

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.

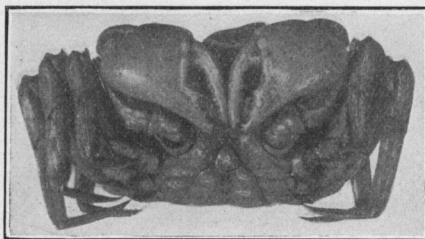


Figure 67.—*Sesarma Ricordi*, var. *terrestris*, nov. Bermuda;  $\times 1\frac{1}{4}$ . Phot. A. H. Verrill.

### BIBLIOGRAPHY.

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.

The earlier works and those of a general character are sufficiently indicated in the synonymy of the species.

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This article includes species taken at Barbados, Cape Verde Is., and Azores, as well as those from W. Africa. A number of the species named are found also in Bermuda.

**Benedict, James E.**—The Anomuran Collections made by the Fish Hawk Expedition to Porto Rico. Bulletin U. S. Fish Commission for 1900, vol. ii, pp. 129–148, pls. iii–vi, 1901.

Contains descriptions of all the Porto Rico genera and species, several of which are found also in Bermuda.

**Benedict, James E. and Rathbun, Mary J.**—The Genus *Panopeus*, Proc. U. S. Nat. Mus., vol. xiv, No. 858, pp. 355–385, pls. xix–xxiv, 1891.

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.)

**Edwards.**—See **Milne-Edwards**.

**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.

**Henderson, R. J.**—Reports of the Voyage of the Challenger; Zoology. Report on the Anomura, vol. xxvii, 1888.

Records only two shallow-water species from Bermuda. Also two deep water species: *Purapagurus abyssorum* Edw. and *Munidopsis serratifrons* Edw., both from 1075 fath.

**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 (*Palammon serratus*) probably = *Penaeus brasiliensis*, body 5.3 inches long; Common Shrimp (*Palammon vulgaris*), = *Palammon 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 *Penaeus*. *P. brasiliensis* 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 *Palammon 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.

**Jones, J. Matthew.**—The Visitors Guide to Bermuda. 12mo, 150 pp. Halifax, London, and New York, 1859.

A correct list of three species of Crustacea on page 145.

**Kingsley, J. S.**—List of Decapod Crustacea of the Atlantic Coast, whose range embraces Fort Macon, Proc. Acad. Nat. Sci. Philadelphia for 1878, pp. 316–328 (1878); 329–330 (1879); 1878–79.

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**Miers, Edward J.**—Reports of the Voyage of the Challenger, Zoology. Report on the Brachyura, vol. xvii, 1886.

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It was published in numbers. The 2d, which begins the systematic part, is dated, on the original cover, 1873; the 3d is 1875; 4th, 1878; 5th, 1879; 6th, 1879; 7th, 1880; 8th, 1880.

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**Von Martens**, see **Martens**.

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

Contains brief description of many Bermuda species. Twenty-three species previously recorded by others, are attributed to Bermuda.

## EXPLANATION OF PLATES.

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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;  $\frac{2}{3}$  nat. size.

Figures 2, 3.—*Ocypode arenarius*, male and female; about  $\frac{3}{4}$  nat. size, resting on Bermuda shell-sand.

### PLATE X.

Figure 1.—*Plagusia depressa*, dorsal view of female, about  $\frac{2}{3}$  nat. size.

Figure 2.—*Sesarma Ricordi*, ♀; typical, about  $1\frac{1}{3}$  nat. size.

Figure 3.—*Percnon planissimum*, ♀; about  $1\frac{1}{3}$  nat. size.

Figure 6.—*Grapsus grapsus*. Large chela of male;  $\frac{3}{4}$  nat. size.

### PLATE XI.

Figure 1.—*Goniopsis cruentatus*; about  $\frac{3}{4}$  nat. size.

Figure 2.—*Grapsus grapsus*; about  $\frac{2}{3}$  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, ×  $1\frac{1}{2}$ .

Figure 3.—*Pachygrapsus transversus*, ♂, × about  $1\frac{1}{2}$ .

Figure 3a.—The same ♀, × about  $1\frac{1}{2}$ ; 3b, 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 4a.—*Goniopsis cruentatus*; large chela of male,  $1\frac{1}{3}$  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  $\frac{3}{4}$  nat. size.

## PLATE XIV.

- Figure 1.—*Lobopilumnus Agassizii*, var. *bermudensis*, ♂; No. 3031, from Bermuda;  $\times$  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  $1\frac{1}{5}$  nat. size.
- Figure 4.—*Xanthodius patreus*, ♂; dorsal view;  $\times 1\frac{2}{3}$ .
- Figure 5.—*Lomera dispar*, ♂; No. 3176, dorsal view of a Bermuda specimen;  $\times$  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.—*Cyclozanthops 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;  $\times$  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;  $\times$  about  $1\frac{1}{3}$ .
- Figure 3.—*E. bermudensis*, var. *sculptus*, nov., ♀;  $\times$  about  $2\frac{1}{2}$ .
- Figure 4.—*E. bermudensis*, ♀; No. 3280; *a*, carapace; *b*, large chela,  $\times$  about  $2\frac{1}{2}$ .
- Figure 5.—*E. serratus*, ♂, No. 3019, carapace;  $\times$  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*, *tartarus*, ♂; dorsal view of a young Bermuda specimen, No. 19036;  $\times$  about  $1\frac{2}{3}$ .
- Figure 2.—*Portunus Sayi*, ♂; from off New Jersey, No. 4036;  $\times$  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.;  $\times$  about  $1\frac{1}{6}$ .

Figure 2.—*Achelous Smithii*, No. 4035b; cotype, dorsal view;  $\times$  about  $1\frac{1}{10}$ ; 2b, chela of the same, front view. Cotype from off Cape Hatteras.

PLATE XX.

Figures 1, 2.—*Achelous anceps*, dorsal view of fresh Bermuda specimens;  $\times$  about  $1\frac{1}{2}$ .

Figure 3.—*A. depressifrons*, dorsal view of a fresh Bermuda specimen;  $\times$  about  $1\frac{1}{2}$ .

PLATE XXI.

Figure 1.—*Portunus Sayi*, ♂, view of ventral side of No. 4036, from off New Jersey;  $\times$  about  $1\frac{1}{3}$ .

Figure 2.—*Achelous Smithii*, ventral view of immature female. Cotype No. 4035, from off Cape Hatteras;  $\times$  about  $1\frac{1}{3}$ .

Figure 3.—*Callinectes marginatus, larvatus*, ventral view of young male, No. 1903b, from Bermuda;  $\times$  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  $1\frac{1}{3}$  nat. size. After A. M.-Edwards.

Figure 3.—*Macrocaeloma 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;  $\times$  about  $2\frac{1}{3}$ .

Figure 2.—*Mithrax depressus*, ♀, No. 3265, from Saint Thomas;  $\times$  about  $1\frac{1}{2}$ .

Figure 3.—*Mithrax hispidus*, ♀, No. 4058, from Bermuda;  $\times$  about  $1\frac{1}{6}$ .

Figure 4.—*Mithrax hispidus*, ♀, No. 4054, immature, from Bermuda;  $\times 1\frac{1}{10}$ .

PLATE XXIV.

Figure 1.—*Epiattus bituberculatus, bermudensis*, type;  $\times 1\frac{1}{2}$ .

Figure 2.—*Mithrax hispidus*, ♀. Under side of No. 4058. See pl. xxiii, fig. 3.

Figure 3.—*Chorinus heros*, ♂; dorsal view;  $\times$  about  $1\frac{1}{2}$ . 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  $\frac{2}{3}$  nat. size.

Figure 2.—*Stenocionops furcatus*, ♂,  $\frac{2}{3}$  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.  $\times 1\frac{1}{2}$ .
- Figure 3.—*Calappa gallus, galloides*; dorsal view; about nat. size.
- Figure 4.—*Dardanus venosus*; *a*, 2d ambulatory leg of left side; enlarged about  $1\frac{1}{4}$ ; *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;  $\times 1\frac{9}{10}$ .
- Figure 2.—*Cycloës Bairdii*, typical form, front view of a cotype from Cape St. Lucas, Gulf of California:  $\times$  about  $1\frac{1}{2}$ .
- Figure 3.—*Petrolisthes armatus*; about nat. size.
- Figure 4.—*Achelous anceps*; dorsal view;  $\times$  about  $1\frac{1}{2}$ ; *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;  $\times 1\frac{1}{2}$ .
- Figure 7.—*Cycloanthops denticulatus*, dorsal view; natural size.
- Figures 8, 9.—*Munida Beanii*, types. Dorsal view of carapace, etc.,  $\times$  about 5.

## PLATE XXVIII.

- Figure 1.—*Albunea oxyophthalma*, side view of a Bermuda specimen;  $\frac{2}{3}$  nat. size.
- Figure 2.—*Dromidia antillensis*; about nat. size.
- Figure 3.—The same. Cheliped of a Brazilian specimen;  $\times$  about 4.
- Figure 4.—*Petrolisthes armatus*; cheliped;  $\times$  about 4.
- Figure 5.—*Parthenope crenulatus*;  $\times$  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.;  $\times$  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.

## INDEX TO SCIENTIFIC AND COMMON NAMES.

- Acanthopus Gibbesii, 334.  
 planissimus, 334.  
 Achelous, genus, 365, 373.  
 key to species, 375.  
 anceps, 375, 378, 454.  
 depressifrons, 374, 375, 391, 454.  
 Gibbesii, 374, 375, 386, 389, 454.  
 Ordwayi, 375, 381, 382, 383, 454.  
 Sebae, 374, 375, 380, 454.  
 Smithii, 364, 374, 375, 386, 387, 388.  
 spinicarpus, 365, 374, 375.  
 spinimana, 385.  
 spinimanus, 373, 374, 375, 385, 386,  
     387, 388, 454.  
 spinimanus, Smithii, 387.  
 sulcatus, 365, 375.  
 tumidulus, 393.  
 Actaea, genus, 335.  
 setigera, 338.  
 Additional species from deep water, 459,  
     460.  
 Albunea oxyophthalma, 438.  
 Gibbesii, 438.  
 Paretii, 438.  
 Albuneidae, 438.  
 Alpheus, 303.  
 Amphioxus, 302.  
 Amphipods, distribution of, 453.  
 Amphitrite depressifrons, 391.  
 Anomura, 430, 433.  
 Arenæus cibrarius, 365.  
 Attergatis lobatus, 336.  
  
 Beach crab, 306.  
 Biographical notes, L. Agassiz, 371.  
     G. Brown Goode, 301.  
     J. M. Jones, 300.  
     Albert Ordway, 384.  
 Blue crab, 365, 370.  
 Boscia, 396.  
 Box crab, 420.  
 Brachyura, key to tribes, 305.  
     distribution of, 452.  
 Brachyura anomala, 430.  
  
 Calappa fluminea, 420, 454.  
     gallus, 422.  
     gallus, galloides, 422, 454.  
     marmorata, 420, 454.  
 Calappidae, 420.  
 Calcinus obseurus, 439, 441.  
     sulcatus, 439, 440.  
     tibicen, 439, 441.  
 Calliactis tricolor, 416.  
 Callio crab, 336.  
 Callinectes, 365.
- Callinectes, key to species of, 366.  
 Danæ, 364, 366, 370.  
 diacanthus, 365, 370.  
 hastatus, 371.  
 larvatus, 368.  
 marginatus, 364, 366, 368, 370.  
 marginatus larvatus, 368, 454.  
 ornatus, 365, 366, 369, 373, 454.  
 sapidus, 365, 366, 370, 371, 453,  
     454, 456.  
 tumidus, 365.  
 Cancer arenarius, 306.  
 borealis, 396.  
 cornudo, 415.  
 depressus, 332.  
 erythropus, 430.  
 fämmea, 420.  
 furcatus, 415.  
 gallus, 422.  
 gonagra, 362.  
 grapsus, 317.  
 heros, 398.  
 hispidus, 404.  
 limosa, 358.  
 lobatus, 336.  
 maculatus, 317.  
 minutus, 325.  
 panope, 344.  
 parvulus, 340.  
 planissimus, 334.  
 quadratus, 306.  
 ruricola, 314.  
 sagittarius, 397.  
 spectabilis, 336.  
 venustus, 336.  
 Caneroidea, 335.  
 Cardisoma armatum, 454.  
     guanhumi, 303, 310, 311, 454.  
 Carpilius corallinus, 456.  
 Catometopa, 306.  
 Cenobita Diogenes, 438.  
 Cenobitidae, 438.  
 Cepon distorta, 323.  
 Charybdella, 366, 374.  
     rubra, 365, 374, 375, 393,  
     tumidula, 399, 364, 374, 375.  
 Chlorodius americanus, 340.  
     dispar, 343.  
     floridanus, 342.  
     limosus, 342.  
 Chorinus armatus, 416.  
     heros, 398.  
 Clibanarius hebes, 450, 451, 452, 453.  
     tricolor, 447, 448.  
     Verrillii, 449, 453.  
 Coryrhynchus Riisei, 398.

- Cyclometopa, 335.  
 Crab, bandana, 336.  
     beach, 306.  
     box, 420.  
     box, yellow, 422.  
     calico, 336.  
     coral, 400, 404.  
     fiddler, 323.  
     cliff, 317.  
     edible, 366, 370.  
     flat, 334.  
     ghost, 306.  
     Gulf stream, 325, 326.  
     hairy, 338.  
     hermit, 439.  
     hermit blue, 447.  
     hermit land, 306, 439.  
     hermit red-veined, 441.  
     hermit spotted, 449.  
     hermit tricolored, 447.  
     land, 308, 310.  
     land, great, 310, 438, 439.  
     mangrove, 314.  
     mottled shore, 321.  
     rock, 456.  
     red shore, 317.  
     silvery clawed, 381.  
     spider, 399, 407, 413, 414.  
     spider, large, 404.  
     spider, red, 400, 413, 414,  
     sponge-carrying, 430.  
     swimming, 364.  
*Cronius bispinosus*, 393.  
*Cryptochirurus coralliodytes*, 429.  
*Cycloës Bairdii*, 423, 424, 425.  
     Bairdii, atlantica, 419, 423, 425.  
*Cylograpsus integer*, 300, 331.  
*Cycloës Bairdii*, 423.  
*Cyclometopa*, 305.  
*Cycloanthops denticulatus*, 339, 454.  
*Dardanus insignis*, 441, 446.  
     venosus, 441, 442, 445.  
*Deformed claw*, 396.  
*Deep-water species*, 459, 460.  
*Distribution of Amphipods*, 453.  
     Anomura, 452.  
     Brachyura, 452.  
     Macrura, 452.  
*Domecia*, 336.  
     hispida, 364, 454.  
*Dorippidae*, 436.  
*Doubtful species*, 396.  
*Dromicea*, 430.  
*Dromides*, 430.  
*Dromiidæ*, 430.  
*Dromiidea*, 430.  
*Dromia erythropus*, 299, 430.  
     lator, 430.  
*Dromidia antillensis*, 431, 432.  
*Edible crab*, 366, 370, 456.  
*Emerita talpoidea*, 437.  
  
     Entomostraca, 453.  
*Epiactus bituberculatus*, 303, 399.  
     bituberculatus, bermudensis, 399.  
     dilatatus, 399.  
     longirostris, 399.  
     sulcirostris, 399.  
*Eriphia*, genus, 336.  
     gonagra, 362, 454.  
*Ethusa*, 426.  
*Eupanopews*, key to species of, 343.  
     americanus, 346, 350, 351.  
     areolatus, 350.  
*Enpanopews bermudensis*, 372, 356.  
     bermudensis, sculptus, 357.  
     Herbstii, 344, 351, 453, 454.  
     Herbstii, minax, 348, 350, 453.  
     Herbstii obesus, 347, 453, 454.  
     occidentalis, 351, 352, 354, 454.  
     serratus, 342, 353, 354.  
*Eurytium*, 335.  
     limosum, 358, 359, 454.  
*Eupilumnus Websteri*, 364.  
  
*Fiddler-crabs*, 323.  
  
     Galatheidae, 433, 435.  
     Galatheidea, 433.  
     Galathoidea, 433.  
     Gecarcinidæ, 308, 459.  
     Gecarcinus lateralis, 308, 309.  
         lagostoma, 308.  
         ruricola, 459.  
     Gelasimus, 306.  
         bugilator, 323.  
     Geographical distribution, 452.  
     *Geograpsus lividus*, 320, 321, 454.  
         occidentalis, 320, 321.  
     Geryon ? incertus, 460.  
     Ghost-crab, 306.  
     *Glypturus Brauneri*, 299.  
     *Goniograpsus eruentatus*, 314.  
         imnotatus, 322.  
     *Goniopsis*, 314.  
         eruentatus, 303, 314, 315.  
         ruricola, 314.  
     *Grapsodactylus Ørstedii*, 303.  
     *Grapsidæ*, key to genera, 313, 314.  
     *Grapsus*, 314.  
         altifrons, 317.  
         cinerens, 325.  
         eruentatus, 314.  
         grapsus, 317, 332, 333, 454.  
         lividus, 320.  
         longipes, 314.  
         maculatus, 317.  
         minutus, 325.  
         ornatus, 317.  
         pelagicus, 325.  
         pelli, 314.  
         pectus, 317.  
         transversus, 321.  
         Webbi, 317.  
     *Gulf-weed crab*, 325, 326.

- Hapalocarcinidae, 426, 427.  
 Hapalocarcinidea, 426.  
 Hapalocarcinus marsupialis, 429.  
 Hermit crab, 439.  
   blue, 447  
   land, 438, 439.  
   red spotted, 439, 449.  
   red-veined, 441.  
   tricolored, 447.  
 Heteractea, 335.  
 Heteractea ceratopus, 341.  
 Heteromacrura, 433.  
 Hippa, genus, 436.  
   adactyla, 436.  
   cubensis, 303, 436, 437, 454.  
   sentellata, 436.  
 Hippidae, 436.  
 Hippide, 433, 436.  
 Hippoidea, 436.  
 Homolidea, 430.  
 Inachidae, 397.  
 Isopods, 452.  
 Juey, 310.  
 Key to genera of Grapsidae, 313, 314.  
   Pilumnidae, 335.  
   Portunidae, 365.  
   species of Achelous and Portunus, 375.  
     Eupanopens, 343, 344.  
     Mithrax, 400.  
   · Tribes of Brachyura, 305.  
 Lambrus crenulatus, 417.  
   Pourtalesii, 418, 419.  
   Verrillii, 418, 419.  
 Land crabs, 308, 309.  
   hermit crabs, 438, 439.  
 Latreutes ensiferus, 326.  
 Leander tenuicornis, 326, 377.  
 Leidya distorta, 323.  
 Leiopholus planissimus, 334.  
 Lepeophtheirus dissimulatus, 453.  
 Leptodius, 335.  
   americanus, 340.  
   dispar, 343.  
   floridanus, 342, 357.  
 Leptopodia lanceolata, 397.  
   ornata, 397.  
   sagittaria, 397.  
 Leucosoidea, 420.  
 Libinia canaliculata, 396, 459.  
   emarginata, 396.  
 Liomera, 335.  
   dispar, 343.  
 Livona pica, 439.  
 Lobopilumnus Agassizii, 359, 360.  
   Agassizii, bermudensis, 360.  
   pulchellus, 359.  
 Lophactaea lobata, 336.  
 Lupa diacantha, 370, 373.  
   Lupa Duchassagni, 378.  
     Gibbesii, 389.  
     hastata, 370.  
     pelagica, 376.  
     Sayi, 376.  
     Sebæ, 380.  
     spinimana, 385.  
   Lupea anceps, 378.  
 Macrocoleoma trispinosum, 414, 454.  
   trispinosa, 414.  
   subparallelum, 415.  
 Macrura anomala, 433.  
   distribution of, 452.  
 Maeandra clivosa, parasite of, 428.  
 Maia, 399.  
   sagittaria, 397.  
   spinicina, 404.  
   taurus, 415.  
 Maiidae, 399.  
 Maioidae, 397.  
 Mammidae, 399.  
 Mangrove crab, 314.  
 Menippe mercenaria, 456.  
 Metopograpsus dubius, 322.  
   gracilis, 324.  
   miniatius, 322.  
 Micropanope spinipes, 361.  
 Mierophrys bicornutus, 413.  
 Milnia bicornuta, 413.  
 Mithracina, 399.  
 Mithraculus, 400.  
   fofeeps, 303, 409.  
 Mithrax, key to species of, 400, 403.  
   cornutus, 400, 401, 402.  
   depressus, 400, 406, 407, 408, 409.  
   forceps, 400, 409, 412, 454.  
   forceps, hirsutipes, 400, 409, 410.  
   hirsutipes, 400, 412.  
   hispidus, 400, 404, 406, 407, 408,  
    409.  
   sculptus, 411, 412.  
   spinosisimus, 400, 401, 402, 403.  
 Monolepis inermis, 306.  
 Munida Beanii, 435, 453.  
   simplex, 436.  
 Munidopsis serratifrons, 459.  
 Mussa, parasite of, 428.  
 Nautilograpus minutus, 325.  
 Nebalia longipes, 464.  
 Nemania acuticornis, 403.  
   rostrata, 403.  
 Neptunus anceps, 378.  
   depressifrons, 391.  
   diacanthus, 370.  
   Gibbesii, 389.  
   hastatus, 373, 376.  
   marginatus, 368, 369.  
   Ordwayi, 381.  
   Sayi, 376.  
   Sebæ, 380.  
   tumidulus, 393.

- Neptanus ventralis*, 378, 379.  
*Nesipus curticandis*, 453.
- Ocypoda albicans*, 306.  
 arenaria, 306.  
 lateralis, 308.  
 rhombica, 306.
- Ocypode albicans*, 306.  
*arenarius*, 303, 306, 307, 454.  
*quadrata*, 306.
- Ocypodidae*, 306.
- Origin of the Bermudian Decapod Fauna, 452.
- Orthoninae*, 399.
- Ostracode*, 453.
- Oxyrhyncha*, 305, 397.
- Oxystomata*, 305, 420, 426.
- Pachygrapsus*, 303, 314.  
*gracilis*, 324.  
*intermedius*, 322.  
*socius*, 322.  
*transversus*, 321, 338, 454.
- Pagurias insignis*, 441.
- Paguridae*, 439.
- Paguridea*, 433, 438.
- Pagurus Diogenes*, 438.  
*insignis*, 441.  
*sulcatus*, 439.  
*tibicen*, 439.  
*tricolor*, 447.  
*venustus*, 441.
- Palæmon affinis*, 459.  
*serratus*, 459.  
*vulgaris*, 459.
- Pandarus Cranchii*, 453.
- Panopeus bermudensis*, 356.  
*Herbstii*, 344.  
*Herbstii*, var. *serratus*, 353.  
*Herbstii*, var. *obesus*, 347.  
*Vimodus*, 358.  
*occidentalis*, 351.  
*parvulus*, 340.  
*serratus*, 353.  
*wurdemani*, 356.
- Panulirus argus*, 459, 464.
- Paramaya*, 399.
- Paramayine*, 399.
- Parapagurus abyssorum*, 459.
- Parasite of *Clibanarius*, 448.
- Pachygrapsus*, 323.
- Parthenope*, genus, 417.  
 (Platylambrus) *crenulata*, 417.  
*longimana*, 417.  
*Pourtaleesi*, 418.
- Parthenopidae*, 417.
- Penaeus brasiliensis*, 459.
- Percnon*, 314.  
*planissimum*, 303, 334, 454.
- Pericera bicorna*, 413.  
*bicornis*, 413.  
*cornudo*, 415.  
*cornuta*, 415.
- Pericera subparallelia*, 415.  
*trispinosa*, 414.
- Periceridae*, 399.
- Pericerinae*, 399.
- Petrocheirus insignis*, 441.
- Petrolisthes armatus*, 434, 454.  
*armatus pallidus*, 453.
- Pilumnidae*, key to genera of, 335.
- Pilumnus*, 336.  
*Agassizii*, 359.  
*ceratopus*, 341.  
*spinipes*, 361, 362.
- Pinnotheridae*, 426.
- Pisa bicorna*, 413.  
*bicornuta*, 413.  
*galibica*, 413.  
*purpurea*, 413.  
*trispinosa*, 414.
- Plagusia*, 314.  
*depressa*, 332, 454.  
*Sayi*, 332.  
*squamosa*, 332.
- Planes*, 325.  
*Linnaeana*, 325.  
*minutus*, 323, 325, 326, 377, 389, 454, 456.
- Platylambrus*, genus, 417.  
*crenulatus*, 417.  
*serratus*, 417.
- Platypodia spectabilis*, 336, 473.
- Pocillopora cæspitosa*, parasite of, 427, 429.
- Podochela Rüsei*, 398, 454.
- Podonema Rüsci*, 398.
- Porcellana armata*, 434.
- Porcellanidae*, 433.
- Porcellanoidea*, 423.
- Portunidae*, 364.  
 key to genera of, 365.
- Portunus*, genus, 365, 373.  
 (Achelous) *anceps*, 378.  
 (Achelous) *depressifrons*, 391.  
*diacanthus*, 370.  
 (Achelous) *Gibbesii*, 389.  
*hastatus*, 370.  
 (Achelous) *Ordwayi*, 381.  
*pelagicus*, 374, 376.  
*sanguinolentus*, 380.  
*Sayi*, 326, 373, 374, 375, 376, 389, 392, 454, 456.  
 (Achelous) *Sebe*, 380.  
*spinimanus*, 385.
- Pseudothelphusa*, 396, 464.
- Remipes*, 436.  
*Barbadensis*, 437.  
*cubensis*, 436.  
*scutellatus*, 436.
- Sand-bug*, 436.
- Scyllarides*, 459.
- Scyllarus equinoctialis*, 459.
- Sesarma*, 303.

- Sesarma angustipes, 327.  
 cinerea, 327, 330.  
 Miersi, 331.  
 Ricordi, 323, 327, 330.  
 Ricordi, terrestris, 328, 453, 457.  
 Robertii, 330.  
 Stimpsonii, 327, 331.  
 Spider crab, 397-399, 400-415.  
 crab, common, 400.  
 crab, red, 400, 404.  
 Spinosella sororia, 430.  
 Sprite, 306.  
 Stegias Clibanarii, 448.  
 Stenocionops furcata, 415, 416.  
 Stenorhynchus sagittarius, 397, 454.  
 Stomatopoda, distribution of, 453.
- Strombus gigas, 446.  
 Swimming crabs, 364.
- Tedania ignis, 336.  
 Triton variegatus, 446, 447.  
 Troglocarcinus, gen. nov., 427.  
 corallicola, 427, 428, 429.
- Uca, 396.
- Xantho denticulata, 339.  
 parvulus, 340.  
 setiger, 338.  
 Xanthodius americanus, 340.  
 parvulus, 340.

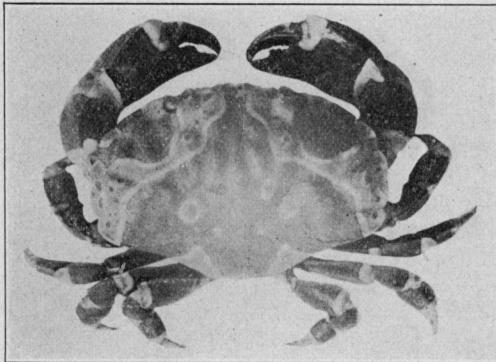


Figure 68.—*Platypodia spectabilis* (see p. 336); enlarged. Phot. A. H. Verrill.

## 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 *Culappa*.