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DECAPOD CRUSTACEA OF BERMUDA; I—BRACHYURA AND ANOMURA. THEIR DISTRIBUTION, VARIATIONS, AND HABITS

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VI.—Decapod Crustacea of Bermuda; I,—Brachyura and Anomura. Their Distribution, Variations, and Habits.

By A. E. Verrill.

The following catalogue is intended to include all the species hitherto known to occur at Bermuda. It is based mainly on the collections made by myself and the small parties of students and others who went with me to Bermuda in 1898 and 1901 to make collections for the Museum of Yale University. But I have also used several earlier collections already in the Yale Museum, especially that of Mr. G. Brown Goode, made in 1876–1877, of which the species were mostly determined by Prof. S. I. Smith, soon afterwards; and the still earlier collections sent to the Museum by Mr. J. M. Jones, about 1866 to 1877; also small collections made about the same period by Dr. C. Hartt Merriam, Dr. F. V. Hamlin, and others.

Recently, Professor Trevor Kincaid, of the Washington State University of Seattle, has sent me, for examination, his entire collection, made while at the Bermuda Biological Station, in 1903.

The Field Natural History Museum of Chicago sent to Bermuda, in 1905, an expedition under Dr. Tarleton H. Bean, especially to collect the fishes, but a good collection of Crustacea was also obtained, including a number of species dredged on the Challenger and Argus Banks. This collection has been sent to me for study by the director, Mr. F. J. Skiff, to whom I am much indebted for the privilege of studying it. The collection contained several interesting additions to the Bermuda crustacean fauna.*

Prof. E. L. Mark, of Harvard University, has also kindly sent me, for study, a collection of Crustacea made by the members of the Bermuda Biological Station, under his direction. It is of special interest because some of the species were dredged on the Argus and Challenger Banks, and a few are new to the fauna. Several partial and nominal lists of Bermuda Decapod Crustacea, mostly without descriptions or figures, have already been published, increasing, from time to time, the number of known species, but none are complete. No doubt many additions will also be made hereafter to the present list, though it is probably nearly complete for the shore and shallow water species.

*Among these are *Dromia erythropus*, a small *Munida*, and a small red *Alpheus*, apparently new, from the Banks; *Charybdella tumidula*, Long Bird I., and *Glypturus Branneri* Rath., from St. Davids Island.

The earlier lists, worthy of notice, are those of Mr. J. M. Jones.* The species enumerated by him, merely by names, were identified for him by others, and were not all reliably named. A good series of his Bermuda Crustacea still remains in the Yale Museum, and has been used in preparing this list, as stated above.

Prof. Sidney I. Smith, in a memoir on the Crustacea of Brazil,† in 1869, recorded five species from Bermuda (coll. J. M. Jones) studied by him in the Yale Museum, and others in his later papers.

Prof. Angelo Heilprin, in his general work on the Bermudas,‡ gave a brief list of the Crustacea obtained. They were identified by Mr. Witmer Stone, who was a member of Prof. Heilprin's party. One of his species (*Cyclograpsus integer*) has not been taken by later collectors. A list of nine species was given by Professor Ortmann in the reports of the Plankton Expedition.§

In a general illustrated work on the West Indian Decapod Crustacea,‖ Mr. Young has enumerated and described 23 species pre-

* The Naturalist in Bermuda, London, 1859, 212 pp., 8vo; The Visitor's Guide to Bermuda, Halifax, New York, and London, 1876, 12mo, 159 pp. For a list of his other writings, see these Trans., vol. xii, p. 201; The Bermuda Is., ii, p. 157.

Mr Jones was a lawyer, resident in Halifax, N. S., but he resided a number of winters in Bermuda, also doing business there. He was much interested in zoölogy, botany, and geology, and did much useful pioneer work there, in those subjects. His books were very useful at the time he wrote, for little had then been published on the natural history of the Bermudas. He devoted more attention to the Mollusca than to any other subject, and made a large collection of shells there, but no complete list of them has been published. He was a personal friend of Governor Lefroy, as shown by their correspondence which I have seen, and they were often associated in making collections. I made his personal acquaintance, while at Halifax, in 1877. Soon after that he sent to the Yale Museum a large part of his collections of corals, echinoderms, bryozoa, etc. At about the same period he sent his collection of Crustacea to be studied by Prof. S. I. Smith of Yale, who was then intending to write a general report on the Bermuda Crustacea for Bulletin 25 of the U. S. National Museum. Other more imperative duties prevented the completion of that work, as well as my own report on the corals and echinoderms, undertaken at the request of Mr. Goode, for that Bulletin.

†Notice of the Crustacea collected by Prof. C F. Hartt, on the Coast of Brazil in 1867. These Trans., vol. ii, pp. 1–42, 1869.

‡Heilprin, Angelo.—The Bermuda Islands. Crustacea on pp. 146–149. Philadelphia, 1889.

§Ortmann, Arnold.—Decapoden und Schizopoden der Plankton Exped., Bd. ii, 1893.

‖Young, Chas. G.—The Stalk-Eyed Crustacea of British Guiana, West Indies, and Bermuda, London, 1900, xix + 514 pp., 7 colored plates.

viously recorded from Bermuda. In the Reports of the Voyage of the Challenger there are lists* of the 25 shallow-water species obtained at Bermuda. Dr. W. M. Rankin, of Princeton University, published in 1900 a much more complete list, including all the species known up to that date.† He recorded 33 species of Brachyura and 6 of Anomura. He utilized the collections made by the parties from the University of New York. He also had, for his use, a list of the species obtained by Mr. G. Brown Goode,‡ in 1876

* Miers, Edw. J.—Report on the Brachyura, vol. xvii, 1886. Henderson, J. R.—Report on the Anomura, vol. xxvii, 1888.

† The Crustacea of the Bermuda Islands, with notes on the Collection made by the New York University Expeditions of 1897 and 1898. Annals New York Acad. Science, vol. xii, No. 12, pp. 521–548.

‡ Mr. G. Brown Goode, who was for many years Assistant on the U. S. Fish Commission; later, Assistant Secretary of the Smithsonian Institution and Director of the National Museum; and at one time Commissioner of Fish and Fisheries; was a prominent ichthyologist. He published a number of important works on fishes. One of his earlier ones was a Catalogue of the Fishes of Bermuda with notes on their colors and habits. (Bulletin of the U. S. National Museum, No. 5, 1876.) He published a more complete catalogue in Bulletin 25, 1884.

He visited Bermuda in the winters of 1876 and 1877, partly for the benefit of his health. While there he made extensive collections, especially of fishes, Crustacea, sponges, corals, and echinoderms. His collections were much larger than any previously obtained there. They contained about 35 species of Brachyura and Anomura; also many Macrura, Amphipods, etc. His corals, actiniæ, echinoderms, bryozoa, etc., were identified by me, before 1880, and studied with reference to the preparation of a faunal report on those groups, for Bulletin 25 of the U. S. National Museum. But this work and several others were laid aside in order to undertake the more important investigation of the deep-sea invertebrate fauna off the American coast, by the U. S. Fish Commission, which was begun in 1880, and placed under my charge by the Commissioner, Professor S. F. Baird. As that work continued annually from 1880 to 1888, and the vast collections obtained were put in my care for study, many of them even to the present time, with scarcely any funds to employ assistants, I have never been able to resume the publication of those Bermuda reports, in the form intended, but the results have, in large part, been included in the papers recently published by me in these Transactions. Although Mr. Goode's collection of Crustacea was the best made up to that date, it was by no means complete.

The following extract from one of Mr. Goode's letters to Professor S. I. Smith will serve to illustrate his interest in collecting the Crustacea:

BERMUDA, March 19, 1877.

My Dear Professor Smith:

"I am making fine hauls among the crustaceans, especially among the minute forms, and have already filled about 125 phials and bottles. Have not yet found

and 1877, which had been identified by Professor S. I. Smith, many years before. A series of the same collection, which was sent to the U. S. National Museum, was studied by Miss Rathbun, who furnished the list for Dr. Rankin. Another series is in the Museum of Wesleyan University. Professor Smith has published measurements and other information in regard to a number of the species in Goode's collection, in several of his papers.

Two papers by me* gave the many additional species obtained by the parties that went with me to Bermuda from Yale University in 1898 and 1901, to study the zoölogy and make more complete collections.

A recent and very important work on the Decapod Crustacea of Porto Rico† has been published by Miss M. J. Rathbun. She has indicated in her report all the species that had been previously recorded from Bermuda, with their general distribution. In that report, brief but clear descriptions are given of all the genera and species, as well as analytical tables of the genera and species. It is, therefore, almost a manual for the Bermuda species, for most of them were also in the Porto Rico collections. For students of these Crustacea it is the most useful of the works readily available. It contains only few figures of the Bermuda species, however.

In the present article I have endeavored to figure as many as possible of the species, even when well known, for such figures greatly facilitate their identification and may largely take the place of descriptions. From this point of view this article may be regarded as a complement to that of Miss Rathbun, to which reference should be made for technical descriptions.

I have, however, included brief descriptions of some of the more difficult species, and also most of the notes that I have on the colors of the living specimens, with such observations on habits as seemed to be of interest. I have also indicated the general distribu-

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the larval stages of any species whatever,—perhaps because I have not had time to use a towing net." * * * *

"Am having excellent success, particularly with fishes and sponges. I have added about 40 species of fishes to my published list. You will be pleased to know that I find *Amphioxus* quite abundantly."

* Additions to the Crustacea and Pycnogonida of the Bermudas, Trans. Conn. Acad. Sci., vol. x, part ii, pp. 573–582, plates lxvii–lxix, 1900.

Additions to the Fauna of the Bermudas from the Yale Expedition of 1901, with Notes on Other Species. Op. cit., vol. xi, pp. 15–62, plates i–ix, 1901.

† Rathbun, Miss Mary J.—The Brachyura and Macrura of Porto Rico. From the U. S. Fish Comm. Bulletin, for 1900, vol. ii, pp. 1–137*, pl. i, ii, 1901.

tion and range of the species. In 1898, one of my sons, Clarence S. Verrill, who was of the Yale party, made notes on the habits and colors of the Crustacea. I am indebted to him for such notes, many of which are here utilized, and have his initials appended.

Another son, A. Hyatt Verrill, made a large collection of Crustacea in March, 1901, before my arrival at Bermuda. He found a number of interesting additions to the fauna. I am also indebted to him for the photographs and drawings used in this paper, and also for a number of colored figures and various notes made on the colors and habits of a number of species. To Miss M. J. Rathbun, whose nomenclature I have generally followed, I am indebted for the identification of many of the smaller and more critical specimens, and for the loan of others. From her papers I have also borrowed, with a few alterations, some of the analytical tables of species, genera, and higher groups.

I am also indebted to Professor S. I. Smith for numerous comparative measurements of a number of species, made by him several years ago for another purpose.

Many of the crabs have colors that are highly protective by day; others have colors that are not protective by daylight, but are highly so at night, in moonlight, or twilight. They afford an excellent field for studies of this kind. Although these Crustacea are numerous in Bermuda, there are many species that are seldom taken by inexperienced collectors, because of their peculiar habits. Many are found concealed beneath large rocks or masses of dead corals, which must be turned over to obtain them. This is particularly true of most of the Pilumnidae, and of *Mithrax forceps*, *Perenon planissimum*, etc. Some live regularly in eroded holes in masses of coral or limestone, like many species of *Alpheus* and the common *Gonodactylus Œrstedi*. The rare crab, *Epialtus bituberculatus*, was found only by breaking up such rocks. Several species are peculiar to the mangrove swamps, and live chiefly among the tangled roots of the mangroves, where it is hard to capture them. The handsomely colored *Goniopsis cruentatus* has this habit, as well as some species of *Sesarma*, *Pachygrapsus*, *Eupanopeus*, etc. The land-crabs, *Gecarcinus* and *Cardisoma*, burrow deeply in the earth, and the same is true of *Ocypode arenarius*, *Hippa cubensis*, etc., which inhabit sandy beaches. These and many others are mainly nocturnal in their habits and can sometimes be caught out of their burrows in the night by means of torches or lanterns, especially in summer. The great *Cardisoma guanhumi* is seldom taken here in any other

way. The various species of Portunidæ are active swimmers in shallow water and must be taken by means of nets. Many species are partial to the outlying reefs, living in holes and crevices, or under broken blocks of stone. A few species have been obtained only by dredging, but so little dredging has hitherto been done, except in very shallow water, that we really know very little about the extensive fauna that undoubtedly inhabits the zone between 10 and 150 fathoms. A few hauls of the dredge were made by the "Challenger" outside the reefs. The expedition sent out by the Field Museum of Chicago, under Dr. Bean, did a small amount of dredging on the Argus and Challenger Banks, and obtained there some interesting additions to the Crustacean fauna, which have been sent to me for study. A few successful hauls were also made there by a party from the Bermuda Biological Station.

Dredging outside the reefs, in 10 to 30 fathoms, where the fauna should be richest, is difficult, not only because of the rough seas that prevail there at the seasons when most collectors visit the islands, but also because the bottom itself is very broken and rough, being covered in most places by large masses of broken rocks and dead corals, and in many localities by living branched corals (*Oculina*) and gorgonians, so that the dredges are apt to be lost or the nets speedily torn. Even tangles are liable to be caught among the rough rocks and lost. The larger Crustacea, living in such places, can only be obtained by means of baited fish-traps or lobster pots. In this way three large species of *Scyllarides* or "Spanish-lobsters" have been obtained, as well as several large crabs. The collections of Crustacea made by my own parties are very much larger than those made by any of the other expeditions, both in the number of species and in the number of specimens, but they were all obtained in the spring, from March 1st to June 4th, and very few were dredged. The same is true of several other collections. Mr. Jones and Mr. Goode collected both in the winter and spring, but the dates are seldom indicated on their labels. The collection from the University of New York, worked out by Dr. Rankin, was made in midsummer, and therefore affords some additional seasonal information. Probably considerable differences would be found between large collections made in midsummer or autumn and those made in winter or spring.

In this respect the collection made by the expedition from the Field Museum of Natural History is of special interest. That party worked from Aug. 18 to Nov. 10, 1905. The collection of

Crustacea obtained is not large, for the fishes were the special objects sought, but it contains many interesting species, some of them not previously found.

Whenever possible I have given the season when females carrying eggs were taken.

Since many species may have been formerly introduced by adhering to the bottoms of vessels, and others may be introduced hereafter in the same way, I have thought it advisable to mention particularly the earlier occurrences of all the species, so far as I know. But very few dates can now be given earlier than those of the collection of J. M. Jones, which was fortunately quite large. Much of his collection was made as early as 1859 to 1866, but his specimens had no labels giving precise dates. Abundant opportunity for the introduction of West Indian species have prevailed for nearly 300 years, but they have much increased in modern times, especially since the establishment of the great naval dry dock. Vast numbers of living marine animals are always scraped from the bottoms of foul vessels, besides barnacles.

BRACHYURA.

*Key to the Superfamilies or Tribes of Brachyura.**

A.—Buccal frame quadrate; efferent branchial channels opening at the sides of the endostome.

B.—Carapace usually quadrilateral, frontal region curved downward. Verges inserted either in the sternal plastron or in the basal joints of the fifth pair of legs of the male, thence passing through channels in the sternum, beneath the abdomen ..... *Catometopa*

B¹.—Carapace not quadrilateral. Verges inserted in basal joints of the fifth pair of legs.

C.—Carapace short and broad, rounded in front, without a projecting frontal rostrum ..... *Cyclometopa*

C¹.—Carapace usually more or less triangular or ovate, with a projecting, pointed, forked, or spined rostrum ..... *Oxyrhyncha*

A¹.—Buccal frame usually triangular, narrowed forward; efferent canals opening at middle of the endostome. Verges inserted in the basal joint of the fifth pair of legs ..... *Oxystomata*

* Taken with slight alterations from Brachyura and Macrura of Porto Rico, by Miss M. J. Rathbun.

CATOMETOPA.

Family **OCYPODIDÆ** Leach.

This family is represented in Bermuda only by the genus *Ocypode*. The "fiddler-crabs" (genus *Uca* or *Gelasimus*), so abundant on most coasts of warm countries, are entirely lacking, so far as known.

Ocypode arenarius (G. Edw.) Say. *Ghost-Crab; Sprite; Beach Crab.*

Cancer arenarius Edwards in Catesby, Nat. Hist. Carolina, ii, pl. 35, 1771.

Cancer quadratus J. C. Fabricius, Entomologia Systematica, ii, p. 439, 1793. ("Habitat in Jamaica Mus. Dom. Banks.")

Ocypode quadrata J. C. Fabricius, Suppl. Entomol. System., p. 347, 1798. S. I. Smith, Trans. Conn. Acad. Sci., iv, p. 257, 1880. (Synonymy and distr.)

Ocypoda albicans Bosc, Hist. nat. Crust., i, p. 196 (not the fig.) (Carolina coast).

Ocypode arenarius Say, Jour. Acad. Nat. Sci. Philadelphia, i, p. 69, 1817.

M.-Edwards, Hist. nat. Crust., ii, p. 44, pl. 19, figs. 13, 14, 1837 (*Ocypoda arenaria*);

Coues, Proc. Acad. Nat. Sci. Philadelphia, 1871, p. 122 (*arenaria*; North Carolina, habits).

Smith, Amer. Jour. Sci. (3), vi, p. 67, 1873 (*Monolepis inermis* = megalops-stage); Inverteb. Vineyard Sd., Report U. S. Fish Comm., i, p. 545 (251), 534 (240), 1874 (*Ocypoda arenaria*).

Kingsley, Proc. Acad. Nat. Sci. Philadelphia, 1878, p. 322 (7), (*Ocypoda arenaria*); op. cit., for 1879, p. 400; op. cit., 1880, p. 184.* Rankin, Crust. Bermuda Is., p. 525, 1900.

Ocypoda rhombea M.-Edwards, Hist. nat. Crust., ii, p. 46, 1837 ("Antilles et Brésil"); Ann. Sci. nat., III, xviii, p. 143 (107), 1852 (*Ocypode*).

Dana, U. S. Expl. Exped., Crust., p. 322, pl. 19, fig. 8, 1852 (Brazil).

Monolepis inermis Say, Jour. Acad. Nat. Sci. Philadelphia, i, p. 157, 1817 (megalops-stage).

Ocypode albicans M. J. Rathbun, Results Branner–Agassiz Exp. Brazil, Proc. Wash. Acad. Sci., ii, p. 134, 1900; Brachy. and Macr. Porto Rico, p. 6, 1901 (descr.); Amer. Naturalist, xxxiv, p. 585, figs. 1, 2, 1900.

FIGURE 1. PLATE IX, FIGURES 2, 3.

This crab is easily distinguished by its thick, quadrate carapace, coarsely granulated on the sides, with finer granules on the middle and posterior parts; the acute anterior angles; and the very large eyes and eye-stalks. The eyes are abruptly rounded distally, but prolonged proximally on the stalks beneath. The chelipeds of the males

* Kingsley, op. cit., p. 184, used the specific name *arenaria*, as from Catesby, 1731 and 1771, dating it from the later edition. That edition was edited by George Edwards, who gave binomial names to the species of Catesby. There is no valid reason for not adopting them when they have priority, as in this case. The name *Cancer arenarius* is given in the text and is also engraved on the plate.

have a stridulating organ, consisting of a vertical series of short raised lines of tubercles on a narrow ridge. It is doubtless used for a sexual call. The ambulatory legs are fringed with long yellow hairs.

The color of the adults at Bermuda, in life, is mostly pale yellow, straw-color, or yellowish white, imitating closely the color of the beaches of yellowish white shell-sand on which it lives. Those

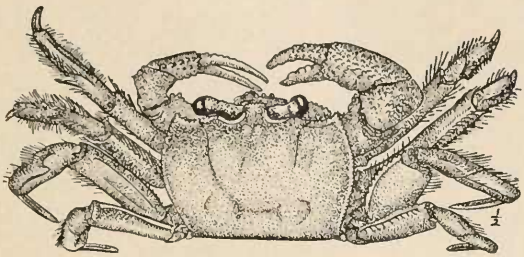

Figure 1.—*Ocypode arenarius*, about $\frac{2}{3}$ nat. size, after photo. by A. H. Verrill.

young specimens that we found living on the coast of New Jersey, in spring, were "pepper-and-salt color," imitating closely the colors of the silicious (granitic) sand of the beaches. When pursued they would run very rapidly, often suddenly stopping and squatting so closely in the sand that they could be easily overlooked.

Its common name, "ghost-crab," alludes both to its pale color and nocturnal habits. It can run very swiftly on the sandy beaches. It lives in deep burrows near or above high tide.

Measurements in millimeters.

Number	Sex	Carapace length	Carapace breadth	Front breadth	Chelæ length	Chelæ height	Eyestalks length	Locality
3060	♀	39	45	5.5	r. 21 l. 36	14 21	16	Bermuda
3154	♂	38	45	5.5	r. 36 l. 45	17 20	16	"
1719	♀	40	50	6.	r. 42 l. 34	22 14	16	Ft. Macon
4063	♂	35	43	5.	l. 38	22	15.5	Bermuda

Its range, in the adult state, is from Virginia to Brazil, but the free-swimming young (*megalops*) are carried much farther north in the Gulf Stream and often arrive alive on the southern coasts of New England.

Prof. S. I. Smith* has recorded the frequent occurrence of the full grown megalops of this species in Long Island Sound and on the

*Amer. Journ. Science (3), vol vi, p. 67, 1875; and Trans. Conn. Acad. Sci., iv, p. 255, 1880.

southern coast of New England, and of the early stages of the adult form, in abundance, on Fire Island Beach, on the south side of Long Island, in September, 1870. Probably it rarely if ever survives the winter so far north. In April, 1872, in company with Professor Smith, I found the young of the previous year abundant and very agile on the outer beaches at Great Egg Harbor, N. J. These had the carapace about 18 to 24^{mm} broad.

At Bermuda we found this crab common on the shell-sand beaches of the south shore, near Tuckers Town and elsewhere, and also on the north shore at Shelly Bay, Long Bird Island and Bailey Bay. One specimen was caught and brought in by a dog, at night. Several large Bermuda specimens in the Yale Museum were collected by Dr. C. Hartt Merriam, April, 1881. Two examples were in Mr. Goode's collection. It has been obtained by several other collectors. The largest that I have seen were obtained at Cooper's Island, by the Field Nat. Hist. Museum Expedition. None of the females that I have seen carried eggs, though they have been taken in spring, midsummer, and autumn. Perhaps the number examined was not large enough to made this negative evidence of much value.

Family **GECARCINIDÆ** M.-Edw. *Land Crabs.*

These land crabs can readily be recognized by their very convex surface, with the margins rounded and dilated over and in front of the branchial regions. The front is strongly bent downward and moderately wide ; orbits and eye-stalks not very large. Chelipeds of the adult males large and powerful, more or less unequal. Distal joints of the legs granulated and fringed.

Gecarcinus lateralis (Frem.) Guerin. *Common Land Crab.*

Ocypoda lateralis Freminville, Ann. Sci. nat., iii, p. 224, 1835.

Gecarcinus lateralis Guerin, Icon. Règne Anim., pl. v, fig. 1. Rankin, Crust. Bermuda, p. 525, 1900.

M. J. Rathbun, Brach. and Macrura Porto Rico, p. 14, 1901.

Verrill, these Trans., vol. xi, p. 706, fig. 57 ; The Bermuda Is., i, p. 294, fig. 57.

Gecarcinus lagostoma (*pars*) Miers, Voy. Challenger, vol. xvii, p. 218, 1886. Young, Stalk-eyed Crustacea, p. 241, 1900.

FIGURE 2.

Commonly the carapace, in life, is mostly of a deep reddish brown or plum-color ; often this color is replaced posteriorly by a wide transverse band of lighter color spotted with yellow ; this band extends forward, along each side, becoming narrower and darker, dis-

appearing near the eye-sockets ; a pair of small white spots close behind the eye-sockets and another pair in the cardiac region. Legs light grayish brown ; chelipeds darker and more red ; last joint bright orange. Under side white.—C. S. V.

The color is often more reddish than above described, especially when immature. The youngest individuals were much paler. The dark purple and red colors are protective at night.

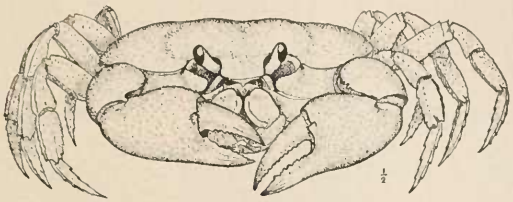

Figure 2.—Land Crab, *Gecarcinus lateralis*, front view, nat. size. Drawing by A. H. V.

It is very common in sandy waste places on many of the smaller islands, especially on those that are uninhabited, or nearly so. It makes its deep burrows both near the shore and on the low hills, 20 to 30 feet high, at some distance from the shore and where the shell-sand was nearly or quite dry. We found them both in open land and among cedar bushes. Its burrows are often very long and deep ; some that we dug out descended obliquely to the depth of 3 to 4 feet or more, and then ran off horizontally 4 to 5 feet, ending in a small chamber. Others, equally large, were quite shallow. Some of the young were exposed by turning over large flat stones, under which they had burrowed. Many burrows were among the tangled roots of cedars, etc., where they could not be dug out.

The largest Bermuda specimen that I have seen was obtained at St. Davids Island by the expedition of the Field Nat. Hist. Museum. They also collected it at Cooper's I. and Castle I. None of the specimens seen carried eggs,* though some were taken in midsummer (Bermuda Biol. Station, Prof. Kincaid).

Measurements in millimeters.

Number	Sex	Carapace length	Carapace breadth	Front breadth	Chelæ length	Chelæ height	Locality
3048.	♂	39	48	10	r. 33 l. 45	r. 15 l. 20	Bermuda
1901*a*.	♂	36	44	9	30	16	Bermuda
Young	♂	26	35	8	r. 19 l. 19	r. 9 l. 9	Bermuda
Young	♂	14	24	6	r. 12.5 l. 12.5	r. 6 l. 6	Bermuda
489 F. M.	♂	46	59	12.5	49	24	Davids I.

* Young, with carapace 7–9^{mm} long, were taken April 24, 1901.

Among the particular localities where we found it abundant were Castle Island, Charles or Goat Island, Bailey Bay Island, etc. It is mainly nocturnal in its habits. During the spring, while we were at Bermuda, it was very rarely seen out of its burrows in the daytime. Perhaps it partially hibernates in its burrows, at that season, like *C. guanhumi*, and becomes more active in summer.

In the early settlement of the islands it seems to have been much more abundant, at least in the cultivated lands, where it was said to be injurious. It was the subject of a law in early times, by which persons were forbidden to dig crabs on lands of other persons, thus causing damage to crops.* They were mentioned as then used for fish bait.

This species ranges from Bermuda and the Florida Keys through the West Indies to Venezuela and Ascension Island.

Cardisoma guanhumi (Latr.) *Great Land-Crab; "Juey."*

Cardisoma guanhumi Latreille, Encycl. Meth., Hist. Nat. Insectes, x, p. 685, 1825. M.-Edw., Illust. Edit. Cuvier, pl. xx, figs. 1—1*i*.

S. I. Smith. Trans. Conn. Acad. Sci., ii, pp. 36, 143, pl. v, fig. 3, 1870 (descr. and syn.) Miers, op. cit., p. 220, 1886.

M. J. Rathbun, Amer. Naturalist, xxxiv, p. 587, fig. 6, 1900.

Rankin, Crust. Berm. Is., p. 525, 1900. M. J. Rathbun, Brach. and Macr. Porto Rico, p. 15, 1901.

Verrill, these Trans., vol. xi, p. 17; The Bermuda Is., i, pp. 37, 264, 295, 1903. Young, op. cit., p. 246, 1900. Stimpson, Rep. Crust. N. Pacific Expl. Exped., p. 111, 1907.

FIGURE 3. PLATE IX, FIGURE 1.

The color of adults in life is pale livid gray, on the carapace, becoming bluish gray on the margins and on the legs; ends of the chelipeds yellow. The young are brownish yellow or dusky brown, like the sand and mud. (A. H. Verrill.)

When well grown the male is about 18–20 inches across the extended legs; carapace about 4 to 5 inches broad. Claws very unequal in size, and variable in form, often widely gaping in the male. Some specimens are even larger. One from Dominica I. (coll. A. H. Verrill) was 21 inches in extent; 5 inches across the carapace; the larger claw (right) 6 inches long and about 3 broad. Right-handed specimens are more numerous in our collection than left-handed ones.

This large crab is found in a few localities in Bermuda, especially at Cooper's Island and around the shores of Hungry Bay. In the latter place its large and deep holes were observed by us 4 to 12 feet

* See The Bermuda Islands, i, p. 706 [294].

above high tide, and mostly among the matted roots of cedars, where they could not be dug out.

It is mainly nocturnal in its habits and can be taken at night, in summer, by the use of lanterns or torches. It was thus obtained by Moseley, at Hungry Bay (Voy. Challenger). Prof. W. R. Coe has given to the Yale Museum a large specimen taken in this same way in 1903. Mr. J. M. Jones sent a large Bermuda specimen to the Yale

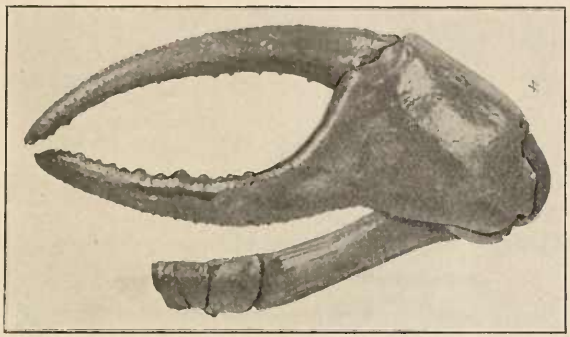

Figure 3.—*Cardisoma guanhumi*, large chela of male; ½ nat. size. Phot. A. H. Verrill.

Museum in 1877, without a statement of the exact locality. It is also in the collection made by Dr. C. Hartt Merriam (April, 1881, Yale Mus.), and in that of the Field Museum of Natural History, 1905.

Very little seems to be known in respect to its breeding habits and young stages.

*Measurements.**

Nat. Mus. number	Sex	Length of carapace	Breadth of carapace	Length of chelæ	Height of chelæ	Length of dactylus	Locality
7507†	♂	91	114	r. 75 l. 155	28 60	53 108	Jamaica
7669*a*‡	♂	64	76	r. 87 l. 45	40 19	58 31	"
7669*b*§	♀	63	75	r. 57 l. 47	26 19	37 30	"
7675§	♀	72	91	r. 79 l. 51	41 19	52 36	"

* The first ten series were made by Prof. S. I. Smith from specimens collected by the "Albatross" in 1884. The others are by the writer.

† Digits of chelæ slender and gaping.

‡ Digits stout. § Digits broad.

Nat. Mus. number	Sex	Length of carapace	Breadth of carapace	Length of chelæ	Height of chelæ	Length of dactylus	Locality
7533*a*‖	♂	71	84	r. 61 l. 59	28 26	41 40	Old Providence
7533*b*†	♂	72	86	r. 53 l. 110	22 48	35 79	" "
7532¶	♂	74	93	r. 124 l. 98	53 23	87 39	" "
7535†	♂	68	85	r. 113 l. 55	48 22	75 37	" "
7534¶	♂	73	88	r. 98 l. 55	47 23	69 37	" "
7551§	♀	74	91	r. 78 l. 54	38 20	53 37	Curaçao
3146¶	♂	90	105	r. 75 l. 142	26 56	48 108	Bermuda
4061 Y. M.	♂	92	108	r. 72 l. —	r. 27 —	50 —	Bermuda
3147‖	♂	51	61	r. 65 l. 39	32 15		Bermuda
——	♂	—	125	r. 150			Dominica

† Digits of chelæ slender and gaping.

§ Digits broad.

‖ Digits broad and only slightly gaping.

¶ Digits not very slender, compressed, gaping.

Nos. 7533*a*, 7534, and 7551 had hairy legs. (S. I. Smith.)

According to Mr. A. H. Verrill, who found it very abundant in many localities in San Domingo, in 1907, especially at Samana and San Lorenzo, it constructs its burrows there almost everywhere in open grassy land or savannas, or even in yards and gardens, but only where there is clay soil beneath the surface. It brings up the soil in the form of hard pellets or ovoid balls, and deposits them around the mouth of the burrows. Some of the balls are often over an inch in diameter. The holes are sometimes 6 to 8 inches in diameter. They abound both on dry land and near the water, sometimes burrowing in the banks of streams. He did not find them particularly pugnacious and the natives handle them freely. They are slow and rather sluggish in their motions. About February they retire into their holes and close them up with small piles of earth made of pellets, remaining there for some time. During this time they are said to be fat and are esteemed as food, especially about Easter, by the natives. At that season they are sold in the markets. Later in the season, in summer and fall, they freely leave their burrows and run about, both at night and in sunlight. At such times they are "lean" and are not

considered fit to eat. They are very fond of meat and greedily devoured the bodies of birds that had been skinned. They are also fond of the cocoa-nuts and other fruits. The large rainfall at San Domingo may account for their living in comparatively dry localities there. Their hibernation is probably connected with their breeding season. When pursued it often takes to the water, if near the shore, but it is not a good swimmer. On Dominica Island he found it much less common. There it was more confined to low lands, near streams.

Saussure, who collected this crab in Cuba, Hayti, and Jamaica, states that it lives in large, deep holes near water, so that the lower part of the hole is filled with water, but where the surface is dry. It dies in a short time if kept entirely dry. He also states that it is very pugnacious and defends itself energetically when its retreat is cut off, seizing a stick so firmly that it can be lifted from the ground before letting go. He found its holes mostly in places shaded by bushes, etc.

It is used as food in most of the West Indian Islands, wherever abundant. Sold in Porto Rico markets under the name of "Juey." (Miss Rathbun.)

It has a wide distribution, being found on both coasts of tropical America, and on the West Coast of Africa. Common on most of the West Indian Islands. Range, Florida Keys to Brazil. Dominica Island (A. H. Verrill, Yale Mus.); San Domingo, abundant (A. H. V.); Cape de Verdes (Stimpson); Florida Keys (Smith); Brazil (White); Texas (Rathbun).

Family **GRAPSIDÆ** Milne-Edwards, 1837.

Carapace depressed or moderately convex, more or less quadrilateral, with the lateral margins straight or slightly arcuate. Front never very narrow, in general decidedly broad. Orbits and eyestalks of moderate size. Third maxillipeds with the palpus articulated at the apex or at the front outer angle of the merus. Chelipeds in adult males usually subequal, moderately developed. In the walking legs the seventh joint is styliform, compressed, and either smooth or spiniferous. The pleon at the base usually covers the whole width of the sternum between the last pair of legs. (M. J. Rathbun.)

*Key to the Bermuda genera of the family Grapsidæ.**

A. Antennæ covered by the front.
  B. External maxillipeds without a piliferous ridge.
    C. Antennæ excluded from the orbit ..... *Goniopsis*
    C′. Antennæ entering the orbit.
      D. Carapace decidedly broader than long.
        E. Merus of maxillipeds longer than broad.
          F. Fingers spoon-shaped at tips ..... *Grapsus*
          F′. Fingers acute ..... *Geograpsus*
        E′. Merus of maxillipeds as broad as long ..... *Pachygrapsus*
      D′. Carapace about as long as broad, legs strongly fringed with hairs.. *Planes*
  B′. External maxillipeds with a piliferous ridge.
    C. Lateral margins straight. Carapace transverse, usually quadrate ..... *Sesarma*
    C′. Lateral margins arcuate and entire ..... *Cyclograpsus*
A′. Antennæ visible from above; two deep frontal notches.
  B. Merus of maxillipeds large, as broad as ischium ..... *Plagusia*
  B′. Merus of maxillipeds small, much narrower than ischium ..... *Percnon*

Goniopsis cruentatus (Latr.) DeHaan. *Mangrove Crab.*

Cancer ruricola DeGeer, Mémoires, Insectes, vii, p. 417, pl. xxv, 1778 (*non* Linné).

Grapsus cruentatus Latreille, Histoire Crust. et Insects, vi, p. 70, 1803. Desmarest, Consid., p. 132. M.-Edwards, Hist. nat. des Crust., ii, p. 85. Gibbes, op. cit., p. 181.

Goniopsis cruentatus DeHaan, F. Jap., p. 33, 1835; M.-Edw., Ann. Sciences nat. 3, xx, p. 164, pl. 7, fig. 2, 1853. Stimpson, Proc. Acad. Nat. Sci., Philad., 1858, p. 101. Smith, Crust. Brazil, these Trans., ii, p. 11, 1869 (syn., no descr.). Miers, Voy. Challenger, xvii, p. 267. (Bermuda.)

M. J. Rathbun, Brachyura and Macrura of Porto Rico, p. 15, pl. i, fig. 2 (colored), 1901. Verrill, The Bermuda Is., vol. i, p. 547, fig. 250, 1903. Rankin, Crust. Berm. I., p. 527.

Grapsus longipes Randall, Journal Acad. Nat. Sci., Philad., viii, p. 125, 1839.

Goniopsis ruricola White, List of Crust. in the British Museum, p. 40, 1847. Saussure, op. cit., p. 30, pl. 2, fig. 18, 1858.

Grapsus peili Herklots, Addit. Faunam Carcin., Afr. Occid., 8, pl. 1, figs. 6, 7, 1851 (t. Kingsley).

Goniograpsus cruentatus Dana, Amer. Jour. Sci. (2), xii, p. 285, 1851; U. S. Expl. Exped., Crust., p. 342, pl. 21, fig. 7, 1852.

Goniograpsus cruentatus Kingsley, Synopsis Grapsidæ, Proc. Acad. Nat. Sci. Philad., 1880, p. 190 (syn. and descr.). Young, op. cit., p. 278, 1900.

Figure 4. Plate XI, Figure 1. Plate XII, Figure 4*a*.

In life a large female had the carapace very dark brown or black, with small, squarish, greenish markings, becoming more numerous

* This Key is taken from that of Miss M. J. Rathbun, Porto Rico Brachyura and Macrura, p. 15, with slight alterations.

posteriorly; along the lateral margins and across the posterior border there is a series of small white blotches, about 2 to 3mm in diameter, the posterior ones smaller. The legs and chelipeds above are red, variegated with black and white spots, the black markings being most abundant on the posterior legs; the anterior ones and the chelipeds being more red; the first joint of the chelipeds is mostly red, with the black and white marks only at the edges; the second and third joints on all the legs are red with black edges, without spots. The chelæ are mostly yellowish, becoming white at the tips and reddish at the joints; the last joint of the other legs is yellow. All the legs are white beneath, except on the last three joints. Abdomen dark purplish brown below, whitish above anteriorly. Eye-stalks colored like carapace above, light red below.—C. S. V.

Figure 4.—Mangrove Crab, *Goniopsis cruentatus*. Carapace, about nat. size. Phot. A. H. V.

Most of the specimens are much brighter colored than the above, especially when the adherent dirt is removed. The larger males usually have a large amount of red on the back of the carapace and chelæ.

The variations in this species seem to be less than in many others of this family.

*Measurements.**

N. Mus. number	Sex	Length of carapace	Breadth of carapace	Breadth at anterior angles	Breadth of front	Locality
7542	♀	31.0	38.2	35.5	20.0	Old Providence
"	♀	34.7	42.5	39.0	22.0	" "
"	♀	44.5	55.0	48.0	28.0	" "

* The first ten series of measurements were made by Professor S. I. Smith from specimens collected by the "Albatross," in 1884. The others are by the writer.

N. Mus. number	Sex	Length of carapace	Breadth of carapace	Breadth at anterior angles	Breadth of front	Locality
7542	♂	34.0	39.5	37.0	20.4	Old Providence
"	♂	48.3	58.0	50.3	27.8	" "
"	♂	42.0	48.0	44.2	25.0	" "
"	♂	41.3	48.0	45.0	24.0	" "
7677	♂	41.6	48.2	45.8	24.6	Jamaica
7537	♀	35.8	43.3	40.3	23.3	Old Providence
"	♀	33.0	39.0	36.9	20.7	" "
3047 Y. M	♂	33	40	38	22	Bermuda
3047*a*	♂	27	31	30	17	"
1901*a*	♂	40	45	43	26	"
1901*b*	♀	26	29	29	16	"
1901*c*	♀	24	30	29	16	"
1901*d*	♂	18	23	23	13.5	"

The chelæ, which are nearly equal, measure in No. 3047 (see pl. xi, fig. 1) 27^{mm} long, 14.5 wide; in 3047*a*, they are 19^{mm} by 10^{mm}; in 1901*a*, 33^{mm} by 20^{mm}.

It has been taken at Bermuda by most collectors. It was in the collections of G. Brown Goode, A. Heilprin, Prof. T. Kincaid, Dr. T. H. Bean, Prof. E. L. Mark, Bermuda Biol. Sta., and others.

It was taken by us in several localities, especially at Coney Island, Hungry Bay, and at Somerset I., near the shore of "The Scaur." It is common among mangroves, living among the tangled roots in burrows, where it is not easily captured, owing to its shyness and agility. It sometimes actively climbs up the aërial roots and trunks of the mangroves, when disturbed.* We also sometimes found it in heaps of stones, at high-water mark, where it was more easily captured. Its colors, though showy, seem to be protective in many places where it lives, for they match the colors of the dead leaves and other objects in the swamps. Perhaps they are more particularly nocturnally protective, for it is most active at night.

It has a very extensive distribution, being found on nearly all tropical American shores. It ranges from Florida to Rio Janeiro, Brazil (Dana), and throughout the West Indies. West Coast of Africa at Ashantee (J. E. Benedict); Liberia; Guinea; Gabun; Angola, etc. West Coast of Central America (Kingsley). Florida Keys and Abrolhos Reefs, Brazil (Smith).

* In such cases it can easily be caught by shaking them off from the branches of the trees into hand-nets held below them.

Grapsus grapsus (Linn.). *Cliff Crab. Red Shore-Crab.*

Cancer grapsus Linné, Systema Naturæ, ed. xii, i, p. 1048, 1767; Amœnit. Acad., 2d ed., iv, p. 252, pl. 3, fig. 10, 1788.

Grapsus pictus Lamarck, Systéme Animaux sans Vertèb., p. 150, 1801.

Desmarest, Consider. Général. Crust., p. 130, pl. 16, fig. 1, 1825.

M.-Edwards, Hist. Nat. Crust., ii, p. 86, 1837 (Antilles); Régne animal de Cuvier, 3me édit., pl. 22, fig. 1.

Gibbes, Proc. Amer. Assoc. Adv. Sci., 3d meeting, p. 181 (17), 1850 (Florida).

Dana, U. S. Expl. Expd., Crust., p. 336, 1852 (Maderia, Cape Verdes, Peru, Paumotu Archipelago, Sandwich Is.). S. I. Smith, Trans. Conn. Acad. Sci., iv, p. 257, 1880 (synonymy and table of measurements).

Miers, Proc. Zool. Soc. London, 1877, p. 73 (Galapagos Is.; >(*G. altifrons* Stimp.).

Hilgendorf, Monatsb. Akad. Wissensch. Berlin, 1878, p. 807 (Mozambique).

Grapsus maculatus M.-Edwards, Ann. Sci. nat., III, xx, p. 167 (133), pl. 6 (= pl. 22, Règne animal de Cuvier, Crust.), 1853 (Antilles).*

Stimpson, Ann. Lyceum Nat. Hist. New York, vii, p. 229 (101), 1860 (Florida).

Kingsley, Proc. Acad. Nat. Sci. Philadelphia, 1879, p. 401 (Santa Cruz, Tahiti). Miers, Voy. Challenger, vol. xvii, p. 255, 1886. Young, op. cit., p. 280, 1900. J. E. Benedict, Crust. West Africa, Proc. U. S. Nat. Mus., xvi, p. 538, 1893.

Grapsus ornatus M.-Edwards, Ann. Sci. nat., III, xx, p. 168 (134), 1853 (Chili).

Grapsus Webbi M.-Edwards, Ann. Sci. nat., III, xx, p. 167 (133), 1853.

Stimpson, Proc. Acad. Nat. Sci. Philadelphia, 1858, p. 102 (48).

Grapsus altifrons Stimpson, Ann. Lyceum Nat. Hist. New York, vii, p. 230 (102), 1860 (Cape St. Lucas).

Grapsus grapsus M. J. Rathbun, Brachyura and Macr. Porto Rico, p. 16, 1901 (descr. and distr.). Rankin, Crust. Berm., p. 527, 1900. Verrill, The Bermuda Is., i, p. 94.

PLATE X, FIGURE 6. PLATE XI, FIGURE 2.

This is a large and conspicuous species, remarkable for its agility and swiftness. It runs and climbs over the rough and eroded rocks and cliffs between tides, and even to some distance above high-water mark, often ascending the nearly perpendicular cliffs with great agility. When pursued by man it usually escapes by rapid running, often hiding in some deep crevice or cavernous place. If hard pressed it will take to the water, where it can usually be caught with a landing net, for it cannot swim very rapidly. Sometimes several

* The name *C. maculatus* in the binomial system dates from Edwards' edition of Catesby, Nat. Hist. Carolinas, 1771, vol. ii, pl. xxxvi, where it is well figured in colors.

can be seen, at a distance, clustered together on the exposed cliffs, for their bright red chelæ and large size render them very conspicuous, but they usually run away rapidly or plunge into the water when approached.

It is not easy to explain how it could have acquired such bright colors by natural selection, for in Bermuda and most other regions where it abounds the colors appear not at all protective, unless at night, but quite the reverse. Possibly the colors were originally developed in some region where its surroundings were different, and red colors prevailed among the rocks; but its colors may be nocturnally protective. At present the species has spread all around the world in tropical seas, and it does not much need color protection, owing to its watchfulness and agility, yet it is often killed by sea-fowl, and also by the *Octopus*.

The colors are somewhat variable. Some are much redder than others. A large one, in life, had the carapace very dark brown, thickly and irregularly mottled and spotted with bluish and grayish white; the lighter color predominating in the radial grooves. Chelipeds with the chelæ and carpal joints bright dark red, white at tips of claws; basal joint pale blue, red at the ends. Legs dark reddish brown above, thickly blotched with bluish white, and bright red at each joint. The posterior pair of legs are tinged with orange on the lighter parts. Beneath, orange red and light blue; branchial areas, oral organs, and area in front of mouth mostly light blue; sternum and under side of legs, orange and blue.

The sexes differ very little in size or color. The larger males are often brighter red than the females, but not constantly so. The ground-color is often blood-red with most of the small yellow spots round and about 1 to 2^{mm} in diameter. The chelæ of the males are usually a little larger than those of the females. The right and left differ but little in the male. Some females taken by us in April, 1901, carried eggs.

This species also varies considerably in its form and the proportions of length to breadth of the carapace, as shown by the following table of measurements. The front is often nearly or quite perpendicular, but in other cases more or less oblique.

*Measurements.**

N. Mns. number	Sex	Length of carapace	Breadth of carapace	Breadth across ant. angles	Br. of front	Height of front	Localities
7647*a*†	♀	44.0	48.3	35.3	18.5	8.0	St. Thomas
7647*b*†	♀	37.5	40.5	30.4	15.0	7.2	" " Yale
7647*c*†	♀	38.0	42.3	31.7	15.8	7.5	" "
7647*d*‡	♀	27.5	30.4	23.8	11.7	4.6	" "
7647*e*§	♀	20.0	22.9	18.4	8.5	3.5	" "
7647*f*‖	♂	33.5	37.7	28.6	14 0	6.0	" "
7647*g*†	♂	37.7	41.6	30.3	15.2	6.5	" " Yale
7647*h**	♂	50.0	53.0	38.2	20.0	9.0	" "
7647*i**	♂	54.3	60.0	41.5	21.5	10.0	" "
7543*a*‡	♂	37.0	42.0	30.2	15.0	6.4	Old Providence
7543*b*‡	♀	37.6	42.0	30.4	15.2	6.5	" "
7564*a*†	♂	38.6	43.2	31.5	15.5	6.9	Sabonilla
7564*b*‖	♂	35.1	38.0	29.0	14.4	6.1	"
7564*c*¶	♀	24.0	27.0	21.2	9.8	3.8	"
7564*d*¶	♀	24.2	27.1	21.6	10.0	4.0	" Yale
7564*e*¶	♂	27.0	30.0	23.1	11.0	4.3	"
7564*f*¶	♂	21.0	23.5	19.0	8.9	3.5	"
7840¶	♀	25.0	21.8	21.8	10.1	4.2	Curaçao
Yale Mus.	♂	37.2	40.5	29.5	14.7	—	Bermuda
4064 Y. M.	♂	67.0	73.8	47.7	26.8	—	Bermuda
4066 YM **	♂	60.0	72.5	46.0	26.0	—	La Paz., L. Cal.
4062 Y. M.	♂	65.0	73.0	58	30.0	12	Bermuda
1901 Y.M.*a*	♂	50	58	42	21	—	"
1901*b*	♀	54	61	42	22	—	"
1901*c*	♀	58	62	34	27	—	"
1901*d*	♀	51	57	40	23	—	"
1898*a*	♂	66	72	49	30	—	"
1898*b*	♀	55	60	41	24	—	"

Chelæ.

		Right		Left	
		length	height	length	height
1901*a*	♂	30	18	26	15
1901*b*	♀	24	14	24	14
1901*c*	♀	25	17	23	13
1898*a*	♂	45	27	44	20

*The first 19 series are by S. I. Smith from specimens collected by "the Albatross" in 1884, mostly now in the U. S. Nat. Museum.

† The front is perpendicular. ‡ The front is slightly oblique.

§ The front is considerably oblique. ‖ The front is very slightly oblique.

¶ The front is nearly perpendicular. ** The front is decidedly oblique.

In nearly all the Bermuda specimens measured the front is nearly perpendicular and very concave.

Nos. 7564*d*, coll. Jan. 17–24, and 7840, coll. Feb. 10–18, carried eggs.

** The right chela in this was 43mm long, 27mm broad; the left was 44mm long, 27mm broad.

It has been taken at Bermuda by nearly all collectors.

We found it very common on most of the precipitous and rocky shores of Bermuda in 1898, but it was far less common in March and April, 1901. Probably the cold period earlier in the winter and spring of 1901, which was so fatal to the fishes,* also killed off many of the crabs of this and allied species.

This species is found on all tropical coasts. On the Atlantic coast it extends from Florida to Brazil. On the Pacific side it ranges from Peru to Lower California. West Africa, at many localities. Cape Verde Islands (Dana, Stimpson). Ascension I. and Fayal (Benedict). Young individuals were taken by us on the reefs and serpentine atolls at Bermuda. Miss Rathbun has recorded an instance of a young one taken on the Pacific far from land. Small specimens often occur among barnacles, etc., on the bottoms of vessels.

Pernambuco, Brazil, New Zealand, Tahiti, Natal, Mauritius (Kingsley). Hawaiian Is. (Dana).

Four specimens were taken from the bottom of a vessel recently arrived from Swan Island, W. Indies, at Woods Hole, Mass., July 14, 1887, (t. S. I. Smith in MSS.).

Geograpsus lividus (Edw.) Stimp.

Grapsus lividus A. Milne-Edw., Hist. Nat. des Crust., ii, p. 85, 1837; Melang. Carcinol., p. 135.

Geograpsus lividus Stimpson, Proc. Acad. Nat. Sci., Philad., 1858, p. 101; Notes on North Amer. Crust., Annals Lyc. Nat. Hist., N. York, vii, p. 230; 1860. Kingsley, Proc. Acad. Nat. Sci., Philad., p. 195, 1880 (description). M. J. Rathbun, Proc. U. S. Nat. Mus., xxi, p. 604, 1898; Brach. and Macr. Porto Rico, p. 16, 1901; Verrill, these Trans., xi, p. 574, 1900.

Geograpsus occidentalis Stimpson, Annals Lyc. Nat. Hist. N. Y., vii, p. 230, 1860 (West Coast).

Figure 5. Plate XXVI, Figure 1.

In life, the carapace in our specimens was light yellowish brown, marbled or irregularly reticulated with very dark brown streaks, or umber-colored markings, most numerous anteriorly; legs olive-brown above, paler beneath; abdomen pale bluish gray. (C. S. V.)

*See The Bermuda Islands, i, p. 91; these Trans., vol. xi, p. 503.

Nat. Mus. number	Sex	Length carapace	Breadth carapace	Br. at ant. angles	Br. of front	Locality
7344*a*	♂	20.0	24.0	20.6	10.4	Sabonilla
7344*b*	♂	17.0	20.9	17.6	8.8	"
7344*c*	♀	11.9	15.0	13.0	6.4	"
7344*d*	♀	15.0	19.0	16.1	8.0	"
7344*e*	♀	17.5	21.6	18.4	9.0	"
7344*f*	♀	19.0	23.5	20.0	10.0	"
7344*g*	♀	19.9	24.5	20.3	10.1	"
7344*h*	♀	22	27.0	22.0	11.0	"
7344*i*	♂	22.5	28.0	22.4	11.3	"
36	♀	18.3	23.8	19.2	10.0	Bermuda (Goode)

Nos. 7344*a*—*i* were measured by Prof. S. I. Smith.

Nos. 7344*e* and *f* were carrying eggs. Taken by the "Albatross," March, 1884.

A single Bermuda specimen (No. 36) was in the collection of G. Brown Goode. The Yale party took two adult specimens in 1898. A larger broken ♂ specimen is in the collection of the Bermuda Biol. Station, 1903, taken at Hungry Bay. Breadth between outside of orbits, 23^{mm}; length of chela, 21; height, 10.5^{mm}. It occurs under stones on rocky shores and sometimes on coral reefs.

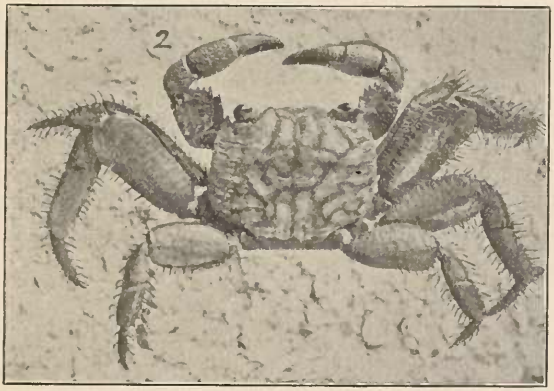

Figure 5.—*Geograpsus lividus*, from Bermuda, × about 1¼. Phot. A. H. V.

Its known range is extensive; from Florida to the Antilles and Columbia. On the West Coast, from Cape St. Lucas to Chili (*G. occidentalis* Stimp.). James I., Galapagos (M. J. Rathbun).

Pachygrapsus transversus Stimpson. *Mottled Shore-Crab.*

Grapsus transversus Gibbes, Proc. Amer. Assoc. Adv. Sci., 3d meeting, p. 181 (17), 1850 (Florida).

Pachygrapsus transversus Stimpson, Ann. Lyc. Nat. Hist. New York, vii, p. 64 (18), 1859; Amer. Jour. Sci. (2), xxvii, p. 446, 1859.

Smith, Report Peabody Acad. Sci. Salem, 1869, p. 91, 1871 (Pacific coast Central America); Trans. Conn. Acad., iv, 259, 1880 (synon. and measurements).

M. J. Rathbun, Branner–Agassiz Exp. Brazil, p. 137; Brach. and Macr. of Porto Rico, p. 17, 1901 (descr.).

Kingsley, Proc. Boston Soc. Nat. Hist., xx, p. 158, 1879 (descr.); Proc. Acad. Nat. Sci. Philadelphia, 1879, p. 400; op. cit., p. 199, 1880 (syn. and descr.).

Goniograpsus innotatus Dana, Proc. Acad. Nat. Sci. Philadelphia, 1851, p. 249 (3), 1851 (South America); Crust. U. S. Expl. Exped., p. 345, pl. 21, fig. 9, 1852.

Metopograpsus miniatus Saussure, Crust. Mexique et Antilles (Mém. Soc. Phys. Hist. nat. Genève, xiv), p. 28, pl. 2, fig. 17, 1858. (Parasited, t. Rathbun.)

Metopograpsus dubius Saussure, op. cit., p. 29, pl. 2, fig. 16, 1858.

Pachygrapsus intermedius Heller, Zool. Bot. Verein Verhandl., Wien, xii, 1862, p. 521 (Brazil); Reise der Novara, Crust., p. 44, 1865. Smith, Trans, Conn. Acad., ii, p. 37.

Pachygrapsus socius Stimpson, Ann. Lyc. Nat. Hist. New York, x, p. 114 1871 (Cape St. Lucas, Panama, Peru).

PLATE XII, FIGURES 3—3*b*.

This species is very variable in colors, but the tints are evidently decidedly protective. The mottlings of yellow, olive, and brown closely resemble the colors of the stained and weather-beaten rocks and dead algæ among which it usually lives.

In life, the ground-color of the carapace is most frequently dull olive-green, yellowish, or yellowish-brown, sometimes dull gray, more or less covered by irregular mottlings of darker brown, reddish, or dark olive, usually darkest anteriorly, where the transverse ridges are often edged with reddish or dark brown, making them more conspicuous; large chelæ are often plain light brown or reddish brown, usually with pale tips, but in some cases they are blotched with darker brown, or tinged with bright red on some parts, especially at the joints. The pereiopods are usually banded with darker and lighter brown.

*Measurements.**

Sex	Length	Breadth	Front	Locality
♀	10.1mm	13.2	7.2	Provincetown
"	11.0	15.0	8.3	Florida
"	11.4	15·9	8.8	"
"	11.5	15.6	8.6	Brazil
"	13.7	18.2	9.8	Acajutla
"	14.2	19.0	10.8	Bermuda
♂	10.0	12.8	7.0	Paita, Peru

* Many of the measurements are by Prof. S. I. Smith.

Sex	Length	Breadth	Front	Locality
♂	10.5	13.7	7.6	Bermuda
"	10.5	13.9	7.6	Panama
"	10.7	14.1	7.8	Bermuda
"	10.7	14.2	7.7	Panama
"	11.0	14.3	7.6	Brazil
"	12.4	16.4	9.0	Bermuda
"	12.5	16.3	8.9	Florida
"	13.1	17.2	9.6	Bermuda
"	13.8	17.4	9.8	Panama
"	14.5	18.2	10.0	Brazil
"	15.2	19.4	10.6	Panama
"	15.3	19.7	10.6	Brazil
"	9.2	13.0	7.0	Bermuda
"	13.0	17.0	10.0	Bermuda†
♀	15.5	21.0	15.0	Bermuda‡

† Length of largest chela, 13^{mm}; height, 6^{mm}.

‡ Length of largest chela, 11.5^{mm}; height, 5.5^{mm}.

The proportion of length to breadth of the carapace varies from 1:1.25 to 1:1.41, but is usually about 1:1.30 to 1:1.35.

A parasitic isopod crustacean sometimes infests its branchial cavities and in some cases causes an enlargement or distortion, due to the swelling of the carapace on one side. The parasite, which is allied to Bopyrus and Cepon, is relatively large.* It occurred in about 25 per cent. of the adult specimens examined from some localities. Some of the specimens collected in April carried eggs. Some were then soft-shelled. Specimens collected in June and July (Berm. Biol. Sta.) also carried eggs.

This appears to be the most abundant shore crab at Bermuda. It is to be found everywhere between tides where there are loose stones or masses of dead algæ under which it can conceal itself. It is also to be seen running actively about in such localities, where it is often associated with *Sesarma Ricordi* and *Planes minutus*.

It is sometimes found, also, on the coral reefs. Also among the roots of mangroves.

It has been taken in Bermuda by nearly every collector of Crustacea.

It has a very wide distribution in all tropical and subtropical seas. It has been found among the barnacles, etc., scraped from the bot-

* These parasites have recently been sent to Miss Harriet Richardson, who identifies them as *Leidya distorta* (*Cepon distorta* Leidy). It was originally found in the gill-cavity of a "fiddler-crab" (*Gelasimus pugilator*) by Leidy on the coast of New Jersey. It has seldom been found by later collectors.

toms of vessels far from its usual habitats. In this way its range may have been greatly extended by commerce in modern times. Adult living specimens were taken at Provincetown, Mass., in 1879. They occurred among barnacles, etc., on the bottom of a whaling vessel returned from a cruise in the Gulf Stream region and were associated with other southern species. (See S. I. Smith, 1884.)

It ranges from Florida and Bermuda to southern Brazil; from Peru to the Gulf of California; West Africa at Loanda, etc. Cape Verde Islands and Madeira; East Indies; Australia; New Zealand; Tahiti; Galapagos Is.; Pernambuco, etc.; Brazil, on stone reefs, and Maceio on coral reefs (M. J. Rathbun); Rio (Heller); Australia (Miers).

Pachygrapsus gracilis (Saussure) Stimp.

Metopograpsus gracilis Saussure, Mem. Soc. Phys. Hist. Nat. Geneva, xiv, p. 443, pl. II, f. 15, 15*a*, 1858.

Pachygrapsus gracilis Stimpson, Ann. Lyc. Nat. Hist. N. York, x, p. 113, 1871. Kingsley, Proc. Boston Soc. Nat. Hist., xx, p. 159, 1870 (descr.). Synop. Grapsidæ, Proc. Acad. Nat. Sci., Philad. for 1880, p. 200 (syn. and descr.) M. J. Rathbun, Branner-Agassiz Exp., p. 137, 1900; Brach. and Macr. of Porto Rico, p. 17, 1901.

Figures 6, 6*a*. Plate XII, Figure 2.

This is usually smaller than the preceding, and is much less common. Its colors are similar, but the reticulations and mottlings are darker brown. It can best be distinguished by the more prominent, thin, and nearly straight, front; the straighter sides of the carapace,

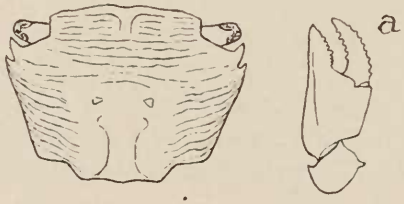

Figure 6.—*Pachygrapsus gracilis*, carapace enlarged; 6*a*, one of the chelæ. After Saussure.

which is not plicated over the cardiac region; and by the chelæ, which have small denticles on the upper side of the carinate manus, and on the dactylus. The manus has fine oblique ridges above, and the carpus is covered with fine oblique and irregular ridges.

It appears to be rare at Bermuda, or at least is seldom taken there. A few good specimens were found at Bermuda by us in 1898 and April, 1901; one of the latter carried eggs. A specimen was also obtained by Mr. Goode, 1876. It has been found at the Florida

Keys, Yucatan, and in the West Indies. Brazil, on mangroves (Rathbun.) It is most frequently found among the roots of mangroves.

Measurements.

No.	Sex	Carapace length	Carapace breadth	Between orbits	Chelæ length	Chelæ height	Locality
4018*a*	♀	11	14	10	9	4	Bermuda
4018*b*	♀ eggs	10.5	13	9	7.5	3.5	"
4018*c*	♀	15.5	20.5	14	11	5.2	"
4018*d*	♀	13	16.5	10	8.5	4	"

Planes minutus (Linn.) Dana. *Gulf-weed Crab.*

Cancer minutus Linné, Syst. Naturæ, ed. 12, i, p. 1040, 1767. Fabricius, Syst. Ent., p. 402, 1775.

Grapsus minutus Latreille, Hist. nat. Crust. et Insectes, vi, p. 68, 1803.

Grapsus cinereus Say, Jour. Acad. Nat. Sci. Philad., i, p. 99, 1817 (*nonGrapsus cinereus* Bosc, *nec Grapsus* (*Sesarma*) *cinereus* Say, 1818).

Grapsus pelagicus Say, op. cit., p. 442, 1818.

Nautilograpsus minutus H. Milne-Edwards, Hist. nat. Crust., ii, p. 99, 1837. Smith and Harger, these Trans., iii, p. 26, 1874. Smith, op. cit., iv, p. 263 ; v, p. 120. Stimpson, Crust. N. Pacific Expl. Exped., p. 121, 1907.

Planes Linnæana Bell, British Stalk-eyed Crust., p. 135 (cut), 1844. White, List of Crust. British Mus., p. 41, 1847.

Planes minutus Dana, United States Expl. Exped., Crust., p. 346, 1852. Kingsley, Synopsis Grapsidæ, Proc. Acad. Nat. Sci. Philad., for 1880, p. 202 (descr. and syn.).

Figure 7. Plate XIII, Figures *a—j'*. Plate XXVII, Figure 6.

In life, this small crab varies greatly in form and color. Usually it is irregularly mottled or blotched with light greenish yellow or pale yellow on a darker olive-green ground-color, usually with a large blotch or spot of pale yellow or whitish on the back of the carapace, thus imitating the olive-green colors of the gulf-weed (*Sargassum*) and the whitish patches of Bryozoa (*Biflustra*) with which the *Sargassum* is commonly covered. Thus its colors are eminently protective, for it naturally lives in the open sea among *Sargassum*.

Measurements of Bermuda specimens.

Sex	Carapace length	Carapace breadth	Front breadth	Chela, larger, length	Chela, larger, height
♂	16	17	9	16	8
♀	13	13	8	9	5
♂	15	15	8	12	6.5
♂	15	15	8	13	7.5
♀	19.5	20	10.5	14	7.5
♂	18	19	10	16	10

The last two are from the region of the Gulf Stream.

Some of the specimens taken in April, 1901, were carrying eggs. Several of those collected by the Bermuda Biological Station in June and July, 1903, also carried eggs.

Wherever fresh masses of *Sargassum* are cast up by the waves this crab can almost always be found beneath them, often in considerable numbers. It is usually associated with small specimens of *Portunus Sayi* and two species of shrimp (*Latreutes ensiferus* and *Leander tenuicornis*). It is contained in all the Bermuda collections that I have examined.

The 36 specimens illustrated on my plate V, to show their variations in form and color, were all taken, with many more, under a single mass of *Sargassum* in March, 1901, by A. H. Verrill.

It is a good swimmer, however, having long legs bordered by a dense fringe of hairs, so that it is not entirely dependent on the *Sargassum*.

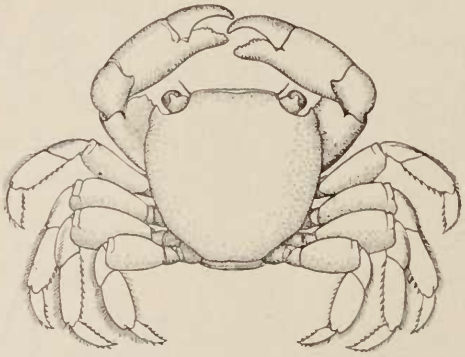

Figure 7.—Gulf-weed crab, *Planes minutus*, enlarged 1½. The hairs of the legs are mostly omitted. J. H. Emerton del.

It is widely distributed, occurring in all tropical and subtropical seas in floating *Sargassum*.

In the Atlantic it occurs along the course of the Gulf Stream as far north, at least, as George's Bank and off Nova Scotia. It is sometimes cast ashore on the coasts of New England and Great Britain. Prof. Smith has recorded a large specimen found at Woods Hole, Mass., by V. N. Edwards, Sept. 11, 1877. Southward it extends to Brazil and Falkland Is. (Kingsley); on the Pacific coast from Peru to the Gulf of California. Also found in the central Pacific and Indian Oceans; Mediterranean (Heller). West Coast of Africa, Cape St. Lucas (Stimpson); Indian Ocean (M.-Edw.); New Zealand and Natal (Kingsley).

Sesarma Ricordi M.-Edw.

Sesarma Ricordi H. M.-Edw., Ann. Sci. Nat., ser. 3, vol. xx, p. 183, 1853. Kingsley, Proc. Acad. Nat. Sci., Philad., for 1880, p. 217. M. J. Rathbun, Synopsis Sesarmæ, Proc. Biolog. Soc. Washington, xi, p. 91, 1897 (descr. and synon.).

Brachy. and Macr. Porto Rico, p. 18, 1901 (descr.). Verrill, these Trans., x, p. 574, 1899.

Sesarma angustipes Stimpson (*pars*) Smith, these Trans., ii, p. 159, 1869 (*non* Dana, t. M. J. Rathbun).

Sesarma cinerea Stone, in Heilprin, op. cit., 1898. Rankin, op. cit., p. 526, 1900 (*non* Say, sp.).

Sesarma Stimpsonii Miers, 1881, not of 1886 (t. Rathbun).

Plate X, Figure 2. Plate XI, Figure 3, var.

This common species is very variable in colors in life. The carapace is usually irregularly and variously mottled with olive-brown, olive-green, or reddish brown on a yellowish green or light olive ground color, in most cases pretty closely imitating the varied colors of the dead algæ and stained stones among which it most commonly lives.

Miss Rathbun, who has examined many of the original types, unites several nominal species with this. It seems to be distinct from the true *cinerea* and *angustipes*, with both of which it has often been confused. Probably the real *cinerea* does not occur at Bermuda.*

The carapace of the typical variety appears nearly smooth to the eye over most of the surface, but under a lens shows minute sparse granules and hairs, which become more evident anteriorly and on the front, while on the sides, posteriorly, there are faint oblique plicæ. The lateral margins are nearly straight or only slightly sinuous; the front is a little sinuous on the edge with a slight median notch. The carapace is only slightly broader than long.

Measurements of Bermuda specimens.

Number	Sex	Carapace length	Carapace breadth	Front breadth	Chelæ length	Chelæ height
a	♀	17	18	10	7	4
b	♂	16	17	9	12	7.5
c	♂	14	15	8	10	6
d	♂	13	13.5	7	9	5.5
e	♂	14.5	15	7.5	10	6

* Dr. Rankin has kindly sent me for examination the specimens that he recorded (1900) as *S. cinerea*. They prove to be *S. Ricordi*.

This is one of the most common species, taken by nearly all collectors in Bermuda. It is often seen running actively about among the stones and dead seaweeds, from low tide nearly to high-water mark, usually associated with *Pachygrapsus transversus*. It may almost always be found under masses of *Sargassum* cast up on the shores as well as under stones.

Its range extends from Florida through the West Indies to Trinidad.

Sesarma Ricordi, var. **terrestris**, subspecies or var. nov.

Plate XI, Figure 3.

This form first attracted my attention on account of its peculiar habits. Unlike most *Sesarmæ*, it lives away from the water, often in very dry, barren, sandy fields or pastures, under stones, though it was also found not far from the shore but where the soil was dry. It runs very rapidly when disturbed, and hides in holes or under other stones, but does not seek the water. Its color was darker than in the ordinary form, and the carapace was usually more or less covered by short hairs and adherent dirt, obscuring the colors, and giving it a gray appearance. Although so different in appearance and habits, it agrees so closely in form and structure that it seems to be only a variety that has acquired terrestrial habits, with trivial changes adapting it better for this mode of life.* But no really intermediate specimens were found. Thus it seems to be a form or subspecies of some considerable antiquity and constancy.

The carapace appears more rough and uneven than in the ordinary form, for it is more strongly areolated and the branchial areas are more swollen, so that the vertical thickness is greater and the reticulated areas of the sides are broader, giving a larger surface for aëration of the water, and indicating larger gill cavities and gills. The dorsal surface of the carapace is covered with more numerous and larger granules, bearing numerous short dark hairs, very evident under a lens of low power, and capable of holding adherent dirt: the plicæ on the postero-lateral sides are stronger and more granulous; the lateral marginal edge is more sinuous anteriorly, owing to the more swollen branchial chamber. The anterior frontal margin is less sinuous, the median indentation often being obsolete or faint.

* The specimens have also been studied by Miss M. J. Rathbun, who agrees with me in its relations.

The ambulatory legs are distinctly larger and longer than in the common form. When the legs are folded the tooth on the distal angle of the merus joint of the legs of the 3d and 4th pairs reaches considerably (2–3^{mm}) beyond the outer orbital angle, while in *Ricordi* it just reaches it, or only slightly exceeds it (.5^{mm} or less). The proportion of the merus joints of these legs to the breadth of the carapace is 1 : 1.36. In *Ricordi*, 1 : 1.5. Ratio of same to length of carapace, 1 : 1.2. In *Ricordi*, 1 : 1.4.

The colors, when living, appear dull or sordid yellowish brown, or mud-color, due to adherent dirt, often mottled with reddish brown. Fresh specimens cleaned in alcohol were variegated with pale bluish gray, dark brownish gray, and blackish, with some yellowish white ; an irregular pale band, speckled with dark gray, extends from eye to eye. Legs above variegated with similar colors, but paler, the dark brown color mostly in irregular transverse bands. Chelæ whitish or pale yellow ; legs bluish white beneath. Some specimens have the carapace finely specked with red.

Measurements of Bermuda specimens.

Number	Sex	Carapace length	Carapace breadth	Front breadth	Chelæ length	Chelæ breadth
3148*a*	♂	18.0	20.0	11.0	15	8.5
3148*b*	♂	16.0	17.0	9.0	12	7.0
3148*c*	♀	17.5	18.5	9.7	10	5.5
d	♀	17.0	19.0	11.0	10	5.5
e	♂	13.5	15.5	8.0	10	7.0

This subspecies is, perhaps, in process of gradual differentation, and destined to eventually become a valid species with true terrestrial habits should it not be prematurely exterminated. At present it has few enemies. It lives in waste uninhabited places. It is not uncommon in several localities. We found it not far from Hungry Bay; on the low barren hills of some of the smaller islands in places partly covered with sparse grass ; and in other localities.

Several good specimens in the Yale Museum were collected by J. M. Jones, before 1867. They have no special labels as to seasons or stations.

This variety approaches *S. cinerea* Say in some characters more nearly than does the common form. In respect to the granulation of the front and frontal lobes, the specimens of *S. cinerea* in the Yale Museum, from Indian River and St. Augustine, Fla., labelled as *S. cinerea* by Miss Rathbun, and which I have compared with this

form, are even less granulated.* Indeed, the latter are scarcely more granulated than the ordinary form of *Ricordi*.

However, the front of *S. cinerea* is narrower and more arched than in *S. Ricordi*; its lower margin is less sinuous, narrows more toward the ends, and is less turned up at the edge, so that it is less concave above. The orbital notch is not so deep. Still these differences are but slight. The carapace seems to be slightly less convex. The chelæ are essentially the same in both, and the carpal joint is roughened in the same way. The merus joints of the pereiopods are about equally flattened in both; the brush of hairs on the under

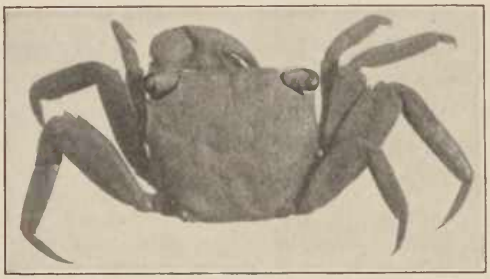

Figure 8.—*Sesarma cinerea* (from Florida), slightly enlarged. Phot. A. H. V.

side of the last two joints is nearly the same in both, though perhaps a little smaller, and with shorter hairs in *S. cinerea*. The differences are so slight that it seems not improbable that *S. cinerea* is another semiterrestrial race or subspecies that has been derived from *S. Ricordi*, under a somewhat different environment. In fact, all those species that live more or less on the dry land or in trees (e. g., *S. Roberti*, an arboreal West Indian species) must have been originally derived from amphibious or aquatic species, but the differentiation has gone farther in some than in others. Doubtless they all go into the sea to breed, and probably they all have similar zoëa and megalops larval stages.

But in the case of the Bermuda forms, it is easy to believe that they have acquired different breeding habits or different breeding

* In Miss Rathbun's analytical table of *Sesarmæ* (Synopsis American Sesarmæ, Proc. Biolog. Soc. Washington, xi, pp. 90, 91, 1897), the smoothness of the suprafrontal lobes, "smooth or nearly so," is made a diagnostic character for *S. Ricordi*, while *S. cinerea* is put in a group having the suprafrontal lobes "tuberculate or granulate," and in a subgroup having them "faintly granulate." The degree of granulation seems to be variable.

seasons, so that they may no longer interbreed. It is also probable that the young crabs of var. *terrestris*, when they quit the megalops stage at the shore, have inherited the instinct to seek the uplands. A careful study of these species in summer might settle these points.

Sesarma Miersii Rathbun.

Sesarma (Holometopus) Miersii M. J. Rathbun, Synopsis American Sesarmæ, Proc. Biolog. Soc. Wash., xi, p. 91, 1897 (descr. and synon.); Branner-Agassiz Exp. to Brazil, p. 138, 1900. Verrill, these Trans., vol. x, p. 574, 1900.

Sesarma Stimpsoni Miers, Rep. Voy. Challenger, Zool., xvii, p. 270, 1886 (not of 1881).

Plate XII, Figure 5.

This species can be distinguished from the preceding by the tuberculated or distinctly granulated protogastric region of the carapace, which in the latter is nearly smooth.

Ordinary mature specimens have the carapace about 19^{mm} long and 21^{mm} wide.

Miss Rathbun refers a young specimen, collected by us in 1898, to this species. It appears to be very rare in Bermuda.

It ranges from Bermudas and the Bahamas to Rio Janeiro, Brazil. Rio Parahyba do Norte (Rathbun). It lives mostly among the roots of mangroves.

Cyclograpsus integer Edw.

Cyclograpsus integer Milne-Edw., Hist. Nat. des Crust., ii, p. 79, 1837. Kingsley, Proc. Acad. Nat. Sci., Philad., Carcinol. Notes, iv, p. 221, 1880. Rankin, Crust. Bermuda, p. 526, 1900. M. J. Rathbun, Brach. and Macr. of Porto Rico, p. 18, 1901.

Plate XII, Figure 1.

This species is easily recognized by its smooth carapace, with convex sides. It is very rare in Bermuda.

It was not found by us, nor has it been taken by any recent collector. A single specimen in the collection of Mr. Goode was identified as this species by Prof. S. I. Smith. The same one was recorded by Rankin. The only other record is that of Heilprin, also a single specimen. It sometimes occurs on coral reefs.

It ranges from Florida to Brazil, and throughout the West Indies. Florida (Kingsley); Porto Rico (Rathbun); Brazil (M.-Edw.).

Plagusia depressa (Fabr.) Say.

Cancer depressus Fabr., Ent. Syst., Supl., p. 406, 1775.

Plagusia Sayi DeKay, N. York Fauna, p. 16. Stimpson, Notes on N. Amer. Crust., i, p. 18 [64]; ii, p. 104 [232].

Plagusia depressa Say, Journ. Acad. Nat. Sci. Philad., i, p. 100, 1817. Rathbun, Dec. Crust. W. Africa, p. 281 (distribution). Results of Branner-Agassiz Exped. to Brazil, Biolog. Soc. Wash., ii, p. 138, 1900; Brach. and Macr. Porto Rico, p. 19, 1901. Verrill, these Trans., vol. x, p. 575, 1900. Benedict, Notice Crust. W. Africa, p. 538, 1893.

Plagusia squamosa Dana (*non* Edw.). Stimpson, Crust. N. Pacific Expl. Exp., Smithsonian Misc. Coll., xliv, p. 122, 1907.

FIGURE 9. PLATE X. FIGURE 1.

When full grown this is a large and handsomely colored crab, remarkable for its shyness and agility. Its colors, which are variable, are evidently protective, and by no means conspicuous when resting

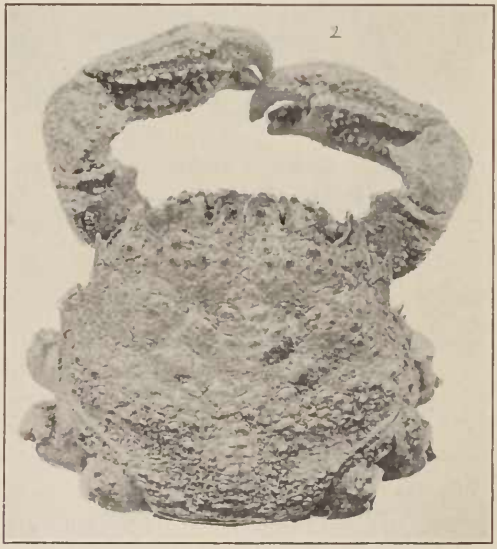

Figure 9.—*Plagusia depressa*, carapace and chelæ of adult male, about nat. size. Phot. A. H. Verrill.

among the rough and stained shore ledges where it usually lives. It is much less conspicuous than *Grapsus grapsus*, which lives in similar situations.

Some large specimens had a grayish or yellowish ground color, mottled and spotted with brown and red; the spots are often bright.

Measurements of Bermuda specimens.

No.	Sex	Carapace length	Carapace breadth	Front width	Chelæ length	Chelæ height
31	♂	51	49.5	34	28	13
3153	♀	45	48	21	r. 18	6
879 F. M.	♂	47	50	17	l. 22	11

Sometimes it may be seen running with great rapidity over the rough ledges and cliffs, often above high-tide mark, in the same manner as *Grapsus grapsus*, but it is even more alert, and swifter in its motions, so that its capture is difficult. It readily takes to water when pursued and swims very well.

Although not rare, it has occurred in but few Bermuda collections, and usually singly, owing probably to the difficulty of capturing it.

In 1898, April to June, we found it common on the rough shore ledges between tides and above high-water mark at Castle Island, Bailey Bay, and other localities, where also its recently cast-off shells were often found considerably above high tide, as they had been left by the crabs. In 1901, at the same season, we could not find a single specimen, even of the cast-off shells, at the same localities, or elsewhere. Probably the species had been greatly reduced in numbers by the unusually cold period in the preceding February, when great quantities of the native fishes also perished.*

It was represented by a single specimen in Mr. Goode's collection. It was also taken by the Field Nat. Hist. Museum expedition in 1905, and by Prof. T. Kincaid, 1903. A small specimen is also in the collection of the Bermuda Biological Station, 1903.

It has an extensive geographical range. On the Atlantic coast it ranges from South Carolina to Brazil, and throughout the West Indies. Pernambuco, Brazil (M. J. Rathbun). On the eastern side of the Atlantic it extends from the Mediterranean to South Africa. St. Helena, Ashantee (Benedict). Hong Kong, Bonin Is., Hawaiian Is., Loo Choo Is , and Madeira (Stimpson).

At Woods Hole, Mass., a single specimen was taken among barnacles from the bottom of a vessel that had just arrived from Swan Island, West Indies, Jl. 14, 1887. (t. S. I. Smith in MSS.)

* See p. 320 above, and the Bermuda Islands, i, p. 94 [506], 1901.

Percnon planissimum (Herbst), M. J. Rathbun. *Flat Crab.*

Cancer planissimus Herbst, Naturh. Krabb., p. 3, pl. lix, fig. 3, 1804.

Acanthopus planissimus Stimpson, op. cit., p. 104 [242], 1860; Crust. N. Pacific Expl. Exp., Smithsonian Misc. Coll., xlix, p. 123, 1870 (1907), (descr. colors) Bonin Is.

Acanthopus Gibbesii Milne-Edw., Mel. Carcin , p. 146.

Leiolophus planissimus Miers, Catal. Crust. N. Zealand, p. 46, 1876.

Percnon planissimum Rathbun, Dec. Crust. W. Africa, Proc. U. S. Nat. Mus., xxii, p. 281, 1900; Brach. and Macr. Porto Rico, p. 19, 1901. Verrill, these Trans., vol x, p. 575, 1900.

Plate X, Figure 3. Plate XII, Figure 4.

Easily recognizable on account of its very flat, smooth body, and the slits in the front and in the eye-sockets. Its structure is admirably adapted to its habit of living in the confined spaces under stones.

In life the carapace is usually variegated or mottled with brown, pinkish flesh-color and salmon; there is generally a median longitudinal stripe of bright pale blue; the legs are banded with reddish brown and light pink. Ventral side of body pale blue; of legs pale pink (C. S. V.).

One female taken in April, 1901, carried eggs; also one taken in midsummer, by Prof. Kincaid.

Measurements of Bermuda specimens.

Number	Sex	Carapace length	Carapace breadth	Front width	Chelæ length	Chelæ height
30	♂	25.5	23.0	--	12.5	8.4
3005	♀	25.0	24.0	10	9.0	5.0
3005*a*	♂	20.0	18.0	8	7.5r.	5.0
----	♂	20.0	17.0	6	7	4.0
Figured	♀	19.0	16.5	6	5	3.5

The chelæ are feeble in the females but large in the males. In the males the two are unequal; the large chela has a large and long tuft of soft hairs on inside of merus.

It was found very commonly by us in 1898 and 1901, on many rocky shores under stones at about low-tide level. It was in the collections of J. M. Jones; G. Brown Goode; Prof. Kincaid, 1903; Field Museum Exped., 1905; Bermuda Biological Station, 1903, and others.

It is widely distributed throughout the West Indies to Brazil. Azores; Spain; Madeira; West Africa and South Africa; Mauritius to Japan, and Hawaiian Is., Bonin Is. Cape St. Lucas to Chili (Rathbun). Colon (Yale Mus.).

Superfamily or tribe **CYCLOMETOPA=CANCROIDEA** (see p. 14).

Family Pilumnidæ.

*Key to the Bermuda genera of the family Pilumnidæ.**

A. The ridges that define the efferent branchial channels, if present, are usually low and are confined to the posterior part of endostome, never reaching to anterior boundary of buccal cavern.

B. Fronto-orbital border less than half the greatest width of carapace.

C. Antero-lateral borders of carapace sharp, crest-like; upper border at least of arms, and of fourth, fifth, and sixth segments of legs sharp and crest-like ..... *Platypodia*

C′. Antero-lateral borders of carapace and upper borders of legs not crest-like

D. Antero-lateral borders divided into lobes or teeth.

E. Carapace usually conspicuously lobulate, granulate, and hairy, chelipeds and legs also granulate and hairy ..... *Actæa*

E′. Carapace, chelipeds, and legs not sharply granulate and hairy.

F. Fingers sharp-pointed, not hollowed ..... *Cycloxanthops*

F′. Fingers blunt-pointed, hollowed at tip. ..... *Xanthodius*

B′. Fronto-orbital border half or more than half the greatest width of the carapace. (True of American species of *Liomera*.)

C. Carapace transversely oval.

D. Ambulatory legs with upper margins of the carpal joint bearing a horned or lunate crest ..... *Heteractæa*

D′. Ambulatory legs with upper margins smooth or nearly so.

E. Antero-lateral teeth strong, greatly projecting. Carapace deeply areolated ..... *Leptodius*

E′. Antero-lateral teeth small, little projecting. Carapace slightly or not at all areolated. Carapace without transverse granulated lines. Fingers somewhat hollowed at tip ..... *Liomera*

C′. Carapace more or less hexagonal, or subquadrate.

D. Ambulatory legs spinulose.

D′. Ambulatory legs not spinulose.

F. Front of moderate width. Postero-lateral margins not strongly converging ..... *Eupanopeus*

A′. The ridges that define the efferent branchial channels extend to anterior boundary of buccal cavern and are often very strong.

B′. Fronto-orbital border just about half or less than half greatest breadth of carapace, which is broad and transversely oval.

C. The basal antennal joint does not nearly reach the front.

C′. The basal antennal joint reaches the front.

D. Anterior margin of merus of outer maxillipeds not notched. *Eurytium*

* This table is taken from that of Miss M. J. Rathbun (Brachyura and Macrura of Porto Rico), with some alterations and omissions. It includes two additional genera (*Heteractæa* and *Lobopilumnus*).

B'. Fronto-orbital border much more than half greatest breadth of carapace.
C. Carapace nodose ..... *Lobopilumnus*
C'. Carapace not nodose.
D. Merus of external maxillipeds as long as or longer than broad.
E. Fronto-orbital border about two-thirds greatest breadth of carapace ..... *Pilumnus*
E'. Fronto-orbital border much more than two-thirds greatest breadth of carapace; arm scarcely projecting beyond lateral border of carapace ..... *Eriphia*
D'. Merus of external maxillipeds about twice as broad as long. *Domecia*

Platypodia spectabilis (Herbst) Rathbun. *Calico Crab; Bandana Crab.*

Cancer spectabilis Herbst, Natur. Krabb., ii, 153, pl. xxxvii, f. 5, 1794.
Cancer lobata M.-Edw., Hist. Nat. Crust., i, p. 375, 1834.
Attergatis lobatus Stimpson, Ann. Lyc. Nat. Hist. N. York, vol. vii, p. 202 [74], 1860.
Lophactæa lobata A. M.-Edw., N. Arch. Mus., Mem., i, p. 249, pl. xvi, fig. 3, 3*a*; Miss. Sci. Mex., p. 242, 1879. Rankin, op. cit., p. 529, 1889.
Cancer venustus Desb. & Scramm., Crust. Guadeloupe, p. 23 (*t.* A. M.-Edw.).
Platypodia spectabilis M. J. Rathbun, Amer. Inst. Jamaica, i, p. 13, 1897; Brachyura and Macrura Porto Rico, p. 26, 1901. Verrill, Trans. Conn. Acad., xi, p. 17, pl. i, fig. 2, 1901 (descr. colors).

Figure 10. Plate XIV, Figure 6.

This is a small and rather rare species, easily distinguishable by the form of its carapace and its remarkable coloration, which appears to be highly protective when the crab lives among the common bright

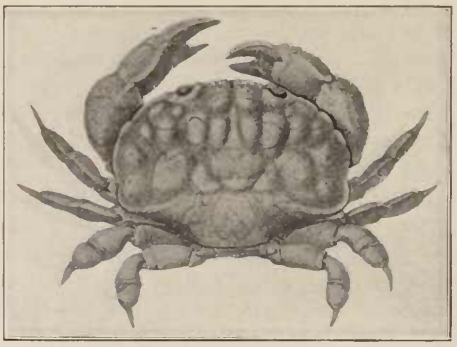

Figure 10.—Calico Crab, *Platypodia spectabilis*, enlarged about 1½ times. After A. M.-Edw.

red and orange-colored sponges (*Tedania ignis*), actiniæ, etc., with which it agrees well in colors, while their irregular arrangement serves to break up the outline of the carapace.

A specimen taken in Castle Harbor, near Walsingham Bay, May 5, 1901, had the colors as follows: Carapace deep orange red, varying to scarlet, with irregular paired spots of pale orange, concentrically bordered with white and purplish brown. The spots are of various sizes and shapes on the carapace, the larger ones often centered with smaller spots of purplish brown. On the chelipeds and legs the spots become transverse, and are mostly at the joints, and larger above than below. Dactylus and thumb black. Sternum orange with margined spots at the bases of the legs. Abdomen with two large spots of the same kind beneath, and smaller ones on the basal segments. Eye-stalks pale orange, with a purplish brown spot on the upper side.

Our largest specimens had the following coloration in life: The carapace was bright orange-red, with pale, particolored, broad, irregular streaks, blotches, and angular or rounded, often ocellated spots of variable sizes. The larger patches of color are frequently quite unsymmetrically developed. The ocellated spots have a small bright yellow center, surrounded by a broad circle of white, which is bordered externally with bright blue and enclosed by a narrow black line. Sometimes similar but smaller ocellated spots occur on the larger pale blotches, in lines and groups, or singly, while others are scattered on the ground-color. The chelipeds and legs are similarly colored, but on them the spots mostly take the form of half bands, with angular patches at the joints. Claws tipped with black. Small specimens are paler. (A. H. V.) These colors soon fade in alcohol.

Measurements of Bermuda specimens.

No.	Sex	Carapace length	Carapace breadth	Front width	Chelæ length	Chelæ height
4007	♂	16	24	6	r. 13 l. 14	r. 8 l. 8
4008	♂	13	18	5	l. 11	6
4008*a*	♀	9.5	13	4	l. 6	4

This handsome species is rare at the Bermudas. It occurs among rocks and cavernous corals, sponges, etc. Sometimes found on the reefs. We found it only in April, 1901 (five specimens), on serpuline atolls, near Hungry Bay; Castle Harbor, etc. (coll. A. H. Verrill).

A single specimen occurred in the collection of Mr. Goode. It was taken at Hungry Bay by the Bermuda Biol. Station, July, 1903.

Several specimens were also taken in 1906 by A. H. Verrill at Dominica Island, where they occurred in the cavities in and beneath

large reef corals. It has been recorded from Florida and through the West Indies to Brazil. Fernando de Noronha (Pocock). Colon (Stimpson). Porto Rico (Rathbun).

Actæa setigera (M.-Edw.) A. M.-Edw.

Xantho setiger M.-Edw., Hist. Crust., i, p. 390, 1834.

Actæa setigera A. M.-Edw., Nouv. Arch. Mus., i, p. 271, pl. xviii, fig. 2, 1865; Miss. Sci. Mex., v, p. 244, 1879. Rankin, op. cit., p. 529, 1900. M. J. Rathbun, Brach. and Macr. Porto Rico, p. 34, 1901.

FIGURE 11.

While living this small crab is densely covered with short hairs to which fine white shell-mud adheres, often effectually concealing it when resting on the bottom. When cleaned the color is reddish brown to purplish red, with paler legs. The carapace and legs are closely granulated beneath the hairs; the dactylus of the chelæ is deeply grooved and hairy.

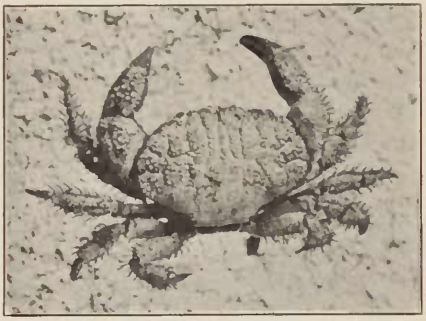

Figure 11.—Hairy Crab, *Actæa setigera*, nat. size. Phot. A. H. V.

Measurements of Bermuda specimens.

No.	Sex	Carapace length	Carapace breadth	Front width	Chelæ length	Chelæ height
812*a*	♂	19	30	6	r. 16 l. 16	9 9
812*b*	♂	12	18	4	r. 10	5
29*a*	♂	20	29	5	l. 17 r. 15	9.5 8
0*b*	♀	21	31	5.7	16	8

It occurs in shallow water bays and on the reefs. Taken by nearly all Bermuda collectors. Good specimens were in the collection of J. M. Jones (812, *a*, *b*). We found it common on rocky shores, usually under stones or in crevices. A small specimen was taken on

the Challenger Bank in 28 fathoms, by the party from the Field Museum Nat. Hist., Oct. 1905.

It ranges from Florida to the Lesser Antilles. It is common in the West Indies. Colon (Yale Mus.).

Cycloxanthops denticulatus (White) Rathbun.

Xantho denticulata White, Ann. Mag. Nat. Hist., 2d s., ii, p. 285, 1848 (*non* Stimpson). Smith, Proc. Boston Soc. Nat. Hist., vol. xii, p. 274, 1869 (descr.); these Trans., ii, pp. 3 and 33, 1869 (Bermuda, Colon, and Brazil). A. M.-Edw., Miss. Sci. Mexico, Crust., p. 252, pl. xlv, figs. 2–2*b*, 1879. Rankin, op. cit., p. 529, 1900.

Cycloxanthops denticulatus M. J. Rathbun, Ann. Inst. Jamaica, i, p. 14, 1897; Proc. U. S. Nat. Mus., xxi, p. 590, 1898; Proc. Wash. Acad. Sci., ii, p. 138, 1900; Brach. and Macr. Porto Rico, p. 27, 1901.

Plate XIV, Figure 8. Plate XXVII, Figure 7.

In life this species is generally some shade of red, purplish red or salmon. "Our specimens are usually reddish salmon, or pink; on the front part of the carapace there is often a red spot. Under surfaces whitish, with some pale brown spots on the abdomen. Chelæ pinkish brown, their tips dark brown or nearly black." (C. S. V.)

The carapace of an unusually large specimen from Brazil, was 16.6^{mm} long, by 26.5^{mm} broad; ratio, 1 : 1.6. (Smith.)

Measurements of Bermuda specimens.

No.	Sex	Carapace length	Carapace breadth	Front width	Chelæ length	Chelæ height
3137*a*	♂	16	25	6	r. 17 l. 16.5	9 7.3
3137*b*	♂	14.5	22	5	r. 15 l. 14.5	8 6
4014	♂	15	24	6	r. 18.5	9.5
4013	♀	14	22	5	r. 13 l. 12	7 6.5

In all our specimens the right chela is the larger. It is easily distinguished by the small, sharp marginal denticles.

We found this species rather rare at Bermuda. It lives under stones at low tide and among dead corals on the reefs. It was also in the early collections of J. M. Jones and G. B. Goode (Yale Mus.), and in the collection made by the Bermuda Biological Station, 1903.

Its range extends from South Carolina and Florida through the West Indies to Colon (Smith), and Rio Janeiro (Dana). Abrolhos Is., Brazil (Smith); Maceio (Rathbun); Cumana (Stimpson). Near Vera

Cruz (Edwards). According to Stimpson it makes a nest of mud among the roots of mangroves.

Xanthodius parvulus (Fabr.) M. J. Rathbun.

Cancer parvulus Fabr., Entomol. Syst., ii, p. 451, 1793 (*t.* Rathbun). (Not *Xantho parvulus* M.-Edw., nor *Panopeus parvulus* Ben. and Rath.)

Chlorodius americanus Saussure, Mem. de la Soc. Phys. et d'Hist. Nat. Genève, vol. xiv, p. 430, pl. i, fig. 5, 1857.

Xanthodius americanus Stimp., Notes on N. Amer. Crust., Ann. Lyc. Nat. Hist., N. York, vii, p. 209 [81], 1860.

Leptodius americanus A. Milne-Edw., Miss. Sci. Mex., v, i, p. 269, 1880. M. J. Rathbun, Proc. U. S. Nat. Mus., xvi, p. 536, 1893.

Xanthodius parvulus M. J. Rathbun, Brach. and Macr. of Porto Rico, p. 27, 1901. Verrill, Trans. Conn. Acad., xi, p. 576, 1901.

Figure 12. Plate XIV, Figure 4.

Average size of adults: carapace about 15^{mm} long; 24.5^{mm} wide; front 6^{mm} wide.

The single adult specimen in the Museum of Yale University, from the collection of Dr. F. V. Hamlin, 1877, has been determined by Miss Rathbun by direct comparison with a photograph of the original type of Fabricius. It is evidently a rare species at the Bermudas, for it was not found in any of the later collections. Probably it lives under stones or in burrows.

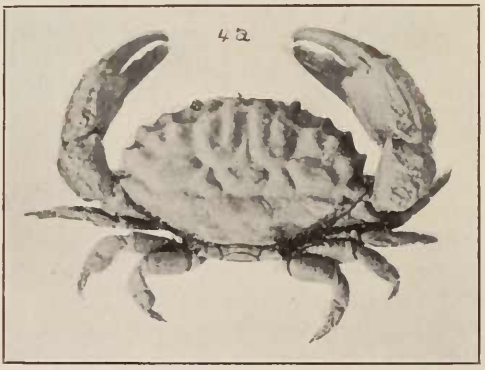

Figure 12.—*Xanthodius parvulus* from Bermuda. × about 2. Phot. A. H. V.

It ranges from the Florida Keys and West Indies to Brazil. Florida and Barbados (Stimpson); Hayti (Saussure); Bahamas, Porto Rico, Curacao, etc. (Rathbun); Fernando Noronha (Pocock).

Heteractæa ceratopus (Stimp.) A. M.-Edw.

Pilumnus ceratopus Stimpson, Annals Lyc. Nat. Hist., New York, vii, p. 215 [87], 1860; and vol. x, p. 109, 1871.

Heteractæa ceratopus A. Milne-Edw., Sci. Miss. Mexico, part v, i, p. 300, pl. lii, figs. 3-3*d*, 1880. Kingsley, op. cit., 1879, p. 396. Rankin, Crust. Bahamas, Annals N. Y. Acad. Sci., xi, p. 232, 1898. Verrill, Trans. Conn. Acad., x, p. 575, 1900 (Bermuda).

FIGURE 13.

This is easily recognized by the very spinose character of the marginal teeth of the carapace and the spiniform tubercles of the chelipeds. The dactylus and thumb are black; the distal part of the manus light red.

Measurements.

No.	Sex	Carapace length	Carapace width	Front between orbits	Chelæ length	Chelæ height	Locality
3145	♂	17	28	10.5	r. 20 l. 17	12 8	Bermuda
4067	♂	9	13	5.0	l. 8.5	5	Dominica

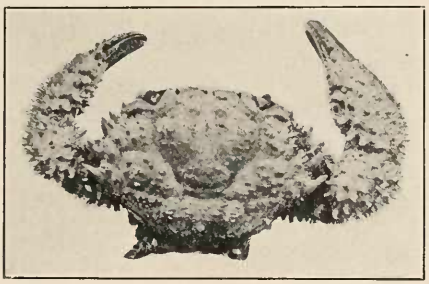

Figure 13.—*Heteractæa ceratopus*, ♂ from Bermuda, about nat. size. Phot. by A. H. V.

This species is apparently very rare at the Bermudas. It is not contained in any of the recent collections examined, nor was it in the early collections of Jones and Goode. One adult specimen was taken by our party in 1898.

It ranges from Florida to Antilles. Florida (Stimpson). Bahamas (S. I. Smith, coll. Bryant). Guadeloupe (Stimpson). Dominica I. (A. H. Verrill, 1906.)

Leptodius floridanus (Gibbes) A. M.-Edw.

Chlorodius floridanus Gibbes, Proc. Am. Assoc. Adv. Sci., iii, p. 175, 1850. Stimpson, Notes on N. Amer. Crust., Annals Lyc. Nat. Hist. N. York, vii, p. 209. S. I. Smith, Crust. Brazil, these Trans., ii, p. 3, 1869 (measurements). Kingsley, Proc. Acad. Nat. Sci., Philad., for 1879, p. 395. Rankin, Ann. N. York Acad., xi, p. 231, 1898.

Leptodius floridanus A. M.-Edw., Miss. Sci. Mex., v. vol. i, p. 268, pl. xlix, figs. 2, 2*a*, 1880. M. J. Rathbun, Proc. Wash. Acad. Sci., ii, p. 139, 1900 (Brazil); Proc. U. S. Nat. Mus., xvi, p. 536; Brachyura and Macr. Porto Rico, p. 27, 1901. Verrill, these Trans. x, p. 575, 1900 (Bermuda).

Chlorodius limosus Desb. and Schramm, Crust. Guadeloupe, p. 30 (*t.* A. M.-Edw.).

Plate XIV, Figure 7.

This is easily distinguished from most of the allied species by the strongly areolated carapace, large lateral teeth, and prominent bilobed front. The upper side of the chelæ is rough with irregular elevations and small rounded tubercles. The smaller specimens often closely resemble *Eupanopeus bermudensis* of similar size, and the young of *E. serratus*, but the areolations of the carapace are stronger and the frontal lobes are more prominent, with a deep notch between them, while the tubercles appear on the chelæ in very young individuals. The tips of the chelæ are excavate or spoon-like even when very young. It is variable in color, but is usually mottled or varied with dull red or reddish brown.

Measurements of Bermuda specimens.

No.	Sex	Carapace length	Carapace breadth	Front width	Chelæ length	Chelæ height
4000*a*	♀	20	28.5	8	r. 19 l. 17	10 8
4001	♀	20	29.5	8	l. 18 r. 17	9.5 8
4002*a*	♂	18	27	7	1. 19	10
4004	♂	18	27	7	r. 18 l. 20	r. 9 l. 11
4019	♂	18	26	9	r. 17 l. 16	6 8
3030	♂	17	25	6.5	1. 17	9

No. 4001 was carrying eggs April, 1901.

This species is common on rocky shores under stones and on the reefs in the crevices and beneath dead corals. Many specimens were taken by the Yale parties in 1898 and 1901. Several taken in April were carrying eggs. Others taken in midsummer by the Bermuda Biol. Station also had eggs. It has been obtained by nearly every collector in Bermuda (J. M. Jones, Mr. Goode, Professor Kincaid, Dr. T. H. Bean, etc.).

Its range is from Florida to Colon and through the West Indies to Brazil. New Providence in pools and under stones on the shore (Rankin); Florida, Colon, and Abrolhos Is. (Smith); Maceio, Brazil (Rathbun); Barbados (Benedict).

Liomera dispar (Stimp.) Rathbun.

Chlorodius dispar Stimp., Prelim. Rep. on Crust. Gulf Stream, Bull. Mus. Comp. Zoöl., ii, p. 140, 1870. Kingsley, Proc. Acad. Nat. Sci., Philad., for 1879, p. 395 (descr.).

Leptodius dispar A. M.-Edw., Miss. Sci., Mex., v, i, p. 271, 1880.

Liomera dispar M. J. Rathbun, Ann. Inst. Jamaica, i, p. 13, 1897; Brachyura and Macr. of Porto Rico, p. 25, 1901. Verrill, Trans. Conn. Acad., x, p. 577, 1900 (Bermuda).

Plate XIV, Figure 5.

A small and very rare species. Easily recognizable by its transversely elliptical and smooth carapace. The tips of the chelæ are jet black. The carapace in our specimens, preserved in alcohol for many years, is plain dull yellowish brown. Doubtless it has changed very much. Length of carapace about 8^{mm}, breadth 13.5^{mm}.

This has not been found in any recent collection. Two specimens in the Yale Museum were collected before 1877, by J. M. Jones (No. 3176). One has been given to the U. S. Nat. Museum. They were identified by Miss M. J. Rathbun.

Key West (Kingsley); Cuba (Stimpson); Bahamas; Porto Rico and Jamaica (Rathbun).

Eupanopeus M. J. Rathbun, 1898.

Panopeus (*pars*) H. M.-Edw., Hist. nat. Crust., 1834, and most subsequent writers. Benedict and Rathbun, The Genus Panopeus, 1891.

Eupanopeus M. J. Rathbun, Bull. Labr. Nat. Hist. State Univ., Iowa, iv, p. 273, 1898.

Artificial key to the Bermuda species of Eupanopeus.

A. No well-defined transverse groove near the distal margin of the carpus of the chelipeds.

B. Marginal teeth with front edge inclined forward; ratio of length to breadth of carapace about 1:1.35 to 1:1.50 ..... *Herbstii*

c. Last three marginal teeth acute, subequal in size, cusps of first two, or coalesced tooth, nearly equal in height. Flanks of carapace not convex ..... Var. *Herbstii*

c'. Last three marginal teeth unequal in breadth, not all divergent; cusps of first and second unequal in height. Flanks usually convex.

d. Third tooth notably large, and broadly rounded outwardly. Flanks convex, in a dorsal view. Front 4-lobed. Legs elongated.. Var. *minax*

d'. Third tooth not greatly enlarged; tip incurved or obtuse. Flanks usually somewhat convex. Legs not so elongated..... Var. *obesus*

B'. Marginal teeth thickened, with front edge not much inclined forward; 4th and 5th squarrose. Ratio of length to breadth of carapace about 1:1.30. Edge of front thickened, distinctly four-lobed ..... *americanus**

A'. A distinct transverse groove near distal end of carpus of chelipeds.

C. Third segment of male abdomen reaches coxal joint of 5th pair of legs; front not grooved. Fingers dark. Size rather large.

D. Third marginal tooth broadest, arcuate posteriorly; carpus of chelipeds smooth with deep groove ..... *occidentalis*

D'. Third marginal tooth dentiform, acute; carpus of chelipeds roughened. *serratus*

C'. Third segment of male abdomen does not reach the coxal joint of 5th pair of legs. Front prominent, 4-lobed, grooved. Fingers pale; size small ..... *bermudensis*

Eupanopeus Herbstii (Milne-Edwards), M. J. Rathbun.

Cancer panope Say, Jour. Acad. Nat. Sci. Phila., i, pp. 58, 447, pl. 4, fig. 3, 1817.

Panopeus Herbstii H. M.-Edwards, Hist. Nat. Crust., i, p. 403, 1834. DeKay, Crust. of N. Y., p. 5, pl. ix, fig. 26 (poor), 1844. Gibbes, Proc. Boston Soc. Nat. Hist., ii, pp. 63, 69, 1845. Stimpson, Amer. Jour. Sci. (2), xxix, p. 444, 1860. Smith, Proc. Boston Soc. Nat. Hist., xii, p. 276, 1869; these Trans., ii, p. 34, 1869; Rept. U. S. Comm. Fisheries for 1871–72 (1874), p. 547. Verrill, op. cit., p. 472 [178], 1874. A. M.-Edwards, Miss. Sci. Mexique, pt. 5, i, p. 308, pl. lvii, fig. 2, 1880. R. Rathbun, Fishery Industries of U. S., section i, p. 772, 1884. Benedict and M. J. Rathbun, The Genus Panopeus, Proc. U. S. Nat. Museum, xiv, p. 358, pl. xix, figs. 1, 2; pl. xxii, figs. 10–12, 1891.

Eupanopeus herbstii M. J. Rathbun, Bull. Labr. Nat. Hist. State Univ. of Iowa, iv, p. 273,1898; Proc. Wash. Acad. Sci., ii, p. 140, 1900; Amer. Naturalist, xxxiv, p. 138, 1900; Brach. and Macr. Porto Rico, p. 28, 1901.

Figures 14, *b*, 15. Plate XV, Figures 1, 2, 3; Varieties.

The common and more typical form of this species, which is generally distributed along the eastern coast of the United States, south of Cape Cod, especially on oyster beds, seems to be rather common in Bermuda. Most of the specimens that I have seen belong to this variety. This form, or variety, regarded as typical (var. *Herbstii*) usually has the postero-lateral margins or flanks of the carapace either straight or slight concave, and convergent, while in the other varieties they are usually distinctly convex, giving the posterior half of the outline a more elliptical form. The legs are rather short. The marginal teeth are inclined forward and acute, the third tooth being only a little broader and less acute than the rest, with the

* Not positively known from Bermuda, but perhaps confused with *Herbstii*, from which it differs but slightly.

posterior edge more convex ; the coalesced first and second teeth have the two cusps prominent and nearly equal in height ; the second is obtuse and broader. The front is somewhat produced and is distinctly 4-lobed or sinuous ; the edge is often upturned and granulated in the adults.

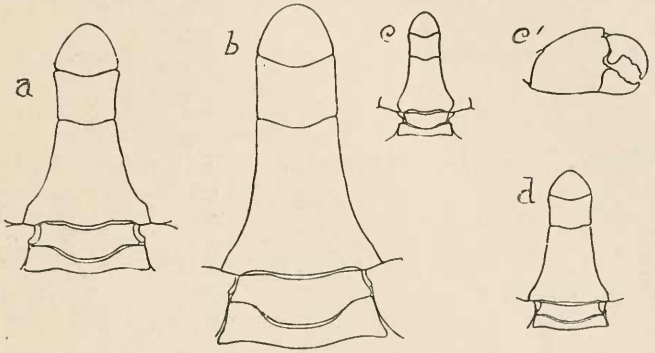

Figure 14.—Male abdomens of *Eupanopeus : a, E. occidentalis* ; *b, E. Herbstii* ; *c, E. bermudensis* ; *c'*, its larger chela ; *d, E. serratus.* All enlarged, after Benedict and Rathbun.

The carpus of the chelipeds is granulated, but nearly smooth to the naked eye, usually with a slight undulation or depression in place of the distal groove, but in some this is entirely obsolete. The carapace is somewhat uneven, with the areolation not much raised but well marked ; slight transverse rugæ are usually present ; the surface is usually finely punctate and granulate, but in some examples it is transversely rugose and more granulose. The color is variable, but usually is yellowish or olive-yellow, mottled more or less thickly with red or red-brown. The fingers are blackish, varying to dark liver-brown, and below, the dark color is apt to extend backward on the manus, a little beyond the base of the dactylus.

A specimen (No. 4016) taken at Long Bird Island, April 19, 1901, in life had the carapace curiously variegated with gray, white, and blackish brown, and with patches of orange in the middle, near the front edge. Chelipeds thickly spotted and specked with bluish gray, and with a patch of orange on the back of the carpus and chela.

The ratio of length to breadth of the carapace, according to the measurements of Prof. S. I. Smith,* varies from 1:1.33 to 1:1.48.

* Proc. Bost. Soc. Nat. History, xii, p. 277.

Our No. 470, which was labelled as *E. Herbstii* by Miss Rathbun, has the ratios 1:1.33. Therefore it has nearly the same proportions as *E. americanus*, in which they are usually about 1:1.3. The difference in form is, therefore, not very reliable. The largest example mentioned by Benedict and Rathbun had the carapace 40mm long and 62mm wide, ratio 1:1.55. It was about the same size as the type of our var. *minax*.

Measurements.

No.	Sex	Carapace length	Carapace breadth	Front between orbits	Chelæ length	Chelæ height	Locality
470	♂	21	28	10	l. 21 r. 19	14 10	Colon
Figd.*	♂	26	35.5	12.5	r. 29 l. 21	18 12	Egmont Key
4042	♀	20	28	11	r. 17 l. 18	7.5 10	Bermuda
4043	♀	17	22.5	9	r. 15	10	"
4018	♂	16	22	9	l. 16	10	
4016		15.5	20.5	8.5	r. 14	8.5	"
41*b*	♂	34.8	50.5	——	r. 35 l. 39	12 22	"

* This belongs to the var. *obesus*. It is the figured specimen, pl. xv, fig. 1.

This is much more active than most species of *Eupanopeus*. In some cases it may be seen actively running about on the stony beaches, as at Spanish Point, in March, 1901, where it was found in considerable numbers and "very lively" by A. H. Verrill. It was not found at any other place in such numbers. These were of medium size and rather bright colors (Nos. 4042, 4043). They were purplish, varied with yellow and yellowish white; on the under side, pale yellow mottled with bright lavender. (A. H. V.)

In the Bermudas it occurs mostly under stones and dead corals on rocky shores and on the reefs. It was obtained by Jones, Goode, Kincaid, and by the Yale parties of 1898 and 1901, but usually in small numbers or singly. This species, as a whole, ranges from Southern New England to Florida, Texas, Colon, and through the West Indies to Brazil (coll. Yale Mus.). It is abundant from Cape Hatteras southward. The typical variety seems to occur, as well as the var. *obesus*, throughout its entire range.

Eupanopeus Herbstii, var. **obesus** (Smith).

Panopeus herbstii, var. *obesus* S. I. Smith, Proc. Boston Soc. Nat. Hist., xii, p. 278, 1869. Coues, Proc. Acad. Nat. Sci. Philad. (3), i, p. 120, 1871. Kingsley, Proc. Acad. Nat. Sci. Philad., p. 318,1878. A. M.-Edwards, Miss. Sci. Mexique, pt. 5, i, p. 309, 1880, pl. lvii, figs. 2, 2*a*. Benedict and Rathbun, The Genus Panopeus, op. cit., p. 359, 1891, pl. xix, fig. 2; pl. xxiii, fig. 11.

FIGURE 14, *b*. PLATE XV, FIGURE 1.

This is an unusual form in collections from Bermuda. It differs from the preceding chiefly in its more elliptical form, due to the convexity of the flanks or posterior branchial areas, a character indicating, perhaps, enlarged gill-chambers and gills. Benedict and Rathbun (op. cit., 1891) state that this variety was found commonly on the Carolina coasts in holes above high tide, and not extending into the water, while the common form was found in the same vicinity on the oyster beds and below tide. This difference in habit may well be associated with a change in the capacity of the branchial chambers. Other characters are found mainly in the marginal teeth. In this form the teeth are broader, blunter, and less prominent; the coalesced first two are more unequal in size and prominence; the third tooth is broader and more arcuate posteriorly.

Measurements of Eupanopeus Herbstii, var. obesus, from Bermuda.

No.	Sex	Carapace length	Carapace breadth	Front between orbits	Chelæ length	Chelæ height
1903*a*	♂	28	39	14	l. 28	15
1903*b*	♀	23.5	33	12	r. 25	12.5
4023		30	42	14	----	----

Prof. Smith's original description was as follows:

"Carapax strongly convex. Front broad, deflexed, not prominent, the edges as seen from above nearly straight, and not at all four-lobed. Post-orbital tooth not prominent, slightly separated from the second normal tooth of the antero-lateral margin by a very shallow sinus; remaining teeth of the margin not very prominent; the third broad, and its outer edge truncate; fourth broad, the anterior edge very short, but slightly hooked forward at the apex, and the outer edge slightly arcuate; last tooth very short, but acute, and its apex slightly curved forward. Inferior regions, chelipeds, etc., very nearly as in *Herbstii.* Color of alcoholic specimens, brownish olive, clouded and spotted with dull red on the anterior part of the carapax, and on the upper side of the chelipeds; fingers black or dark brown, lighter at the tips. In all the specimens the hands are spotted externally with red."

"Length of carapax in a male, 23.6^{mm}; breadth, 33.4^{mm}; ratio, 1:1.41."

"Egmont Key, Fla.; Col. E. Jewett. Aspinwall; F. H. Bradley.

Specimens from Egmont Key appear quite distinct from specimens of *Herbstii* from the same locality, having the carapax broader and much more convex, the teeth of the antero-lateral margin less prominent and somewhat different in form, and the coloration quite different; but specimens of *Herbstii*, in the Society's collection, from Bahama and Florida, approach quite closely to the variety, in the breadth and convexity of the carapax, the form of the teeth of the antero-lateral margin of the carapax, and even slightly in coloration."

The following measurements of three specimens from Maranhao, Brazil (coll. C. F. Hartt, 1870), occur in Prof. Smith's MSS. notes:

No.	Sex	Carapace length	Carapace breadth	Ratio
236*b*	♂	23.7	35.1	1:1.48
232*a*	♀	22.0	33.3	1:1.51
232*b*	♀	18.5	26.9	1:1.45

I have personally examined the original specimens described by Professor Smith (Yale Mus. coll.) and numerous others from various localities, which were also studied by Benedict and Rathbun.

Its range is essentially the same as that of var. *Herbstii*.

Eupanopeus Herbstii, var. or subspecies, **minax**, nov.

Plate XV, Figure 2.

A single large male was taken by us in 1901. This is a large, stout crab, for one of this group. Its legs appear to be relatively longer than in var. *obesus* and other allied forms. Its carapace is convex and more swollen on the flanks, with the postero-marginal outlines decidedly convex, when seen from above. Its antero-marginal teeth are relatively large and more prominent than in the related forms. The coalesced first and second teeth are not very unequal; the first is smaller, short, acute, triangular; the second, which is separated half way to base by a broad, regularly curved notch, is rather larger and broader, concave in front and convex posteriorly. On the left side these teeth are much more unequal, apparently due to some injury to the first. The notch between the second and third is narrow at bottom. The third tooth is especially large, wide, and broadly rounded, or arcuate outwardly; the fourth and fifth teeth have acute tips, directed obliquely outward and upward; the fourth has the anterior edge subtruncate and but little inclined forward, with the posterior edge arcuate; the fifth is a little shorter and narrower, thickened and triquetral at base, with a sharp tip

directed slightly forward. All the teeth have the outer edge thickened and granulous, curved upward. The front is distinctly four-lobed, the outer lobes much the smaller, separated from the inner by a sinuous curve ; inner lobes broadly arcuate, separated by a narrow deep notch ; the edges are thickened and rather coarsely granulous.

The areolation of the carapace is well marked with the areas convex. The surface is rather finely granulose. The chelipeds are very large and strong, with massive unequal chelæ, appearing nearly smooth to the naked eye, but closely and rather finely granulous under a lens, with numerous small shallow unequal pits on the chelæ, which, on the carpus, become shallow transverse or wavy furrows, separated by very slightly elevated finely granulous rugæ. The distal transverse groove is indicated only by a very shallow, ill-defined wave-like depression. The carpal tooth is large and conical. No perceptible dorsal carina on the manus.

The male abdomen differs somewhat from that of var. *Herbstii*, as figured. The penultimate segment is relatively shorter ; it is wider than long, so that the suture between it and the last segment is behind the sternal suture, instead of coincident with it. Its sides and the sides of the distal portion of the preceding segment are nearly paralliel ; last segment broad ovate, rounded at the end, about as broad as long.

Fingers dark horn-color, the dark color of the propodus terminating in a regular curve, convex proximally, a little back of the articulation of the dactylus.

The general color of the upper surface of the dry specimen is dull red, becoming brownish red on the chelæ, and brighter orange-red on the carapace ; under surface dull yellow.

Measurements of type.

Length of carapace	41
Breadth of carapace	62
Front, between orbits	18
Length of right chela	53
Height of right chela	30
Length of merus, right chela	26
Length of left chela	51
Height of left chela	24
Length of merus, left chela	23
Total length of 1st pereiopods	76
Length of merus, 1st pereiopods	25
Length of carpus, extreme	13
Length of propodite, extreme	14
Length of dactylus	17

The type, which is the only specimen known, was caught in a baited fish trap in Harrington Sound, in shallow water, April, 1901.

The specimen which approaches most nearly to the type of this variety is a cast shell, found on the shore (fig. 15) and of which only the carapace was preserved. I have included its measurement with variety *obesus*, however, as a matter of convenience, though it differs from that in having larger and more squarrose marginal teeth, of which the second and third are obtusely rounded; and in having a prominent and distinctly 4-lobed front, as in *minax*, from which it differs, therefore, chiefly in the shorter second and third teeth, and the narrower and more rounded carapace. The flanks were convex and the

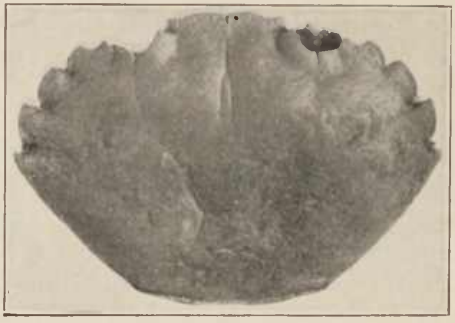

Figure 15.—*Eupanopeus Herbstii* variety *minax*. Carapace of No. 4023, × 1½. Phot. A. H. V.

granulation pretty fine, except on the front. Ratio of length to breadth, 1:1.4; length of carapace 30^{mm}; breadth 42^{mm}; front 14^{mm}.

E. americanus (Saus.) = *E. areolatus* Rath., figure 16, differs very little from some of the forms of this species. Although it averages slightly narrower, there are specimens of *Herbstii* (No. 470 in our collection, see table) as narrow as some of those from Brazil, referred to this species by Miss Rathbun (in Coll. Yale Mus.). The lateral marginal teeth are a little less oblique and less concave in front, but in some specimens this distinction fails; indeed, the teeth of opposite sides of one specimen may sometimes differ considerably in outline, or about as much as the species differ in this particular. But in this form the teeth are more thickened at base above, and are rather more granulous at the edges. The fourth and fifth teeth are more squarrose, and the tips are turned upward. The third tooth often differs but little from the others in size, but its tip bends forward and the outer margin is convex; it is not always as large as

the fourth ; the fifth is often smaller than the fourth. The front is a little more produced in the middle and is more evidently 4-lobed, the outer small lobe being more distinct. The distal groove on the carpus is sometimes distinct, but ill-defined ; in other cases it is lacking ; this variation may occur on the two chelæ of an individual. A Brazilian specimen (No. 236, Yale Mus.), studied both by Prof. Smith and by Miss Rathbun, has the carapace 21^{mm} long ; 28^{mm} wide ; ratio 1:1.33.

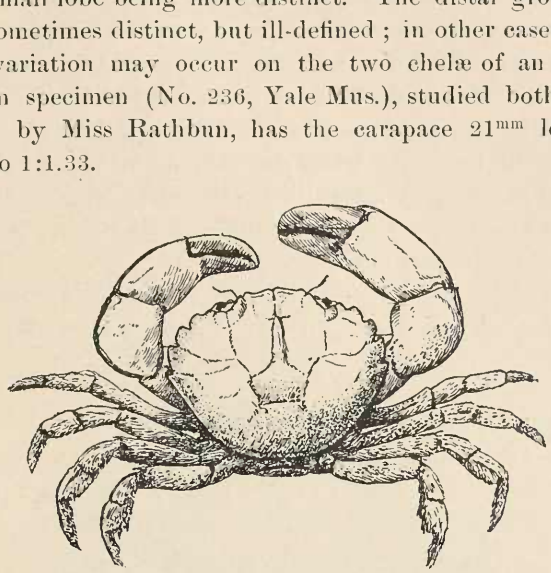

Figure 16.—*Eupanopeus americanus*, nat. size. After Benedict and Rathbun (as *P. areolatus*).

Some of our Bermuda specimens may belong to this species, if it be really distinct.

Eupanopeus occidentalis (Saus.) Rathbun.

Panopeus occidentalis H. de. Saussure, Rev. et Mag. de Zoöl. (2), 9, p. 502, 1857 ; Mem. Soc. Phys. Genève, xiv, p. 431, pl. i, fig. 6, 1857. Stimpson, Amer. Jour. Sci. (2), 27, p. 446, 1859. S. I. Smith, Proc. Boston Soc. Nat. Hist., xii, p. 279, 1869. E. v. Martens, Arch. für Natur., xxxviii, p. 90, 1872. A. M.-Edw., Miss. Sci. au Mexique, pt. 5, i, p. 310, 1880 ; Bull. Mus. Comp. Zoöl., viii, p. 13, 1880. Benedict and Rathbun, Proc. Nat. Mus., xiv, p. 360, pl, xx, fig. 3 ; pl. xxiii, fig. 14, 1891.

Eupanopeus occidentalis Rathbun, Bull. Labr. Nat. Hist. Univ. Iowa, iv, p. 273, 1898 ; Proc. Wash. Acad., ii, p. 140, 1900 ; Crust. Porto Rico, p. 29, 1901.

Figure 17. Plate XVI, Figure 2.

Antero-lateral teeth slightly elevated ; their anterior margins truncate ; the three posterior teeth are pointed ; first tooth separated from the post-ocular tooth by a rather deep sinus, which, however, does not divide the coalesced tooth to its base. Front produced, thin, slightly depressed, with a median fissure, each lobe slightly

emarginate, giving the front a somewhat four-lobed appearance. Median lobes more produced ; lateral lobes faint. Space between the two fissures of the upper orbital margin slightly rounded, interrupting the regular curve of the orbit ; external hiatus widely V-shaped and deep. The inner suborbital angle forms a prominent tooth ; a rather deep sinus divides this from the lobe which reaches to the external fissure ; lower orbital margin produced.

Abdomen of the male wider than in *herbstii*, outline concave, penultimate segment widest at its distal end. Coxæ of fifth pair of feet in broad contact with third abdominal segment. Seventh segment of sternum shows but little.

The marginal depression on the carpus near the articulation with the hand is wide and deep. In some specimens the carpus is finely

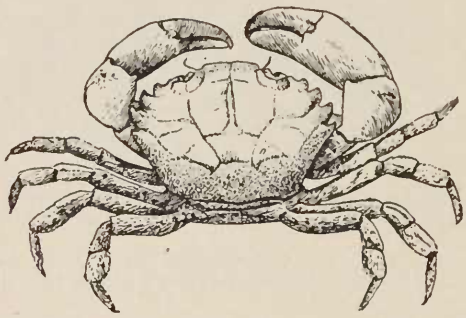

Figure 17.—*Eupanopeus occidentalis*, nat. size. After Benedict and Rathbun.

granulate ; in others the granules are thrown up in slight rugæ. The hand varies in much the same way ; in some specimens finely granulate ; in others, thrown up in rugæ as on the carpus. In the latter case the hand is always much smoother than the carpus in the same specimen. Fingers brown or horn-color, shading to clear white at the tips. There is a large tooth at the base of the dactyl of the large hand.

The color on the immovable finger does not extend beyond the line of color on the movable finger ; while in *Herbstii* it usually extends considerably beyond.

This species closely resembles *E. Herbstii*, as shown by the above description, and is easily confounded with it. The most important distinctive character seems to be the much more distinct distal groove on the carpus, but this varies. In *Herbstii* it is sometimes

evident on one cheliped and entirely lacking on the other, but it is always, when present, ill-defined. The marginal teeth have nearly the same outlines ; the front edge is a little less concave, and consequently the tips are not so much incurved, but this character is also variable in both species. The marginal teeth are, however, thicker vertically. The front is a little more prominent in the middle, and the median notch is less distinct. The specimen figured (No. 3021) was identified and labelled as this species by Miss Rathbun, several years ago. It was collected at Hamilton by Dr. C. Hartt Merriam, April, 1881, and carried eggs. The ratio of length to breadth is 1:1.3.

Measurements.

No.	Sex	Carapace length	Carapace breadth	Front between orbits	Chelæ length	Chelæ height	Locality
3021	♀	17.5	23.5	9	r. 18	10	Bermuda
3264	♂	16	23	8	r. 16 l. 14	9.5 7.5	Florida Keys

This species is not common in Bermuda, and is not contained in most of the collections. It was first obtained by Dr. Merriam, in 1881 (see above).

Its range extends from S. Carolina through the West Indies to Pernambuco, Brazil.

Eupanopeus serratus (Saussure).

Panopeus serratus Saussure, Rev. et Mag. de Zoöl., (2), ix, p. 502, 1857 : Mém. Soc. Phys. Genève, xiv, p. 432, pl. i, fig. 7, 1857. Stimpson, Amer. Jour. Sci. (2), xxvii, p. 446, 1859. Smith, Proc. Boston Soc. Nat. Hist., xii, p. 280, 1869. E. v. Martens. Arch. für Natur., xxxviii, 90, 1872. A. Milne-Edw., Miss. Sci. Mexique, pt. 5, i, p. 311, 1880 ; Bull. Mus. Comp. Zoöl., viii, p. 13, 1880. Benedict and Rathbun, The Genus Panopeus, Proc. U. S. Nat. Mus., xiv, p. 371, pl. xxiv, figs. 3, 4, 1891.

Panopeus Herbstii, var. *serratus* Miers, Rep. Voy. Chall., Zoöl., xvii, p. 129, 1886.

Eupanopeus serratus Rathbun, Bull. Labr. Nat. Hist. Univ. of Iowa, iv, p. 273, 1898.

Figures 14,*d*, 18. Plate XVI, Figures 1, 5.

The following description is that of a young specimen :

Carapace convex, with rather well-marked areolets. Front very little produced, nearly straight, thin, with a line of granules on the edge, giving it a minutely denticulate appearance. Antero-lateral teeth sharp, the posterior three hooked forward. Sinus between the external angle of the orbit and the first tooth deep. External hiatus of orbit a large V-shaped opening. Subhepatic tubercle small but

well defined. Abdomen much like that of *occidentalis*. Seventh segment of sternum exposed. Coxæ of fifth pair of feet in contact with third abdominal segment. Length of carapace of a young specimen, 7mm ; width, 8mm.

Carpus and hand coarsely and densely granulated, rugose above. Carpal spine sharp, pointing forward ; fingers not gaping, a large tooth at the base of the dactyl on the large hand, and a tooth on the hand at the base of the dactyl. (Benedict and Rathbun, abridged.)

Figure 18.—*Eupanopeus serratus*, carapace and chelipeds of No. 3019, Yale Mus., × about 1.10. Phot. A. H. V.

An unusually large male (No. 3019, pl. 16, fig. 5), which was collected by our Yale Exped. of 1898, has been studied by Miss M. J. Rathbun, who furnished the following notes :

"Length 19.3mm, width 27mm, exorbital width 15.9mm. Color in formaline, light red and white mottled ; upper part of chelipeds a darker red ; fingers a light horny brown, terminal third white. Third segment of abdomen reaching the coxæ of the last pair of legs.

This specimen demonstrates conclusively the distinctness of this species from *E. occidentalis ;* all the lateral teeth are narrower and sharper ; the areolations strongly marked ; the surface rougher, the short transverse granulated lines more prominent and more numerous. The chelipeds, also, are rougher, especially the carpus."

A somewhat larger and still better male specimen was taken in 1901. (No. 4068, see pl. xvi, fig. 1.) This, after preservation for a few years in formol, and doubtless much faded, is pale flesh-color and yellowish white, with patches of brighter yellow on the carapace and chelipeds ; the upper parts of the manus and carpus are pale

purple and yellow ; hairs on the legs and carapace yellow ; under parts and front of chelæ white; dactyl and thumb dark horn-color with pale tips.

The areolations of the carapace and the transverse granulated rugæ are even stronger than in the specimen just described, but otherwise the same; the marginal teeth are nearly the same, but a trifle larger and more acute. They are much thickened vertically at base and the posterior ones bend upward ; their edges and bases are thickly covered with strong granulations which bear long hairs ; the posterior tooth has a dorsal carina, granulated on its edge. The transverse ridges of the carapace and especially of the front are strongly granulated and bear long hairs in life. The frontal edge is convex, prominent, granulated, and divided by a narrow median notch ; each lobe is slightly sinuous, with the smaller, faint, outer lobe rounded at the external angle. The outer orbital tooth is prominent and acute, but smaller than the next and well separated from it by a wide concave notch.

An excellent ♀ specimen in the collection of Prof. Kincaid (1903), preserved with glycerine, is pale lemon-yellow with minute specks of red-brown on the carapace and chelæ; larger blotches of the same on the legs ; two brown hepatic patches ; a distal band of paler yellow on the manus ; fingers smoky brown, pale at tips. The carapace in life was covered with rather sparse hairs and small tufts of longer ones ; the legs are hairy and with longer hairs on the front edge. The areolation of the carapace is rather strong, with rather numerous transverse rugæ. The carpus has a deep distal groove and also a series of irregular oblique grooves and granulated broken ridges. The chelæ have a slight dorsal longitudinal groove and very minute granules. (See fig. 5, *b*, pl. xvi.)

Measurements of Bermuda specimens.

No.	Sex	Carapace length	Carapace breadth	Front between orbits	Chelæ length	Chelæ height
3019	♂	19.3	27	9.5	r. 19.5 l. 18.5	11 8
1903*a*	♀	13	19	8	14	7.5
4068	♂	21	30	10.5	r. 24 l. 22	15 10

This appears to be a rather rare species at the Bermudas, or else it has been generally overlooked by collectors. Nor is it common in other regions.

Its known range is not extensive. Florida Keys (Benedict and Rathbun) ; St. Thomas (Smith).

Eupanopeus bermudensis (Ben. and Rath.) Rathbun.

Panopeus bermudensis Benedict and Rathbun, Proc. U. S. Nat. Mus., xiv, p. 376, pl. xx, fig. 2; pl. xxiv, figs. 14, 15, 1891. Rankin, Crust. Berm., p. 528.

Eupanopeus bermudensis Rathbun, Bull. Labr. Nat. Hist. Univ. Iowa, iv, p. 273, 1898; Proc. Wash. Acad. Sci., ii, p. 140, 1900; Brachy. and Macr. Porto Rico, p. 29, 1901.

Panopeus wurdemannii Ben. and Rathbun, The Genus Panopeus, op. cit., p. 372, pl. xxiv, figs. 6, 7, 1891 (*non* Gibbes t. M. J. Rathbun, 1900).

Figures 14, *c*, *c'*. Plate XIV, Figure 9; Plate XVI, Figures 3, 4.

This is a very common species, but small and easily overlooked. In life it is quite variable in colors. Many specimens were variegated with lighter and darker gray; others are olive-green or olive-brown, mottled with paler; some have red-brown patches, other were finely mottled with brown and gray on a whitish ground-color, so as to very closely imitate the color of the sand, etc. of its environment. A few were plain bright red-brown. The colors appear to be highly protective in most cases. The fingers are somewhat variable in color, but are usually pale, sometimes with a smoky brown tinge, especially on the proximal half.

The following is condensed from the detailed original description:

Carapace distinctly areolated, posteriorly as well as anteriorly; areolations with transverse lines and occasional small clusters of granules. Front much produced, rather deeply cleft in the center, the cleft rounding out into the median lobes which are produced at this point; outer angles of the front not produced in some specimens, and slightly in others; edge of front oblique, thickened; densely granulate, and showing a slight marginal groove; two fissures on the upper orbital margin.

First and second [post-orbital] teeth of the antero-lateral margin flat and thin; third and fourth thickened, with anterior margins concave and hollowed. The sulcus of the coalesced tooth varies greatly with the specimen. Second [post-orbital] tooth the largest, separated from the first by a wide and deep notch; its margin straight, pointing slightly forward and not at all hooked. The third tooth is much narrower than the second, and its posterior margin curves gradually backward to the bottom of the notch; fourth tooth much the smallest, sharp pointed, and directed nearly perpendicular to the median line.

Outline of male abdomen slightly concave. First and third segments comparatively narrow and of about equal width. Second

segment much narrower, showing the sternal plates. Coxæ of fifth pair of feet not in contact with anchylosed segment.

Carpi, chelipeds, and bases of the dactyls finely granulate; carpal depression well defined along the margin, and extending around to the tooth on the inner angle. Large cheliped very deep and rather thick ; fingers light brown ; in some specimens white. Ambulatory feet slender; dactyls very slender and hairy. (Bened. and Rathbun, abridged.)

The larger specimens and many of the smaller ones have the areolations of the carapace very conspicuous, and the transverse ridges are high and sharply cut or nearly perpendicular on the anterior side, with the crest granulated ; but in some specimens the ridges are obtuse with the front side sloping. The dorsal side of the carpus of the chelæ, especially of the smaller one, is grooved and roughened and often bears two or three rounded tubercles. The dactylus is strangely grooved above, or slightly bicarinate.

Measurements of Bermuda specimens.

No.	Sex	Carapace length	Carapace breadth	Front between orbits	Chelæ length	Chelæ height
4017*a*	♂	9	12	5.5	r. 10.5	5.5
4617*b*	♀	8	10.5	5	r. 7.5	4.5
——	♂	8	11	4.5	——	——
——	♀	6.5	8.5	4	6.5	3.5

Variety **sculptus,** nov. Plate xvi, figure 3.

The strongly sculptured specimens differ so much in appearance from the smoother ones that they might easily be mistaken for a distinct species, especially as they usually have also stronger marginal teeth, and the carpi of the chelipeds are rougher with about three small rounded tubercles, which are lacking in the smoother form.

The coalesced post-orbital tooth is often distinctly divided into two subequal denticles by a rounded notch ; in others the notch is very shallow, while in some it is lacking so that the whole forms a rounded or subtruncate lobe. I have, however, found these extreme variations on the opposite sides of a single individual.

This little species is very common at Bermuda, under stones at low-tide and in shallow water dredgings. It is often associated with the young of *Leptodius floridanus*, of the same sizes, which it often closely resembles, in form, in the areolations, and in the mar-

ginal denticles. But the latter, even when not over 8 to 10^{mm} across the carapace, has the tips of the chelæ concave or spoon-like; the post-orbital tooth is not coalescent with the next, and the front is a little more evidently bilobed.

The original types of this species were from Bermuda (coll. Goode, 1877). It was in the collection of J. M. Jones, and has been obtained by nearly all later collectors. We found it abundant in 1898 and 1901, at low-tide, associated with the young of several other species. Some specimens taken in April carried eggs, although less than 8^{mm} long (see No. 3280*a*, fig. 4, pl. xvi).

Its range extends from Florida to Maceio, Brazil. (Porto Rico and Maceio, Rathbun.)

Eurytium limosum (Say) Stimpson.

Cancer limosa Say, Jour. Acad. Nat. Sci. Philad., i, p. 446, 1817.

Panopeus limosus Milne-Edw., Hist. Nat. des Crust., i, p. 404, 1834. De Kay, Crust. of N. Y., p. 5, 1844. Gibbes, Proc. Acad. Nat. Sci. Philad., v, p. 23, 1850. Lucas, Hist. nat. des Crust., p. 90, 1851. Benedict and Rathbun, op. cit., p. 379, 1891.

Eurytium limosum Stimpson, Ann. Lyc. Nat. Hist., vii, p. 56, 1859, Kingsley, Proc. Acad. Nat. Sci. Philad., p. 319, 1878; xxxi, p. 394, 1879. A. Milne-Edw., Miss. Sci. Mexique, pt. 5, i, p. 332, pl. lx, fig. 2, 2*a*, 1880. Miers, Voy. Challenger, Zoöl., xvii, p. 141, 1886 (Bermuda). M. J. Rathbun, Amer. Naturalist, xxxiv, p. 128, 1900. Brach. and Macr. Porto Rico, p. 41, 1901.

Figure 19. Plate XIV, Figure 10.

Carapace very convex longitudinally, nearly straight transversely. Front much deflexed, composed of two lobes, the inner and outer angles alike and evenly rounded. A slight emargination in the coalesced tooth. Second tooth semi-lobate; third and fourth short, pointed, triangular. Carpal groove wanting. Fingers evenly dentate. In the larger cheliped there is a slight tooth on the dactyl, and also one on the manus. Appendages of male abdomen very much like those of *herbstii*.

In the fresh state this species is readily recognized and separated from all other crabs by the color. Carapace, a brilliant purplish blue; carpus and hand, bluish; proximal upper half of the dactyls of chelipeds, pink; remainder of fingers, porcelain white; lower portion of chelipeds and carpal tooth, orange-yellow. (Benedict and Rathbun, abridged.)

Length of carapace of a large specimen, 28^{mm}; width, 42.5^{mm}. The ♂ specimen from Bahia (pl. xiv, fig. 9, No. 4028) has the carapace 9^{mm} long, 14^{mm} wide; front 5^{mm}; larger chela 10^{mm} long, 5^{mm} high.

This interesting species appears to be rare at Bermuda, but this may be due to its living in places seldom visited by collectors. It usually inhabits holes excavated in the muddy or marshy banks of inlets, about high-tide level. It was recorded from Bermuda by Miers, in Voyage "Challenger"; taken in the mangrove swamp at Hungry Bay. It was not in the earlier collections of Jones and Goode, nor was it taken by us, in 1898 and 1901. It is not in the later collections that I have examined.

Its range extends from New Jersey to Florida, and through the West Indies to Bahia, Brazil. S. Carolina (Stimpson); Sarasota Bay, Fla., (Kingsley); Bahia (R. Rathbun). New York to Brazil (Rankin; M. J. Rathbun). St. Augustine and Cedar Key, Fla. (Yale Mus.).

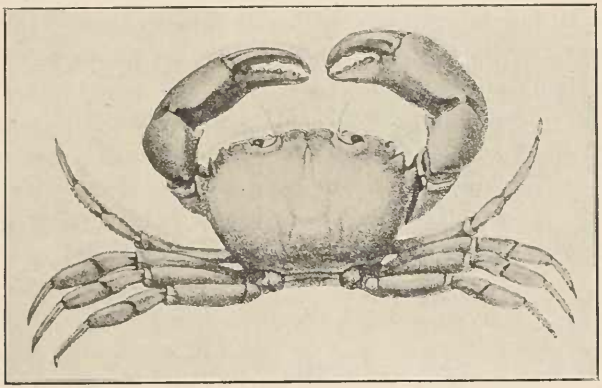

Figure 19.—*Eurytium limosum*, nat. size. After A. M.-Edw.

Lobopilumnus Agassizii (Stimp.) A. M.-Edw.

Pilumnus Agassizii Stimpson, Bull. Mus. Comp. Zool., ii, p. 142, 1870.

Lobopilumnus pulchellus A. M.-Edw., Exped. Miss. Sci. Mex., p. 299, pl. lii, fig. 5, 1880 (t. M. J. R.).

Lobopilumnus Agassizii M. J. Rathbun, Bull. Labr. Nat. Hist. Univ. Iowa, iv, p. 269, 1898; Amer. Naturalist, xxxiv, p. 139, 1900. Rankin, Crust. Bermuda I., p. 529.

Plate XIV, Figures 1, 2 (Variety).

The typical form of this species is not common at the Bermudas. Some of our specimens, taken in 1898 and 1901, appear to belong to it.

According to Miss Rathbun (op. cit., p. 269), the form described and figured by A. M.-Edw., in 1880, as *L. pulchellus* is the typical form of *L. Agassizii*, while his *L. Agassizii* is the peculiar variety (*bermudensis*). The latter is the prevailing form at the Bermudas.

The types of Stimpson were from off the Tortugas, in 5 to 13 fathoms.

Lobopilumnus Agassizii (Stimp.), var. **bermudensis** Rathbun.

Lobopilumnus Agassizii A. M.-Edw., Miss. Sci. Mex., v, p. 298, pl. lii, figs. 4–4*c*, 1880 (t. Miss Rathbun). Rankin, op. cit., p. 529, 1900.

Lobopilumnus Agassizii, var. *bermudensis* M. J. Rathbun, Bull. Labr. Nat. Hist. Univ. Iowa, iv, p. 268, 1898.

Plate XIV, Figures 1, 2.

This crab is easily recognized by its rough hairy carapace, sharp, divergent, marginal teeth, denticulated frontal lobes, and the thickly tuberculated chelæ. The larger granules, which occur in clusters on the dorsal eminences, around the bases of the marginal spines, and on the front, bear long hairs, while a thick close coating of short hairs covers the intervening spaces. When cleaned, the general color of fresh specimens is yellowish or salmon; the fingers are black.

When living the carapace and legs are often rather thickly covered, and sometimes almost concealed, by a coating of whitish calcareous mud and sand that adheres to the hairs that cover the back. This is evidently a good protection against its enemies. Some of our specimens, taken in April and May, carried eggs (Nos. 3123, 4010, 4011).

Measurements of Bermuda specimens.

No.	Sex	Carapace length	Carapace breadth	Front between orbits	Chelæ length	Chelæ height
4010	♀ eggs	15	21	9.5	r. 14 l. 12	9 7
4011	♀ eggs	18	24	10	l. 15	9
3123*	♀ eggs	18.5	26	11	r. 17	11
3167	♂ dry	23	32	12	r. 26 l. 23	17 13
3136	♂ dry	16	22	9	15.5	9
3031†	♀ dry, fig.	20	27	11	l. 19	11
4088	♂	25	34	--	r. 27 l. 24	18 14
1903	♂	23	29	12	20	11.5

* This is the specimen figured on pl. xiv, fig. 2.

† This is the original of pl. xiv, fig. 1.

It is most frequently found under stones and dead corals. One specimen was taken from the base of a gorgonian (*Verrucella grandis*), brought up from over 100 feet of water, outside the reefs (No. 4012). Common, both on the reefs and rocky shores, at low-tide.

It was in the early collections of J. M. Jones and G. B. Goode, in the Yale Museum. Florida and Bermuda (A. M.-Edw., from coll. Yale Mus.). Bermuda (Miss Rathbun). It is also in the 1905 collection of the Field Mus. Nat. History, and in that of Prof. T. Kincaid, 1903.

Pilumnus spinipes (A. M.-Edw.) Rathbun.

Micropanope spinipes A. M.-Edw., Miss. Sci., Mexico, v, i, p. 326, pl. liv, figs. 3–3*c*, 1880. (Abrolhos Is., Brazil, 30 fath.).

Pilumnus spinipes Rathbun, Bull. Labr. Nat. Hist. Univ. Iowa, iv, p. 264, 1898. Verrill, these Trans., vol. v, p. 577 (Bermuda).

Figure 20. Plate XXVI, Figure 1.

A male (No. 3119, Yale Mus., pl. xxvi, fig. 1) and a female of this rare species were taken by our party in 1898. They have been studied by Miss M. J. Rathbun, who furnished the following notes on them: "The ♂ is 7.2^{mm} long and 10.2^{mm} wide. The outer face of the hands in the male is almost entirely smooth, as in the ♀, only the upper and proximal portion being spinulous; the outer and upper surface of the wrists is entirely covered with spinules or sharp granules. The upper surface of the carapace is rough with scaly granules, which, on the hepatic region, are developed into sharper and higher projections. The lobes of the front slope backward a little from the middle, where they are separated by a V-shaped notch; the margins of the lobes are nearly straight, and the little tooth next the orbit is scarcely separated from the rest of the margin. The outer orbital tooth and the next antero-lateral tooth are very small, but plainly marked and acute; below and between them there is a sharp subhepatic tubercle; the last three antero-lateral projections are sharp subequal spines. The ambulatory legs are very slender."

To these characters it may be added that the front is strongly bent downward, and there is a narrow transverse ridge at the bend, nearly parallel with the edge; the upper margins of the orbits are minutely denticulate; the sharp granules of the carapace and chelæ bear hairs, while many much finer hairs arise between them; the legs are covered above with long slender hairs; their merus joints have a row of small sharp spines along the front edge; the carpal joint of the chelipeds has a distal transverse groove, and two sharp spines on the anterior edge; the manus of the smaller chela has a slight dorsal groove bordered by rows of sharp granules; the dactylus has two distinct dorsal grooves, and the thumb one on each side, below. On the larger chela, which is much stouter, the grooves are

less evident. The large chela, in the specimen described (No. 3119), is 9.5^{mm} long; 4^{mm} high.

The color of the male, after being a short time in formalin, was pale buff on the upper side of the carapace and legs; chelæ yellowish or salmon on the palm, with a white patch preceded by a yellow one at the base of the claws, which were umber-brown.

The figure given by M.-Edwards, from which our fig. 20 was copied, is not very exact. The lateral teeth are too large and the two small post-ocular ones are omitted. The carapace, also, is more swollen laterally and wider posteriorly than in our specimens, so that the proportions are different.

Our two specimens are the only ones known from Bermuda. It occurs in the West Indies and as far south as the Abrolhos Reefs, Brazil (Edwards).

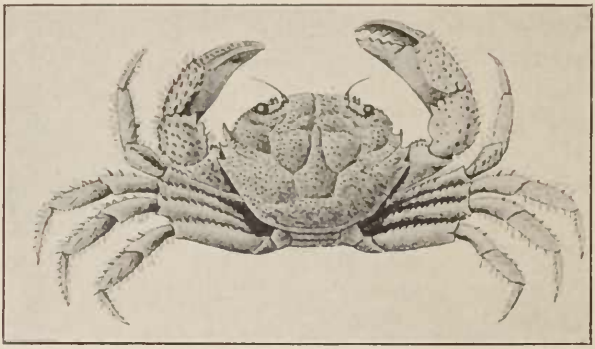

Figure 20.—*Pilumnus spinipes*, ♀, ×2½ times. After A. M.-Edw.

Eriphia gonagra Edwards.

Cancer gonagra Fabricius, Suppl. Ent. syst., p. 337, 1798.

Eriphia gonagra M.-Edwards, Hist. nat. Crust., i, p. 426, pl. xvi, figs. 16, 17, 1834; Ann. Sci. nat., 3, xvi, pl. 8, fig. 10, 1851. Gibbes, op. cit., p. 177. Dana, U. S. Expl. Exped. Crust., p. 250. Stimpson, Annals Lyc. Nat. Hist., New York, vol. vii, p. 217. Heller, Reise Fregatte Novara, p. 24, 1865. Smith, Crustacea of Brazil, these Trans., ii, p. 7, 1869 (measurements). Kingsley, Proc. Acad. Nat. Sci. Philad., for 1878, p. 397. A. M.-Edw., Miss. Sci. Mex., v. p. 238, pl. lvi, figs. 4–4*b*. Miers, Voy. Chall., xvii, p. 163. Rankin, op. cit., p. 527. M. J. Rathbun, Proc. Wash. Acad. Sci., ii, p. 141, 1900 (descr. colors); Brach. and Macr. Porto Rico, p. 42, 1901 (descr.).

Plate XIV, Figure 3.

This species is easily recognized by the regularly and strongly tuberculated chelæ, while the central part of the back of the cara-

pace is nearly smooth, and in life is gayly colored, but the colors are variable. Some of our specimens were colored as follows: "Carapace mottled with green and pink on a gray ground color. Chelæ nearly white, with the round tubercles of the upper side dark green, becoming yellow; dactyl and end of thumb chocolate-brown; ambulatory legs yellow, conspicuously banded with reddish brown, each band formed by numerous minute, red-brown spots. Under surfaces white (C. S. V.). These gay colors appear to be protective when in its natural environment, among bright colored sponges, algæ, etc., on the reefs.

The ratio of length to breadth of the carapace varies from 1:4 to 1:5.

Measurements of Bermuda specimens.

No.	Sex	Carapace length	Carapace breadth	Front between orbits	Chelæ length	Chelæ height
89*a*	♂	25	35	18	r. 28 l. 12.5	r. 15 l. 11
89*b*	♂	24.5	34	18	28	15
89*c*	♀ eggs	23	32	17	24	14
4009	♀ fig.	14	21	10.5	r. 19 l. 12	9 7
1903	♂	18.5	26	14	r. 20.5	11.5

Nos. 89*a*–89*c* were collected in the autumn of 1905, at Nonesuch I., by the Field N. H. Mus. expedition. No. 89*c* carried a large mass of eggs. No. 4009 is the figured specimen.

It lives mostly under large loose stones and dead masses of corals, both on the reefs and on the rocky shores. Several good specimens were taken by our Yale parties, both in 1898 and 1901. It had previously been taken by Mr. Goode, Mr. J. M. Jones, and others. It was also in the 1903 collections of the Biological Station and of Prof. Kincaid.

Rankin reported two specimens with ova taken in the summer of 1897.

It has a wide range, from S. Carolina and the Florida Keys to Rio, Brazil (Smith); Abrolhos Reefs, Brazil (Smith). Bahamas (Rankin); Porto Rico (Rathbun); S. Carolina (Rankin); Indian Key, Fla. (Yale Mus.). Pernambuco and Maceio, Brazil (Rathbun); Rio Janeiro (Dana; Heller); Colon (Yale Mus.).

Domecia hispida Eyd. and Soul.

Domecia hispida Eydoux and Souleyet, Voy. Bonite, i, Crust., p. 325, 1842, Atlas, pl. ii, figs. 5–10. Dana, U. S. Expl. Exped., Crust., p. 251, 1852. Stimpson, Annals Lyc. Nat. Hist. N. York, vii, p. 218 [90], 1860; Bull. Mus. Comp. Zool., ii, p. 145. A. M.-Edw., Miss. Sci. Mexico, Crust., p. 345, pl. lviii, figs. 2–2*d*, 1880. M. J. Rathbun, Bull. Labr. Nat. Hist. Univ. Iowa, iv, p. 276, 1898; Branner-Agassiz Exped. Brazil, p. 141, 1900; Brach. and Anomura, Porto Rico, p. 43, 1901.

Eupilumnus Websteri Kingsley, Proc. Acad. Nat. Sci. Philad., for 1879, p. 383 (descr. of young, Florida, t. M. J. R.). Generic name was preoccupied.

FIGURE 21.

This is a very small species, covered above with pale hairs. Length of carapace about 6.6^{mm}; breadth, 9.50. The color in life is light yellowish red, with the spines blackish; front darker.

It appears to be very rare in Bermuda. It lives between branches of corals and in holes in dead corals and stones. One small specimen, taken at Bermuda, was identified by Miss Rathbun.

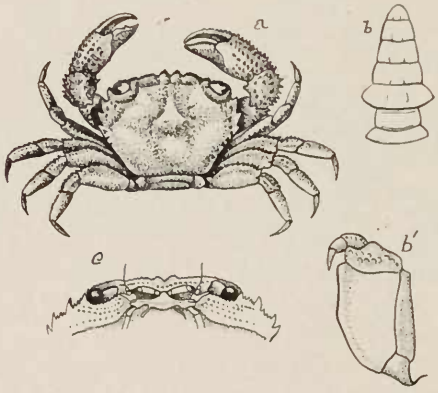

Figure 21.—*Domecia hispida*, male, enlarged; *b*, abdomen of male; *c*, front and antennal area; *b'*, outer maxilliped. After A. M.-Edwards.

It is very widely distributed in all tropical seas. Florida to Brazil; Hawaiian Is.; East Indies; Indian Ocean; Senegal; Cape Verde Is.; Maceio and Pernambuco, Brazil (Rathbun); Florida and Cuba (Stimpson). Gulf of California and Panama, between branches of *Pocillopora* (Yale Mus.).

Family, **PORTUNIDÆ** Leach, 1819. Swimming Crabs.

Of this extensive family, only twelve species have been collected hitherto at the Bermudas, and of these four* have not been previ-

* Namely: *Callinectes marginatus*, *C. Danæ*, *Achelous Smithii*, and *Charybdella tumidula*.

ously recorded. No doubt others can be obtained by using small-meshed seines in the shallow bays, and by the use of trawl-nets in deeper water.

We should naturally expect to find there *Charybdella rubra*, *Arenæus cribrarius*, *Achelous spinicarpus*, and *Achelous sulcatus*, all of which are found at least as far north as the Georgia and Carolina coasts, and part of them as far north as Cape Hatteras.

Analytical Table of the Bermuda Genera.

A.—Abdomen of male T-shaped; carapace wide, thick, and strong; marginal teeth 8, besides outer orbital, all except last subequal; 8th stout and sharp ..... *Callinectes*

A'.—Abdomen of male not T-shaped; carapace weaker, less thick; chelæ slender, prismatic.

B.—Marginal teeth 8, subequal, except last, which is generally longer or stouter; flagellum of antennæ included in the orbit, the antennal notch wide.

C.—Carapace convex, nearly smooth, glossy; ambulatory legs remiform and fringed; swimming legs without longitudinal ribs and grooves on merus and carpus: merus of maxillipeds not prolonged ..... *Portunus*

C'.—Carapace more depressed, usually with granulated transverse ridges, and covered with short scale-like hairs; ambulatory legs tapered, not evidently remiform; swimming legs flat, strengthened with longitudinal ribs and hairy grooves on most or all the segments except basal, which is transversely grooved; merus flat; merus of maxillipeds prolonged beyond insertion of flagellum ..... *Acheloüs*

B'.—Marginal teeth 8, alternately larger and smaller; last one not much elongated; flagellum of antennæ wholly or partly excluded from orbit; antennal notch of orbit narrow ..... *Charybdella*

Callinectes Ordway, 1863.

This genus embraces a considerable number of species of large, very active, predaceous swimming crabs, most of which are American, but a few occur on the West coast of Africa. They occur on both coasts of America, in the temperate and tropical zones. Nearly all the species are valued as food.

The common "blue crab" or "edible crab" of the eastern coast of the United States (*C. sapidus*, formerly *C. diacanthus*) is the type. The species resemble each other pretty closely, and can best be distinguished, in doubtful cases, by the form and length of the male generative appendages, as was first pointed out by Ordway, in his monograph of the genus.

Four species have been taken at the Bermudas, but only one (*C. ornatus*) is common. Other species, especially *C. tumidus*, may be expected to occur, when the fauna becomes more fully known.

Analytical Table of the Bermuda species of Callinectes.

A.—Frontal teeth four, not counting inner orbitals.

B.—Intramedial gastric area broad and short; ratio of length to breadth about 1:3; male appendages not very short; tips crossed ..... *ornatus*

B′.—Intramedial area longer and less broad; length to breadth about 1:2.

C.—Male appendages very short, scarcely exceeding 3d abdominal segment. *marginatus*

C′.—Male appendages much exceeding 3d abdominal segment; tips straight, not crossed ..... *Danæ*

A′.—Frontal teeth two, not counting the inner orbitals; male appendages very long, about reaching end of abdomen, tips divergent ..... *sapidus*

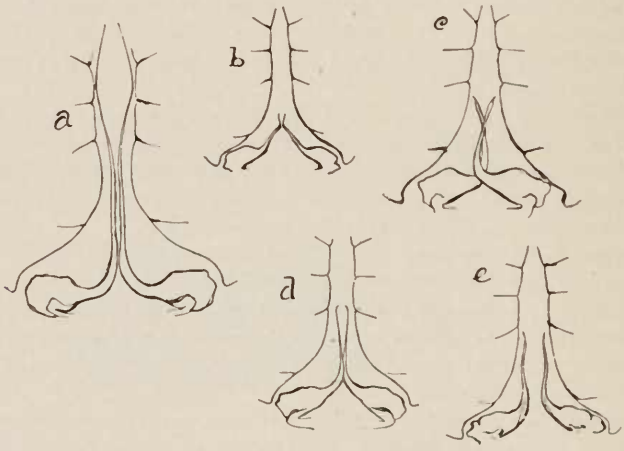

Figure 22.—Male generative appendages (verges) of *Callinectes: a*, of *E. sapidus; b*, of *C. marginatus; c*, of *C. ornatus; d*, of *C. Danæ; e*, of *C. tumidus*. All these are West Indian species. After M. J. Rathbun.

Callinectes ornatus Ordway. *Edible Crab.*

Callinectus ornatus Ordway, Boston Journ. Nat. Hist., vol. vii, p. 571, 1863. Smith, Crust. Brazil, these Trans., ii, p. 8, 1869 (descr.). A. M.-Edw., Miss. Sci. Mex., v, p. 225, 1879 (as var. of *diacanthus*). Smith, Annual Rep. U. S. Fish Comm., for 1885, p. 29, 1886. Rankin, Annals N. York Acad. Sci., xii, p. 529. Rathbun, The Genus Callinectes, Proc. U. S. Nat. Mus., xviii, p. 356, pl. xv (general); pl. xxiv, fig. 3, pl. xxv, fig. 2, pl. xxvi, fig. 2, pl. xxvii, fig. 2 (details), 1896; vol. xxi, p. 596; Brach. and Macr. Porto Rico, p. 48, 1901 (descr.); Amer. Naturalist, xxxiv, p. 140.

Figures 22*c*, 23*b*. Plate XVII, Figure 1. Plate XXI, Figure 2.

This species can easily be distinguished from most of the others of this genus by the four prominent, frontal teeth; those of the antero-lateral margins are rather long, nearly straight and acute. The ambulatory legs are long and slender. The carapace is convex.

The colors of the adults, especially of the males, are often handsome, but are variable. Frequently the carapace is dull olive or olive-brown, usually with a large, ill-defined, roundish spot of orange or orange-red on each side posteriorly; the lateral spines and denticles light blue or whitish; eye-stalks purple. Chelipeds proximally similar to carapace, with the spines pale blue and joints red, with blue spots; inner surface of palm of chela with a large bright blue patch, bordered with purple; digits mostly purple, tipped with red. Ambulatory legs bright blue above, with a band of scarlet at each joint and a patch of paler blue or green on the posterior and lower side of each segment; tarsi red. Swimming legs similar in color, but with the red articular bands wider; a patch of yellow or orange on each segment; terminal segment bright scarlet on the distal half, separated from the blue proximal portion by a band of orange. Abdomen posteriorly light blue.

23 24

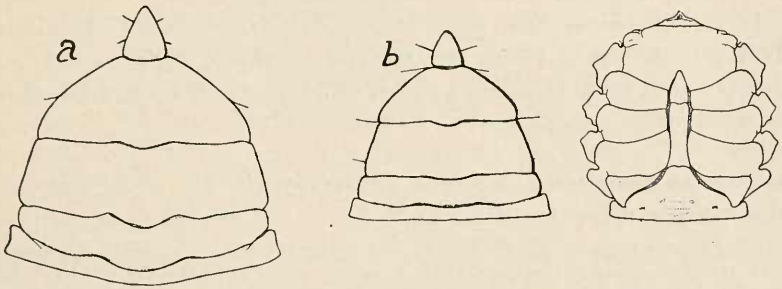

Figure 23.—Abdomens of female *Callinectes; a*, of *C. sapidus; b*, of *C. ornatus.*
Figure 24.—Abdomen of a male *Callinectes sapidus*, ⅔ nat. size.

Many specimens are much less brilliantly colored. Some are mottled with lighter and darker olive on the carapace. The young are usually rather dull or plain olive-yellow; some are light olive or greenish above. Albino specimens often occur in which the entire carapace and legs are pale gray or nearly white, or in which white is the prevailing color.

One large dark male had the carapace, above, dull dark brown, the long postero-lateral spines, as well as the others, with white tips. Chelæ purplish brown, above; inner lateral and lower surfaces white, except inner surfaces of finger and thumb, which were deep purple. Ambulatory legs dark blue and brown both above and below, with whitish bands at the joints beneath. Swimming legs dark bluish brown, with a central yellowish white patch on outside of each segment, except the last, which is bright brownish red.

Measurements of Bermuda specimens.

No.	Sex	Carapace l'gth	Carapace br'dth total	Carapace br'dth spines	Front bet. orbits	Chelæ l'gth	Chelæ h'ght	Central gastric area l'gth	Central gastric area br'dth
4041	♀	39	73	63	13	r. 39	14	--	--
4039*a*	♂	50	101	85	17	r. 59 / l. 52	18 / 14	7.5	21
4039*b*	♂	47	99	83	17	r. 59	16	7	21
4039*c*	♂	42	92	75	15	r. 53 / l. 55	13.5 / 15	6	18.5
4039*d*	♂	35	75	59	13	r. 38.5	12	5	15
158 F	♂	14	31.5	23.5	6	13	4		

We found this species very common at Bermuda in the shallow water of inlets and bays, especially at Hungry Bay, in March and April, 1901. Also at Castle Harbor, Long Bird I., etc. It was contained in the earlier collections of J. M. Jones, G. B. Goode, and others. In the 1905 collection of the Field Nat. Hist. Museum, there are many fine specimens from St. Davids I., Hermit Bay, etc. One of the latter, only 13.5^{mm} long, carried eggs.

Its range extends from Cape Hatteras to Brazil. Off C. Hatteras, 14 fath. Abrolhos Reefs and Caravellas, Brazil (Smith); S. Carolina (Ordway); St. Catharine, Brazil (M.-Edw.). Florida (Stimpson). Victoria, Brazil (Rathbun).

Callinectes marginatus (M.-Edw.), var. **larvatus** (Ord.). *Edible Crab.*

Neptunus marginatus A. Milne-Edw., Nouv Arch. Mus. Hist. Nat. Paris, x, p. 318, pl. xxx, fig. 2, 1861* (*t.* M. J. Rathbun)..

Callinectes larvatus Ordway, Jour. Boston Nat. Hist. Soc., vii, p. 573, 1863. Smith, these Trans., ii, p. 9, 1869 (Brazil). M. J. Rathbun, The Genus Callinectes, Proc. Nat. Mus., xviii, p. 358, pl. xvii, xxiv, f. 5, xxv, f. 4, xxvi, f. 4, xxvii, f. 4, 1895. Rankin, Crust. from Bahamas, Annals N. Y. Acad. Sci., xi, p. 232, 1898.

Callinectes marginatus M. J. Rathbun, Proc. Biol. Soc. Wash., xi, p. 149, 1897; Proc. Wash. Acad. Sci., ii, p. 142, 1900. Brach. and Macr. Porto Rico, p. 48, 1901.

Figure 22*b*. Plate XVIII, Figure 1.

This is closely allied to *C. Danæ*, of the West Indies and Brazil. The latter has straighter and more equilateral marginal teeth and the male generative appendages are longer and different in form.

It also closely resembles *C. ornatus* in most respects. It can best be distinguished by the longer and narrower intramedial gastric area of the carapace, which is only about twice as broad as long. The

* This species was based on a small sterile female (figured as a male) from W. Africa. Prof. S. I. Smith first referred it to *Callinectes*, with some doubt, in 1869.

marginal teeth and frontal lobes are very similar to those of *C. ornatus*, but in this the two middle frontal lobes are a little more prominent. The basal appendages of the male abdomen are unusually short and small, and quite unlike those of the other species. (See fig. 22, *b*.) Its colors in life were not noted.

Measurements.

No.	Sex	Carapace l'gth	Carapace breadth total	Carapace breadth —spines	Front bet. orbits	Chelæ length	Chelæ height	Locality
1735	♂	42	90	77	16	r. 58 l. 55	r. 20 l. 16	Key West, Fla.
1903*b* fig.	♂	20	41	34	7	r. 21	6.5	Bermuda
1427	♂	47	99	84	28	r. 66 l. 64	23 18	Florida

On No. 1735, the intramedial gastric area is 7.5^{mm} long in middle; 16^{mm} broad anteriorly, In 1903*b*, it is 3.75^{mm} by 8^{mm}; in 1427, it is 8^{mm} long, by 20 broad at widest part anteriorly.

A rather large specimen was in the collection of Mr. Goode (1876). Several young were obtained in the summer of 1903 by the Bermuda Biological Station. It ranges from Florida to Bahia, Brazil (Smith). It is common and used as food in some of the West Indies. Dominica I., common (A. H. Verrill, 1906). On the west coast of Africa, from Cape Verde Islands to St. Paul de Loanda (Rathbun). Pernambuco, Maceio, etc., Brazil (Rathbun). Ordway's types of *C. larvatus* were from Florida, Bahamas, and Hayti.

The type of *N. marginatus* (Edw.) was from West Africa. It was a barren or immature female with no very evident characters, as figured, to identify it with this species. This determination was made by Miss Rathbun.*

* I am not convinced of the correctness of this determination. The latter, as described and figured, has a broader carapace; ratio, as described, 1:2.17, as figured, 1:2.33, while in our *C. larvatus*, of similar size, it is 1:2.05; the merus of the maxillipeds has a decided notch at the insertion of the palpus, to which Edwards particularly refers; in *larvatus* the notch is not evident. The transverse granulated ridge of the carapace, from the anterior base of the lateral spines, curves much farther forward than in *C. larvatus*. It seems to me more probable that *marginatus* is a distinct but closely allied African species.

However Miss Rathbun has recorded additional specimens of *C. marginatus* from several localities on the W. African coast and Cape Verde Islands (op. cit., p. 291, 1900), but she has neither figured nor described the African specimens. Meantime, I prefer to retain *larvatus* as a name for the American form.

Callinectes Danæ Smith.

Lupa diacantha Dana, Crust. U. S. Expl. Exped. i, p. 272, 1852, Atlas, pl. xvi, fig. 7, 1855.

Callinectes diacanthus Ordway, op. cit., p. 575, 1863 (*non* Latr. sp.).

Callinectes Danæ Smith, these Trans., ii, p. 7, 1869 (measurements). M. J. Rathbun, The Genus Callinectes, Proc. U. S. Nat. Mus., xviii, p. 357, pl. xvi, pl. xxiv, fig. 4, xxv, fig. 3, xxvi, fig. 3, xxvii, fig. 3, 1895 (descr.); Brach. and Macrura, Porto Rico, p. 4, 1901 (descr).

Figure 22, *d*.

The carapace of this species closely resembles that of *C. marginatus*, but the male is easily distinguished by the form of the male verges (see fig. 22, *d*). The female abdomen is narrower than in the other species. The carapace is rather strongly granulated. The five antero-marginal teeth, following the orbital, are all similar, broad at base, with sharp acuminate tips, their two edges nearly equal, and scarcely bent forward, granulated and hairy on the bases; the two succeeding teeth are still more acute and more squarrose; the last tooth is more than three times the length of the preceding. The front has four lobes, the two inner much smaller than the others, obtuse; the outer ones prominent, subacute; preorbital tooth about equal in size and more acute.

The length to breadth of the carapace varies from 1:2.08 to 1:2.26, Our Bermuda specimen has the carapace 32^{mm} long; 66^{mm} wide (total); 53^{mm} wide without spines.

The only Bermuda specimen examined was a male collected long ago by J. M. Jones (coll. Yale Mus.). Its range is from Florida to Rio, Brazil. Pernambuco and Bahia, Brazil (Smith); Rio Janeiro (Dana). Porto Rico (Rathbun).

Callinectes sapidus Rathbun. *Blue Crab; Edible Crab* of the northern United States.

Portunus hastatus (*pars*) Fabr., Supl. Ent. Syst., p. 367.

Portunus diacanthus (*pars*) Latr., Encycl. Meth., x, p. 190, 1825.

Lupa hastata Say, Journ. Acad. Nat. Sci. Phila., i, p. 65, 1818. Desm. Consid. Gen. Crust., p. 98.

Lupa diacantha (*pars*) H. M.-Edw., Hist. nat. Crust. i, p. 451, 1835; Dekay Zoöl. N. York, Crust., p. 10, pl. iii, fig. 2 (*non* Dana).

Neptunus diacanthus (*pars*) A. M.-Edw., Nouv. Arch. Mus. N. Hist., x, p. 316, pl. xxx, fig. 1–1*c*, 1861.

Callinectes diacanthus (*pars*), var. *hastatus* A. M.-Edw., Miss. Sci. Mex., v, pp. 223, 224, 1879.

Callinectes sapidus M. J. Rathbun, The Genus Callinectes, Proc. U. S. Nat. Mus., xviii, p. 352, pl. xii, pl. xxiv, fig. 1, pl. xxv, fig. 1, pl. xxvi, fig. 1, pl. xvii, fig. 1 (details), pp. 368–373 (habits), 1896; Amer. Naturalist, xxxiv, p. 140, fig. 3, 1900.

W. P. Hay, The Life History of the Blue Crab (*Callinectes sapidus*). Appendix to Annual Report of the Com. of Fisheries for 1904, pp. 397–413, 4 plates, 1905 (habits; moulting, breeding, etc.).

Callinectes hastatus Ordway, op. cit., p. 568. S. I. Smith, these Trans., vol. v, p. 33: Report Invert. Vineyard Sound, etc., p. 548. Verrill, Rep. Invert. Vineyard Sound, pp. 367, 468, 1873 (habits). R. Rathbun, Fisheries and Fishery Industries of the U. States, Crustacea, Part V, sec. i, pp. 775–778, pl. 267 (habits and statistics), 1884; sect. v, vol. ii, pp. 629–648, 1887.

Paulmier, F. C., Higher Crustacea of New York City, New York State Museum, Bulletin 91, Zoölogy 12, p. 142, fig. 11, 1905.

FIGURES 22*a*, 23*a*, 24. PLATE XVII, FIGURE 2.

In this species the adult males are handsomely marked by bright blue on the chelipeds, legs, and margins of the carapace, the greater part of the dorsal surface of the carapace being green. In the adult female a dull red usually takes the place of the blue of the male.

According to observations first made on this crab by Professor Louis Agassiz, about 1860, it has interesting courting habits.*

Probably the bright blue ornamentation of the male is due to sexual selection, for the male, during his courtship, stands on the tips of his legs, and "dances" or struts in front of the female, with his claws outspread to display his charms. The rival males, also, are belligerent at such times.

An account of the courting and pairing habits was quoted by Miss Rathbun (The Genus Callinectes, p. 369) from a long letter on the habits of this crab by Hon. John D. Mitchell, of Victoria, Texas, which agrees closely with the account by Agassiz.

He states that the sexually mature females are in their third summer. Meeting one of these, the adult male "will elevate himself on the tips of his legs, getting as high from the ground as possible, extend his claws to their widest extent, supporting himself with his paddles, and in this position he will strut slowly and pompously in front of her. Should another male appear, a battle ensues. The sexual act lasts from three to six hours."

* Professor Agassiz then described in detail these phenomena and other habits of this crab to me and several of my classmates, his special students. He stated that they were new observations that he had just made on the south coast of New England, and in which he was then very much interested. I wrote out his observations in a diary that I kept at that time and preserved for many years. I am not aware that he ever published these observations.

According to Prof. W. P. Hay (op. cit., p. 405) the male takes possession of the young female, shortly before she is to moult into the adult condition, and carries her around with him until she is ready to moult, when he places her in a safe retreat and stands guard over her during the moulting. As soon as this is accomplished he immediately copulates with her and carries her away, remaining with her for "a day or two" or until her shell hardens.

That large numbers of males are taken in spring, each carrying a female with him (called "doublers" by the fishermen), is well known. But it is probable that only a part pair in this way, and that both accounts are correct.

Professor Hay thinks the females neither pair nor produce eggs but once, dying soon afterwards. This belief rests on very insufficient evidence. Most of the larger species of crabs are found carrying eggs at various stages of growth, and females of this crab, of at least two different sizes, are often found with eggs. In dissecting large numbers, during many years of instruction of students in my zoölogical laboratory, we have found large numbers of large size, and apparently more than three years old, containing fully developed ova, in early spring, indicating that the females breed at least twice, like the males. Perhaps these older females are the ones before whom the males perform their courtship dances. This matter needs much more careful investigation, under very favorable conditions, before it can be considered as settled.

This species and probably other allied crabs, can readily be put into a limp and helpless condition, apparently like the hypnotic state of man, by gently and continuously rubbing the carapace, over the region of the heart, in a particular way. I have often made the most pugnacious and active adult males perfectly docile in this way in a few minutes, and if the treatment be carried further, they soon become limp and helpless, as if dead, remaining where placed for some time. They soon spontaneously recover their activity, if left to themselves. I have often done this, as long ago as 1870.

This performance is generally a great surprise even to the fishermen who have handled crabs all their lives, for it does not seem to be generally known.

Our largest specimen (No. 1712, var. *acutidens* ♂) is from Nassau, N. P. Length of carapace, 185^{mm}; total breadth, 204^{mm}; less spines, 152^{mm}; between orbits, 25^{mm}; length of larger (left) chela, 116^{mm}; its height, 32^{mm}. The lateral teeth are very acute.

This species appears to be very rare, if not accidental, at Bermuda. It has been recorded by Miss Rathbun as in the Mus. Comp.

Zoölogy, from the collection of A. S. Bickmore, made about 1862. We were unable to find it or learn of its presence there, nor has it occurred in any of the other Bermuda collections that I have seen.* It is the common edible crab of the Atlantic coast, abundant from Southern New England to Florida, Louisiana and Texas.

It ranges to Brazil.† Rio Grande (Miss Rathbun ; also in Yale Mus.). It often ascends estuaries to points where the water is very brackish. Very abundant in Chesapeake Bay, where it is fished on a great scale.

Portunus Fabr. and **Achelous** De Haän, 1833.

Some of the distinctions between *Portunus* (Fabr., 1798, as now restricted) and *Acheloüs* (type *A. spinimanus*) are neither very definite nor constant. The species intergrade in some of the characters. In respect to the form of the carapace, which in typical *Portunus* is more broadly arched, "the center of the arc near the posterior end," the proportions change greatly with the growth. Young specimens of some species would thus fall in one group (*Acheloüs*) and the broader adults in the other. *A. anceps*, of the sizes usually taken, is nearly intermediate in form, if the long lateral spines be not reckoned in the measurements, but it lacks the flat remiform front legs of *Sayi*.

In *P. Sayi*, however, we see a distinctly remiform character of the anterior two pairs of ambulatory legs. They have the basal joint and merus smooth and nearly terete, while the three terminal segments are much flattened and strongly fringed with hairs on the edge, thus adapting them specially for swimming. This would seem to be a true generic character, for in the species of typical *Acheloüs* the distal segments of the legs are tapered and grooved, with the dactylus slender and sharp, and therefore adapted for walking.

To this may be added the character of the merus of the outer maxillipeds, which in *Acheloüs* is prolonged beyond the insertion of the palpus and is angular outwardly, while in *P. Sayi* it is not pro-

* Mr. Witmer Stone, in Heilprin's "Bermuda Is.," p. 147, recorded two small males of "*Neptunus hastatus*." They may have been *Portunus Sayi* or *Callinectes ornatus*, but probably not this species.

Hurdis, Rough Notes and Mem., 1897, p. 361, gives *Lupa diacantha* as a Bermuda species in his brief list of Crustacea, but his names of the Crustacea are very unreliable. (See Bibliography, below.)

† Miss Rathbun (1896) established a variety or subspecies *acutidens* for a South American form, having sharper lateral teeth. This variety extends from the Bahamas to Rio Janeiro.

longed and is rounded distally. Hence I am disposed to consider the group including *P. Sayi* a distinct genus.

In these characters this species agrees with *P. pelagicus*, the type of the genus. I have compared it with a number of characteristic specimens of the latter from Japan. (Yale Mus., coll. E. S. Morse.)

Charybdella M. J. Rathbun, 1897=*Cronius* Stimpson, 1860 (name preoccupied).

This genus was established for *C. rubra*, as the only species. The latter, which is a common West Indian and Florida species, differs from our species of *Acheloüs* in several important characters. Its outer maxillipeds have the merus short; the manus of the chelipeds bears three distal spines; the antero-marginal teeth are alternately larger and smaller; the antennal sinus of the orbit is much contracted; the inner orbital tooth is deeply bilobed. But the *Charybdella tumidula*, referred later to the same genus by Miss Rathbun, would seem to go about as well in *Acheloüs*, where it had previously been placed, for its characters are partly intermediate between the two genera. In most respects it is very closely related to *A. Gibbesii*, which it closely resembles in the strong areolation of the carapace; the frontal denticles; and bilobed interorbitals; the distal denticulation of the merus of the swimming feet, etc. But owing mainly to the alternation of large and small marginal teeth, I have left it in *Charybdella*. The characters of the antennal sinus and antennæ are intermediate.

Some special diagnostic characters of the Bermuda species (and some others nearly allied) of Portunus, Acheloüs, and Charybdella.

1.—Carapace convex, nearly smooth, glossy, with feeble areolations and few hairs ..... *Sayi*

2.—Lateral marginal teeth alternately distinctly larger and smaller. *tumidula; rubra*

3.—Posterior corners of carapace distinctly angular ..... *spinicarpus*

4.—Posterior lateral marginal spine scarcely longer than the rest ..... *depressifrons*

5.—Inner orbital tooth bilobed, so that the front has eight teeth or lobes between the orbits, counting the inner orbitals. *tumidula; rubra; Smithii; Gibbesii* (bilobing feeble); *spinimanus*

6.—Carapace when fresh having a pair of well defined, round, ocellated, red spots on the flanks ..... *Sebæ*

7.—Carapace having a pair of ill defined red or brownish spots on the flanks. *tumidula*

8.—One or two round silvery spots on each side of carapace, near bases of marginal spines ..... *Gibbesii*

9.—Merus of chelipeds having five or six spines on the inner margin. *Gibbesii; rubra* (not always); *Sebæ; depressifrons; spinimanus* (sometimes).

10.—Posterior distal spine of merus of chelipeds obsolete or reduced to a tubercle ..... *tumidula ; depressifrons ; Sayi*

11.—Manus of chelipeds with two distal spines, one behind the other. *anceps ; (ventralis) ; sulcatus ; Sebæ*

12.—Manus with three distal spines, each on a different rib ..... *rubra*

13.—Manus with a brilliant silvery or iridescent area on the superior outer surface ..... *Ordwayi*

14.—Inner spine of carpus more than half as long as manus ..... *spinicarpus*

15.—Ambulatory legs long, oar-like, with the three distal segments wider, much flattened, and strongly fringed on the under margin ..... *Sayi*

16.—Swimming (posterior) leg with an erect acute spine on the basal joint. *Sebæ*

17.—Swimming legs having the posterior distal end of merus angular and armed with a sharp spine ..... *spinimanus* (spine small) ; *rubra ; Sebæ*

18.—The same, armed with a row of small, often unequal denticles. *spinimanus ; Smithii ; tumidula ; Gibbesii ; Ordwayi*

Analytical table of the Bermuda species of Portunus, Achelous, and Charybdella.

A. Frontal teeth six, counting the inner orbitals, which are not bilobed.

B. Anterior ambulatory legs remiform with the distal segments flat and strongly fringed ; merus not flat nor fringed. Carapace wide, with margin broadly arched in front ..... Genus *Portunus*

b. Carapace nearly smooth, glossy, not pubescent ..... *Sayi*

B′. Anterior legs adapted for walking, not distinctly remiform, nor much flattened distally ; dactylus slender. Carapace margin more narrowly arched anteriorly ; dorsal surface strongly areolated or sculptured, usually closely covered with short hairs ..... Genus *Acheloüs*

C. Posterior lateral tooth distinctly longer than those in front of it.

D. Basal joint of posterior legs with a sharp erect spine ; also a straight spine on outer distal angle of its merus. Four inner frontal spines prominent. A pair of round red spots on the flanks ..... *Sebæ*

D′. Basal joint of posterior legs without a spine ; no large spine on its merus.

E. Chelæ with a smooth, iridescent area on upper outer surface of manus ; a single distal spine on manus ; four inner frontal teeth prominent .. *Ordwayi*

E′. Chelæ without an iridescent area.

F. Chelæ with two distal spines on manus, one before the other ; posterior lateral tooth elongated, spiniform ..... *anceps*

C′. Posterior lateral tooth little or not at all larger than the others. Chelæ with a single distal spine on manus. Frontal teeth very short, middle two much smaller ..... *depressifrons*

A′. Frontal teeth eight, counting the inner orbitals, which are bilobed, each as two. Carapace sculptured, closely pubescent ; posterior lateral tooth moderately elongated ..... Genera *Acheloüs* (*pars*) and *Charybdella*

F. Antero-marginal teeth, except last, equal or nearly so.

G. Two interior frontal teeth decidedly more prominent than the others. *spinimanus*

G′. Two interior frontal teeth scarcely more prominent than the others .. *Smithii*

F′. Antero-marginal teeth unequal, alternately larger and smaller ... *C. tumidula*

Portunus Sayi (Gibbes) Rathbun.

Portunus pelagicus Bosc, Hist. nat. des Crust., p. 219, pl. v, fig. 3, 1805.

Lupa pelagica Say, Jour. Acad. Nat. Sci. Philad., i, p. 97, 1817. DeKay, Nat. Hist. New York, Crust., p. 11, pl. vi, fig. 8, 1844 (*non* Linn, spec., *nec* Fabr.).

Lupa Sayi Gibbes, Proc. Amer. Assoc. Adv. Sci., 3d meeting, p. 178, 1850. Dana, U. S. Expl. Exped. Crust., p. 273, pl. xvi, fig. 8, 1852. Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 38.

Neptunus Sayi Stimpson, Ann. Lyc. Nat. Hist. New York, vii, p. 220 (92), 1860; Bulletin Mus. Comp. Zoöl., i, p. 147, 1870. A. Milne-Edw., Nouv. Arch. du Mus. d'Hist. Nat., x, p. 317, pl. xxix, figs. 2, 2*a*, 2*b*, 1861. Smith and Harger, Trans. Conn. Acad., iii, p. 26, 1874. Kingsley, Proc. Acad. Nat. Sci. Philad., 1878, p. 319, 1878; op. cit., for 1879, p. 398. A. M.-Edw., Miss. Sci. Mex., v, p. 210, 1879. Smith, these Trans., v, p. 121, 1879.

Portunus Sayi M. J. Rathbun, Bull. Labr. Nat. Hist. Univ. Iowa, p. 276, 1898; Amer. Nat., xxxiv, p. 140, 1900.

? Neptunus hastatus W. Stone, in Heilprin's Berm. I., p. 147 (*non* Linné sp.).

Figure 25. Plate XVIII, Figure 1. Plate XXI, Figure 1.

This has the anterior ambulatory legs longer, and decidedly more flattened and fringed more strongly with long hairs on the distal

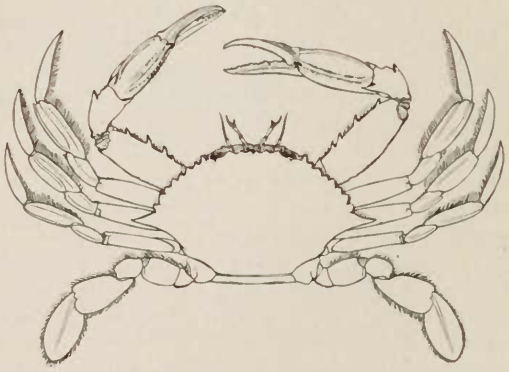

Figure 25.—*Portunus Sayi*, ½ nat. size. Drawing by J. H. Emerton, from nature.

joints than any other of our allied species, and its swimming legs are long and thick, in accordance with its more strictly oceanic habits. The merus and carpal joints of the swimming legs, also, are smooth, ovate, and thickened, and the basal joints are longer than usual. It is an active swimmer. The carapace is smoother than in the other Bermuda species. In addition to these characters, it has, as other diagnostic characters, four small, but nearly equally prominent and regular frontal teeth; the inner ones rather smaller and

narrower; the posterior lateral tooth is stout, thickened, excavate on the front edge; the other lateral teeth are regular, triangular, nearly equilateral, not much inclined forward.

The ratio of length to breadth of carapace, not including lateral spines, is about 1: 1.60.

The inner orbital tooth is usually simple, but in one case (4036*b*) it was bilobed on one side, entire on the other.

Measurements.

		Carapace			Front	Chalæ		
No.	Sex	l'gth	br'dth total	br'dth —spines	bet. orbits	length	height —spines	Locality
11074*a*	♀ eggs	30	61	48	11	r. 35.5 l. 34.0	9.5 8.5	Off Hatteras
11074*b*	♂	31	62	53	10	r. 46	10	Off Hatteras
4036 fig.	♂	22.5	44	36	9	31	7.0	Off N. Jersey
4036*b*	♀ eggs	23	46	38	10	27	7.5	Off N. Jersey
1903*a*	♀ eggs	17	34	21	8	r. 19	5.5	Bermuda
1903*b*	♂ juv.	14	26	21.5	5.5	17	4.0	Bermuda

No. 1903*a*, with few eggs, was taken by the Biological Station party in July, 1900. The specimen (No. 4036*b*), carrying eggs, was taken in July, 1883, by the "Albatross." No. 11074*a* was taken Sept. 21.

This is one of the numerous species of invertebrates that have acquired the habit of living normally among the masses of floating "gulf-weed" or *Sargassum*, etc., in mid-ocean, and especially along the course of the Gulf Stream. Like most of the other animals associated with it, this crab has colors imitative of the gulf-weed and the whitish patches of encrusting bryozoa (*Biflusta*), so common on the gulf-weed. The whitish patches of bryozoa look much like the pale patches on the back of the crab, while the olive-green and brown mottled colors of the latter are like those of the plants. It is, however, able to leave the gulf-weed and swim rapidly for some distance. Perhaps it does not come ashore at the Bermudas except when cast on the shores in masses of gulf-weed, etc. Most of those collected, if not all, have thus occurred. It is usually associated, in such cases, with *Planes minutus*, *Leander tenuicornis*, and other species having the same mode of life.

It was in the collection of Mr. Goode, 1876. We took it, in the same way, in 1898 and 1901. Young specimens were contained in the collections of the Bermuda Biological Station, obtained in the summer of 1903, associated with *Planes*.

It is often carried northward in the Gulf Stream to Cape Cod, St. Georges Bank, and even off Nova Scotia. Prof. Smith took it in

N. lat. 41° 30′, in *Sargassum*, 1872. Southward it is abundant along the Gulf Stream to Florida, Cuba, and the Gulf of Mexico. Few of the Bermuda specimens carried eggs; most are quite young.

Achelous anceps (Saus.) Stimpson.

Lupea anceps Saussure, Crust. Antilles, Mex., Mem. Soc. Phys. Hist. Nat., Genève, xiv, p. 434 [18], pl. ii, fig. 11–11*b*, 1858 (Cuba).

Neptunus anceps A. M.-Edw., Arch. Mus. Nat. Hist., x, p. 328, 1861; Miss. Sci. Mex., v, p. 213, 1879. Rankin, Ann. N. York Acad. Sci., xii, p. 530, 1900. S. I. Smith, Annual Rep. U. S. Fish Comm. for 1895, p. [30], 1886 (Cape Hatteras).

Lupa Duchassagni Desb. and Schramm, Crust. Guadeloupe, p. 39, pl. iv, fig. 25 (*t.* Stimpson).

Portunus (*Achelous*) *anceps* (*pars*) M. J. Rathbun,* Amer. Naturalist, vol. xxxiv, p. 140.

Neptunus ventralis A. M.-Edw., Exp. Sci. Mex., v, pl. xi, fig. 3, 1879. Rathbun, Brach. and Macr. Porto Rico, p. 45.

Acheloüs anceps Stimpson, Ann. Lyc. Nat. Hist. N. York, p. 113, 1871.

Figure 26. Plate XX, Figures 1, 2. Plate XXVII, Figure 4.

This species is easily recognizable by the long, sharp, posterior lateral spines; the four very short, obtuse, unequal frontal teeth; and

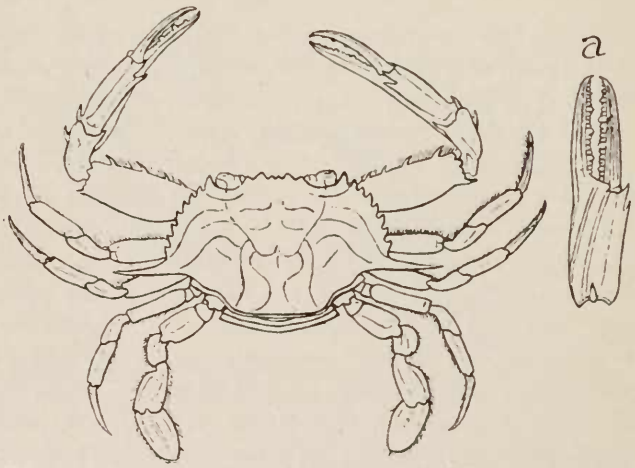

Figure 26.—*Acheloüs anceps*, female, enlarged 1½ times; *a*, chela. After Saussure.

the two distal spines, one behind the other, on the chelæ, besides other obvious characters. The two middle frontal teeth are much smaller than the others. The lateral teeth are acute and curve

* Miss Rathbun (loc. cit.), in her analytical table, placed *anceps* in a group with short posterior lateral spines. She informs me that she then had another species in mind.

forward. This appears to be a small species. The Bermuda specimens taken in Castle Harbor, March and April, 1901, were all small; in life the carapace was usually mottled with gray and yellowish white, so as to imitate the color of the sand pretty closely. The first pair of ambulatory legs in some were yellow, in others red; the chelipeds and other legs had, in part, the same colors. Perhaps the difference was sexual; both sexes were in the lot noted.

The colors soon fade in alcohol or formol to uniform yellowish or salmon, with a tinge of red on the tips of the chelæ. The ratio of length to breadth, less spines, is from 1:1.5 to 1:1.60. All our specimens are small, but apparently about adult, as several carry eggs.

Measurements of specimens.

		Carapace			Front	Chelæ		
No.	Sex	length	breadth total	br'dth —spines	bet. orbits	length	height	Locality
4038, fig.		12	24	18	5.5	17	3.5	Bermuda
4044	♂	13	26	20	5.5	19	3.5	Bermuda
4045*a*	♀ eggs	13	25	19	5	17.5	3.5	Off Hatteras
4045*b*	♀ eggs	12.5	25	19	5	16	4.25	Off Hatteras

Our largest male has the carapace 16^{mm} long and 32^{mm} wide, including the lateral spines, or 24^{mm} without the spines.

One Bermuda specimen, taken in April (No. 4060) carried eggs. Similar specimens were taken in a seine at Nonesuch I., Sept. 4, 1905, by the party from the Field Mus. Nat. History (No. 158), one of which carried a large mass of eggs, indicating sexual maturity, but probably not full size.

Specimens taken in 7 fathoms, off Cape Hatteras, by the "Albatross," station 2288, Oct. 20, 1884, average a little larger. Three of them (No. 4045, *a*, *b*, *c*) carried large clusters of eggs; these were all 12 to 14^{mm} in length of carapace.

It is not uncommon at Bermuda, in the shallow waters of sheltered sandy bays. Our specimens were taken in March and April, mostly in Hungry Bay and at "Waterloo," near Walsingham Bay, Castle Harbor.

Its known range is from the Antilles to Cape Hatteras. Off C. Hatteras, 7–16 fathoms (Smith).

It seems to me probable that *N. ventralis* A. M.-Edw. (op. cit., fig. 3) is identical with this species, with which it agrees in nearly all details. Miss Rathbun gives measurements of *ventralis* from Porto Rico as follows: length of carapace, 15^{mm}; total breadth, 30^{mm}; breadth less spines, 23.7^{mm}. The proportions, therefore, are the same as some of those in my table.

Achelous Sebæ (H. M.-Edw.) Smith.

Portunus sanguinolentus (*pars*) Latreille, Encyc. Method., pl. 272, fig. 6. (*non* Herbst sp. *nec* Stimpson).

Lupa Sebæ H. M.-Edw., Hist. Nat. Crust., i, p. 455, 1834.

Neptunus Sebæ A. M.-Edw., Arch. Mus. Hist. Nat., x, p. 329, pl. xxviii, figs. 2, 2*a*, 1861; Miss. Sci. Mex., v, p. 217, 1879.

Achelous Sebæ S. I. Smith, Crust. Brazil, these Trans., ii, p. 34, 1869 (Brazil).

Portunus (*Achelous*) *Sebæ* Rathbun, Brach. and Macr. Porto Rico, p. 46, 1901.

FIGURE 27.

This fine species grows to large size. It is easily recognized by an upright, acute spine on the basal joint of the posterior legs, and a small spinule on the outer distal angle of the merus joint of the same legs; and when recent by a pair of large round red spots on the flanks of the carapace. But these spots are liable to fade in alcohol, and in dry specimens exposed to light, becoming pale yellow.

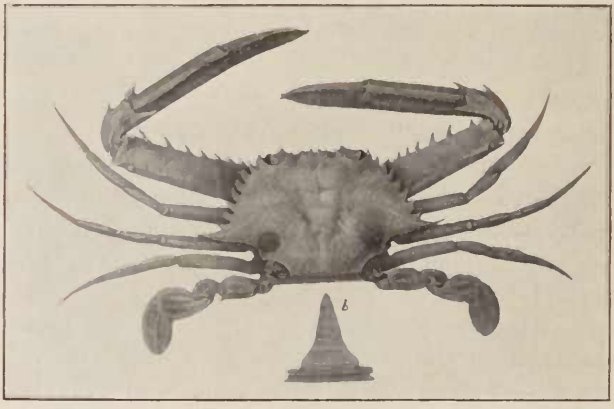

Figure 27.—*Achelous Sebæ*, about ⅓ nat. size; *b*, abdomen of male. After A. M.-Edwards.

It is said to be the only species having an upright spine on the basal joint of the swimming legs.

The chelæ have two distal dorsal spines, one behind the other. The middle two frontal teeth are a little more prominent than the outer ones, which are more acute. The inner orbital tooth is acute. The posterior lateral tooth is sharp, rather long, somewhat curved forward, and bears the small preceding tooth on the inner basal portion.

In life the carapace and legs are closely pubescent and the legs and chelipeds are fringed with longer red hairs. The merus of the

chelipeds has six sharp spines on its anterior edge with a close fringe of long red hairs above, and a smaller one below them ; it has also a sharp distal spine on the posterior side. There are three sharp dorsal spines on the manus : the proximal at the joint, one sharp and curved toward the distal end, and a smaller one at the extreme end. Carpal spines two, very sharp. Nearly all the spines are red at base with a pale middle band and darker tip. The dactylus has a dorsal fringe of red hairs. The general color of preserved specimens is pale orange yellow ; three faint reddish bands on the legs and chelæ ; fingers red.

Measurements.

No.	Sex	Carapace length	Carapace breadth total	Carapace breadth —spines	Front between orbits	Chelæ length	Chelæ height	Locality
47*	♀	45.2	89	—	—	r. 56 / l. 60		Bermuda
4084*a*	♂	45	91	69	20	r. 69 / l. 68	r. 15 / l. 14	Dominica

* No. 47 was measured by Prof. S. I. Smith (Goode's coll.).

This species has rarely been taken in the Bermudas. An adult female was obtained by Mr. G. B. Goode in 1876 (coll. Wesleyan Univ.). It probably lives in rather deep water. Large specimens collected at Dominica I., Antilles, in 1906, were taken in fish-nets, in shallow water (A. H. Verrill, Yale Mus.).

Its range extends from North Carolina through the West Indies to Brazil. Martinique and Brazil (Edw.) ; Porto Rico (Rathbun).

Achelous Ordwayi Stimp. *Silvery-clawed Crab.*

Achelous Ordwayi Stimpson, Notes on N. Amer. Crust., ii, p. 96 [224], 1860 (Florida and St. Thomas) ; Bulletin Mus. Comp. Zoöl., ii, p. 148. S. I. Smith, Brazilian Crustacea, these Trans., ii, p. 9, 1869 (descr.).

Neptunus Ordwayi A. M.-Edw., Arch. Mus., p. 450, 1861, Addenda ; Miss. Sci. Mex., p. 217, pl. xl, fig. 2–2*b*, 1879.

Portunus (*Achelous*) *Ordwayi* M. J. Rathbun, Bulletin Labr. Nat. Hist. Univ. Iowa, 1898, p. 276; Brach. and Macr. Porto Rico, p. 46, 1901.

Figures 28, 29. Plate XVIII, Figure 3.

This species is easily recognized by the smooth silvery or iridescent area on the outer surface of the chelæ. The four frontal teeth are narrow, prominent, and subacute ; the inner orbital tooth is simple, triangular and acute. The posterior lateral tooth is larger than the others, but not very long ; it is sharp and curves forward ; all the other teeth curve forward. The carapace and legs are pubescent

in life, and the legs are fringed with longer hairs; the hairs on the front edge of the merus of the chelipeds are red and long, forming a close fringe concealing the four large spines; there is another fringe of long hairs near the lower edge. The manus has but one distal spine, and a long proximal spine at the carpal articulation. The manus lacks the subdorsal ridge present in the other species, its place being covered by the iridescent patch; the dorsal ridge is subcarinate; its edge is obtuse and fringed with a row of red hairs on each side; it terminates in a strong sharp spine, slightly hooked inward, situated at about the distal fourth of the edge.

The areolations of the middle of the carapace, on perfect dry specimens, from which the pubescence has not been rubbed, form a rather conspicuous and curious face-like or mask-like figure, more noticeable than in the allied species.

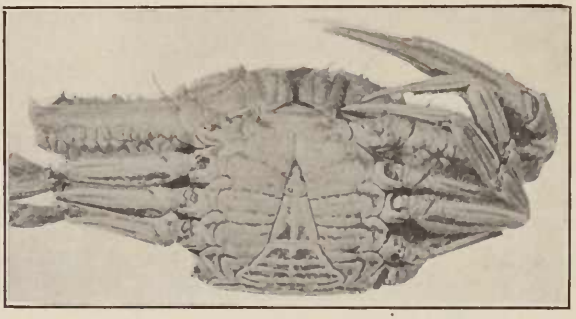

Figure 28.—*Achelous Ordwayi*, under side of carapace of male, nat. size. Phot. A. H. V.

Specimens, with the carapace 32 to 38^{mm} long, taken April, 1901, in Castle Harbor, were in life more highly colored than the smaller ones. The carapace and legs were finely and elaborately variegated and mottled with red, yellowish brown and gray, producing the general effect of reddish brown. A small whitish spot, bordered with brown, appeared behind the bases of the posterior lateral spines. The under side was pale orange, pinkish around the mouth, deeper orange on the chelipeds and legs; and with some spots of orange-brown on the basal segments of the abdomen. The chelæ, above, were deep red-brown, the fingers crossed by two light orange-red bands; the iridescent area on the outer surface reflected prismatic colors, but especially green, red, and silvery tints. The iridescent

areas may be of use in attracting the sexes in the pairing season, but perhaps they may also serve for a lure to attract small fishes, or other prey. We had no opportunity to study this matter. One would naturally suppose that they might also attract enemies in the shape of larger predacious fishes, many of which are well known to be attracted by a white or bright metallic bait. But it must happen that the advantage gained is more than the disadvantage, or else the species would have become extinct.

Younger specimens, noted by my son, C. S. Verrill, in April, 1898, had the following colors in life: Carapace light gray, with darker shades over the cardiac region, and around the edges of the carapace. Ventral surfaces white. Chelipeds light gray, purple at the joints.

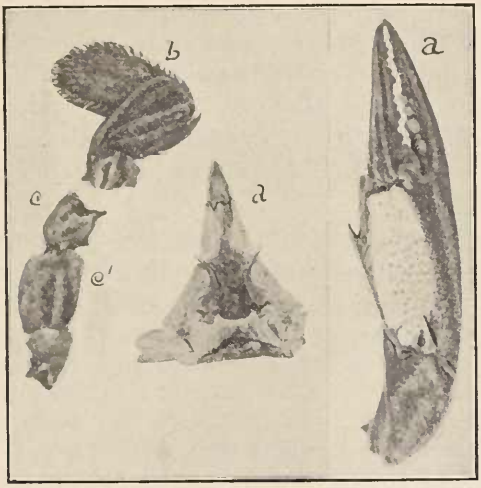

Figure 29.—*A. Ordwayi*, *a*, one of the chelæ, showing the iridescent area, × 1½; *b*, *c*, parts of swimming leg; *c'*, denticulated angle of merus; *d*, verges and abdomen of male, enlarged. Phot. A. H. V.

Ambulatory legs light gray, except the posterior legs, which have a red blotch on the last joint. Eye-stalks light gray, the eyes black. Chelæ with a brilliant iridescent area.

In alcohol the colors soon fade and the general color becomes yellowish or salmon, often showing some red mottlings; two bands of pale red often cross the chelæ, and the tips of the digits may be pale red; the fringe of long hairs on the merus often long retains its red color in alcohol.

Measurements.

No.	Sex	Carapace length	Carapace breadth total	Carapace breadth —spines	Front between orbits	Chelæ length	Chelæ height —spine	
4037	♂	24	36	30.5	10	27	7	Bermuda
3162	♂	25.5	39	34	10.5	28	7	Bermuda
4087	♂	22	35	28	9.5	25	6	Off Hatteras
4083	♂	33	52	45	18.5	r. 37	10	Dominica
4083*a*	♂	33	51	43	11	r. 37	9.5	Dominica

This interesting species is not uncommon at Bermuda, in suitable localities. It lives in shallow bays, with whitish shell-sand bottoms. We found it near and at Walsingham Bay on Castle Harbor; Hungry Bay; the north side of Long Bird Island, at "The Reach," etc. It can rarely be caught except by the use of nets. It was also in the collections of J. M. Jones, G. Brown Goode, and the Field Museum of Natural History.

The type localities were Florida and St. Thomas.

It was taken off Cape Hatteras, in shallow water, by the U. S. Steamer "Albatross." It ranges from North Carolina through the W. Indies to Brazil. Off Florida Keys, 5-7 fathoms (Stimpson). Bahia, Brazil (Smith).

This species was dedicated to Albert Ordway, a classmate of the author, while a student of Professor Louis Agassiz, 1858 to 1861.*

* Mr. Ordway was, at that time, an enthusiastic student of Crustacea, and a young man of much ability. His best known work on Crustacea, written at that time, but published later, is that on the genus Callinectes (see Bibliography), in which he first demonstrated the great systematic importance of the form and structure of the male appendages in this family, and applied his discovery to the correct elucidation of the numerous species of this group, to which he also added six new species.

During the winter and spring of 1860 and 1861, the writer spent several months in Washington closely associated with Mr. Ordway and several other young zoölogists, among whom were Dr. Wm. Stimpson, E. D. Cope, Theodore Gill, Elliott Coues, F. W. Putnam. We were engaged in working upon the collections of the Smithsonian Institution, by the requests of the Secretary, Prof. Joseph Henry, and Assistant Secretary, Prof. S. F. Baird.

At that time the writer remembers seeing Dr. Stimpson, who was at first skeptical, give Mr. Ordway a severe test, as to his ability to distinguish the various forms of *Callinectes* by his new method. He put before him all the specimens in the large Smithsonian collection with no labels except catalogue numbers. Mr. Ordway very rapidly and correctly separated them, not only into their species, but assigned each to its proper geographical area, greatly to the surprise of Dr. Stimpson and others.

At the time when we were in Washington, political and sectional excitement was at fever heat, and the presentment of impending war was almost universal,

Achelous spinimanus (*pars*, Latr.) DeHaan.

? Portunus spinimanus (*pars*) Latreille, Encyc., t. x, p. 188 (*teste* A. M.-Edwards); Nouv. Dict. Hist. Nat., xxviii, p. 47, 1819.

? Lupa spinimana Leach, Desmarest, Consid. gén. sur la classe des Crust., p. 98, 1825. ?H. M.-Edwards, Hist. nat. Crust., i, p. 452, 1834. Gibbes, op. cit., p. 178. Dana, United States Expl. Exped., Crust., p. 273. Stimpson, Annals Lyc. Nat. Hist., New York, vol. vii, p. 57.

? Achelous spinimanus DeHaan, Fauna Japonica, Crust., p. 8, 1833. White, List Crust. Brit. Mus., p. 28, 1847. Stimpson, Annals Lyc. Nat. Hist., New York, vol. vii, p. 221, 1860. A. M.-Edwards (*pars*), Arch. Mus. d'Hist. nat., lx, p. 341 (*non* pl. xxxii, fig. 1, 1*b*), 1861;* Miss. Sci. Mex., v, p. 230, pl. xxxix, figs. 2, 2*a*, 1879. Smith, Crust. Brazil, these Trans., ii, p. 9 (measurements, p. 34). S. I. Smith, Annual Report U. S. Fish Comm., for 1885, p. 30, 1886. Rankin, Trans. N. York Acad. Sci., xi, p. 233, 1898 (Bermuda).

Achelous spinimana Kingsley, Proc. Acad. Nat. Sci., Philad., 1878, p. 5.

Portunus (*Achelous*) *spinimanus* M. J. Rathbun, Bull. Lab. Nat. Hist. Univ. Iowa, 1899, p. 276; Brach. and Macr. Porto Rico, p. 45, 1901 (descr.).

Figures 30, 31.

The front is rather prominent. The inner orbital tooth is bilobed, its outer lobe with the four median teeth making six unequal frontal teeth, not including the inner lobe of the bilobed orbitals, of which

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Mr. Ordway was very patriotic and took great interest in the exciting events of the time. Probably the unusual excitement of that time and place had much to do with his entering the army a little later.

When the war broke out he immediately enlisted and remained in the Army of the Potomac through the entire war. He distinguished himself for bravery and efficiency on various occasions and was rapidly promoted. At the close of the war he had attained the rank of Brevet Brigadier General, Aug. 13, 1865. After Richmond was captured he was appointed Provost Marshal of the city. He eventually married there and continued to live there some years, engaged in business, but he never resumed his zoölogical studies after the war.

He afterwards resided in Washington, D. C., and was Commander of the National Guard of the District of Columbia, and at one time Commander of the Loyal Legion. He was also president of the American Ordnance Company.

General Ordway was born in Boston, 1843. He died in New York, Nov. 21, 1897.

* The figure given by A. M.-Edwards, in this work, represents a species from the coast of Chili. It is evidently distinct from the one figured in his subsequent work from the West Indies. Which of the two is the true *spinimanus* of Latreille seems doubtful, but the name is now commonly applied to the West Indian species, or to both.

Probably all the early writers, cited above, confounded two or more species under this name. Their descriptions are too brief and indefinite to determine species of this genus. Probably the figure of the Chilian species given by A. M.-Edw. affords the earliest means for the accurate determination of any of those included under this specific name. If so, the name ought to be restricted

the middle two are distinctly larger than the others. The middle four are all rather elongated, and subacute. The posterior lateral tooth is stout, rather curved forward. The others are all nearly equal in size, acute. The merus of the chelipeds has five stout, rather close anterior teeth* and a large posterior distal one, according to Edwards' figure. The manus has a single distal tooth on a strong carina, at the distal fourth. This species, in respect to its areolation, lateral teeth, and six frontal teeth, is similar to *A. Smithii*, but in the latter the frontal teeth are blunt and the middle ones are less prominent; it also differs in having the merus of outer maxillipeds more prolonged. The chelipeds are shorter and stouter, the merus particularly so; its large posterior distal tooth seems to be distinctive. Personally I have seen no specimens agreeing well with Edwards' figure and description of 1879.

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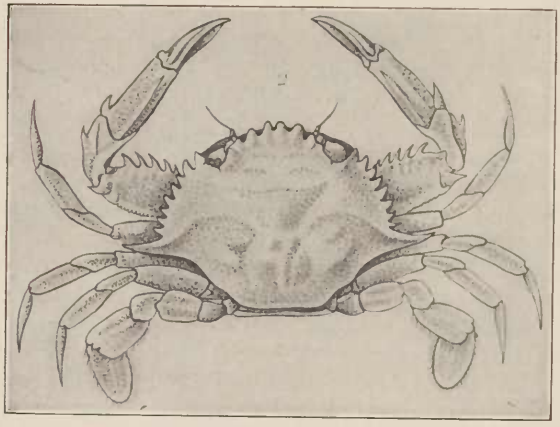

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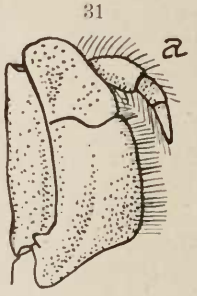

Figure 30.—*Achelous spinimanus*, about $\frac{1}{2}$ nat. size; 31, maxilliped, enlarged. After A. M.-Edw.

Measurements for ratio of length to total breadth. (Part, *A. Smithii.*)

Length of carapace including frontal teeth	Breadth of carapace including spines	Ratio of length to breadth	Locality
37.0mm	61.5mm	1:1.66	Brazil (Smith)
44.4	77.4	1:1.74	Brazil (Smith, 829 ♀)
56.0	95.0	1:1.70	Brazil (Smith)
54.2	90.0	1:1.65	Porto Rico (Rath.)

to the Chilian species. In that case the Atlantic species should take the name, *A. Smithii*, unless there be an earlier one. None of the early writers, before A. M.-Edw. have given a figure of either form, so far as I know.

* Miss Rathbun, 1901, gives, in her description, only four, as in *Gibbesii*. In our No. 829, there are four on one side and five on the other.

In No. 829 the larger chela is 54^{mm} long ; 15^{mm} high ; breadth of carapace, less spines, 66^{mm}. This appears to be the adult of *A. Smithii.*

This species appears to be very rare in Bermuda. It has been reported only by Dr. Rankin. Its recorded range is from off Cape Hatteras, 13 fathoms (Smith),* to Rio Janeiro, Brazil.

Florida (Stimpson). Bahia, Brazil, and Egmont Key, W. Florida (Smith). Bahamas in *Sargassum* (Rathbun).

Achelous spinimanus, var. or subspecies **Smithii,** nov.

Achelous spinimanus (*pars*) Smith, Rep. Decapod Crustacea, Ann. Report U. S. Comm. Fish and Fisheries for 1884, p. [30], 1886.

Figures 32, 33. Plate XIX, Figures 2, 2*a*. Plate XXI, Figure 2.

Carapace strongly areolated, and with unusually prominent, arched, transverse ridges, which are coarsely granulated on the front edge ; elsewhere the surface is closely covered with minute hairs and granules; a fringe of long marginal hairs between and on the lateral teeth.

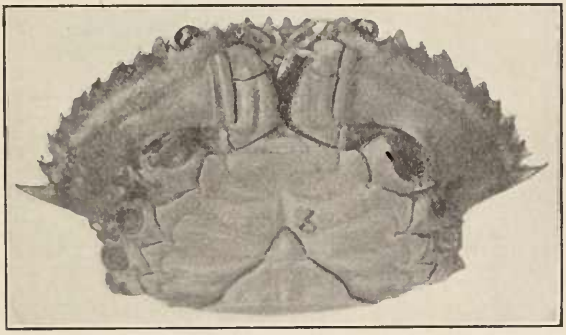

Figure 32.—*Achelous Smithii :* ventral side of young female, about 1¼ nat. size. Phot. A. H. V.

The inner orbital tooth is bilobed, so that there are six frontal teeth, not counting the inner lobe of the orbital, which is rather shorter than the outer lobe. The four true frontal or rostral teeth are a little prominent, subacute, the two middle ones a little smaller and scarcely more prominent than the others.

* The smaller specimens from this locality, which I have examined, proved to be a distinct form (*A. Smithii* nov.), but there were larger ones that I have not seen, now in the U. S. Nat. Museum, which may be the *spinimanus* of Edw., 1879.

Of the lateral teeth, the first eight are subequal, all acute and curved forward; the third is a trifle wider; posterior lateral tooth not very large, about twice as long as the preceding, acute, curved a little forward. Merus of chelipeds with four strong anterior spines directed forward, and sometimes a small or subobsolete distal posterior one, which may be wholly lacking; two carpal spines rather short. Manus with a strong dorsal carina, ending in a sharp divergent tooth at about the distal fourth. Merus of swimming feet broader distally, its posterior distal angle armed with a very small sharp spine and several more minute, acute denticles.

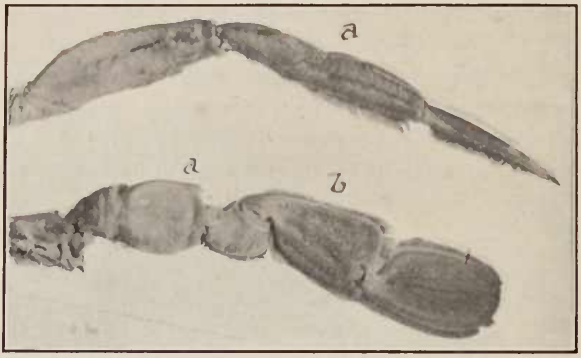

Figure 33.—*Achelous Smithii; a*, first ambulatory leg; *b*, swimming leg; *d*, denticulated angle of merus, enlarged. Phot. A. H. V.

This form is very closely allied to *A. spinimanus*, from which it is best distinguished by the less prominent front; the smaller and nearly equally prominent frontal teeth; the shorter and weaker posterior lateral spines; and by the small or nearly obsolete posterior distal spine of the merus of the chelipeds. The chelipeds are also longer. Some of our specimens (No. 4035) were catalogued as *A. spinimanus* by Prof. S. I. Smith, who depended on the figure of A. M.-Edwards. The type specimens, here described and figured, are from that lot.

Measurements of Types and Cotypes.

		Carapace			Front	Chelipeds		
		l'gth	br'dth total	br'dth —spines	bet. orbits	length	height —spines	Locality
4035*a* fig.	♂	26	42	36	9.5	r. 29	7.5	Off Hatteras
4035*b*	♀	29	48	42	10	33	8	Off Hatteras
4049	♀	26	44	37	11	l. 28	7	Ft. Macon

The ratio of length to breadth, not including large lateral spines, is 1:1.40 to 1:1.45.

Young specimens of this form were not uncommon at Bermuda, in masses of *Sargassum*, associated with *Portunus Sayi* and *Planes minutus*. It was also taken by the Bermuda Biological Station in July, 1905, in *Sargassum*.

The larger specimens are from Fort Macon (Yale Mus., coll. Dr. Yarrow, 1871); off Hatteras, in 13 fathoms (U. S. Fish Comm. Steamer "Albatross," Oct., 1884, sta. 2285); West Florida (Coons coll., Yale Mus.); and Brazil.

Achelous Gibbesii (Stimp.).

Lupa Gibbesii Stimpson, Notes on N. Amer. Crust., i, Annals Lyc. Nat. Hist. N. York, vii p. 57 [11].

Achelous Gibbesii Stimpson, Notes, I, op. cit., vii, p. 22 [94], 1860 (Beaufort, N. C.).

Neptunus Gibbesii A. M.-Edw., Nouv. Arch. Mus. Nat. Hist. Paris, x, p. 326, pl. xxxi, figs. 1, 1*a*, 1*b*, 1861; Miss. Sci. Mex., p. 213, 1879.

Achelous Gibbesii Smith, Ann. Rep. U. S. Comm. Fish and Fisheries, for 1882, p. 349, 1884 (off Hatteras); op. cit., for 1885 [p. 30], 1886 (off Hatteras), Kingsley, Proc. Philad. Acad., for 1879, p. 398.

Portunus (*Achelous*) *Gibbesii* M. J. Rathbun, Amer. Naturalist, xxxiv, p. 140, 1900.

FIGURES 34, 35.

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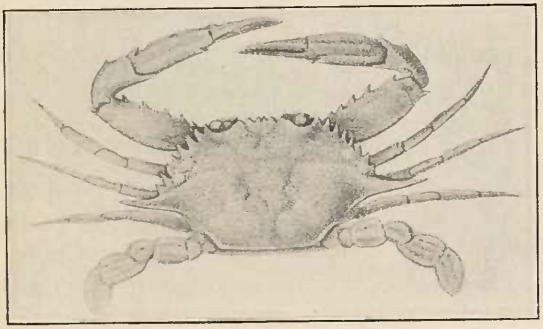

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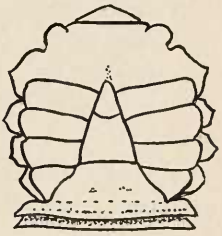

Figure 34.—*Achelous Gibbesii*, young, × 1½. After A. M.-Edw.
Figure 35.—The same, abdomen of ♂, enlarged. After A. M.-Edw.

This species, which is introduced here mainly for convenient comparison, is not yet definitely recognized as native of Bermuda. The few specimens most resembling it are too young for positive determination.

It has four small, nearly equal rostral teeth, besides the obitals, which are slightly bilobed (scarcely at all in the young); the merus

of the chelipeds has five sharp teeth on the front margin ; the lateral spines are long and sharp, curved forward a little ; there are usually one or two round silvery spots near the bases of the anterior marginal teeth, on each side. It is a rather small species. A female with the adult form of the abdomen, from Egmont Key, Fla., has the carapace only 20^{mm} long, 40^{mm} wide, including spines.

A female from Ft. Macon, N. C. (coll. Dr. Yarrow, 1871, No. 4087), has the adult form of the abdomen, but no eggs. Its carapace is 25^{mm} long; 51^{mm} broad with spines; without spines, 40^{mm} wide; length of chelæ, 31^{mm}; height, 7.5^{mm}.

The four inner frontal teeth are about equal in length, but the two inner are narrower. The merus of the swimming legs has a row of 5 or 6 small acute spinules on its posterior distal edge, the outer ones longer. The anterior two pairs of legs are flattened, with the merus as well as the distal segments fringed. The distal end of the dorsal carina of the chelæ is sub-spiniform, so that in profile it looks a little like a second spine, in front of the principal one, which is sharp and divergent. The manus has five strong granulated ribs on the superior and outer surfaces, with deep hairy grooves between them. The dactylus has four ribs, besides an inner one. The surface of the ribs, when the hairs are removed, is shining or silvery. The carapace is strongly granulated and hairy ; the small silvery spots* are very distinct. The merus of the right cheliped has six inner marginal spines, that of the left cheliped only five. They are sharp and directed forward, but not so near together as in the figure; usually there are but five.

The chelipeds are very long, being longer than in the figure. The length of the merus exceeds half the total breadth of the carapace. The chelæ and carpi are also elongated. When extended, the expanse of the chelipeds is seven times the length of the carapace. In a male (981*a*) the carapace is 24^{mm} long; expanse of chelipeds, 168^{mm}; when folded the end of the merus projects 15^{mm} beyond tip of the lateral spine. The ambulatory legs are also long and much flattened.

Off C. Hatteras, Str. "Albatross," Nov. 9, 1883, sta. 2107, in 16 fathoms, three, one with eggs (Smith) ; off C. Hatteras, 5 stations, 13–48 fath., 1884, 16 specimens, 1886 (Smith).

* These spots are variable in form and number and are often lacking on one side. They look as if they might have been made by the tips of the claws of the opposite sex during the mating season. The surface of the carapace becomes silvery whenever the hairs are rubbed off by friction.

Beaufort, N. C., and West Florida (Kingsley). Egmont Key, Fla., No. 981, and Fort Macon (Yale Mus.).

Achelous depressifrons Stimp.

Amphitrite depressifrons Stimpson, Notes, No. I, Annals Lyc. Nat. Hist. N York, vii, p. 58 [12],1859.

Achelous depressifrons Stimp., op. cit., p. 223 [95], 1860. A. Milne-Edw., Arch. Mus. Nat. Hist., x, p. 342, 1861 ; Miss. Sci. Mex., v, p. 230, pl. xl, fig. 4, 4*a*, 1879. Cones, Proc. Acad. Nat. Sci. Philad., for 1872, p. 121 (Fort Macon). Kingsley, Proc. Acad. Nat. Sci., Philad., for 1878, p. 5. Rankin, N. York Acad. Sci., p. 233, 1898.

Neptunus depressifrons Miers, op. cit., p, 181, 1886. Rankin, Annals N. Y. Acad. Sci., xii, p. 531, 1900 (Bermuda).

Portunus (*Achelous*) *depressifrons* M. J. Rathbun, Bull. Lab. Nat. Hist. Univ. Iowa, 1878, p. 27 ; Brach. and Macr. Porto Rico, p. 45, 1901.

Figure 36. Plate XX, Figure 3.

This is easily distinguished from most of the other Bermuda species by the shorter posterior lateral spine, which is scarcely longer than those in front of it. The front is not at all prominent;

Figure 36.—*Achelous depressifrons*, resting on shell-sand, to show protective coloration. Nat. size. Phot. A. H. V.

its four rostral or true frontal teeth are very short, blunt, subequal, and close together ; most frequently the middle two are a little smaller than the others; in other cases they equal or a little exceed them in length.

The inner orbital tooth is broad, with the frontal angle dentiform and the middle of the margin a little concave, but not bilobed.

The carapace is strongly areolated and has prominent, but thin, curved transverse ridges or crests, sharply granulated on their edges. The areolations of the gastric region form a conspicuous mask-like figure, when dry. The depressed areas are mostly covered with minute, sharp, but not very close granules, which bear minute rough hairs to which dirt often adheres; the legs are similarly clothed, except the small glossy areas. The edges of the carapace and marginal teeth are fringed with longer hairs.

The chelipeds are unusually long. The ambulatory legs are notably long and slender, the first pair rather longer than the others; the three distal segments of the front legs are somewhat flattened and well fringed with long hairs below, thus somewhat approaching the form seen in those of *Portunus Sagi*, but less flattened and less remiform. The legs of the second and third pairs are only slightly flattened and lightly fringed. The basal and merus segments of the swimming feet are unarmed; the distal end of the merus is rounded.

The marginal teeth are all similar in form and size, very acute, curved forward and upward.

The merus of the chelipeds has an anterior row, usually of six, slender, sharp spines, unequally spaced, the first very small, increasing in size distally, the last at the distal angle; posterior distal spine reduced to a tubercle or obsolete; carpal spines two, the inner longer, of moderate length, banded with red. The manus has a prominent dorsal carina, curved over to the inside, leaving a fringed groove beside it; it bears, at the extreme distal end, a single, acute, nearly straight tooth, directed forward. The dactylus is strongly grooved; the dorsal side is fringed with long hairs; the thumb has two fringes. The hand has five ribs on the outer, under, and upper sides; the middle outer one is much the stronger, so that the form of the hand is rather triquetral in an end view. There are small smooth areas between the ribs and on the carpus and fingers, which are glossy or lustrous when dry.

In life the carapace is irregularly mottled with light and dark gray, closely imitating the colors of the sand; the chelipeds and posterior legs are similar, though paler; but the first pair of ambulatory legs, which are longer than the others, are bright purple or deep blue in the larger specimens, while some portion of the same color is usually seen on the next two pairs, but the color of the first pair is in striking contrast with that of the rest of the crab. This has, no doubt, some useful purpose, but as it appears in specimens apparently too young to mate, it is probably not a sexual attraction.

Perhaps these long slender legs may be spread out on the surface of the sand to imitate annelids and so serve as a lure for small fishes. We had no opportunity to test this proposition. The very young specimens did not show this distinction in the color of the legs, so far as observed.

Measurements of Bermuda specimens.

		Carapace			Front	Chelæ	
No.	Sex	length	breadth total	breadth —spines	bet. orbits	length	height
4048	♀	20	28	27	7	21	7
4055*a*	♂	17	25	24	6	25	6.5
4055*b*	♂	16	23	22	5	22	5
4055*c*	♀	15	22	21	4		
3038	♂ fig.	17	25	24	5.5	24	6

The total expanse of the extended chelæ in 4055*a* was 104^{mm}; total length of cheliped, 47^{mm}; extent beyond the edge of the carapace, 40^{mm}.

When recently dried there are small smooth areas on the carapace and legs, especially the last pair, that are lustrous and somewhat iridescent; most of the under side of body and legs is smooth and shining.

At Bermuda it is a very common species. We found it abundant in shallow water in April, 1898 and 1901, on the sandy bottoms of sheltered coves and inlets, as near Walsingham Bay, Coney Island, Hungry Bay, etc.

It was also contained in the early collections of J. M. Jones, Dr. F. V. Hamlin, G. B. Goode and others. Most of the more recent collectors have also taken it, but all the specimens that I have seen are small and probably immature, for none bear eggs. It was originally described by Dr. Stimpson from Charleston, S. C. and Beaufort, N. C. Its range extends from Cape Hatteras to the Antilles. Fort Macon, N. C. (Dr. Yarrow); Bahamas (Rankin); Culebra (Miss Rathbun).

Charybdella tumidula (Stimp.) Rathbun.

Achelous tumidulus Stimpson, Bull. Mus. Comp. Zoöl., ii, p. 149, 1871.

Neptunus tumidulus A. M.-Edw., Miss. Sci. Mex., Crust., p. 218, 1879. Rankin, Annals N. York Acad. Sci., xi, p. 233, 1898 (Nassau).

Cronius bispinosus Miers, Voy. Chall., Zoöl., vol. xvii, p. 188, pl. xv, fig. 2, 1879.

Charybdella tumidula M. J. Rathbun, Brach. and Macr. Porto Rico, p. 51, 1901.

Plate XIX, Figure 1.

Our single Bermuda specimen is considerably larger than those from Porto Rico, described by Miss Rathbun, and very much larger

than Stimpson's type. On this account, probably, it does not fully agree with either description.

The carapace is relatively wider than stated by Stimpson; the ratio of length to breadth, minus lateral spines, is 1:1.33. The carapace is strongly areolated, and has conspicuous, curved transverse ridges with sharp, granulated anterior edges. Its surface is well covered with fine and rather short hairs, arising from fine granulations, and with a fringe of longer hairs on the lateral and frontal margins. The legs are also pubescent and fringed with slender hairs.

The four true frontal teeth are conspicuous; a little prominent; and all are of nearly the same form and breadth; they are obtusely rounded at the end; the two middle ones are a little longer and a trifle narrower than the others, with the middle notch a little narrower; the notch between the outer of these and the next tooth (bilobed orbital) is deeper and narrow. The orbital is distinctly bilobed, the outer lobe being a little larger and longer than the other, but not so long or large as the true frontal teeth.

The nine marginal teeth are alternately large and small; the small ones, which are the 2d, 4th, 6th and 8th, lack the naked sharp tips seen on the 3d, 5th, 7th and 9th. The 8th is the smallest. The first, or outer orbital, is broader than the others, with the outer side broadly arched. The others are all strongly curved forward and acute, fringed with hairs on the edges. The last, or 9th, is not much longer than the 7th, but twice as long as the 8th; it is less curved forward than the others and bends a little upward.

The chelipeds are long and large; about two-thirds of the merus projects beyond the edge of the carapace; it has four stout, naked-tipped, sharp granulated spines on its front edge, of which the proximal is smallest; the distal posterior spine, usually present in this group, is lacking.

The carpus has a very small outer spine, and a much larger inner one, which is slightly curved forward and very sharp, but it reaches less than one-third the length of the upper side of the manus, being, therefore, much shorter than in Stimpson's and Miss Rathbun's specimens. The proximal or articular spine of the manus is of moderate size; the distal dorsal one is rather larger, strong at base, very sharp, divergent; its front edge is situated at about the distal third of the dorsal edge. The surface of the chelæ is covered with short hairs and is granulated; there are four strongly granulated ribs besides the dorsal one on the outer surface, but no additional spine.

The dactylus has two sharply denticulated dorsal carinæ and two strong granulated lateral ribs on the outside, with deep grooves between them.

The left cheliped is considerably smaller, but otherwise is much like the right, though the dorsal carina of the manus, in this, ends in a prominent angle distally, but not forming a true spine.

Ambulatory legs are of moderate length, not much flattened, finely fringed. The merus of the swimming feet has the distal posterior end rounded and very finely denticulated, but without a spine. The segments of the male abdomen are crossed by depressed areas, covered with fine scale-like hairs. The male generative organs are thick at base, strongly convergent, then divergent, with slender flexuous tips, which reach a little beyond the middle of the penultimate segment.

The color of the alcoholic specimen is pale orange yellow, with a pair of ill-defined rounded spots of light red on the flanks, and pale red bands on the legs and chelæ. The fingers have blackish tips and inner edges; the dactylus is crossed by a pale band; the proximal half is red above.

Measurements.

		Carapace			Front	Chelæ		
			br'dth	br'dth	bet'wn		height	
No.	Sex	length	total	—spines	orbits	length	—spine	Locality
692 F. M.	♂	27	41	36	12	r. 35	r. 12.5	Bermuda
——	♂	21	31.2	—	—	l. 33.5	l. 10	Porto Rico

The type described by Stimpson* was only .20 of an inch in length; total breadth, .31; breadth minus spines, .25; ratio of length to latter breadth, 1:1.25.

The second, given in the above table, is that measured by Miss Rathbun, from Porto Rico. The ratio of length to breadth decreases with growth.

Our specimen, as stated above, differs from the smaller ones. According to Stimpson his had the front more prominent and the two middle teeth were "smaller and more prominent, and separated from the lateral ones by a rather broad and shallow sinus." This inequality is not so evident in ours. He says there is no notch in the inner orbital tooth. It was present in Miss Rathbun's specimens, and she considers its absence due to immaturity. In Stimpson's type "the inner spine of the carpus is long, reaching to the middle of the palm of the hand." It is much shorter in the Bermuda specimen. Probably this is a character only of the very young.

* Dr. Stimpson's types of Crustacea were all burned in the great Chicago fire.

Stimpson did not notice the alternation of smaller and larger marginal teeth, but that condition was described by Miss Rathbun. Notwithstanding these and other differences I do not doubt the identity of the Bermuda example.

The only Bermuda specimen known to me was taken Sept. 30, 1905, at Long Bird Island (probably in a fish seine), by the expedition from the Field Natural History Museum.

Stimpson's types were from off the Florida Reefs in 37 to 40 fathoms (Pourtalès coll.). Porto Rico, four stations (Rathbun). Bahia, Brazil (Miers).

Doubtful Species.

According to M. Walter Faxon there is in the Museum of Comparative Zoology, Cambridge, Mass., a specimen of *Cancer borealis* Stimpson, labelled as from Bermuda.

My belief is that its label is erroneous, or has been accidentally transposed. It is a large northern species, common at low tide on some of the rocky shores of Casco Bay, Me., and ranging southward in the deeper water of the arctic current as far as off Cape Hatteras.

Boscia ?, sp.

Willem.-Suhm states that he collected a species in Bermuda "allied to *Boscia*." No such species was mentioned in the final report by Miers. To what he refers is problematical. *Boscia* is a fresh-water genus (= *Pseudothelphusa*). See Bibliography, below.

Libinia emarginata Leach = *L. canaliculata*.

This species is recorded by Hurdis (Rough Notes, p. 361), without any notes. It has not been found by anyone else. Probably his identification was erroneous. It is common from Cape Cod to Florida.

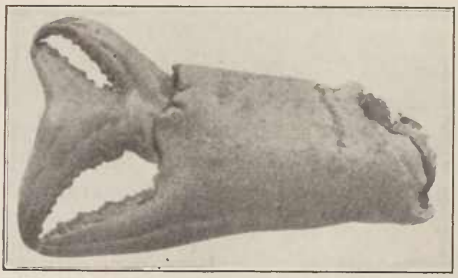

Figure 37.—Deformed claw of an undetermined cancroid crab, from the collection of J. M. Jones, but without a special label. Supposed to be from Bermuda, × $1\frac{2}{3}$.

OXYRHYNCHA = MAIOIDEA. (See p. 305.)

Family INACHIDÆ. *Spider Crabs.*

Basal joint of antennæ narrow. Orbits incomplete, sometimes absent; eyes not completely retractile. Chelipeds feeble; legs often long; rostrum well developed.

Stenorhynchus sagittarius (Fabr.). Rathbun.

Cancer sagittarius Fabr., Ent. Syst., ii, 442, 1793.

Maia sagittaria Bosc, Hist. Crust., ii, p. 253, 1801. Latreille, Gen. Crust., i, p. 38, 1806.

Leptopodia sagittaria Leach, Zoöl. Miscell., ii, p. 16, pl. lxvii, 1815. Latreille, Encycl. Meth., Insects, pl. 299, fig. 1, 1818. Desm., Consid. Crust., p. 155, pl. xvi, fig. 2, 1825. Latr. in R. Anim., Cuvier, ed. ii, p. 64, 1829. Guerin, Iconog. Reg. Anim., pl. ii, fig. 4. Von Martens, Cuban Crust., Arch. Naturg., p. 79, 1872. Smith, Ann. Rep. U. S. Fish Com. for 1885, p. 16. H. Milne-Edw., Hist. nat. Crust., i, p. 276, 1874; Atlas, reg. anim., Cuv., Crust., pl. xxxvi, fig. 1. A. M.-Edw., Mission Sci. Mex., part v, vol. i, p. 172, 1878; Bull. Mus. Comp. Zoöl., viii, p. 6, 1880. M. J. Rathbun, Proc. U. S. Nat. Mus., xvii, p. 44, 1895 (distr.).

Leptopodia ornata Guilding, W. Ind. Crust., Trans. Linn. Soc., p. 335, 1825 (*t.* Edw.).

Leptopodia lanceolata Brullé, Hist. Nat. Canaries, Crust., fig. 1, 1844 (*t.* Edw.).

Stenorhynchus sagittarius M. J. Rathbun, Ann. Inst. Jamaica, i, p. 4, 1897; Decapod Crust. West Africa, Proc. U. S. Nat. Mus., xxii, p. 293, 1900; Brach. and Macr. Porto Rico, p. 53, 1901. Verrill, these Trans., vol. x, p. 577, 1900 (Bermuda).

Plate XXII, Figures 1–1*d*.

A specimen of this species was contained in the local collection of the late J. T. Bartram, of St. Georges. While Mr. Goode was in Bermuda, 1877, he made a drawing of Mr. Bartram's specimen and sent it to Professor S. I. Smith for identification. There is no other Bermuda record. Probably the specimen referred to was obtained through the deep-water fisheries or in lobster-pots.

Its range is from Cape Hatteras to Florida and throughout the West Indies, to Rio Janeiro, Brazil; Madeira; Cape Verde; and Canary Is.; Mediterranean and West Africa.

Off Cape Hatteras, 11–27 fathoms, Albatross dredgings, 1885 (Smith). West Indies, Blake Exp., dredged in 27–115 fathoms. West Indies, Albatross dredgings, 9–130 fath. (Rathbun). Dominica Island, 100–140 fathoms (A. H. Verrill, 1906, Yale Univ. Mus.). Porto Rico, 6–76 fathoms (Rathbun). It has been recorded from 2 to 814 fathoms.

Podochela Riisei Stimp.

Podochela (*Podonema*) *Riisei* Stimp., Ann. Lyc. Nat. Hist. N. York, vii, pp. 196, 197, pl. ii, fig. 6, 1860 (descr.); Bull. Mus. Comp. Zoöl., ii, p. 126, 1870.

Podochela Reisei A. Milne-Edw., Crust. Miss. Sci. Mex., v, p. 193, pl. xxxiv, fig. 1, 1879.

Podochela Riisei Miers, Voy. Challenger, Zoöl., xvii, p. 11, 1886. Smith, Ann. Rep. U. S. Fish Comm. for 1885, p. 16, 1886. M. J. Rathbun, Proc. U. S. Nat. Mus., xvii, p. 48, 1895 (distr.); Amer. Naturalist, xxxiv, p. 508, fig. 1, 1900; Brach. and Macr. Porto Rico, p. 54 (descr.).

Coryrhynchus Riisei Kings., Amer. Nat., xiii, p. 585, 1879; Proc. Acad. Nat. Sci. Philad., xxxi, p. 384, 1879.

Plate XXII, Figure 2.

This species has been taken at Bermuda only by the Challenger Expedition, by which it was dredged in shallow water. It is rarely obtained except by dredging.

Bermuda (Miers, Chall. Exped.). Off Cape Hatteras, 13–49 fath. (Smith, 1886). West Indies to Pernambuco, Brazil. St. Thomas and Tortugas (Stimpson). Gulf of Mexico and Caribbean Sea, 3–30 fath. (Rathbun). Bahia Honda, Cuba, on wharf (Rathbun). Key West and Sarasota Bay, Fla. (Kingsley). Off Pernambuco, 30+ fathoms (Miers).

Chorinus heros (Herbst) Latr.

Cancer heros Herbst, Krabben und Krebse, ii, p. 165, pl. xlii, fig. 1; pl. xviii, fig. 102, 1796.

Chorinus heros Leach, Mss., in Latreille, Encyc. Meth., x, p. 139, 1825. M.-Edw., in Cuvier, Illust. ed., Crust., p. 85, pl. xxix, fig. 2. A. M.-Edw., Miss. Sci. Mex., part v, vol. i, p. 86, 1873. Von Martens, Arch. für Naturg., xxxviii, p. 80, pl. iv, fig. 2 (Cuba). Kingsley, Proc. Acad. Nat. Sci. Philad. for 1879, p. 385 (measurements, Florida specimens). M. J. Rathbun, Proc. U. S. Nat. Mus., xvii, p. 65, 1894; Brach. and Macr. Porto Rico, p. 61, 1901 (descr.).

Plate XXIV, Figure 3.

This appears to be a very rare species at the Bermudas, at least in shallow water. It probably inhabits the rough bottoms off the reefs. The only Bermuda specimen known is a carapace, found on the beach (coll. J. M. Jones, Yale Mus., No. 3126).

Its range extends from Florida to Bahia, Brazil. Off Florida, 12 fath. (Stimpson). Key West (Gibbes). Barbados and Martinique (M.-Edw.). Bahia (Rathbun). Porto Rico, 9½ to 16 fath. (Rathbun).

Epialtus bituberculatus (M.-Edw.) var. **bermudensis** Ver.

Epialtus bituberculatus H. M.-Edw., Hist. nat. Crust., i, p. 345, pl. xv, fig. 11, 1834. A. M.-Edw., Miss. Sci. Mex., Crust., p. 139, pl. xxvii, figs. 1-3, 1878. M. J. Rathbun, Proc. U. S. Nat. Mus., xvii, p. 67, 1895 (distrib.); Brach. and Macr. Porto Rico, p. 60, 1901.

Epialtus sulcirostris and *E. longirostris* Stimpson, Ann. Lyc. Nat. Hist., vii, pp. 198, 199, 1860; A. M.-Edw., op. cit., p. 141, pl. xxvii, figs. 5, 6.

Epialtus dilatatus A. M.-Edw., op. cit., p. 140, pl. xxvii, fig. 4, 1878 (*t.* M. J. Rathbun).

Epialtus bituberculatus, var. *bermudensis* Verrill, these Trans., xi, p. 16, pl. i, fig. 1, 1907 (descr.).

Plate XXIV, Figure 1.

A single specimen (see figure) taken by A. H. Verrill, March, 1901, is the only one known from Bermuda. It was found in a small cavity in a ledge, between tides. The entrance to the cavity was so small that the stone had to be cut away with a chisel before the crab could be extracted. That specimen is fully described in the place quoted above. The species has a wide range, with several local varieties or races. It extends from Indian River, Fla., to Rio Janeiro, Brazil. Egmont Key, West Florida (Yale Mus.). The West Coast form ranges from Southern California to Chili (var. *minimus* Lockington).

Family **Pericerida** (=**Maiidæ**,* some authors). *Spider Crabs.*

Basal joint of the antennæ well developed, inserted beneath the eyes, and usually forming a large part of the inferior boundary of the orbits. Chelipeds not of unusual size, often not much larger than the other legs. Orbits complete; eyes retractile.

This family, as here understood, includes several groups that have been regarded as subfamilies, or even families: *Pericerinæ*, *Mithracinæ*, *Orthoninæ*, *Paramayinæ*, etc.

Probably many more species of this family than are here recorded inhabit the rough bottoms at moderate depths around the outer reefs.

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* The generic name *Maia*, as shown by Miss Rathbun, cannot be used for a genus of this group. Therefore this family name should also be changed.

More recently (1905) Miss Rathbun has stated that *Paramaya* de Haan, 1837, is identical and should have priority.

Mamaiidæ Stebbing (S. African Crust., Part iii, p. 22, 1905) has been proposed for the group here regarded as a subfamily, *Paramayinæ*.

Mithrax (including *Mithraculus*).

Analytical Key to the Bermuda Species of Mithrax and some allied species
(Modified from that of Miss Rathbun).

A. Carapace without oblique, parallel, branchial grooves.
B. Manus of chelipeds spinulose. Carapace with conical spines; not setose.
a, Two distal segments of ambulatory legs stout, very setose; spines of manus in one dorsal row ..... *spinosissimus*
a', Two distal segments of ambulatory legs long and slender, sparsely hairy. Spines of manus in two dorsal rows ..... *cornutus*
B'. Manus smooth, without spinules.
C. Rostral horns short, blunt or tuberculiform.
D. Spines or tubercles of antero-lateral margin four, behind orbitals, simple or bifid: basal joint of antennæ with inner tooth longest.
E. Carapace not multi-tuberculate; carpus often nearly smooth; merus of chelipeds multispinose; basal joint of antennæ narrow, with two denticles ..... *hispidus*
E'. Carapace and carpus of chelipeds tuberculate; merus spinose; rostral horns about as long as broad, obtuse; basal joint of antennæ wider, with two acute spines ..... (*depressus*)
C'. Rostral horns long and slender ..... *acutivornis*
A'. Carapace with oblique, parallel, branchial grooves; antero-lateral margins with four acute spines; carapace broader than long in adults ..... *forceps* (*hirtipes*)

Mithrax cornutus Saussure. *Coral Crab, Red Spider Crab.*

Mithrax cornutus Saussure, Mem. Crust. nouv. Mex. et Antilles, p. 7, 1858. A. M.-Edw., Miss. Sci. Mex., v, i, p. 97, pl. xxii, 1875.

FIGURE 38.

This species grows to rather large size in the West Indies. The only Bermuda specimen known is young.

It closely resembles *M. spinosissimus* of the West Indies* in the form and spinulation of the carapace and chelæ, but it can easily be distinguished by the longer and more slender chelipeds and legs, and especially by the far more slender distal two segments of the ambulatory legs, which are nearly destitute of spines and have only short, sparse hairs, while in the latter these segments are stout, not abruptly attenuated, and are thickly covered with strong dark colored hairs.

In both species the merus and carpus of the chelipeds are covered with numerous strong and acute curved spines; in this species the merus is longer and has about eight or nine very acute spines on the posterior border, and near them another irregular row of nearly the

* This species is likely to occur on the rough grounds outside the Bermuda reefs. Hence I have given the most obvious distinctions here.

same number and size on the upper surface; numerous smaller unequal conical spines are scattered on the upper surface or form broken rows, while the anterior margin bears a row of about five or six obtuse spines, much smaller than those of the other margin; there is also a row of three or four still smaller ones on the under side.

In *M. spinosissimus* the spines of the merus are not so numerous, but larger, longer, more equal, more curved and very acute and bear rough, divergent stiff hairs; about ten to twelve large, nearly equal spines stand on the posterior border; two or three large and some small ones on the anterior border; the upper surface bears about six large spines and a few very small ones; the largest are distally situated and some of them are larger than the marginal ones; there

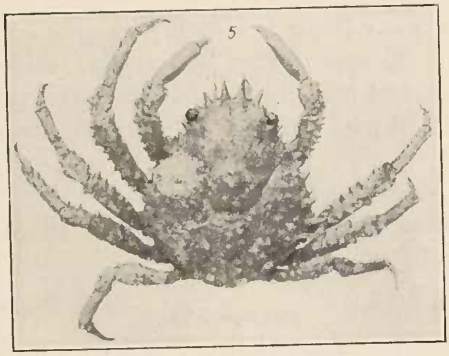

Figure 38.—*Mithrax cornutus*, from Bermuda; young with eggs, about $\frac{7}{8}$ nat. size. Phot. A. H. V.

is a row of about three short spines on the under side; the carpus is also covered with numerous (about twenty-five to thirty) very unequal, very acute, divergent spines, some on the inner edge as large as those of the merus.

In *M. cornutus* the carpus bears rather more numerous spines, but they are mostly smaller and less acute, more than half of them being mere conical tubercles.

The manus in this species bears two distinct rows of eight to ten spines on the upper edge, which is not much compressed; these spines are short and obtuse.

In *M. spinosissimus* the dorsal spines of the manus, of which there are about eight to ten, form a single zigzag row; they are also longer and usually more acute, but in large specimens often become blunt. The dorsal part of the manus is strongly compressed.

The frontal horns in *cornutus* are rather larger and straighter than in the other, and the subrostral process, between the antennulæ, is narrow and directed strongly backward, while in the other it is wider, thick, and nearly perpendicular, with an acute, excurved tip.

The buccal area has the anterior, lateral sinuses more strongly arched in *M. cornutus*, and the corresponding parts of the outer maxillipeds are, therefore, more convex.

There are other distinctions that might be noticed, but the wide difference in the tips of the legs is the most convenient diagnostic character.

In *M. cornutus* the ratio of the proximal vertical diameter of the propodus of first pair of ambulatory legs to its length is 1:4.5 to 1:5; of the dactylus, 1:6. In *M. spinosissimus* the corresponding ratios are 1:3 and 1:4.

The propodus in the latter is strongly compressed and decidedly tapered, but in *M. cornutus* it is scarcely compressed, and not tapered, the distal end being larger than the middle and about equal to the proximal end; its dactylus is also less curved and the tip very slender.

The color of *M. cornutus* in life is bright red above, lighter below; when recently dried it soon changes to pale red, yellowish red, or terra-cotta color, by exposure to light.

Measurements.

		Carapace				Chelæ		
	Sex	total length	length —rostum	breadth total	—spines	length	height	
4069	♂	64	58	62	53	46	13	Dominica
453 F.M.	♀ eggs	29	26	25.5	22	14	4	Bermuda
4070	♀ eggs	68	59	60	52	33	8	Dominica

In No. 4069 the merus of chelipeds is 35^{mm} long; greatest thickness, without spines, 9^{mm}; merus of first amb. leg, 28^{mm}; thickness in middle, 6^{mm}; its propodus, length, 21^{mm}; thickness, 4.5; dactylus, 18^{mm}; proximal diameter, 3^{mm}.

M.-Edwards gives for his largest (♂) specimen: length of carapace, 92^{mm}; breadth, 90^{mm}; length of chela, 82^{mm}.

The only specimen known from Bermuda (453 F. M.) was taken October 12, 1905, in 30 fathoms on the Challenger Bank, by the expedition from the Field Museum of Natural History. It is a small and evidently young female, but it carried a considerable mass of eggs.

At Dominica Island, in 1906, Mr. A. H. Verrill obtained a number of much larger perfect specimens, taken in fish-pots, in rather deep water (40–150 fathoms) where it was associated with *M. spinosissimus*, of very large size, and other large spider crabs.

It is a comparatively rare species, recorded by few authors. A. M.-Edwards knew only two specimens, from Martinique, in the Paris Museum. It was not mentioned by Stimpson, nor was it in the Porto Rico collection, studied by Miss Rathbun. It was not represented in the large collections of the National Museum enumerated by her in 1892.

Mithrax (Nemausa) acuticornis (Stimpson).

Mithrax acuticornis Stimpson, Bull. Mus. Comp. Zoöl., ii, p. 116, 1870. A. M.-Edw., Miss. Sci. Mex., v, p. 98, 1875. M. J. Rathbun, Amer. Naturalist, xxiv, p. 512, fig. 8, 1900.

Nemausa rostrata A. M.-Edw., Miss. Sci. Mex., Part v, i, p. 81, pl. xvii, figs. 4–4*d*, 1875. Miers, Voy. Challenger, Zoöl., p. 85, 1886 (Bermuda).

Mithrax (Nemausa) acuticornis M. J. Rathbun, Proc. U. S. Nat. Mus., xv, p. 260, pl. xxxvii, fig. 1, 1892; Bull. Labr. Nat. Hist. Univ. Iowa, iv, p. 259, 1898. Brach. and Macr. Porto Rico, p. 66, 1901.

FIGURE 39.

This species is characterized by its elongated and narrow carapace, the sharp lateral spines, and especially the unusually long and acute rostral horns.

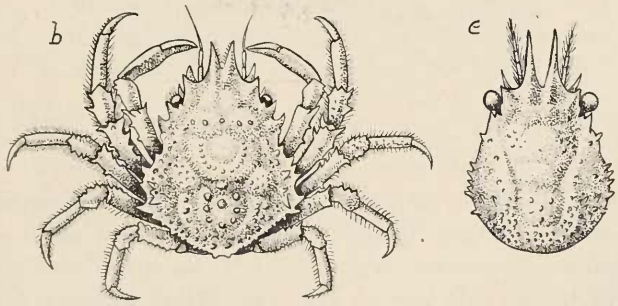

Figure 39.—*Mithrax acuticornis*; *c*, the same, the carapace of a younger specimen, × about three times. After A. M.-Edwards.

Recorded from Bermuda by Miers (Voy. Chall.), but not obtained by later collectors. Florida, West Indies and Gulf of Mexico, shore to 164 fathoms. Off Key West, 60 fathoms (Rathbun).

Mithrax hispidus (Herbst) Edwards. *Large Red Spider-crab; Coral Crab.*

Cancer hispidus Herbst, op. cit., Band i, p. 247, tab. xviii, fig. 100, 1790.

Mithrax hispidus H. Milne-Edwards. Mag. de Zoölogie, 2e an., 1832: Hist. nat. des Crust., i, p. 322, 1834. DeKay, Zoölogy of New York, Crust., p. 4, 1844. Gibbes, op. cit., p. 172. Stimpson, Amer. Jour. Sci., 2d ser., xxix, 1860, p. 132; Annals Lyc. Nat. Hist., New York, vol. vii, p. 18, 1860. Smith, these Trans., ii, pp. 2, 32, 1869 (descr. and measurements, Brazil). A. M.-Edw., Miss. Sci. Mex., v, i, p. 93, 1873, pl. xxi, fig. 1, 1875. M. J. Rathbun, Proc. U. S. Nat. Mus., xv, p. 265, 1892 (synon. and distribution); Brach. and Macr. Porto Rico, p. 67, 1901.

Maia spinicincta Lam., Hist., v, p. 241, 1818.

Figure 40. Plate XXIII, Figures 3, 4. Plate XXIV, Figure 1.

This species grows to large size. In life the larger specimens are nearly uniform deep brownish red or terra-cotta color above, brighter on the chelipeds and darker on the legs (due to brown hairs). The legs often have brighter red bands at the joints. Under parts of body mostly white or bluish white; legs red, specked with pale yellow.

Figure 40.—*Mithrax hispidus*, young ♀, from Bermuda, about $\frac{4}{5}$ nat. size. Phot. A. H. V.

A young specimen (No. 4058, fig. 40) in life had bright colors: the carapace was bright reddish brown, varied with paler patches; the spines and tubercles were light brown; chelæ pink with fine black spots; legs red, banded with pale yellow; ventral parts pale blue and bluish white. (C. S. V.)

In large individuals the gastric area is prominent, wide, with convex sides and defined by a wide and deep groove; the groove bounding the cardiac area is wide, but shallower.

Our larger Bermuda specimen has many unequal conical spines and tubercles on the surface, but between them the surface is smooth

and finely punctate, without granules. The arrangement of the spines is sufficiently well shown by the figures. The posterior lateral spine is simple, very acute, hooked, with the point turned upward and forward; the next, which is the largest and least curved, has three to five small spinules on its base; the next, which is nearly as large and more strongly hooked forward, is very acute and has one or two small basal spinules; the next (or second behind the orbitals) is larger and swollen at base, strongly hooked forward and acute at tip, and bears an acute spinule on its anterior base, and a cluster of about three small tubercles on the swollen upper side of its base; sometimes it appears bifid at base. The next spine in front is usually blunt and tuberculiform, with one or two smaller rounded tubercles on its swollen base, or the two larger tubercles may be subequal. Below the latter, on the subhepatic region, there are two large prominent, unequal spines near together. An irregular row of smaller spines is situated lower down.

The orbit is surrounded by six unequal spines, besides the antennal; of these the inner (preorbital) and outer are about equal, tuberculiform and obtuse; the two superior are small rounded tubercles. The larger antennal spine, which exceeds the rostrals in length, is acute, with tips curved mediad; the smaller antennal is also acute and about equals the inner orbitals in size and length, and it has a small rounded tubercle or tooth at its outer base.

The subrostral process is rather broad, a little concave in front, obtuse, and descends nearly perpendicularly from the rostrum. The buccal area has an angular sinus on each side of the front edge.

The ambulatory legs are covered above with sharp spines, except on the dactylus; the spines are in two or three rows. There is also a row of five or six acute spines on the lower anterior border of the merus of the two anterior legs; two or three spines on the third, and none on the last leg, below. The ambulatory legs are covered above, between the spines, with unequal sharp hairs which are most abundant on the dactyls, which have naked horn-colored tips.

The chelipeds, especially of the larger males, are unequal, large and strong. In the female they are equal. The merus bears two large, unequal, stout, subacute spines on the front margin, the distal one the longer and more curved; the upper surface has about ten unequal conical spines irregularly arranged (four or five in younger specimens); the posterior border has a row of about five to seven longer conical, subacute spines, sometimes with a few small ones interpolated. The carpus is large and swollen, punctate, nearly

smooth, but faint indications of three to five nearly obsolete tubercles can usually be seen, and in some cases two or three small proximal ones are fairly distinct. The manus is strongly compressed above, proximally, with a large round articular tubercle, but smooth, with no indication of spines or granules.

Measurements of M. hispidus and M.? depressus.

No.	Sex	Carapace: length, total	Carapace: breadth, total	Carapace: —spines	Bet. orbits	Chelæ: length	Chelæ: height	Manus above
3019	♂	8.5	9	8.5	4	5.5	2	3.5
3265	♀	20	22.5	---	12	14	4	---
1810	♀	23	27	24	8.5	17.5	5	10
4054	♀	29	34	31	9	22	6	13
1753	♂	29.5	35	31	---	23	7	13
4058	♀	69	87	73	---	60	17	33.5
868 F.	♂	67	86	74	16	r. 57 l. 61	17 r. 18 l.	32 35
34	♂	87	115	100	---	60	36	---

Nos. 3019, 4054, 4058, 868 F. Mus., and 34 are from Bermuda; No. 3265, from St. Thomas; No. 1810, East Mexico; No. 1753, Key West, Fla.

Nos. 34 and 1753 were measured by Prof. S. I. Smith. No. 34, from Goode's Bermuda collection, I have not examined.

Nos. 3019, 2265, 1810 are those referred, more or less doubtfully, to *M. depressus.*

Proportions of M. hispidus and M.? depressus.

Catalogue number	3019	3265	1810	4054	1753	4058	868F.	M. 34
Sex	♂	♀	♀	♀	♂	♀	♂	♂
Length carapace	8.5	20	23	29	29.5	69	76	87
Length to breadth	1:1.06	1:1.12	1:1.17	1:1.17	1:1.18	1:1.26	1:1.28	1:1.32
Length to breadth minus spines	1:1.0	....	1:1.04	1:1.07	1:1.05	1:1.07	1:1.10	1:1.15
Locality	Berm.	St. Th.	Mex.	Berm.	Key W.	Berm.	Berm.	Berm.

The two first in this series (No. 3265 and 4054, Yale Mus.) were labelled as *M. depressus* by Miss Rathbun. Nos. 3019, 3265, 4054, and 4058 are figured on plate xxiii.

This fine species is rare at Bermuda, at least in shallow water. It has not been found in many of the collections made there. The largest Bermuda specimen known to me was obtained by Mr. Goode (No. 34) in 1887. It was probably taken outside the reefs in fish-traps. My Yale party took a small one in 1898, and a larger one

(No. 4058) 1901, both in shallow water. The party from the Field Nat. Hist. Mus., 1905, obtained a larger and perfect specimen from off Tuckerstown point. Probably it was taken in a fish seine.

Very likely it is common in deeper water, on rough bottoms, among and outside the outer reefs, where it can be taken only in baited fish-traps. It appears to be one of the species that the fishermen call "coral crabs," probably on account of its red color.

It is commonly taken, of large size, in the West Indies, on similar rough bottoms, in five to thirty fathoms, in fish-traps. It is sluggish in its motions.

It ranges from S. Carolina to the Abrolhos Islands, Brazil (Smith). S. Carolina (Gibbes); Florida (Stimpson); Abrolhos Is., 30 fath., and off Cape St. Roque, 20 fath. (M. J. Rathbun).

Mithrax depressus A. M.-Edw. *Spider Crab.*

? *Mithrax depressus* A. Milne-Edw., Mission Sci., Mexico, part v, i, p. 96, pl. xx, figs. 4–4*d*, 1875. (Guadeloupe.) Verrill, these Trans., vol. x, p. 577, 1900 (Bermuda). M. J. Rathbun, Brach. and Macr. Porto Rico, p. 68, 1901.

Figure 41. Plate XXIII, Figures 1 ?, 2.

The only Bermuda record of this species is based on a very young ♂ specimen (No. 3019, see pl. xxiii, fig. 1) taken in April, 1898.* It has the carapace only 8.5^{mm} long by 9^{mm} broad.

It agrees closely in spinulation with the larger specimens of *M. hispidus*, but the dorsal spinules appear sharper. All the marginal spinules are simple and acute, with the points turned forward. The basal joint of the antennæ has a long, acute, central tooth, with the tips slightly incurved, as in the larger ones, and also a smaller outer acute tooth. The carpus of the chelipeds bears several small tubercles; the merus has one small spine on the inner edge; others above.

The carapace is yellowish white, with blotches of bright red; the two largest spots of red are over the branchial areas; a median is on the cardiac area; a pair is situated farther back; another small pair is behind the orbits; and another underneath the orbits; legs yellowish white, blotched or barred with red; chelæ light red with pale tips.

Although this young specimen differs from the larger ones of *M. hispidus* in proportions and general appearance, the details of the spinulation, etc., are the same. It does not agree well with the figures of *M. depressus* given by A. M.-Edwards. There are, how-

* This is the specimen recorded by me in 1900, as *M. depressus*, on the authority of Miss Rathbun, who had examined it.

ever, specimens of intermediate sizes, that seem to unite the two supposed species together in one series.

Although this specimen appears to me to be the young of *M. hispidus*, I have kept it under *M. depressus* out of deference to the opinion of Miss Rathbun, who has examined it, for she has had opportunities to study a far larger series of both forms than I have had.

It differs from the original figure of *M. depressus* (see our fig. 34), not only in its proportions, but especially in having all the four antero-lateral marginal teeth acute and curved forward, while in the latter the anterior three are tuberculiform and obtuse. Its front is narrower between the orbits. The basal antennal joint has the

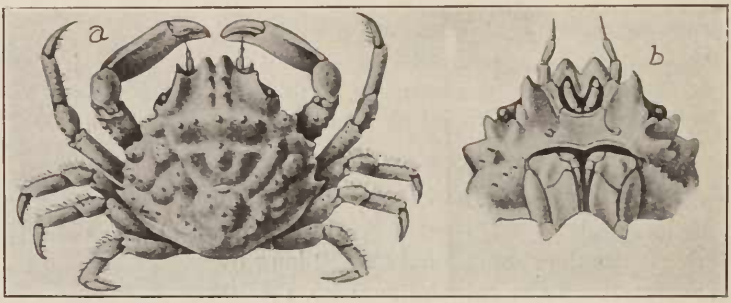

Figure 41.—*Mithrax depressus; a*, dorsal view, × 2⅓ times; *b*, under side of front, more enlarged. After A. M.-Edwards' original figures. According to the natural size diagram of Edwards, his specimen was 13mm long and 12mm wide.

inner tooth narrower and sharper, and the outer one more prominent and acute. The merus of the chelipeds has a different form, the proximal end being concave instead of convex, etc. It is rather smaller than Edwards' type, which was also young, but longer than wide, while ours is wider than long.

On plate xxiii, fig. 2, I have figured a St. Thomas specimen of larger size, also labelled as *M. depressus* by Miss Rathbun, for comparison. This is rather larger than Edwards' type and agrees more nearly with his figure in respect to the form of the marginal teeth, but is otherwise very similar to the undoubted young of *M. hispidus*. The carpus of the young of the latter is also spinulous.

The larger antennal tooth is shorter and more obtuse than in any of the others figured.

From the east coast of Mexico, near Vera Cruz, we have a specimen (No. 1810 ♀ Yale Mus.) which agrees very closely with Edwards' figure of *M. depressus* as to the tubercles of the carapace and the marginal spines, and also as to the teeth of the basal antennal joint. But the merus of the maxillipeds is concave proximally, as in our other specimens. In this, the most posterior (4th) marginal tooth is very acute and hooked forward, but the other three are short-tuberculiform or broad obtuse-conical, with coarse granules on their bases; the more anterior are the larger, as in Edwards' figure. The tubercles of the carapace are broadly rounded or flattened, which is the case in *depressus*.

The merus of the chelipeds has a single obtuse spine on the inner edge; five on the outer, and two on the upper surface. The carpus is angular and uneven, with a distal transverse fossa and about nine unequal rounded tubercles.

This approaches the type of *M. depressus* more nearly than any other that I have seen. It has the adult form of the female abdomen, while number 4558 (*M. hispidus*), which is considerably larger, has the immature form of the abdomen. It is, however, very unlike the small Bermuda specimen, described above.

The range of *M. depressus* is from Florida to the Abrolhos Islands, Brazil (t. M. J. Rathbun). East coast of Mexico (Yale Mus.).

Mithrax forceps (M.-Edw.) sub-sp. **hirsutipes** Kings. *Common Spider Crab.*

? *Mithraculus forceps* A. M.-Edw., Exp. Sci. Mex. Crust., i, p. 109, pl. xxiii, fig. 1, Dec., 1875 (t. Miers).

Mithrax hirsutipes Kingsley, Proc. Boston Soc. Nat. Hist., xx, p. 147, 1879 (descr.); Proc. Acad. Nat. Sci., Philad., p. 389, pl. xiv, figs. 1, 1*a*, 1879 (measur.) Rankin, Crust. Berm., p. 532, 1900.

Mithrax forceps Miers, Rep. Voy. Chall., xvii, pp. 87, 88, 1886. Rathbun, Bull. Labr. Nat. Hist., Univ. Iowa, 1898, p. 260 (Bahamas and Florida).

Mithrax forceps Rathbun, Proc. U. S. Nat. Mus., xv, p. 269, 1892 (descr., synon., and distribution); Brach. and Macrura Porto Rico, p. 70, 1901.

FIGURE 42. PLATE XXIII, FIGURES 4, 5, 6.

This species is easily distinguishable, from the others found at Bermuda, by the three strongly marked oblique ridges and intervening wide grooves on the branchial areas of the carapace. The last of these is more or less broken up and nodular; the two anterior are stronger and smoother, but often bear small tubercles. Two pairs of small tubercles are situated behind the rostral teeth, but there are no tubercles on the median line, and no transverse row on the gastric

area. The four antero-lateral spines are usually all similar in size, simple, and mostly acute and curved forward, but the anterior one is often a little shorter than the 2d and rather obtuse; the 2d and 3d are always acute, with the tips bent forward; the 4th is often smaller and more conical and less acute. The surface of the carapace and chelipeds is polished and shining, with no indications of hairs or granulus.

The chelipeds of the adult males are relatively large and strong, subequal, with the claws gaping. The dactyl is curved, denticulate only distally, with a strongly excavate tip, and it bears a strong tooth about the middle; the thumb has a broader denticulate tooth toward the base. In the young these teeth are absent.

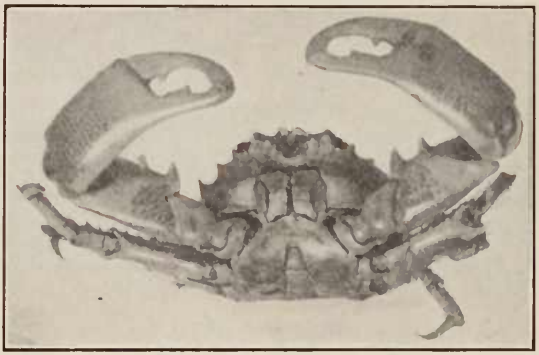

Figure 42.—*Mithrax forceps, hirsutipes*, adult male from Bermuda, under side, about nat. size. Phot. A. H. Verrill.

The carpus and chelæ are smooth, with no tubercles except a small denticle on the inside edge of the carpus; the merus bears two large acute spines on the inner margin, and about 4 or 5 much smaller, obtuse ones on the outer margin; the upper surface may have a few minute ones, or in adults a row of two or three obtuse ones. The ambulatory legs are rough with small short spines and long unequal stiff hairs; the dactyls are strong, incurved, with sharp tips; there is a prominent articular plate at the superior distal end of the propodus.

The basal antennal plate is wide and thick, tridentate; the outer tooth, which is much the largest, is broad and obtuse, its base occupying about half the width of the plate; the next is not more than half as large and subacute; it is separated from the still smaller

inner one by the notch for the base of the flagellum; the inner one is inconspicuous and often abortive. The notch between the two larger teeth is broadly concave. The outer tooth is just about the same length and size as the preocular tooth, but is more obtuse. The rostral teeth are short and obtuse, with thickened and slightly upturned edges in the adults. The subrostral process is large, concave, and obtuse.

Young specimens differ much from the adults in appearance. The oblique ridges of the carapace are all more broken up into nodules and tubercles, and the whole surface of the carapace is more nodose, so that it resembles that of *M. sculptus* in this respect, but the latter can easily be distinguished by the tuberculiform lateral teeth, roughened carpus, and other characters. The carapace of the young is also longer in proportion to the breadth (1:1.12 to 1:1.15).

Specimens recently preserved in alcohol and not much altered are mostly light yellowish brown or chestnut-color, varying in the same lot to orange and to purplish brown.

In life the carapace is usually uniform yellowish brown, varying to dull yellow and to greenish brown, without mottlings. Often there is a wide, pale yellow, medial dorsal stripe, especially in the young. Large males are sometimes plain chestnut or terra-cotta color. In the young the legs are often banded with lighter colors.

Females carrying abundant eggs were often taken in April and May, 1898 and 1901. A large female, taken in midsummer by Prof. Kincaid, also carried eggs. This crab is often captured by the large *Octopus*.

Measurements of Bermuda specimens.

		Carapace			Front	Chelæ		
No.	Sex	length total	breadth total	breadth —spines	bet. orbits	length total	manus above	height
3169	♂	22	26	24.5	9	25	13	10
3169*a*	♂	25	31	28	10	28	14	13
3169*b*	♂	19	21.5	20	8	19	11	9
718	♂	23	28	26	9	27	14	10.5

The ratios of length to total breadth in the above are 1:1.18, 1:1.24, 1:1.13, 1:1.22 respectively.

The egg-bearing females, taken in April and May, can be grouped in three pretty distinct sizes, though some intermediate ones occurred. The larger ones averaged in length of carapace, about 16^{mm}; breadth, 18^{mm}; those in the next smaller series average about 13^{mm} long; 15^{mm} wide; the smallest group, about 11^{mm} long; 12.5^{mm} wide. The

smallest individual with eggs is 10^{mm} long, 11.5^{mm} wide. Some of the eggs contain well developed young, about ready to hatch.

Dr. Stimpson failed to recognize this common species among the large W. Indian collections that he studied. He probably confused it with *M. sculptus*, which is closely allied.

Although several recent writers identify this species with *M. forceps* M.-Edw. (from S. America), it must be admitted that it does not agree with his figure and description. However, I have examined Brazilian specimens agreeing well with those from Bermuda. But two similar species may occur there.

Edwards does not describe his species as having strong, oblique branchial ridges and grooves, though they are, perhaps, faintly indicated in his figure. He says that the surface of the carapace is scarcely nodular, some tuberculiform elevations showing only near the branchial regions.

The carapace, as stated by him, is proportionately the same as ours (length, 30^{mm}; breadth, 35^{mm}; ratio 1:1.17; in our larger males it is from 1:1.18 to 1:1.24. The form of the merus of the maxillipeds is quite unlike our species, and the same is true of the basal joint of the antennæ. Unless his figures and description were very incorrect, in all these and other respects, it would be unreasonable to consider them identical, for the allied species do not vary to any such extent in these important characters. Of the present species I have had more than a hundred specimens, of all sizes, for comparison. Although the young differ considerably from the adults, as to areolations, they have essentially the same forms of the basal antennal plate and maxillipeds and do not approach those figured by Edwards.

The chelæ of the male, according to his description and figure, are rather long and slender, length to breadth as 3:1; while in ours, of similar size or smaller, they are much stouter, ratios about as 2:1. Moreover specimens of the present species, formerly sent to M.-Edwards by Prof. Smith, were not identified as his species by him.

Therefore I have preferred to retain *hirsutipes* (Kings.) as the name for the Bermuda and West Indian form, at least as a variety or geographical race, until Edwards' type can be reëxamined.

We found this one of the most common crabs at the Bermudas. It occurred on almost every rocky shore and reef in crevices and living under stones and dead corals, and also often exposed, between tides and in shallow water; 1–17 fathoms (Challenger coll.).

It was in the collections of Jones; Goode; the Challenger; and nearly every other later collector.

It ranges from Beaufort, N. C. to the Abrolhos Islands and Bahia, Brazil. Off Cape Fear, N. C., 15–17 fathoms, West Indies, 6–16 fathoms, Florida, and many other localities (Rathbun). Bermuda and Bahia, Brazil (Miers; Rathbun); Abrolhos (Smith, Yale Mus.).

Microphrys bicornutus (Latr.) A. M.-Edw. *Spider Crab.*

Pisa bicornuta Latreille, Encyc. Meth., Nat. Hist., x, p. 141, 1825.

Pericera bicorna H. Milne-Edwards, Hist. nat. Crust., i, p. 337, 1834.

Pisa bicorna Gibbes, Proc. Amer. Assoc., 3d meeting, p. 170, 1850.

Pericera bicornis Saussure, Crust. Antilles et du Mexique, p. 12, pl. 1, figs. 3, 3*c*, 1858.

Milnia bicornuta Stimpson, Notes on North Amer. Crust., Annals Lyc. Nat. Hist., New York, vol. vii, pp. 51, 180, 1860. Smith, Brazil Crust., these Trans., ii, p. 1, 1869.

Microphrys bicornutus A. Milne-Edw., Nouv. Arch. Mus. Hist. Nat., viii, p. 247, 1872; Miss. Sci. Mex., v, p. 61, pl. xiv, figs. 2–4, 1873; Bull. Mus. Comp. Zool., viii, p. 1, 1880. Miers, Voy. Chall., Zool., viii, p. 83, 1886 (Bermuda).

Microphrys bicornutus M. J. Rathbun, Proc. U. S. Nat. Mus., xv, p. 253, 1892 (synon.); Brach. and Macrura Porto Rico, p. 72, 1901.

Pisa galibica and *Pisa purpurea* Schramm and Desb., Crust. Guadeloupe, p. 18, 1867 (*t.* A. M.-Edw.).

FIGURE 43.

In life, this species nearly always has its carapace covered with closely adherent algæ, bryozoa, sponges, etc. which pretty effectually

Figure 43.—*Microphrys bicornutus*, nat. size, with foreign growths on the carapace. Phot. A. H. V.

conceal it. When cleaned, it is dull yellowish brown; its chelipeds are always covered with small, round, purplish spots. This is diagnostic for the species.

Many of the females collected April 20, 1901, carried eggs.

It is everywhere common on the rocky shores at low tide and on the reefs, living in crevices and under stones, or often more or less exposed. It is contained in nearly every Bermuda collection, including those of Jones, Goode, and others of early date.

Its range extends from Florida to Bahia, Brazil. Common on coral reefs throughout the West Indies. Abrolhos Reefs, Brazil, Colon, Florida, and Bermuda (Smith); Pernambuco (Rathbun).

Macrocœloma trispinosum (Latr.) Miers. *Spider Crab.*

Pisa trispinosa Latr., Ency. Meth., Nat. Hist., x, p. 142, 1825.

Pericera trispinosa H. Milne-Edw., Hist. nat. Crust., i, p. 336, 1834. A. M.-Edw., Miss. Sci. Mex., v, p. 52, pl. xv, fig. 2, 1873.

Macrocœloma trispinosa Miers, Journ. Linn. Soc. London, xiv, p. 665, 1879; Voy. Chall., Zoöl., xvii, p. 80, 1886. M. J. Rathbun, Proc. U. S. Nat. Mus., xv, p, 249, 1892 (syn. and distribution); Brachy. and Macr. Porto Rico, p. 74, 1901.

FIGURE 44.

This is one of the more common crabs at the Bermudas. It occurs from low water to 10 fathoms and more. It is very slow in its

Figure 44.—*Macrocœloma trispinosum*, with the hairs, etc., removed from the left side of the carapace; about nat. size. Phot. A. H. V.

motions and for its protection depends largely on the growth of sponges, algæ, etc. which usually entirely covers the nodulose carapace, causing it to resemble a stone or a mass of sponges. When

cleaned, it is reddish brown. Some taken in April, 1898, and April 20, 1901, carried eggs; also one taken in midsummer by Prof. Kincaid. Its range extends from North Carolina to Bahia, Brazil. Dominica I. (Yale Mus., coll., A. H. Verrill).

Off N. Carolina, 17 fathoms (U. S. Fish Com.).

Macrocœloma subparallelum (Stimp.) Miers.

Pericera subparallela Stimpson, Ann. Lyc. Nat. Hist. N. York, vii, p. 182 [54], 1860 (St. Thomas); A. M.-Edw., Crust. Miss. Sci. Mex., p. 54, pl. xiii, figs. 3–3*d*, 1873. Verrill, these Trans., vol. xi, p. 17, 1901 (Bermuda).

Macrocœloma subparallela Miers, Voy. Chall., Zool., xvii, p. 79, 1886; Rathbun, Proc. U. S. Nat. Mus., xv, p. 250, 1892.

Macrocœloma subparallelum M. J. Rathbun, Brach. and Macrura Porto Rico, p. 74, 1901.

Plate XXIII, Figures 3, *a*, *c*, *d*.

The first Bermuda specimen known was a small one, taken by the Yale party, in 1898. A much larger specimen (No. 640) was taken in a seine at Nonesuch I., Sept. 3, 1905, by the party from the Field Mus. Nat. History. It is a female carrying eggs. Its carapace is 34^{mm} long, less rostrum 27.5^{mm}; 29^{mm} broad, less spines 23^{mm}; length of rostral horns 6.5^{mm}; length of chelæ, 10.5; height, 3.5^{mm}. The horns are rather long and sharp, nearly parallel, with a large U-shaped space between them. There is a row of seven stout spiniform or conical tubercles across the posterior part of the carapace; the central and two lateral are the larger. It is covered with algæ, beneath which it is provided with a coating of stiff, rough hairs, with hooked tips.

The species ranges from Florida to Brazil.

Stenocionops furcata (Olivier) Rathbun.

Cancer furcatus Olivier, Encyc. Meth., Hist. Nat., Insectes, vi, p. 174, 1791 (*t.* Rathbun).

Cancer cornudo Herbst, Natur. Krabben u. Krebse, iii, part 4, p. 6, pl. lix, f. 6, 1804.

Pericera cornuda Latreille, Cuvier's Règne Anim., ed. 2, iv, p. 59, 1829 (*t.* M.-Edw.).

Maia taurus Lamarck, Hist., v, p. 242, 1818.

Pericera cornuta Latr., Cuvier, R. Anim., 2d ed., iv, p. 58, 1831. H. M.-Edw., Hist. nat. Crust., i, p. 335, pl. xiv, *b*, figs. 4, 5, 1834. Atlas Illust. ed. Cuvier, R. Anim., Crust., pl. xxx, fig. 1. Gibbes, op. cit., p. 172, 1850. Stimpson, Notes, i, op. cit. p. 183 [55]; Bull. Mus. Comp. Zool., ii, p. 113, 1870. A. M.-Edw., Miss. Sci. Mex., v, p. 51, 1875. Hurdis, Rough Notes, p. 361 (Bermuda). Miers, Voy. Challenger, Zool., xvii, p. 76, 1886. M. J. Rathbun, Family *Periceridæ*, Proc. U. S. Nat. Mus., xv, p. 244, 1892 (descr., syn., and bathymetrical distrib.).

Stenocionops furcata M. J. Rathbun, Ann. Inst. Jamaica, i, p. 6, 1897; Brachyura and Macrura of Porto Rico, p. 73, 1901.

Chorinus armatus Randall, Journ. Acad. Nat. Sci. Philad., viii, p. 108, 1839 (*t.* M. J. R.).

PLATE XXV, FIGURE 2.

In life the back of the carapace is closely covered with dark brown, stout hairs, many of them with hooked tips, and in most cases it is more or less concealed by foreign growths, especially sponges (see fig.). Most of the specimens taken in deep water at Dominica I. had the back, and sometimes the legs, covered with an elegantly colored sea anemone (*Calliactis tricolor*), so numerous that the edges of their bases were in close contact, but others had sponges attached to the carapace.

A good male specimen from Egmont Key, W. Florida (No. 971, Yale Mus.), has very little foreign growths on the carapace, except a few small red algæ. But there is considerable fine sand adhering between the hairs. It comes from a sandy region, and had, perhaps, recently moulted. The long hooked hairs are partly in clusters or large groups.

Measurements.

		Carapace				Chelæ			
No.	Sex	length total	length —horns	bd'th total	bd'th —spines	length	height	Dactyl	Locality
971	♂	115	88	84	63	88	16	30	W. Florida
4061	♂	100	76	63	49	62	10.5	21	Dominica

The total length of a cheliped, of No. 971, is 186^{mm}; merus, 74^{mm}; carpus, 25^{mm}; chela, 88^{mm}; rostral horns, 30^{mm}.

The old males sometimes become very large, having the body nearly six inches long and four wide, including the horns and spines, but most of our specimens from Dominica are about two-thirds that size.

The only Bermuda record is that given by Hurdis, but he could hardly have mistaken such a peculiar and conspicuous species. His specimen was taken in a lobster-pot.

It ranges from off Georgia to Bahia, Brazil. Gulf of Mexico and off Yucatan, seventeen stations, 21–30 fathoms (Rathbun). Bahia, Brazil (A. M.-Edw.); Dominica I., 10–150 fathoms in fish-traps (A. H. Verrill, 1906, Yale Mus.). Egmont Key, W. Florida, Santa Cruz, and east coast of Mexico (Yale Mus.).

Family **PARTHENOPIDÆ.**

Chelipeds usually much stouter and often very much longer than the legs. Basal joint of the antennæ narrow and small, situated between the front and the bottom of the orbits.

Parthenope* (*Platylambrus*) **crenulata** (Saus.).

Lambrus crenulatus Saussure, op. cit., p. 429, pl. i, figs. 4, 4*a*, 1855. Stimpson, Notes, No. ii, p. 201 [73]; Bulletin Mus. Comp. Zool. ii, p. 129 (*Platylambrus*) 1870.

Platylambrus serratus (*pars*) A. M.-Edw., op. cit., p. 156, pl. xxx, figs. 1–1*c*, 1875.

Plate XXVII, Figure 5.

Our Bermuda specimen agrees well with Saussure's description and figure, though it is much smaller. The carapace, as in his type, has an elongated, acute, lateral spine on each side. It also has the same form of rostrum, and agrees well in the tubercles and areolation of the carapace and armature of the chelipeds.

The carapace is much cut away and slightly concave behind the large lateral spine, and has no posterior lateral spines or teeth, while there are in front of the large, lateral spine six or seven small, obtuse, nearly even antero-lateral teeth or crenulations, on the evenly convex margin. Its rostrum is wide, and not constricted near the base; the tubercles of the carapace are relatively large and obtuse; five of the largest size stand in the median row, and three or four in a curved row on each side on a ridge nearly parallel with the convex, antero-lateral margin. The cervical constriction is very marked. The under edge of the chelæ has a row of minute granule-like denticles. The only remaining ambulatory leg (3d) is small, slender, and smooth. Most of the other characters are shown in the figure.

There is, on each side, a wide channel on the under side of the carapace, as in *Platylambrus* (Stimp.). Stimpson himself proposed that genus for Saussure's species and another one, similar in respect to the channels. This genus was adopted by A. M.-Edwards. He considered *crenulatus* a synonym of *P. serratus*, but his figure of the latter does not agree with our specimen.

Saussure's type was 18^{mm} in length of carapace; breadth, with spines, 24^{mm}; without spines, 19^{mm}. The Bermuda specimen is 8^{mm}

* Miss Rathbun has shown (Proc. Biolog. Soc. Wash., xvii, p. 170, 1904) that the genus *Parthenope* (Weber, 1795) was restricted by Lamarck, 1801, to the type *P. longimana* (L.), and, therefore, that *Parthenope* should replace *Lambrus* (Leach, 1814), as usually understood.

long; 9^{mm} wide with spines; 7.5^{mm} without spines; length of chela, 8^{mm}; height, 3.5^{mm}.

Saussure's specimens were from the Antilles. Off Tortugas (Stimpson).

The single small specimen, which I refer to Saussure's species, without much doubt, was dredged on the Challenger Bank by the party from the Biological Station, in 1903.

In proportions and general appearance it resembles *P. Pourtalesii*, with which it was at first thought to be identical by me and others. The latter is not a *Platylambrus*.

It differs considerably from Stimpson's original description* of *P. Pourtalesii* in the form of the rostrum, areolation, tubercles, and form of the carapace, number and character of the marginal teeth and of those on the chelipeds, etc.

The principal references to *P. Pourtalesii* are as follows:

Parthenope Pourtalesii (Stimp.).

Lambrus Pourtalesii Stimpson, Bull. Mus. Comp. Zool., ii, p. 129, 1870. ? A. M.-Edwards, Miss. Sci. Mex., v, p. 149, pl. xxx, figs. 2–2*d*. In part, M. J. Rathbun, Amer. Naturalist, xxxiv, p. 514 (fig. 11 copied from S. I. Smith's *L. Verrillii*).

? *Lambrus Verrillii* Smith, Proc. Nat. Mus., iii, p. 415, 1881; op. cit., vol. vi, p. 14, 1883; Annual Rep. U. S. Fish Comm. for 1885, p. [24], pl. ii, fig. 2, 1886.

It should be noted that the figures given by A. M.-Edwards do not agree very well with Stimpson's description.† M.-Edwards' figures show a decidedly larger number of tubercles on the carapace; more numerous lateral teeth; two, instead of one, large posterior spines; more denticles on the chelipeds; a broader rostrum. It may well be doubted whether he really had the same species, unless his figures are very incorrect or the species remarkably variable. Our specimen comes nearer to Stimpson's type, in some respects, than to M.-Edwards' figures. But it agrees much better with Saussure's figure.

Prof. S. I. Smith, in 1881, described and figured‡ a very similar form from deep water off the eastern coast of the United States, under the name of *L. Verrillii*.

* Stimpson's types of Crustacea were destroyed in the great Chicago Fire.

† The description in Edwards' work is a mere translation of Stimpson's and does not agree with the figures.

‡ This same figure has been used by Miss Rathbun, without credit, to illustrate *L. Pourtalesii* (Amer. Natur., xxxiv, p. 515, fig. 11). She considers the two identical.

Professor Smith later (1886) noted rather wide variations in the species that he described (see Ann. Rep. U. S. Fish Comm. for 1885), and suggested that it might prove to be the same as *L. Pourtalesii.*

His figure, however, differs much from that of M.-Edwards', especially in the much more spinulose lateral and postero-lateral margins; the much less prominent tubercles on the medial line ; different areolations; and narrower front and rostrum. But the chelipeds are much more alike in both figures, than either is like those of the Bermuda form.

Stimpson's specimens were from off Florida, in 40–107 fathoms. Straits of Florida, in 95–116 fath. (M.-Edwards). Off east coast of United States (*L. Verrillii*), in 59–67 fathoms.

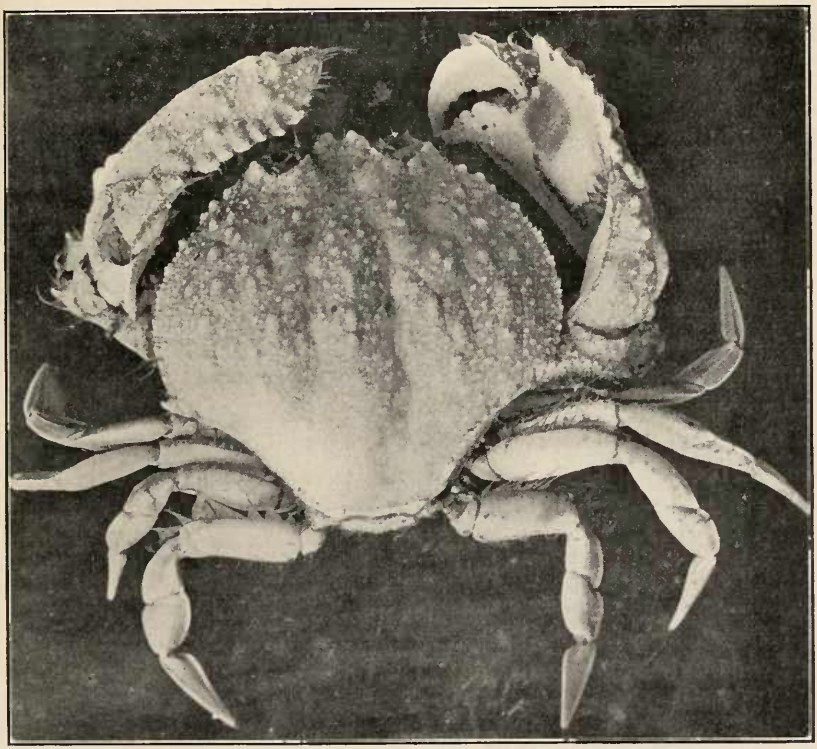

Figure 44*a*.—*Cycloës Bairdii, atlantica ;* ×1½. Phot. A. H. V.

OXYSTOMATA or LEUCOSOIDEA.

Family **CALAPPIDÆ**. *Box Crabs.*

Calappa flammea (Herbst) Bosc. *Box Crab.*

Cancer flammea Herbst, op. cit., vol. ii, p. 161, pl. xl, fig. 2, 1794.

Calappa flammea Bosc, Hist. nat. Crust., i, p. 185, 1802. Miers, Voy. Challenger, xvii, p. 284, pl. xxiii, figs. 1–1*b*, 1886 (synonymy). Rankin, op. cit., p. 532.

Calappa marmorata Latr., Hist. nat. Crust., v, p. 392, 1803 (*non* Fabr.). Desmarest, Consid. Crust., p. 109, 1825. H. Milne-Edw., Hist. nat. Crust., ii, p. 104, 1837. Smith, these Trans., iv, p. 263, 1880 (young at Woods Hole; descr. of megalops); Ann. Rep. U. S. Com. Fish and Fisheries for 1885, p. 31, 1886.

Calappa flammea M. J. Rathbun, Brach. and Macr. Porto Rico, p. 84, pl. ii (colored).

Plate XXV, Figure 1.

This large and curious species is easily distinguished from all others by its form and colors.

The most common color variety, taken in Castle Harbor, had the ground-color of the carapace dull olive-brown, in life, streaked irregularly with many flame-shaped blotches of bright red; edges of carapace bright yellow. Distal part of chelipeds yellow, with large broad patches of dark red; digits pale red or pink. Ambulatory legs pink above; the anterior edges bright red; the posterior edges and tarsi bright yellow.

Other specimens had the carapace covered with pretty regular, round, ocellated spots, the center white, surrounded by a ring of dark red or reddish brown. Chelipeds pink, spotted with roundish spots of deep red; spines red; tips of digits yellow. Ambulatory legs purple, with the articulations and posterior edges red; tarsi yellow. Its colors appear to be nocturnally protective.

The young of this species are narrower than the older ones, as shown by the following table. The ratios of the length to breadth of the carapace increases pretty regularly from 1:1.22, up to 1:1.59 in the largest. In still younger specimens examined the ratio is even smaller than the smallest in this table.

Measurements for proportions of Carapace.

No.	Sex	Carapace length	Carapace breadth	Ratios	Locality
7676	♀	60	85	1:1.42	Jamaica
7567	♂	58	86	1:1.48	Sabanilla
	♂	73.5	111	1:1.59	Brazil
	♂	69	106.3	1:1.54	Key West
	♂	58	85	1:1.46	Egmont Key
	♀	34.3	46.5	1:1.35	Bermuda
	♂	22	27	1:1.23	Vineyard Sound
3166	♂	32	42	1:1.31	Bermuda
3165	♀	65	90	1:1.38	Bermuda

The first seven series of the above are by Prof. S. I. Smith.

Measurements.

No.	Sex	Carapace length	Carapace breadth total	Carapace breadth —spines	Chelæ length	Chelæ height	Locality
3165	♀	65	90	84	51	46.5	Bermuda
3166	♂	32	42	38	23	21.5	Bermuda
7567	♂	58	86	72.6	--	--	Sabanilla
7676	♀	60	85	73	--	--	Jamaica
	♀	34	46.5	40	--	--	Bermuda
	♀	54	78	70.5	--	--	Egmont Key

This species has large and curiously shaped larval stages (see S. I. Smith, these Trans., iv, p. 263). It evidently lives a long time in the free-swimming zoea and megalops forms. This, no doubt, accounts in part, at least, for its wide distribution. At Bermuda it is common in sheltered sandy bays and lagoons in shallow water, but is probably more abundant at greater depths. It was taken by us in Castle Harbor and Hungry Bay. It was in the early collections of J. M. Jones, Mr. Goode, C. Hartt Merriam, and others.

Its normal range extends from off Cape Hatteras to Brazil and S. Africa. Taken by the Albatross in 1884, off N. Carolina, in 13–27 fathoms (Smith). Beaufort, N. C. (Stimpson, Kingsley) ; Charleston, S. C. (Gibbes); Egmont Key, W. Fla. (Yale Mus.); Dominica I., taken in fish-pots in 5–10 fathoms (A. H. Verrill, 1906, Yale Mus.); Brazil (Smith); Simons Bay, Cape G. Hope (Miers).

The megalops stages are frequently carried northward by the Gulf Stream to southern New England at Woods Hole, Newport, etc., in large numbers. In mild winters a few survive. Specimens 1 to 2 inches across have been taken at Woods Hole by Mr. Vinal Edwards and others. (See S. I. Smith, these Trans., iv, p. 263.)

Calappa gallus (Herbst) Latr., var. **galloides** (Stimp.). *Yellow Box Crab.*

Cancer gallus (*pars*) Herbst, op. cit., iii, pt. 3, pp. 18, 46, pl. lviii, fig. 1, 1803.
Cancer (*Calappa*) *gallus* (*pars*) Latr., Règ. Anim., iii, p. 24, 1817.
Calappa gallus H. M.-Edw., Hist. nat. Crust., ii, p. 105, 1837. Dana, Crust. U. S. Expl. Exp., p. 393, 1852. Capello, Journ. Sci. Math., Phys. Nat. Lisboa, iii, p. 133, pl. ii, fig. 4, 1871 (W. Africa).
Miers, Voy. Challenger, xvii, p. 286, 1886 (Bermuda). Rankin, op. cit., p. 533. M. J. Rathbun, Decapod Crust. W. Africa, Proc. U. S. Nat. Mus., xxii, p. 297, 1900; Brach. and Macr. Porto Rico, p. 85, 1901.
Cancer galloides Stimpson, Ann. Lyc. Nat. Hist. N. York, vii, p. 71, 1859.

FIGURE 45. PLATE XXVI, FIGURES 3.

Color of upper parts generally orange to orange-brown, becoming brighter on the front of the chelæ; under parts dull yellow. Carapace, above, and front of chelæ, covered with irreguiar spots of dark red or reddish brown, variable in size and form; many of the larger

Figure 45.—*Calappa gallus, galloides,* front view, about nat. size. Phot. A. H. V.

granules and tubercles of the carapace are white, especially those that lie in rows on the posterior transverse ridges and those on the scattered elevations. This causes the elevations to appear higher than they really are. The digits of the chelæ are smoky horn-color, becoming blackish on the upper side of the dactyl. Ambulatory legs yellow, finely reticulated with red lines.

Measurements.

No.	Sex	Carapace length	Carapace breadth total	Front bet. orbits	Chelæ length	Chelæ height	Locality
1903*k*	♂	51	66	8	r. 39 / l. 38	32 / 32	Bermuda

This was first recorded from Bermuda by Miers. We took good specimens in March, 1901, in shallow sandy places in Castle Harbor. The Bermuda Biological Station had it from Hungry Bay. It was also in Prof. Kincaid's collection (1903*k*). It was not in the early collections of Jones, Goode, etc.

The Atlantic form (var. *galloides*) ranges from Florida to Bahia, Brazil, and West Africa. Cape Verde Islands and Fernando Noronha (Miers). Common in the West Indies; Dominica I., in fish-traps, 20–30 fathoms (A. H. Verrill, 1906, Yale Mus.). Bahia (Rathbun).

The typical Pacific form (var. *gallus*) has a wide range through the Indian and Pacific Oceans; Red Sea; Persian Gulf, etc. Philippines (Miers).

Cycloes Bairdii Stimp., var. **atlantica** nov.

Cyclois Bairdii Stimpson, Annals Lyc. Nat. Hist. N. York, vii, p. 237 [109] 1860 (Cape St. Lucas). Verrill, these Trans. xi, p. 18, pl. ii, figs. 1, 2, 1901 (Bermuda).

Cycloës Bairdii M. J. Rathbun, Proc. U. S. Nat. Mus., xxi, p. 610, 1898; Brach. and Macr. Porto Rico, p. 85, 1901.

Figures 46, 47. Plate XXVII, Figure 2.

The carapace is evenly rounded in front of the lateral teeth; surface strongly areolated and rough with unequal granules and low

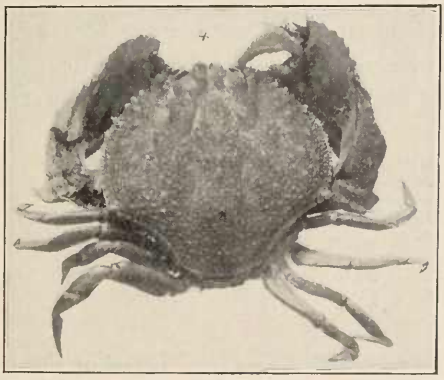

Figure 46.—*Cycloes Bairdii*, var. *atlantica*, No. 4050, $\frac{9}{10}$ nat. size. Phot. A. H. V.

rounded tubercles; a median row and two or three irregular series on each side most prominent; antero-lateral margins with many small unequal denticles and granules; posterior lateral tooth larger, triangular, with the tip bent forward and acute. Front with two

subacute denticles. Chelipeds strongly granulated, and with a few irregularly arranged small tubercles on the outer surface of the manus; lower margin double, with two rows of large granules; crest high and convexly rounded, with seven acute angular teeth, of which the third is highest; dactylus of one chela (the right in our specimens) with a large, stout, downward bent tooth near the base, when closed fitting into a socket between a tooth on the thumb and a large obtuse tooth on the manus; a large, flat, rounded distal tooth near the lower edge.

Its colors are bright in life. The carapace is pale yellow or whitish with lemon-yellow spots in irregular rows, and many small bright red or crimson spots, especially laterally. Chelipeds and legs bright yellow, spotted and banded with bright scarlet red; chelæ with a crescent of red at the articulation of the dactylus on the inside; tips of digits and teeth of the dorsal crest of manus red; carpus with two red spots. Legs bright yellow, with bands of red and purple, and purplish red margins on the merus; eye stalks orange.

There is a close fringe of slender yellowish hairs on the dorsal crest of the carpus, manus, and dactylus of the chelipeds, and transverse fringes at the joints; the merus has two hairy lines forming a V-shaped figure on its upper surface; on the inner surface of the manus there is a Y-shaped arrangement of long hairs, and a dense distal tuft on the thumb; the ambulatory legs have a dorsal fringe of hairs and also transverse ones at the joints. The under side of the carapace and the outer maxillipeds are also covered with long yellow hairs.

Measurements.

No.	Sex	Carapace length	Carapace breadth	Ratio	Chelæ length	Chelæ height	Locality
4050	♀	32	33	1:1.03	16.5	12.5	Bermuda
1424*a*	♂	35	36.5	1:1.04	26	21	C. St. Lucas (typical)
1424*b*	♀	36	37.5	1:1.04	26.5	21.5	" " "

Our form is so very similar to *C. Bairdii* of the Pacific coast that it can hardly be separated as a species. I have been able to compare it carefully with specimens from Panama and with two specimens,* male and female, from Stimpson's type-locality (Cape St. Lucas, coll. Xantus, Yale Mus.). The latter are, however, larger than our best Bermuda specimen, which is an immature female. The Bermuda

* See plate xxvii, figure 2, photo. from one of these.

form has the carapace more strongly areolated and appears rougher, owing to the relatively larger granules and more elevated tubercles. The two frontal teeth are more acute and have a small lobe or shoulder on the outer edge, while those of *C. Bairdii* are obtuse at tips and have no lobe. The carapace has the posterior lateral spines sharper, longer, and farther back, in the Atlantic form, and the sides are more rapidly contracted behind the spines; the crests of the chelæ are higher and the edge more convex, the third tooth from the front being longest, while in typical *C. Bairdii* the second is longest. These teeth in the former are angular or carinate on the front side, while in the latter they are evenly convex; they are granulated in both. The outer surface of the chelæ has fewer but larger tubercules in the Atlantic form, and the lower edge is bevelled

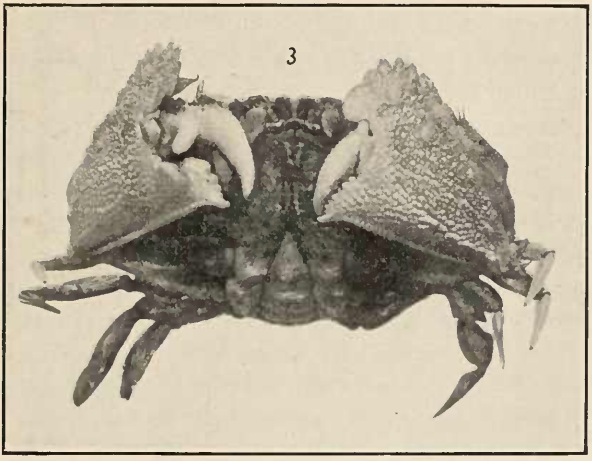

Figure 47.—*Cycloes Bairdii*, var. *atlantica*, from Bermuda, under side, × about 1¼. Phot. A. H. V.

and has two rows of small rounded granule-like denticles, while in *O. Bairdii* it is flatter, with two rows of larger obtuse denticles. The large tooth, near the lower proximal end, is acute-triangular in *O. Bairdii;* broadly rounded and obtuse in the Atlantic form.

There are various other minor differences, but whether they are constant or not is uncertain, on account of the small number of Atlantic specimens available for comparison. I have not been able to compare the male appendages.

There is much difference in the abdomen, but this is evidently largely due to the immaturity of the smaller specimen.

Two specimens of this species were taken in shallow water, in a sandy cove of Castle Harbor, near Walsingham Bay, in March, 1901 (coll. A. H. Verrill, Yale Mus.). Cast-off shells were found elsewhere, of larger size. Bahamas, six fathoms, and Porto Rico (Rathbun).

The Pacific form ranges from the Gulf of California to Panama. Cape St. Lucas (Stimpson, coll. Xantus, Yale Mus.). Panama (Capt. V. Dow, Yale Mus.).

HAPALOCARCINIDEA, nov.

The position of the family *Hapalocarcinidæ* in the system seems to be decidedly doubtful. Stimpson thought his genus was most nearly related to the Grapsoids.

Heller placed his genus, *Cryptochirus*, next to the *Pinnotheridæ*. Miss Rathbun (Crust. Haw. Is., 1906) placed the family at the end of the *Oxystomata*, in proximity to the *Dorippidæ* (*Ethusa*, etc.), to some of which there is considerable resemblance.

On the whole, it seems to me best to consider it as constituting a peculiar superfamily group, in which the genera are highly specialized, so as to adapt them to the peculiar habit of living in cavities, dens, or galls in the living parts of corals.

Each species hitherto discovered appears to represent a distinct genus, the genera differing among themselves widely in structure.

In general form and habits they superficially resemble some of the *Anomura*, especially the females, which have a large, elongated abdomen, in the form of a pouch, with all the sutures distinct, but not capable of curling up closely beneath the thorax, but there are no appendages on the sixth segment. The abdomen of the males is narrow and is applied closely to the sternum, as in ordinary Brachyura.

The epistome is feebly developed; the buccal area is large and arched anteriorly. The lower border of the orbit is little developed. The outer antennæ are small and extraorbital. The antennules have a large, prominent basal joint. The carapace is narrow and more or less oblong, or semicylindrical, not much narrowed anteriorly. The front is usually subtruncate or emarginate without a central tooth.

The outer maxillipeds are separated at base by a sternal lobe; they have the ischium broad, often with a convex inner lobe; the merus is small, seated well back, with the palpus articulated in a notch of the inner edge; the exognath is small.

The chelipeds are feeble, often little if any larger than the next legs; the chelæ are simple, with acute tips. The ambulatory legs

are all similar, short, with short, sharp, hooked claws, for strong adhesion. The posterior ones are not articulated much higher up than the others.

Family **HAPALOCARCINIDÆ.**

Troglocarcinus, gen. nov.

This generic name is proposed for a curious crustacean that inhabits holes and dens in the growing surface of living corals.

It is evidently closely related to the *Hapalocarcinus marsupialis* Stimpson of the Hawaiian Islands, which occupies gall-like nests between the living branches of *Pocillopora*. As in the latter, the abdomen of the female forms a capacious egg-pouch.

It differs in having the front of the carapace abruptly bent downward and operculum-like; in having the antero-lateral margin and front denticulate; in the form of the maxillipeds; and in several other characters. The eyes are not retractile; orbits feebly developed; a spine on the outer margin.

Troglocarcinus corallicola, sp. nov.

Figures 48, 49, *a*, *b*, *c*. Plate XXVIII, Figure 8.

Carapace oblong, transversely convex; the sides nearly parallel posteriorly; front abruptly bent downward and covered with small, unequal, sharp spinules and hairs to which dirt, etc., firmly adheres; front edge minutely notched in the middle and finely spinulated; antero-lateral margin with a row of fine sharp spinules; upper surface, back of the frontal bend, hairy and granulated, the granules larger anteriorly and toward the sides; minute posteriorly. The sloping anterior part of the carapace has a concave area, each side of the median line. The antero-marginal spines decrease in size backward; the one at the exterior edge of the orbit is largest. The carapace is much higher or thicker in front, especially at the bend, than posteriorly. Sternum smooth, concave in the middle; genital openings of ♀ lunate, near together on the sternum.

Chelipeds small, in the female smaller than the first ambulatory legs; in the male about as stout, but not longer, hairy; chelæ small, with simple, acute digits. Ambulatory legs hairy, short, incurved, with simple, sharp, incurved claws; posterior legs becoming shorter, but similar to the others, articulated slightly higher up.

Eyes small on thick, short stalks; orbits looking forward. Pedicels of antennulæ large, longer than the eye-stalks, rather stout, near together, spinulose distally, with about three longer terminal spinules.

The antennules are small, folding vertically, the tips reaching but little beyond the eyes. Antennæ small, about as long as the eye-stalks. Outer maxillipeds have the merus short and broad, with a decided notch on the inner distal edge, at the articulation of palpus. The ischium is broader than long, with a rounded or semicircular lobe on its inner margin; exognath is small and short. The large palpi occupy about all the space to the bases of the antennules. The anterior lobe of the sternum separates the bases of the maxillipeds. Legs and maxillipeds very hairy.

The abdomen is convex and has the rings thin, but somewhat indurated above. In the female the edges are expanded and form a well developed egg-pouch below, containing eggs in two specimens.

Figure 48.—*Troglocarcinus corallicola*, ♀, anterior parts, from below; diagrammatic sketch, much enlarged, from a Dominica specimen.

This curious species lives in oven-shaped cavities or dens formed in the upper surface of living corals, especially of *Mussa*, *Mœandra*, *Dichocœnia*, etc.; as many as 8–12 such cavities are sometimes found in a coral six inches in diameter. The opening of the den is usually semicircular or lunate, commonly oblique to the surface of the coral; the opening being preserved, no doubt, by the friction due to the constant motions of the crab. The downturned, rough, and dirt-covered front of the crab serves as a lid or operculum, closing the aperture very nicely. The crabs can leave their dens, at least when young, as they often do so when the fresh corals are put aside to dry. The full grown crabs are probably unable to leave their dens.*

Length of carapace in one of the larger females, 7^{mm}; breadth, 4^{mm}. This one carries eggs.

It does not appear to be common at Bermuda. Abundant at Dominica I., in *Mussa* and *Mœandra clivosa*, from 3–5 fathoms (A. H. V., 1906, Yale Mus.).

* In the figure pl. xxviii, fig. 8, the crab was intentionally placed in a den too large for it, in order to show its form.

It appears to be nearly allied to *Hapalocarcinus marsupialis* Stimpson,* which forms curious "houses" among the branches of *Pocillopora caspitosa*. The branches of the coral, in the latter case, grow up around the crab and enclose it, leaving several small apertures for the entrance of water and food, but from which the crab cannot emerge.

In the latter, however, the front of the carapace is flat, not bent downward, and it does not serve for an operculum, which is not needed in its case.

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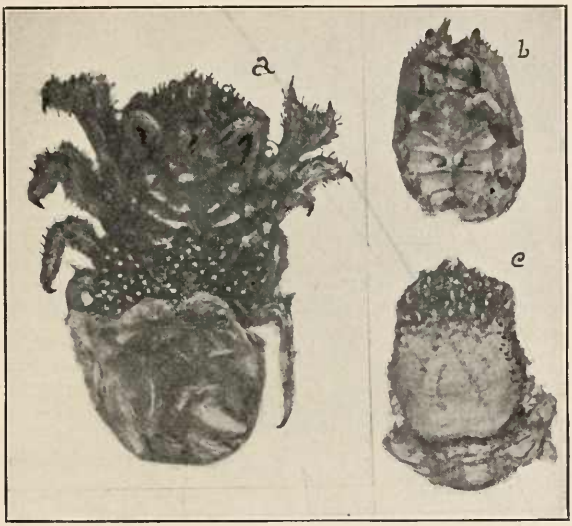

Figure 49.—*Troglocarcinus corallicola ; a*, dorsal view, × about 4 times, of a ♀ removed from its den in a coral (*Mussa*), from Dominica I.; *b*, a smaller ♀ specimen, × about 4 times, ventral view ; the abdomen, legs, outer maxillipeds, and antennules are removed, except one basal antennular segment ; *c*, the same, another ♀ example ; dorsal view, ×4. Phot. A. H. V.

It is, perhaps, more closely allied to *Cryptochirus coralliodytes* Heller,† from the Red Sea and Maldives, which lives in the same manner, in dens in *Leptoria* (=*Mæandra*).

The latter, however, has a differently formed carapace, smooth, convex in front, without marginal spines ; orbits simple, without spines ; and very different maxillipeds.

* Proc. Boston Soc. Nat. Hist., vol. vi, p. 412, 1859. Calman, Trans. Linn. Soc. London, ser. 2, vol. viii, p. 43, pl. iii, figs. 29–40, 1900. M. J. Rathbun, Crust. Hawaiian Is., U. S. Fish Com. Bulletin, for 1903, part iii, p. 892, 1906.

† Heller, Cam., Sitzungsb. Math.-Naturwiss. Classe. Akad. Wissenschaften, Wien, xliii, i, 1861, p. 366, pl. iv, figs. 33–39.

DROMIACEA de Haan, 1839, *Dromides.*

Dromiacea Boas, 1880. A. M.-Edw. and Bouvier, 1899 and 1900.
Dromiacea or Dromides Alcock, 1901.
Brachyura anomala Stebbing, 1900, 1903.
Anomura (*pars*) Dana and many other authors.
Dromidea Ortmann, 1896.

The relations of this rather anomalous group are recognized by nearly all modern writers to be rather with the Brachyura than with the remainder of the old group *Anomura*. It includes, according to Alcock and Stebbing, two superfamily groups: *Dromiidea* (restricted) and *Homolidea*.

Family **DROMIDÆ**. *Sponge-carrying Crabs.*

This small and curious family is represented in the Bermudas by the two more common West Indian species, but both have been discovered only recently, in rather deep water. Both were dredged on the "Challenger" and "Argus" Banks. Both species carry a living sponge over the back, for concealment and protection. They use various species of sponges for this purpose, holding the sponge in position by means of the two posterior pairs of legs, which bend upward for this purpose.

Dromia erythropus (Geo. Edw.) Rathbun.

Cancer erythropus Geo. Edwards, in Catesby, Nat. Hist. Carolina, etc., ed. of 1771, ii, p. 37, pl. xxxvii.
Dromia lator H. M.-Edw., Hist. nat. Crust., ii, p. 174, 1837.
Dromia erythropus M. J. Rathbun, Annals Inst. Jamaica, i, p. 39, 1897; Results of Brauner-Agassiz Exped. to Brazil, Proc. Wash. Acad. Science, ii, p. 143, 1900. Benedict, Anomura Porto Rico, p. 172, 1901 (descr.).

FIGURE 50.

In life this species is densely covered with dark brown or blackish stiff hairs, only the tips of the dactylus being naked; these are light red. Beneath the hairs the surface is whitish. It grows to considerable size; the carapace is often 70 to 75^{mm} broad. It always covers its back with a concave fragment of some living sponge, but numerous species of sponges are used for this purpose. Very often it is some light silicious sponge of the family *Chalinidæ*, as *Spinosella sororia;* in other cases it is a tough compact species belonging to the *Suberitidæ;* in several cases it was a keratose sponge of the genus *Hircina;* one from Dominica carried a large concave mass of a silicious sponge of the genus *Agelas*, several times its own bulk.

The only Bermuda specimen known to me was obtained by the party from the Field Mus. Nat. Hist. on the Argus Bank, 30–40 fathoms, Oct. 13, 1905. It was taken from the stomach of a Hamlet Grouper, and was, consequently, badly damaged. It was a large specimen.

Its range is from Florida to Pernambuco, Brazil (Rathbun).

A number of large specimens, in the Yale Mus., were collected at Dominica, 1906, by A. H. Verrill. They were caught in fish-traps set in 50–150 fathoms.

Figure 50.—*Dromia erythropus* from Dominica, with a flat Chalinid sponge held over its back, about ½ nat. size. Phot. A. H. V.

Dromidia antillensis Stimpson.

Dromidia antillensis Stimpson, Proc. Acad. Nat. Sci., Philad., for 1858, p. 225; Annals Lyc. Nat. Hist. N. York, vii, p. 71, 1859. Smith, these Trans., ii, p. 17, 1869 (meas.). Benedict, Anom. Coll. Porto Rico, p. 132, 1901.

Figure 51. Plate XXVIII, Figures 2, 3.

The carapace, which is about as long as broad, is convex in both directions, high in the middle, and pretty evenly rounded, covered with fine, close, yellowish hairs, beneath which it is white, nearly smooth, minutely punctate. Similar hairs cover the chelipeds; those of the other legs are longer. The narrow front is abruptly bent downward at tip; it bears three small obtuse teeth standing equally spaced, forming a triangle, in a front view; the inner orbital tooth is small and acute; the superior orbital is nearly as large and acute; the inferior orbital is similar to the frontal spines in size and form. There are four small, acute lateral spines, of which the first two are stouter, and divergent, the first a little larger; the 3d and 4th are strongly hooked forward at the tip and very acute. The carpus of the chelipeds has three distal, subspiniform angles, the

upper one smaller, obtuse; the two outer ones prominent, subacute. The manus is carinate above, with 4 or 5 small granule-like denticles on the edge; the thumb and dactylus are strongly excavated at tip and bear 5 or 6 serrate teeth, on the outer edge, the distal ones largest. The last two legs are sharply subchelate at tips, the last most perfectly so.

Figure 51.—*Dromidia antillensis*, under side, × about 1½. Phot. A. H. V.

Color, in alcohol, white under the yellowish pubescence; chelæ with light red or flesh-colored, partly naked fingers, white at the tips.

It always protects itself by means of a living sponge (sometimes a compound ascidian) held over its back by the posterior two pairs of legs. The carapace is about as long as broad.

Measurements of Carapace for variations of Ratios.

No.	Sex	Carapace length	Carapace breadth	Ratios	Locality
831*a*	♂	15.5	15.6	1:1.01	Brazil
831*b*, fig.	♂	18.2	18.5	1:1.02	"
831*c*	♀	16.0	16.0	1:1.00	"
831*d*	♀	18.0	18.2	1:1.01	"
703, fig.	♂	12.5	13.5	1:1.08	Bermuda

The first four series of measurements are by Prof. S. I. Smith.

In No. 831*b*, the chelæ are relatively much larger than in the Bermuda example, probably owing to its maturity; length of chela, 12.5^{mm}; height, 6.5^{mm}; the manus has a row of four conspicuous denticles on upper edge, proximally; the edges of the digits are strongly and coarsely toothed. The carpus has three conspicuous distal tuberculiform teeth. The lateral teeth of the carapace are conspicuous, the two anterior ones the larger and less acute; on the left side the 2d tooth is double. The preorbital and suborbital teeth are about as large as the lateral.

A single specimen was dredged by the party from the Bermuda Biological Station on the Challenger Bank in 1903.

It agrees pretty closely with Stimpson's original description, except as to the form and relative size of the lateral spines. But it does not agree so well with Mr. Benedict's later description, in several characters. The differences may be due to age, or there may be distinct local races or varieties. More specimens are needed to determine this.

The range of the species is from Mexico and west coast of Florida to the Abrolhos, Brazil. Florida and St. Thomas (Stimpson). Santa Cruz (Yale Mus., 1018, coll. Dr. Bishop); Abrolhos Is., Brazil, No. 831 (Smith); Porto Rico (Rathbun); Bahamas (Rankin); east coast of Mexico (Yale Mus.).

HETEROMACRURA, nom. nov. = ANOMURA (in part).

Anomura or *Anomoura* M.-Edw. (*pars*); Dana (*pars*); Henderson (*pars*); and many other authors.

Macrura anomala Alcock, 1901; Stebbing, 1903.

This group seems to lack a suitable name. At least there is great diversity in the use of former names.

Anomura is still used, as it has been for the past fifty years or more, in very diverse senses. Therefore it will save confusion to abandon it, unless as a loosely applied general term.

"Anomala" (de Haan), being an adjective term, has been used in many diverse senses, not only in Crustacea, but in other groups also. Hence I now propose to give this group the above name.

It includes the superfamily groups: *Galatheidea*, *Hippidea*, *Paguridea*.

GALATHEIDEA *Henderson.*

Porcellanoidea + *Galatheoidea* Stimpson, 1860.

This group as defined by Henderson, Ortmann, Alcock, and other recent writers, includes the families *Porcellanidæ*, *Galatheidæ*, and some others.

Family PORCELLANIDÆ.

It is remarkable that only one species of this large family has hitherto been found at the Bermudas, for numerous other species occur on the reefs of the West Indies and Florida.

Petrolisthes armatus (Gibbes) Stimp.

Porcellana armata Gibbes, op. cit., p. 190, 1850.
Petrolisthes armatus Stimpson, Proc. Acad. Nat. Sci., Philad., 1858, p. 227; Ann. Lyc. Nat. Hist. N. York, vii, p. 73, 1860. Kingsley, Proc. Acad. Nat. Sci., Philad., 1879, p. 406. Ortmann, Zoöl. Jahr., x, p. 280, 1897. Benedict, Anomura Porto Rico, p. 133, 1901.

Plate XXVII, Figure 3. Plate XXVIII, Figure 4.

Color variable; carapace, in life, often yellowish green, with minute white spots, legs similar, except on the last two joints, which have white transverse bands; under surfaces pale yellow or white, except the large chelæ, which are pale blue (C. S. V.).

Some specimens are dark gray above, finely spotted with white and light gray. Others are red or reddish brown, thickly specked and spotted with white or yellowish white.

The colors are imitative of the sand, gravel, stones, algæ, etc.

The median tooth of the front is obtuse. There is a very distinct, transverse, granulated ridge across the front. The merus of the chelipeds usually has three (rarely 4) sharp teeth on the inner margin; the outer margin is finely serrulate.

The chelæ are large, flat, angular; the manus has a distinct, granulated, raised line on the outside.

One of our larger male specimens has the carapace 11.5^{mm} long; 9.5^{mm} broad; between orbits, 5^{mm}; merus of chelipeds, 10^{mm} long; larger chela, 18^{mm} long; 7.3^{mm} high. The larger chela is stouter than the other, with shorter and stouter digits, which are laterally incurved and slightly crossed at the tips.

Variety **pallidus**, nov.

Many Bermuda specimens differ from the ordinary form in having the carapace nearly smooth, with scarcely any traces of the transverse rugæ and granules, so conspicuous in the typical form, and in lacking the coarse granules on the outer surface of the chelæ. The color is usually white or pale yellow. The chelæ are the same in form and carinæ, and the merus of the chelipeds has three sharp, spaced teeth on the front edge, as in *armatus*. In most other respects there are no differences between them. Whether it has the same habits was not noted. Length of carapace, $8–10^{mm}$.

This species is very common at Bermuda. It lives under stones and in the interstices and crevices of dead corals, etc. It was in the early collections of J. M. Jones, and has been taken by nearly all

later collectors. Its range is very extensive; from off Cape Hatteras to Maceio, Brazil; from Panama to southern California; Pacific Islands; Indian Ocean, etc. Common on the Florida reefs and Keys, and in the West Indies. Colon, Key West, and Egmont Key, W. Florida (Yale Mus.). Gulf of Calif. (Lockington).

Family **GALATHEIDÆ** Dana.

Munida Beanii, sp. nov.

FIGURE 52. PLATE XXVII, FIGURES 8, 9.

A small species, with an ovate carapace, widest opposite the third pair of legs. Transverse, elevated, ciliated ridges are well separated; about sixteen on the carapace, of which four or five are incomplete. Marginal spines about eight, small, acute, the most anterior largest;

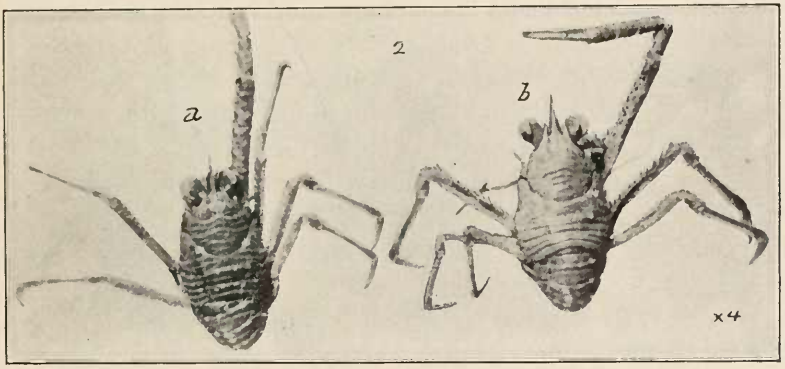

Figure 52—*Munida Beanii; a*, dorsal view of specimen with shorter ocular spines; *b*, specimen with longer ocular spines, × about 3 times. Phot. A. H. V.

dorsal spines ten, very small; of these there are three on each side, anteriorly, in an obliquely transverse line, nearly parallel with the post-orbital border; the inner one is largest; a single spine on each side, behind the second ciliated ridge; a single one, on each side, behind the cervical groove.

Rostrum moderately long, tapered, nearly smooth, acute, triquetral, or with a slight dorsal carina. Orbital spines lanceolate, with sharply acuminate tips, in some cases nearly half as long as the rostrum and reaching the cornea of the eyes; in others not over one-third as long as the rostrum and shorter than the eye-stalk.

Eyes large on rather long, stout stalks; in several specimens the right eye is distinctly larger than the left (see figures). Chelipeds slender; the merus is nearly as long as the chela; the fingers gape at base, at least in the male, the thumb being curved downward at base rather abruptly; outer edge of thumb finely denticulate beyond the curve, edge and tips of finger fringed with short hairs. Entire surface of chelipeds finely spinulose, with minute flat transverse rugæ between the spinules, having ciliated edges. Ambulatory legs also spinulose. The largest specimen has the carapace 7.5^{mm} long; 4.5 wide; length of merus of cheliped, 8^{mm}; of chela, 9; of dactylus, 4^{mm}. Another specimen had the carapace 7^{mm} long, 4^{mm} wide. This species is closely allied to *M. simplex* Benedict, but Mr. Benedict, who has examined the specimens, considers them distinct. In the latter there are two pairs of spines behind the cervical suture; the rostrum is longer and more slender; the chelipeds are longer, and the chelæ longer in proportion to merus. Possibly these differences may be due in part or wholly to immaturity.

Seven specimens, No. 893, were dredged in 50 fathoms, on the Argus Bank, Oct. 13, 1905, by the expedition from the Field Museum of Natural History, under Dr. T. H. Bean, to whom it is dedicated.

HIPPIDEA, de Haan.

Hippidea Stimpson, 1859. *Hippoidea* Stimpson, 1860. *Hippidea* Ortmann, 1896.

Family **HIPPIDÆ** Stimpson.

Hippa Fabricius (restr.).

Hippa (*pars*) Fabr., Mant. Insect., pp. 329, 330, 1787; (restr.) 1798, type *H. adactyla*.

Remipes Latreille, 1806, and most later authors.

Hippa M. J. Rathbun, Proc. U. S. Nat. Mus., xxii, p. 301, 1900 (*non* M.-Edw.).

Miss Rathbun has restricted this generic name to the group typified by *adactyla*, the only species left in the genus by its author, in 1798.

Hippa cubensis (Saussure) Rathbun. *Sand-bug.*

Remipes cubensis Saussure, Rev. Mag. Zool., (2), ix, p. 503, 1857; Crust. Antilles and Mex., Mem. Soc. Phys. Nat. Hist. Genève, xiv, p. 452, pl. ii, figs. 19, 20, 1858. Rankin, Ann. N. Y. Acad., xi, p. 237; op. cit., xii, p. 533 (Bermuda).

Remipes scutellatus Miers, Jour. Linn. Soc. London, xiv, 1879, p. 319. Henderson, Voy. Challenger, Zoöl., xxvii, p. 138, 1888. (? Not *Hippa scutellata* Fabricius. Ent. Syst., ii, p. 474, 1793.)

Remipes Barbadensis Stimpson, Proc. Philad. Acad., 1858, p. 229 [67]; Ann. Lyc. Nat. Hist. N. York, x, p. 120, 1871.

Hippa cubensis Rathbun, Proc. U. S. Nat. Mus., xxii, p. 300, 1900 (W. Africa).

FIGURES 53, 54.

The carapace is somewhat depressed. The antennæ are much smaller than in the related species of the eastern U. S. coast. (*Emerita talpoidea.*)

The females are much larger than the males and usually more numerous in collections.

Our specimens, taken in spring and October, are without eggs. Henderson records a number of specimens taken at Bermuda by the Challenger, in May, several of which carried eggs.

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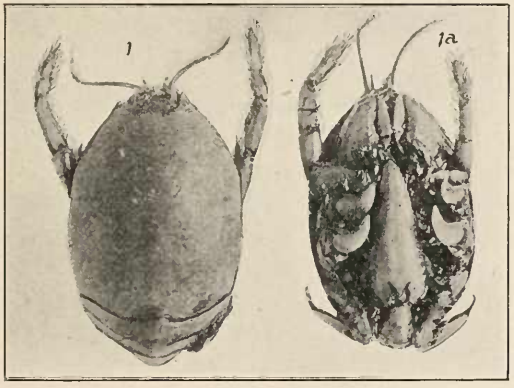

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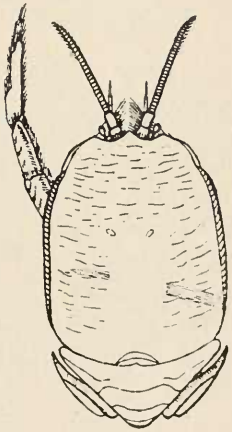

Figure 53.—*Hippa cubensis;* 1, dorsal; 1*a*, ventral view; × about 1¼. Phot. A. H. V.

Figure 54.—The same; carapace, enlarged, after Saussure.

Adult female specimens are about 20 to 23^{mm} long, by 17 to 19^{mm} wide; the males are about 12^{mm} long. One of the largest females is 22^{mm} long; 18.5 wide.

It lives in the shifting sands at and below low-tide level. When laid bare by the waves it can quickly retreat backward into the sand for some depth.

It is not uncommon at Bermuda, on sandy shores, but requires special search. It was in the early collections of Jones, Goode, and Merriam. Also obtained by the Challenger Expedition. Rankin records it from Cooper's Island.

Its range is from the Florida Keys to Brazil and to West Africa and the adjacent islands. Common in most of the West Indies. Abundant on the shores of Cuba (Saussure); Old Providence, April, 9, 1884, with eggs (Str. Albatross, Smith).

Cape Verde Islands (Studer, Miers, etc.); Dahomey (Osorio); Quinchoxo (Studer); Ascension Island (Miers, Benedict); Bahamas (Rankin); Dominica I. (A. H. Verrill, 1906). Brazil (coll. Hartt, Yale Mus.).

Family **ALBUNEIDÆ** Stimpson.

Albunea oxyophthalma Miers.

Miers, Jour. Linn. Soc. London, xiv, p. 329, pl. v, figs. 14, 15, 1879. Benedict, Anom. Crust. Porto Rico, p. 139, 1901. Verrill, these Trans., xi, pp. 18, 62, pl. viii, fig. 1, 1901 (Bermuda, *oxycephala* on p. 18 by error).

? *Albunea Paretii* Guerin, Rev. et Mag. de Zoöl., ser. ii, vol. v, p. 48, pl. i, fig. 10. Kingsley, Proc. Philad. Acad. Sci. for 1879, p. 409 (W. Florida).

Plate XXVIII, Figure 1.

This species is peculiar in having eleven or twelve spines each side of the central rostral tooth, and unusually long eye-stalks. In the closely related species (*A. Gibbesii*) of the U. S. coast, there are only nine or ten teeth on each side.

The only Bermuda specimen known to me is the one recorded in 1901. It was found buried in the beach sand by Mr. T. G. Gosling. It is, no doubt, nocturnal in its habits.

Its range is from West Florida to Brazil. St. Christophers, Cayenne, and Brazil (Miers). Sarasota Bay, W. Florida (Kingsley).

PAGURIDEA, Stimpson, 1859.

Family **CENOBITIDÆ**. *Land Hermit Crabs.*

Cenobita Diogenes (Latr.) Edw. *Land Hermit Crab.*

Pagurus Diogenes Latr., Encyc., pl. 284, figs. 2, 3 (after Catesby).

Cenobita Diogenes H. M.-Edw., Hist. nat. Crust., ii, p. 240, pl. ii, figs. 11–14, 1837. Smith, these Trans., ii, p. 38 (Brazil). Rankin, op. cit., p. 533, 1900 (Bermuda). Benedict, Anomura Porto Rico, p. 139, 1901 (descr.). Verrill, Geology of Bermuda, Amer. Journ. Science, ix, p. 338, 1899, fig. 12; these Trans., vol. xi, pp. 464, 708, fig. 22*a*; The Bermuda Islands, pp. 52, 296, fig. 22*a* (habits); these Trans., vol. xii, pp. 158, 179, 196, 197, fig. 60, 1906 (fossil).

Figure 55.

This is the only land hermit crab of this faunal region. Easily recognized by the large, massive, purplish left chela; stout ambulatory legs; the wide compressed propodus of the left leg of the second pair; and the compressed eye-stalks.

Not uncommon at Bermuda and often found on the high sand hills, far away from the shore, and in gardens. Large specimens usually occupy fossil shells of *Livona pica*, which have weathered out from the soft æolian limestones. These fossil shells were doubtless carried from the shore to the ancient sand dunes by the remote ancestors of these same crabs.

Figure 55.—Land Hermit Crab in shell of *Livona pica*, about ⅔ nat. size. From living specimen by A. H. V.

Its range is from Florida Keys to Brazil. Key West, Santa Cruz, Dominica I. (Yale Mus.). Andros I. and Nassau (Rankin). Found on nearly all West India Islands.

A fossil Bermuda specimen, in a shell of *Livona pica*, is in the Yale Mus. (coll. Jones).

Family **PAGURIDÆ.** *Hermit Crabs.*

Calcinus sulcatus (M.-Edw.). Stimp. *Red Hermit Crab.*

Pagurus sulcatus M.-Edw., Ann. Sci. Nat., ser. 2, vi, p. 279, 1836; Hist. nat. Crust., ii, p. 230, 1837.

Calcinus sulcatus Stimpson, Proc. Acad. Nat. Sci., Philad., 1858, p. 234. S. I. Smith, these Trans., ii, p. 17, 1869 (Brazil). Hilgendorf, Monats. Preuss. Akad. Wiss., Berlin, 1878, p. 823. Henderson, Rep. Challenger, Zoöl., vol. xxvii, Anomura, p. 61. Verrill, these Trans., x, p. 578, 1900. Benedict, Proc. U. S. Nat. Mus., xvi, p. 939, 1893; Anom. Porto Rico, p. 141, pl. v, figs. 3, 3*a*, 1901 (descr.).

Pagurus tibicen White (*variety*), List of Crust. in the British Museum, p. 61.

Calcinus tibicen Rankin, Ann. N. York Acad., xii, p. 533, pl. xvii, fig. 1, 1900 (descr. colors, etc.).

Calcinus obscurus Stone, in Heilprin, op. cit., p. 149 (*non* Stimpson).

Figures 56, 57. Plate XXVIII, Figure 7.

The colors appear to be pretty constant, in the Bermuda examples, and last very well in formalin or alcohol. The legs and chelæ in

one of the fresher specimens are mostly dark red, becoming brighter red on the margins and at the joints; the chelæ have a patch of dark olive brown on the middle of both sides of the palm; the tips of the dactylus and thumb are white or pale yellow; the whole surface of the chelipeds and ambulatory legs, except on the white

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Figure 56.—*Calcinus sulcatus*, about natural size. Phot. A. H. V.

tips, is covered with very small round spots of blue; these are also present on the carapace anteriorly. The ambulatory legs are brownish red or bright red, with a band of white or pale yellow on the distal end of the carpus and proximal end of the dactylus, and a narrower one at the base of the nail, which is black. The basal joints of the ambulatory legs are white and pale reddish underneath.

57

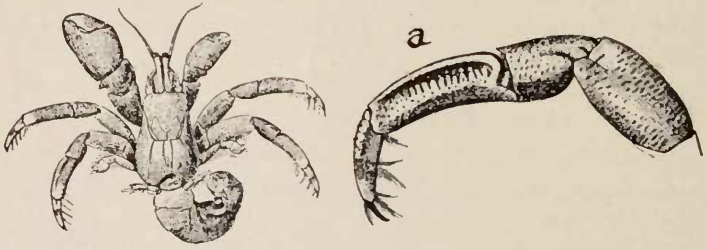

Figure 57.—*Calcinus sulcatus* removed from shell; *a*, second left leg of same, more enlarged to show sulcus; after Benedict.

The outer maxillipeds and the basal joints of the antennæ beneath are dark olive green or yellowish green; flagellum of antennæ orange-yellow. The eye-stalks are light orange-red, with a pale yellow or white band close to the eye. The anterior part of the carapace is red or brown, like the chelæ, and has a median patch of dark olive-green; posterior part bluish white or purplish white, irregularly spotted with red or brown; in some there is a large ill-defined patch of white about the suture or on the sides. The variations are mainly in the darker or lighter shades of color. The young

and some adults are pale red, instead of brownish red. In some there is but little white on the tips of the chelæ; this is often preceded by an orange tint; in some the white bands of the legs are bordered by pale purple.

Some of the females taken by the members of the Biological Station, in June and July, 1903, carried eggs.

"It is closely allied to *C. tibicen* Dana and *C. obscurus* Stimpson, but differs remarkably from both of them in the deep and rugose sulcus on the outer side of the propodus of the left leg of the second ambulatory pair. This sulcus is very marked, extends the whole length of the segment, and is limited on the upper side by a sharp carina. From the *obscurus* it differs moreover in having the carapax broader in front, and the antero-lateral angle more prominent, and not rounded as it is in that species."

"Length of body from front of carapax to tip of abdomen, 23.5^{mm}; length of left hand, 7.6; breadth of left hand 4.5." (S. I. Smith.)

This is a common species in shallow water at the Bermudas. We obtained numerous specimens in 1898 and 1901. It is in the early collections made by Jones, Goode, and Merriam. Dr. Rankin records females carrying eggs, taken in midsummer. It was also obtained by the Bermuda Biological Station, 1903, and the Field Nat. Hist. Museum, October, 1905.

Its range is from Florida to the Abrolhos Islands, Brazil (Smith). Pernambuco and Maceio, Brazil, on reefs (Rathbun).

Dardanus venosus (Edw.) *Red-veined Hermit Crab.*

Pagurus venosus H. M.-Edw., Ann. des. Sci. Nat., ser. 3, vol. x, p. 61, 1848. Stimpson, Notes, No. i, Ann. Lyc. Nat. Hist. N. York, vii, p. 82 [36], 1859.

Petrocheirus insignis M. J. Rathbun, Brauner-Agassiz Exp. to Brazil, p. 144, 1900 (*non* Saus. sp.*). Verrill, these Trans., x, p. 578, 1900 (*non* Saus.).

Pagurias insignis Benedict, Anomura Porto Rico, p. 141, 1901 (descr., *non* Saus. sp.).

Figures 58, 59.

This species sometimes grows to large size. It is handsomely colored in life.

It has been repeatedly confused with *D. insignis*, as indicated in the synonymy,† but is very distinct from that species, as the accompanying figures show.

* *Pagurus insignis* Saussure, Crust. Antilles, Mex., Mem. Soc. Phys. Hist. Nat. Genève, xiv, p. 453, pl. iii, figs. 20, 20*a*, 1858.

† Stimpson's description was very brief, but characteristic. Mr. Benedict, op. cit., 1901, has given a much better description of it, under the name of *insignis*.

The following description is from large Dominica specimens. The carapace is broad posteriorly, and much narrower in front of the deep transverse groove; the harder anterior portion is longer than broad, with the posterior margin truncate medially, in front of which there is an incised V-shaped groove, and some lateral oblique ones; front edge with three rounded lobes, the middle one more obtuse and less prominent than the others and obscured by hairs; a strong submarginal bent-bow-shaped groove; sides of carapace hairy; middle part nearly smooth. Posterior part of carapace with swollen, broadly expanded flanks, covered with oblique and divergent grooves; posterior margin deeply emarginate.

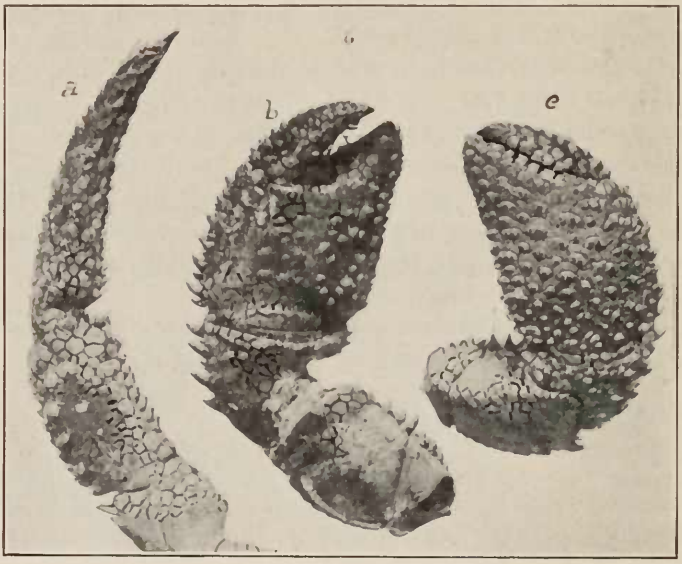

Figure 58.—*Dardanus venosus; a*, 2d ambulatory leg of left side, inner surface; *b*, the same, inner surface; *c*, left cheliped, outer surface; × about 1½. Phot. A. H. V.

The chelipeds are unequal, the left being decidedly larger, with the chela shorter, much more robust, and differently ornamented. The left cheliped has the merus triquetral, the two lower angles spinulose; the upper one serrate with flat teeth; the outer surface has slight rugæ and small tufts of hairs, otherwise the surface is smooth and glossy. The carpus is sharply spinulose above, five large acute spines stand on the upper edge; near the distal outer margin

the spinules are crowded in transverse rows, with close fan-shaped groups of yellowish plumose hairs arising from their outer bases. The manus is elegantly ornamented on the outer side with small, rounded, single and clustered tubercles, surrounded by regular stellate and fan-shaped groups of even plumose hairs that radiate horizontally from their bases, except on the proximal side, the tips of the adjacent groups of hairs mostly overlapping, so as to nearly cover the whole surface between the tubercles; toward the upper margin the tubercles become higher and more pointed or spiniform; those along the margin are acute spines, bent forward; on the thumb and dactyl the tubercles of each cluster blend together and form larger rounded tubercles, usually paler in color, but carrying plumose basal hairs; the thumb and dactyl each have, along the cutting edge, a row of five or six strong, rounded, paler teeth and are tipped with a narrow, subacute, but strong black nail or claw, excavate within.

The inner surface of the manus is rather smooth, with some scattered, unequal, rounded tubercles, especially on the lower half, and a regular row of larger ones along the lower margin. Many of these tubercles bear terminal clusters or pencils of slender hairs, especially those along the inner edges of the digits, where the pencils of hairs are larger and arise from pits. The dactyl is so articulated that it moves up and down in a nearly vertical plane.

The right chela is scarcely half as thick and more tapered. The tubercles of the outer surface are low or flattened, and bear comparatively few longer slender hairs, but those along the upper margin become acute spinules; on the inner surface the tubercles are flat or scarcely raised above the smooth surface, but have a central hair-bearing pit, and are marked out by the narrow red lines that surround most of the tubercles.

The left leg of the second ambulatory pair is very characteristic in its armature and ornamentation. The two distal segments are triquetral, owing to a strong carina that runs along the middle of the outer side, above which there is a wide and deep sulcus. This carina, on the propodus, carries, on its upper and outer surfaces, about ten or eleven oblique transverse rows of small appressed tubercles, arising from ridges, and decreasing in size downward; the proximal rows have six to eight, but the distal ones have only one or two tubercles; from the basal ridges arise crowded rows of short, appressed, plumose hairs, which cover the intervening spaces. On the dactylus the transverse ridges are shorter but more prominent

and the rows of tubercles decrease from about three, proximally, to one or two distally ; the ridges bear on the distal side plumose hairs, as on the propodus. The lower marginal carina bears one or two upper rows of subacute or conical tubercles, and an under row of larger, white, obtuse tubercles, with a pit bearing a pencil of long hairs, while the upper ones bear basal, plumose, appressed hairs. The distal articular margin is also fringed with long hairs. The upper outer surface also bears transverse rows of conical tubercles on raised ridges, carrying short plumose hairs on the distal side, as below ; on the propodus there may be three or four tubercles in a row, but on the dactyl there are but two or three, or only one distally, and the hairs are longer.

On the upper surface of the propodus there are two or three rows of large, mostly acute, often double, hair-bearing tubercles, with pencils of hairs arising from pits ; on the dactyl these tubercles become broader, truncate, or even concave, with clusters of numerous pits from which pencils of longer and stouter hairs arise. The terminal claw is short and black.

The second ambulatory leg of the right side, as mentioned by Stimpson, is also flattened, though less so than the left, and has near the margins of the propodus, above and below, flattened, transverse tubercles, which bear rows of small appressed hairs on the distal edge, becoming longer at the margins ; similar, but smaller flat tubercles are scattered on the middle portion, but there is no median carina.

The other ambulatory legs are more slender, and covered with appressed tubercles, bearing pencils of long hairs. The legs of the third pair have rather stout chelæ, and are very hairy.

The eye-stalks are stout, somewhat enlarged distally, with large black eyes ; they are shorter than the width of the anterior part of the carapace ; they bear scattered pencils of slender hairs.

The ocular scales are about as broad as long, well separated, with the outer end three-toothed, the inner tooth longest, minutely denticulate and fringed with hairs.

The aciculum of the antennæ is long, slender, acute, and very hairy. The antennulæ are much longer than the eye-stalks, which reach to about the middle of the last joint of the peduncle.

Specimens of large size, when recently dried, have the legs and chelipeds light orange, varying to red on the exposed surfaces, with the tubercles of the chelæ crimson or purple; those surfaces less exposed in life are paler orange or yellowish; under a lens the surfaces

of the chelipeds and legs are seen to be covered with a reticulation of narrow, bright red lines, which generally, also, surround and mark out the paler colored tubercles and spinules, but they may also form a network of small polygons on the smooth surfaces. When the chelæ and tubercles are red, as in some of the larger specimens, these lines become dark red, but are less conspicuous, especially on the outer surface, where the appressed hairs between the tubercles conceal them.

The ambulatory legs are usually crossed by three or four wide, rather conspicuous bands of red, one on each segment, or the red color may sometimes predominate, and then the bands are yellow or orange, on a red ground-color.

A specimen of medium size, from Dominica, has the carapace 31^{mm} long; anterior portion, 13^{mm}; breadth of anterior part, 12.5^{mm}; of posterior part, 26^{mm}; length of eye-stalks, 8^{mm}; length of larger chela 22^{mm}; height, 13^{mm}; length of right chela, 13^{mm}; height, 8^{mm}; propodus of 2d left ambulatory leg, 13^{mm} long; 7.5^{mm} wide; dactylus, 20^{mm} long; 5^{mm} wide at base.

A larger specimen has the left chela, 25^{mm} long; 15^{mm} high; 10^{mm} thick; palm above, 13^{mm}; dactylus, 13^{mm}.

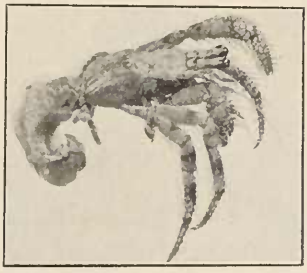

Figure 59.—*Dardanus venosus.* Young, from Bermuda, about $\frac{4}{5}$ nat. size.

The carapace of a small specimen preserved for a short time in formol is pale yellow, with a bright purple median area anteriorly, and a branchial patch of the same on each side, and bands of the same color at the bases of the legs and on the middle of the eye-stalks. The chelipeds are orange, finely reticulated with bright red lines, the reticulations enclosing the whitish tubercles. The second leg on the left side is larger and has on its outer side a median row of bright purple rounded tubercles on the two distal segments, and an outer sublateral row of smaller ones of the same color; the four distal segments of the legs have each a wide band of dark red.

The left chelipeds and second ambulatory leg are covered with fan-shaped groups of plumose hairs, mostly dark red, but some are whitish. Tips of the digits black and spoon-shaped. The left chela is the larger, compressed, and covered with coarse granules. This is from Bermuda, fig. 59.

This species appears to be rare in Bermuda. We obtained one specimen in 1898; another in the Yale Museum was collected by Dr. F. V. Hamlin about 1877. Its range is from Florida to Brazil. Porto Rico (Benedict as *insignis*); ? Maceio and Rio Goyanna, Brazil, on reefs (Rathbun as *insignis*).

About a dozen good specimens of this conspicuously colored species were obtained at Dominica Island by A. H. Verrill, in 1906 (Yale Mus.). They were taken in baited fish-traps in 10 to 25 fathoms. They occupied shells of *Triton variegatus*, *Murex*, and half-grown *Strombus gigas*.

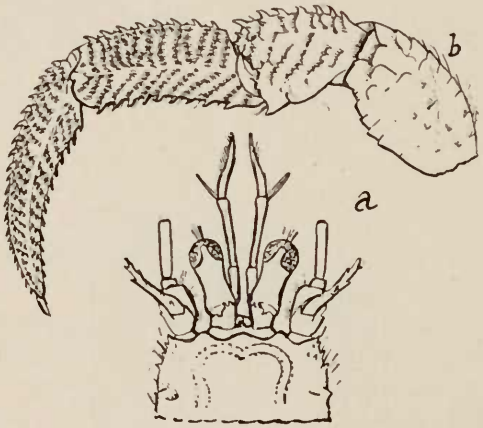

Figure 60.—*Dardanus insignis; a*, anterior part of carapace and appendages enlarged; *b*, distal part of 2d ambulatory leg of left side, more enlarged. After Saussure. See also pl. xxvi.

This species is pretty closely allied to *D. insignis*, but is easily distinguished by the armature of the chelæ and second left ambulatory leg. The eye-stalks of the latter are also shorter (see fig. 59), not reaching to the end of the antennal acieulum, and the ocular scales are different in form. In *D. insignis* the second left ambulatory leg has no median carina on the outer surface (see fig. 59, and Plate xxvi, 4, 5), the oblique ridges and long rows of small tubercles curve backward and meet in "herring-bone" fashion along the convex middle line, on the propodus, but are interrupted by a groove on the dactylus; they are armed with appressed plumose hairs, as in *D. venosus*.

But, unlike the latter, this has also many short, curved, or convex ridges on the carpus and distal part of the merus externally, similarly furnished with appressed hairs; other similar, curved ridges are on the inner surface of the propodus and dactylus, above and below.

It is also more yellow in color and more uniform, without conspicuous bands of red on the legs, and without the red reticulated lines.

Two large specimens of *D. insignis* obtained at Dominica I., in 1906, by A. H. Verrill, are in the Yale Museum. They occupy shells of *Triton variegatus*.

They were taken in fish-traps, in 10 to 25 fathoms, associated with *D. venosus*. The latter was much more common. Saussure's type was from Guadeloupe.

Clibanarius tricolor (Gibbes) Stimp. *Tricolored Hermit-Crab. Blue Hermit-Crab.*

Pagurus tricolor Gibbes, Proc. Amer. Assoc. Adv. Sci., iii, p. 189, 1850.
Clibanarius tricolor Stimpson, Proc. Acad. Nat. Sci., Philad., p. 234 [72], 1858. Rankin, op. cit., p. 239, 1900 (Bahamas); vol. xii, p. 535 (Bermuda). Benedict, Anom. Crust. Porto Rico, p. 142, pl. vi, fig. 2, 1901 (descr.).

Figures 61, 62, 63.

This is a small and very abundant species easily distinguished from all others by its remarkable coloration, in which blue predominates.

61

62

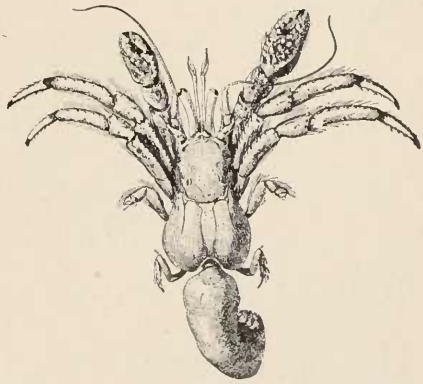

Figure 61.—*Clibanarius tricolor* in a shell of *Modulus*, × about 4 times. Phot. A. H. V.
Figure 62.—The same, much enlarged, after Benedict.

The carapace and eye-stalks are generally bright blue; the antennæ are annulated with bright orange; chelipeds dark olive-green and brown, irregularly spotted with blue, orange, and white; the chelæ

are lighter olive with more numerous spots on the palm, becoming paler or yellowish green distally and on the digits, with the granules white. The ambulatory legs are bright blue, with about four orange or bright yellow bands, at the articulations on the proximal end of the segments, each yellow band preceded by a dark blue band;

Figure 63.—*Clibanarius tricolor*, ×2. Phot. A. H. V.

dactyls bright orange at base, followed by pale orange or whitish, and covered by small bright orange spots; tips of digits black, excavate within. Several variations were noticed. One differed from all others in having no blue color, except the blue ring that precedes the orange band on the legs, but the legs had the usual round orange spots. The chelæ were orange red with white granules and black tips.

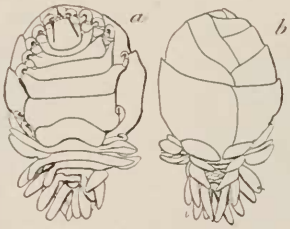

Figure 64.—*Stegias clibanarii*, female, much enlarged; *a*, ventral; *b*, dorsal view. After Richardson.

It is very abundant at Bermuda, among rocks and in tide pools at low-tide. It occupies many kinds of small gastropod shells, such as *Cerithium*, *Modulus*, *Littorina*, *Neritina*, *Anachis*, *Columbella*, *Natica*. Frequently it takes possession of various land shells, commonly washed ashore. It is sometimes infested by a parasitic isopod crustacean (*Stegias clibanarii* Richardson).*

* Proc. U. S. Nat. Mus., vol. xxvii, p. 59, 1904; Monograph of Isopods of N. America, p. 586, figs. 580, *a*, *b*, 1905.

Some of the specimens taken in June and July, 1903, by the members of the Biological Station, carried eggs.

Its range is from Florida to the Antilles. Porto Rico (Benedict); Bahamas (Rankin).

Clibanarius Verrillii Rathbun. *Spotted Hermit-Crab.*

Clibanarius Verrillii M. J. Rathbun, Amer. Journ. Science, ser. iv, vol. xi, p. 328, 1901. Verrill, these Trans., xi, p. 18, pl. viii, figs. 2, 3, 1901.

Plate XXVII, Figure 5. Plate XXVIII, Figure 6.

The following description was furnished by Miss Rathbun several years ago:

"The anterior or hard part of the carapace is a little longer than wide. The median projection of the front is moderately prominent, greater than a right angle; the lateral projections of the front are slightly marked and are broadly rounded. The sides of the carapace diverge posteriorly. The eye-scales are narrow-triangular and are tipped with a short spine. The eye-stalks are very slender and nearly as long as the anterior part of the carapace; they reach to the middle of the antennular flagella. The antennal acicle is slender and reaches to the middle of the last joint of the peduncle; the joint ends a little beyond the middle of the eye-stalk; the flagellum is about twice as long as the eye-stalk."

"The chelipeds are similar in shape but noticeably unequal, the propodus of the right being $\frac{5}{6}$ the length of the left. The distal margin of the carpus of both chelipeds is in line with the end of the eyes. The merus of the larger cheliped is two-thirds as high as long; its outer surface is marked by a few short, faint rugose lines; the upper margin is similarly rugose. The carpus is furnished with rough granules above and along the distal margin; there is a large tubercle on the outer surface. The palm is subrectangular, about equally long and high; upper margin convex. The margins are rough with granules; the outer surface is nearly smooth. Both fingers are stout and deflexed, and gape widely; the inner margins are very unevenly toothed; the upper margin of the dactylus is bordered by two rows of sharp granules. The fingers are excavated at the tips, which are white.

The smaller cheliped differs not only in being shorter and narrower, but in having the upper margin of the carpus and propodus cut into stout spines, increasing in size distally. A similar large spine is on the upper margin of the dactylus at the proximal third. The right cheliped is more hairy than the left, with long light hairs.

The propodus of the second pair of feet reaches the extremity of the large cheliped; the third pair reaches about to the middle of the dactylus of the second pair. Both these legs have a small spine at the lower outer distal angle of the merus, and a longer spine at the upper distal angle of the carpus. The dactyli are a little shorter than the propodi. These legs are furnished sparingly with hairs."

Colors.—In formalin a pinkish-white or yellowish-white ground-color with small roundish spots of bright yellowish-red or orange which are most numerous along the upper and distal margins of the segments of the legs, where they tend to form irregular transverse bands. There are four bands on each of the propodal and terminal joints of the second and third pairs of legs; chelæ and eye-stalks spotted with red." (M. J. Rathbun.)

Total length about 40^{mm}. It becomes much larger.

Bermudas, 4 large and 1 small specimen (coll. Dr. F. V. Hamlin); Yale Mus. and U. S. Nat. Mus."

"This species is nearer *Clibanarius* than it is to any other described genus, and while it perhaps possesses all the essential characters of that genus, it differs notably from the usual form of *Clibanarius* in the inequality of the chelipeds."

No locality, except Bermuda, has been recorded for this rather conspicuous species.

Clibanarius hebes Verrill, sp. nov.

FIGURES 65, 66.

Carapace constricted at the cervical suture; front part shield-shaped, longer than broad; anterior edge five-angled; central tooth small, acute, a little more prominent than those at the base of the antennæ, with the intervening margin a little concave; lateral angles very obtuse and farther back; surface glossy, with small scattered punctæ over the middle, becoming larger and raised on slight rough elevations laterally, each bearing one or several hairs; the one next the cervical suture, on each side, is larger in the form of a small low rounded tubercle. Posterior part with marked longitudinal sunken lines and scattered punctæ; the sides hairy. Eye-stalks slender, about as long as the width of the front of the carapace, shorter than its length; eye-scales small, oblique-ovate, pointed, close together. Peduncle of antennulæ nearly as long as eye-stalks. Antennæ longer than ambulatory legs; the aciculum is narrow, tapered, acute at tip, reaching slightly beyond the penultimate joint of the peduncle, fringed on the inner edge and tip with long hairs.

Chelipeds granulated and hairy, nearly equal in size and form; the distal end of the carpus is about even with the ends of the eyes; merus strongly compressed above proximally, and punctate; carpus covered with sharp granules, bearing one or several slender, pale hairs; on upper side they form two rows of larger acute granules; each row ends distally in a small acute denticle. Chelæ not angular, nor tapered, covered all around with rather small, sharp, nearly equal, hair-bearing granules, which tend to form irregular longitudinal rows; their hairs are pale and slender and too few to conceal the granules; the digits, which are blunt and thick, end in broad, evenly rounded, strong, black nails; lateral edges of digits with sharp white denticles. Ambulatory legs rather long, all about equal,

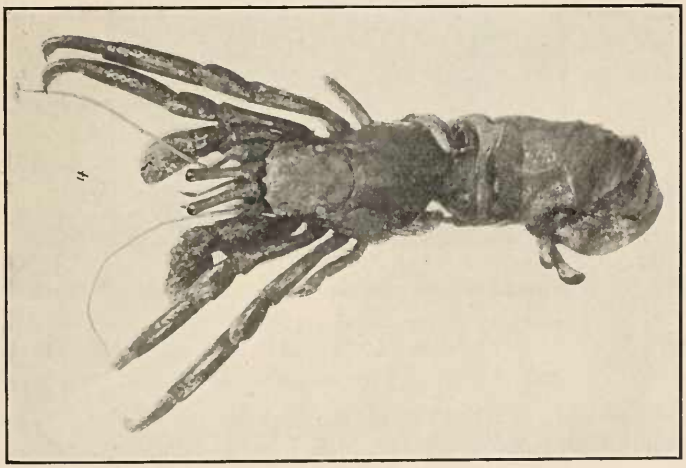

Figure 65.—*Clibanarius hebes*. Type, dorsal view; × about $1\frac{3}{4}$. Phot. A. H. V.

glossy when dry, covered with small, rather sparce punctæ, which bear few slender, pale hairs; the merus joint of all the legs is compressed.

Color of chelipeds and legs, in alcohol, nearly uniform bright orange; eye-stalks, antennæ and front of carapace a lighter tint of the same. There are no traces of bands, vittæ, nor spots of other colors.

The largest specimen (see figure 65) has the anterior part of the carapace 7^{mm} long; 6^{mm} wide; posterior part 8^{mm} long; 9^{mm} wide; length of eye-stalks, 9^{mm}; length of chelæ, 7^{mm}; diameter, 3^{mm}; length of first ambulatory legs, 26^{mm}.

Two small specimens were collected about 1877, by Dr. F. V. Hamlin (Yale Mus., 3294); a much larger specimen, which is the one figured, was taken in the summer of 1903, by the party of the Bermuda Biological Station, at Coney Island.

Figure 66.—*Clibanarius hebes*, anterior parts, × about 4. Phot. A. H. V.

Geographical Distribution; Origin of the Bermudian Decapod Fauna.

In the preceding article 78 species, subspecies, or named varieties, have been discussed, of which 16 have not been previously recorded from Bermuda. Among these, 9 are described as new.

Of the total number, 72, equal to 93 per cent., have been recorded also from the Florida Keys or the West Indies, or from both, demonstrating the close faunal relations of the two regions. The macruran Decapoda and other groups show similar relations.*

About 53 of the forms (about 68 per cent.) range from Florida to Pernambuco, Brazil, or farther south.

A considerable number, about 25 species, or 31 per cent., extend their range north of Florida to the coast of South Carolina or farther north, the greater portion of these reaching Cape Hatteras. Six or seven reach southern New Jersey.

* The true Macrura of Bermuda (not included in this article) consist of 35 species. Of these 31 species (or 88 per cent.) belong also to the West Indian fauna, a large part of them ranging south to Brazil. Eight of the species are

Two species, *Callinectes sapidus*, *Eupanopeus Herbstii* and its var. *obesus*, range northward to southern New England, as permanent residents.

Several others occur occasionally or sporadically on this coast, being carried northward by the Gulf Stream, or by shipping, but fail to become naturalized so far north, owing to the cold of winter.

It is evident, therefore, that the Bermuda Decapod Crustacean fauna is an offshoot or colony from the West Indian fauna, with only a slight admixture of species from other regions. In this respect the Crustacea agree with the Anthozoa, Mollusca, Echinoderms, Fishes, etc.

Of the total number, only seven species and subspecies are, so far as now known, peculiar to the Bermudas. These are all recently described forms and no doubt most of them will soon be discovered, also, in the West Indies. They are as follows:—

Sesarma Ricordi, var. *terrestris*, nov.
Eupanopeus Herbstii, var. *minax*, nov.
E. bermudensis, var. *sculptus*, nov.
Petrolisthes armatus, var. *pallidus*, nov.
Munida Beanii, sp. nov.
Clibanarius Verrillii Rathbun.
Clibanarius hebes, sp. nov.

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widely distributed free-swimming forms which extend their range even to the Indian and Pacific Oceans ; 3 have been found on the west coast of Africa; 2 on the southern coasts of Europe ; 9 species reach the Carolina coasts ; 1 ranges to New England ; 3 to the Pacific coast of North America.

Of the total number, 4 have not yet been found in the W. Indies, but one of these is a new species, recently discovered, and another is, perhaps, not correctly named.

The marine Isopods, which have been well worked up by Miss Richardson, afford a much larger proportion of species peculiar to Bermuda, so far as now known, but that is largely due to the fact that the West Indian Isopods have not been very thoroughly collected and studied.

Dr. B. W. Kunkel has found, among the 45 species of Bermuda Amphipods, a considerable proportion, 20–21, of Mediterranean species, but the West Indian Amphipods are little known. Twenty species, so far as now known, are peculiar to Bermuda, (Science, vol. xxvii, p. 489, 1908.)

The Bermuda Entomostraca have not been much studied. Among the parasitic species Mr. Chas. P. Wilson has recently identified the following : *Nesipus curticaudis* Dana ; *Pandarus Cranchii* Leach (from shark) · *Lepeophtheirus dissimulatus* Wilson (stomach of hamlet grouper).

In the spring of 1898 we found an undetermined Ostracode Crustacean abundant in the rain-water tanks at Bailey Bay.

The three species of Stomatopoda are all West Indian forms.

The following 24 species range northward on the American coast to or beyond South Carolina, as permanent residents:—

Ocypode arenarius, (to N. Jersey.)
Planes minutus, (to N. Jersey.)
Plagusia depressa.
Cycloxanthops denticulatus.
Eupanopeus Herbstii, (to C. Cod.)
E. Herbstii obesus, (to C. Cod.)
E. occidentalis.
Eurytium limosum, (to N. Jersey.)
Eriphia gonagra.
Callinectes ornatus.
C. sapidus, (to C. Cod.)
Portunus Sayi.
Achelous anceps.
A. Gibbesii.
A. spinimanus, Smithii.
A. Sebæ.
A. Ordwayi.
A. depressifrons.
Stenorhynchus sagittarius.
Podochela Riisei.
Mithrax forceps.
Macrocœloma trispinosum.
Calappa flammea.
Petrolisthes armatus.

Several of the species, mostly grapsoids, are found in most, or all, tropical seas, as well as in the West Indies. They are as follows:—

Grapsus grapsus.
Geograpsus lividus.
Pachygrapsus transversus.
Planes minutus.
Plagusia depressa.
Percnon planissimum.
Domecia hispida.
Petrolisthes armatus.

Of these the most widely distributed is probably *Planes minutus*, which, in the Atlantic, ranges from Nova Scotia to the Straits of Magellan, and in the Pacific from California to New Zealand, etc.

Nearly all the widely distributed species, included in the last list, are found on the West Coast of Africa. But some additional species, common to Bermuda and the W. Indies, are also found on the West African coast. Namely :

Goniopsis cruentatus
Callinectes marginatus, larvatus
Stenorhynchus sagittarius
Calappa flammea
C. gallus, galloides
Hippa cubensis

On page 313, *Cardisoma guanhumi* is also given as occurring in West Africa. Stimpson, Ortmann and other writers have recorded it from there, but Miss Rathbun (1900) places all such records under *C. armatum* Herkl. The Pacific Coast record is also probably erroneous.

Probably the locality, Ascension I., given for *Gecarcinus lateralis*, on p. 310, is erroneous, the species found there being *G. lagostoma* M.-Edw.

Aside from the widely distributed grapsoid crabs, found in all tropical seas, very few of the Bermuda species are found on the Pacific coasts of Central and North America. But many others are represented there by closely allied species or subspecies.* The species that have been considered identical or distinguishable only as varieties by recent good authorities are as follows :

Goniopsis cruentatus
**Grapsus grapsus*
**Geograpsus lividus*
**Pachygrapsus transversus*
**Planes minutus*
**Plagusia depressa*
**Percnon planissimum*
**Domecia hispida*
Epialtus bituberculatus (varieties)
**Calappa gallus* (varieties)
Cycloës Bairdii (varieties)
**Petrolisthes armatus*

Those preceded by an asterisk are circumtropical.

It is well known that a considerable number of species of Mollusca, Echinoderms, Anthozoa, etc., as well as Crustacea, are common to West Africa, Brazil, and the West Indies. Such species may have originated on the African coast and from thence migrated across the Atlantic to South America, and thence northward to the W. Indies, Florida, and Bermuda, during recent geological times. All the species of Decapod Crustacea having this wide range exist for a considerable length of time as free-swimming larval forms, in the zoëa and megalops stages. These larval forms may be carried long distances by the prevailing oceanic currents, especially in the regions of the trade winds.

It is scarcely admissible to suppose that they could have traveled in the opposite directions, against the currents, unless by human agency, in recent times.

Many Crustacea, including the higher and more active forms, especially the grapsoid and cancroid crabs, are in the habit of hiding among the clusters of barnacles, etc., attached to the bottoms of vessels, and in this way they may be carried across the oceans in any direction, so long as the temperature of the water is suitable for their existence. In this way many tropical species reach the New England coast in summer, but die out during the winter.

* Mr. Walter Faxon has given, in parallel columns, comparative lists of the closely related species occurring on the two coasts. See Mem. Mus. Comp. Zoology, vol. xviii, pp. 235–237, 1895.

Several species of crabs and shrimps habitually live among floating *sargassum*, or attached to floating driftwood. This is the case especially with *Planes minutus*, *Portunus Sayi*, and some others. That they have migrated to Bermuda in this way is very evident, for they do so constantly, day by day, at the present time.

But the majority of the species common to Bermuda and the West Indies do not have such habits, and must have migrated northward in the free-swimming larval stages. The direction of the Gulf Stream and prevailing wind currents are favorable for the transportation of free-swimming animals from the Bahamas, Cuba, etc., to the Bermudas.

On the other hand, very few if any strictly East American species have established themselves in the Bermudas, notwithstanding the constant passage of vessels in that direction for nearly three hundred years. Perhaps the temperature of the Gulf Stream is too high to allow such species to be carried across it, or they may not be able to endure the summer temperature of the Bermuda waters.

There are, likewise, no Decapod species of European or Mediterranean origin known in the Bermuda fauna, though such are known to occur in other orders, especially in those groups that habitually cling to the foul bottoms of vessels.

The chances of many species being introduced into Bermuda waters by this means have been unusually good, for the great dry dock has existed at the naval station for many years. And long before that, even from the first settlement, the sheltered harbors and beaches of Bermuda have been favorite places for the beaching of vessels to clean their bottoms.

It would be of great scientific interest, as well as evident economical benefit, to experiment with the introduction of edible East American and West Indian crustacea that do not now exist at the Bermudas. Among those that might succeed are the large Southern Rock Crab (*Menippe mercenaria*); the West Indian Rock Crab (*Carpilius corallinus*); the southern variety of the Edible Blue Crab (*Callinectes sapidus*), and many others. Probably their fertilized eggs could be transported far more easily than the adults, and in vastly greater numbers. With suitable arrangements at the new Bermuda Biological Station, such eggs could easily be hatched and the young liberated in great numbers, in suitable places.

It would probably be useless to attempt to introduce those species that are restricted to our coast north of Cape Hatteras, such as the common lobster, but there seems to be no reason why any species

from the Carolina coasts or the Florida Keys should not flourish in Bermuda if once introduced there in considerable numbers and protected from their enemies at first.

Probably hundreds of species have been accidentally carried there, singly or in small numbers, in past times, which have failed to establish themselves, either because they became too far separated to find their mates at the breeding season, or because they were too soon eaten up by voracious fishes. Yet a single female crab, carrying fertilized eggs, might succeed in introducing the species, for their eggs often amount to 5,000, or even 10,000 at one time. Aside from edible species, the introduction of the smaller kinds would afford a large additional supply of food for useful fishes, and thus benefit the fisheries.

Probably there is no locality in the world so well adapted by nature for experiments in the naturalization of marine animals as Bermuda. There are here numerous deep basins and ponds, of pure sea water, due to fallen caverns, which have subterranean connections with the sea through pores and crevices in the porous limestone, by which the sea water is constantly renewed. In such places large numbers of marine creatures could be protected and allowed to breed till well naturalized, and numerous enough to be safely liberated. The equable temperature of the climate is also particularly favorable for such experiments. That any given species of the West Indian marine fauna is not now found in Bermuda does not prove that it is not able to live there, but rather that it has lacked the opportunity or means of arriving there.

There is a large field open here for enterprising naturalists and biologists.

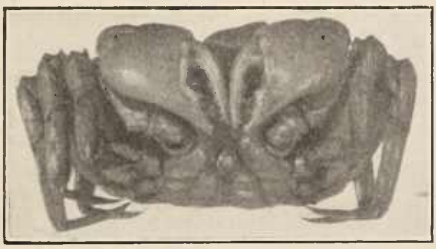

Figure 67.—*Sesarma Ricordi*, var. *terrestris*, nov. Bermuda; × 1¼. Phot. A. H. Verrill.

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The following list is intended to include only the later works that relate to the Bermuda species, especially those in which special mention is made of specimens from Bermuda. But as the West Indian species are largely the same as the Bermudian, works relating exclusively to West Indian localities have also been included.

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A monographic revision of all the species of this group, with distribution.

Cole, George Watson.—Bermuda in Periodical Literature, with occasional reference to Other Works. A Bibliography; pp. 275, with portrait of the author and 8 fac-simile reproductions of the title-pages of ancient works on Bermuda, 1907. Published by the author, Riverside, Conn.

Includes notices of all works relating to Bermuda collections of Crustacea, usually with lists of the new species and new additions to the Bermuda fauna. (Total number of titles given is 1382.)

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Gibbes, Lewis R.—On the Carcinological Collections of the United States, Proc. Amer. Assoc. Adv. Sci., vol. iii, pp. 167–201, 1850.

Godet, Theod. L.—See *Verrill*, Bermuda Is., i, p. 456, for review.

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Hurdis, John L.—Rough Notes and Memoranda relating to the Natural History of the Bermudas (edited by his daughter, H. J. Hurdis). London: R. H. Porter, 1897, 8vo, 408 pp.

This work relates mainly to the birds. The observations and notes were mostly made from 1841 to 1853. On p. 361 is a brief list of Crustacea (10 species) with their common names, and partly with Latin names, many of which are incorrect. The species are as follows:—Land Crab (*Gecarcinus ruricola*)= *G. lateralis;* "Edible Crab (*Lupa diacantha*) of the United States," probably= *Callinectes ornatus;* Spider Crab (*Libinia canaliculata*), probably = *Mithrax* sp. ?: Long-tailed Crab, Stump, or French Lobster (*Scyllarus equinoctialis*) probably correct, now *Scyllarides;* Soldier or Hermit Crab (*Pagurus* ———), probably *Cenobita diogenes* was referred to; Cray Fish called "Lobster" (*Palinurus* ———), = *P. argus.* "It is of large size and fairly abundant." Sand Bug (*Hippa* ———)= *Hippa cubensis;* Common Prawn (*Palæmon serratus*) probably= *Penæus braziliensis,* body 5.3 inches long; Common Shrimp (*Palæmon vulgaris*), = *Palæmon affinis* probably; Coral Crab = *? Mithrax cornutus;* ("*Pericera cornuta*"), = *Stenocionops furcatus.* "Taken in a lobster pot."

His notes on the size, colors, and spines of the "Coral-crab" indicate a large red spiny *Mithrax*, probably *M. cornutus* (possibly *M. spinosissimus*). He gives some descriptive notes in regard to the large Prawn, stating that it has 6 chelate legs, but none for the "Shrimp." The presence of six chelate legs and long rostrum shows that his prawn was a *Penæus. P. braziliensis* is the only Bermuda species that grows to the size he gives. The "shrimp" is described as abundant in tide pools. This would still apply to *Palæmon affinis.*

It is possible that the *Callinectes sapidus*, or "Edible Crab of the U. S," did occur commonly at that time, but at that date the abundant *C. ornatus* had not been separated from it even by naturalists. His *Libinia* is, of course, very doubtful (see above, p. 396). No species much resembling it is now known from Bermuda.

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EXPLANATION OF PLATES.

All the figures, unless otherwise stated, have been made from photographs of the subjects by Mr. A. Hyatt Verrill. In nearly all cases Bermuda specimens were used for this purpose. Unless the locality is otherwise given, it is to be understood as Bermuda.

Plate IX.

Figure 1.—*Cardisoma guanhumi;* dorsal view of a half-grown male from Bermuda; ⅔ nat. size.

Figures 2, 3.—*Ocypode arenarius,* male and female; about ¾ nat. size, resting on Bermuda shell-sand.

Plate X.

Figure 1.—*Plagusia depressa,* dorsal view of female, about ⅔ nat. size.

Figure 2.—*Sesarma Ricordi,* ♀; typical, about 1⅓ nat. size.

Figure 3.—*Percnon planissimum,* ♀; about 1⅓ nat. size.

Figure 6.—*Grapsus grapsus.* Large chela of male; ¾ nat. size.

Plate XI.

Figure 1.—*Goniopsis cruentatus;* about ¾ nat. size.

Figure 2.—*Grapsus grapsus;* about ⅔ nat. size.

Figure 3.—*Sesarma Ricordi,* var. *terrestris,* nov. Co-type; × about 2.

Plate XII.

Figure 1.—*Cyclograpsus integer,* dorsal view of a West Indian specimen, about nat. size.

Figure 2.—*Pachygrapsus gracilis,* ♀, dorsal view of a Bermuda specimen, × 1½.

Figure 3.—*Pachygrapsus transversus,* ♂, × about 1½.

Figure 3*a*.—The same ♀, × about 1½; 3*b*, large chela, somewhat enlarged.

Figure 4.—*Percnon planissimum,* large chela of male, slightly enlarged; *h*, the tuft of hair on inner side of merus.

Figure 4*a*.—*Goniopsis cruentatus;* large chela of male, 1⅓ nat. size.

Figure 5.—*Sesarma Miersii,* dorsal view of carapace, × about 2.

Plate XIII.

Figures *a–j*.—*Planes minutus,* dorsal view of 36 specimens selected from a large lot taken at one time and place at Bermuda, to show variations in form and color, about ¾ nat. size.

Plate XIV.

Figure 1.—*Lobopilumnus Agassizii*, var. *bermudensis*, ♂; No. 3031, from Bermuda; × about $1\frac{1}{6}$.

Figure 2.—The same, No. 3123; female with eggs; central view; enlarged about $1\frac{1}{2}$.

Figure 3.—*Eriphia gonagra*, ♀; about $1\frac{1}{8}$ nat. size.

Figure 4.—*Xanthodius parvulus*, ♂; dorsal view; × $1\frac{2}{3}$.

Figure 5.—*Liomera dispar*, ♂; No. 3176, dorsal view of a Bermuda specimen; × about $1\frac{1}{2}$.

Figure 6.—*Platypodia spectabilis*, ♂; dorsal view of a fresh specimen from Bermuda; about nat. size.

Figure 7.—*Leptodius floridanus*, ♂, dorsal view; about nat. size.

Figure 8.—*Cycloxanthops denticulatus*, dorsal view; about nat. size.

Figure 9.—*Eupanopeus bermudensis*, var. *sculptus*; nat. size.

Figure 10.—*Eurytium limosum*, dorsal view of a small specimen from Bahia, Brazil, nat. size.

Plate XV.

Figure 1.—*Eupanopeus Herbstii*, var. *obesus*, ♂; dorsal view, about nat. size.

Figure 2.—*E. Herbstii*, *minax*, nov., ♂; dorsal view of the type from Bermuda; $\frac{9}{10}$ nat. size.

Figure 3.—*E. Herbstii*, ♂, typical; from a Bermuda specimen; × about $1\frac{1}{3}$.

Plate XVI.

Figure 1.—*Eupanopeus serratus*, ♂; from Bermuda; about nat. size.

Figure 2.—*E. occidentalis*, female with eggs, No. 3021, from Bermuda; × about $1\frac{1}{5}$.

Figure 3.—*E. bermudensis*, var. *sculptus*, nov., ♀; × about $2\frac{1}{2}$.

Figure 4.—*E. bermudensis*, ♀; No. 3280; *a*, carapace; *b*, large chela, × about $2\frac{1}{2}$.

Figure 5.—*E. serratus*, ♂, No. 3019, carapace; × about $1\frac{1}{2}$; *b*, large chela of the same.

Plate XVII.

Figure 1.—*Callinectes ornatus*, ♂; dorsal view of a fresh Bermuda specimen, about $\frac{2}{3}$ nat. size.

Figure 2.—*C. sapidus*, ♀; dorsal view of a fresh New Haven specimen; about $\frac{1}{2}$ nat. size.

Plate XVIII.

Figure 1.—*Callinectes marginatus*, *larvatus*, ♂; dorsal view of a young Bermuda specimen, No. 1903*b*; × about $1\frac{2}{3}$.

Figure 2.—*Portunus Sayi*, ♂; from off New Jersey, No. 4036; × about $1\frac{1}{3}$.

Figure 3.—*Achelous Ordwayi*, young; about nat. size.

Plate XIX.

Figure 1.—*Charybdella tumidula*, dorsal view of a Bermuda specimen, No. 672, F. M.; × about $1\frac{1}{6}$.

Figure 2.—*Achelous Smithii*, No. 4035*b*; cotype, dorsal view; × about $1\frac{1}{10}$; 2*b*, chela of the same, front view. Cotype from off Cape Hatteras.

Plate XX.

Figures 1, 2.—*Achelous anceps*, dorsal view of fresh Bermuda specimens; × about $1\frac{1}{3}$.

Figure 3.—*A. depressifrons*, dorsal view of a fresh Bermuda specimen; × about $1\frac{1}{3}$.

Plate XXI.

Figure 1.—*Portunus Sayi*, ♂, view of ventral side of No. 4036, from off New Jersey; × about $1\frac{1}{3}$.

Figure 2.—*Achelous Smithii*, ventral view of immature female. Cotype No. 4035, from off Cape Hatteras; × about $1\frac{1}{3}$.

Figure 3.—*Callinectus marginatus, larvatus*, ventral view of young male, No. 1903*b*, from Bermuda; × about $1\frac{1}{3}$.

Plate XXII.

Figure 1.—*Stenorhynchus sagittarius*, about $\frac{1}{2}$ nat. size; *a*, frontal area; *b*, outer maxilliped; *c*, sternum; *d*, male abdomen. After A. M.-Edwards.

Figure 2.—*Podochela Riisei*, about $1\frac{1}{2}$ nat. size. After A. M.-Edwards.

Figure 3.—*Macrocœloma subparallelum*, ♂; *a*, dorsal view, about nat. size; *c*, left chela; *d*, ventral surface of male. After A. M.-Edwards.

Plate XXIII.

Figure 1.—*Mithrax depressus?* or *M. hispidus*; young ♂, No. 3019; from Bermuda; × about $2\frac{1}{3}$.

Figure 2.—*Mithrax depressus*, ♀, No. 3265, from Saint Thomas; × about $1\frac{1}{4}$.

Figure 3.—*Mithrax hispidus*, ♀, No. 4058, from Bermuda; × about $1\frac{1}{3}$.

Figure 4.—*Mithrax hispidus*, ♀, No. 4054, immature, from Bermuda; × $1\frac{1}{10}$.

Plate XXIV.

Figure 1.—*Epialtus bituberculatus, bermudensis*, type; × $1\frac{1}{2}$.

Figure 2.—*Mithrax hispidus*, ♀. Under side of No. 4058. See pl. xxiii, fig. 3.

Figure 3.—*Chorinus heros*, ♂; dorsal view; × about $1\frac{1}{3}$. After Cuvier.

Figure 4.—*Mithrax forceps, hirsutipes*; adult male; nat. size.

Figures 5, 6.—The same; young; about nat. size.

Plate XXV.

Figure 1.—*Calappa flammea*; about $\frac{3}{4}$ nat. size.

Figure 2.—*Stenocionops furcatus*, ♂, $\frac{3}{8}$ nat. size, with hairs removed from left side, but with an attached chalinid sponge, which is infested with parasitic polyps of *Parazoanthus parasiticus*. From Dominica; about $\frac{1}{2}$ nat. size.

Plate XXVI.

Figure 1.—*Geograpsus lividus*, ♂, larger chela. × 1⅓.

Figure 3.—*Calappa gallus, galloides;* dorsal view; about nat. size.

Figure 4.—*Dardanus venosus;* *a*, 2d ambulatory leg of left side; enlarged about 1⅔; *mm*, merus; *ca*, carpus; *p*, propodite; *d*, dactyl; *b*, *c*, parts of the corresponding leg of *D. insignis*, lettered as before. Photo. from Dominica specimens by A. H. V.

Figure 5.—Portions of the propodite of the same legs as those in fig. 4, more enlarged; *a*, *Dardanus venosus;* *b*, *D. insignis.*

Plate XXVII.

Figure 1.—*Pilumnus spinipes*, dorsal view of male from Bermuda, No. 3119; × 1 9/10.

Figure 2.—*Cycloës Bairdii*, typical form, front view of a cotype from Cape St. Lucas, Gulf of California; × about 1½.

Figure 3.—*Petrolisthes armatus;* about nat. size.

Figure 4.—*Achelous anceps;* dorsal view; × about 1½; *a*, cheliped; *b*, swimming leg.

Figure 5.—*Clibanarius Verrillii*, cotypes; *a*, side view; *b*, dorsal view; about nat. size.

Figure 6.—*Planes minutus;* dorsal view of a fresh specimen; × 1½.

Figure 7.—*Cycloxanthops denticulatus*, dorsal view; natural size.

Figures 8, 9.—*Munida Beanii*, types. Dorsal view of carapace, etc., × about 5.

Plate XXVIII.

Figure 1.—*Albunea oxyophthalma*, side view of a Bermuda specimen; ⅔ nat. size.

Figure 2.—*Dromidia antillensis;* about nat. size.

Figure 3.—The same. Cheliped of a Brazilian specimen; × about 4.

Figure 4.—*Petrolisthes armatus;* cheliped; × about 4.

Figure 5.—*Parthenope crenulatus;* × about 3.

Figure 6.—*Calcinus sulcatus;* slightly enlarged.

Figure 7.—*Clibanarius Verrillii*, cotype; slightly enlarged.

Figure 8.—*Troglocarcinus corallicola*, ♀, partially out of its den in a coral (*Mussa*) from Dominica I.; × about three times. The crab was intentionally placed in a den belonging to an older individual, otherwise but little of it could be seen. Phot. A. H. V.

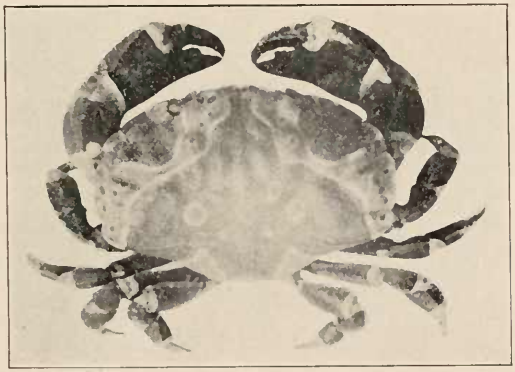
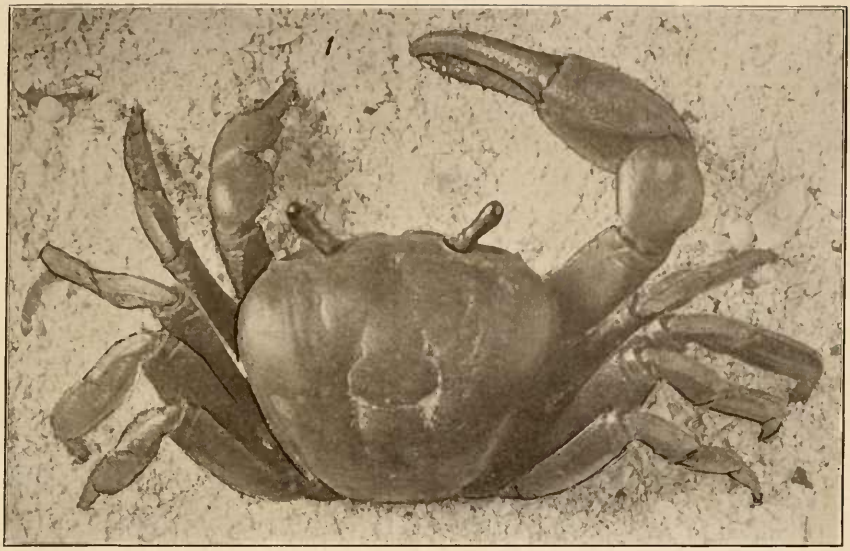
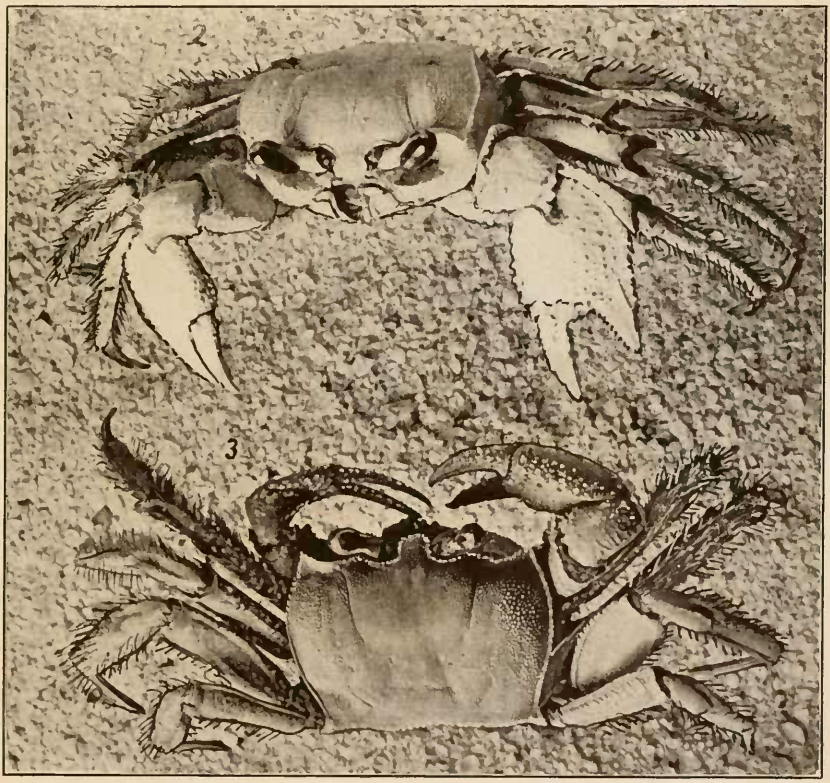


Figure 68.—*Platypodia spectabilis* (see p. 336); enlarged. Phot. A. H. Verrill.

ERRATA.

Page 310, line 14, omit Ascension I.
Page 313, line 21, omit West Coast of Africa.
Page 335, line 1, for p. 14, read p. 305.
Page 336, line 13, for lobata, read lobatus.
Page 362, line 7 from bottom, for p. 238, read p. 338.
Page 408, line 8, for fig. 34, read fig. 41.
Page 422, line 10, for *Cancer*, read *Calappa*.





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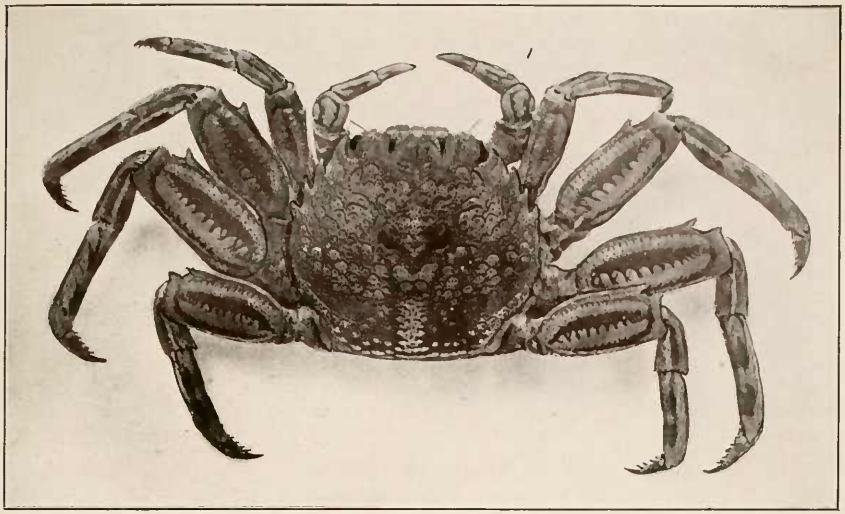
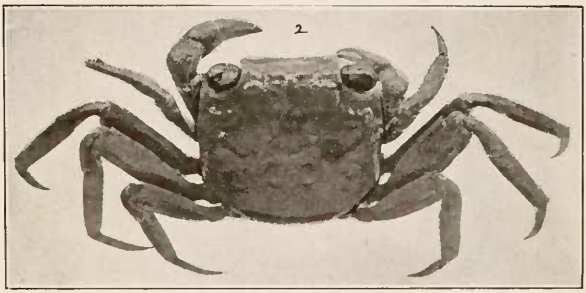
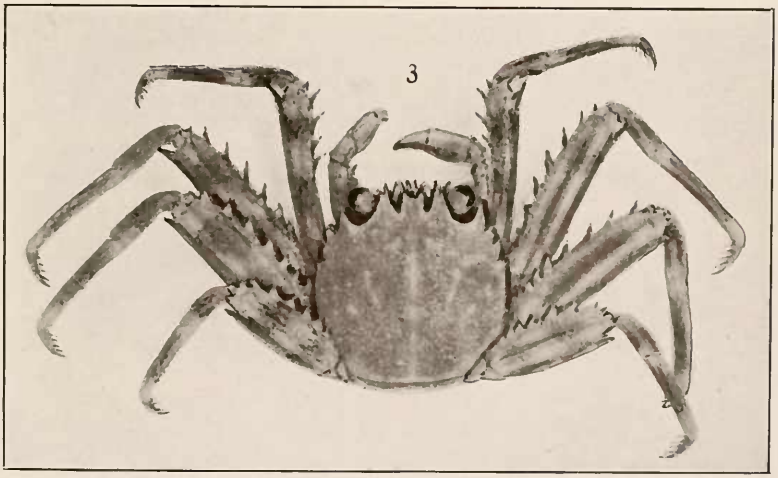
BERMUDA CRUSTACEA.

1. Land Crab, *Cardisoma guanhumi;* 2, 3. Beach Crab, *Ocypode arenarius.*







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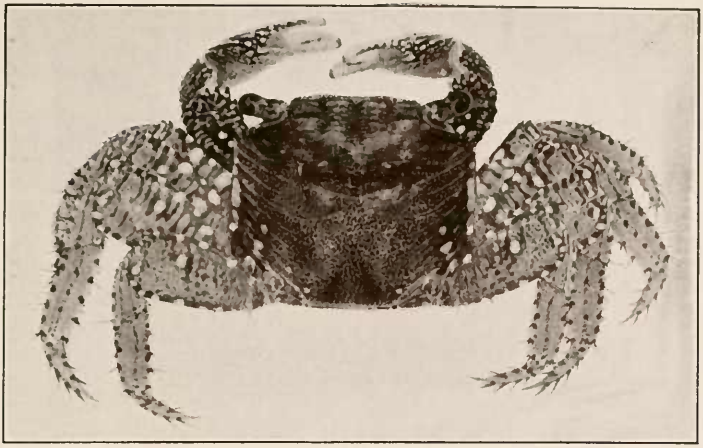
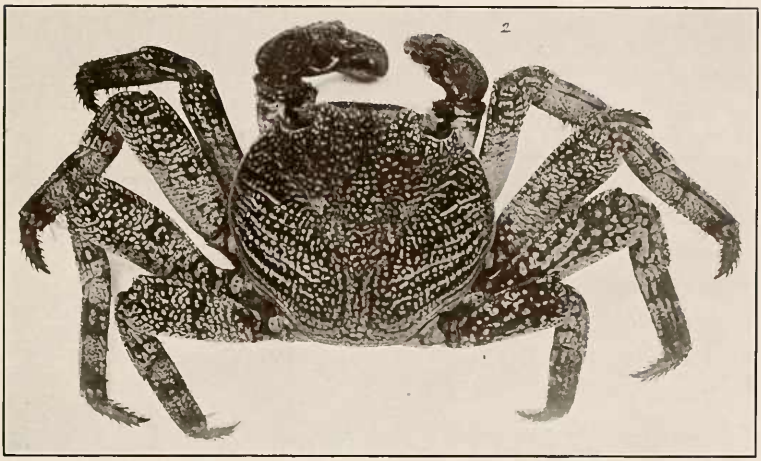
1. Cliff Crab, *Plagusia depressa*; 2. *Sesarma Ricordi*; 3. *Percnon planissimum*; 6. *Grapsus grapsus*.

1





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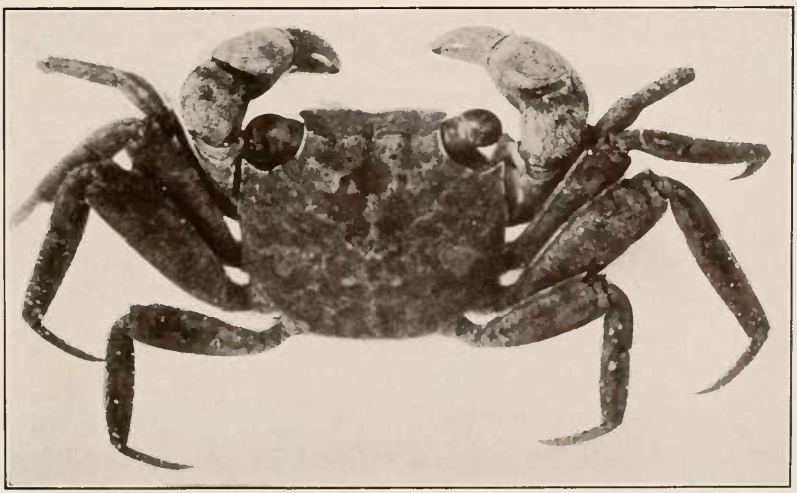
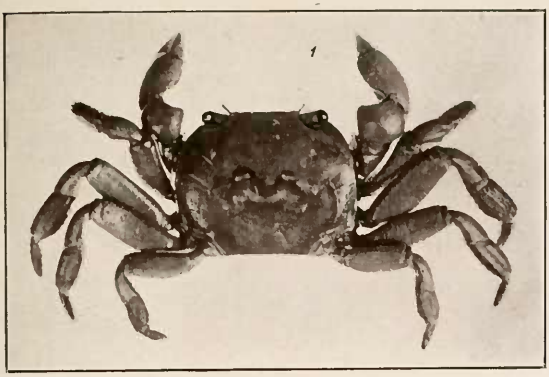
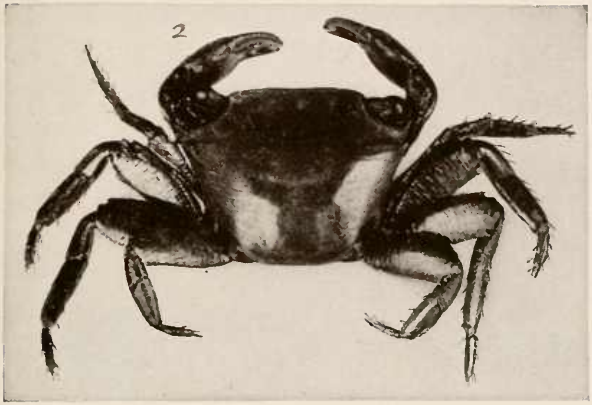
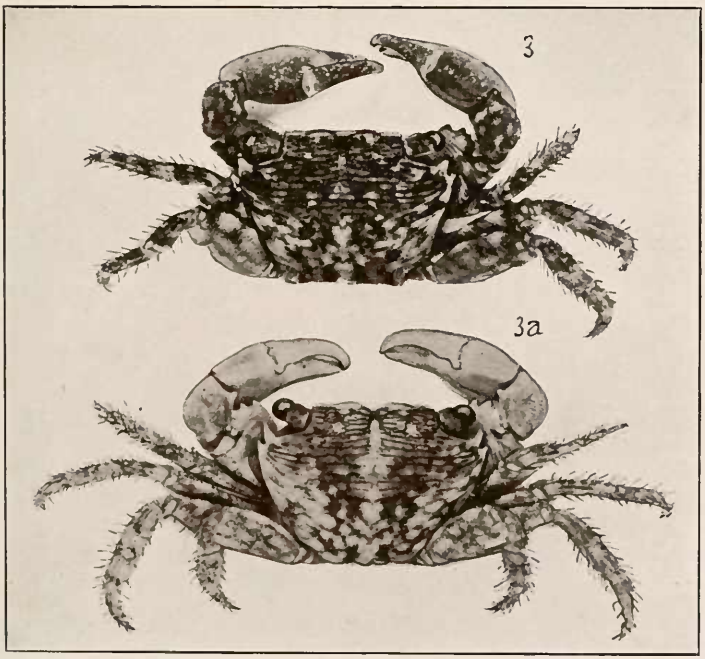


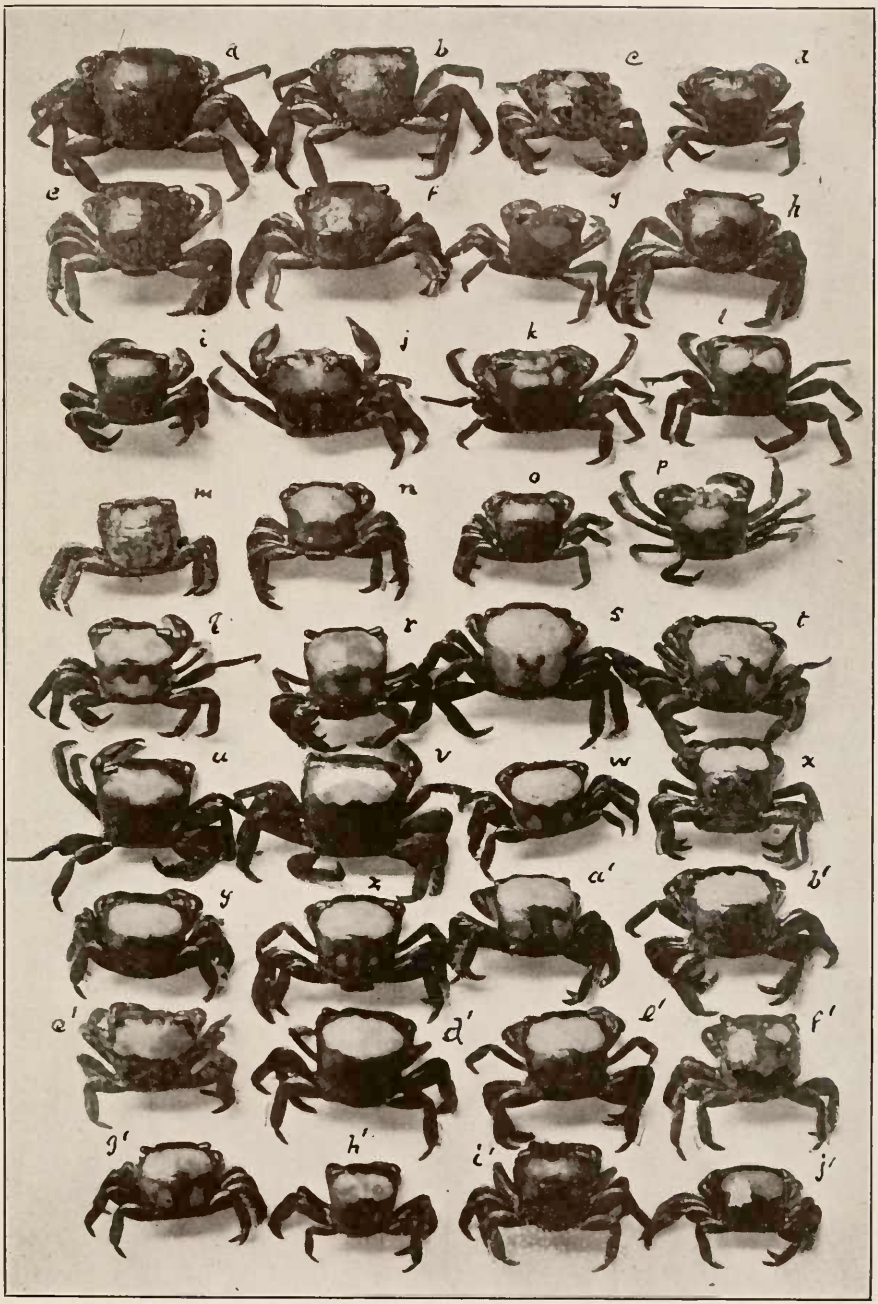
1. *Goniopsis cruentatus;* 2. *Grapsus grapsus;* 3. *Sesarma Ricordi*, var. *terrestris*, nov.







1. *Cyclograpsus integer*; 2. *Pachygrapsus gracilis*; 3, 3*a*, 3*b*. *P. transversus*; 4. *Percnon*; 4*a*. *Goniopsis*; 5. *Sesarma Miersii*.



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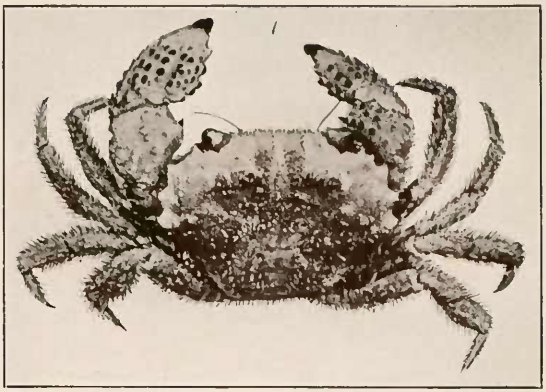
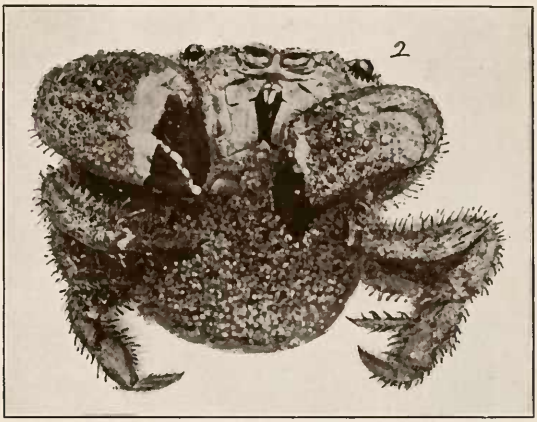
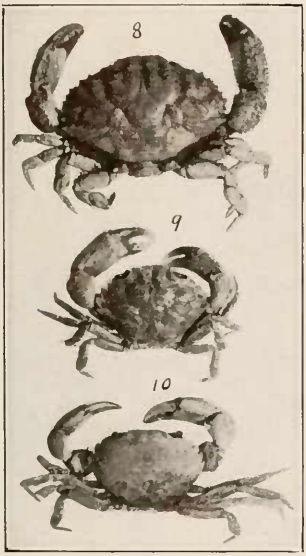
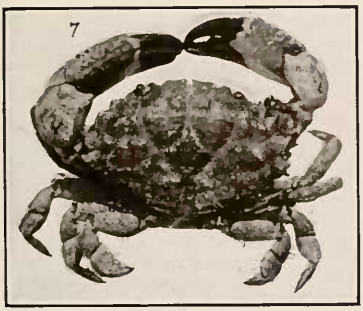
Gulf-weed Crab, *Planes minutus*, showing variations.









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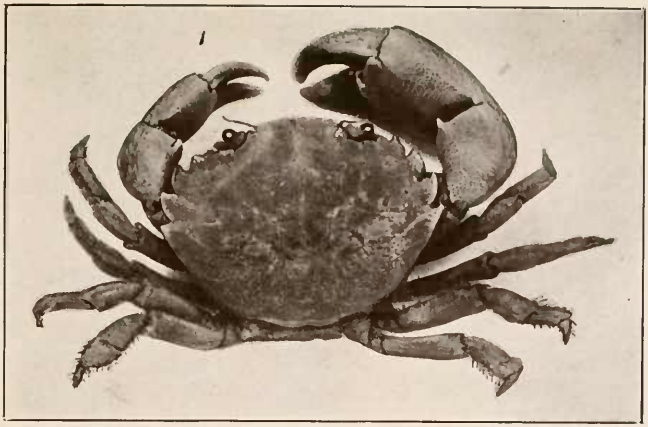

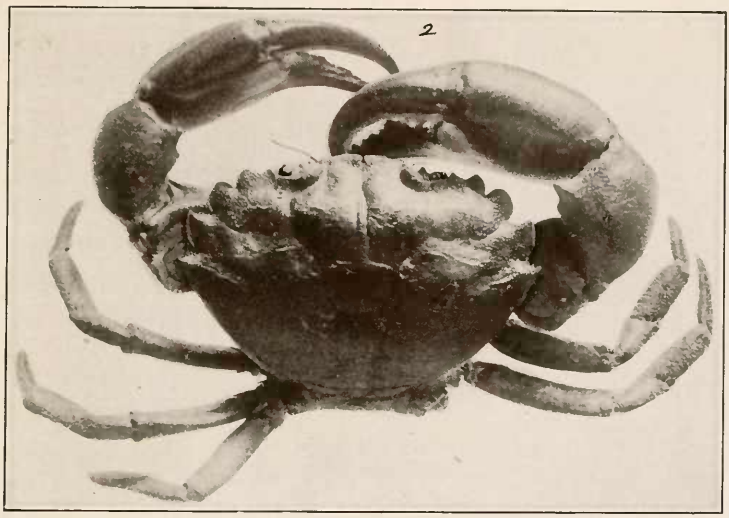

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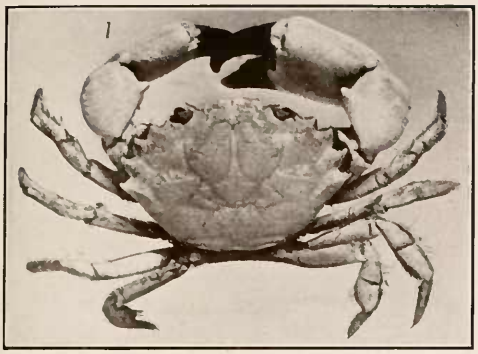
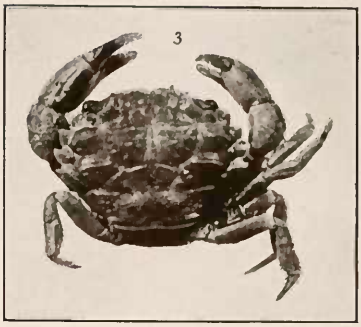
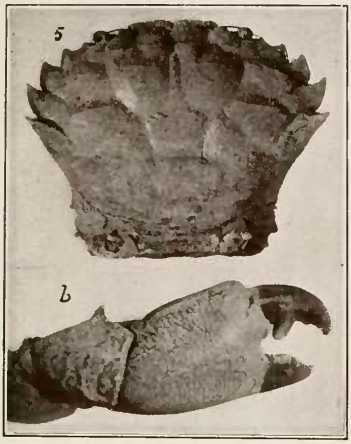
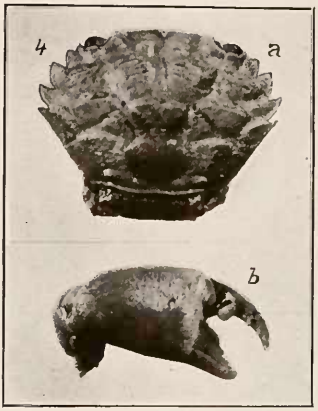
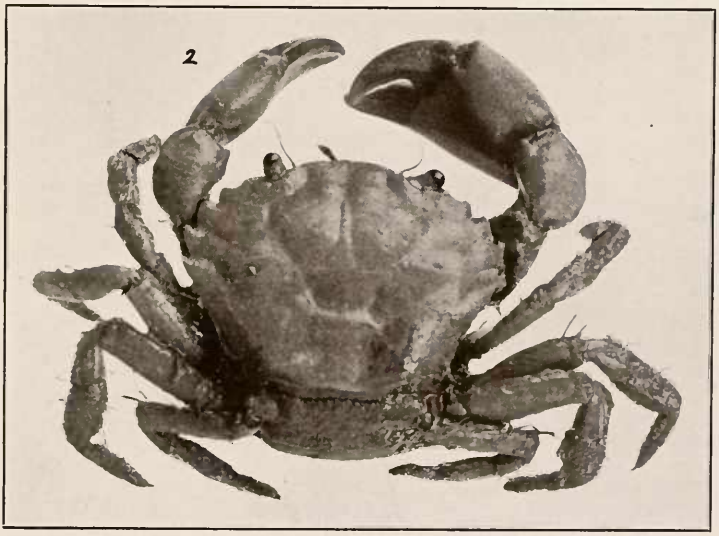
1. *Eupanopeus Herbstii*, var. *obesus*; 2. *E. Herbstii*, var. *minax*; 3. *E. Herbstii*.





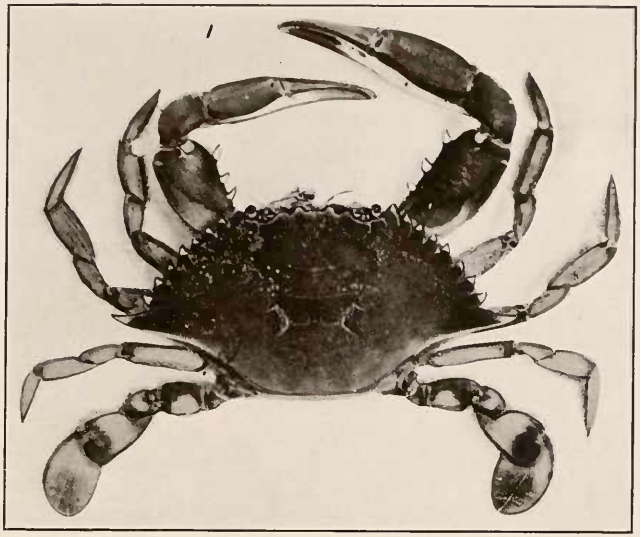






BERMUDA CRUSTACEA.

1, 5. *Eupanopeus serratus*; 2. *E. occidentalis*; 3, 4. *E. bermudensis*.



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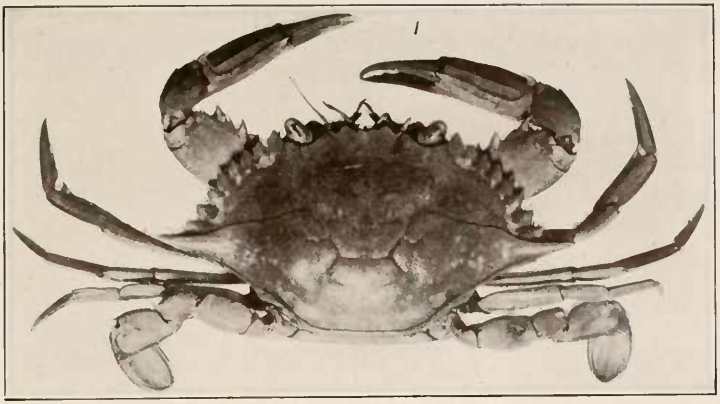
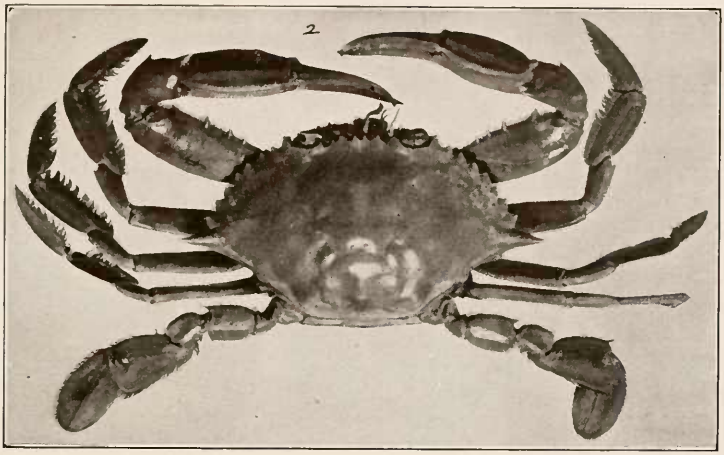
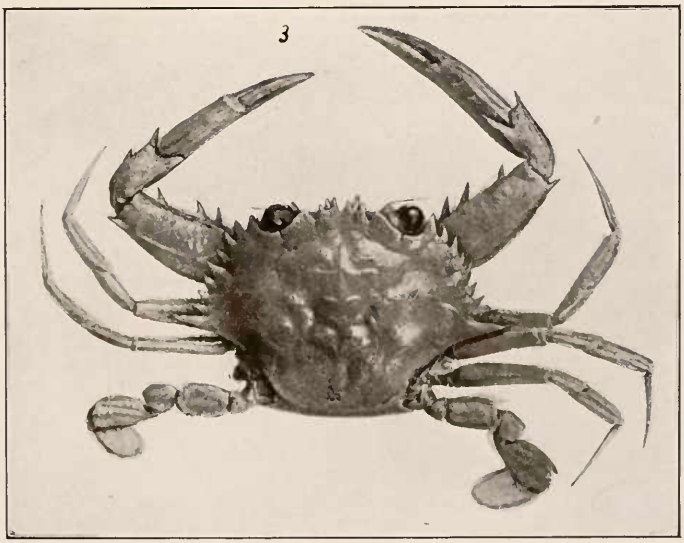
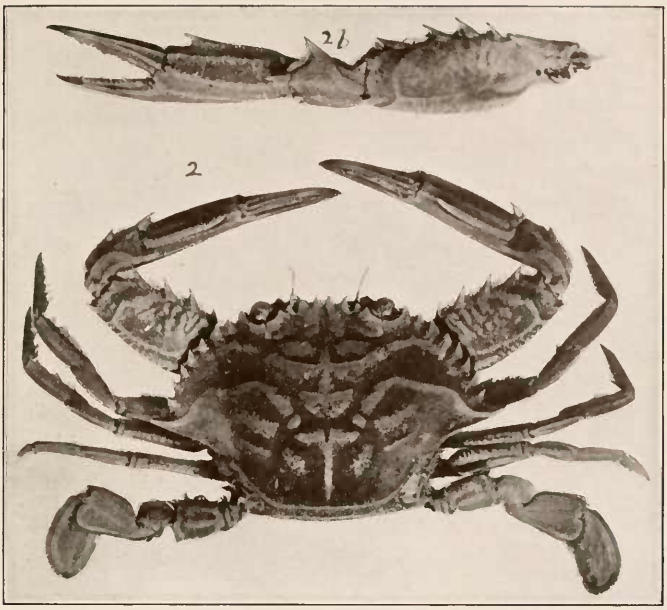
1. *Callinectes ornatus;* 2. Blue or Edible Crab, *Callinectes sapidus.*

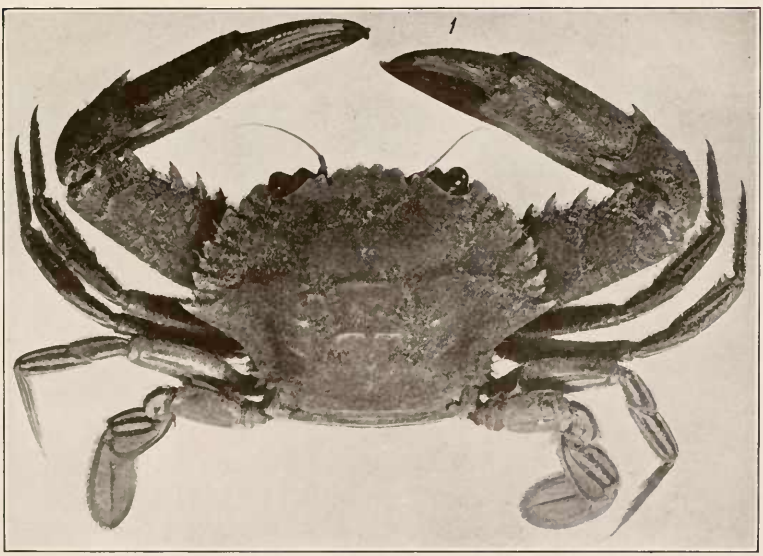






1. *Callinectes marginatus, larvatus ;* 2. Gulf-weed Swimming Crab, *Portunus Sayi ;* 3. *Achelous Ordwayi.*





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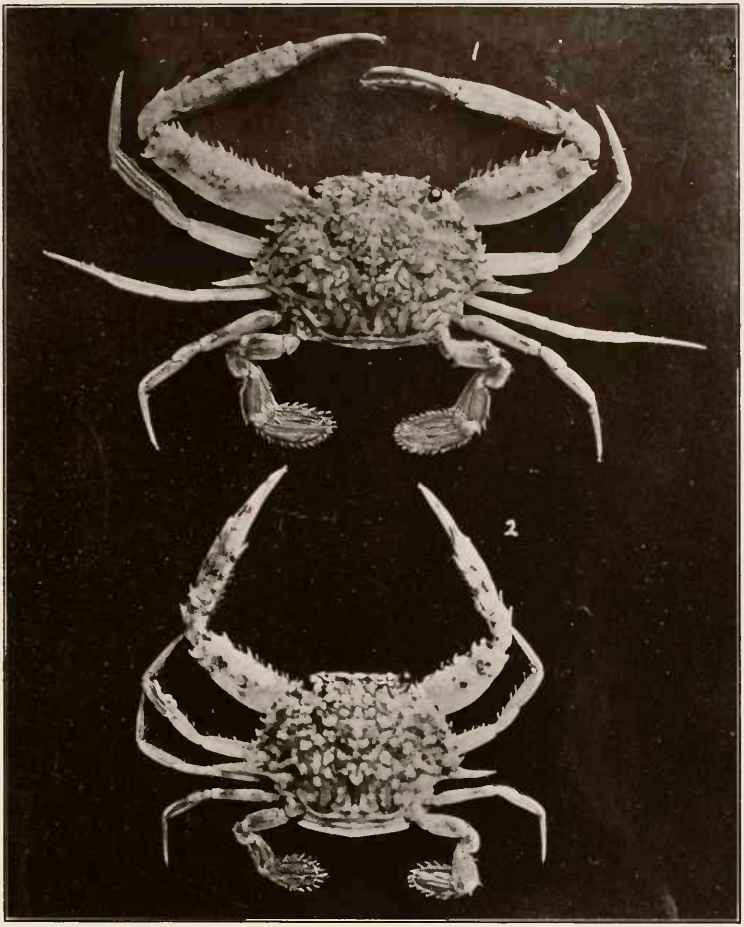
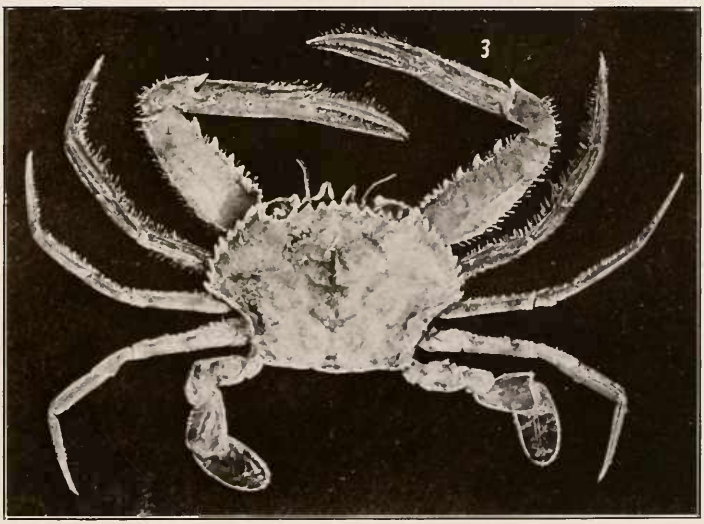
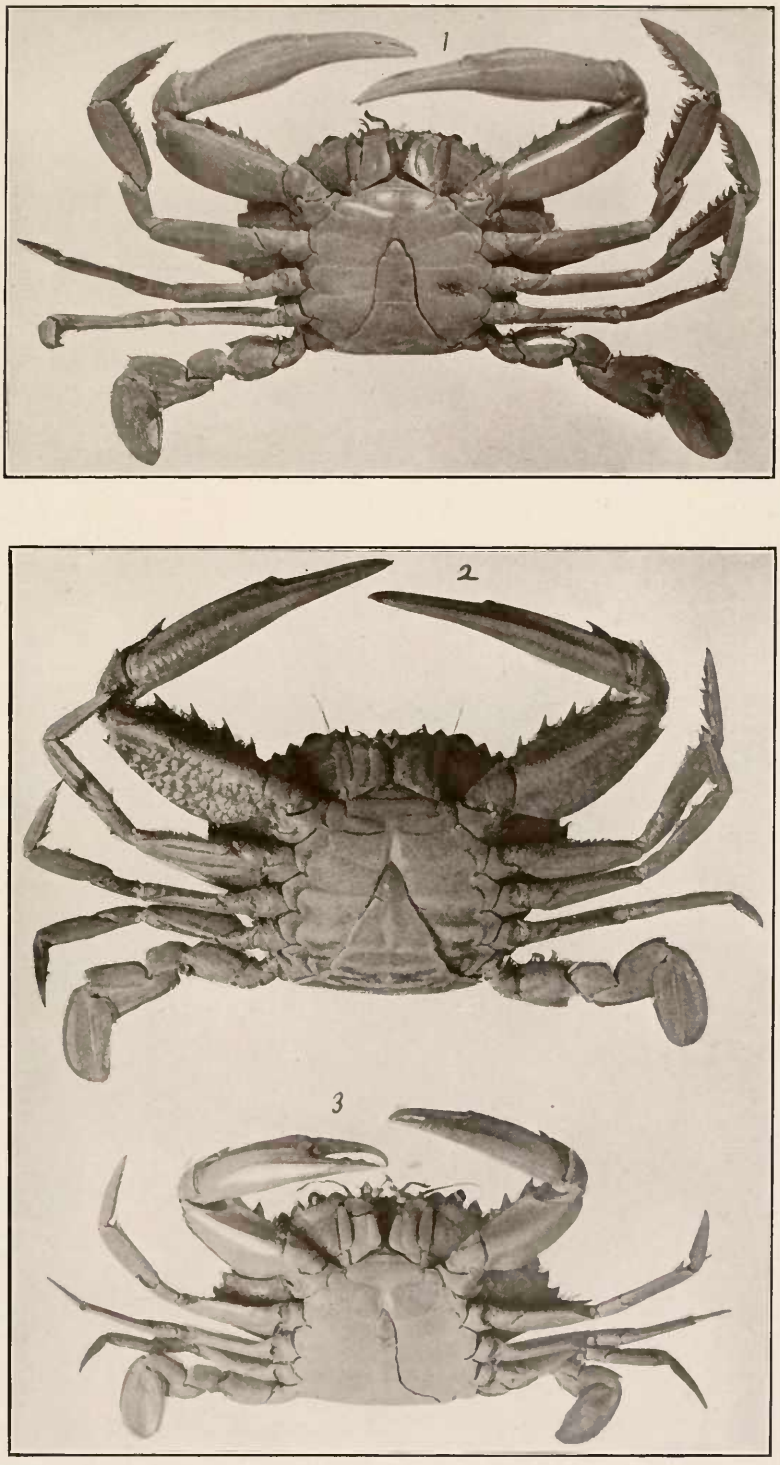
1. *Charybdella tumidula;* 2. *Achelous Smithii.*

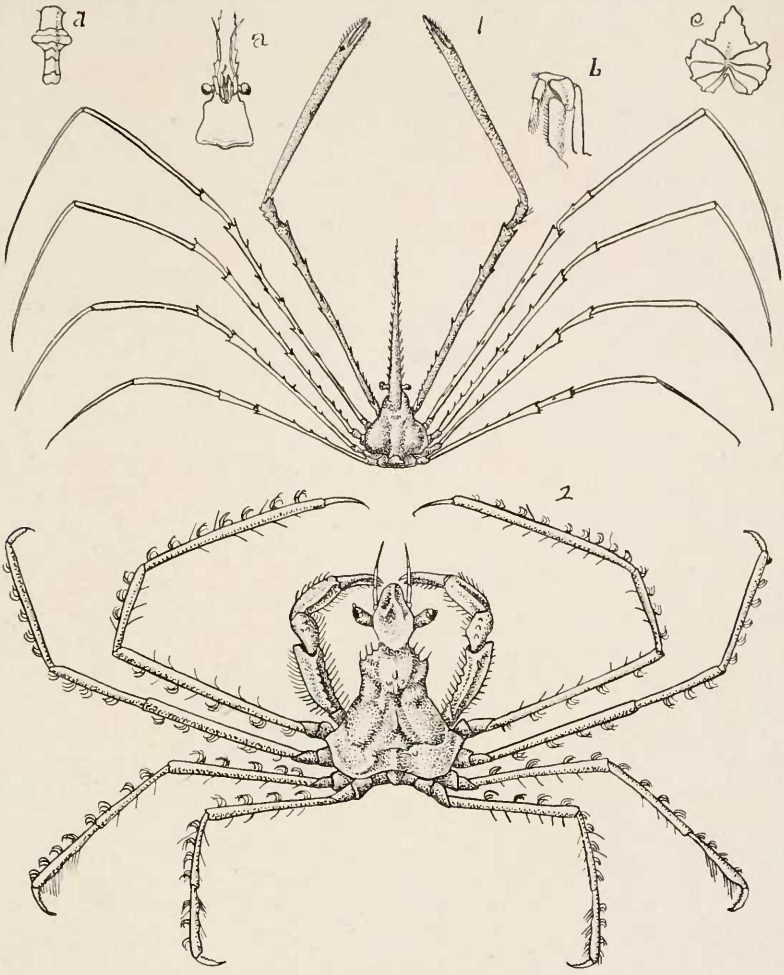


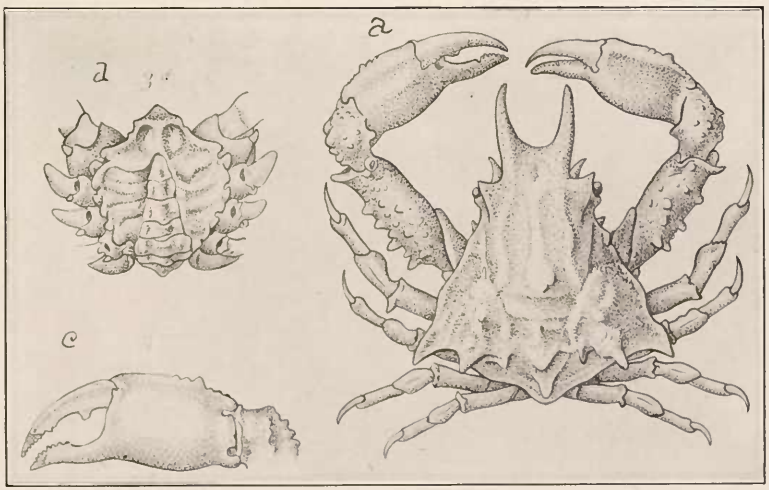


1, 2. *Achelous anceps*; 3. *Achelous depressifrons.*



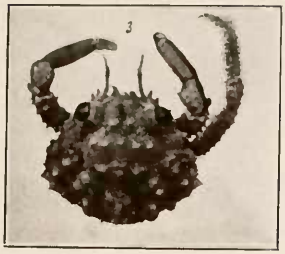
1. Gulf-weed Crab, *Portunus Sayi*; 2. *Achelous Smithii* ♀;
3. *Callinectes marginatus, larvatus.*

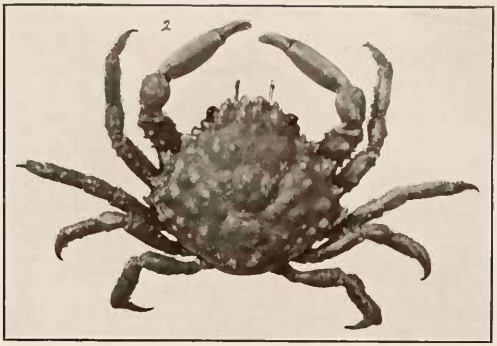


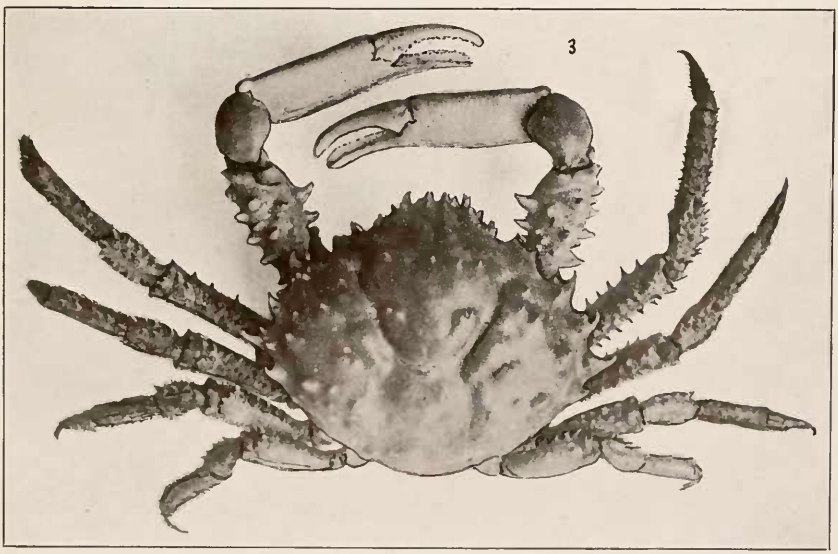


1. *Stenorhynchus sagittarius* ; 2. *Podochela Riisei* ; 3. *Macrocœloma subparallelum*. After A. M.-Edw.

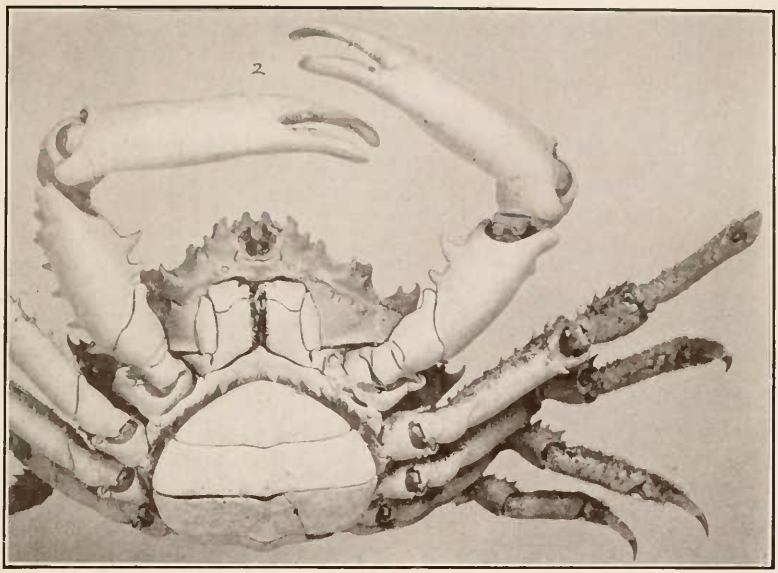
1

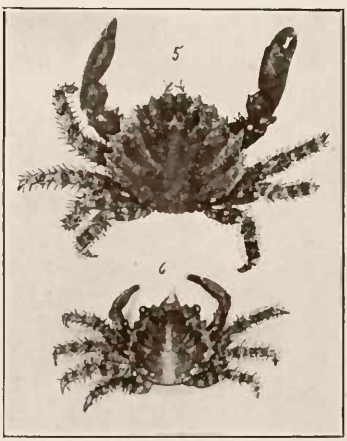




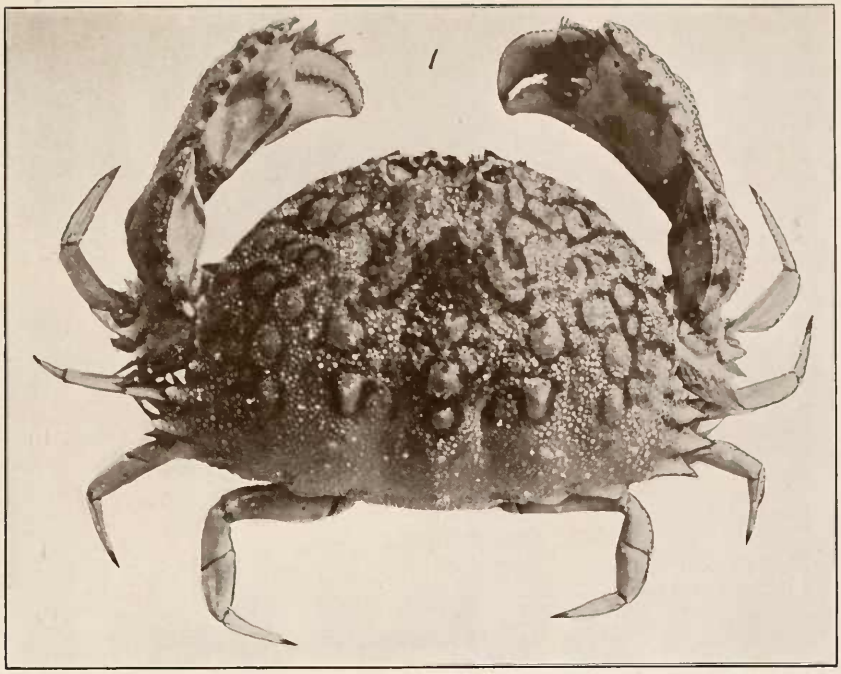


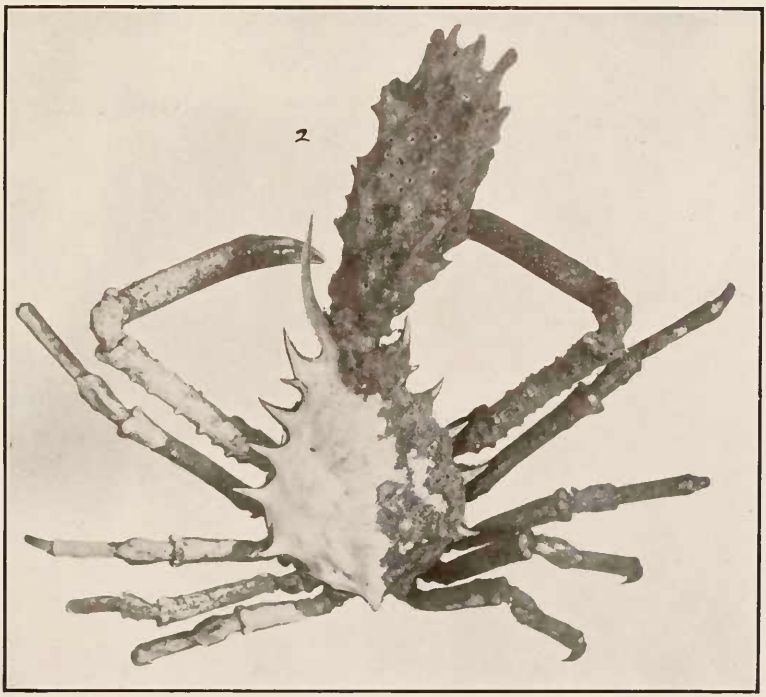
1. *Mithrax depressus?*; 2. *M. depressus?*; 3. *M. hispidus* ♀; 4. *M. hispidus* ♀.



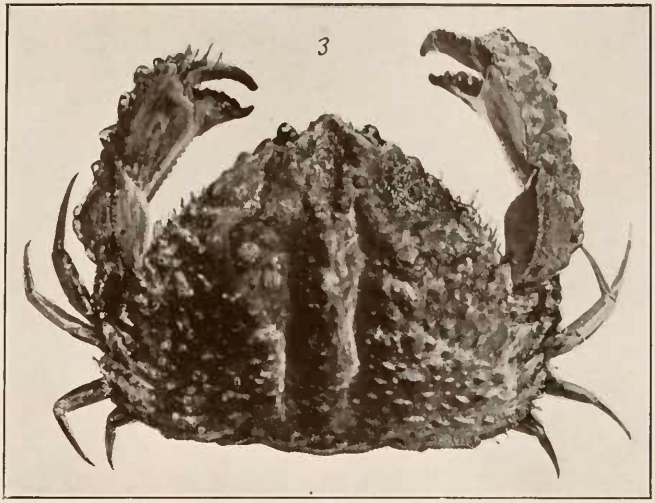


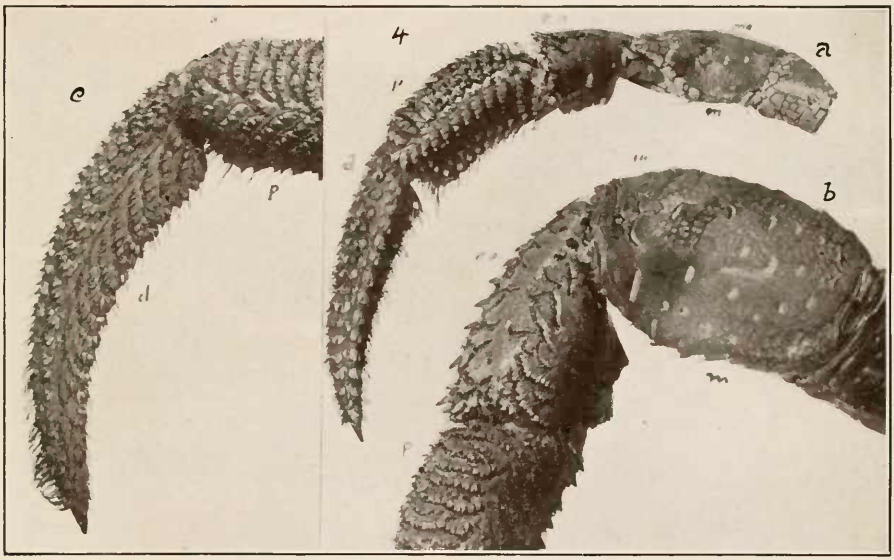
1. *Epialtus bituberculatus;* 2. *Mithrax hispidus;* 3. *Chorinus heros;* 4, 5, 6. *Mithrax forceps, hirsutipes.*

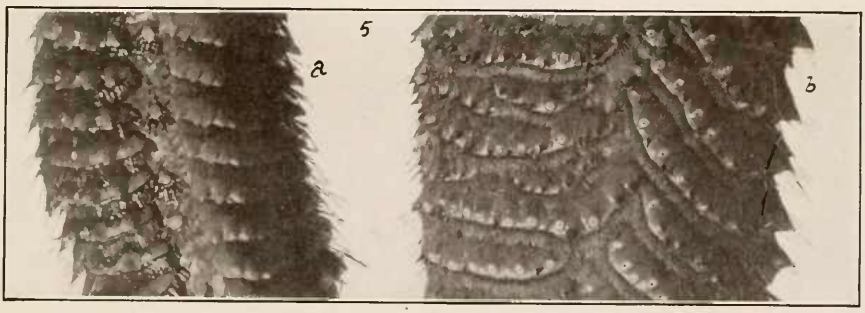




1. Box Crab, *Calappa flammea ;* 2. *Stenocionops furcatus*, with sponge attached.







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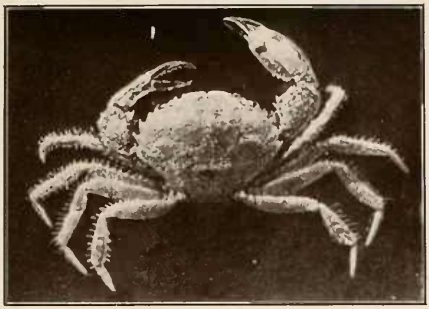

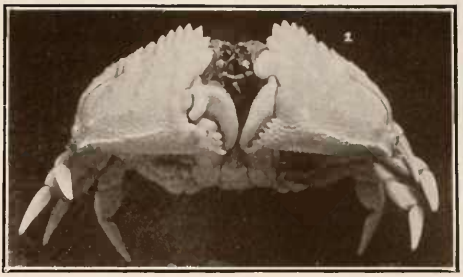

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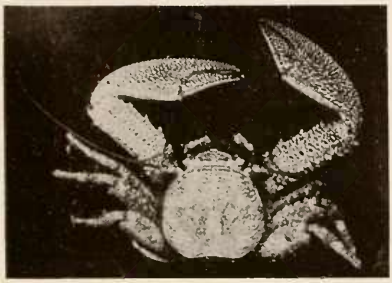

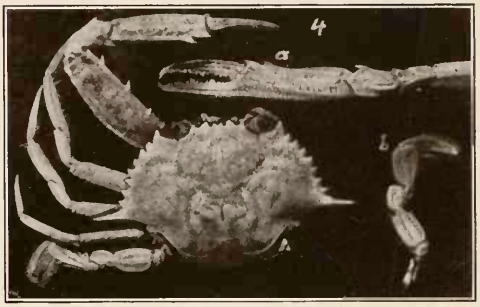

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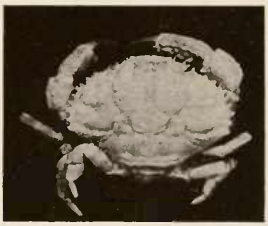

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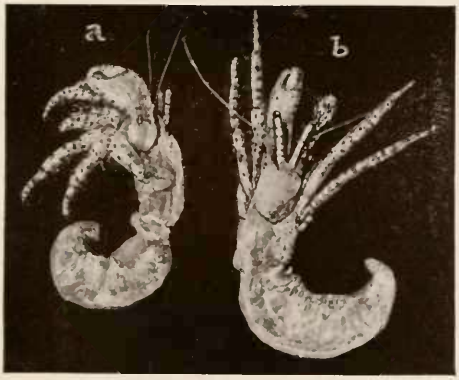

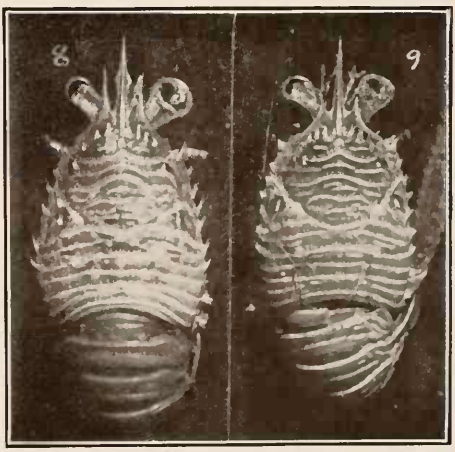

A. H. Verrill, phot.

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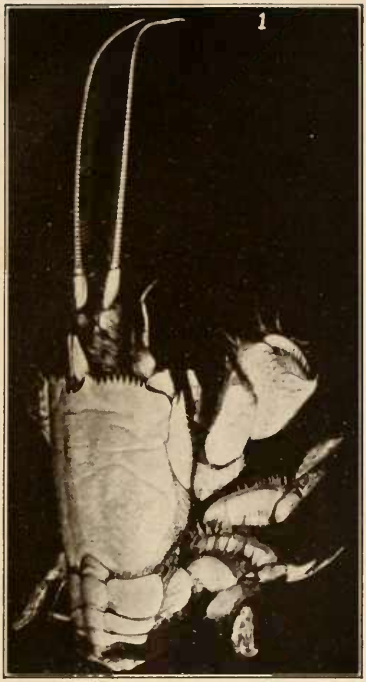

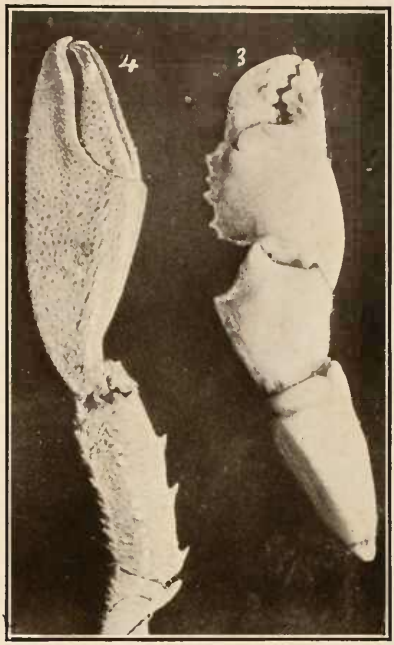

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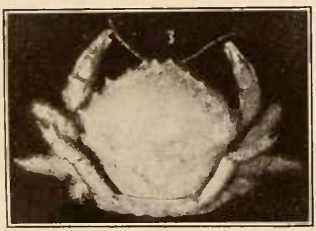

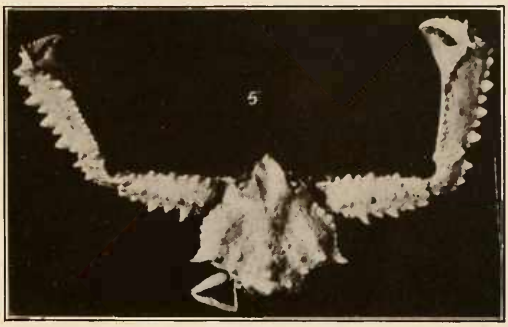

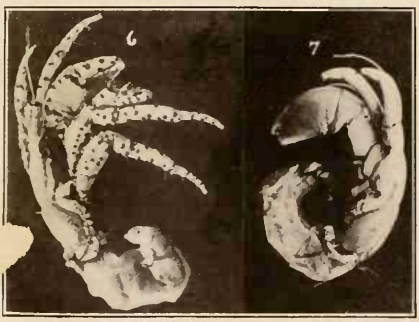

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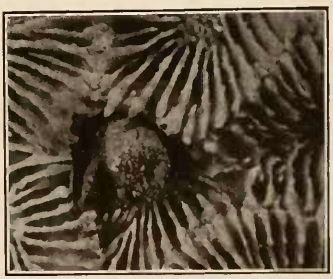

A. Hyatt Verrill, phot.

Stoddard & Brown, eng.

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