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

BY

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DECAPOD CRUSTACEA

OF

BERMUDA

I. BRACHYURA AND ANOMURA.

By ADDISON E. VERRILL,

PROFESSOR OF ZOOLOGY, YALE UNIVERSITY.

PAGES 299-474. PLATES IX-XXVIII.

[FROM THE TRANSACTIONS OF THE CONNECTICUT ACADEMY OF SCIENCES,
VOL. XIII, 1908.]

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, actiniae, 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 distribution of 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 *Auiphioxus* quite abundantly."

* Additions to the Crustacea and Pycnogonida of the Bermudas, Trans. Conn. Acad. Sci., vol. x, part ii, pp. 573-582, plates lxxvii-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*, *Percnon planissimum*, etc. Some live regularly in eroded holes in masses of coral or limestone, like many species of *Alpheus* and the common *Gonodactylus Erstedii*. The rare crab, *Epiplatys 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 Portunidae 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 Bose, 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. 41, 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 rhombica 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

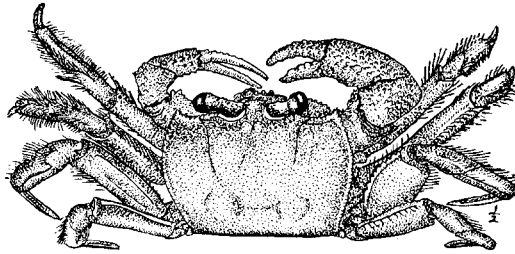


Figure 1.—*Ocypode arenarius*, about $\frac{2}{3}$ nat. size, after photo. by A. H. Verrill.

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	Chela length	Chela height	Eye-stalks 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.	1. 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 make this negative evidence of much value.

Family **GEARCINIDÆ** 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.

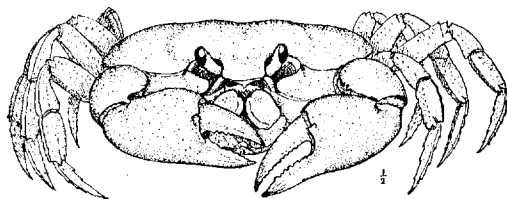


Figure 2.—Land Crab, *Gecarcinus lateralis*, front view, nat. size. Drawing by A. H. V.

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		Front	Chelæ		Locality
		length	breadth	breadth	length	height	
3048.	♂	39	48	10	r. } 33	r. 15	Bermuda
					l. } 45	l. 20	
1901a.	♂	36	44	9	30	16	Bermuda
Young	♂	26	35	8	r. } 19	r. 9	Bermuda
					l. } 19	l. 9	
Young	♂	14	24	6	r. } 12.5	r. 6	Bermuda
					l. } 12.5	l. 6	
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. guanhumii*, 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 guanhumii* (Latr.) Great Land-Crab: "Juey."**

Cardisoma guanhumii Latreille, *Encycl. Meth., Hist. Nat. Insectes*, x, p. 685, 1825. M.-Edw., *Illust. Edit. Cuvier*, pl. xx, figs. 1—11.

S. I. Smith, *Trans. Conn. Acad. Sci.*, ii, pp. 36, 143, pl. v, fig. 3, 1870 (deser. 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

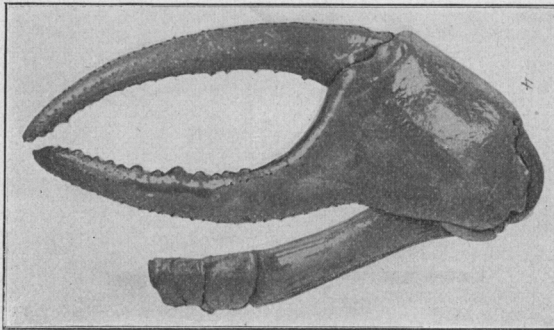


Figure 3.—*Cardisoma guanhumii*, large chela of male; $\frac{1}{2}$ nat. size. Phot. A. H. Verrill.

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
7669a†	♂	64	76	{ r. 87 l. 45	{ 40 19	{ 58 31	"
7669b§	♀	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 chela	Height of chela	Length of dactylus	Locality
7533a	♂	71	84	{ r. 61 l. 59	{ 28 26	{ 41 40	Old Providence
7533b†	♂	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. 7533a, 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 eye-stalks 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 Grapsidae.*

- 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 ruficola DeGeer, Mémoires, Insectes, vii, p. 417, pl. xxv, 1778 (non Linné).

Grapsus cruentatus Latreille, Histoire Crust. et Insectes, 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 ruficola White, List of Crust. in the British Museum, p. 40, 1847. Saussure, op. cit., p. 30, pl. 2, fig. 18, 1858.

Grapsus pelli 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 Grapsidae, 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 4a.

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.