the outer border. Of the usual five crests of the hand, the third is obsolete, also the middle portion of the fourth, at least in old specimens. Fourth anterolateral tooth very small or absent.

Large specimens may have a carapace nearly 2 inches broad.

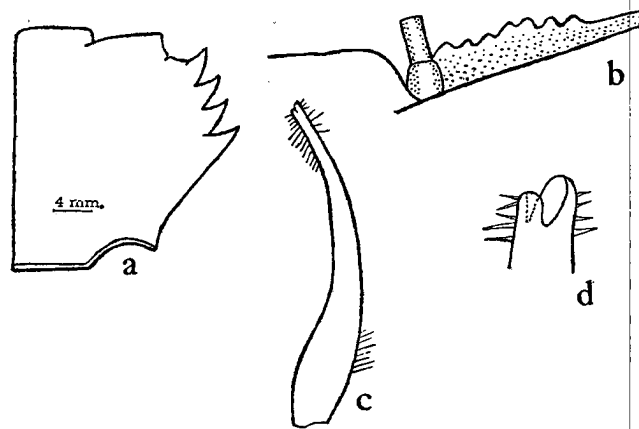


FIGURE 29.—*Thalamita edwardsi*: a, outline of half-carapace; b, crest of basal segment of antenna; c, first pleopod, male; d, tip of c.

This portunid is a very common one on the reefs of the Hawaiian Islands, where it may be found under stones near the water's edge. In general appearance it resembles *T. integra*, but the two may be easily distinguished by an examination of the crest of the basal segment of the antenna. *T. edwardsi* probably has a wide distribution in the Indian and Pacific Oceans.

Some authors retain this form as a variety of *T. admete* (*T. admete* var. *edwardsi* Borradaile).



FIGURE 30.—*Thalamita admete*: a, view of carapace; b, outer surface of chela (Rarotonga).

***Thalamita admete*** (Herbst), Alcock, Asiatic Soc. Bengal, Jour. 68 (2): 82, 1899 (1900).—Rathbun, U. S. Fish Comm., Bull. 23 (3): 874, 1903 (1906).—Sakai, Studies on the crabs of Japan IV..., 414, 421, 1939. (See figures 30, a-b; 31, a-e.)

Carapace covered with a fine tomentum; ridges across cardiac and post-branchial regions, as well as the usual ones of anterior areas of carapace. Front a pair of broad, straight lobes meeting the broad, slightly inclined supraorbital angles. Anterolateral border with five acutely pointed teeth, the fourth smaller than the others. Peduncle of antenna arising adjacent to the lateral extremity of the frontal lobe.

Large specimens exceed 1 inch in breadth of carapace.

Rathbun (24) is of the opinion that in specimens qualifying for this species, the fourth anterolateral tooth should be well-developed; but Sakai (28) states that it may be small or rudimentary. Bishop Museum has specimens which I believe fall within this species from Guam, Laysan, and Wake Islands; the Andamans; and Rarotonga. Rathbun records the species from Laysan Island and Kauai. Specimens illustrated are from Rarotonga and Guam (Bishop Mus. coll.) and the Gilbert Islands (U. S. National Mus. coll.).

In this species, ridges on the outer surface of the palm of the cheliped are better developed than those of *T. edwardsi*.

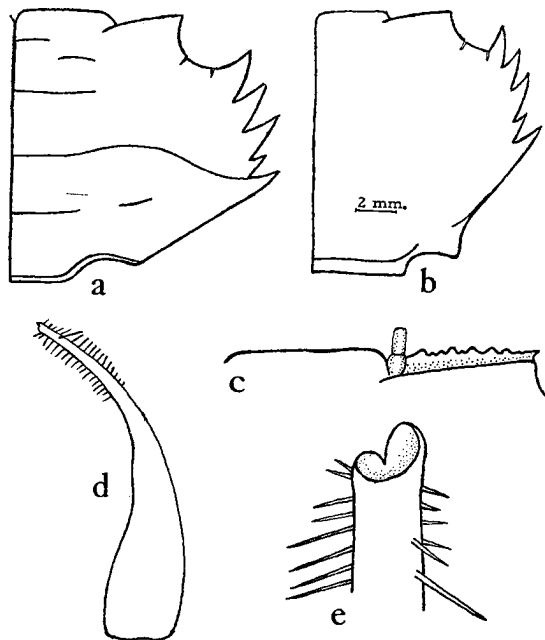


FIGURE 31.—*Thalamita admete*: a, outline of half-carapace (Gilbert Islands); b, outline of half-carapace (Guam); c, front and crest of basal segment of antenna; d, first pleopod, male; e, tip of d.



*Thalamita auauensis* Rathbun, U. S. Fish Comm., Bull. 23 (3) : 874; 1903 (1906).—Edmondson, B. P. Bishop Mus., Occ. Papers 20 (13) : 222, 1951. (See figure 32, *a-d*.)

Carapace somewhat resembles that of *T. admete* with respect to the transverse ridges and the front, but is more convex. Anterolateral teeth four or five; if five, fourth is very small. Last tooth smaller than either of first three.

The carapaces of the larger individuals range from 12 to 15 mm. in breadth.

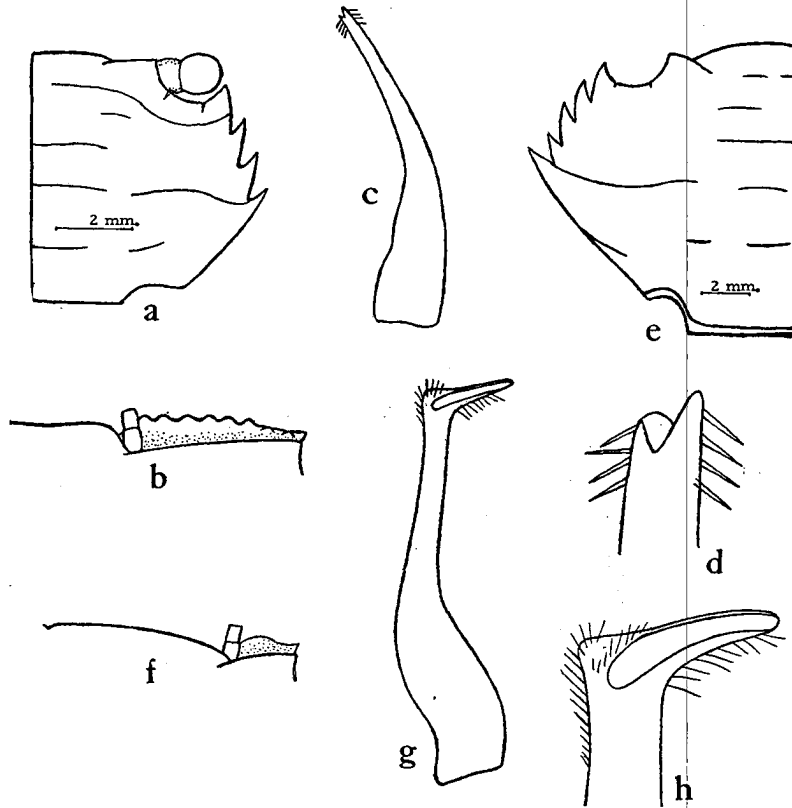


FIGURE 32.—*a-d*, *Thalamita auauensis*: *a*, outline of half-carapace; *b*, front and crest of basal segment of antenna; *c*, first pleopod, male; *d*, tip of *c*. *e-h*, *T. sima*: *e*, outline of half-carapace; *f*, front and crest of basal segment of antenna; *g*, first pleopod, male; *h*, tip of *g*.

This species is known only from the Hawaiian area, where it has not been reported from the shallow reefs or near-shore waters. It was taken by the *Albatross* from numerous stations about the islands, the channel between Molokai and Maui being the type locality. Bishop

Museum has specimens dredged by Kuhns from off Waikiki, Oahu, at depths of 30 to 50 fathoms, and specimens taken by the *Makua* at a number of stations about Oahu at depths of 16 to 20 fathoms. Numerous living specimens are bright pink in color.

***Thalamita sima*** Milne Edwards, Alcock, Asiatic Soc. Bengal, Jour. 68 (2): 81, 1899 (1900).—Rathbun, U. S. Fish Comm., Bull. 23 (3): 873, 1903 (1906).—Sakai, Studies on the crabs of Japan IV. . . , 414, 423, 1939. (See figure 32, *e-h*.)

Surface of carapace pilose; front consists of two broad lobes sloping outward or slightly arched with a very shallow notch in middle. Inner supraorbital angle about one-half as broad as frontal lobe, slightly arched. Of the five anterolateral teeth, the first is broad, the second and third slightly smaller, the fourth smallest of all, and the fifth about as large as the third, directed outward.

Apparently the species has not been observed in Hawaiian waters for more than 60 years. It is widely known in the Indian and Pacific Oceans; and Bishop Museum has specimens from Guam, Japan, and the North Queensland coast. A specimen from Japan (fig. 32, *e*) has a carapace 22 mm. in breadth.

***Thalamita spiceri*, new species (fig. 33 *a-e*).**

Type specimen a female, maximum breadth of carapace 9 mm., length 4.5 mm.; front, between orbits, just under 5 mm. Upper surface of carapace slightly convex, pilose, microscopically granular on anterior half. A well-defined ridge crosses cardiac and postbranchial areas, and other ridges mark the anterior portion of carapace, as is usual in members of the genus. Front slightly bent down, consisting of two broad, square-cut lobes separated by a narrow notch. Supraorbital angles a little narrower than frontals, slightly sloping. Superior margin or orbit smooth with two shallow notches.

Anterolateral teeth four in number, the first the largest and the third very small; the fourth smaller than the second. Basal segment of antenna a little shorter than long diameter of orbit, granular, its crest bearing a few minute tubercles. Lower margin of orbit minutely serrate in part, with one narrow notch. Suborbital area of carapace bears granules which become small blunt tubercles anteriorly.

Chelipeds stout, the left one slightly the larger. Arm granular above, three teeth on distal half of anterior border; posterior half of border granular. Carpus with a strong tooth on inner border; two teeth on outer border and upper surface densely covered with granules and minute tubercles, some of which are acutely pointed. Palm of hand with two strong costae on outer surface, both extending forward on the immovable finger. Palm smooth between costae, on lower border and inner surface. Upper border of hand roughened by minute tubercles, some of which are sharp. Four sharp spines borne on upper border of hand, two in a row on inner edge, one at articulation with carpus and a smaller one farther forward. Walking legs slender; merus of fifth leg with a strong subterminal tooth on posterior border and a smaller terminal one; propodus with five spinules on posterior margin.

The Hawaiian species is very close to *T. pilumnoides* Borradaile, described from Minikoi of the Laccadive Archipelago. The chief difference is in the character of the front. The supraorbital angles in *T. pilumnoides* are very narrow and strongly arched, being quite different from those of the Hawaiian form. There are also slight differences be-

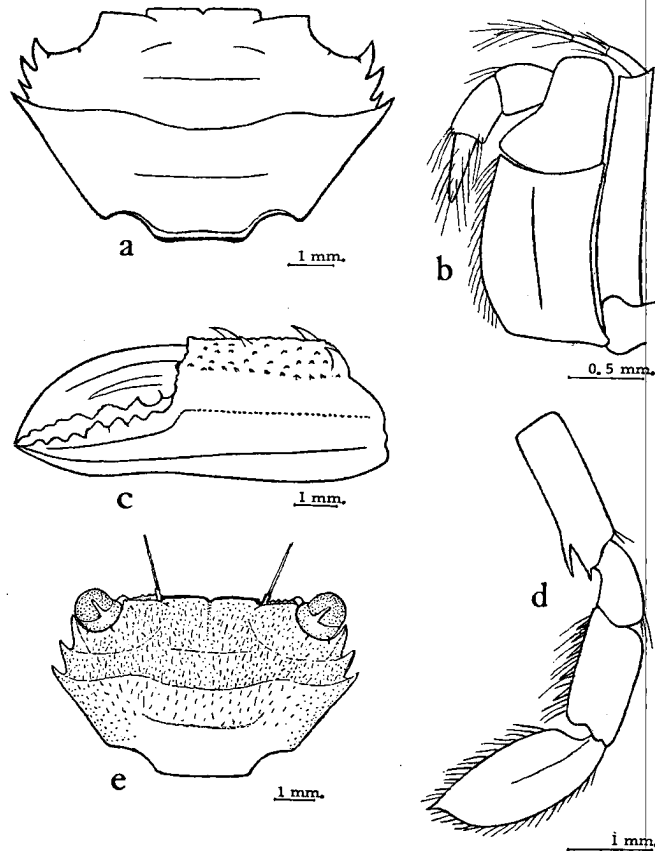


FIGURE 33.—*Thalamita spiceri*: a, outline of carapace; b, outer maxilliped; c, left chela, outer surface; d, fifth leg; e, outline of carapace of specimen with but three anterolateral teeth.

tween the two species in the costae of the outer surface of the hand, and in the fifth leg. Borradaile indicates all of the ridges of the hand to be granular, and he shows more spines on the merus of the last leg and fewer on the propodus than characterize the Hawaiian species.

The new species was collected in shoal water at Midway Islands by V. D. P. Spicer in 1941. A smaller specimen, also a female, was taken with the type. In Bishop Museum is another specimen, an ovigerous female 7.5 mm. broad, dredged by the *Makua* from a depth of 20 fathoms 1,000 yards off the east coast of Oahu in 1949. A special feature of this specimen is that there are only three anterolateral teeth. (Bishop Mus. coll.: no. 5032, type; no. 5313, paratype; no. 5817, Oahu specimen.)

***Thalamita medipacifica*, new species (figs. 34, a-h; 35, a).**

Type specimen an ovigerous female 21 mm. broad. Carapace moderately convex, covered with a dense pile; transverse ridges of upper surface, including one on cardiac and postbranchial areas, well-developed. Front consists of four lobes, the median pair broad, straight; lateral pair very narrow, not so

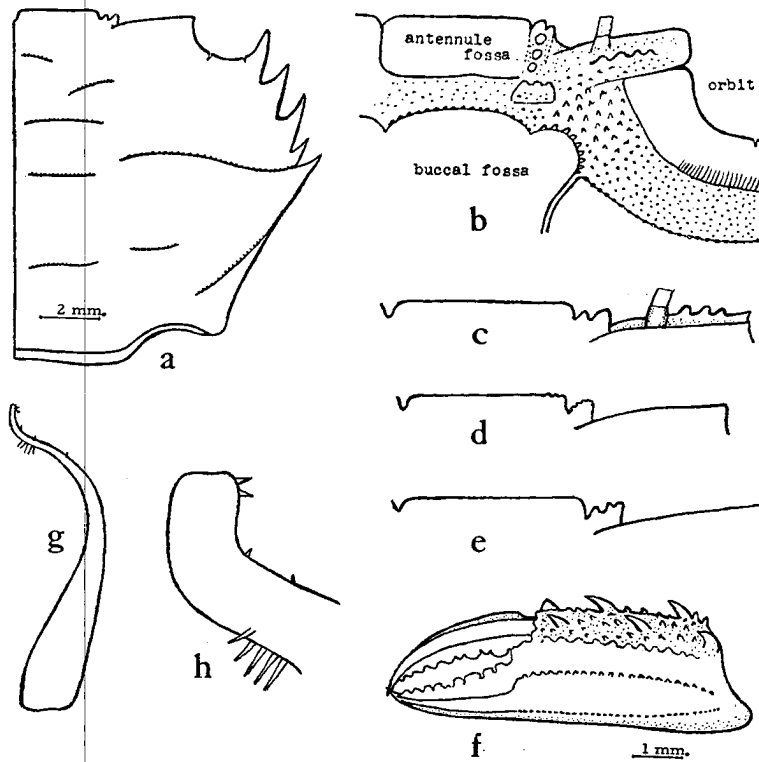


FIGURE 34.—*Thalamita medipacifica*: a, outline of half-carapace; b, ventral surface, fronto-orbital region of carapace, c-e, anterior border of carapace, showing variation in lateral frontal teeth; f, left chela, outer surface; g, first pleopod, male; h, tip of g.

advanced as the median pair, each consisting of one or more processes separated from the broad lobes by a slight notch. Inner supraorbital angle about as broad as median frontal lobe, slightly inclined. Low crest of basal segment of antenna bears four or five small tubercles. Superior margin of orbit with two notches; inferior margin granular with a large rounded inner lobe and a notch near outer border. Pterygostomial region granular, the granules becoming larger and more pointed medially. Between buccal fossa and basal segment of the antenna is a prominent raised process crowned by tubercles. Lateral boundary of antennular fossa formed by a tuberculate ridge which appears to terminate dorsally in narrow lateral lobe of front.

Chelipeds subequal, the left slightly the larger, somewhat pilose; anterior border of arm bears three sharp teeth and some granules; carpus granular with three short teeth on outer border, a larger one on upper border, and a stout one at inner angle. Palm of hand bears five teeth in two rows on upper border, besides the one at articulation with carpus. Three longitudinal ridges on outer surface of hand, upper two tuberculate, the lower one granular. Granules and sharp tubercles cover surface between teeth on upper border and extend as low on outer surface as upper longitudinal ridge. Lower and inner surfaces of palm smooth. Fingers shorter than palm, deeply channeled. Walking legs somewhat pilose with longitudinal rows of longer hairs on last three segments. Propodus of fifth leg bears a row of stout spinules on posterior margin. First pleopod of male truncate at tip.

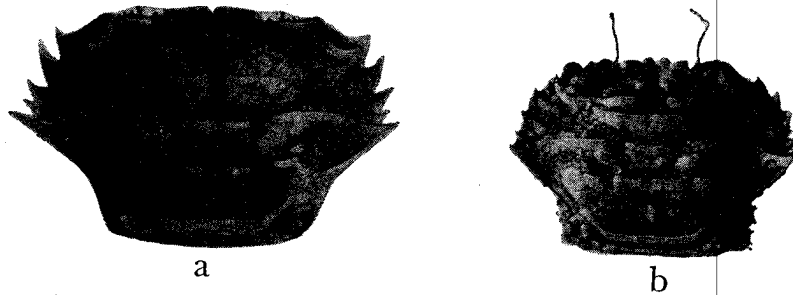


FIGURE 35.—a, carapace of *Thalamita medipacifica*; b, carapace of *T. picta*.

This species, which is not uncommon on the reefs of the Hawaiian Islands, is close to *T. admete* in the pilose surface and the strongly developed ridges on the carapace and palm of the cheliped. It differs, however, from that species in the frontal lobes. The narrow lateral lobes of the front of this apparently new form consist of one or more tubercular processes which appear to be dorsal portions of the lateral boundary of the antennular fossa extending upward and fusing with the outer ends of the broad frontal lobes. As a result, the origin of the antennal flagellum is removed to a greater distance from the outer extremity of the broad frontal lobe than in either *T. edwardsi* or *T. admete*.

One species, *T. seurati*, which bears some slight resemblance to the Hawaiian form, was described from Marutea Island, Tuamotus, by Nobili (21) and reported by Balss (2) from the Gilbert Islands. Nobili figures each of the median frontal lobes, described as "largamente smarginati," as broadly concave and the narrow lateral frontal lobe as subtriangular. The inner supraorbital angle is narrow and arched, and the crest of the basal segment of the antenna bears large acute granules, described by Balss as "3-4 stumpfe Zähnen." The fourth anterolateral tooth is rudimentary, and Balss mentions a thickening of the chelae as a distinctive character.

The carapace of *T. seurati* is pilose, and the transverse ridges of its surface compare fairly well with those of *T. medipacifica*; but after a careful comparison of the features of the two forms, I am convinced that the Hawaiian thalamitid is distinct from Nobili's species and probably has not been previously recorded.

Bishop Museum has specimens of this apparently new form from a number of localities about Oahu, from the Olowalu coast of Maui, and also one specimen from Howland Island. All were taken in shallow water. (Type locality, Oahu; type specimen, Bishop Mus. coll., no. 5074.)

***Thalamita wakensis*** Edmondson, B. P. Bishop Mus., Bull. 27: 38, 1925.—Sakai, Studies on the crabs of Japan IV. . . , 413, 418, 1939. (See figure 36, *a-d*.)

Carapace covered with a fine pile; a few scattered granules about frontal and anterolateral borders. Front consists of six lobes, the median pair being overlapped by the submedian; lateral teeth narrow. Inner supraorbital angle narrow and strongly arched. Crest of basal segment of antenna serrated. Fourth anterolateral tooth may be smaller than the others, rudimentary, or absent. Upper border of palm of cheliped with five spines; its outer face, like that of carpus, is granular, bearing three longitudinal ridges.

This small species may be recognized by the overlapping of the median frontal lobe by the submedian to such an extent that these two adjacent lobes have the general appearance of being a single one with a shallow notch in the middle. Some resemblance of the male first pleopod of this species to that of *T. picta*, the following species, is seen. The two species differ, however, in the character of the front and the basal segment of the antenna.

The type specimen, which is 8 mm. broad, described from Wake Island, is in Bishop Museum, as is a specimen taken from Kawela Bay, Oahu. Sakai (28) reports the species from Japan.

The present records indicate *T. wakensis* to be a shallow-water form.

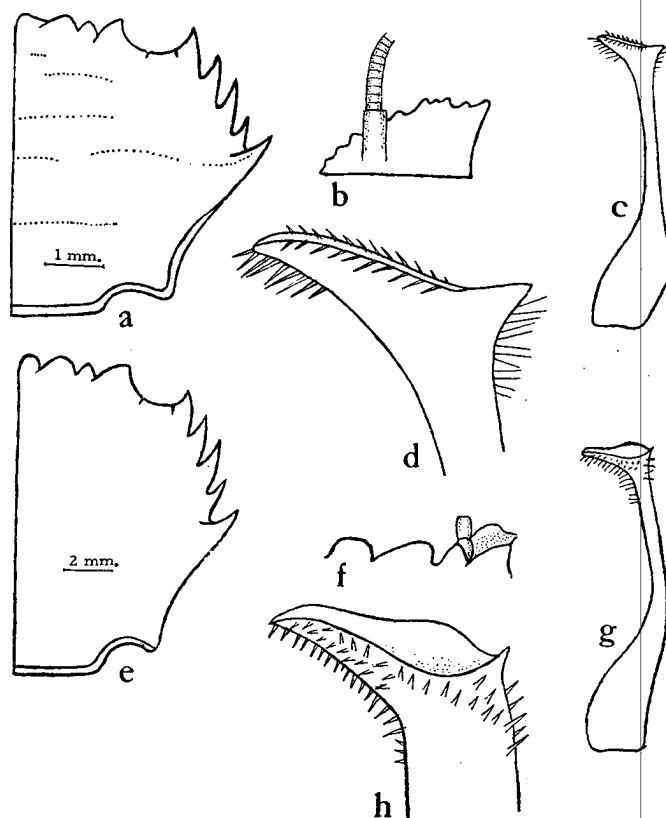


FIGURE 36.—a-d, *Thalamita wakensis*: a, outline of half-carapace; b, crest of basal segment of antenna; c, first pleopod, male; d, tip of c. e-h, *T. picta*: e, outline of half-carapace; f, front and crest of basal segment of antenna; g, first pleopod, male; h, tip of g.

*Thalamita picta* Stimpson, Acad. Nat. Sci. Philadelphia, Proc. 10 (4): 39, 1858.—Rathbun, U. S. Fish Comm., Bull. 23 (3): 873, 1903 (1906).—Sakai, Studies on the crabs of Japan IV. . . , 413, 417, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. 22: 283, 1946. (See figures 35, b; 36, e-h.)

Front of carapace consists of six teeth, the median pair being small and placed on a lower level than the others; submedian pair largest; laterals small, acutely pointed. Inner supraorbital angle narrow, arched; crest of

basal segment of antenna smooth. Fourth tooth of anterolateral border of carapace smaller than others.

This rather small form, usually less than 1 inch in breadth of carapace, is not an uncommon species on Hawaiian reefs and has also been taken at moderate depths about the islands. Bishop Museum has many specimens from the larger Hawaiian Islands and also examples from the leeward group, and from Wake and Christmas Island (north Pacific Ocean).

*T. picta* has a wide distribution in the Indian and Pacific Oceans.

A general similarity between the second pleopod of the male of this species and that of *T. wakensis* will be noted. The difference between the two species, however, may be observed on examination of the frontal teeth and the basal segment of the antenna. Some authors consider *T. picta* to be a variety of *T. prymna* (Herbst), a species not observed in Hawaii.

***Thalamita alcocki*** de Man, Senckenb. naturf. Ges., Frankfort a.M., Abhandl. 25: 646, 1902.—Rathbun, U. S. Fish Comm., Bull. 23 (3): 875, 1903 (1906). (See figure 37, *a, b*.)

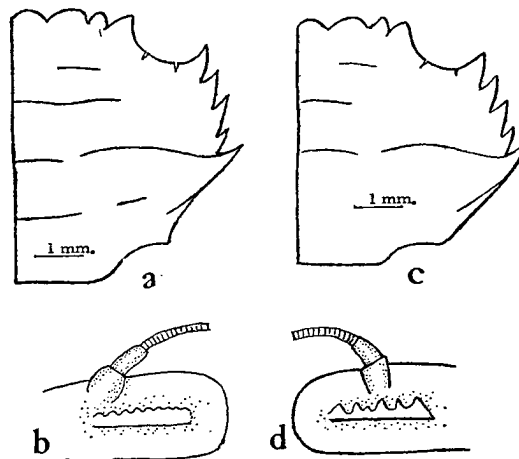


FIGURE 37.—*a, b*, *Thalamita alcocki*: *a*, outline of half-carapace; *b*, crest of basal segment of antenna. *c, d*, *T. kükenthali*: *c*, outline of half-carapace; *d*, crest of basal segment of antenna.

Surface of carapace covered with short pile; a ridge crosses cardiac region and extends onto postbranchial areas. Pile does not conceal the ridges, as a result of which they stand out clearly. Front somewhat resembles that of *T.*



*kükenthali*. Of the six frontal teeth, the median on each side is broadly but evenly rounded, slightly narrower than the submedian, anterior border of which slopes inward, whereas outer border slopes abruptly to notch formed with the lateral tooth. Lateral tooth much narrower than either of the others and bluntly rounded. Inner supraorbital angle narrow, arched. Basal segment of antenna bears a low keel microscopically serrate, almost smooth.

Of the five anterolateral teeth first, second, and third are about equal in size, fourth is smallest of all, and fifth is larger than fourth but a little smaller than third.

Arm of the cheliped bears three spines on inner border; carpus bears a strong spine on inner border and three spinules on outer border, which is pilose. Palm of hand with two ridges on upper border, each bearing two spines in addition to the one at junction of palm and carpus. Outer surface of palm bears three prominent ridges, each consisting of closely set tubercles, the lower one extending on the immovable finger. Propodus of fifth leg bears a row of a few spinules on its posterior border.

The type specimen, a male 12.5 mm. broad, was recorded from Ternate by de Man (19), and described without figures. One female specimen, 11.6 mm. broad, was taken by the *Albatross* near Nihoa Island at 26 to 33 fathoms. I have examined this specimen in the U. S. National Museum.

***Thalamita kükenthali*** de Man, Senckenb. naturf. Ges., Frankfurt a. M., Abhandl. 25: 650, 1902.—Rathbun, U. S. Fish Comm., Bull. 23 (3): 875, 1903 (1906). (See figure 37, *c, d*.)

A small form very close to *T. alcocki* de Man and, like that species, having a pilose carapace. Cardiac and postbranchial areas without transverse ridges. Frontal teeth somewhat resemble those of *T. alcocki*, the chief difference being in the laterals, which are narrow and pointed; outer border of submedian tooth descends less abruptly than in *T. alcocki*.

First anterolateral tooth largest of all, second and third about equal in size, fourth smallest of all, and fifth a little smaller than third. Basal segment of antenna bears a crest with six or seven sharpish tubercles.

Chelipeds and walking legs agree closely with those of *T. alcocki*, differing only in minor details. Posterior border of propodus of fifth leg bears a row of spinules, as in *T. alcocki*.

The type specimen, an ovigerous female 9 mm. broad, described by de Man, is without designated locality. The *Albatross* dredged a male specimen 11.4 mm. broad from the channel between the islands of Maui and Hawaii at depths of 176 to 49 fathoms. I have examined this specimen in the U. S. National Museum.

***Thalamita coeruleipes*** Jacquinot, in Jacquinot and Lucas, Voy. Pôle Sud., Zool. 3: 53, 1853 (pl. 5, fig. 6, 1852).—de Man, Zoologische Jahrb. syst. 8: 568, 1895; 9: pl. 14, figs 12a, b, 1897.—

Rathbun, U. S. Fish Comm., Bull. 23 (3) : 873, 1903 (1906). (See figures 38, a-f; 39, a.)

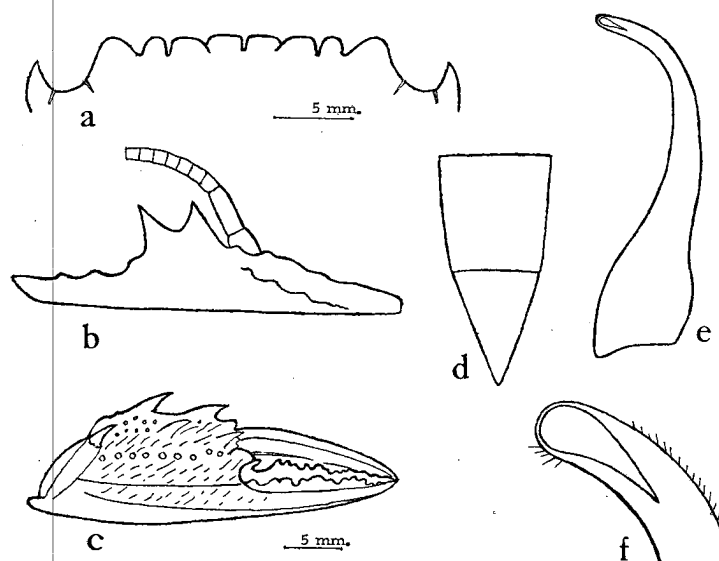


FIGURE 38.—*Thalamita coeruleipes*: a, outline of front; b, crest of basal segment of antenna; c, chela, outer surface; d, tip of abdomen, male; e, first pleopod, male; f, tip of e.

Carapace almost flat, anterior portion with transversely disposed denticulated ridges, the posterior one connecting the last anterolateral teeth. Front consists of six teeth, medians and submedians about equal in breadth, the latter sloping on inner border and slightly overlapping the former, both pairs truncate; laterals a little narrower and less truncate than other frontals. Median fissure of front and that separating submedian from lateral teeth open and deep. Inner supra-orbital angle narrow, strongly arched. Crest of basal segment of antenna bears a pair of strong spines produced from a raised base. Carapace and chelipeds, in specimens examined, well covered with a downy pile, except central area of carapace and ventral surface of chelipeds.

Anterolateral border of carapace bears five sharp teeth, the first three large, the last two smaller, about equal in size or the fourth a little smaller than the fifth. Inner border of arm of cheliped with three spines; a strong spine at inner angle of wrist and three on outer border. Upper border of palm bears five sharp spines and numerous tubercles; outer surface with three longitudinal ridges, the upper consisting of a series of isolated tubercles; inner surface of palm inflated with a longitudinal row of tubercles in central area.

According to de Man (18) this species closely resembles *T. prymna* (Herbst) in the basal segment of the antenna, in the cheli-

pedes, and in the walking legs; but it is apparently distinguished from that species by the character of the frontal teeth. Jacquinet and Lucas (15) observe that the frontal teeth of *T. coeruleipes* are more lamellate than those of *T. crenata* Latreille and that the basal segment of the antenna is denticulate, instead of being granular and tubercular as in that species.

Rathbun (24) indicates that but one specimen of *T. coeruleipes* is known to have been taken from Hawaiian waters, that by H. Mann in 1864. It is now in the Museum of Comparative Zoölogy at Harvard College.

The species is known from Indian Ocean and Indonesian localities, from the area through the Caroline and Gilbert Islands, and from the shores of Mangareva. The latter, spelled Mangavéra by Jacquinet and Lucas, is the type locality. There are no specimens of *T. coeruleipes* in Bishop Museum. Three specimens which I have examined, through the courtesy of the Museum of Comparative Zoölogy, were taken at the Gilbert (Kingsmill) Islands and determined by W. Faxon.

***Thalamita crenata*** Latreille, Alcock, Asiatic Soc. Bengal, Jour. 68 (2): 76, 1899 (1900).—Sakai, Studies on the crabs of Japan IV. . . , 413, 414, 1939.—Balss, K. Vet. Vitterh. Samh., Handl., ser. B, 5 (7): 32, 1938. (See figures 39, *b*; 40, *a-f*.)



FIGURE 39.—*a*, *Thalamita coeruleipes*; *b*, *T. crenata*.

Carapace smooth, no transverse ridge on cardiac or postbranchial areas, and those more anteriorly not strongly developed. Front consists of six broadly rounded teeth; the medians, which slope outward, broadest and a little overlapped by the submedians, which slope inward. Laterals smaller

than the others and evenly rounded at ends. Inner supraorbital angle broad, arched.

The five anterolateral teeth sharp, decreasing in size from front backward. Basal segment of antenna bears a few granules or low tubercles. Chelipeds quite smooth; arm a little rough on posterior border and bearing three teeth and some granules on anterior margin, the two more distal teeth thick and stout. A stout tooth at inner angle of carpus and three blunt tubercles on outer border. Palm bears five small teeth in two rows on upper border, inner row almost forming a crest; outer and inner surfaces somewhat inflated, smooth. A low ridge on outer surface of palm extends from about middle to extremity of immovable finger. Posterior border of propodus of fifth leg bears a row of minute spinules.

Large specimens may exceed 3 inches in breadth of carapace.

This species differs from *T. coeruleipes* Jacquinot in a few well-defined features. The frontal teeth are more rounded at the ends, the crest of the basal segment of the antenna is granular and tubercular

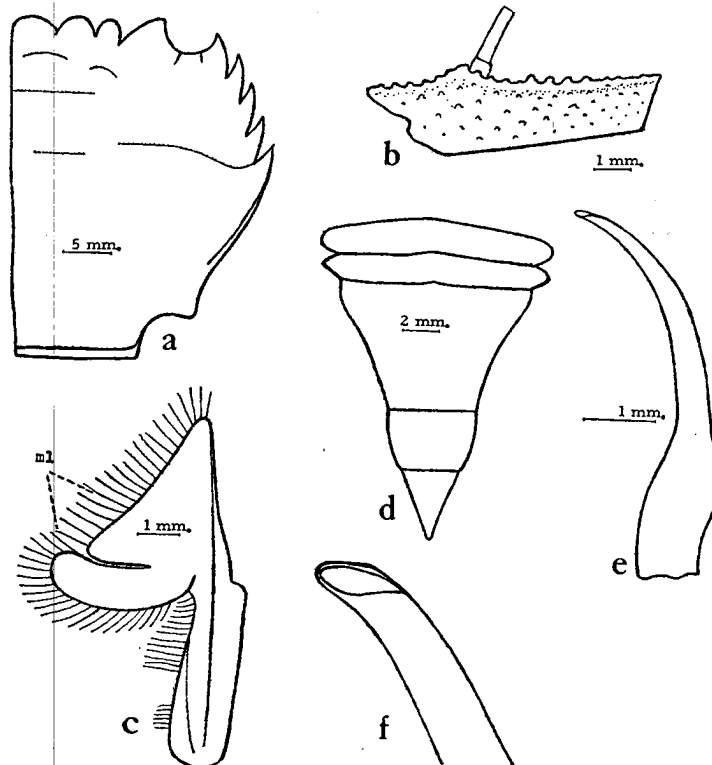


FIGURE 40.—*Thalamita crenata*: a, outline of half-carapace; b, crest of basal segment of antenna; c, endopodite of first maxilliped, showing membranous lobes (*ml*); d, abdomen, male; e, first pleopod, male; f, tip of e.

instead of spiniform, and the spines of the chelipeds are not so pronounced or so slender as in *T. coeruleipes*.

This largest thalamitid in Hawaiian waters is apparently well represented in certain situations. It is frequently taken in traps in Pearl Harbor fishponds, along with *Portunus sanguinolentus* and *Podophthalmus vigil* and, with them, is offered for sale at the fish markets. Some local persons with more imagination than observation have assumed the large thalamitid to be a juvenile form of *Scylla serrata*. *Thalamita crenata* also inhabits the broad flats of Moanalua Bay, Oahu, where it is associated with *T. integra*, but it is less common than that species. The species doubtless has existed in Hawaiian waters for a long time, but only recently has its true identity been recognized locally.

*T. crenata* is widely dispersed in the Indian and Pacific Oceans.

***Thalamita spinifera*** Borradaile, Fauna and Geogr. Maldive and Laccadive Arch. 1: 203, 1903.—Rathbun, U. S. Fish Comm., Bull. 23 (3): 874, 1903 (1906).—Edmondson, B. P. Bishop Mus., Occ. Papers 20 (13): 221, 1951. (See figures 41, *a-d*; 42 *a*.)

Carapace without pile; a transverse ridge on cardiac and postbranchial regions. Front consists of six teeth, median pair at a lower level and slightly smaller than submedians; laterals very small and pointed. Inner supraorbital angle narrow and strongly arched. Six anterolateral teeth, one very small and situated immediately behind first. The five larger anterolateral teeth decrease in size from first to last.

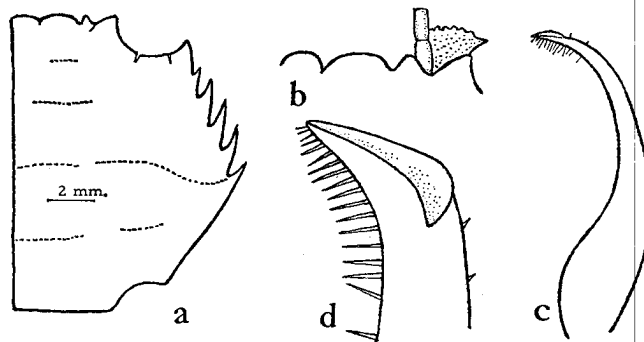


FIGURE 41.—*Thalamita spinifera*: a, outline of half-carapace; b, front and crest of basal segment of antenna; c, first pleopod, male; d, tip of c.

Borradaile considers this form a variety of *T. exetastica* Alcock; but Rathbun, who gives it specific rank, points out that the surface

of the chelipeds is granular instead of squamose and that the posterior margin of the propodus of the fifth leg is spinose instead of smooth, as in *T. exetastica*.

Borradaile records the var. *spinifera* from numerous localities in the Maldive Archipelago at depths of 30 to 45 fathoms. Apparently the only other locality on record is the Hawaiian Islands, where it is not a shallow reef dweller but seems to be plentiful at lower levels. The *Albatross* procured many specimens from various stations about the islands. Kuhns dredged 25 specimens off Waikiki, Oahu, in 30 to 50 fathoms; and the *Makua* took the species off Kauai at depths ranging from 14 to 24 fathoms, and off Oahu in 25 fathoms. The largest specimen in Bishop Museum is 20 mm. broad. The species, *T. exetastica* Alcock, which *T. spinifera* closely resembles, is known from the east coast of India and from Japan.

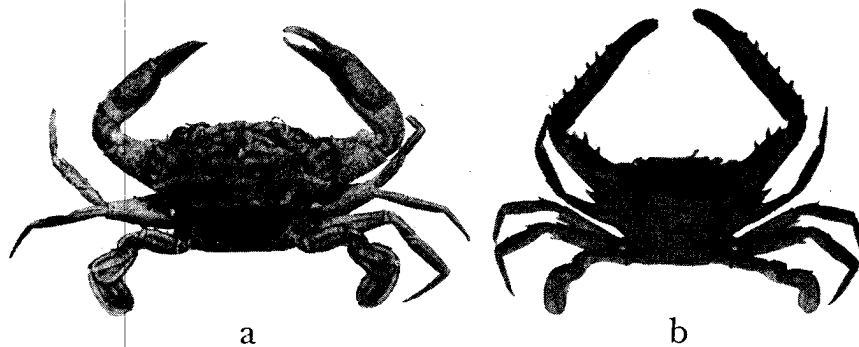


FIGURE 42.—a, *Thalamita spinifera*; b, *Thalamitoides quadridens*.

#### Genus *Thalamitoides*

*Thalamitoides quadridens* (A. Milne Edwards), *Nouv. Arch. Mus. d'Hist. Nat. Paris, Bull.* 5: 147, 1869.—Rathbun, *Mus. Comp. Zoöl., Mem.* 35: 64, 1907.—Balss, W. *Vet. Vitterh. Samh., Handl., ser. B,* 5 (7): 35, 1938. (See figures 42, b; 43, a-c.)

Carapace broad, smooth. Front consists of four lobes, the median pair broad and straight, the laterals narrower and slightly directed outward. Inner supraorbital angle arched, broader than lateral frontal lobe but narrower than median frontal. Four anterolateral teeth, the second the largest, the fourth the smallest. Palm of cheliped bears two rows of sharp teeth on upper border.

The genus *Thalamitoides*, which is regarded by Edwards as a subgenus of *Thalamita*, is represented in the Pacific by at least two species, of which only the larger form, *Thalamitoides quadridens*, is recorded for the Hawaiian Islands. Bishop Museum has specimens from Pearl and Hermes Reef, and from several localities about Oahu. Some were taken at depths of 2 or 3 fathoms, and one was procured from fouling on the bottom of a boat in dry dock in Pearl Harbor. The largest specimens I have seen are about 1 inch broad.

This species is widely known, being recorded from the Red Sea, Madagascar, Amboina, Samoa, and Johnston Island.

The slightly smaller form, *T. tridens typica* (A. Milne Edwards), also has a wide distribution but has not been recorded from Hawaii. It differs from *T. quadridens* in having three anterolateral teeth instead of four.

#### SUBFAMILY PODOPHTHALMINAE

##### Genus *Podophthalmus*

***Podophthalmus vigil*** (Fabricius), Rathbun, U. S. Fish Comm., Bull 23 (3) : 875, 1903 (1906).—Leene, Siboga-Exped., Monogr. 39c<sup>3</sup>: 12, 1928.—Sakai, Studies on the crabs of Japan IV. . . , 426, 427, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. 22: 283, 1946. (See figures 43, *d-e*; 44.)

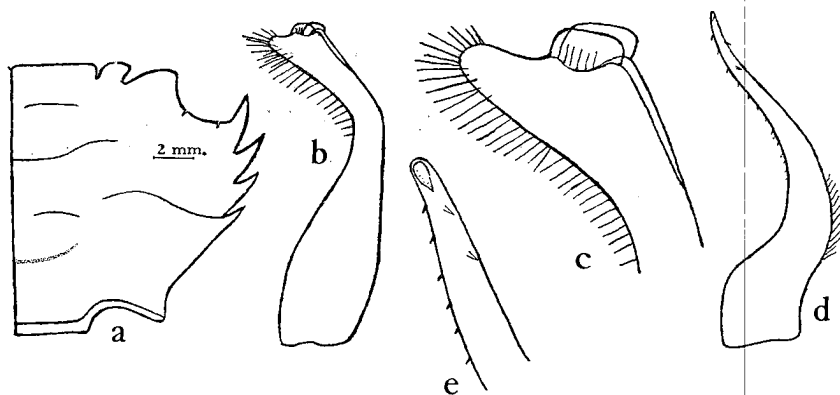


FIGURE 43.—*a-c*, *Thalamitoides quadridens*: *a*, outline of half-carapace; *b*, first pleopod, male; *c*, tip of *b*. *d, e*, *Podophthalmus vigil*: *d*, first pleopod, male; *e*, tip of *d*.

Carapace smooth, anterior border very broad, converging to posterior border, which is less than half as broad as the anterior. True front (between eyestalks) very narrow; remainder of anterior border consists of trough-like orbits which protect the long eyestalks when they are not erected. External orbital angle produced into a stout spine directed outward, behind which is a smaller spine. Chelipeds and walking legs slender. Posterior margin of propodus of fifth leg without spinules.

This is the only genus and the one species of Podophthalminae recognized in the Hawaiian Islands. Its very long eyestalks, which can be erected for all around vision, make it a unique form among local swimming crabs. The species is abundant in bays and harbors; and is sold in large numbers at the fish markets, where it supplements *Portunus sanguinolentus* as a popular edible crab.

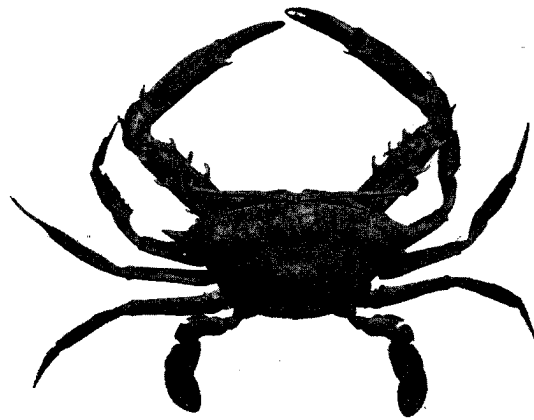


FIGURE 44.—*Podophthalmus vigil*.

There is a wide range of *Podophthalmus vigil* through the Indian and Pacific Oceans where it frequents quiet waters of protected areas about the shores.



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