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Xanthidae of Hawaii

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INTRODUCTION

This report is the third in my series on the higher brachyuran crabs of Hawaiian waters. The other two, both published by Bishop Museum Press, were on the Portunidae (12) and Grapsidae (13).[1] This paper is an attempt to bring the taxonomy of the known representatives of Hawaiian Xanthidae up to date and to indicate their general geographical range.

Little has been published on Hawaiian Xanthidae since Mary J. Rathbun's report on "The Brachyura and Macrura of the Hawaiian Islands" (40), which includes the results of the dredging operations of the *Albatross* in 1902, collections of other expeditions, and the material of independent collectors and investigators whose activities extended over three-quarters of a century. During the following half-century few investigators did systematic research on Hawaiian brachyuran crabs. Though I included an abbreviated record of near-shore forms in "Reef and shore fauna of Hawaii" (10), fewer than a score of species of Xanthidae have been recorded from this locality since 1906, when Miss Rathbun credited more than 90 species to the area. A revision of the family by Odhner (36) brought about a degree of taxonomic modification, but Rathbun's fundamental work remains a most valuable account of the Hawaiian Xanthidae.

Xanthidae is a very large family and, in Hawaii as elsewhere, contains a far greater number of genera and species than any other brachyuran group. This paper lists 40 genera and 111 species, including some 20 species reported from the islands many years ago. These

[1] Numbers in parentheses refer to Bibliography, page 307.

are considered in this report, on the assumption that localities cited by early investigators were accurate and that failure to find the same species more recently does not rule out their presence among local fauna. About 20 other species of Xanthidae credited to the Hawaiian area are known only from dredged material taken by the United States Fish Commission steamer *Albatross* in 1902, by the survey vessel *Makua* of the Fish Division of the Territorial Board of Agriculture and Forestry of Hawaii in 1949, and by the more recent Pele Expedition. This latest expedition, called the Pele Expedition after *Murex pele* for which it was searching, was under the leadership of Mary E. King of Honolulu. It conducted dredging activities about the islands of Molokai, Maui, Oahu, Kauai, and Niihau during the summer and early autumn of 1959, operating, for the most part, at depths of less than 100 fathoms.

Approximately 70 known species of Xanthidae are inhabitants of the shoal waters about the islands or their surrounding reefs. In the near-shore areas is a sufficient number of varied habitats to accommodate a large number of crabs which do not differ greatly in modes of life. Many seem to be widely dispersed without reference to any particular environment within a given area, wandering at random, seeking concealment under stones or in crevices of dead or living coral heads. Comparatively few appear to have selected more or less localized situations as habitats. Certain species of *Pseudozius, Ozius,* and *Leptodius* are typical of the shoreline, often concealing themselves under stones in the intertidal zone. These forms, which live in moist environments but out of water for considerable periods of time, are highly tolerant of fresh water, surviving heavy downpours of rain without apparent ill effects. Species of *Trapezia* and *Domecia* are adapted to a specific existence with coral colonies, where they find protection among branches of reef-building forms, chiefly species of *Pocillopora.* The extensive geographical distribution of these crabs parallels the dispersal of the corals with which they are habitually associated. Some Xanthidae, appropriately termed "mud crabs," are typical of situations which persist near the mouths of rivers or in shallow bays.

Species of the genera *Lybia* and *Polydectus,* not uncommon in Hawaiian shoal waters, are characterized by the strange habit of carrying sea anemones in their chelae, a true example of commensalism. The stinging cells of the actinians may offer a degree of protection to the crab, whereas an advantage may accrue to the anemones through im-

proved oxidation offered by the movements of the crab and a more varied, if not a greater, opportunity to obtain food. Observation of *Polydectus* in captivity reveals curious activities in its relationship to the anemones. If its chelae are forced to drop the anemones, the crab at once begins a search for more actinians. When a suitable anemone is found, the crab backs up to it and pulls the actinian loose by using its hind legs and rolling the anemone forward under its body until a chela can seize it. The search is then continued for a second anemone for the crab's other pincer. Even the substitution of large anemones for the small ones normally carried does not discourage *Polydectus*, which will move about laboriously carrying two actinians almost as large as it is (fig. 34). A xanthid crab of the subfamily Menippinae, which also carries sea anemones, has been reported by Ward (50) from Albany Passage, North Queensland.

That the marine crustaceans of the Hawaiian Islands have a closer affinity with those of the western Pacific and the Indian Ocean than with those of the west American shores is clearly shown by a general analysis of the distribution of Xanthidae. Klunzinger (25), in an account of the crabs of the Red Sea, lists nearly 40 species of this family which are recognized among the Hawaiian fauna, some of them very common forms. Approximately one-half of the known species of Xanthidae in the Hawaiian area are typical of the Indian seas; and of the species accredited to Hawaii, about 40 percent are found in Japanese waters. Although the central Pacific obviously has received its crustacean population from Indo-Pacific sources, this west-east migration has, for the most part, been checked in the Hawaiian and Marquesan areas. Whereas at least 27 genera of Xanthidae are common to Hawaii and the west American shores, the common species number only seven (Rathbun, 43; Finnegan, 21). Garth (22) lists 42 species of the family from the Galapagos Islands, of which three of the seven ranging to the American coast are recognized in the Hawaiian area.

Of the species of Xanthidae now recognized as common to Hawaii and the west American coast, four (*Trapezia cymodoce maculata, T. c. ferruginea, T. digitalis,* and *Domecia hispida*) are coral associates, two (*Leptodius sanguineus* and *Pseudozius caystrus*) are near-shore forms, and the seventh is the "mud crab" (*Panopeus herbstii*). These, except *P. herbstii,* range from the Red Sea through the Indian and Pacific Oceans to the west American shores. Four of them (*Trapezia*

cymodoce ferruginea, Pseudozius caystrus, Domecia hispida, and *Panopeus herbstii*) also occur on the Atlantic side of the Americas. *Panopeus herbstii,* typically an Atlantic species, has long been seen on the west American shores; but it has been noted in Hawaii only recently. It may have reached Hawaii among fouling on the bottom of a ship, thereby reversing the migratory trend.[2]

In terms of human economy, the Hawaiian Xanthidae play an indirect, but not insignificant, role. As a direct source of human food they are negligible. Nearly all species are small, many of them less than 1 inch in breadth of carapace. Two species which attain a breadth of 6 inches (*Carpilius maculatus* and *Etisus splendidus*) have rather stout chelipeds which supply considerable flesh, but neither is common in the shoal waters about the islands or is fished for human food. However, in the natural economy of the reef, the Xanthidae, among other near-shore fauna, doubtless occupy a position of no small significance. There is much direct evidence that these small crabs are an important factor in the food supply of associated organisms such as cephalopods and fishes, especially eels.

Included in the present report are five species which, so far as I can determine, have not been described previously. One of these (*Actaea* sp.) is assigned to a generic position only, and to that with some reservations. A few wide-ranging species have not been reported from the Hawaiian area before. One, described as new, was taken from among fouling on the hull of a sea-going craft in a Pearl Harbor dry dock, which warrants a locality record but hardly justifies the species being considered a valid member of the local fauna without further evidence.

Most of the following species diagnoses are supplemented by illustrations. For the few not figured here, I state where they may be found. The keys are especially adapted to known Hawaiian species and will need revising from time to time, as knowledge of the group advances and new forms make their appearance. It is difficult to formulate workable keys for the large number of genera and species of this family, many of which differ from each other only slightly.

I wish to acknowledge indebtedness to Dr. Fenner A. Chace, Curator, Division of Invertebrates, United States National Museum,

[2] The affinity of the Hawaiian Xanthidae with those of certain localities of the south Pacific is noted in the recent publication, "Crustacés Décapodes Brachyoures de Tahiti et des Tuamotu," by Jacques Forest and Danièle Guinot (Paris, 1961). This excellent work, which includes more than 30 percent of the Xanthidae recognized in Hawaiian waters, was issued after the completion of my manuscript.

Washington, D. C. for the privilege of examining numerous type specimens of Xanthidae in the National Museum and for his counsel respecting certain doubtful species. I am also grateful to Dr. Jacques Forest and Dr. Danièle Guinot-Dumortier of the Muséum National d'Histoire Naturelle of Paris for information regarding specimens of Xanthidae collected at an early date and now in the Paris museum, as well as for helpful observations leading to the specific determination of a number of specimens. In addition, figure 25, *d* was supplied by the Paris investigators. I also appreciate the suggestions of Dr. R. Serene, Director of the Institut Océanographique de Nhatrang, Vietnam, respecting certain taxonomic problems involved in this report.

SYSTEMATICS

The taxonomic position of the family Xanthidae is as follows: class, Crustacea; order, Decapoda; tribe, Brachyura; subtribe, Brachygnatha; superfamily, Brachyrhyncha; family, Xanthidae.

The characteristic features of the family Xanthidae are as follows: The carapace varies somewhat in shape but is typically transversely oval, nearly always broader than long. The front is often broad, never produced into a rostrum. The antennules are usually folded transversely, sometimes slightly obliquely. The external maxillipeds never overlap the well-defined anterior boundaries of the buccal cavity. The antenna is short. The anterolateral borders of the carapace are usually arched, typically bearing lobes, teeth, or spines.

Key to Hawaiian Genera

Ridges defining efferent branchial channels, if present, low and confined to posterior part of endostome.
- Abdomen of male six-segmented (third and fourth fused); carapace smooth, front three-lobed, anterolateral border entire except for an epibranchial tooth..... **Carpilius.**
- Abdomen of male five-segmented (third to fifth fused); anterolateral borders convex; posterolateral borders convergent; posterior border short.
  - Fingers of chelipeds sometimes hollowed out but not hoofed; flagellum of antenna arising from orbit or orbital hiatus; anterolateral borders of carapace with lobes or teeth.
    - Anterolateral borders of carapace and walking legs crested.
      - Anterolateral borders of carapace almost entire, lobes marked by closed fissures..... **Atergatis.**
      - Anterolateral borders of carapace with distinct lobes or teeth.
        - Fingers of chelipeds hollowed out at tips.

Anterior margin of merus of outer maxilliped deeply incised; surface of carapace granular ..... **Zozymodes.**

Anterior margin of merus of outer maxilliped not deeply incised; surface of carapace and walking legs covered with flat tubercles ..... **Zozymus.**

Fingers of chelipeds sharp; carapace often granular or tomentose.

Carapace granular and tomentose; anterolateral lobes broad ..... **Platypodia.**

Carapace not granular or tomentose; anterolateral borders toothed.

Front margin of carapace continuous with supraorbital border; posterior two teeth of anterolateral border carinate above ..... **Lophozozymus.**

Front margin of carapace separated by a notch from supraorbital border; none of anterolateral teeth carinate; palm crested ..... **Cycloxanthops.**

Neither anterolateral borders of carapace nor walking legs crested (an exception is *Neoliomera insularis*, not Hawaiian).

A deep notch in anterior margin of merus of external maxillipeds ..... **Daira.**

No deep notch in anterior margin of merus of external maxillipeds.

Carapace not markedly transversely oval; anterior two-thirds convex in both directions, flat posteriorly.

Anterolateral margin of carapace extended below the orbit toward buccal cavity ..... **Medaeus.**

Anterolateral margin of carapace not extended below orbit.

Anterolateral margin of carapace continuous with external orbital angle; anterolateral teeth usually stout.

Fingers sharply pointed ..... **Xantho.**

Fingers slightly hollowed out ..... **Leptodius.**

Anterolateral margin of carapace usually noncontinuous with external orbital angle; anterolateral lobes often obtusely toothed.

Lateral angle of front continuous with supraorbital border; chelipeds equal ..... **Xanthias.**

Lateral angle of front separated by a notch from supraorbital border; chelipeds unequal.

Surface of carapace smooth; front subtruncate ..... **Paraxanthias.**

Surface of carapace bearing sharp granules; front truncate, deflexed ..... **Micropanope.**

Carapace transversely oval, convex in both directions.
- Fingers slightly hollowed out (an exception is *Neoliomera immigrans*).
  - Regions of carapace well defined; anterolateral border with four thick, rounded lobes.....**Carpilodes.**
  - Regions of carapace not well defined; anterolateral border lobed or entire.....**Neoliomera.**
- Fingers not hollowed out; anterolateral border of carapace lobed or toothed.
  - Regions of carapace not well marked; posterior two lobes of anterolateral border toothlike.....**Lachnopodus.**
  - Regions of carapace well marked.
    - Fingers not blade-like.
      - Front of carapace advanced, consisting of four subacute teeth.....**Peloeus.**
      - Front of carapace not advanced, consisting of lobes not toothlike; external maxillipeds approximated.....**Actaea.**
    - Fingers blade-like; external maxillipeds not approximated .....subgenus **Banareia.**

Fingers of chelipeds hollowed out, hoofed; orbital hiatus closed or open.
- Orbital hiatus closed, antenna excluded from the orbit (an exception is young of *Chlorodopsis*).
  - Carapace smooth or somewhat granular, without hair .....**Etisus.**
  - Carapace granular, pubescent, setose or hairy.....**Chlorodopsia.**
- Orbital hiatus open, antenna not excluded from the orbit.
  - Carapace not markedly convex, considerably broader than long; no characteristic articulation between dactylus and propodus of walking legs.
    - Regions of carapace well marked, smooth or granular, with or without hairs.
      - Carapace granular and hairy.....**Pilodius.**
      - Carapace smooth or granular, without hair.
        - Anterolateral teeth of carapace broad and flat, first and second partly fused .....**Panopeus.**
        - Anterolateral teeth of carapace not broad and flat, first and second distinct .....**Phymodius.**
    - Regions of carapace faintly marked or not at all .....**Chlorodiella.**
  - Carapace markedly convex, little broader than long; characteristic articulation between dactylus and propodus of walking legs..**Liocarpilodes.**

Ridges defining efferent branchial channels extend to anterior border of buccal cavity.
Second pleopods of male long, slender, and curved near tip. Characteristic of subfamily Menippinae (an exception is *Pseudozius*).
Orbital hiatus open, antenna not excluded from orbit.
Basal segment of antenna broad, short, not in contact with front.
Carapace much broader than long, convex or quite flat, smooth or nearly so; anterolateral borders cut into teeth or lobes.
Carapace convex, regions unmarked or faintly outlined; anterolateral borders cut into four teeth.
Anterolateral borders longer than posterolateral ones, cut into about equal triangular teeth ..... **Sphaerozius.**
Anterolateral borders shorter than posterolateral ones, anterior two teeth obtuse, posterior two acute ..... **Galene.**
Carapace flat, regions unmarked; anterolateral borders cut into four low lobes or two sharp teeth (in addition to external orbital angle).... **Pseudozius.**
Carapace little broader than long, surface granular and hairy; anterolateral borders granular or tubercular ..... **Globopilumnus.**
Basal segment of antenna in broad contact with front; carapace tuberculate or punctate, without hair..... **Ozius.**
Orbital hiatus completely closed, antenna excluded from orbit.
Front narrow; surface of animal smooth; anterolateral border of four pointed lobes (in addition to external orbital angle), last one obscure..... **Lydia.**
Front broad, surface of animal often roughened by tubercles or spines; anterolateral border with teeth or spines ..... **Eriphia.**
Breadth of fronto-orbital border about two-thirds, or less, the greatest width of carapace.
Regions of carapace usually well defined; animal typically tomentose or well covered with hairs.
Carapace strongly convex, tomentose, posterolateral borders concave; fingers short, stout, bluntly pointed ..... **Actumnus.**
Carapace not strongly convex, typically covered with hair; anterolateral borders bearing spiniform teeth; posterolateral borders not markedly concave; fingers sharp pointed..... ..... **Pilumnus.**[3]
Regions of carapace not well defined, surface smooth, glabrous, with little hair or none; sometimes a narrow zone of pubescence about front and anterolateral borders ..... **Glabropilumnus.**

[3] Second pleopods of male very short, cylindrical, which is characteristic of subfamily Pilumninae.

Breadth of fronto-orbital border much more than two-thirds greatest breadth of carapace (an exception is *Polydectus*).
Orbital hiatus closed, or nearly so, antenna excluded from orbit.
Carapace smooth, without hair; front and anterolateral borders without spines ..... **Trapezia.**
Carapace smooth, somewhat hairy; front and anterolateral borders spiny ..... **Domecia.**
Orbital hiatus open, antenna not excluded from orbit. (including anemone-carrying species in Hawaii).
Carapace smooth or tubercular, bearing few tufts of hairs or somewhat pubescent; no tubercles on orbital border ..... **Lybia.**
Carapace and entire animal covered with a dense coating of plumose hairs; three cupped tubercles on orbital border ..... **Polydectus.**

Key to Hawaiian species of Carpilius

Convex carapace smooth, marked by 11 red spots, symmetrically arranged ..... **maculatus.**
Convex carapace smooth, central area mottled with gray and white.. **convexus.**

Carpilius maculatus (Linnaeus), Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 79, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 842, 1903 (1906).—Sakai, Studies on the crabs of Japan IV . . ., 445, pl. 55, fig. 1, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 284, 1946. (See figure 1, *a*.)

Carapace convex, smooth, no regions indicated, marked by 11 large red spots, four in a row along posterior border, three across middle area and two behind each orbit. Anterolateral border entire but for a blunt tooth at posterior extremity. Chelipeds very stout, unequal, smooth. Breadth of carapace may reach 6 inches.

This species ranges widely from the Red Sea and the east coast of Africa through Indo-Pacific waters to southern Japan, Australia, and Hawaii.

Carpilius convexus (Forskål), Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 80, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 842, 1903 (1906).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 125, pl. 1, fig. 1, *a, b*; pl. 5, fig. 1, *a-f*, 1913.—Sakai, Studies on the crabs of Japan IV. . ., 446, pl. 87, fig. 3, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 284, fig. 176, *a*, 1946. (See figure 1, *b*.)

In the convexity and smoothness of the carapace, in the character of the anterolateral border, and in the chelipeds this species closely resembles *C. maculatus*. The dark-red carapace, however, is without red spots but is mottled with gray and white. Specimens may attain 3 inches in breadth of carapace. They are commonly found under stones or concealed in holes in coral blocks.

Numerous juvenile specimens of *C. convexus* were dredged by the Pele Expedition, which would seem to indicate that the earlier phases

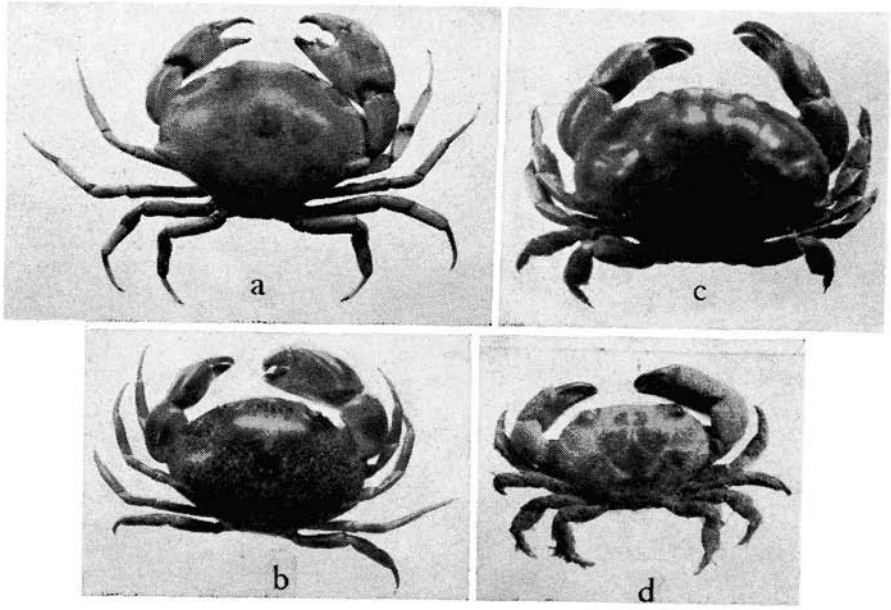

FIGURE 1.—**a**, *Carpilius maculatus;* **b**, *C. convexus:* **c**, *Atergatis floridus;* **d**, *Zozymodes bimanuis.*

of the species were spent in slightly deeper water than that in which the adult is normally found.

The geographical range and local habitat of the two species of *Carpilius* are more or less parallel, but in Hawaiian waters the smaller form is more frequently observed.

Atergatis floridus (Linnaeus), Alcock, Asiatic Soc. Bengal, Jour. **67** (1) : 98, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3) : 845.

1903 (1906) (as *A. ocyroe*).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2) : 152, 1913.—Sakai, Studies on the crabs of Japan IV. . ., 447, pl. 58, fig. 1, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22** : 286, fig. 176, *b*, 1946. (See figure 1, *c*.)

Carapace smooth, slightly lumpy, regions faintly defined by shallow depressions. Anterolateral border crested, lobes indicated by closed fissures, terminating posteriorly in a tubercle. Chelipeds smooth except for outer surface of palm, which is somewhat rough because of a network of low ridges. Arms and palms of chelipeds and long joints of walking legs crested on upper border. Large specimens about 2 inches in breadth of carapace.

A. floridus is dispersed widely through the Indo-Pacific area. It was reported from Oahu in 1864, but we have no recent records of adult forms being seen locally. However, a juvenile specimen taken recently at Kahala, Oahu, apparently represents this species.

Zozymodes biunguis (Rathbun), U. S. Fish Comm., Bull. **23** (3) : 849, pl. 8, fig. 10, text fig. 12, 1903 (1906) (as *Xanthodius biunguis*).—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1) : 82, 1925.—Balss, K. Vet. o. Vitterh. Samh., Handl., ser. B, **5** (7) : 38, 1938.—Edmondson, B. P. Bishop Mus. Sp. Pub. **22** : 289, fig. 177, *c*, 1946. (See figure 1, *d*.)

Carapace with areas fairly well outlined, especially in the middle region, granulate and sparsely coated with coarse hairs. Four low, inconspicuous anterolateral lobes. Chelipeds unequal, granulate except inner arm and lower border of palm; fingers hollowed out at tips and very black. Walking legs finely granulate and hairy on upper margins, dactylus double-tipped. Larger specimens about 8 mm. in breadth of carapace.

Z. biunguis is recorded only from the Hawaiian Islands, where it is not uncommon on coral reefs in shallow water.

Zozymus aeneus (Linnaeus), Alcock, Asiatic Soc. Bengal, Jour. **67** (1) : 104, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3) : 846, 1903 (1906).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2) : 164, pl. 5, fig. 12, 1913.—Sakai, Studies on the crabs of Japan IV. . ., 450, pl. 88, fig. 3, 1939. (See figure 2, *a*.)

Carapace completely covered by smooth, well-defined lobules, small and numerous posteriorly. Anterolateral border crested, cut into four lobes, first three rounded, last toothlike. Chelipeds equal, carpus and palm roughened; palm crested above, fingers grooved, bearing strong teeth and hollowed out at tips. Walking legs crested above, furrowed longitudinally, fringed with long hairs. Large specimens may exceed 3 inches in breadth of carapace.

Z. aeneus is widely distributed through Indo-Pacific waters. It was reported from Oahu in 1864, but apparently there are no recent records from the Hawaiian area.

Key to Hawaiian species of Platypodia

Anterolateral border of carapace not spinulate.
- Superior border of palm of cheliped rounded.....**granulosa.**
- Superior border of palm of cheliped crested.
  - Crest of palm tubercular.....**semigranosa.**
  - Crest of palm granular.
    - Palm with longitudinal ridge on upper outer surface; last anterolateral lobe toothlike .....**actoeoides.**
    - Palm without a ridge on outer surface; last anterolateral lobe not toothlike.....**eydouxii.**

Anterolateral border of carapace spinulate and granular.....**hawaiiensis.**

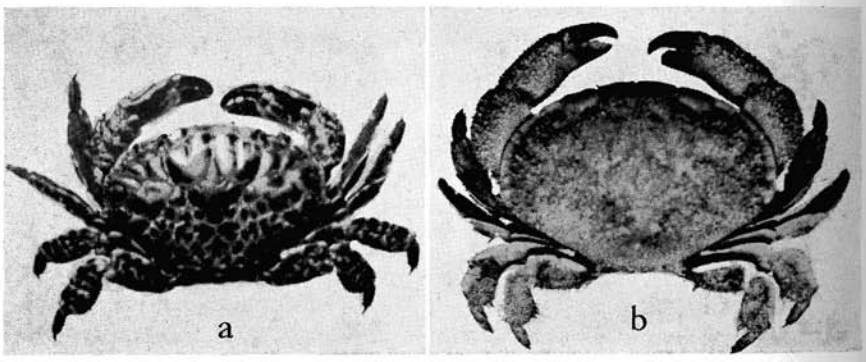

FIGURE 2.—**a,** *Zozymodes aeneus;* **b,** *Platypodia granulosa.*

Platypodia granulosa (Rüppell), A. Milne Edwards, Nouv. Arch. Mus. d'Hist. Nat. Paris **1**: 247, 1865 (as *Lophactaea granulosa*).—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 101, 1898 (as *L. granulosa*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 845, 1903 (1906).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 159, 1913 (as *L. granulosa*).—Sakai, Studies on the crabs of Japan IV . . ., 452, pl. 89, fig. 3, 1939. (See figure 2, *b*).

Carapace convex, well areolated, lobules densely covered with pearly granules which are reduced in size in postgastric region. Protogastric lobes completely subdivided by a deep furrow. Four anterolateral lobes of carapace separated by

closed fissures. Chelipeds equal, outer and upper surface of wrist and palm densely granulated, as is carapace; no crest on palm. Stiff yellow hairs coat carapace and chelipeds and fringe walking legs.

P. granulosa was reported from Hawaii by Randall in 1840 and by Miers in 1886, but we have no recent records from this locality. Specimens in Bishop Museum are from Australia, Wake Island, and Tongatabu. Among those from Tongatabu is a specimen 40 mm. in breadth of carapace.

Platypodia semigranosa (Heller), A. Milne Edwards, Nouv. Arch. Mus. d'Hist. Nat. Paris **1**: 248, 1865 (as *Lophactaea semigranosa*).—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 101, 1898 (as *L. semigranosa*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 845, 1903 (1906).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 157, pl. 5, fig. 10, 1913 (as *L. semigranosa*).—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 286, 1946. (See figure 3, *a*.)

Carapace convex, areas outlined by shallow grooves, surface, for most part, smooth. Pearly granules on anterolateral lobules but much of carapace free of them. Outer and upper surface of wrist and palm of cheliped covered with granules, which become larger on hand. Crest of palm capped by five or six large tubercles. Walking legs crested, sparsely haired on margins.

P. semigranosa, which is known from the Indian seas, was dredged by the *Albatross* at various localities about the Hawaiian Islands at depths of less than 100 fathoms. This apparently widespread dispersal of the species in local waters was verified by the Pele Expedition, which took specimens at numerous stations. Occasionally the species is taken on the shallow reefs.

One of the larger specimens in Bishop Museum is 24 mm. in breadth of carapace.

Platypodia actoeoides (A. Milne Edwards), Nouv. Arch. Mus. d'Hist. Nat. Paris **9**: 189, pl. 7, fig. 7, 1873 (as *Lophactaea actoeoides*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 846, 1903 (1906).—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 287, 1946. (See figure 3, *b*.)

Carapace somewhat convex, surface bearing tubercles and a rather dense coating of yellow bristles. Front bilobed, margin confluent with supraorbital lobe. Parallel with front are two transverse furrows bordered posteriorly by slightly imbricated lobes. Anterolateral border cut into four lobes, the last tooth-like. Chelipeds subequal, wrist tuberculate and roughened by irregular raised lobes. Palm with granulated crest, below which is a thick longitudinal lobe subdivided transversely into a number of small lobules. Tubercles of outer and

lower border of palm disposed in irregular, longitudinal rows. Crest of walking legs bordered by longitudinal groove.

P. actoeoides is known from New Caledonia, and there are specimens in Bishop Museum from Hawaiian localities and from Wake Island.

The largest specimen I have seen is nearly 2 inches in breadth of carapace.

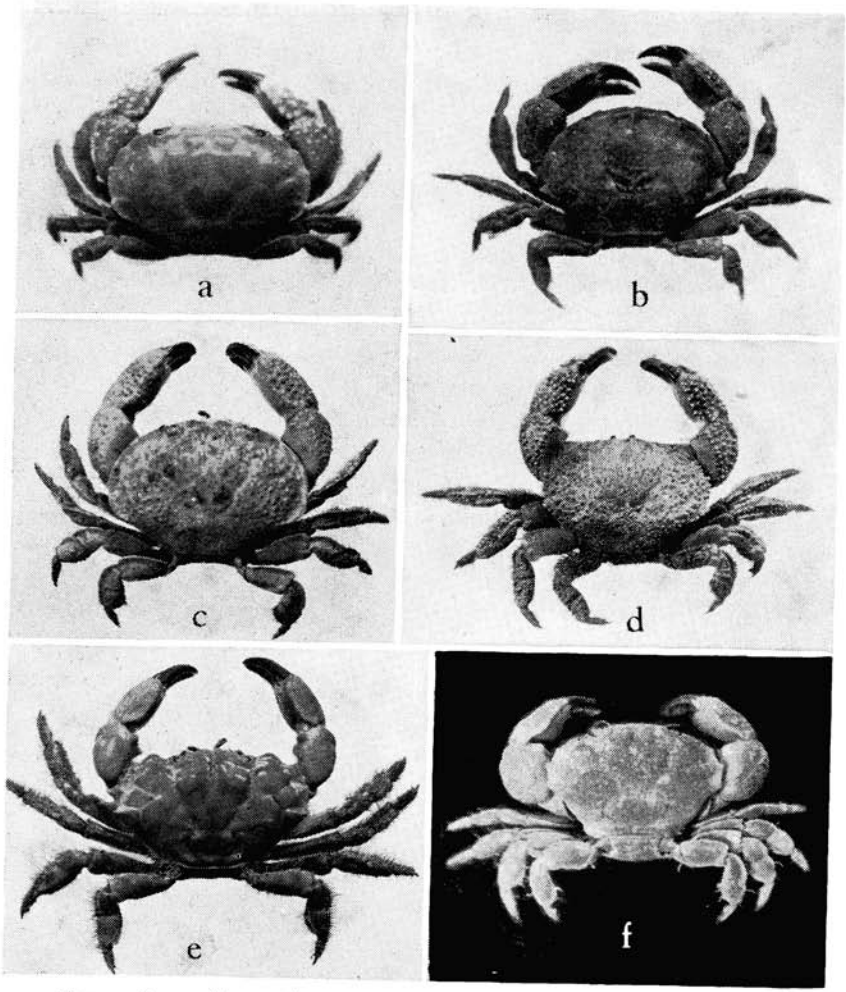

FIGURE 3.—a, *Platypodia semigranosa;* b, *P. actoeoides;* c, *P. eydouxii;* d, *P. hawaiiensis;* e, *Lophozozymus intonsus;* f, *L. dodone.*

Platypodia eydouxii (A. Milne Edwards), Nouv. Arch. Mus. d'Hist. Nat. Paris **1**: 248, pl. 16, fig. 2, 1865 (as *Lophactea eydouxii*).—Streets, U. S. Nat. Mus., Bull. **7**: 105, 1877 (as *Atergatis limbatus*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 845, 1903 (1906).—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 286, fig. 176, *c*, 1946. (See figure 3, *c*.)

Carapace with regions fairly well outlined and granulated, granules stronger in anterior and lateral areas. Lobulation of carapace rather weak by reason of shallow grooves outlining areas. Protogastric lobes usually completely subdivided in older specimens but often incompletely so in young specimens, furrows always shallow. Outer and upper borders of wrist and palm of chelipeds densely granulated. Upper margin of palm without definite crest but occupied by row of granules. Crest of walking legs very wide.

P. eydouxii is apparently very close to *P. granulosa* but may be distinguished from that form by the lobulation of the surface of the carapace. In *P. granulosa* the lobes are strongly defined, being outlined by deep furrows. The range of *P. eydouxii* is very wide in the Indo-Pacific area, and it is a common species on Hawaiian reefs.

Specimens may attain a breadth of nearly 2 inches.

Platypodia hawaiiensis (Rathbun), Henderson, Linn. Soc. London, Trans. (Zool.) II, **5**: 355, pl. 36, figs, 8, 8, *a*, 1893 (as *Lophactaea fissa*).—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 103, 1898 (as *L. fissa*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 853, pl. 9, fig. 9, 1903 (1906) (as *Actaea hawaiiensis*).—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1): 36, 1925.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 287, fig. 176, *d*, 1946 (as *Platypodia fissa*). (See figure 3, *d*.)

Carapace granular, granules becoming sharp toward lateral borders and on anterolateral margins. Anterolateral border spinose and granular. Front bilobed with V-shaped incision in middle. Chelipeds stout, subequal; outer and upper surface of wrist and palm tuberculate. Walking legs crested, surface granular, carpus with longitudinal furrow. Carapace and legs bear coating of stiff yellow hairs.

P. hawaiiensis is known from the Indian seas, from the Hawaiian area, and from the Line Islands. Odhner (36) considers it an aberrant *Lophactaea* (*Platypodia*) and suggests retaining the name I have employed until a time when it might be advisable to establish a new genus for it.

Some specimens from Oahu are marked by red coloration on the gastric region and along the anterolateral borders; the chelipeds are blotched, and the walking legs banded, with the same color.

The largest specimen in the Bishop Museum collections is 36 mm. in breadth of carapace.

Key to Hawaiian species of Lophozozymus

Surface of carapace quite smooth or somewhat imbricated but never covered by a network of red lines.
  Surface of carapace smooth, without hair; last two lobes of anterolateral border toothlike.
    Outer surface of palm of cheliped bearing four longitudinal ridges ..... **intonsus.**
    Outer surface of palm of cheliped without longitudinal ridges.... ..... **dodone.**
  Surface of carapace somewhat rough and imbricated, furrows bearing hair ..... **incisus.**
Surface of carapace finely granular, covered with network of red lines.... ..... **pulchellus.**

Lophozozymus intonsus (Randall), Acad. Nat. Sci. Philadelphia, Jour. **8**: 113, 1839 (1840) (as *Xantho intonsus*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 846, pl. 8, fig. 8, 1903 (1906).—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 287, fig. 176, *a*, 1946. (See figure 3, *e*.)

Carapace smooth, regions well marked. Anterolateral border cut into four lobes, first two rounded, last two more pointed, a ridge extending inward from last tooth. Chelipeds subequal, upper border of arm thin, fringed with long hairs and bearing coarse granules; wrist and hand granular; palm with upper border bluntly crested, outer surface bearing four blunt, longitudinal ridges; fingers long, the black color of pollex extending far back on hand. Walking legs with sharp upper margin and bearing long yellow hairs.

L. intonsus seems to be confined to the central Pacific area. Specimens in Bishop Museum are from the Hawaiian reefs and the Line Islands.

Large specimens may attain or exceed 3 inches in breadth of carapace.

Lophozozymus dodone (Herbst), A. Milne Edwards, Nouv. Arch. Mus. d'Hist. Nat. Paris **9**: 206, 1873 (as *L. radiatus*).—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 108, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 846, pl. 8, figs. 2, 2, *a*, 1903 (1906).—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 287, 1946. (See figure 3, *f*.)

Carapace fairly flat, smooth, regions faintly outlined. Anterolateral border crested, cut into four shallow lobes, the first confluent with orbit, last two some-

what pointed. Chelipeds equal, wrist and hand granular on outer border; both upper and lower borders of palm crested, fingers short, pointed. Walking legs smooth, crested, and sparsely haired.

L. dodone is known from a few localities in the Indian and south Pacific Oceans, as well as from the Hawaiian area, where it is not uncommon on the reefs.

Large specimens are about 20 mm. in breadth of carapace.

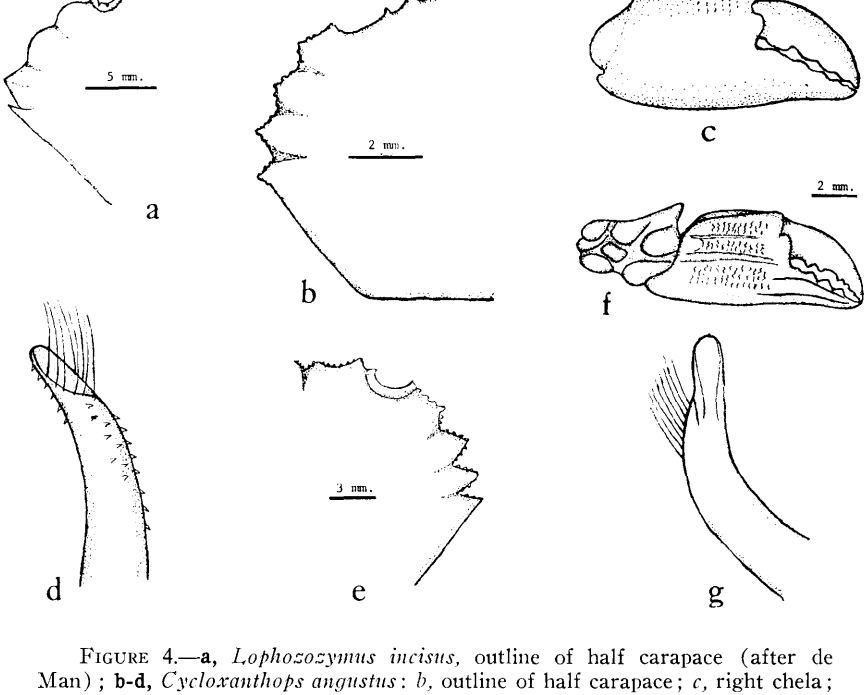

FIGURE 4.—**a,** *Lophozozymus incisus,* outline of half carapace (after de Man); **b-d,** *Cycloxanthops angustus*: *b,* outline of half carapace; *c,* right chela; *d,* tip of first pleopod of male. **e,** *Medaeus elegans,* outline of carapace. **f,** *Xanthias latifrons,* right wrist and chela. **g,** *X. glabrous,* tip of first pleopod of male.

Lophozozymus incisus (Milne Edwards), de Man, Archiv Naturgesch. **53** (1): 268, pl. 10, fig. 1, 1887.—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 107, 1898.— Lenz, Zoologische Jahrb., Abt. Syst. **14**: 429-482, 1901.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 846, 1903 (1906).—Sakai, Studies on the crabs of Japan

IV. . ., 452, pl. 88, fig. 2, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 288, 1946. (See figure 4, *a*; 5, *a*.)

Regions of carapace well marked; lobules of branchial and gastric (part) areas with anterior margins sinuose and undermined, furrows filled with hair. Anterolateral border crested, cut into four lobes, the first confluent with orbit, last two pointed and keeled. Chelipeds equal, upper border of arm, palm, and dactylus crested; outer surface of wrist and palm covered with large granules. Walking legs with upper borders crested. Both chelipeds and walking legs bear long shaggy hairs. Large specimens may exceed 3 inches in breadth of carapace.

L. incisus is known from Japan, Molucca, Amboina, and Australia, and was reported from Laysan Island by Lenz in 1901. There is no other record from the Hawaiian area.

Lophozozymus pulchellus A. Milne Edwards, Nouv. Arch. Mus. d'Hist. Nat. Paris **9**: 205, pl. 6, fig. 3, 1873.—Rathbun, Linn. Soc. London, Trans. (Zool.) II, **14**: 214, 1911.—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 162, pl. 5, fig. 11, 1913.—Montgomery, Linn. Soc. London, Jour. **37**: 435, 1931.—Sakai, Studies on the crabs of Japan IV. . ., 452, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 287, 1946. (See figure 5, *b*.)

Carapace broader than long, somewhat convex, finely granular on anterior portion, marked by a network of red lines and two transverse raised lines of granules; one line across hepatic and gastric areas, the other, more conspicuous one extending from posterior extremity of anterolateral border toward gastric region. Anterolateral border cut into three very low teeth, in addition to external orbital angle, the first tooth of normal series of four being obsolescent. Chelipeds subequal, finely granular on surface; fingers sharply pointed. Walking legs smooth, crested above. Chelipeds and walking legs marked by broad bands of red.

This readily distinguished species is widely distributed from the Red Sea and East Africa to the central Pacific, and specimens have been taken on the reefs from numerous localities about the Line and Hawaiian Islands. It was dredged off Oahu by the Pele Expedition at depths down to 20 fathoms.

Hawaiian specimens seen are less than 1 inch in breadth of carapace.

Key to Hawaiian species of Cycloxanthops

Areas of carapace well marked, coarsely granular with short pubescence ..... **angustus.**

Areas of carapace obscurely marked, very irregular, finely granular, without pubescence ..... **cavatus.**

Cycloxanthops angustus Rathbun, U. S. Fish Comm., Bull. **23** (3): 849, pl. 9, fig. 6, text fig. 13, 1903 (1906). (See figure 4, *b-d.*)

Surface of carapace deeply areolated and lobulated, coarsely and unevenly granulated. Front of two rather broad lobes separated in middle by a shallow notch; margin two-edged, upper edge bearing coarse granules, a blunt tooth at outer angle. Anterolateral border cut into four teeth, in addition to external orbital angle; teeth low, broad, granular, separated by deep furrows, the last tooth smallest. Chelipeds unequal, granular, a longitudinal groove in upper border of each palm; a prominent tubercle on upper border of each palm at articulation with carpus. Fingers toothed, cutting edges in contact when closed; a large basal tooth on dactylus of larger hand. Walking legs very rough, granular; grooves mark carpi and propodi and meral joints of last pair.

Specimens now in the United States National Museum were dredged off the coast of Molokai by the *Albatross*. The type specimen is less than 0.5 inch in breadth of carapace, but a specimen in Bishop Museum that is 12 mm. broad was dredged off Lahaina, Maui, at shallow depths, by the *Makua*, April 1, 1949. The Pele Expedition took a specimen off Oahu at a depth of 38 to 55 fathoms, August 29, 1959.

Cycloxanthops cavatus Rathbun, Mus. Comp. Zoöl., Mem. **35** (2): 41, pl. 5, fig. 8, pl. 6, figs. 3, 3, *a*, 1907.—Edmondson, B. P. Bishop Mus., Bull. **27**: 46, pl. 3, *B*; fig. 8, *a-d*, 1925 (as *Euxanthus minutus*); B. P. Bishop Mus., Occ. Papers **9** (17): 11, pl. 4, *A*, *a-c*, 1931 (as *Megametope sulcatus*).—Balss, K. Vet. o. Vitterh. Samh., Handl., ser. B, **5** (7): 43, 1938. (See figure 5, *c.*)

Anterior portion of carapace grooved longitudinally and two broad, transverse furrows extend inward from between anterolateral teeth. Of the four anterolateral teeth, the first is smallest. Upper surface of wrist and palm deeply sculptured by ridges and depressions; granules on outer border of larger hand disposed in longitudinal lines; outer surface of smaller hand reticulate through raised lines of granules. Walking legs granulate, upper border of meral joints sharp, carpal and propodal segments grooved.

C. cavatus has been reported from numerous Pacific localities: from the Tuamotus by Rathbun; from Christmas and Washington Islands in the Line Islands, from Wake Island, and from Maui and Oahu in the Hawaiian Islands by Edmondson; and from the Gilbert Islands by Balss.

The Hawaiian specimens, the largest 8 mm. in breadth of carapace, were taken from dead coral blocks in shallow water.

Noting the marked difference between this species and other members of the genus, especially the genotype, *C. sexdecemdentata* (Edwards and Lucas), Forest, in a personal letter of November 26, 1957, suggests that the genus may deserve some subdivision.

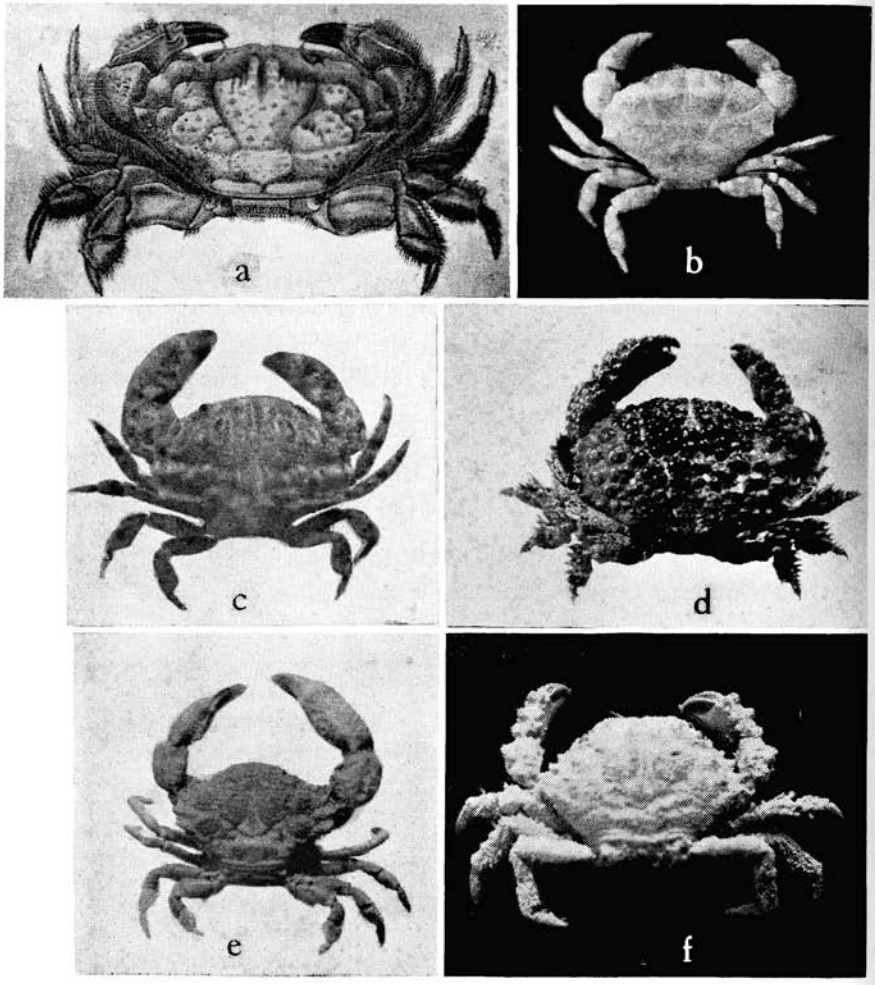

FIGURE 5.—**a**, *Lophozozymus incisus* (after de Man); **b**, *L. pulchellus;* **c**, *Cycloxanthops cavatus;* **d**, *Daira perlata;* **e**, *Medaeus simplex;* **f**, *M. ornatus.*

Daira perlata (Herbst) Alcock, Asiatic Soc. Bengal Jour. **67** (1): 155, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 854, 1903 (1906).—Sakai, Studies on the crabs of Japan IV. . ., 457, pl. 89, fig. 5, 1939. (See figure 5, *d.*)

Carapace strongly convex, covered with finely pitted lobules; anterolateral border with numerous crenulations. Chelipeds unequal, wrist lobulated as in cara-

pace; upper and outer surface of hand covered with tubercles, many of them sharp; fingers blunt-pointed, hollowed out at tip. Upper edge of walking legs fringed with long hairs; propodus and dactylus with spine-like tubercles. Large specimens may exceed two inches in breadth of carapace.

D. perlata, typical of coral reefs, is widely dispersed through the Indo-Pacific area. It was recorded from Hawaii in 1864, but we have no recent record of its occurrence in local waters.

Key to Hawaiian species of Medaeus

Carapace and chelipeds comparatively smooth.....**simplex.**
Carapace and chelipeds roughened by granulated nodules.
  No spinules or sharp granules between teeth of anterolateral border; meral joints of walking legs spinulate.....**ornatus.**
  Spinules or sharp granules between teeth of anterolateral border; meral joints of walking legs free of spinules.....**elegans.**

Medaeus simplex A. Milne Edwards, Mus. Godeffroy, Jour. **4**: 79, 1873.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 849, pl. 9, fig. 10, 1903 (1906).—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 288, fig. 176, *g*, 1946. (See figure 5, *e*.)

Carapace smooth, areas fairly well outlined, front square-cut, prominent, notched in middle. Chelipeds unequal in male, granular; palm with a shallow, longitudinal groove in upper border, large granules on upper, inner border. Walking legs sparsely haired on upper and lower borders; upper margin of meral joints of last pair with a row of small, sharp tubercles. Large specimens a little less than 1 inch in breadth of carapace.

Numerous specimens of this species are in Bishop Museum, most of them from Hawaiian reefs; two are from Wake Island. There are also records of the species from Madagascar and other localities in the Indian Ocean, and from American Samoa in the south Pacific.

Medaeus ornatus Dana, U. S. Exploring Exped. **13**: 182, 1852, pl. 8, fig. 1, 1855.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 849, pl. 9, fig. 5, 1903 (1906).—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 288, 1946. (See figure 5, *f*.)

Carapace roughened by granulated lobules. Front broad, bilobed, the lobes slightly concave, separated in middle by a deep notch, margins granular. Anterolateral teeth four in number, conical, scabrous and acute, third largest, fourth smallest. Chelipeds unequal, granular, wrist and palm bearing nodules which, on palm, are in longitudinal series, four or five of those on upper border tall and conical. Walking legs hairy, hairs feathered; meral joints spinulose on anterior border. Adult specimens a little less than 1 inch in breadth of carapace.

Adult specimens in the United States National Museum were

taken by the *Albatross* in Hawaiian waters at depths of less than 100 fathoms. A few juvenile specimens of this species taken from the reefs and at shallow depths about the Hawaiian Islands are in Bishop Museum collections.

The largest of these, 11 mm. in breadth of carapace, came from a depth of 3 fathoms off Waikiki, Oahu.

Medaeus elegans A. Milne Edwards, Nouv. Arch. Mus. d'Hist. Nat. Paris **9**: 211, pl. 8, figs. 1, 1, *a*, 1873.—Balss, K. Vet. o. Vitterh. Samh., Handl., ser. B, **5** (7): 43, 1938.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 288, 1946. (See figures 4, *c*; 6, *a*.)

Surface of carapace rough, strongly lobed, especially in front, lobules covered with small granules. Front consisting of two concave lobes separated by V-shaped notch in middle, each lobe produced into small tooth at median and lateral extremities. Anterolateral borders cut into three principal teeth, broad, low, serrated, or granular on margins with intervening spaces spinous or tubercular. Chelipeds subequal, outer surface of arm smooth, upper margin serrate and granular with a subterminal notch. Wrist rough with ridges and tubercles, a blunt tooth at inner angle. Lower two-thirds of outer border of palm finely granular, some granules disposed in longitudinal rows; upper border of palm very rough with tubercles, a prominent one at articulation with wrist. Viewed from above, upper border of palm broad posteriorly, narrowing toward distal end. Fingers sharp, crossing at tips when closed, each bearing several small teeth. Black color of pollex extends diagonally backward a little way on palm. Walking legs slender, small spines on upper margin of merus, a few on corresponding margin of carpus toward distal extremity; segments sparingly fringed with short hairs, denser coating on propodus and dactylus.

M. elegans, which somewhat resembles *M. ornatus* in general appearance, may best be recognized by the broad, low teeth of the anterolateral border of the carapace with granular margins. Also, the nodulation of the chelipeds is less pronounced than in *M. ornatus*.

M. elegans has been reported from New Caledonia, from the Gilbert Islands, and from the Hawaiian area. To judge from the collections in Bishop Museum, this species is more common in Hawaiian waters than is *M. ornatus*.

Large specimens are nearly 1 inch in breadth of carapace.

Key to Hawaiian species of Xantho

Interspaces between anterolateral teeth of carapace with accessory denticles ..... **danae.**

Interspaces between anterolateral teeth of carapace without accessory denticles. Surface of carapace pitted.

Carapace areolated by deep, broad furrows, convex lobules deeply pitted ..... **lacunosus.**

Carapace areolated by shallow furrows, convex lobules lightly pitted.
Front narrow, bilobed, each lobe concave, resulting in appearance of four small teeth.....**crassimanus.**
Front broad, bilobed, each lobe somewhat prominent at outer angle .....**quinquedentatus.**

Key to Hawaiian species of Leptodius

An accessory tooth or granulated ridge behind fourth tooth of anterolateral border of carapace.
A small accessory tooth behind fourth tooth of anterolateral border .....**sanguineus.**
A granulated ridge and groove behind fourth tooth of anterolateral border .....**waialuanus.**
No accessory tooth or granulated ridge behind fourth tooth of anterolateral border of carapace.
Carapace moderately convex, quite smooth; anterolateral teeth broad, thin, not strongly pronounced.....**gracilis.**
Carapace slightly convex, well areolated anteriorly; anterolateral teeth not broad and thin, well pronounced.....**exaratus.**

Xantho danae Odhner, Dana, U. S. Exploring Exped. **13**: 209, 1852; pl. 11, fig. 12, 1855 (as *Chlorodius nudipes*).—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 121, 1898 [as *Xantho* (*Leptodius*) *nudipes*].—Rathbun, U. S. Fish Comm., Bull. **23** (3): 848, pl. 9, fig. 3, 1903 (1906) (as *Leptodius nudipes*).—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1): 80, 1925.—Balss, K. Vet. o. Vitterh. Samh., Handl., ser. B, **5** (7): 41, 1938.— Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 289, 1946. (See figure 6, *b*.)

Carapace with anterior two-thirds well areolated, posterior portion quite smooth, surface granular or pitted. Anterolateral border bearing four principal teeth, in addition to external orbital angle, with intervening spaces armed with accessory denticles making 10 or 12 teeth, large and small. Chelipeds stout, wrist and palm finely eroded on upper border.

X. danae, which ranges widely through the Indo-Pacific area, was reported from Hawaii many years ago. We know of no recent record for this locality, but Bishop Museum has specimens from Palmyra, Christmas Island (north Pacific), and Samoa.

A specimen from Christmas Island is 22 mm. in breadth of carapace.

Xantho lacunosus Rathbun, U. S. Fish Comm., Bull. **23** (3): 847, pl. 8, fig. 6, text fig. 9, 1903 (1906).

Carapace comparatively broad, deeply furrowed anteriorly and laterally, surface with that of chelipeds, walking legs and abdomen deeply pitted. Anterolateral

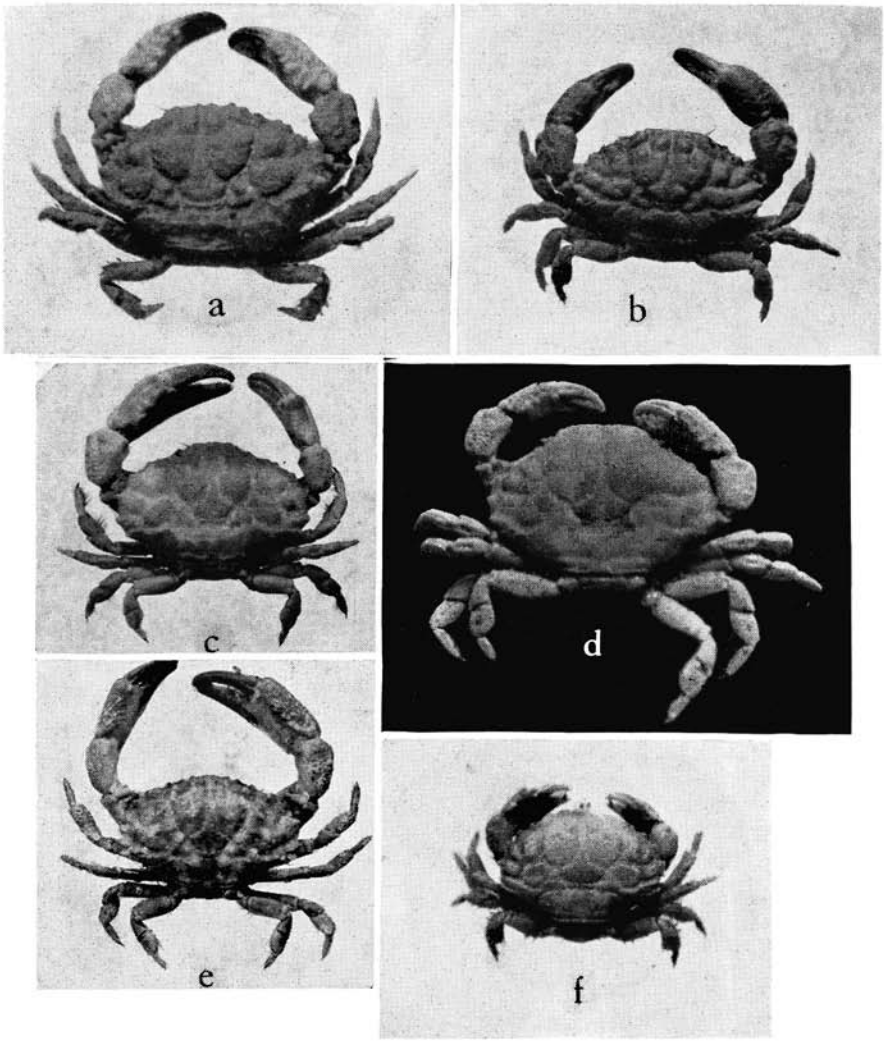

FIGURE 6.—**a**, *Madaeus elegans;* **b**, *Xantho danae;* **c**, *Xantho crassimanus;* **d**, *X. quinquedentatus;* **e**, *Leptodius sanguineus;* **f**, *L. waialuanus.*

border of carapace bearing four thick, blunt lobes, in addition to external orbital angle. Chelipeds subequal, a double tubercle on inner angle of wrist; upper border of palm with a longitudinal furrow; fingers sharp-pointed. Meral joints of walking legs with upper margin bluntly crested; grooved.

X. lacunosus is known only from the Hawaiian area. Specimens in the United States National Museum were dredged by the *Albatross* from Auau Channel at moderate depths.

Large specimens are about 30 mm. in breadth of carapace.

Xantho crassimanus A. Milne Edwards, Nouv. Arch. Mus. d'Hist. Nat. Paris **9**: 226, pl. 11, fig. 4, 1873.—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 120, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 847, 1903 (1906).—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 289, fig. 177, *b*, 1946. (See figure 6, *c*.)

Surface of carapace pitted; front narrow, the two lobes deeply concave, giving appearance of four small teeth. Anterolateral border cut into five teeth in addition to external orbital angle, in this respect resembling *Leptodius sanguineus;* but fingers of chelipeds slightly hollowed out.

This species is recorded from widely separated localities; the Indian seas, Australia, Hawaii, and other parts of central Pacific. Numerous specimens in Bishop Museum are from the Hawaiian area and the Line Islands.

The largest specimen I have seen, which came from Australia, had a breadth of carapace of 45 mm. Most of the larger specimens taken on Hawaiian reefs slightly exceed 1 inch in breadth of carapace.

Xantho quinquedentatus Krauss, IN Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 121, 1898 [*as X.* (*Leptodius*) *euglyptus*].—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 214, 1913.—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1): 80, 1925.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 289, 1946. (See figure 6, *d*.)

Carapace relatively narrow, convex anteriorly, areas well marked, surface pitted. Front broad and advanced. Anterolateral border cut into four low teeth in addition to external orbital angle, the margin between them granular. Chelipeds unequal, upper and outer surface of wrist wrinkled and pitted, of palm nodular, ridged, and wrinkled. Fingers slightly hollowed out at tip. Carpus and propodus of walking legs longitudinally grooved.

X. quinquedentatus is recorded from South Africa, Ceylon, and Burma; and a juvenile specimen was taken at Waikiki, Oahu.

Adult specimens attain a breadth of carapace of about 16 mm.

Leptodius sanguineus (Milne Edwards), Dana, U. S. Exploring Exped. **13**: 207, 1852; pl. 11, fig. 11, *a-d*, 1855 (as *Chlorodius sanguineus*).—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 119, 1898 [as *Xantho* (*Leptodius*) *sanguineus*].—Rathbun, U. S. Fish Comm., Bull **23** (3): 847, 1903 (1906).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 213, 1913.—Sakai, Studies on the crabs of Japan IV. . ., 464, pl. 90, fig. 3, 1939 [as *Xantho* (*Leptodius*) *sanguineus*].—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 288, fig. 177, *a*, 1946. (See figure 6, *e*.)

Carapace well areolated; front comparatively narrow, bilobed, each lobe concave; anterolateral border bearing four principal teeth in addition to external orbital angle, with a small inferior tooth between orbital angle and first tooth and a small accessory tooth behind fourth. Chelipeds unequal, outer surface of wrist and upper border of palm roughened by irregular ridges. Fingers hollowed out at tips. Walking legs sparsely haired. Very large adults may approach 2 inches in breadth of carapace.

L. sanguineus ranges widely from the Red Sea and the east coast of Africa through the Indian and Pacific Oceans to the west coast of South America, where there is one record from the shores of Peru. In Hawaiian waters it is one of the more common reef crabs, abundant under stones near shore.

Leptodius waialuanus Rathbun, U. S. Fish Comm., Bull. **23** (3): 848, pl. 8, fig. 9, text fig. 11, 1903 (1906).—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 289, 1946. (See figure 6, *f*.)

Carapace comparatively narrow, regions well marked, finely granulated; pitted; front narrow, advanced. Anterolateral border without a supplementary tooth behind fourth, as has *L. sanguineus*, but having in its place a granulated ridge and groove which extend a short distance on carapace. Chelipeds unequal, much as in *L. sanguineus*, but shorter; fingers short, dactylus with a lobe at base. Walking legs short, hairy on margins.

L. waialuanus is known only from the central Pacific area. The type specimen (U. S. National Museum), which is from Oahu, is 13.8 mm. in breadth of carapace; but of the several specimens in Bishop Museum from Hawaiian waters and Johnston Island, none exceeds 20 mm. in breadth.

Leptodius gracilis (Dana), U. S. Exploring Exped. **13**: 210, 1852; pl. 11, fig. 13, 1855 (as *Chlorodius gracilis*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 848, pl. 9, fig. 2, 1903 (1906).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 214, 1913.—Sakai, Studies on the crabs of Japan IV. . ., 465,

pl. 91, fig. 2, 1939 [as *Xantho* (*Leptodius*) *gracilis*].—Edmondson, B. P. Bishop Mus., Sp. Pub. 22: 289, 1946. (See figure 7, *a*.)

Surface of carapace quite smooth, with areas not very well defined. Anterolateral border cut into four lobes in addition to external orbital angle, none of which is very sharp or very prominent. Chelipeds stout, subequal, wrist and palm microscopically granular; fingers hollowed out at tips, dark color of pollex extending back a little distance on palm.

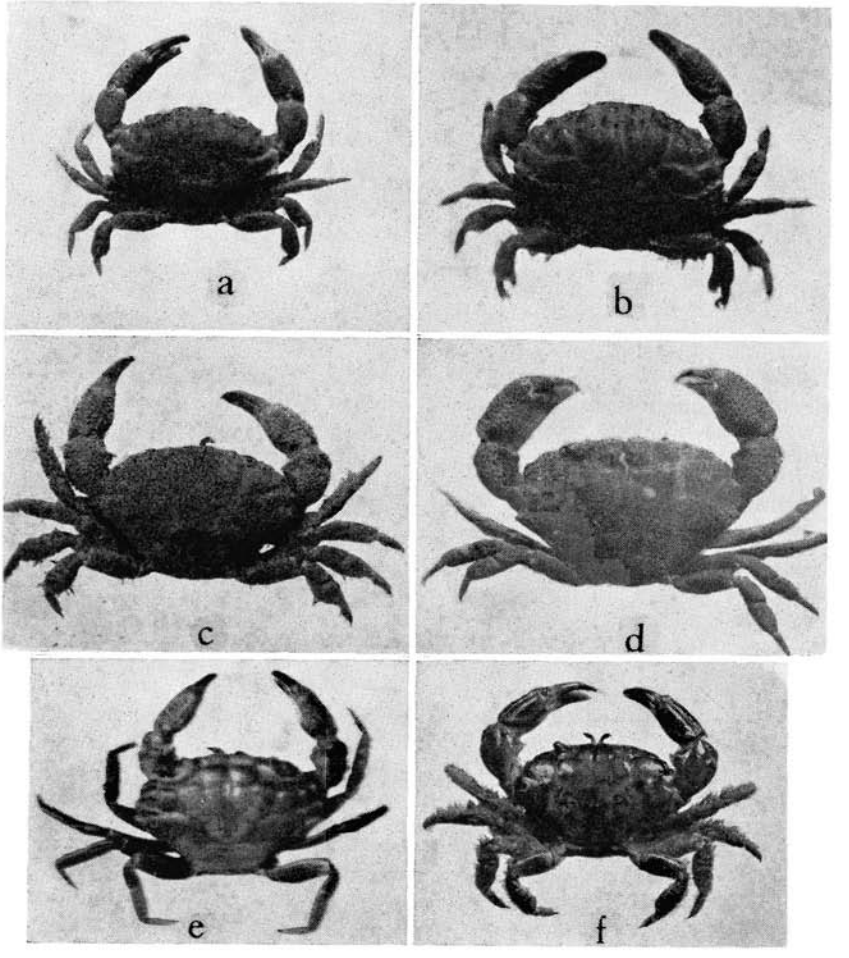

FIGURE 7.—**a**, *Leptodius gracilis;* **b**, *L. exaratus;* **c**, *Xanthias lamarckii;* **d**, *X. oahuensis;* **e**, *X. latifrons;* **f**, *X. canaliculatus.*

L. gracilis has a wide distribution from the Red Sea and East Africa to the central Pacific. It was reported from Hawaii many years ago, but there are no recent records from this locality. In Bishop Museum are specimens from the Line Islands and Samoa.

A specimen from Fanning Island is 17 mm. in breadth of carapace.

Leptodius exaratus (Milne Edwards), A. Milne Edwards, Nouv. Arch. Mus. d'Hist. Nat. Paris **4**:71, 1869.—Alcock, Asiatic Soc. Bengal, Jour. **67** (1):118, 1898 [as *Xantho (Leptodius) exaratus*].—Rathbun, U. S. Fish Comm., Bull. **23** (3):847, 1903 (1906).— Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2):209, pl. 3, fig. 6; pl. 5, fig. 16, 1913.—Sakai, Studies on the crabs of Japan IV. . ., 464, pl. 58, fig. 3, 1939 [as *Xantho (Leptodius) exaratus*].—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**:289, 1946 [as *Xantho (Leptodius) exaratus*]. (See figure 7, *b*.)

L. exaratus very much resembles *L. sanguineus* in appearance and size, but it lacks the supplementary tooth behind the fourth tooth of the anterolateral border of the carapace. It also differs from *L. gracilis*, in that the carapace is rougher and the four anterolateral teeth are more pronounced and sharper.

L. exaratus is a common species in its range, which extends throughout the warmer seas of the Indo-Pacific area, including Hawaii. It is also recorded from various localities about Australia and the Abrolhos Islands by Montgomery (34), who considers it a synonym of *Xantho hydrophilius* (Herbst).

Key to Hawaiian species of Xanthias

Carapace and chelipeds granular.
- Palm of cheliped furrowed longitudinally ..... **lamarckii.**
- Palm of cheliped not furrowed longitudinally.
  - Anterolateral border of carapace with four somewhat dentiform lobes ..... **flavescens.**
  - Anterolateral border of carapace with three dentate lobes and one broadly rounded one ..... **oahuensis.**

Carapace smooth and shining, non-granular.
- Wrist of cheliped nodular ..... **latifrons.**
- Wrist of cheliped smooth.
  - Palm with three longitudinal furrows ..... **canaliculatus.**
  - Palm with one incomplete longitudinal furrow and three faint ridges ..... **glabrous.**

Xanthias lamarckii (Milne Edwards), A. Milne Edwards, Nouv. Arch. Mus. d'Hist. Nat. Paris **9**: 200, pl. 7, fig. 3, 1873 (as *Xanthodes lamarckii*).—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 157, 1898 (as *Xanthodes lamarckii*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 854, 1903 (1906).—Sakai, Studies on crabs of Japan IV . . ., 466, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 291, 1946. (See figure 7, *c*.)

Anterior and lateral areas of carapace well areolated and granular, posterior portion comparatively smooth. Anterolateral border of carapace with four rather broad granular lobes, in addition to the external orbital angle, the two posterior ones bluntly pointed. Chelipeds equal, short and stout; upper and outer surface of wrist and palm covered with pearly granules, palm marked with three longitudinal furrows; fingers sharp-pointed. Walking legs granular, sparsely haired.

X. lamarckii is reported from numerous localities in Indo-Pacific regions. There are early records from Hawaii but, apparently, no recent ones. The species is common at Wake and Palmyra Islands.

Adult specimens are about 1 inch in breadth of carapace.

Xanthias flavescens Rathbun, U. S. Fish Comm., Bull. **23** (3): 855, pl. 9, fig. 11, text fig. 15, 1903 (1906).

Carapace with areas well outlined anteriorly and medially, finely granular except posteromedial region. Anterolateral border cut into four lobes, in addition to external orbital angle, first two very low, third large and pointed, fourth very small. Chelipeds unequal in male, granular, wrist nodular. Large chela stout, dark-brown color of pollex extending far back on palm. Walking legs finely granular, carpus and propodus nodular, sparsely haired. Longitudinal yellow stripes mark carapace, and bands of same color ornament chelipeds and walking legs.

X. flavescens, which was dredged by the *Albatross* from moderate depths near Laysan Island and in the Alenuihaha Channel, has not been seen recently.

An adult male is recorded as 7.2 mm. in breadth of carapace.

Xanthias oahuensis Edmondson, B. P. Bishop Mus., Occ. Papers **20** (13): 231, figs. 32, *a-e*; 33, *a*, 1951. (See figure 7, *d*.)

Carapace well outlined anteriorly, posterior portion almost smooth. Anterior half of carapace ornamented with rounded granules, posterior areas smooth or marked by transversely disposed granules. Front bilobed, lobes separated by a broad median fissure, margins granular. Anterolateral border with a broad, rounded lobe immediately behind minute external orbital angle, followed by three granular teeth, the last smallest. Chelipeds of female equal, short, stout; wrist and palm covered with prominent rounded granules. Walking legs slender, smooth, sparsely haired.

Only one specimen of *X. oahuensis* is known, a female 12 mm. in

breadth of carapace, which was taken on Kahala reef, Oahu, in shallow water (Bishop Museum collection). It is apparently close to *X. gilbertensis* Balss (6) but differs from it in the character of the lobes of the anterolateral border and in the disposition of the granules of the palm of the chelipeds. Furthermore, the walking legs of the Hawaiian species are without hair.

Xanthias latifrons (de Man), Archiv Naturgesch. **53** (1): 265, pl. 9, fig. 4, 1887 (as *Panopaeus latifrons*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 855, pl. 9, fig. 14, text fig. 16, 1903 (1906) (as *Xanthias minutus*).—Sakai, Studies on the crabs of Japan IV. . ., 468, text fig. 32, 1939. (See figure 7, *e*.)

Carapace smooth, without granules, areas marked by deep grooves anteriorly and laterally. Front very broad, convex. Anterolateral border cut into three rounded lobes in addition to external orbital angle. Chelipeds subequal, upper border of arm ending in a sharp tooth with a subterminal notch. Wrist nodular, palm nodular above, outer border with longitudinal ridges and finely granular. Walking legs slender, last two joints finely but sparsely haired.

X. latifrons was dredged by the *Albatross* from moderate depths at several stations about the Hawaiian Islands, and the Pele Expedition dredged the species at a number of stations off Oahu and Kauai. Specimens in Bishop Museum were taken by Kuhns off Waikiki, Oahu, at depths of 30 to 50 fathoms and by the *Makua* off Waikiki at depths of 10 to 25 fathoms. There are also records from the Red Sea, Japan, and Amboina.

Specimens I have seen are less than 20 mm. in breadth of carapace.

Xanthias canaliculatus Rathbun, U. S. Fish Comm., Bull. **23** (3): 856, pl. 9, fig. 12, text fig. 17, 1903 (1906).—Sakai, Studies on the crabs of Japan IV . . ., 466, text fig. 31, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 291, fig. 177, *d*, 1946. (See figure 7, *f*.)

Carapace smooth and shining, sparingly punctate, little areolation of surface; gastric region outlined, with groove extending inward from between second and third anterolateral lobes. Anterolateral border cut into four lobes in addition to external orbital angle, first two lobes low and rounded, third and fourth more acute, last very small. Chelipeds equal, stout, smooth, and punctate; a subterminal groove on outer border of wrist, three longitudinal grooves on outer border of palm. Walking legs smooth, upper borders densely haired.

There are many specimens of this species in Bishop Museum, mostly from the Hawaiian reefs, but some are from Wake Island and the Line Islands. It is also reported from Japan.

Adult males may reach 18 mm. in breadth of carapace.

Xanthias glabrous Edmondson, B. P. Bishop Mus., Occ. Papers **20** (13) : 230, figs. 29, *b;* 31, *a-c,* 1951. (See figures 4, *g;* 8, *a.*)

Carapace moderately convex anteriorly, flat posteriorly; surface smooth and shining, areas fairly well defined by broad and deep furrows. Anterolateral border cut into four lobes in addition to external orbital angle, third lobe largest, third and fourth more acuminate than first and second. Chelipeds large, subequal; wrist smooth, outer border impressed by tri-radiate grooves; palm finely

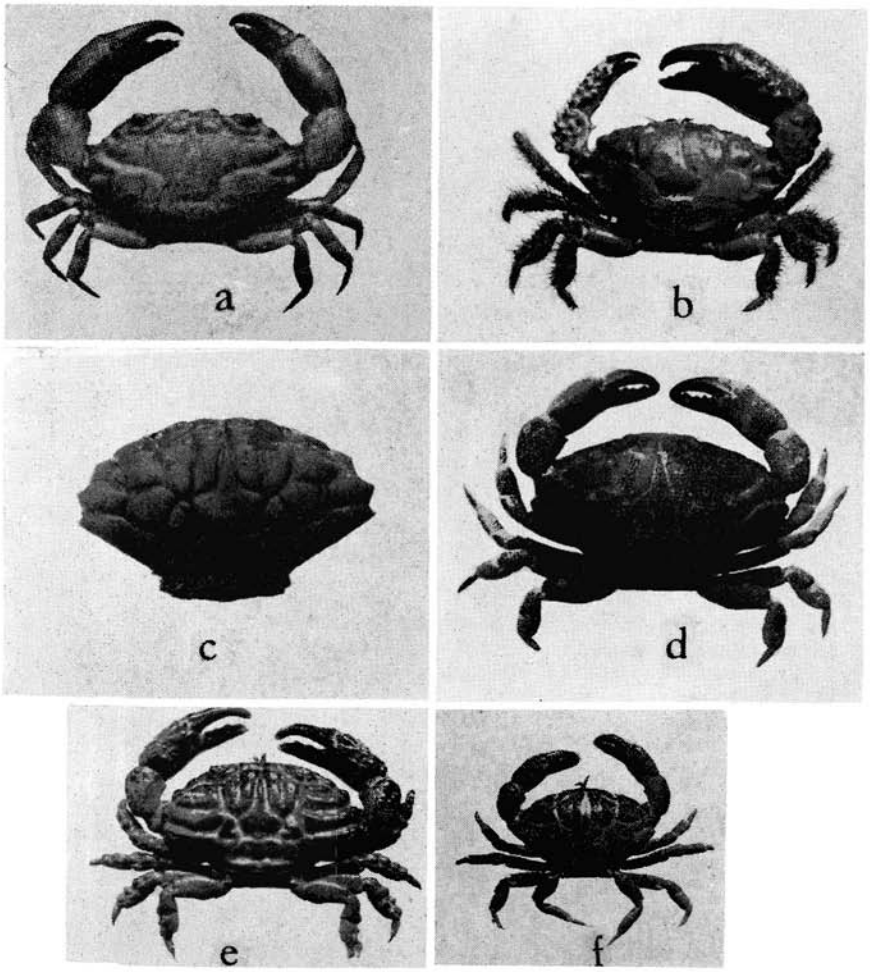

FIGURE 8.—**a,** *Xanthias glabrous;* **b,** *Paraxanthias notatus;* **c,** *Carpilodes ruber;* **d,** *C. tristis;* **e,** *C. supernodosus;* **f,** *C. bellus.*

pitted, outer surface with a longitudinal groove near upper border and three faint longitudinal ridges lower down. Walking legs slender, smooth; propodus sparsely, dactylus densely, haired. Color, claret red with bluish tints at articulations of walking legs. Pollex and much of surface of palm black.

X. glabrous was described from a single male specimen 21 mm. in breadth of carapace, dredged by the *Makua* off the southwest coast of Oahu at depths of 40 to 300 feet (Bishop Museum no. 5612).

In 1958 Tune Sakai procured a small male specimen (about 10 mm. broad), taken from Tokyo Bay at a depth of 85 meters, which conforms closely with the Hawaiian specimen in specific characters, including the first male pleopods. A reexamination of the first pleopods of the Hawaiian specimen (fig. 8, *a*) revealed a clearer and more accurate view of these appendages than is illustrated in the original description of the species.

When first seen, the carapace of the Japanese specimen presented distinct color markings in the form of a network of lines and round red spots, but they soon faded in alcohol. No color markings of this nature were apparent in the Hawaiian specimen when I first saw it.

Paraxanthias notatus (Dana), U. S. Exploring Exped. **13**: 178, 1852; pl. 8, fig. 12, *a, b*, 1855 (as *Xanthodes notatus*).—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 158, 1898 (*X. notatus*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 855, 1903 (1906) (as *Xanthias notatus*).—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1): 84, 1925.—Sakai, Studies on the crabs of Japan IV . . ., 470, text fig. 33, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 291, fig. 177, *e*, 1946. (See figure 8, *b*.)

Carapace smooth, areas well marked by deep grooves. Anterolateral border cut into four teeth, in addition to external orbital angle, last two sharp, spine-like. Chelipeds unequal, outer and upper borders of wrist and palm of larger one armed by low, blunt tubercles, whereas on corresponding segments of smaller cheliped tubercles are sharp, spine-like. Upper margins of meral joints of walking legs bear a single row of spines; those of carpal and propodal joints, a double row. Long bristles border walking legs.

The distribution of *P. notatus* appears to extend from Ceylon through the Pacific to Japan and eastward to the Tuamotus. It is a very common species on Hawaiian reefs.

Adult specimens are about 20 mm. in breadth of carapace.

Micropanope sexlobata Rathbun, U. S. Fish Comm., Bull. **23** (3): 856, pl. 9, fig. 13, text fig. 18, 1903 (1906).

Carapace with areas well outlined by grooves which bear a short pubescence;

surface covered with sharp granules. Front deflexed, bilobed, each lobe divided into three, middle one broad and rounded. Anterolateral border bears four teeth in addition to external orbital angle, first and fourth very small, second and third much larger, acuminate. Chelipeds unequal, a triangular tooth at inner angle of wrist. Wrist and upper and outer surface of palm granular, granules of larger palm becoming finer toward lower border. Walking legs long, slender, somewhat hairy; meral joints bearing spinules on upper margins.

M. sexlobata is known only from the Hawaiian area, where it was dredged by the *Albatross* from moderate depths near Laysan Island and in the Alenuihaha Channel.

The breadth of carapace for two specimens in the United States National Museum is recorded for a male as 8 mm., for a female as 8.5 mm.

Key to Hawaiian species of Carpilodes

Regions of carapace well demarcated by grooves, lobulated.
- Subdivision of protogastric lobes complete.....**ruber.**
- Subdivision of protogastric lobes incomplete.
  - Subdivision of protogastric lobes indicated by a notch only.....**tristis.**
  - Subdivision of protogastric lobes well pronounced.
    - Chelipeds and walking legs strongly nodular and pitted.....**supernodosus.**
    - Chelipeds and walking legs comparatively smooth and granular.
      - Posterior portion of carapace quite smooth, without granules .....**bellus.**
      - Posterior portion of carapace furrowed and granular.
        - Branchial lobes of carapace elongate-transverse, strongly convex .....**rugatus.**
        - Branchial lobes of carapace not elongate-transverse or strongly convex.....**virgatus.**

Regions of carapace little demarcated or lobulated.....**medipacificus.**

Carpilodes ruber A. Milne Edwards, Nouv. Arch. Mus. d'Hist. Nat. Paris **1**: 226, pl. 12, figs. 4, 4, *a*, 1865.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 843, pl. 8, fig. 4, 1903 (1906) (as *C. coccineus*).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 138, 1913.—Odhner, K. Vet. o. Vitterh., Samh., Handl. **29** (1): 23, pl. 2, fig. 2, 1925.—Sakai, Studies on the crabs of Japan IV . . ., 474, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 291, 1946. (See figure 8, *c*.)

Regions of carapace outlined by deep, smooth grooves; protogastric areas completely subdivided; surface of lobules distinctly granulate. First two lobes of anterolateral border of carapace very low, posterior two larger, more acumi-

nate. Chelipeds subequal, granular as in carapace; palm with groove near upper outer border and faint longitudinal ridge lower down. Black color of pollex extends far back on palm. Walking legs granular. Color red all over except fingers and portion of palm.

C. ruber is known from the Red Sea, from localities in Indian waters, and from around islands of the Pacific, including Hawaii. It was frequently taken at moderate depths in the Hawaiian area by both the *Albatross* and the Pele Expeditions.

Adult specimens are about 1 inch in breadth of carapace.

Carpilodes tristis Dana, U. S. Exploring Exped. **13**: 193, 1852; pl. 9, fig. 7, *a-d,* 1855.—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 82, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 842, 1903 (1906).—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1): 12, pl. 1, fig. 1, 1925. (See figure 8, *d.*)

Carapace with regions well outlined, surface of lobules covered by microscopic granules, resulting in smooth appearance. Subdivision of protogastric lobes indicated by a notch only in anterior border. Anterolateral border with four lobes, first two low and rounded, posterior two better defined and more acuminate. Chelipeds and walking legs granular as in carapace and with same smooth appearance.

C. tristis has a wide distribution in the Indian and Pacific Oceans. Early records from the Hawaiian Islands show its presence, but there are no recent local reports of it. In Bishop Museum are specimens from a number of south Pacific localities.

Adult specimens may slightly exceed 1 inch in breadth of carapace.

Carpilodes supernodosus Rathbun, U. S. Fish Comm., Bull. **23** (3): 844, pl. 8, fig. 5, text fig. 6, 1903 (1906).—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1): 18, pl. 1, fig. 11, 1925.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 291, fig. 178, *a,* 1946. (See figure 8, *e.*)

Surface of carapace lobulated, lobules separated by deep smooth furrows, finely granulate and pitted. Protogastric lobes deeply but incompletely subdivided. Lobules of lateral areas long, transversely disposed. Four lobes on anterolateral border, the first confluent with external orbital angle, following ones more distinct. Chelipeds equal, wrist and upper palm covered with irregular nodules; three longitudinal ridges on outer surface of palm. Carpus and propodus of walking legs nodular as in chelipeds. Large specimens about 1 inch in breadth of carapace.

C. supernodosus is known only from the Hawaiian area. Numerous specimens in Bishop Museum include some from the reefs of the

larger islands and many from the leeward chain, including Pearl and Hermes Reef and Laysan Island. The type specimen (U. S. National Museum) was dredged in the vicinity of Laysan Island.

Carpilodes bellus (Dana), U. S. Exploring Exped. **13**: 196, 1852; pl. 11, fig. 2, 1855 (as *Actaeodes bellus*).—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 85, 1898 (as *Carpilodes vaillantianus*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 843, 1903 (1906) (as *C. vaillantianus*).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 140, 1913 (as *C. vaillantianus*).—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1): 16, pl. 1, fig. 9, 1925.—Sakai, Studies on the crabs of Japan IV . . ., 476, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 291, fig. 177, *f*, 1946. (See figure 8, *f*.)

Carapace with areas well outlined in anterior and lateral areas but quite smooth and flat posteriorly. Lobules very finely granular. First of the four anterolateral lobes confluent with external orbital angle, third and fourth distinct, rounded. Chelipeds and walking legs finely granular but smooth in appearance. Color, yellowish or pale brown. Large specimens 20 mm. in breadth of carapace.

C. bellus has a wide distribution in the Indian and Pacific Oceans and is a very common form on the Hawaiian reefs.

Carpilodes rugatus (Milne Edwards), A. Milne Edwards, Nouv. Arch. Mus. d'Hist. Nat. Paris **1**: 230, pl. 12, figs. 3, 3, *a*, 3, *b*, 1865.—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 86, 1898 (as *C. monticulosus*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 844, 1903 (1906) (as *C. monticulosus*).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 139, pl. 1, fig. 2; pl. 5, fig. 5, *a-c*, 1913.—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1): 20, pl. 1, fig. 16, 1925.—Sakai, Studies on the crabs of Japan IV . . ., 476, pl. 92, fig. 2, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 291, 1946. (See figure 9, *a*.)

Carapace with areas outlined by deep furrows, lobules covered with distinct granules. Of the four anterolateral lobes, first is confluent with external orbital angle, the others distinct, rounded. Last anterolateral lobule marked by transverse furrow, which does not reach border. Chelipeds and walking legs granular, as in carapace, granules of palm tending to be arranged in longitudinal series. Color, bright red.

C. rugatus has a wide distribution throughout the Indo-Pacific area and is a common form on the Hawaiian reefs.

Large specimens are about 1 inch in breadth of carapace.

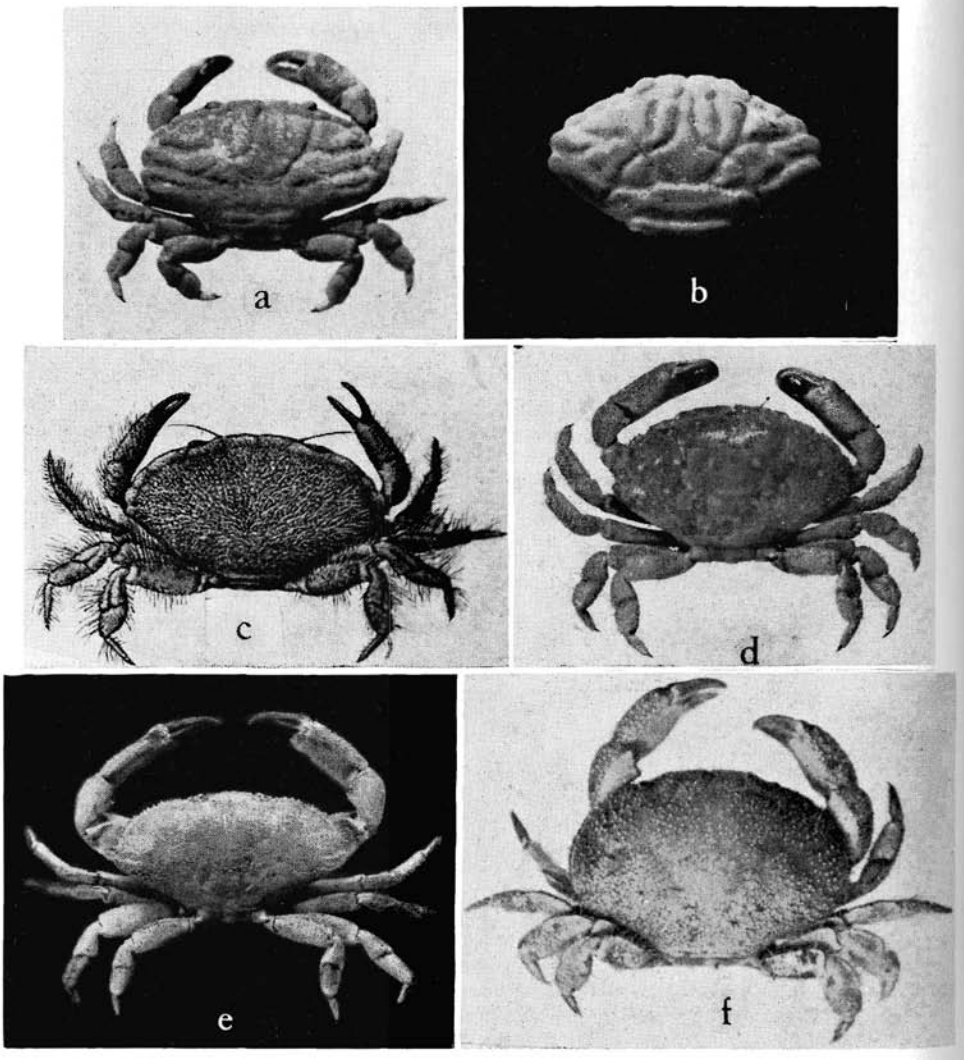

FIGURE 9.—**a**, *Carpilodes rugatus*, **b**, *C. virgatus;* **c**, *Neolimera praetexta* (after Odhner) ; **d**, *N. pubescens;* **e**, *N. richtersi;* **f**, *N. immigrans.*

Carpilodes virgatus Rathbun, U. S. Fish Comm., Bull. **23** (3) : 843, pl. 8, fig. 3, 1903 (1906).—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1) : 16, pl. 1, fig. 8, 1925. (See figure 9, *b.*)

Carapace with regions well outlined by broad, deep furrows. Lobules and furrows covered with microscopic granules. Of four anterolateral lobes, first is flat, confluent with external orbital angle, the others distinct, rounded. Chelipeds subequal, somewhat rough, granules on palm arranged in reticulate patterns around smooth areas. Fingers black, color of pollex extending far back on palm. Walking legs granular, carpal joints somewhat bilobed. Color, bright scarlet, legs banded with buff.

C. virgatus, which was dredged by the *Albatross* at a number of stations about the Hawaiian Islands at depths down to 179 fathoms, is also known from the China Sea and the Indian Ocean. In Bishop Museum are damaged ones, taken by Kuhns off Waikiki, Oahu, at depths of 50 fathoms.

The type specimen, a male (U. S. National Museum) is 18 mm. in breadth of carapace.

Carpilodes medipacificus Edmondson, B. P. Bishop Mus., Occ. Papers **20** (13) : 226, fig. 27, *a-d*, 1951. (See figure 10, *a.*)

Carapace convex, smooth, few areas of surface outlined, chiefly in gastric region. Anterior portion of carapace microscopically pitted. Front slightly arched, bilobed, margin smooth. Anterolateral lobes four in number, the first confluent with external orbital angle, three following low, bluntly pointed, fourth smallest. Chelipeds subequal, of smooth appearance, upper margin of arm sharp, serrate; outer surface of wrist and palm finely pitted. Fingers grooved longitudinally, hollowed out at tips. Walking legs slender, smooth and unarmed, a few bristles on last three segments.

C. medipacificus, known only from the type specimen (Bishop Museum), is a female 18 mm. in breadth of carapace taken in shallow water at Pearl and Hermes Reef.

Key to Hawaiian species of Neoliomera

Walking legs not keeled; anterolateral border of carapace cut into lobes, distinct or not.
- Carapace without transverse grooves.
  - Anterolateral border of carapace keeled, cut into four distinct lobes ..... **praetexta.**
  - Anterolateral border of carapace not keeled, cut into four indistinct lobes ..... **pubescens.**
- Carapace with two short, parallel, transverse grooves extending inward from lateral borders ..... **richtersi.**

Walking legs keeled; anterolateral border of carapace entire, tuberculate (fingers of chelae not hollowed out at tips) ..... **immigrans.**

Neoliomera praetexta (Rathbun), U. S. Fish Comm., Bull. **23** (3): 844, text fig. 7, 1903 (1906) (as *Liomera praetexta*).—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1): 34, pl. 2, fig. 15, 1925.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 292, 1946. (See figure 9, *c*.)

Carapace nearly twice as broad as long, convex, sparingly granular, tufts of long yellow hairs rising from granules. Front deflexed, bilobed, slight notch in middle. Anterolateral border crested, cut into four lobes, diminishing in size posteriorly, the first confluent with external orbital angle. Chelipeds equal, small, outer border of wrist and upper palm granular and hairy. Palm diminishing in size distally, outer border with a longitudinal row of granules below middle. Fingers long, slender, slightly hollowed out at tips. Walking legs broad, meral joints sharp on upper margin, granular and fringed with long hairs.

N. praetexta is known only from the Hawaiian area, where specimens have been dredged from the Auau Channel at 28 to 65 fathoms.

The type specimen, a female (U. S. National Museum) is 18 mm. broad; its color is reported to be orange brown in alcohol.

Neoliomera pubescens (Milne Edwards), A. Milne Edwards, Nouv. Arch. Mus. d'Hist. Nat. Paris **1**: 223, pl. 12, figs. 6, 6, *a*, 1865 (as *Liomera pubescens*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 844, 1903 (1906) (as *L. pubescens*).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 135, 1913 (as *L. pubescens*).—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1): 28, pl. 2, figs. 6, 7, 1925.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 292, fig. 178, *b*, 1946. (See figure 9, *d*.)

Carapace convex, about twice as broad as long, granulate, regions not well defined, gastric area faintly outlined; surface marked by scattered white spots and covered with short yellow hairs. Anterolateral border cut into four very low lobes, the first fused with the external orbital angle. Chelipeds equal, long and slender, granular; fingers short, gaping, hollowed out at tips. Walking legs short, granular, bordered with short hairs.

The known distribution of *N. pubescens* is wide and scattered, with records from Mauritius, the Palau Islands, Tahiti, and Hawaii. Specimens were dredged by the *Albatross* on the south coast of Molokai, and some in Bishop Museum are from various Hawaiian reefs.

A specimen from Pearl and Hermes Reef is 30 mm. broad.

Neoliomera richtersi (de Man), Zoologische Jahrb., Abt. Syst. **4**: 412, pl. 9, fig. 2, 1889 (as *Actaeodes richtersi*).—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1): 33, pl. 2, fig. 13, 1925.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 292, 1946. (See figure 9, *e*.)

Carapace broad, convex, granular, and sparsely haired. Anterolateral border sharp, indistinctly lobed, margin with numerous minute teeth of irregular size. Two parallel furrows extend inward from posterior half of anterolateral border, anterior one longer. Chelipeds subequal (male), long, granular, upper margin of arm sharp, serrate; inner angle of wrist with two granular, acuminate teeth, upper one broad, curved upward. Palm granular throughout, granules becoming microscopic on lower border, a longitudinal row of large granules about middle of outer border; a broad longitudinal furrow near upper outer border, and a more shallow depression in a corresponding position on inner border. Fingers grooved longitudinally, the black color of pollex extending a little way on palm. Meral joints of walking legs sharp above, finely serrate; segments fringed with long golden hairs.

N. richtersi is known from a number of localities in the western Pacific and ranges as far east as Tahiti and Hawaii. A specimen in Bishop Museum, taken in shoal water on the Kona coast of Hawaii, is 56 mm. in breadth of carapace.

Neoliomera immigrans, new species (figs. 9, *f;* 10, *b, c*).

Carapace of male 30 mm. broad, 20 mm. long, convex in both directions, regions faintly outlined. Upper surface of carapace covered by large rounded granules, more thickly set near lateral borders, and a rather dense coating of long golden hairs. Front deflexed, consisting of two slightly arched lobes separated in middle by a shallow notch; each lobe with front margin entire but upper border bearing a row of granules and laterally merging with supraorbital border. Orbital border granulate without an appreciable notch except large inner one occupied by antenna. Anterolateral border entire, without lobes but marked by a row of granules like those on surface of carapace.

Chelipeds unequal in male, outer surface of arm smooth, upper margin keeled; outer surface of carpus covered with rounded granules, inner angle with two obtuse teeth distantly separated. Upper and most of outer border of palm granulate, lower distal portion bare and smooth. Dactylus strongly keeled above; cutting edge of fingers toothed, that of dactylus with four teeth of nearly equal size, that of pollex with three large teeth and three of smaller size. Fingers sharp at tips, crossing when closed.

Dense coat of very short, fine hairs covers outer border of arm; short stiff yellow hairs borne on outer border of carpus and palm and to a lesser degree, inner border, interspersed with longer hairs. Walking legs flattened, upper margin of meri distinctly keeled. Outer borders of walking legs covered with short hairs, margins fringed with long ones.

Two specimens of this apparently undescribed species were taken from fouling on the bottom of a barge in a Pearl Harbor drydock in 1950, after the barge had been in service in Guam for some time. *N. immigrans* presents features of *N. insularis* (White) and of *N. ovata* Tweedie in the keeled character of the meri of the walking legs. It also resembles *N. nobilii* Odhner, in the anterolateral border of the carapace, which is entire and without evidence of lobes.

In 1939 Odhner (36) keyed and described the nine species of the genus recognized at that time, but the Hawaiian species is not in complete agreement with any of them. Since Odhner's publication, three additional species of *Neoliomera* have been recorded as follows: *N. sakagutti* Sakai, from Japan, is characterized by a granular but hairless carapace without crested borders; *N. striata* Buitedijk, from the Moluccas, has the granules of the carapace disposed in numerous transverse rows with smooth intervening areas; and *N. ovata* Tweedie,

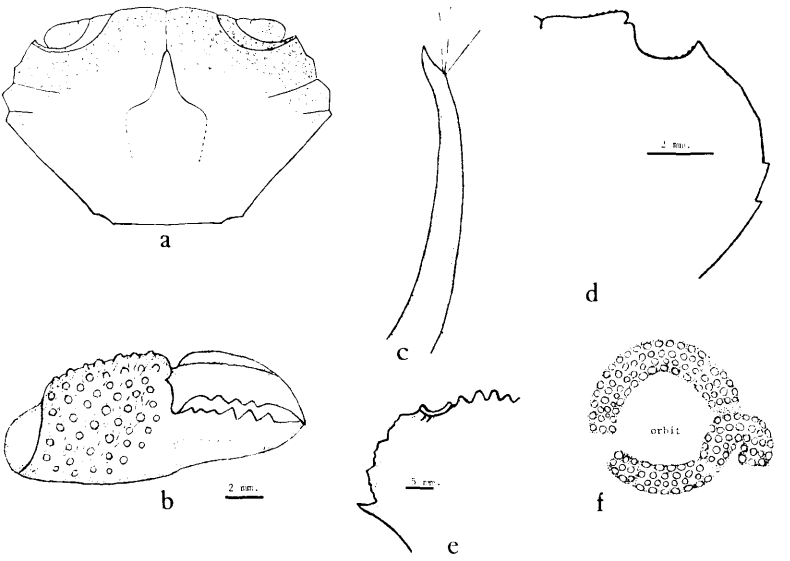

FIGURE 10.—**a,** *Carpilodes medipacificus,* carapace; **b, c,** *Neolimera immigrans: b,* right chela; *c,* first pleopod of male. **d,** *Lachnopodus subacutus,* outline of half carapace. **e,** *Pelocus armatus,* outline of half carapace (after Eydoux and Souleyet). **f,** *Actaea superciliaris,* orbital border.

from Aor Island in the South China Sea, presents a smooth, hairless carapace with areas almost obsolete, the walking legs with strongly keeled meri. Tweedie (48), in connection with the description of *N. ovata,* offers a key to the 12 species then known. My key (p. 251) is an abbreviated one to accommodate only the recognized Hawaiian species.

Still another feature of *N. immigrans* deserves comment. The sharp fingers of the chelipeds do not conform to the recognized hollowed-out

fingers of the typical *Neoliomera*. Therefore, if the species is rightly placed in its generic position, an exception in this particular character seems necessary.

Of the two specimens of this form which have come to my attention, one, a female cotype, is in the United States National Museum; the other, a male type, is in Bishop Museum (no. 5625).

Lachnopodus subacutus (Stimpson), Miers, Challenger Report, Zoology (Brachyura) **17** (49) : 126, pl. 11, fig. 4, 1886 (as *Xantho bidentatus*).—Rathbun, U. S. Fish Comm., Bull. **23** (3) : 847, 1903 (1906) (as *X. bidentatus*).—Stimpson, Smithsonian Misc. Coll. **49** (1717) : 39, pl. 5, fig. 1, 1907 (as *Liomera subacuta*).—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1) : 83, 1925.—Sakai, Studies on the crabs of Japan IV . . ., 480, 1939. (See figure 10, *d*.)

Carapace slightly convex, smooth and shining; surface faintly lobulated. Anterolateral border with only two distinct teeth, fourth and fifth of normal series. Chelipeds unequal, smooth and polished, merus very short, palm punctate on outer border, fingers sharp. Walking legs slender, slightly compressed.

L. subacutus is known from the east coast of Africa and from localities in the western and southern Pacific as far east as Tahiti. It was reported from Hawaii many years ago, but apparently has not been observed in local waters recently.

A damaged Samoan specimen in Bishop Museum measures 13 mm. in breadth of carapace.

Peloeus armatus Eydoux and Souleyet, Voy. Bonite, Zoology (Crustacea) **1** (2) : 226, pl. 1, figs. 10-15, 1842.—Rathbun, U. S. Fish Comm., Bull. **23** (3) : 850, 1903 (1906). (See figure 10, *e*.)

Carapace a little broader than long, convex, smooth, regions not well outlined. Front advanced, horizontal; of four blunt, toothlike lobes, medial lobe somewhat more advanced than lateral lobes, which are separated from internal orbital angles by a slight notch. Anterolateral border cut into three broad, low, crenulated lobes, in addition to external orbital angle; posterior lobe terminating in a stout, acute tooth. Chelipeds large, smooth, fingers not hollowed out at tips. Walking legs fringed, in part, by long hairs above and below. Color of carapace reddish violet with numerous yellowish white spots, small anteriorly, becoming larger behind. Legs spotted with red above. Breadth of carapace slightly exceeds 2 inches.

Hawaii is indicated as the type locality of *P. armatus*. In fact, there is no record of the species other than the type, which is in the National Museum of Natural History, Paris.

Key to Hawaiian species of Actaea

Carapace and appendages not covered with a dense coat of long hairs; chelipeds of usual form, fingers not usually compressed.
- Chelipeds and walking legs prominently nodular.
  - Nodules tall, some spine-like ..... **nodulosa.**
  - Nodules low, moundlike ..... **rufopunctata.**
- Chelipeds and walking legs without nodules.
  - Animal covered with dense coat of short fur ..... **tomentosa.**
  - Animal without dense coat of short fur.
    - Grooves of carapace without hair; lobules with a thin coat of long hairs.
      - An inverted U-shaped lobule on lower lateral border of orbit ..... **superciliaris.**
      - No U-shaped lobule on border of orbit.
        - Hands of chelipeds inflated, fingers very short, rounded ..... **variolosa.**
        - Hands not inflated, fingers not short and rounded.
          - Fingers *Banareia*form, three round lobes on cutting edge of pollex ..... **parvula.**
          - Fingers not *Banareia*form, four low teeth on cutting edge of pollex ..... **Actaea** sp. ?
    - Grooves of carapace filled with short hair; lobules without long hair.
      - Grooves filled with short tomentum; lobules flat, compact ..... **speciosa.**
      - Grooves filled with short black bristles; lobules convex ..... **remota.**

Carapace and appendages covered with a dense coat of long hairs; fingers of chelipeds more or less compressed.
- Anterolateral border of carapace cut into four, thick, narrow, granular lobes (besides orbital) ..... **A. (Banareia) villosa.**
- Anterolateral border of carapace indistinctly cut into four, broad, low, granular lobes (besides orbital) ..... **banareias.**

Actaea nodulosa White, Zool. Soc. London, Proc. **15**: 224, 1847.—Nobili, Mus. Hist. Nat. Paris, Bull. **11**: 404, 1905 (as *A. pisigera*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 853, pl. 9, fig. 4, 1903 (1906) (not as *A. nodulosa* Alcock).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. **99** (2): 192, 1913.—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1): 56, pl. 3, fig. 20, 1925.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 294, 1946. (See figure 11, *a*.)

Carapace broader than long, upper surface divided into numerous lobules and densely covered with granular tubercles, some of which are rounded, others tall and bluntly pointed. Tubercles larger on anterior areas of carapace, smaller posteriorly. Front border bearing four tubercles, median pair much larger. The four anterolateral lobes of carapace marked by large tubercles, which stand

out more prominently than others. Just in front of posterior border of carapace are two transverse parallel lines of small tubercles, anterior one broken in middle.

Chelipeds equal in females, subequal in males, well covered with tubercles, those of upper borders of segments being the larger and those of outer surface of palm disposed in longitudinal rows. Fingers short, longitudinally grooved; teeth on cutting edges of both fingers, those of immovable finger prominent. In male black color of fingers extends far back on lower portion of palm. Walking legs granulate and tuberculate, upper border of joints (merus to propodus) covered with very tall tubercles.

Odhner (36), in discussing the species, observed that Miss Rathbun in her account of *A. nodulosa* White (40) presented an accurate figure of the species but cited as a synonym the *A. nodulosa* treated by Alcock (1), whereas that form is now recognized as a representative of *A. margaritifera* Odhner (36).

The species *A. nodulosa* White is known from the Red Sea, from Madagascar and Mauritius in the Indian Ocean, from the China Sea, and from the Hawaiian area in the central Pacific. It was dredged by the *Albatross* from numerous stations about the Hawaiian Islands, usually at depths of less than 100 fathoms. Specimens in Bishop Museum were taken by Kuhns off Waikiki, Oahu, at depths of about 50 fathoms and by the *Makua* at a number of stations about Oahu at depths of less than 50 fathoms. It was also one of the species frequently dredged by the Pele Expedition.

The larger specimens are slightly under 1 inch in breadth of carapace.

Actaea rufopunctata (Milne Edwards), A. Milne Edwards, Nouv. Arch. Mus. d'Hist. Nat. Paris **1**: 268, pl. 18, fig. 1, 1865.—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 142, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 852, pl. 9, fig. 8, 1903 (1906) (as *A. garretti*).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. **99** (2): 183, pl. 1, fig. 4, *a-c;* pl. 6, fig. 6, *a-e,* 1913.—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1): 60, 1925.—Sakai, Studies on the crabs of Japan IV . . ., 488, pl. 93, fig. 2, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 294, 1946. (See figure 11, *b.*)

Carapace ovoid, strongly lobulated, furrows broad and deep between lobules, which are covered with large granules; grooves filled with downy fur and long hairs. Anterolateral border with four rounded lobes, in addition to external orbital angle. Chelipeds bearing rounded nodules on wrist and palm. Carpus and propodus of walking legs nodulated as are chelipeds. Legs very hairy. Large specimens about 1 inch in breadth of carapace.

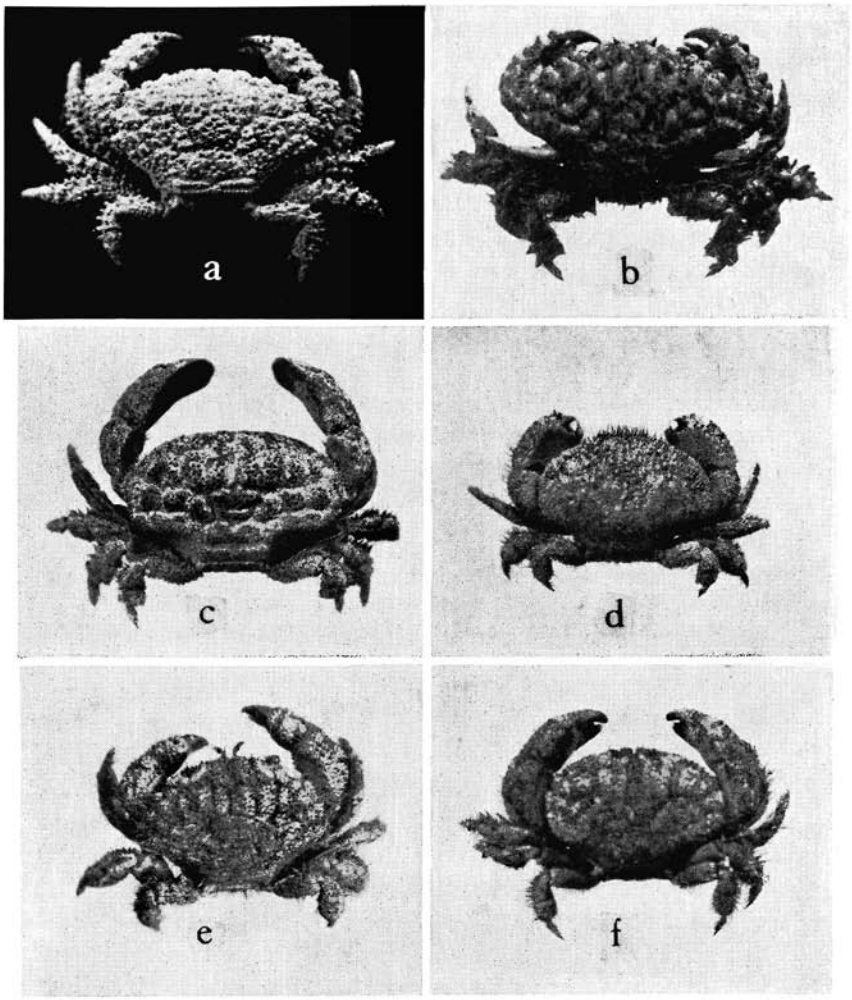

FIGURE 11.—**a**, *Actaea nodulosa;* **b**, *A. rufopunctata;* **c**, *A. tomentosa;* **d**, *A. variolosa;* **e**, *A. superciliaris;* **f**, *A. parvula.*

A. rufopunctata has a wide distribution in Indo-Pacific waters. It is seen only occasionally on Hawaiian reefs.

Actaea tomentosa (Milne Edwards), A. Milne Edwards, Nouv. Arch. Mus. d'Hist. Nat. Paris **1**: 262, 1865.—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 140, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 852, 1903 (1906).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 188, pl. 6, fig. 6, *a-c*, 1913.—Sakai, Studies on the crabs of Japan IV . . ., 487, pl. 93, fig. 8, 1939. (See figure 11, *c*.)

Carapace very broad, strongly lobulated, covered with large granules. Surface of carapace, chelipeds, and walking legs covered by short blackish felt. Anterolateral border cut into four very shallow lobes, in addition to external orbital angle. Chelipeds equal; wrist and palm granular under felt, as on carapace. Walking legs short, granular, fringed with coarse, tufted hair.

A. tomentosa is widely distributed in the Indo-Pacific region. It was reported from Hawaii many years ago, but there are no recent records of its having been observed locally.

Some specimens from Samoa in Bishop Museum are 30 mm. in breadth of carapace.

Actaea superciliaris Odhner, Rathbun, U. S. Fish Comm., Bull. **23** (3): 852, 1903 (1906) (as *A. hirsutissima*).—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1): 49, pl. 3, fig. 11, 1925.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 292, 1946. (See figure 10, *f*; 11, *e*.)

Carapace ovoid, surface strongly lobulated, lobules granulated, hairy and separated by deep, smooth furrows. Anterolateral border cut into four rounded lobes, in addition to external orbital angle. Chelipeds and walking legs granular and hairy. A distinguishing feature is a prominent granulated tubercle, halfmoon-shaped, forming part of lateral boundary of orbit.

A. superciliaris is known from numerous localities in the western Pacific and is not uncommon on the Hawaiian reefs.

Specimens in Bishop Museum slightly exceed 1 inch in breadth of carapace.

Actaea variolosa Borradaile, Fauna and Geogr. Maldive and Laccadive Arch. **1** (3): 256, text fig. 54, 1902.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 853, 1903 (1906).—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1): 63, 1925.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 294, 1946. (See figure 11, *d*.)

Carapace convex, granular and covered with short, stout bristles. Arched anterolateral border much longer than posterolateral border. Chelipeds short, stout; wrist and inflated palm granular on outer border; fingers very short, strongly arched. Walking legs short, stout, haired. About 12 mm. in breadth of carapace.

A. variolosa is known from Natal, East Africa, and from several western and central Pacific localities. It was dredged by the *Albatross* in Hawaiian waters and was frequently taken by the Pele Expedition. It has also been taken on the reefs of Oahu.

Specimens are about 12 mm. broad.

Actaea parvula (Krauss), Südafrikanischen Crustaceen 34, pl. 2, fig. 2, 1843 (as *Menippe parvulus*).—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1) : 51, pl. 3, fig. 13, 1925.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22** : 294, 1946. (See figures 11, *f;* 14, *a.*)

Carapace a little broader than long, deeply lobulated and granular, bearing long soft hairs. Four low, granular lobes on anterolateral border. Chelipeds stout, granular and hairy; palm increasing in height distally; fingers compressed, sharp, pollex with cutting edge bearing three rounded lobes, two of which are large. Walking legs hairy.

The known range of *A. parvula* is from east Africa to the Marquesas in the Pacific, although it has not been taken at many intervening localities. The species is seen occasionally on Hawaiian reefs.

A specimen in Bishop Museum is 14 mm. broad.

Actaea species (figs. 12, *a;* 14, *b-e*).

Carapace, male specimen, 13 mm. in breadth, 10 mm. in length, moderately convex longitudinally, less so transversely. Regions of carapace fairly well marked, lobules not strongly developed, deepest furrows bounding gastric area laterally. Surface densely covered by granules or small tubercles, those of central region larger and depressed, those of branchial areas smaller and more conical. Sparse coat of yellow hairs covers surface of carapace, denser toward front but nowhere so thick as to conceal areolation or granules. Front consists of two slightly convex lobes, granular on margin, separated in middle by deep U-shaped notch and laterally forming slight lobe as they merge with orbital border. Orbital border granular above and below; antenna resting in orbital hiatus. Anterolateral border cut into four low, granular lobes, as well as external orbital angle; third lobe broadest, fourth narrow and thick, more conical than others. Transverse groove close to posterior margin of carapace is bounded posteriorly by even row of rounded granules.

Chelipeds equal, arm very short, outer border microscopically granular but appearing smooth, superior and anterior margins granular and fringed with hair, a blunt lobe at lower distal angle. Wrist thickly covered on upper and outer borders by conical tubercles, a vertical, granular ridge at inner angle, long yellow hairs interspersed among tubercles. Upper and outer borders of palm bearing rather tall conical tubercles and hairs, as on wrist. Fingers sharp-

pointed, tips crossing when closed; hair and tubercles extending over base of dactylus, which is grooved above. A few low teeth on cutting edges of both fingers; four on pollex, which is grooved on outer border. Upper and lower margins of merus of walking legs granular; carpus with a longitudinal groove near upper margin on outer border bounded on either side by row of conical tubercles; propodus bears small tubercles on upper and outer borders; dactylus tipped by long brown claw. Segments of walking legs fringed by long hairs, carpus to dactylus also more or less heavily haired on outer borders.

This unique Hawaiian specimen is tentatively placed under the genus *Actaea,* with considerable doubt as to its proper taxonomic position. If it is an *Actaea,* it is atypical, as the weak lobulation of the

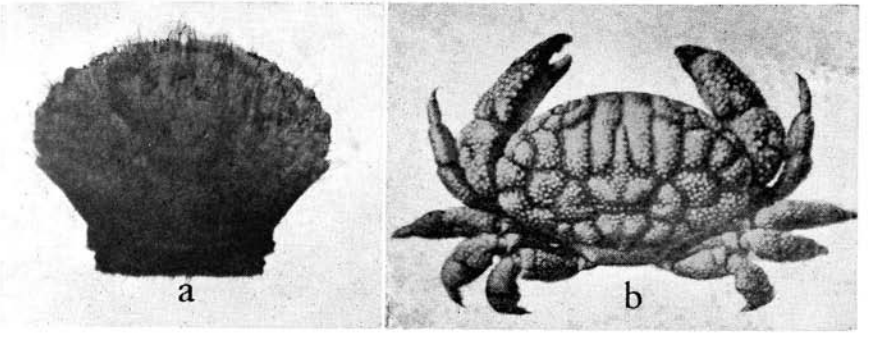

FIGURE 12.—**a,** *Actaea* sp.; **b,** *A. remota* (after Odhner).

carapace shows. In the character of the anterolateral border of the carapace it seems to approach that of *A. acies* Rathbun (42) which, according to Odhner (36), equals *A. kraussi* Heller ?. In other features the two are different. However, the first pleopods of the male of this doubtful form (fig. 14, *e*) conform favorably with the general pattern of corresponding appendages of species of *Actaea.* A single male specimen was collected at Kawailoa, Oahu, in June 1921 (Bishop Museum no. 732).

Actaea speciosa (Dana), U. S. Exploring Exped. **13**: 198, 1852; pl. 11, fig. 4, *a-c,* 1855 (as *Actaeodes speciosa*).—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 143, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 852, 1903 (1906).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 179, pl. 1, fig. 3, pl. 6, fig. 1, *a-g,* 1913.—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1): 62, 1925.—Sakai, Studies on the crabs of Japan IV . . .,

489, pl. 93, fig. 3, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 292, fig. 178, *c*, 1946. (See figure 13, *a*.)

Carapace well areolated, somewhat flattened, lobules crowded close together with narrow furrows between and covered with large granules, but free of hair. Chelipeds and walking legs lobulated and covered with granules, as on carapace.

A. speciosa, which is widely known in the Indo-Pacific area, is a common form on Hawaiian reefs.

Specimens are about 15 mm. broad.

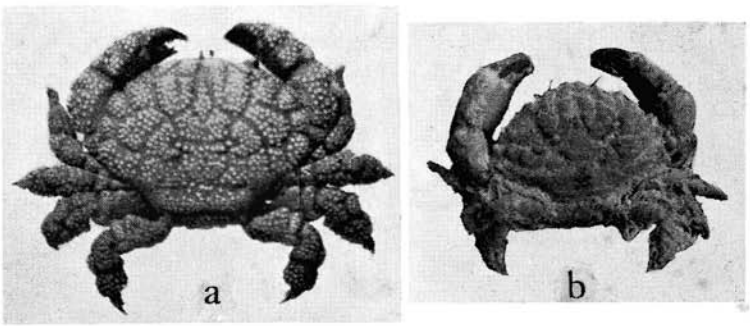

FIGURE 13.—**a**, *Actaea speciosa*; **b**, *Etisus electra*.

Actaea remota Rathbun, Mus. Comp. Zoöl., Mem. **35**: 43, pl. 1, fig. 9, pl. 7, fig. 1, 1907.—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1): 63, 1925.—Sakai, Studies on the crabs of Japan IV . . ., 490, pl. 93, fig. 4, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 294, 1946. (See figure 12, *b*.)

Carapace with lobules covered by large granules; furrows between lobules bearing short setae but free of long hairs. Chelipeds and walking legs granular; wrist with three small grooves in outer border, one longitudinal and two transverse; short diagonal groove in posterior upper border of palm. Carpal joints of walking legs grooved longitudinally.

The type locality of this small, smooth appearing species is Easter Island; but it is also reported from the Red Sea and from Hawaiian waters. It is recorded from Hilo, Hawaii; and a specimen 9 mm. broad, closely conforming to this species, was taken in shallow water from Kawela Bay, Oahu, in 1934 (Bishop Museum, no. 3897).

Actaea (Banareia) villosa (Rathbun), U. S. Fish Comm., Bull. **23** (3): 854, pl. 9, fig. 15, text fig. 14, 1903 (1906) (as *Banareia villosa*).—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 294, 1946.

Carapace a little broader than long, very convex fore and aft, regions well outlined; surface covered with granules of irregular size, in addition to 13 symmetrically placed red tubercles. Anterolateral border with three granulated lobes, a wide space between last two lobes. Chelipeds equal, granulate on outer border; fingers compressed, blade-like. Surface of carapace almost completely covered by a dense coating of long tubular hairs which also cover outer border of chelipeds and walking legs.

A. villosa is known from specimens in the United States National Museum which were dredged in the vicinity of Laysan Island.

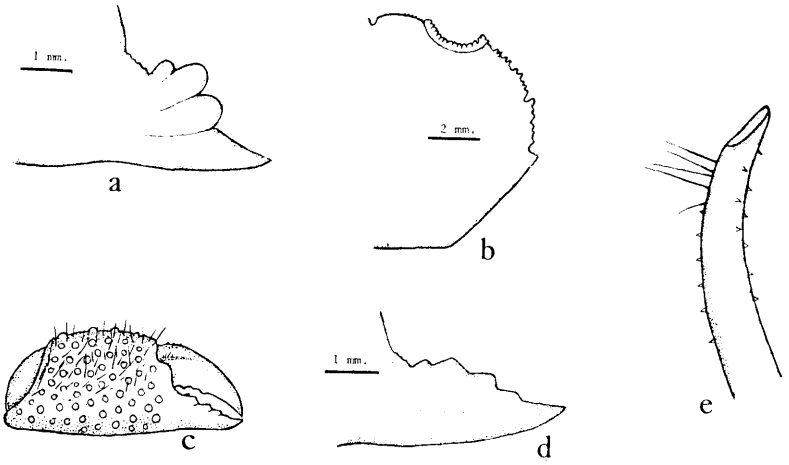

FIGURE 14.—**a,** *Actaea parvula,* pollex; **b-e,** *Actaea* sp.: *b,* outline of half carapace; *c,* right chela; *d,* pollex; *e,* tip of first pleopod of male.

The type specimen, a female, is 9.2 mm. in breadth of carapace.

According to Balss (2), *Banareia villosa* Rathbun is identical with *Actaea banareias* Rathbun (42) from Chagos archipelago. Odhner (36, p. 85) disagrees with Balss, and the marked differences in the anterolateral borders of the two seem to leave no question about their distinction.

Actaea banareias Rathbun, Linn. Soc. London, Trans. II, **14**: 223, pl. 18, figs. 7, 8, 1911. (See figure 15, *a-c.*)

Carapace and appendages almost completely covered by shaggy coat of hairs. Anterior portion of carapace moderately convex, posterior half flattened; regions marked out but not lobulate; conical granules scattered over surface. Front of two lobes convex medially, where separated by a broad V-shaped notch, concave

laterally forming a small lobe as they merge with orbital border. Anterolateral border cut into four low, granular lobes (besides orbital) indistinctly marked by enlarged granules.

Chelipeds equal, palm granular, hair and granules extending on to base of dactylus. Fingers flat, dactylus grooved above. Walking legs short, broad, dactylus long, slender. Species resembles *Banareia* in its shaggy coat, differing from typical *Actaea* in absence of areolation of carapace. Breadth of type (from Solomon Islands) 7.9 mm.

The above diagnosis, adapted from Rathbun, corresponds quite closely with that of a Hawaiian specimen determined by Fenner A. Chace of the United States National Museum. This specimen, some-

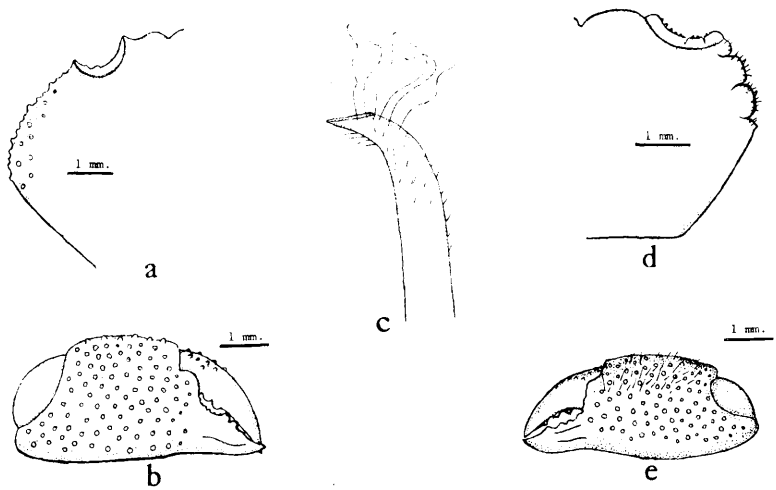

FIGURE 15.—**a-c,** *Actaea banareias: a,* outline of half carapace; *b,* right chela; *c,* tip of first pleopod of male. **d, e,** *Chlorodopsis oahuensis: d,* outline of half carapace; *e,* left chela.

what smaller than the type, differs from it chiefly in the paucity of granules on the surface of the carapace. The few granules noted are almost wholly confined to an area bordering the anterolateral margin. However, the lack of granules may be due to the immaturity of the specimen. A few small teeth are formed on the sharp cutting edges of the fingers, the tips of which cross when closed. The long hairs that compose the shaggy coat of the walking legs are mostly feathered.

In the Hawaiian specimen, taken in shallow water at Maili Point, Oahu, in 1934, the carapace is 7 mm. broad (Bishop Museum, no.

6335). Another specimen, apparently identical with the Hawaiian specimen, even to size, was taken in Tonga in 1924 (Bishop Museum, no. 1705).

Key to Hawaiian species of Etisus

Anterolateral border of carapace cut into four teeth (in addition to external orbital angle) of about equal size. Small species.
- Front divided into four teeth of about equal size; anterolateral teeth not very sharp ..... **electra.**
- Front divided into two concave lobes; anterolateral teeth large and acute ..... **demani.**

Anterolateral border of carapace cut into four or more teeth (in addition to external orbital angle). Large species.
- Anterolateral border of carapace with numerous teeth of unequal size.
  - Anterolateral teeth eight to 13 in number, the first broad and bifurcated; wrist with two large teeth on inner angle.... **splendidus.**
  - Anterolateral teeth eight to 10 in number; wrist with single tooth on inner angle ..... **dentatus.**
- Anterolateral border of carapace with four broad teeth, last two with sharp points turned forward ..... **laevimanus.**

Etisus electra (Herbst), Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 133, 1898 (as *Etisodes electra*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 851, pl. 9, fig. 7, 1903 (1906) (as *Etisodes electra*).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 243, pl. 1, fig. 11, pl. 6, fig. 15, 1913.—Sakai, Studies on the crabs of Japan IV . . ., 500, text fig. 40, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 294, fig. 178, *d*, 1946. (See figure 13, *b*.)

Carapace narrow, regions well outlined; front with four rounded teeth, median pair more advanced than lateral ones. Internal orbital angle toothlike. Surface of carapace and nodules of chelipeds finely granular. Walking legs fringed with hair.

This widely distributed species is known from the Red Sea and Indo-Pacific regions as far east as the Tuamotus. It is occasionally taken in shallow water on Hawaiian reefs.

Specimens are about 1 inch in breadth of carapace.

Etisus demani Odhner, IN de Man, Carcinological Stud. Leyden Mus. **13**: 8, pl. 1, fig. 2, 1891 (as *Etisodes frontalis*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 847, pl. 9, fig. 1, text fig. 10, 1903 (1906); Linn. Soc. London, Trans. II, **14**: 216, 1911 (as *Lep-*

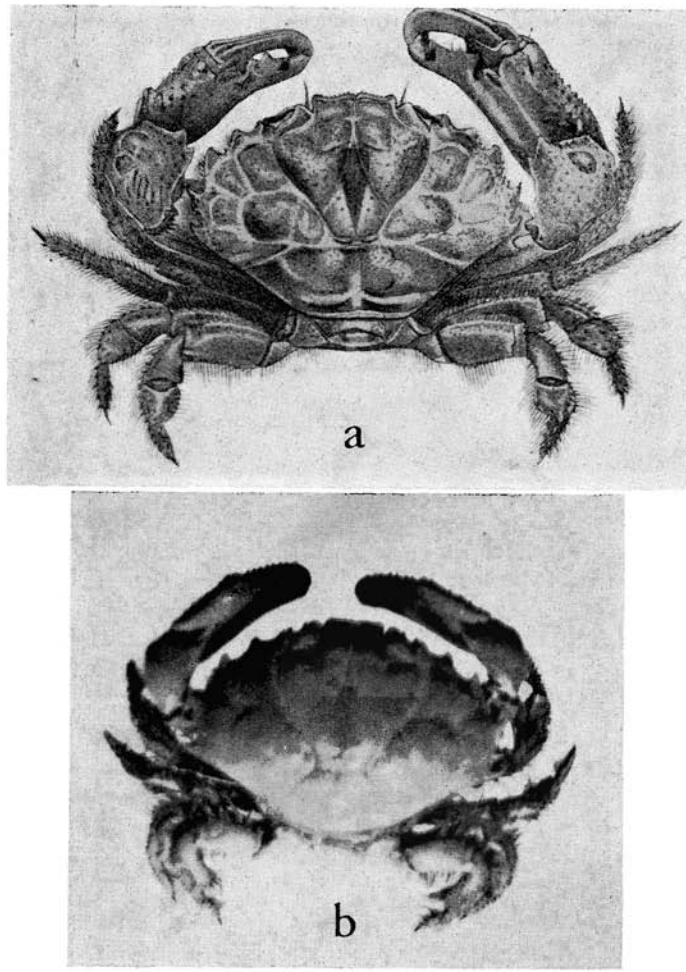

FIGURE 16.—**a**, *Etisus demani* (after de Man) ; **b**, *E. dentatus.*

todius molokaiensis).—Odhner, K. Vet. o. Vitterh. Samh., Handl. **29** (1) : 6, 83, 1925.—Balss, K. Vet. o. Vitterh. Samh., Handl., ser. B, **5** (7) : 45, 1938. (See figure 16, *a*.)

Carapace one and one-half times as broad as long, convex anteriorly, flattened posteriorly, strongly lobulated, lobules pitted. Front of two convex median lobes separated from each other by a narrow incision, and two smaller lateral obtuse lobes separated from inner orbital border by triangular notch. Antero-lateral border of carapace cut into four triangular teeth, as well as external

orbital angle; first two teeth subacute, posterior two very sharp. Posterolateral margin almost straight, granular; transverse groove just in front of posterior border. Under surface of carapace granular and hairy. Chelipeds unequal, arm short, upper margin bearing small teeth and long hairs; wrist somewhat rough, punctate, two teeth at inner angle. Larger palm bearing transverse or oblique rows of very small granules on upper outer border. Fingers stout, widely gaping; dactylus arched, furrowed above with three tubercles at base, strong tooth on proximal cutting edge and smaller one in front of it. Pollex grooved on outer border, cutting edge with strong tooth in middle and a few smaller ones on each side. Walking legs short, margins granular, fringed with long hairs.

The above diagnosis is adapted from de Man, who presents a very detailed description of *Etisodes frontalis* from Samoa. Odhner proposed the new name, *Etisus demani,* to include various determinations by a number of investigators. Rathbun described specimens from Hawaii as *Leptodius molokaiensis* (type) and later assigned specimens from the Solomon Islands to the same species, pointing out, however, a few differences. The *Etisodes frontalis* of Dana (7), which has a much narrower carapace than *Etisus demani,* was believed by Odhner to be near, if not identical, to *Etisus electra.*

The known range of *Etisus demani* is from the Red Sea and Madagascar to Samoa and Hawaii in the Pacific.

Of the two Hawaiian specimens dredged by the *Albatross* off the south coast of Molokai, a male was 14.7 mm. in breadth of carapace. Several specimens, the largest 12 mm. broad, were taken about the islands by the Pele Expedition. De Man records a specimen 21.75 mm. broad.

Etisus splendidus Rathbun, U. S. Fish Comm., Bull. **23** (3): 850, pls. 3, 10, 1903 (1906).—Sakai, Studies on the crabs of Japan IV . . ., 500, pl. 95, fig. 1, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 295, fig. 178, *c,* 1946. (See figure 17, *a.*)

Carapace convex, smooth, without granules; regions fairly well outlined but not lobulated. Front narrow, advanced, bilobed, each lobe slightly concave. Anterolateral border bearing nine to 13 teeth of unequal size. Chelipeds in male very large, unequal; arm with one to three spines on upper margin (more in female), wrist with two sharp spines at inner angle and a few tubercles on outer border; palm with two rows of blunt spines on outer upper border; fingers gaping, hollowed out at tips. Walking legs fringed with hairs. Color, bright red.

E. splendidus, which is occasionally seen in Hawaiian waters, is known from the Red Sea, Madagascar, Japan, and islands of the western Pacific.

The carapace of this large species may exceed 6 inches in breadth.

Etisus dentatus (Herbst), Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 129, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 850, 1903 (1906).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 239, pl. 2, fig. 14, pl. 6, fig. 14, *a-c*, 1913.—Sakai, Studies on the crabs of Japan IV . . ., 501, pl. 96, fig. 1, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 295, 1946. (See figure 16, *b*.)

Surface of carapace much like that of *E. splendidus*. Anterolateral border with seven to eight clawlike teeth which differ in size, four of them larger than the others. Chelipeds long and stout in male; arm bearing a few spinules on upper border; wrist with one sharp spine at inner angle; palm smooth or with a few granules on upper outer border. Walking legs fringed with hairs, carpus and propodus bearing spinules on upper border.

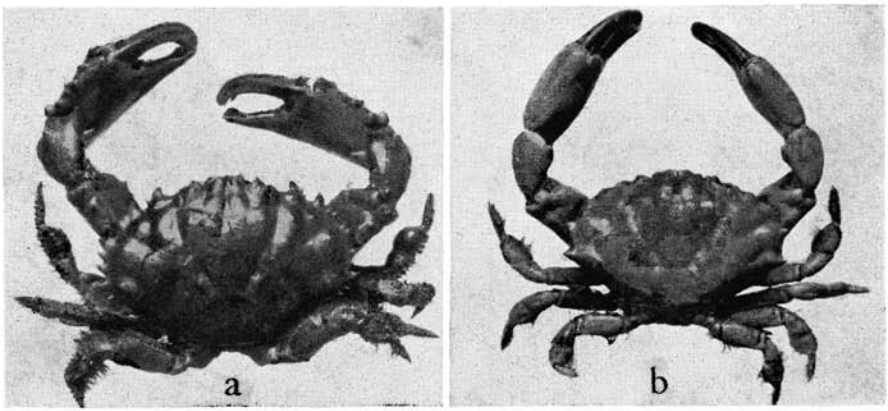

FIGURE 17.—**a**, *Etisus splendidus*; **b**, *E. laevimanus*.

E. dentatus is known from the Red Sea and East Africa through the Indo-Pacific region as far as Tahiti. There are early records of the species from Hawaii, but we know of no recent reports from this locality. Bishop Museum has specimens from Guam and the Andaman Islands.

Large specimens may exceed 4 inches in breadth of carapace.

Etisus laevimanus Randall, Acad. Nat. Sci. Philadelphia, Jour. **8**: 115, 1939 (1940).—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 131, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 851, 1903 (1906).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta,

Abhandl. K. **99** (2) : 237, pl. 6, fig. 13, *a, b*, 1913.—Sakai, Studies on the crabs of Japan IV . . ., 497, pl. 59, fig. 3, pl. 95, fig. 3, 1939. —Edmondson, B. P. Bishop Mus., Sp. Pub. **22** : 294, 1946. (See figure 17, *b*.)

Carapace smooth, without granules, gastric region well outlined, lobulated anteriorly and along anterolateral border. Four broad teeth mark the anterolateral border, last two more prominent and sharper than others. Chelipeds long, stout, and smooth; a blunt spine at the inner angle of the wrist. Fingers long, smooth, and hollowed out at tips. Walking legs fringed with hairs.

E. laevimanus ranges widely from the Red Sea to the central Pacific and is not uncommon in Hawaiian waters.

Large specimens may exceed 2 inches in breadth of carapace.

Key to Hawaiian species of Chlorodopsis

Carapace bearing short hairs, if any; anterolateral borders more or less distinctly lobate, without spines.
- Lobules of carapace bearing large pearl-like granules.....**areolata.**
- Lobules of carapace bearing small granules.
  - Surface of carapace with short pubescence; anterolateral border distinctly lobate.....**oahuensis.**
  - Surface of carapace quite free of hairs; anterolateral border indistinctly lobate, granular.....**kauaiensis.**

Carapace bearing long hairs or sharp tubercles; anterolateral borders spinous.
- Carapace ornamented by minute, rounded tubercles, densely haired .....**hawaiiensis.**
- Carapace ornamented by sharp tubercles, sparsely haired.....**aberrans.**

Chlorodopsis areolata (Milne Edwards), A. Milne Edwards, Nouv. Arch. Mus. d'Hist. Nat. Paris **9** : 231, pl. 8, fig. 8, 1873.—Alcock, Asiatic Soc. Bengal, Jour. **67** (1) : 166, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3) : 852, 1903 (1906) (as *Actaea affinis*).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2) : 250, 1913.—Sakai, Studies on the crabs of Japan IV . . ., 502, pl. 97, fig. 3, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22** : 206, fig. 178, *f*, 1946. (See figure 19, *a*.)

Carapace completely areolated, lobules covered by pearly granules, and furrows filled with short fur which also surrounds granules. Anterolateral border cut into four rounded granulated lobes. Chelipeds unequal, upper and outer borders covered with granules, as on carapace. Fingers strongly arched, base of dactylus grooved and granulated. Walking legs covered on outer surface with granules and dense fur, their margins fringed with shaggy hair.

C. arcolata, which has a wide distribution from the Red Sea through the Indo-Pacific area and Polynesia, is one of the more common crabs on Hawaiian reefs.

Specimens are about 1 inch broad.

Investigators generally agree that the juvenile forms taken at Honolulu and Papeete and tentatively assigned to the species *C. scabricula* (Dana) by Rathbun (40, 41) were immature representatives of a different genus, probably *Phymodius.*

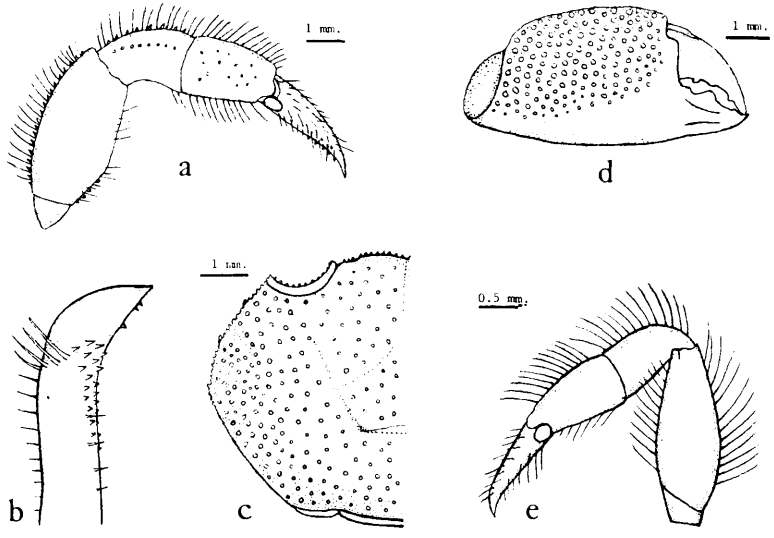

FIGURE 18.—**a, b,** *Chlorodopsis oahuensis: a,* walking leg; *b,* tip of first pleopod of male. **c-e,** *C. kauaiensis: c,* outline of half carapace; *d,* right chela; *e,* walking leg.

Chlorodopsis oahuensis, new species (figs. 18, *a, b;* 19, *b*).

Type specimen a male, breadth of carapace 7 mm., length 4 mm. Carapace slightly convex, regions well marked, lobules covered with minute rounded granules and coated by short, dense pubescence. Front consisting of two convex lobes separated in middle by a U-shaped indentation and laterally from the orbital border by a slight notch. Margin of orbit granular, upper border with two distinct notches. Anterolateral border of carapace cut into four lobes, first small, hardly distinct from orbital border, second and third broadly convex, fourth smaller and more pointed. Granular lobes, two to four, in type specimen each capped by a sharp granule and bearing short bristles.

Chelipeds slightly unequal in both sexes, granular and densely pubescent, as on carapace, and bearing a few long hairs. Arm with a prominent lobe at

lower distal extremity; wrist with a blunt lobe at inner angle, a short longitudinal furrow, and three transverse furrows in outer border. Outer, upper, and part of inner surfaces of palm bear small rounded granules; lower border smooth, free from granules and hair. Fingers of larger hand with a few teeth on each cutting edge, dactylus moderately arched; fingers broadly hollowed out at tips. Walking legs densely pubescent, haired on upper and lower margins, outer borders more or less granular, a row of sharp granules on upper margin of propodus and carpus and on both margins of merus. Dactylus densely haired, bearing row of small teeth on lower border.

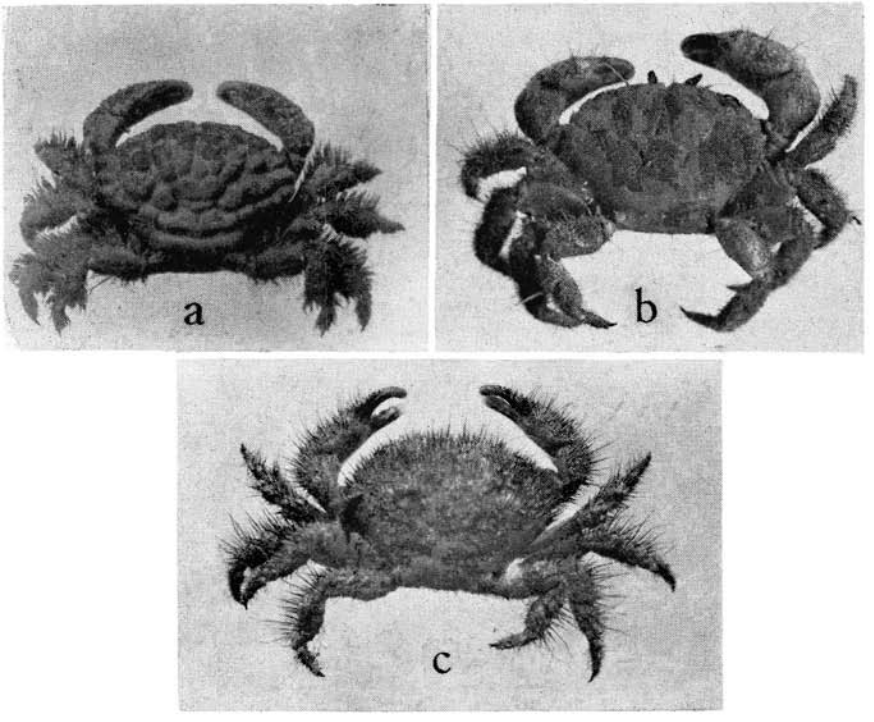

FIGURE 19.—**a**, *Chlorodopsis areolata*; **b**, *C. oahuensis*; **c**, *Pilodius flavus*.

Type locality, Kawela, Oahu (Bishop Museum, no. 4346).

C. oahuensis is a small species, which has been taken at various localities about Oahu, including Kawela, Waianae, Waimanalo, and Waikiki in association with *Sargassum* sea weed. Variations are frequent in the anterolateral lobes of the carapace, which may or may not be capped by a sharp granule or minute tooth. In fact, differences

appear on the opposite sides of the same individual or on adjacent lobes of the same side.

C. oahuensis is very near *C. philippinensis*, described but not figured by Ward (51). In size and pubescent coating the two forms compare favorably. However, in several particulars the Hawaiian form appears to be distinct. No tooth is produced at the lateral extremity of the frontal lobes, and the granulation of the palm is much more extensive. Ward refers to large granules on the slopes of the antero-lateral lobes of the Philippine species, a character which does not harmonize with features of the Hawaiian specimens. Furthermore, Ward mentions no granular characteristics of the walking legs, a very obvious and distinctive mark of the Hawaiian species.

Chlorodopsis kauaiensis, new species ? (fig. 18, *c-e*).

Specimen described an ovigerous female, breadth of carapace 9 mm., length 6 mm. Carapace slightly convex transversely, moderately so longitudinally, regions indistinctly outlined, most conspicuous furrow bounding gastric area posteriorly. Surface of carapace smooth in appearance but well covered by microscopic granules, larger and more numerous on branchial and postbranchial areas. A few short, scattered hairs on upper surface of carapace, under surface more densely haired.

Front consisting of two slightly convex lobes granular on margin, separated medially by slight notch and laterally from orbital border by V-shaped indentation. Orbital border evenly granulated, with no indication of a notch in upper margin.

Anterolateral border of carapace cut into four low, granulated lobes, their boundaries indicated by enlarged granules, the first fusing with external orbital angle, the last represented by sharp granule. Slight depressions extend a short distance inward on carapace from some of marginal lobes.

Chelipeds unequal, right much stouter than left. Outer border of arm smooth, upper and lower margins fringed with long hairs; lower distal angle prolonged into a strong, obtusely pointed lobe. Outer and upper borders of wrist covered with granules, inner angle a blunt lobe; transverse furrow traverses outer border near articulation with palm. In large chela, upper border of palm and more than half of inner and outer borders densely covered by granules or small tubercles, which are more salient above. Lower portion of palm smooth; fingers short, stout, hollowed at tips. Immovable finger bears one strong tooth, dactylus a few small teeth. By comparison, in small chela palm is more slender, a greater portion of outer border is covered by granules; fingers are relatively longer, dentition less pronounced. In both chelipeds palm is free from hairs except at articulation with wrist.

Walking legs smooth, margins entire and densely fringed with long hairs. Merus of third maxilliped broader than long; abdomen oval in outline, margin densely fringed with long hairs.

Two specimens of this unique form were taken on the reef at Waimea, Kauai, in August 1931. Both were ovigerous females; one was 8 mm. and the other 9 mm. in breadth of carapace. The convexity and

faint areolation of the carapace, together with the hollowed-out tips of the fingers, present the general appearance of a juvenile *Neoliomera;* but the breadth of the frontal margin seems to exclude them from that genus. I have, therefore, tentatively assigned them to the genus *Chlorodopsis* as an undescribed species. If this generic position is correct, the Kauai species clearly differs from other members of the genus which have come to my notice. The paucity of hairs on the upper surface of the carapace of this apparently new form is a feature shared by *C. pugil* (Dana) and *C. spinifera* (Heller). However, the Kauai specimens are clearly distinguished from these long-known species, by the absence of spines on the anterolateral border of the carapace.

Specimens from Kauai are in Bishop Museum (no. 3664).

Chlorodopsis hawaiiensis, new species (fig. 21, *a-e*).

Carapace a little broader than long, slightly convex, regions well marked, lobules bearing minute tubercles and densely clothed with short hairs interspersed with longer hairs; under surface of carapace finely haired. Front slightly bent down, consisting of two arched lobes separated in middle by rather narrow U-shaped notch and laterally from each orbital border by shallow notch. Orbital border granular, two notches in upper margin.

Anterolateral border of carapace cut into four lobes behind outer orbital angle, each lobe bearing a slender primary spine. First of four spines the smallest, second to fourth much larger and about equal in size. Typically, an accessory spinule in front of and behind second and third primary spines.

Chelipeds stout, subequal; outer surface of merus somewhat granular but quite free from hairs, upper margin bearing row of short spines and fringe of hairs. Vertical subdistal furrow traverses upper two-thirds of outer surface of merus, lower distal border of which is a rounded lobe. Carpus short, outer and upper borders tuberculate and hairy, some of tubercles spiniform; a stout, acute tubercle at inner angle. Palm of hand tuberculate on outer surface and on upper border, where a few tubercles are spiniform; these areas of palm densely haired. Fingers stout, hollowed out at tips, two or three teeth on cutting edge of each finger. Tubercles and hairs extend over fingers for more than one-half their length; on basal portion of dactylus tubercles often spiniform. Fingers typically black, color extending but slightly back on ventral border of palm.

Walking legs compressed, a row of small spines borne on upper margin of merus and carpus gradually fading out on propodus. Long hairs densely clothe walking legs, giving animal a shaggy appearance.

Type specimen from Pokai Bay, Oahu (Bishop Museum, no. 6877).

This hairy *Chlorodopsis,* with its spiniform anterolateral teeth, is unlike any member of the genus hitherto seen in Hawaiian waters and apparently differs from other well-known species of the Indo-Pacific area. From the widely dispersed *C. nigracrinita* (Stimpson) the Hawaiian species seems to differ in such characters as the front and

anterolateral borders and, especially, in the first pleopod of the male. In the latter feature, it somewhat resembles *C. pilumnoides* (White) but bears long hairs instead of short setae only. The Hawaiian species also differs from *C. pugil* (Dana), which presents only three anterolateral spines behind the outer orbital angle of the carapace, the legs and chelipeds of which are heavily armed with stout, sharp spines.

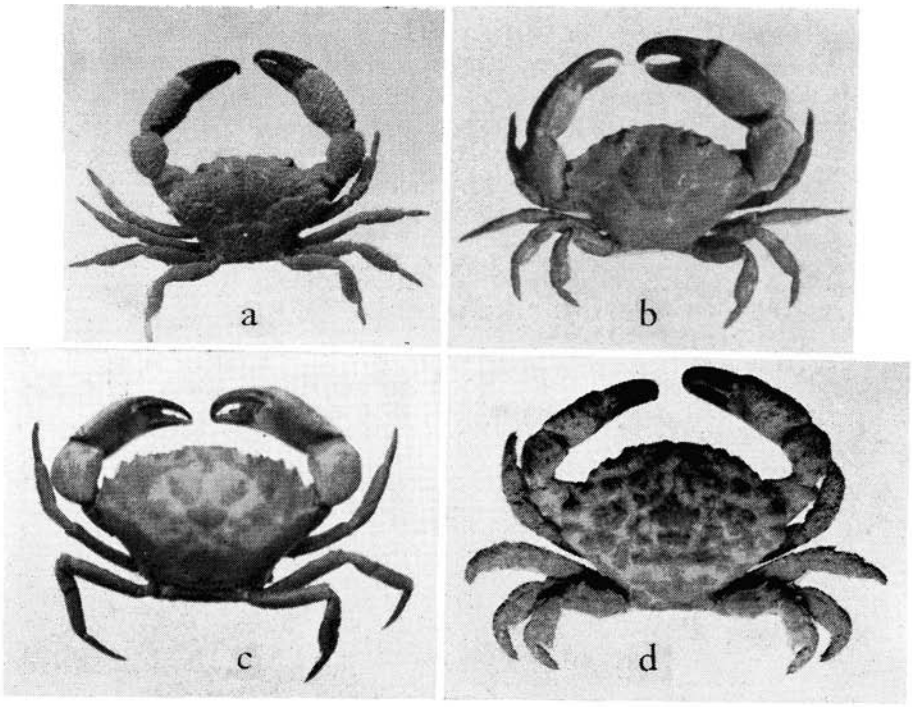

FIGURE 20.—**a,** *Chlorodopsis aberrans;* **b,** *Panopeus pacificus;* **c,** *P. herbstii;* **d,** *Phymodius obscurus.*

Examples of the Hawaiian species were taken by the Pele Expedition off the west shore of Oahu and at several localities about Kauai. Apparently it is not uncommon at depths ranging from 6 to 16 fathoms.

Chlorodopsis aberrans Rathbun, U. S. Fish Comm., Bull. 23 (3): 859, text fig. 20, 1903 (1906).—Edmondson, B. P. Bishop Mus., Sp. Pub. 22: 295, 1946. (See figure 20, *a*.)

Carapace with areas well outlined, lobes covered anteriorly with sharp tubercles which become granules in posterior portion. Surface also sparingly haired. Front bilobed with granular margin. Anterolateral border with granulated lobe just behind and below external orbital angle, followed by three sharp teeth with granulated borders. Chelipeds well covered by sharp, conical tubercles, which continue from palm half-way along fingers. Walking legs granulate, their upper margin spinulate, sparingly haired.

One specimen of *C. aberrans,* a male, was taken by the *Albatross* in Hawaiian waters near Modu Manu Island at a depth of 23 to 26 fathoms; Bishop Museum has 13 specimens, believed to represent this species, which were taken in shoal water at Johnston Island in 1923. The largest of these specimens has a carapace breadth of 12 mm.

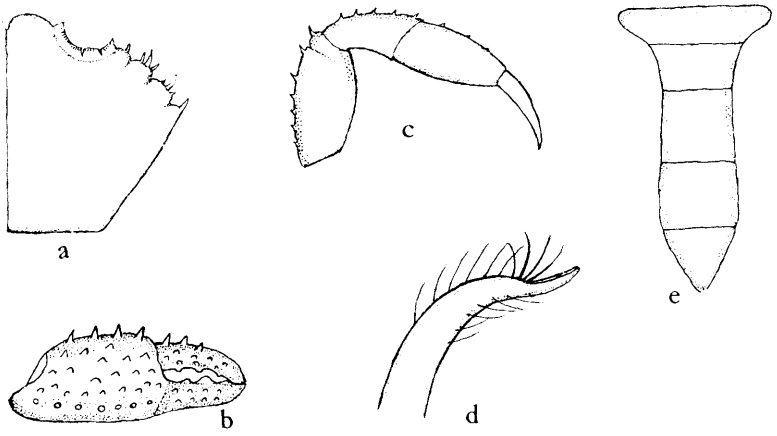

FIGURE 21.—**a-e,** *Chlorodopsis hawaiiensis: a,* outline of half carapace; *b,* right chela; *c,* walking leg; *d,* tip of first pleopod of male; *e,* abdomen of male, segments 3 to 7.

Pilodius flavus Rathbun, U. S. Fish Comm., Bull. **23** (3): 860, text fig. 21, 1903 (1906).—Balss, K. Vet. o. Vitterh. Samh., Handl., ser. B, **5** (7): 57, 1938.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 299, fig. 180, *b,* 1946. (See figures 19, *c;* 22, *a, b.*)

Carapace well areolated, lobules covered with rough granules and long yellow hairs. Front cut into four lobes, medial pair rounded, granulated, separated by a U-shaped notch; lateral pair bluntly triangular, bent down, separated from inner orbital angle by a small notch and groove. Basal segment of the antenna short, permitting flagellum to rest in orbital hiatus. Anterolateral border with four spines, in addition to external orbital angle, each with one or more

accessory spines. Chelipeds unequal, especially in male; arm with spines on upper border; conical granules cover outer and upper borders of wrist and palm. In larger hand of male, lower outer border of palm is smooth; but in small hand and both chelae of female whole outer surface of palm is spinous. Fingers hollowed out at tips. Walking legs spinous and both chelipeds and walking legs very hairy.

The *Albatross* dredged specimens of *P. flavus* at numerous stations about the Hawaiian Islands, usually at shallow depths. Specimens in Bishop Museum, all taken in shoal water, are from Oahu, from the leeward islands of the Hawaiian chain, and from Rarotonga. The species is also recorded from Jaluit, Marshall Islands, and from Ternate.

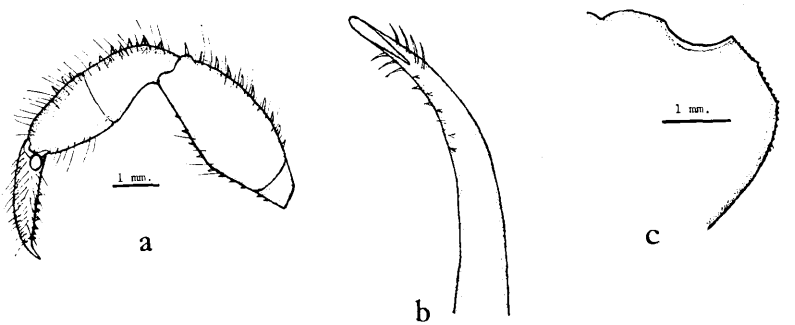

FIGURE 22.—**a, b,** *Pilodius flavus: a,* walking leg; *b,* tip of first pleopod of male. **c,** *Liocarpilodes integerrimus,* outline of half carapace.

Adult specimens are about 0.5 inch in breadth of carapace.

The genus *Pilodius* was established by Dana in 1852; the genus *Chlorodopsis,* by A. Milne Edwards in 1873. Since 1873 the status of the two closely allied genera has been a subject of much divided opinion, resulting in more or less interchange of species. According to Edwards, one of the chief diagnostic features of *Chlorodopsis* which distinguishes it from *Pilodius* is the antenna-orbital pattern, in which a branch of the basal segment of the antenna occupies the orbital hiatus, thereby excluding the flagellum of the antenna from the orbit. In adult specimens, this antennal feature appears to be a valid distinction between the two genera. However, Balss (5) cites the observation of Bouvier, who notes that the antennal pattern of the adult *Chlorodopsis* is undeveloped in immature forms, which are difficult to distinguish from specimens of *Pilodius.* Authorities may

eventually reach a common opinion that the two genera *Pilodius* and *Chlorodopsis* are identical, thereby giving preference to *Pilodius* according to the rules of priority. However, until the situation is further clarified I am tentatively retaining both genera in this report.

Key to Hawaiian species of Panopeus

Carpus of cheliped with groove parallel with distal margin; palm with shallow longitudinal groove in dorsal border. Small species.....**pacificus.**
Carpus of cheliped without groove parallel with distal margin; palm without longitudinal groove in dorsal border. Large species.....**herbstii.**

Panopeus pacificus Edmondson, B. P. Bishop Mus., Occ. Papers **9** (17) : 12, pl. 4, *B, a-c,* 1931. (See figure 20, *b.*)

Carapace slightly convex, areas defined by shallow grooves; surface smooth except for scattered granules, mostly along lateral borders, and a few interrupted raised lines of granules disposed in a transverse direction. Two such lines cross protogastric area, one crosses gastric region, two cross mesobranchial region, and a short one crosses metabranchial region. Front of two broad lobes with a thick margin, beaded above and below. Anterolateral border bearing four teeth, in addition to external orbital angle, the first a rounded lobe separated from orbital angle by a broad, shallow groove; second and third teeth strong with sharp points curving forward; fourth tooth straight and sharp, slightly smaller than third. Chelipeds unequal, granular; wrist roughened on outer surface by granular tubercles, a deep groove near distal border, parallel to articulation with hand. Palm granular on outer and inner borders, smooth below, a shallow, longitudinal groove traversing dorsal border. Fingers of larger hand short, stout, strongly toothed, of smaller hand longer and less strongly toothed. Walking legs granular on upper border, fringed with long hairs.

As *P. pacificus* has been taken only in Pearl Harbor among fouling complexes on buoys, it may have been transported to Hawaii on the bottoms of boats.

Large males are 12 mm. to 15 mm. in breadth of carapace; ovigerous females are smaller.

Panopeus herbstii Milne Edwards, Rathbun, U. S. Nat. Mus., Bull. **152** : 335, pls. 156, 157, 1930. (See figure 20, *c.*)

Carapace a little broader than long, regions well marked, surface somewhat granular. An interrupted transverse line of granules crosses branchial area, one runs obliquely backward from last anterolateral tooth and other short lines may occur on anterior portion of carapace. Anterolateral border bears four teeth, in addition to external orbital angle; first tooth blunt, separated from the orbital angle by a shallow groove. Teeth 3 to 5 acutely pointed, the fourth smallest. Chelipeds heavy, finely granular, a subterminal tooth on anterior border of arm. Much hair on under surface of carapace, on anterior border of arm, and on walking legs. Segments 3 to 5 of male abdomen fused; terminal segment a little broader than long, rounded at tip.

The first Hawaiian record of this typical Atlantic species was made in December 1947, when a specimen was taken from the fouling of a boat in Pearl Harbor. In 1953 numerous specimens were taken in Maunalua Bay, Oahu, where the species appears to be well established. Its introduction into Hawaiian waters doubtless came about through transportation on the bottom of a ship in very recent times.

The largest local specimen I have seen is 54 mm. in breadth of carapace.

Key to Hawaiian species of Phymodius

Carapace of a smooth appearance; walking legs without much hair.
  Chelipeds rough with low, blunt tubercles.
    Palm well covered with tubercles.....**ungulatus.**
    Palm, for greater part, smooth.....**obscurus.**
  Chelipeds with palms bearing sharp spinules.....**nitidus.**
Carapace covered with sharp granules; walking legs very hairy.....**laysani.**

Phymodius ungulatus (Milne Edwards), Dana, U. S. Exploring Exped. **13**: 205, 1852, pl. 9, fig. 8, *a, b,* 1955 (as *Chlorodius ungulatus*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 857, 1903 (1906).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 225, pl. 1, fig. 8, 1913.—Sakai, Studies on the crabs of Japan IV . . ., 509, pl. 97, fig. 4, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 296, fig. 179, *c,* 1946. (See figure 23, *a*).

Surface of carapace separated into numerous finely granulated lobules by smooth furrows. Front bilobed, with minute lobule at outer end of each lobe. Anterolateral border cut into four conical teeth in addition to external orbital angle, teeth about equally developed. Chelipeds somewhat unequal, arm, wrist, and palm bearing numerous low, blunt tubercles. Walking legs granular, upper borders of merus, carpus, and propodus spinulate. Color brown, fingers black.

P. ungulatus has a very wide distribution throughout the Indo-Pacific area and is abundant on Hawaiian reefs.

Large specimens exceed 1 inch in breadth of carapace.

Phymodius obscurus (Lucas), Dana, U. S. Exploring Exped. **13**: 206, 1852, pl. 11, fig. 9, *a-f,* 1855 (as *Chlorodius monticulosus*).—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 163, 1898 (as *Phymodius monticulosus*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 858, 1903 (1906).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 226, 1913.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 296, 1946. (See figure 20, *d.*)

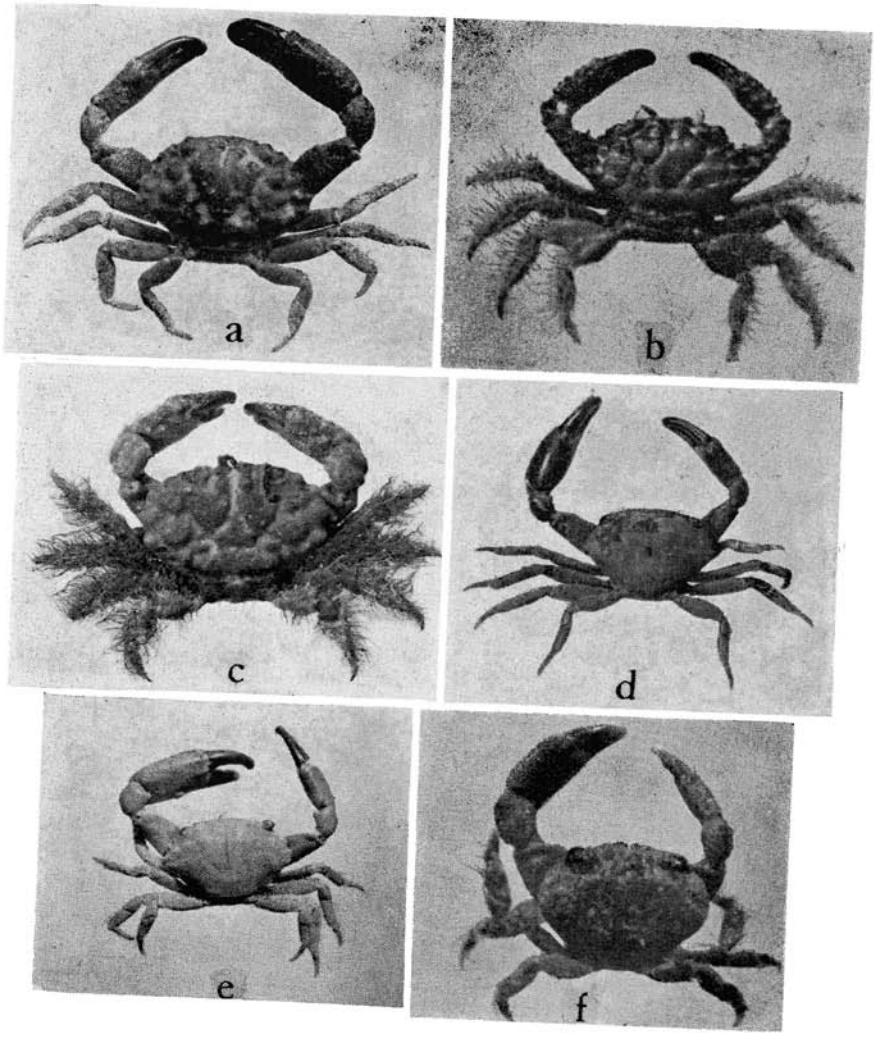

FIGURE 23.—**a**, *Phymodius ungulatus*; **b**, *P. nitidus*; **c**, *P. laysani*; **d**, *Chlorodiella niger*; **e**, *C. laevissima*; **f**, *Liocarpilodes integerrimus*.

Specimens closely resemble those of *P. ungulatus*, but furrows of carapace are shallow and entire surface has a worn appearance. Anterolateral teeth blunt and much worn. Chelipeds quite smooth, for the most part free from nodules and tubercles. Spinules of walking legs blunt and coarser than in *P. ungulatus*.

Rathbun reports a few records of specimens from Hawaii which may possibly justify the separation of *P. obscurus* from *P. ungulatus*, and Alcock reports such specimens from the Nicobars, Mauritius, Australia, and the south seas. I have seen no Hawaiian specimens taken in recent years that I believe represent *P. obscurus*, but specimens in Bishop Museum from Tonga agree in characters with this form. However, no support is given to the view that *P. obscurus* is distinct from *P. ungulatus* on the basis of a comparison of the first pleopods of the males. As nearly as I can determine by means of high magnification, the first pleopods of the two forms are identical, both in the curvature of the apex and in the arrangement of the processes of the distal extremity.

Phymodius nitidus (Dana), U. S. Exploring Exped. **13**: 218, 1852, pl. 12, fig. 7, 1855 (as *Pilodius nitidus*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 858, 1903 (1906).—Balss, K. Vet. o. Vitterh. Samh., Handl., ser. B, **5** (7): 55, 1938.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 296, fig. 179, *b*, 1946. (See figure 23, *b*.)

Carapace smooth and shining, well areolated, the lobules presenting a flat surface. Anterolateral lobes four in number, in addition to external orbital angle, two posterior ones somewhat acute. Chelipeds unequal, wrist and palm bearing sharp tubercles. Two sharp spines on inner angle of wrist. Walking legs pubescent, meral joints spinous on upper margins.

P. nitidus is widely distributed through the Indo-Pacific region, and it is not uncommon on Hawaiian reefs.

Most specimens are less than 1 inch in breadth of carapace.

Phymodius laysani Rathbun, U. S. Fish Comm., Bull. **23** (3): 858, pl. 12, fig. 8, text fig. 19, 1903 (1906).—Balss, K. Vet. o. Vitterh. Samh., Handl., ser. B, **5** (7): 55, 1938.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 296, fig. 179, *d*, 1946. (See figure 23, *c*.)

Carapace well areolated, lobules granular, separated by deep grooves. Anterolateral border with four lobes, in addition to external orbital angle. Chelipeds equal, short, arm granular, wrist nodular and granulate; palm with granulated nodules above merging into large, then small, granules below. Walking legs granular, densely fringed with long bristles.

Rathbun points out that this species is an unusual *Phymodius* in that it has a granulated carapace. In Bishop Museum are many speci-

mens of *P. laysani* from the Hawaiian Islands and other central Pacific localities.

Specimens of the species are less than 1 inch in breadth of carapace.

Key to Hawaiian species of Chlorodiella

Areas of carapace faintly outlined; anterolateral teeth four in number, all very small.....**niger.**
Areas of carapace hardly discernable; of the four anterolateral teeth, first and fourth are very small, third the largest.....**laevissima.**

Chlorodiella niger (Forskål), Alcock, Asiatic Soc. Bengal, Jour. **67** (1) : 160, 1898 (as *Chlorodius niger*).—Rathbun, U. S. Fish Comm., Bull. **23** (3) : 857, 1903 (1906).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2) : 217, pl. 6, fig. 10, *a-d*, 1913 (as *Chlorodius niger*).—Sakai, Studies on the crabs of Japan IV . . ., 508, pl. 97, fig. 1, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22** : 296, fig. 179, *a*, 1946. (See figure 23, *d*.)

Carapace with regions faintly outlined in gastric area and along anterolateral border. Anterolateral border bearing four small teeth of about equal size, in addition to external orbital angle; last two teeth sometimes with acute tips. Chelipeds smooth, with spine or tubercle on anterior border of arm; fingers somewhat arched, black. Walking legs hairy with long interspersed bristles.

C. niger has a wide distribution throughout the Indo-Pacific region, and it is very common on the Hawaiian reefs.

Large specimens may reach 20 mm. in breadth of carapace.

The distinctive features separating this species from the following one, *C. laevissima,* are very slight and exact determinations are often difficult, especially for young or immature specimens.

Chlorodiella laevissima (Dana), U. S. Exploring Exped. **13** : 215, 1852, pl. 12, fig. 4, *a-g*, 1855 (as *Chlorodius laevissimus*).—Alcock, Asiatic Soc. Bengal, Jour. **67** (1) : 161 (as *Chlorodius laevissimus*).—Rathbun, U. S. Fish Comm., Bull. **23** (3) : 857, 1903 (1906).—Sakai, Studies on the crabs of Japan IV . . ., 508, pl. 62, fig. 3, text fig. 44, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22** : 296, 1946. (See figure 23, *e*.)

Carapace very smooth, faint indications of regions, if any. Anterolateral border bearing four teeth of unequal size, in addition to external orbital angle; third tooth, which is the largest, sometimes with an acute point turned forward. Chelipeds long, smooth, anterior border of arm usually without a spine or tubercle; fingers strongly arched, brown instead of black. Walking legs bearing long bristles, but often without hairs.

Of the above characters of *C. laevissima*, which have been cited by various observers, probably the more reliable ones include the smooth carapace with even fewer indications of regions than are found in *C. niger*, the nature of the anterolateral teeth, and the brown color of the strongly arched fingers. The general distribution of the two forms is apparently parallel, and they have a close association in local habitats.

Liocarpilodes integerrimus (Dana), U. S. Exploring Exped. **13**: 201, 1852, pl. 11, fig. 7, 1855 (as *Actaeodes ? integerrimus*).—Borradaile, Fauna Geogr. Maldive and Laccadive Arch. **1** (3): 241, fig. 43, 1902 (as *Pseudozius coralliophilus*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 854, 1903 (1906) (as *Actaea ? integerrima*).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 142, pl. 5, fig. 6, 1913.—Edmondson, B. P. Bishop Mus., Bull. **27**: 44, pl. 3, *C*, text fig. 7, *f-i*, 1925 (as *Chlorodiella asper*).—Balss, K. Vet. o. Vitterh. Samh., Handl., ser. B, **5** (7): 47, 1938. (See figure 22, *c*; 23, *f*.)

Carapace convex, not much broader than long; surface faintly areolate, quite smooth, bearing a few granules and hairs. Front broad, two convex lobes. Anterolateral border entire, granulate with indications of one or two lobes. Chelipeds unequal, smooth in appearance but covered with minute granules, sharp on wrist and hand. Merus bearing a row of larger granules on lower margin; inner angle of wrist granular; granules somewhat larger on outer border of smaller hand and disposed in longitudinal rows. Fingers rounded, gaping, spooned and scalloped at tips; dactylus of larger hand with one tooth, none on pollex; one tooth on each finger of smaller hand. Walking legs quite smooth, sparsely haired on margins; meral joints serrated on upper margins.

L. integerrimus is known from the Red Sea through the Indo-Pacific region to the Tuamotus. Dana reported it from the Hawaiian Islands (Oahu or Maui), but we have no recent records from this locality. Specimens in Bishop Museum are from Johnston Island.

Some specimens of this small form slightly exceed 5 mm. in breadth of carapace.

Sphaerozius nitidus Stimpson, Smithsonian Misc. Coll. **49** (1717): 62, pl. 7, figs. 5, 5*a*, 1907.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 861, pl. 11, fig. 4, 1903 (1906) (as *Menippe convexa*).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 285, pl. 7, fig. 9, 1913.—Sakai, Studies on the crabs of Japan IV . . ., 513, pl. 98, fig. 2, 1939. (See figure 25, *a*.)

Carapace a little broader than long, strongly convex, smooth, slightly areolated. Four small, acute teeth borne on anterolateral border. Chelipeds un-

equal, stout, rounded, palm granulate on outer and upper borders. Walking legs somewhat hairy. According to Miers (33), carapace and chelipeds covered with minute purple spots. Carapace about 6.5 mm. broad.

S. nitidus is known from the Red Sea, from the Indian Ocean, and from the coasts of China and Japan. A damaged specimen is reported by Rathbun to have been taken in the Hawaiian Islands (collector unknown), but we have no recent record of the species from the central Pacific.

Galene hawaiiensis Dana, U. S. Exploring Exped. **13**: 232, 1852, pl. 13, fig. 5, *a, b*, 1855.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 851, 1903 (1906). (See figure 24, *a*.)

Carapace broader than long, smooth, regions faintly outlined, front slightly sinuose. Anterolateral border cut into four teeth, in addition to external orbital angle; first two teeth obtuse, the first with concave margin fused with external orbital angle, the posterior two more sharply pointed. Chelipeds unequal, short, smooth, hand rounded above, dactylus with a tubercle-like tooth at base. Walking legs slender, somewhat pubescent.

G. hawaiiensis was reported from Hawaii by Dana, but no recent records are known. Its carapace is recorded as slightly exceeding 1 inch in breadth.

Key to Hawaiian species of Pseudozius

Carapace broadly oval, smooth, not strongly convergent posteriorly.
- Lobes of anterolateral border of carapace obscure; walking legs smooth, with few hairs ..... **caystrus.**
- Lobes of anterolateral border of carapace distinct; walking legs with joints (carpus-propodus) haired below and propodus haired above ..... **inornatus.**

Carpus ovate, smooth, strongly convergent posteriorly ..... **trianguiculatus.**

Pseudozius caystrus (Adams and White), Dana, U. S. Exploring Exped. **13**: 233, 1852, pl. 13, fig. 6, *a-h*, 1855 (as *P. planus*).—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 181, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 861, 1903 (1906).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 284, 1913.—Sakai, Studies on the crabs of Japan IV . . ., 514, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 298, fig. 179, *c*, 1946. (See figure 25, *b*.)

Carapace transversely oval, depressed, smooth, without distinct outline of areas. Anterolateral border fairly sharp, cut into four low, broad lobes, the first two almost confluent, the last two more distinct. Chelipeds large, unequal, smooth; two blunt tubercles at inner angle of wrist; fingers arched, pointed.

Walking legs smooth, bearing scattered hairs, dactyli densely coated with short hairs.

P. caystrus is reported from widely separated localities in the Indian and Pacific Oceans. It is not uncommon about Hawaiian shores, where it is concealed under stones between high and low water marks.

Large specimens exceed 1 inch in breadth of carapace.

Finnegan (21) records it from both the Pacific and Atlantic sides of the Isthmus of Panama. It is one of the few Indo-Pacific species of the family which has succeeded in becoming established on the east shores of America.

Tweedie (49) noted that in this species the second pleopods of the male are quite short, contrary to the character assigned by Balss (3) for the subfamily Menippinae. I have verified Tweedie's observation, and I find that short second pleopods are constant in other species of *Pseudozius* examined. Obviously, an exception should be made with respect to the second pleopods of the male, if this genus is to be retained within the subfamily Menippinae.

Pseudozius inornatus Dana, U. S. Exploring Exped. **13**: 234, 1852, pl. 13, fig. 7, *a-e*, 1855.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 861, 1903 (1906).—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 298, 1946.

Closely related to *P. caystrus* but reported as differing from it in the following respects: Margin of carapace behind eye thickened and surface somewhat uneven. Lobes of anterolateral border more distinct. Wrist of cheliped a little rough; fingers of hand longer, straighter, and more slender than in *P. caystrus*. Walking legs hairy below and propodus sparingly hairy above, mostly in scattered tufts.

P. inornatus is about the same size as *P. caystrus*, and the two are found in similar situations. The range of *P. inornatus*, however, appears to be more restricted, having been reported only from Funafuti and Hawaii.

Pseudozius trianguiculatus Borradaile, Fauna Geogr. Maldive and Laccadive Arch. **1**: 242, text fig. 44, 1902.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 861, 1903 (1906). (See figures 24, *b, c*; 25, *c*.)

Carapace a little broader than long, slightly convex, quite smooth. Front broad, prominent, concave in middle. Anterolateral border short, bearing three low, sharp teeth, including external angle, the second largest. Chelipeds very unequal, granular, largest granules on upper and outer borders of large hand. Fingers compressed, sharp at tips, those of smaller hand without teeth. Walking legs slender, dactylus tipped by three claws, two much smaller than third.

Bishop Museum specimens of this small crab are from Pearl and Hermes Reef, Oahu, Washington Island, Palmyra, and Christmas Island (North Pacific). Borradaile described it from the Laccadives, but Balss (6) doubts the position assigned this species by Borradaile and suggests its place to be near *Domecia*. However, after examining specimens from the central Pacific, I am tentatively accepting Borradaile's determination, as I do not see a close resemblance to *Domecia*.

The largest specimen of this species that I have seen is approximately 5 mm. in breadth of carapace.

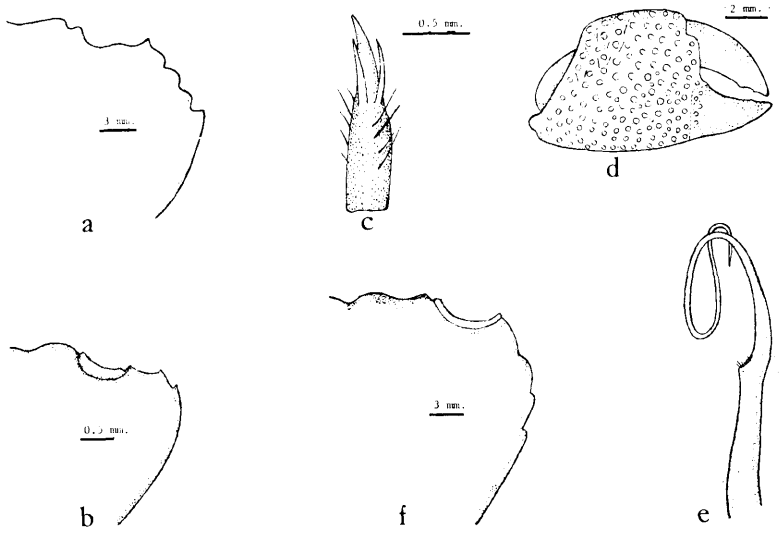

FIGURE 24.—**a,** *Galene hawaiiensis*, outline of half carapace. **b, c,** *Pseudozius triangniculatus: b,* outline of half carapace; *c,* tip of dactylus of walking leg. **d, e,** *Globopilumnus globosus: d,* right chela; *e,* tip of second pleopod of male (Howland Island). **f,** *Ozius hawaiiensis*, outline of half carapace (after Rathbun).

Globopilumnus globosus (Dana), U. S. Exploring Exped. **13**: 236, 1852, pl. 13, fig. 10, 1855 (as *Pilumnus globosus*).—A. Milne Edwards, Soc. Ent. France, Ann. IV, **7**: 280, 1867 (as *Pilumnus ovalis*).—de Man, Carcinological Stud. Leyden Mus. **12**: 59, pl. 3, fig. 3, 1890 (as *Pilumnus globosus*).—Borradaile, Fauna Geogr. Maldive and Laccadive Arch. **1**: 248, 1902 (as *Actumnus glob-*

osus).—Balss, Capita Zoologica **4** (3) : 7, pl. 1, figs. 1, 2, 1933. (See figures 24, *d, e*; 25, *d*.)

Carapace little broader than long, upper surface convex, regions faintly outlined, bearing a few scattered granules and densely coated with rather short yellowish hairs. Front narrow, consisting of two lobes separated in middle by a deep incision, margins sloping backward to merge with orbital border. Antenna and its basal segment both very short. Anterolateral border of carapace entire, bearing three small granules some distance apart.

Chelipeds unequal in both sexes. Larger hand very thick, outer surface strongly convex; outer surface and upper and lower borders bearing numerous granules arranged in irregular order; granules acute near articulation with wrist, smaller and more obtuse near base of fingers. Fingers short, quite smooth, base of dactylus microscopically granular. Smaller hand bearing conical, acute granules slightly larger than those of larger hand and tending to be arranged in transverse rows; dactylus granular and hairy at base. Fingers of both hands provided with a few small teeth.

The above description is adapted from de Man.

The range of *G. globosus* is extensive, having been recorded from Indian Ocean localities, through the Pacific to Japan and the Philippines, and eastward to Hawaii, Tahiti, and the Tuamotus.

De Man's specimens, locality unknown, are 16 mm. in breadth of carapace; other records are somewhat smaller. A specimen in Bishop Museum from Howland Island is 12 mm. broad.

The only known Hawaiian example of the species, described by Edwards as a *Pilumnus*, is in the Muséum National d'Histoire Naturelle, Paris. I am indebted to Dr. Jacques Forest of the Paris Museum for a reexamination of the specimen and for the determination of its proper taxonomic position. The figure of the Hawaiian specimen (fig. 25, *d*) is from a photograph supplied by Dr. Forest.

Ozius hawaiiensis Rathbun, U. S. Nat. Mus., Proc. **26** : 77, text fig. 3, 1902; U. S. Fish Comm., Bull. **23** (3) : 862, 1903 (1906). (See figure 24, *f*.)

Carapace convex, a narrow depressed area around the front and part way along the anterolateral border; areas not well outlined, surface somewhat roughened by irregular punctae. Front deflexed; of four lobes, median ones largest. Anterolateral border with four broad teeth, the first fused with orbital angle, the second most prominent. Chelipeds of female unequal, wrist and hand roughened by pits, free from hair. Walking legs sparsely haired. A female specimen is 28 mm. in breadth of carapace.

O. hawaiiensis was described from specimens taken at Hilo, Hawaii, by H. W. Henshaw from under stones at high-tide mark. It was later reported by Rathbun (41) from other Pacific localities, including the Marquesas, the Tuamotus, and the Carolines.

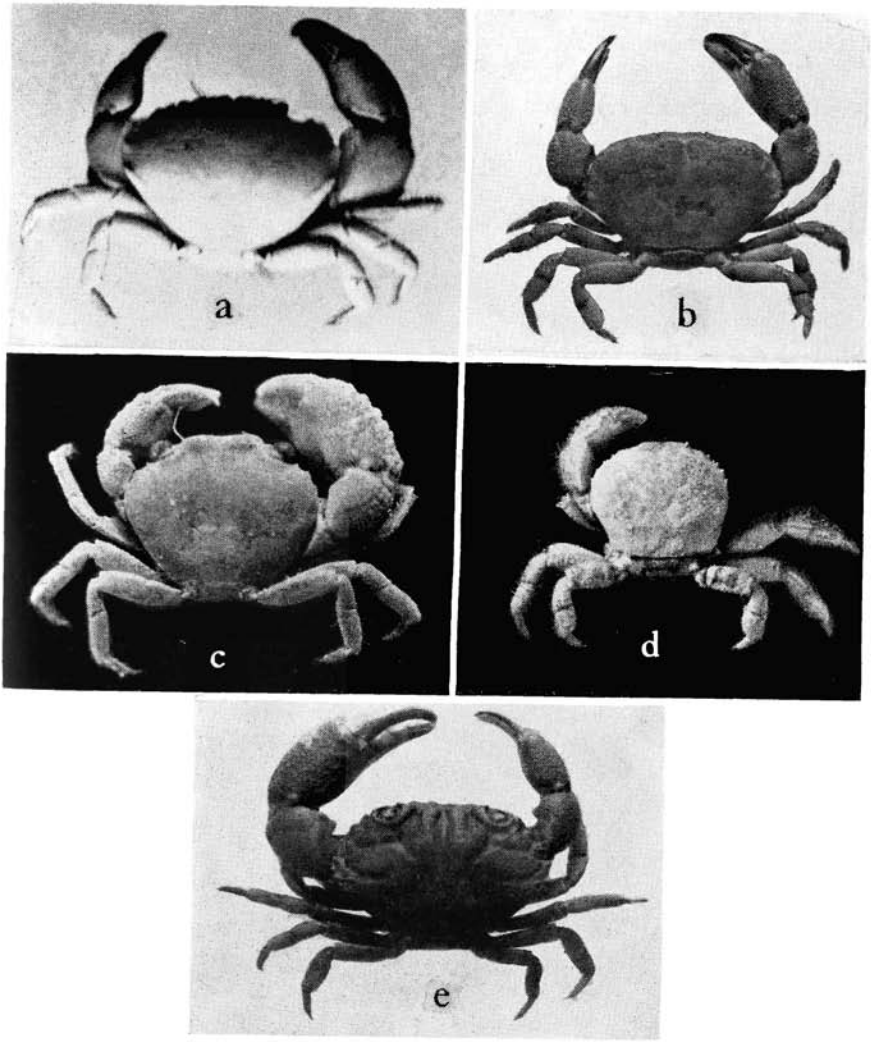

FIGURE 25.—**a**, *Sphaerozius nitidus*; **b**, *Pseudozius caystrus*; **c**, *P. triangulatus*; **d**, *Globopilumnus globosus* (negative by Forest); **e**, *Lydia annulipes*.

Lydia annulipes (A. Milne Edwards), Alcock, Asiatic Soc. Bengal, Jour. **67** (1) : 188, 1898 [as *Ozius* (*Euruppellia*) *annulipes*].—Rathbun, U. S. Fish Comm., Bull. **23** (3) : 862, 1903 (1906).—Sakai, Studies on the crabs of Japan IV . . ., 521, pl. 64, fig. 3, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22** : 298, 1946. (See figure 25, *e*.)

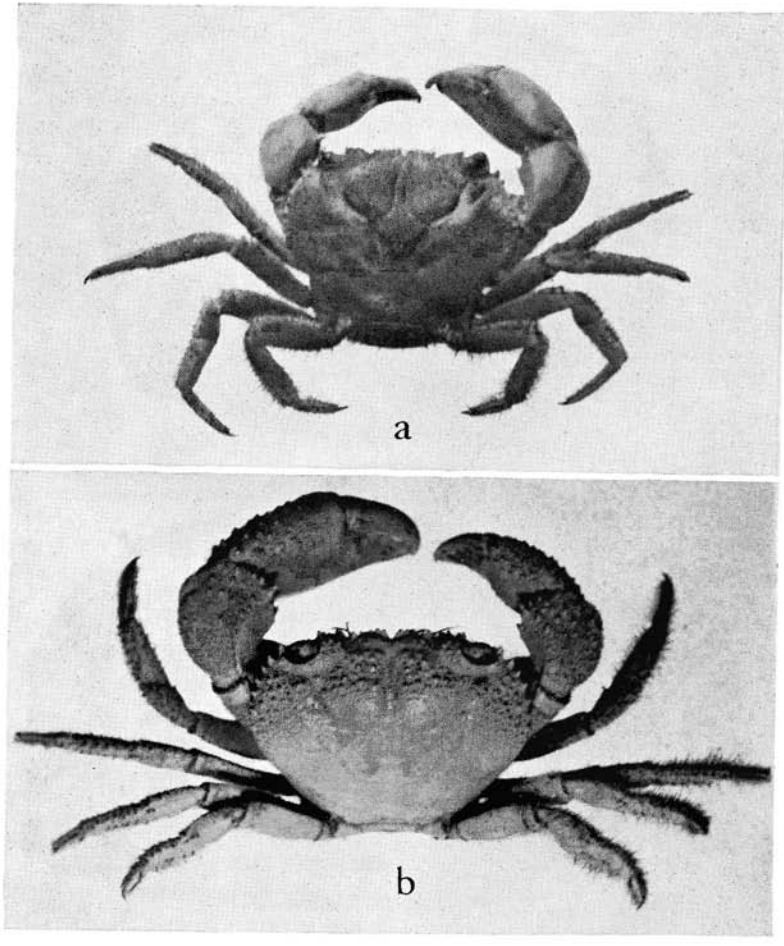

FIGURE 26.—**a**, *Eriphia laevimana*; **b**, *E. l. smithii*.

Carapace transversely oval; areas clearly outlined in anterior half by deep furrows, faintly marked in posterior half, surface smooth. Anterolateral border with five pointed lobes, in addition to external orbital angle, the last lobe very small. Basal segment of antenna excluded from orbit, which is closed. Chelipeds unequal, wrist and hand rough above, dactylus of larger hand with tubercle-like tooth at base of cutting edge. Walking legs smooth; in life, banded by purple.

L. annulipes is widely distributed in the Indo-Pacific area but is not a common species in Hawaiian waters.

Large specimens may exceed 1 inch in breadth of carapace.

Key to Hawaiian species of Eriphia

Chelipeds appearing smooth but covered with microscopic granules..... .....**laevimana.**
Chelipeds covered with tubercles and short setae.....**laevimana smithii.**

Eriphia laevimana Latreille, Dana, U. S. Exploring Exped. **13**: 249, 1852, pl. 14, fig. 7, *a-c*, 1855.—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 214, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 865, 1903 (1906) (as *E. sebana*).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 300, 1913.—Sakai, Studies on the crabs of Japan IV . . ., 522, pl. 99, fig. 1, 1939. (See figure 26, *a*.)

Carapace ovate, a little broader than long; gastric region divided into three large areas. Surface of carapace covered by tubercles anteriorly and by minute granules posteriorly. Front margin with blunt teeth. Anterolateral border bearing five or six blunt spines, decreasing in size posteriorly. Chelipeds unequal, of smooth appearance but covered with microscopic granules. Walking legs stout, smooth, segments more or less hairy, meral joints dentate above.

E. laevimana, which ranges widely through the Indo-Pacific area, was reported from Hawaii in 1864; but there are no recent local records of it.

Large specimens may attain or exceed 3 inches in breadth of carapace.

Eriphia laevimana smithii McLeay, Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 216, 1898.—Sakai, Studies on the crabs of Japan IV . . ., 523, pl. 64, fig. 4, text fig. 49, 1939. (See figure 26, *b*.)

This subspecies, or variety of some authors, differs from the typical *E. laevimana* only in that the wrist and hand of the cheliped are covered with sharp tubercles and setae. It is widely distributed from the Red Sea and the east coast of Africa through the Indo-Pacific area

to Australia and Japan. It has also been recorded from the islands of Tonga and Hawaii, but we have no recent evidence of its presence in local waters. Sakai (44) states that the subspecies has a much wider range in Japan than has the typical species. This condition may also persist on the China coast, as Gordon (23) lists the var. *smithii* from that area but does not include the typical species, *E. laevimana*.

Actumnus obesus Dana, U. S. Exploring Exped. **13**: 244, 1852, pl. 14, fig. 3, 1855.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 865, pl. 11, fig. 2, 1903 (1906).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 274, 1913.— Balss, Capita Zoologica **4** (3): 37, 1933.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 299, 1946. (See figures 27, *a*; 28, *a*.)

Carapace little broader than long, strongly convex, surface well areolated, granular. Front slightly advanced in middle. Anterolateral border cut into three granular lobes in addition to external orbital angle, separated by very shallow incisions, each lobe topped by a sharp granule or minute spine at anterior end. Chelipeds unequal, very short and stout; wrist granular; palm covered with sharp granules on outer and upper borders; fingers short, stout, slightly spooned at tips, dactylus strongly arched. Walking legs short, stout, chelipeds and walking legs sparingly haired.

Specimens of *A. obesus* were dredged by the *Albatross* south of Molokai and near Lahaina, Maui; and Bishop Museum has specimens taken off Oahu by Kuhns in 1917 at depths of 50 fathoms. It was also dredged from numerous stations by the Pele Expedition in 1959.

Large specimens are about 15 mm. broad.

This species is also known from Madagascar, Amirante, the Andemans, West Australia, New Guinea, Fiji, Samoa, and the Marquesas.

Key to Hawaiian species of Pilumnus

Animal covered by dense coat of long hairs; a subhepatic tooth accessory to external orbital angle.....**vespertilio.**

Animal not covered by a dense coat of long hairs; no subhepatic tooth accessory to external orbital angle.

Carapace relatively narrow.

Front projecting with lobes very oblique.....**acutifrons.**

Front not projecting and lobes not oblique.

Anterolateral border of carapace cut into low lobes; a fringe of long hairs extending across front and on eye-stalks .....**alcocki.**

Anterolateral border of carapace cut into teeth; no fringe of long hairs across front.

Surface of carapace quite smooth; three anterolateral teeth behind external orbital angle.....**nuttingi.**
Surface of carapace quite rough; four anterolateral teeth .....**planes.**
Carapace relatively broad.
Carapace without distinctive color pattern.
Palm of large cheliped granular at base and along upper border .....**oahuensis.**
Palm of large cheliped tubercular on upper and outer basal borders .....**longicornis.**
Carapace with distinctive color pattern.....**taeniola.**

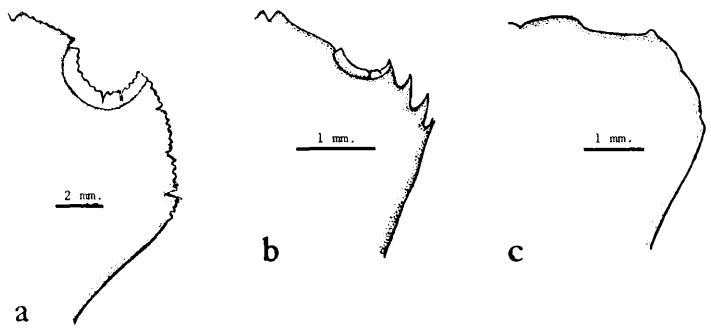

FIGURE 27.—**a,** *Actumnus obesus,* outline of half carapace; **b,** *Pilumnus acutifrons,* outline of half carapace (after Rathbun); **c,** *P. alcocki,* outline of half carapace (after Borradaile).

Pilumnus vespertilio (Fabricius), Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 192, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 862, 1903 (1906).—Balss, Capita Zoologica **4** (3): 21, 1933.—Sakai, Studies on the crabs of Japan IV . . ., 532, pl. 100, figs. 1, 2, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 301, 1946. (See figure 28, *b.*)

Carapace, walking legs, and greater part of chelipeds concealed by a dense coat of tufted and matted hairs. When coat is removed the following characters are noted: Carapace oval, a little broader than long, regions well outlined and surface covered with groups of small granules which give rise to hairs. Front bilobed, median portion of lobes advanced. Anterolateral border with three teeth, in addition to external orbital angle, below which is another small spinule. Chelipeds unequal, upper and outer borders of wrist, smaller hand and, in part, larger hand covered with groups of small granules. Lower front corner and lower border of larger hand bare and smooth. Walking legs short, carpal and propodal joints of all legs and meral joints of last pair with upper margins granular.

P. vespertilio ranges widely from the Red Sea and East Africa through the Indo-Pacific area to Australia, Japan, and eastward into Polynesia. It was recorded from Hawaii many years ago, but it has not been reported from this locality recently.

Specimens may exceed 1 inch in breadth of carapace.

Pilumnus acutifrons Rathbun, U. S. Fish Comm., Bull. **23** (3) : 863, text fig. 23, 1903 (1906). (See figure 27, *b*.)

Carapace not much broader than long, regions well marked, smooth, with scattered tufts of hair. Margins of frontal lobes very oblique, separated in middle by V-shaped incision. Anterolateral border with three sharp spines, in addition to sharp external orbital angle, the last very small, bifid at tip. Chelipeds unequal, bearing rather long, recurved spines which, in larger hand, cover only about upper half of palm. Walking legs slender, with long spines above and smaller ones below, sparingly haired.

This small form, with carapace less than 4 mm. broad, is known only from a dredged specimen, now in the United States National Museum, taken near French Frigate Shoal at a depth of about 17 fathoms.

Pilumnus alcocki Borradaile, Fauna Geogr. Maldive and Laccadive Arch. **1** : 248, text fig. 48, 1902.—Rathbun, U. S. Fish Comm., Bull. **23** (3) : 862, 1903 (1906).—Balss, Capita Zoologica **4** (3) : 26, 1933. (See figure 27, *c*.)

Carapace with regions well marked, sparingly covered with long hairs. Front slightly arched, notched in middle, posterior of margin supporting a transverse fringe of long hairs, which extend on peduncles of eyes. Anterolateral border cut into three low lobes, in addition to external orbital angle, last two very small. Chelipeds subequal, granular, covered with long hairs; fingers gaping, toothed. Walking legs short, stout, pubescent, and hairy; no spines on meral joints. Breadth of carapace slightly exceeding 6 mm.

Borradaile describes *P. alcocki* from Suvadiva Atoll, where it was taken at depths of 20 fathoms. Rathbun records it from two stations in Hawaiian waters from depths of 14 to 28 fathoms and 33 to 71 fathoms.

Pilumnus nuttingi Rathbun, U. S. Fish Comm., Bull. **23** (3) : 862, pl. 11, fig. 8, text fig. 22, 1903 (1906).—Balss, K. Vet. o. Vitterh. Samh., Handl., ser. B, **5** (7) : 68, 1938. (See figure 30, *a*.)

Carapace narrow, a little broader than long, regions well marked, almost smooth, covered with short hairs. Front consisting of two slightly convex lobes separated from each other in middle by V-shaped indentation and laterally from inner orbital angle by slight notch. Anterolateral border cut into three lobes, in addition to external orbital angle, each lobe capped by a sharp spine directed forward. Chelipeds unequal, stout, arm with subterminal tooth on upper

border; wrist and hand granulate, granules on palm larger near upper border, where they extend over base of dactylus. Chelipeds sparingly haired; walking legs smooth, rather long, short hairs on margins.

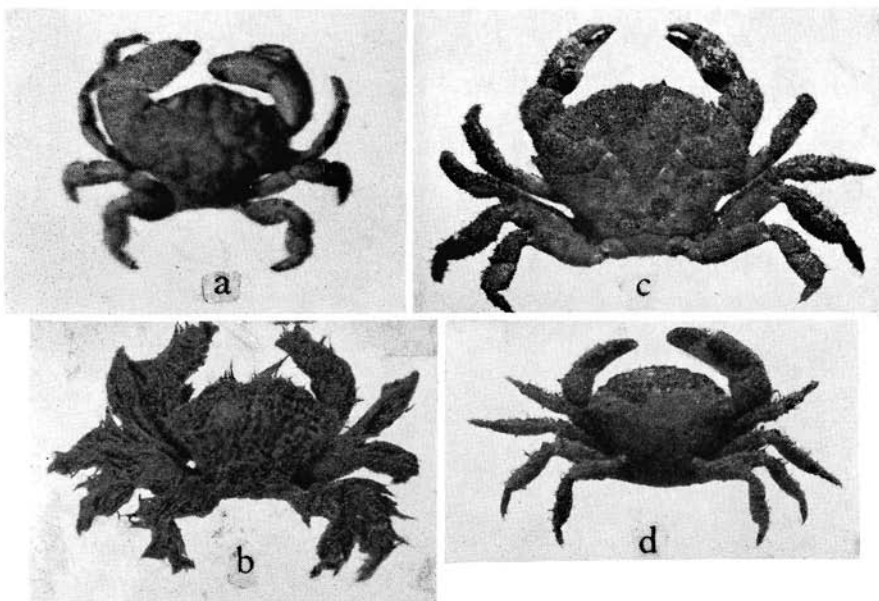

FIGURE 28.—**a**, *Actumnus obesus;* **b**, *Pilumnus vespertilio;* **c**, *P. planes;* **d**, *P. oahuensis.*

P. nuttingi was first dredged by the *Albatross* at several stations about the Hawaiian Islands at depths down to 160 fathoms. Specimens were also taken off Waikiki by Kuhns in 1917 at depths of 50 fathoms, and specimens in Bishop Museum were dredged by the *Makua* in 1949 in localities about Oahu at depths ranging down to 25 fathoms. Additional specimens were taken at a number of stations about the Hawaiian Islands by the Pele Expedition of 1959. Balss records the species from Fiji.

Large specimens are about 7 mm. in breadth of carapace.

Pilumnus planes Edmondson, B. P. Bishop Mus., Occ. Papers **9** (17): 8, pl. 3, *a-d*, 1931; B. P. Bishop Mus., Sp. Pub. **22**: 299, fig. 180, *d*, 1946. (See figure 28, *c*.)

Carapace slightly broader than long, very flat, anterior half distinctly areolated; frontal, hepatic, and anterolateral regions thickened and roughened by

elevations which are covered with tubercles. Short, stiff hairs coat anterior and lateral portions of carapace. Anterolateral border with four strong teeth, in addition to external orbital angle, with spinules about their base. Chelipeds subequal, outer and, to some extent, inner borders of wrist and palm covered with tubercles and stiff hairs. Merus of walking legs with blunt tubercles on upper border; joints of legs, especially carpus to dactylus, coated with stiff hairs.

P. planes has been taken on Maui and Oahu from stones at the water's edge.

Large specimens attain a breadth of carapace of about 1 inch.

Pilumnus oahuensis Edmondson, B. P. Bishop Mus., Occ. Papers **9** (17) : 7, pl. 2, *a-e*, 1931; B. P. Bishop Mus., Sp. Pub. **22** : 299, fig. 180, *c*, 1946. (See figure 28, *d*.)

Carapace broader than long, somewhat convex in both directions; surface bearing long and short hairs. Front prominent with two convex lobes, each of which is subdivided into a large inner and a small outer portion, the latter toothlike and confluent with orbital angle. Anterolateral border with three sharp teeth, in addition to external orbital angle, which is prominent but not acute. Chelipeds unequal, arm with a row of teeth on upper and lower borders; outer border of wrist granular, palm of larger hand smooth except for a few granules on upper border and near articulation with wrist. Palm of smaller hand with longitudinal rows of small tubercles on outer and upper borders. Hairs similar to those on carapace cover both chelipeds except for palm of larger hand, which is sparsely coated with hair along posterior border. Walking legs smooth, coated with long hairs.

P. oahuensis has been taken in Pearl and Honolulu Harbors among fouling on buoys and piling.

Breadth of carapace 11 mm.

Pilumnus longicornis Hilgendorf, Alcock, Asiatic Soc. Bengal, Jour. **67** (1) : 193, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3) : 863, 1903 (1906) (as *P. andersoni*).—Balss, Capita Zoologica **4** (3) : 15, 1933.—Sakai, Studies on the crabs of Japan IV . . ., 533, pl. 100, fig. 3, 1939. (See figure 29, *a*.)

Carapace with regions faintly outlined, granular along anterolateral border, coated with long flexible hairs. Front of two lobes each divided into a median convex portion and an outer toothlike projection. Anterolateral border with three sharp spines, in addition to external orbital angle. Chelipeds unequal, wrist of larger one granular, palm with tubercles on upper and outer basal borders, but much of outer and lower surface smooth and glabrous. Smaller palm with small tubercles arranged in longitudinal series. Walking legs long, spinules on upper meral joints of first three pairs. Chelipeds and walking legs sparsely coated with long hairs like those on carapace.

P. longicornis is widely distributed from East Africa through the Indian Ocean to Australia, Japan, and the central Pacific. Balss (4)

calls attention to the apparent difference in size of specimens from Indian Ocean areas compared with those taken from regions farther east. Karachi specimens have attained a carapace breadth of 29 mm., whereas those from Ceylon, Australia, New Zealand, and Japan range from about 14 mm. to 17 mm. broad. Specimens in Bishop Museum, taken from the hull of a boat in Pearl Harbor drydock, are 14 mm. in breadth of carapace. Rathbun (40) records specimens (probably juveniles) dredged near Laysan Island only 6.2 mm. broad.

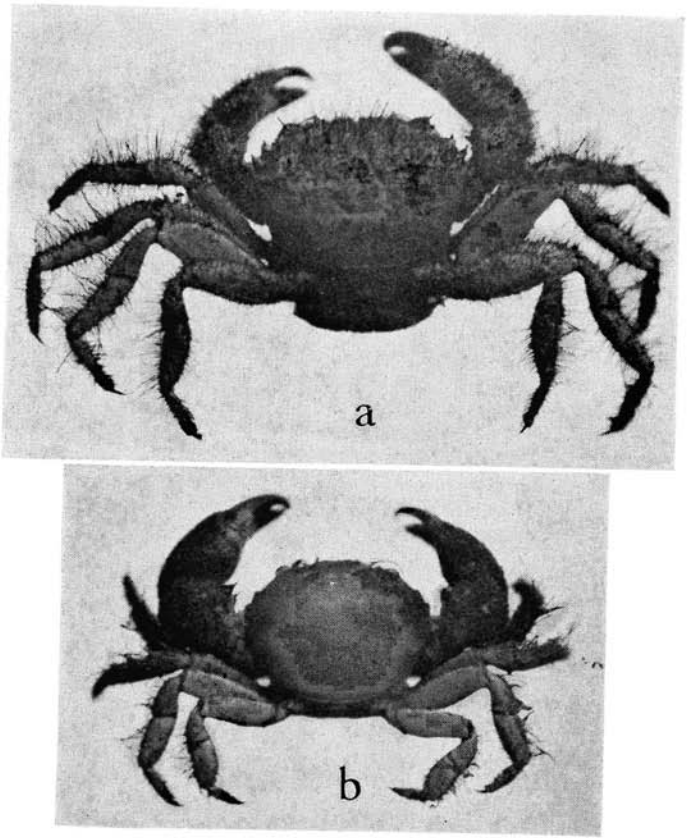

FIGURE 29.—**a**, *Pilumnus longicornis;* **b**, *Glabropilumnus seminudus.*

Pilumnus taeniola Rathbun, U. S. Fish Comm., Bull. **23** (3) : 864, pl. 11, fig. 3, text fig. 24, 1903 (1906). (See figure 30, *b-d.*)

Carapace with surface smooth, punctate, thinly coated with long hairs. Posterolateral borders of carapace nearly parallel. Front with two convex lobes. Anterolateral border short, bearing two small spines, in addition to external orbital angle. Chelipeds with wrist and palm granular, clothed in long hairs, granules and hair continued on base of dactylus. Walking legs long, slender, densely haired. Color pattern consisting of white bands bordered by a narrow

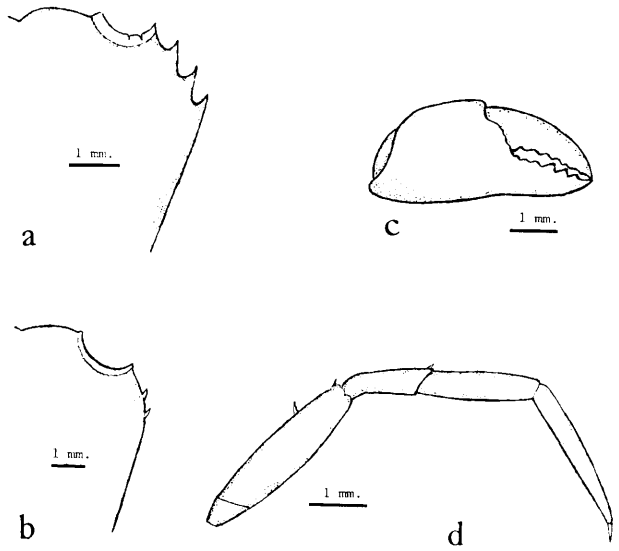

FIGURE 30.—**a,** *Pilumnus nuttingi,* outline of half carapace. **b-d,** *P. taeniola: b,* outline of half carapace; *c,* right chela; *d,* walking leg.

stripe of brown, extending across front, encircling anterolateral margin and curving across gastric region. Similar bands of color converge from orbital areas toward central portion of carapace. In anterior portion, under surface of carapace also marked by a color pattern.

P. taeniola was dredged by the *Albatross* at a number of Hawaiian stations at depths down to 28 fathoms. Since that time other specimens have been taken off Oahu at depths down to about 50 fathoms.

The type specimen, a female (U. S. National Museum), is 7.7 mm. in breadth of carapace.

Glabropilumnus seminudus (Miers), IN Rept. Zool. Coll. H.M.S. *Alert*, Crustacea, 222, pl. 21, fig. *C*, 1884 (as *Pilumnus seminudus*). —Balss, Zeitschrift f. wissenschaft. Zool. **142** (4) : 517, figs. 3, 4, 1932.—Edmondson, B. P. Bishop Mus., Occ. Papers **21** (6) : 83, figs. 10, 11, 1952. (See figure 29, *b*.)

Carapace a little broader than long, slightly convex. Greater part of carapace smooth and shiny; narrow zone of short, dense pile about front and anterolateral borders; transverse row of longer hairs between orbits, extending onto eyestalks. Anterolateral border bearing three stout, acute teeth, in addition to external orbital angle. Chelipeds unequal, the larger stout, carpus and palm inflated, outer surface of palm covered with rounded tubercles. Fingers stout, pointed, tuberculate at base. Dense pile of carapace extends over chelipeds. Walking legs slender, unarmed, bearing long and short hairs.

A single specimen believed to represent *G. seminudus* was taken from fouling on the hull of a barge in Pearl Harbor which had seen service in Guam for two years. The species has also been recorded from the Celebes, Australia, Torres Straits, and Hong Kong.

The Hawaiian specimen is 12 mm. in breadth of carapace.

Key to Hawaiian species of Trapezia

Carapace with a spine or tooth about middle of lateral border.
- Carapace of uniform color.
  - Upper border of palm of cheliped sharp, its outer surface bearing soft hairs ..... **cymodoce.**
  - Upper border of palm of cheliped rounded, its outer surface hairless ..... **cymodoce ferruginea.**
- Carapace spotted; palm of cheliped with or without reticulate lines.
  - Carapace marked by pale brown spots; upper portion of palm with fine brown reticulate lines ..... **cymodoce intermedia.**
  - Carapace marked by red or yellow spots; without reticulate lines on palm.
    - Carapace marked by red spots but without reticulate lines.
      - Lower border of palm of cheliped sharp, entire ..... **cymodoce maculata.**
      - Lower border of palm of cheliped granular or serrate ..... **rufopunctata.**
    - Carapace marked by yellow spots and reddish reticulate lines ..... **flavopunctata.**

Carapace without a spine or tooth about middle of lateral border ..... **digitalis.**

Trapezia cymodoce (Herbst), Alcock, Asiatic Soc. Bengal Jour. **67** (1) : 219, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3) : 863, pl. 11, fig. 6, 1903 (1906) (as *Grapsillus cymodoce*).—Sakai, Studies on the crabs of Japan IV . . ., 551, text fig. 63, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22** : 301, 1946.

Carapace very slightly convex, smooth and shiny. Front prominent, bilobed, median angle of each lobe toothlike, lateral angle pronounced, rounded, separated from toothlike inner orbital angle by notch. Anterolateral borders nearly parallel, junction with posterolateral border marked by a tooth, often acute and slightly curved forward. Chelipeds subequal, long, anterior border of arm with numerous teeth; palm compressed, long, upper and lower borders sharp, upper and part of outer surface covered by silky hairs; fingers compressed, cutting edges sharp. Walking legs smooth, joints, carpus to dactylus, fringed with bristles.

T. cymodoce ranges from the Red Sea and East Africa through the Indo-Pacific area to Japan and eastward to Polynesia.

Large specimens are about 15 mm. in breadth of carapace.

Trapezia cymodoce ferruginea Latreille, Dana, U. S. Exploring Exped. **13**: 257, 1852, pl. 15, fig. 5, 1855 (as *T. cymodoce*).—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 220, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 865, 1903 (1906) (as *Grapsillus ferrugineus*).

Quite similar to *T. cymodoce* but differs from it in following respects: Front of carapace less prominent and teeth less pronounced. Outer orbital angle and tooth at junction of anterolateral and posterolateral borders not so sharp. Upper border of palm of cheliped not so sharp and its outer border smooth, polished, and entirely free of hair.

Features of *T. c. ferruginea* such as size, brown coloration, range of distribution, and local habitat correspond closely with those of *T. cymodoce,* but the known dispersal is even greater, specimens having been reported from the Galapagos Islands, the Gulf of California, and off the Colombian coast. Finnegan (21) records the species from the Bay of Panama and from Colon on the Atlantic side of the Isthmus of Panama.

Trapezia cymodoce intermedia (Miers), 1N Rept. Voy. Challenger **17**: 168, pl. 12, fig. 2, 1886 (as *T. rufopunctata* var. *intermedia*).—Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 220, 1898 (as *T. ferruginea* var. *intermedia*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 865, 1903 (1906) (as *Grapsillus ferrugineus intermedius*); Linn. Soc. London, Trans. II, **14**: 235, 1910-1912.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 301, fig. 180, *c*, 1946. (See figure 31, *a*.)

Differs from subspecies, *T. c. ferruginea,* chiefly in coloration, as follows: Cheliped, walking legs, arms, and wrists of chelipeds covered with pale brown spots. Upper surface of palms marked by network of fine brown lines and bearing very fine pubescence.

This subspecies has been reported from the Indian Ocean and from the coast of Burma, but most of the records are from the central Pacific, where Hawaiian waters are the chief distributional area. It is a very common form on Hawaiian reefs among branches of *Pocillopora* coral.

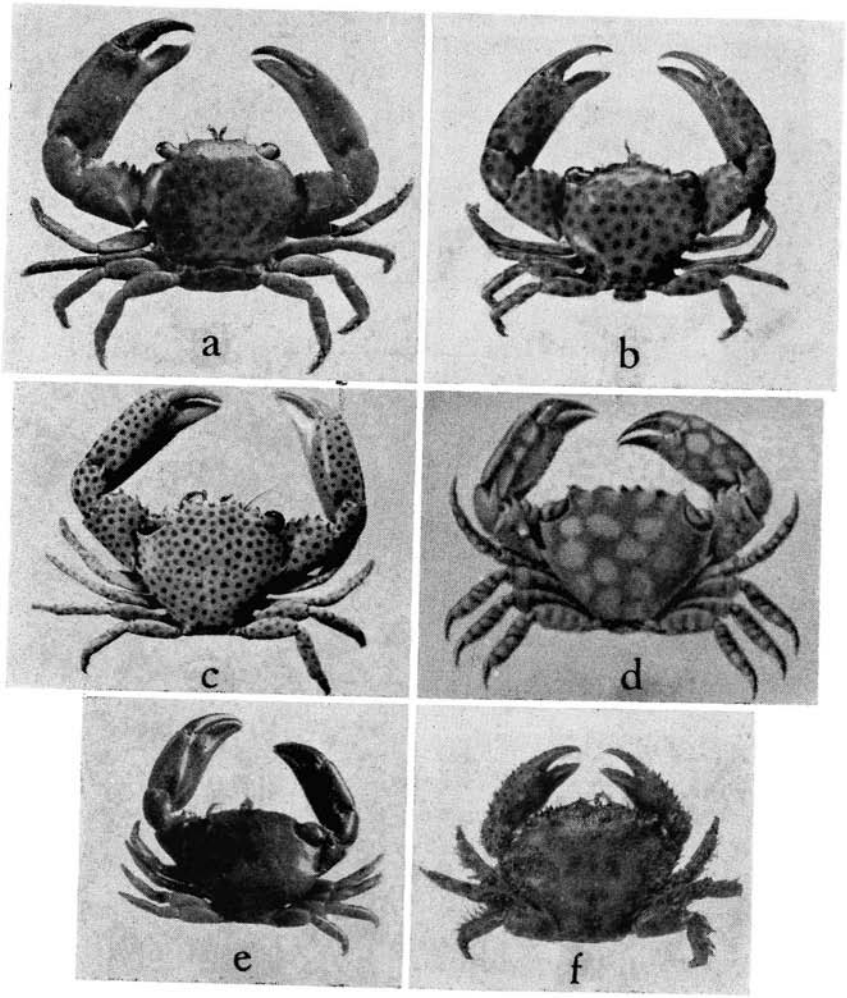

FIGURE 31.—**a**, *Trapezia cymodoce intermedia*; **b**, *T. c. maculata*; **c**, *T. rufopunctata*; **d**, *T. flavopunctata* (after A. Milne Edwards); **e**, *T. digitalis*; **f**, *Domecia hispida*.

Trapezia cymodoce maculata (Macleay), Alcock, Asiatic Soc. Bengal, Jour. **67** (1) : 221, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3) : 865, 1903 (1906) (as *Grapsillus maculatus*).—Edmondson, B. P. Bishop Mus., Sp. Pub. **22** : 301, fig. 180, *f*, 1946. (See figure 31, *b*.)

Differs from *T. cymodoce* in following respects: Carapace, chelipeds, and walking legs covered with round red spots. Front of carapace not so prominent and teeth less pronounced. Chelipeds shorter; wrist with strong spine at inner angle; palm smooth, hairless, lower border sharp, entire.

A principal distinction between this subspecies and *T. rufopunctata* appears to be the character of the lower border of the palm which in *T. c. maculata* is smooth, without granules or serrations, whereas in *rufopunctata*, the margin has minute teeth or sharp granules.

T. c. maculata is known from scattered localities over a wide range through the Indo-Pacific region to Hawaii, Tahiti, and the west coast of Mexico. Specimens in Bishop Museum are from the central Pacific, including Hawaii and the Line Islands.

Trapezia rufopunctata (Herbst), Dana, U. S. Exploring Exped. **13** : 255, 1852, pl. 15, fig. 3, *a, b*, 1855.—Alcock, Asiatic Soc. Bengal, Jour. **67** (1) : 222, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3) : 866, 1903 (1906) (as *Grapsillus rufopunctatus*).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2) : 309, pl. fig. 13, 1913.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22** : 301, 1946. (See figure 31, *c*.)

Front of carapace similar to that of *T. cymodoce*, but outer angle of frontal lobe more acute, toothlike, and more prominent. Wrist of cheliped with sharp tooth at inner angle and outer border of palm smooth, as in *T. c. maculata;* but lower margin sharp, either granular or serrate. Carapace, chelipeds, and walking legs covered with round red spots.

T. rufopunctata is known from the Red Sea, from the Indian Ocean, from Ceylon, and from Pacific localities as far east as Tahiti and Hawaii. Bishop Museum has numerous specimens from the Hawaiian area and the Line Islands.

Large specimens may slightly exceed 20 mm. in breadth of carapace.

Trapezia flavopunctata Eydoux and Souleyet, Voy. Bonite, Zool. 1 (2) : 230, pl. 2, fig. 3, 1842.—Edwards, Nouv. Arch. Mus. d'Hist. Nat. Paris, **9** : 259, pl. 10, fig. 7, 1873 (as *T. latifrons*).—Rathbun,

U. S. Fish Comm., Bull. **23** (3) : 866, 1903 (1906) (as *Grapsillus rufopunctatus flavopunctatus*).—Edmondson, B. P. Bishop Mus., Sp. Pub. **22** : 301, 1946. (See figures 31, *d*; 32, *a*.)

Carapace a little broader than long, front slightly turned down, margin with six rounded lobes, median and lateral pairs narrower and more pointed than submedian. Epibranchial teeth on lateral borders sharp. Chelipeds stout, arm toothed on lower border; wrist with stout, sharp tooth at inner angle; palm pitted above, a longitudinal ridge on outer surface, serrate and tuberculate on lower border. Fingers inflexed, toothed. Walking legs smooth, sparsely haired, except terminal joints, which are more densely coated with hair. Color reddish brown with large yellow spots. Fingers banded in middle with black.

T. flavopunctata is very close to *T. rufopunctata,* of which it is considered a subspecies by Rathbun. De Man (30) observes that the only difference to be detected between the two lies in the color pattern. The authors of *T. flavopunctata,* however, stress the obtuse teeth

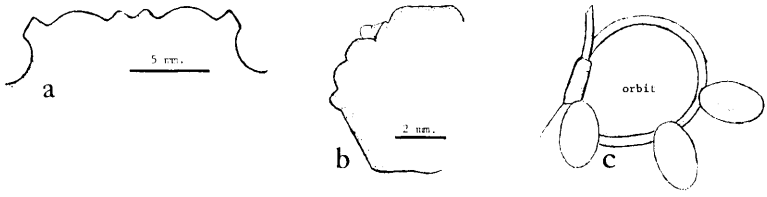

FIGURE 32.—**a,** *Trapezia flavopunctata,* front margin; **b,** *Lybia caestifera,* outline of half carapace (after Alcock) ; **c,** *Polydectus cupulifer,* orbital border.

of the fronts as a distinction. Also, the posterolateral borders of the carapace sharply converge toward a markedly narrow posterior border, giving the outline of the carapace a somewhat triangular appearance.

Few reports of *T. flavopunctata* are known. Apparently the most recent record is that of a specimen, now in the United States National Museum, taken by P. S. Galtsoff at Pearl and Hermes Reef on August 30, 1930, at a depth of 10 feet. In this specimen the submedian lobes of the front are very broadly convex (fig. 32, *a*). Edwards (18) reports *T. latifrons* from New Caledonia and Hawaii, and Lenz (27) records it from Laysan Island.

The type specimen is 22 mm. in breadth of carapace and 21 mm. in length.

Trapezia digitalis Latreille, Alcock, Asiatic Soc. Bengal, Jour. **67** (1) : 222, 1898.—Rathbun, U. S. Fish Comm., Bull **23** (3) : 866, 1903 (1906) (as *Grapsillus digitalis*) ; U. S. Nat. Mus., Bull. **152** : 559, pl. 228, figs. 5, 6, 1930.—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2) : 312, pl. 7, fig. 14, *a-c*, 1913.—Sakai, Studies on the crabs of Japan IV . . ., 552, pl. 100, fig. 10, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22** : 301, 1946. (See figure 31, *e*.)

Carapace with smooth, polished surface; front not prominent, bilobed. A minute notch at junction of anterolateral and posterolateral borders only. Chelipeds subequal, arm short, broad; wrist with acute inner angle; palm rounded above, sharp beneath. Walking legs smooth. Color dark brown, fingers and lower borders of hands lighter.

T. digitalis has a very wide range: from the Red Sea through the Indian and Pacific Oceans as far as the west coast of America. It is common in Hawaiian waters.

Large specimens are about 12 mm. in breadth of carapace.

Domecia hispida Eydoux and Souleyet, Voy. Bonite, Zool. **1** (2) : 235, pl. 2, figs. 5-10, 1842.—Alcock, Asiatic Soc. Bengal, Jour. **67** (1) : 230, 1898.—Rathbun, U. S. Fish Comm., Bull. **23** (3) : 866, 1903 (1906).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2) : 303, pl. 7, fig. 11, *a-c*, 1913.—Sakai, Studies on the crabs of Japan IV . . ., 553, pl. 100, fig. 4, 1939.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22** : 391, fig. 181, *a*, 1946. (See figure 31, *f*.)

Carapace smooth, for most part, regions not well marked; surface somewhat pubescent, lateral areas bearing some small spines; anterolateral borders with five or six small sharp teeth. Chelipeds stout, arm toothed on anterior margin, wrist spinous above, smooth below; palm spinous on upper border, smooth on outer and lower borders. Walking legs strong, smooth, haired. Color brownish yellow, mottled; spines black.

D. hispida ranges from the Red Sea through the Indo-Pacific area and the warmer parts of the Pacific to the west coast of America and is known on the Atlantic side of the Americas from the southeastern coast of the United States as far south as Brazil.

Large specimens are about 10 mm. in breadth of carapace.

Key to Hawaiian species of Lybia

Carapace smooth, bearing scattered tufts of long hairs.....**tesselata.**
Carapace rough, tuberculate, somewhat pubescent posteriorly and laterally .....**caestifera.**

Lybia tesselata (Latreille), Borradaile, Fauna Geogr. Maldive and Laccadive Arch. **1**: 250, text fig. 49, 1903 (as *Melia tessellata*).—Rathbun, Biol. Soc. Washington, Proc. **17**: 102, 1904; U. S. Fish Comm., Bull. **23** (3): 866, 1903 (1906).—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 302, fig. 181, *b*, 1946. (See figure 33.)

Carapace a little broader than long, nearly rectanguiar, convex, smooth, bearing a few tufts of short hairs. Front broad, somewhat inclined. Anterolateral border bearing one sharp tooth in addition to external orbital angle. Chelipeds more slender and shorter than walking legs. Walking legs long, cylindrical, sparingly fringed with long hairs. Color of carapace consists of polygonal patterns in shades of pink, brown, or yellow. The walking legs are banded with dark purple.

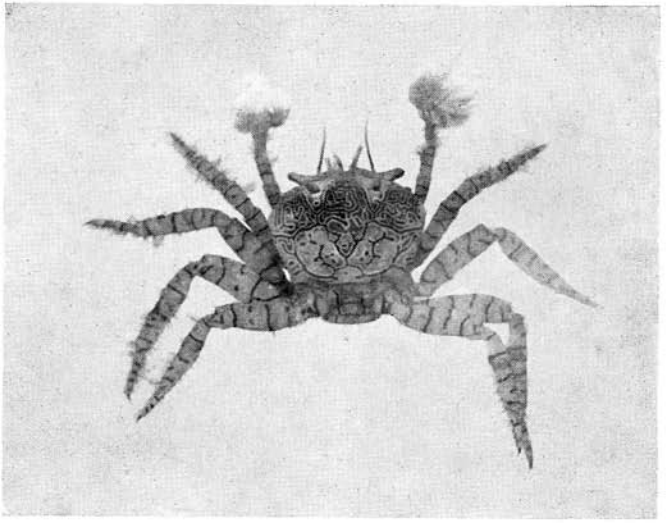

FIGURE 33.—*Lybia tesselata*.

L. tesselata, which typically carries sea anemones in its claws, is known widely through the Indo-Pacific region and is not an uncommon crab on Hawaiian reefs.

Specimens are about 15 mm. in breadth of carapace.

Lybia caestifera (Alcock), Alcock, Asiatic Soc. Bengal, Jour. **67** (1): 231, 1898 (as *Melia caestifer*); Illustr. Zool. Invest., Crustacea (7): pl. 38, fig. 4, 1899.—Rathbun, U. S. Fish Comm., Bull. **23** (3): 866, 1903 (1906).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 278, pl. 7, fig. 7, 1913. (See figure 32, *b*.)

Carapace hexagonal, about as long as broad, areas well outlined, rough, tubercular, somewhat pubescent. Front broad, horizontal. Anterolateral border with three blunt lobes, the first confluent with external orbital angle. Chelipeds slender, hand almost concealed by hair, fingers slender, hooked. Walking legs somewhat pubescent.

Alcock (1) reports *Lybia caestifera* from off Ceylon, at depths of 34 fathoms. Klunzinger (25) records it from the Red Sea and figures a specimen holding an actinian in its claw. Rathbun (40) considers a specimen dredged by the *Albatross* off the coast of Molokai (23 to 24 fathoms) as probably this species. This specimen (U. S. National Museum) is slightly under 5 mm. in breadth of carapace and a little larger than the type, but somewhat smaller than representatives from the Red Sea.

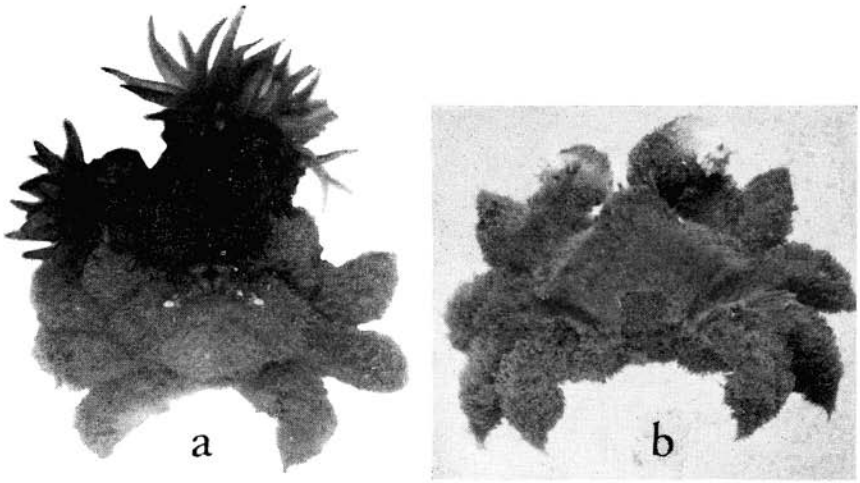

FIGURE 34.—*Polydectus cupulifer:* **a**, with introduced anemones; **b**, normal.

Polydectus cupulifer (Latreille), Milne Edwards, Hist. Nat. Crustacés **2**: 146, 1837 (as *P. cupulifera*).—Dana, U. S. Exploring Exped. **13**: 227, 1852, pl. 3, *a-e*, 1855 (as *P. villosus*).—Rathbun, U. S. Fish Comm., Bull. **23** (3): 866, 1903 (1906).—Klunzinger, Acad. Caes. Leopold.-Carol., Nova Acta, Abhandl. K. **99** (2): 281, pl. 7, fig. 8, 1913.—Edmondson, B. P. Bishop Mus., Sp. Pub. **22**: 301, 1946. (See figures 32, *c*; 34.)

Carapace, chelipeds, and walking legs covered with dense coat of long hair. Carapace convex, front advanced, bilobed, horizontal. Anterolateral border not distinct, slightly concave. Three cuplike tubercles about orbit, one at outer angle and two on lower border. Chelipeds equal, fingers long, slender, only tips touching when closed.

P. cupulifer, like *Lybia tesselata,* has the strange habit of carrying sea anemones in its claws. It is known from Indian Ocean localities and has been recorded from the Tuamotus in the Pacific. Furthermore, numerous specimens in Bishop Museum are from Hawaiian reefs and the Line Islands.

Specimens are about 12 mm. in breadth of carapace.

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