A Review of the Grapsid Crab Genus *Sesarma* (Crustacea: Decapoda: Grapsidae) in America, with the Description of a New Genus

LAWRENCE G. ABELE

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY · NUMBER 527

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SMITHSONIAN INSTITUTION PRESS
Washington, D.C.
1992

ABSTRACT

Abele, Lawrence G. A Review of the Grapsid Crab Genus *Sesarma* (Crustacea: Decapoda: Grapsidae) in America, with the Description of a New Genus. *Smithsonian Contributions to Zoology*, number 527, 60 pages, 41 figures, 1 table, 1992.—All 39 species of *Sesarma* reported from the Americas were examined, and 23 of these are considered valid. The genus *Sesarma* is here restricted to the Americas, and the following species are assigned to this genus: *reticulatum* (the type species), *crassipes*, *curacaoense*, *rectum*, *bidentatum*, *jarvisi*, *cookei*, *verleyi*, *aequatoriale*, *sulcatum*, *rhizophorae*, and *rubinofforum*. A new genus, *Armases*, is described; *Sesarma cinereum* is the type species. The following species previously assigned to *Sesarma* are assigned to this new genus: *benedicti*, *ricordi*, *americanum*, *roberti*, *angustipes*, *miersii*, *angustum*, *occidentale*, *gorei*, and *magdalenense* from the Americas and *elegans* from the eastern Atlantic. All American species are illustrated, and keys for their identification are provided.

OFFICIAL PUBLICATION DATE is handstamped in a limited number of initial copies and is recorded in the Institution's annual report, *Smithsonian Year*. SERIES COVER DESIGN: The coral *Montastrea cavernosa* (Linnaeus).

Library of Congress Cataloging-in-Publication Data
Abele, Lawrence G.
A review of the Grapsid crab genus Sesarma (Crustacea: Decapoda: Grapsidae) in America, with the description of a new genus / Lawrence G. Abele.
p. cm.—(Smithsonian contributions to zoology ; no. 527)
Includes bibliographical references.
1. Sesarma—America—Classification. 2. Armases—America—Classification. I. Title. II. Series.
Q11.S54 no. 527
[QL444.M33]
591 s—dc20 91-46154
[595.3'842] CIP

♾ The paper used in this publication meets the minimum requirements of the American National Standard for Permanence of Paper for Printed Library Materials Z39.48—1984.

Contents

	Page
Introduction	1
Abbreviations	1
Acknowledgments	2
Genus *Sesarma* Say, 1817	2
Armases, new genus	2
Key to *Sesarma* and *Armases*, new genus	4
Key to the Western Atlantic Species of *Sesarma*	5
Key to the Western Atlantic Species of *Armases*, new genus	5
Key to the Eastern Pacific Species of *Sesarma*	5
Key to the Eastern Pacific Species of *Armases*, new genus	6
Species of *Sesarma*	7
Sesarma reticulatum	7
Sesarma crassipes	10
Sesarma curacaoense	12
Sesarma rectum	15
Sesarma bidentatum	16
Sesarma jarvisi	17
Sesarma cookei	20
Sesarma verleyi	21
Sesarma aequatoriale	22
Sesarma sulcatum	25
Sesarma rhizophorae	28
Sesarma rubinofforum	29
Species of *Armases*, new genus	30
Armases cinereum	30
Armases ricordi	32
Armases americanum	36
Armases roberti	39
Armases angustipes	40
Armases miersii	43
Armases angustum	45
Armases occidentale	48
Armases gorei	49
Armases magdalenense	53
Armases benedicti	53
Ecological Notes	55
Literature Cited	57

A Review of the Grapsid Crab Genus *Sesarma* (Crustacea: Decapoda: Grapsidae) in America, with the Description of a New Genus

Lawrence G. Abele

Introduction

The grapsid crab genus *Sesarma* (sensu lato) consists of more than 125 species in temperate and tropical regions of the world. Species occur in a variety of environments including intertidal marine, brackish water, freshwater, and terrestrial habitats (see "Ecological Notes"). In the Americas they occur on the east coast from Massachusetts to the lower coast of Brazil including the Gulf of Mexico and on the west coast from Baja California, Mexico, to Peru.

The genus was created by Say (1817) with *Ocypode reticulatus* Say, 1817, as the type species. Since then species assigned to the genus have been reassigned to no less than 20 other genera or subgenera. The result is systematic and nomenclatural confusion (see Manning and Holthius, 1981:241). The American species of *Sesarma* have traditionally been placed in two subgenera, *Sesarma* and *Holometopus* (= *Chiromantes*, see Holthuis, 1977). Serène and Soh (1970) described, from the Indo-West Pacific, a number of new genera allied to *Sesarma* and tentatively placed two Jamaican species (*S. jarvisi* and *S. verleyi*) in their new genus *Sesarmoides* (type species *Sesarma krausii*). In my opinion, these two species belong in the genus *Sesarma* and form part of a morphological continuum of species that range from aquatic to terrestrial habits in Jamaican sesarmids (see Hartnoll, 1964b, 1965). Von Hagen (1978) redefined the subgenus *Sesarma* and showed that some species previously in the subgenus *Holometopus* should be in the subgenus *Sesarma*. The data presented by von Hagen (1978) support the recognition of two groups of American species, one in the subgenus *Sesarma* and the other in *Chiromanetes*. It is not clear from the material that I have examined (which included almost all type species of sesarmid genera and subgenera) that the American species previously referred to *Holometopus* are sufficiently similar to *Sesarma haematocheir* (the type species of *Chiromantes*) to warrant their inclusion in the same taxonomic unit (see also von Hagen, 1978:52). Therefore, at the cost of adding to an already substantial synonymy, I will treat these species as belonging to a distinct genus described herein.

In the synonymy of *Sesarma*, I have followed Manning and Holthuis (1981:241) and listed all genera and subgenera whose species had previously been referred to *Sesarma*. I am sure that some of these will be recognized as valid in the future.

Table 1 lists all species of *Sesarma* reported from the Americas and their current status. Although 39 species have been reported, only 23 are considered valid. The synonymies for the species are not intended to be complete but refer to major papers dealing with the American fauna. Several taxonomic problems have been inadequately addressed here. It is highly likely that the species referred to herein as *Armases miersii* and *A. angustipes* require further study. These two species are very similar morphologically, and some specimens can be identified only tentatively as one or the other. Populations of *Sesarma curacaoense* and *S. reticulatum* appear to merge morphologically along the east coast of Florida, and Darryl L. Felder (University of Southwestern Louisiana, pers. comm.) has pointed out that *S. reticulatum* consists of two distinct color forms in the Gulf of Mexico. Two species, *Armases cinereum* and *A. ricordi*, show considerable variation over their geographic ranges, and it is possible that each actually comprises more than one species.

ABBREVIATIONS.—The following acronyms and abbreviations are used: AHF, the Allan Hancock Foundation, Los Angeles; AMNH, the American Museum of Natural History, New York; BMNH, the Natural History Museum, London (formerly the British Museum (Natural History)); cb = carapace breadth at the midline; cl, carapace length; iw, interorbital width (or width of the frontal region); LGA, personal collection of author; MCZ, the Museum of Comparative Zoology, Harvard University, Cambridge; MIZS, the Museo ed Istituto

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di Zoologica Sistematica di Torino, Turin; ml, meral length; mw, meral width; MZ, Musée Zoologique de l'Université Louis Pasteur, Paris; RMNH, the Rijksmuseum van Natuurlijke Historie, Leiden; UMML, the University of Miami Marine Laboratory, Miami; UPRC, the University of Panama Reference Collection; USNM, collections of the former United States National Museum, now deposited at the National Museum of Natural History, Smithsonian Institution, Washington, D.C.; YPMNH, the Yale Peabody Museum of Natural History, New Haven.

All material will be deposited in the National Museum of Natural History, Smithsonian Institution, unless otherwise stated.

ACKNOWLEDGMENTS.—I thank Dr. F. Douin, Curator of the Musée Zoologique de l'Université Louis Pasteur, Strasbourg, for the loan of syntypes of *S. aequatoriale;* Ms. Janet Haig of the Allan Hancock Foundation, Los Angeles, for the loan of material; Dr. R. Manning and Mr. C.A. Child of the National Museum of Natural History, Washington, D.C., for the loan of material and for assisting me during a visit to that institution; Dr. H. Levy of the Museum of Comparative Zoology, Cambridge, for assistance during a visit to that institution; Mr. H. Feinberg of the American Museum of Natural History, New York, for assistance during a visit to that institution; Dr. Orsetta Elter, Curator of the Museo ed Istituto di Zoologica Sistematica della Universita di Torino for his patience, time, and trouble involved in my numerous requests for material; and Dr. W.T. Hartman, Yale University, for his hospitality during my visit and for answering requests for material. Support and facilities for some of the field work were provided by the Smithsonian Tropical Research Institute, Panama, and I thank Dr. Ira Rubinoff for his help. Support was provided by the National Science Foundation. The illustrations were rendered by Ms. Teresa C. Ellis and Ms. Lilly K. Manning.

Genus *Sesarma* Say, 1817

Sesarma Say, 1817:76 [type species: *Ocypode reticulatus* Say, 1817, by monotypy; gender: neuter].

Pachysoma de Haan, 1833:5 [circ. pl. 2, pl. 7: fig. 4, pl. 8: fig. 3. Invalid junior homonym of *Pachysoma* MacLeay, 1821 (Coleoptera); type species: *Grapsus (Pachysoma) haematocheir* de Haan, 1833, by selection by Holthuis (1977:170); gender: neuter].

Chiromantes Gistel, 1848:x [substitute name for *Pachysoma* de Haan, 1833; type species: *Grapsus (Pachysoma) haematocheir* de Haan, 1833; gender: masculine].

Holometopus H. Milne Edwards, 1853:187 [type species: *Grapsus (Pachysoma) haematocheir* de Haan, 1833, by monotypy; gender: masculine].

Geosesarma De Man, 1892b:341 [type species: *Sesarma (Geosesarma) nodulifera* De Man, 1892b, selected by Serène and Soh (1970:402); gender: neuter].

Episesarma De Man, 1895:165 [type species: *Sesarma taeniolatum* Miers, 1877 (= *Sesarma taeniolata* White, 1847, a nomen nudum), a subjective junior synonym of *Sesarma mederi* H. Milne Edwards, 1853, selected by Holthuis (1978:24); gender: neuter].

Parasesarma De Man, 1895:181 [type species: *Cancer quadratus* Fabricius, 1798 (not Fabricius, 1787) (= *Ocypode plicata* Latreille, 1803), by selection by Rathbun, 1918:284); gender: neuter].

Perisesarma De Man, 1895:208 [type species: *Sesarma (Perisesarma) eumolpe* De Man, 1895, selected by Holthuis (1977:170); gender: neuter].

Baenium Serène and Soh, 1970:389, 394 [type species: *Sesarma batavica* Moreira, 1903, by original designation; gender: neuter].

Neosesarma Serène and Soh, 1970:389, 394 [type species: *Sesarma gemmiferum* Tweedie, 1936, by original designation; gender: neuter].

Neoepisesarma Serène and Soh, 1970:390, 395 [type species: *Sesarma mederi* H. Milne Edwards, 1853, by original designation; gender: neuter].

Muradium Serène and Soh, 1970:390, 396 [type species: *Cancer tetragonus* Fabricius, 1798, by original designation; gender: neuter].

Selatium Serène and Soh, 1970:390, 397 [type species: *Sesarma brockii* De Man, 1887, by original designation; gender: neuter].

Tiomanum Serène and Soh, 1970:391, 398 [type species: *Sesarma indica* H. Milne Edwards, 1837, by original designation; gender: neuter].

Bresedium Serène and Soh, 1970:391, 399 [type species: *Sesarma edwardsii brevipes* De Man, 1889, by original designation; gender: neuter].

Pseudosesarma Serène and Soh, 1970:391, 399 [type species: *Sesarma edwardsi* De Man, 1888, by original designation; gender: neuter].

Sesarmops Serène and Soh, 1970:391, 400 [type species: *Sesarma impressa* H. Milne Edwards, 1837, by original designation; gender: masculine].

Labuanium Serène and Soh, 1970:392, 401 [type species: *Sesarma polita* De Man, 1888, by original designation; gender: neuter].

Sesarmoids Serène and Soh, 1970:392, 401 [type species: *Sesarma krausii* De Man, 1887, by original designation; gender: masculine].

Namlacium Serène and Soh, 1970:392, 401. Type species: *Sesarma crepidatum* Calman, 1925, by original designation; gender: neuter].

DIAGNOSIS.—Carapace slightly broader than long (average cl/cb ratio about 0.9); regions defined; outer orbital angle sharp; either an anterolateral tooth or distinct stria posterior to outer orbital angle. Verwey's groove on epistome well defined, smooth, bordered by distinct row of hairs on upper and lower margin. Merus of cheliped with row of granules on posteriodistal margin ending proximal to distal margin; palm with single row of closely set granules on superior surface extending from proximal to distal margin; movable finger with row of sharp tubercles, not broadened at base. Second walking leg with dense soft pubescence on dorsal surface of propodus (though reduced in terrestrial species). (Modified after von Hagen, 1978).

The genus *Sesarma* includes the type species, *S. reticulatum*, as well as the following species, all from the Americas: *aequatoriale, bidentatum, cookei, crassipes, curacaoense, jarvisi, rectum, rhizophorae, rubinofforum, sulcatum,* and *verleyi*. All of the remaining American species, including *S. elegans* Herklots, 1851, from the eastern Atlantic, form a second group of species that is here placed in a new genus, *Armases*.

Armases, new genus

DIAGNOSIS.—Carapace slightly broader than long to slightly longer than broad; regions weakly defined; outer orbital angle sharp; anterolateral margin smooth, or slight emargination posterior to outer orbital angle; Verwey's groove on epistome poorly defined, bordered by distinct row of hair on lower

FIGURE 1.—*Sesarma reticulatum*, male, Dauphin Island, Alabama.

margin only. Merus of cheliped with row of granules on posteriodistal margin extending to distal margin; palm with scattered granules on dorsal surface; movable finger often broadened at base with scattered granules on dorsal surface. Second walking legs with no pubescence on dorsal surface of propodus.

TYPE SPECIES.—*Sesarma cinereum* Bosc, 1802.

ETYMOLOGY.—An anagram derived from *Sesarma*. Gender neuter.

REMARKS.—Species included are *americanum, angustipes, angustum, benedicti, cinereum, gorei, magdalenense, miersii, occidentale, ricordi, roberti*, all from the Americas, and *elegans* (Herklots, 1851) from the eastern Atlantic.

The genus *Armases* is in the subfamily Sesarminae of the Grapsidae. Excluding the extensive subdivisions of the genus *Sesarma*, there are approximately 10 other genera in this subfamily. *Armases, Sesarma* (sensu lato), and *Sarmatium* form a group characterized by (1) the presence of lines or ridges on the pterygostomial region, which are lined with geniculate setae, and (2) the formation of the ventral margin of the orbit by the basal portion of the antennae (see figs. 1, 2 of Felgenhauer and Abele, 1983). *Sarmatium* is distinguished from both *Armases* and *Sesarma* by its arcuate (rather than quadrate) anterior caparace region and its obliquely (rather than sharply) deflexed frontal region.

Sesarma is a large genus that has already been subdivided, and the question arises as to the relationship of *Armases* to those genera already established. I have examined the type species of all these subgenera, including *Chiromantes haematocheir* (De Haan), thought to be closely related to species now assigned to *Armases*. *Armases* is distinguished from all *Sesarma* (sensu lato) by the lateral margins of its carapace, which are continuous posterior to the outer orbital angle (i.e., the margin is not dentate), and by the dorsal surface of the palm, which is smooth or granulate but never has distinct ridges. *Chiromantes*, the subgenus to which the American species had previously been assigned, has *C. haematocheir* (De Haan) as the type species. Von Hagen (1978) has already noted that this species is unlike any American species. *Chiromantes haematocheir* can be easily distinguished from all American species by the presence of low, amber-colored transverse ridges on the dorsal surface of the movable finger. Each ridge appears to consist of two or three partially coalesced granules. No species of *Armases* has anything resembling ridges on the movable finger. In addition, Verwey's groove is very well defined in *Chiromantes* and poorly defined in *Armases*.

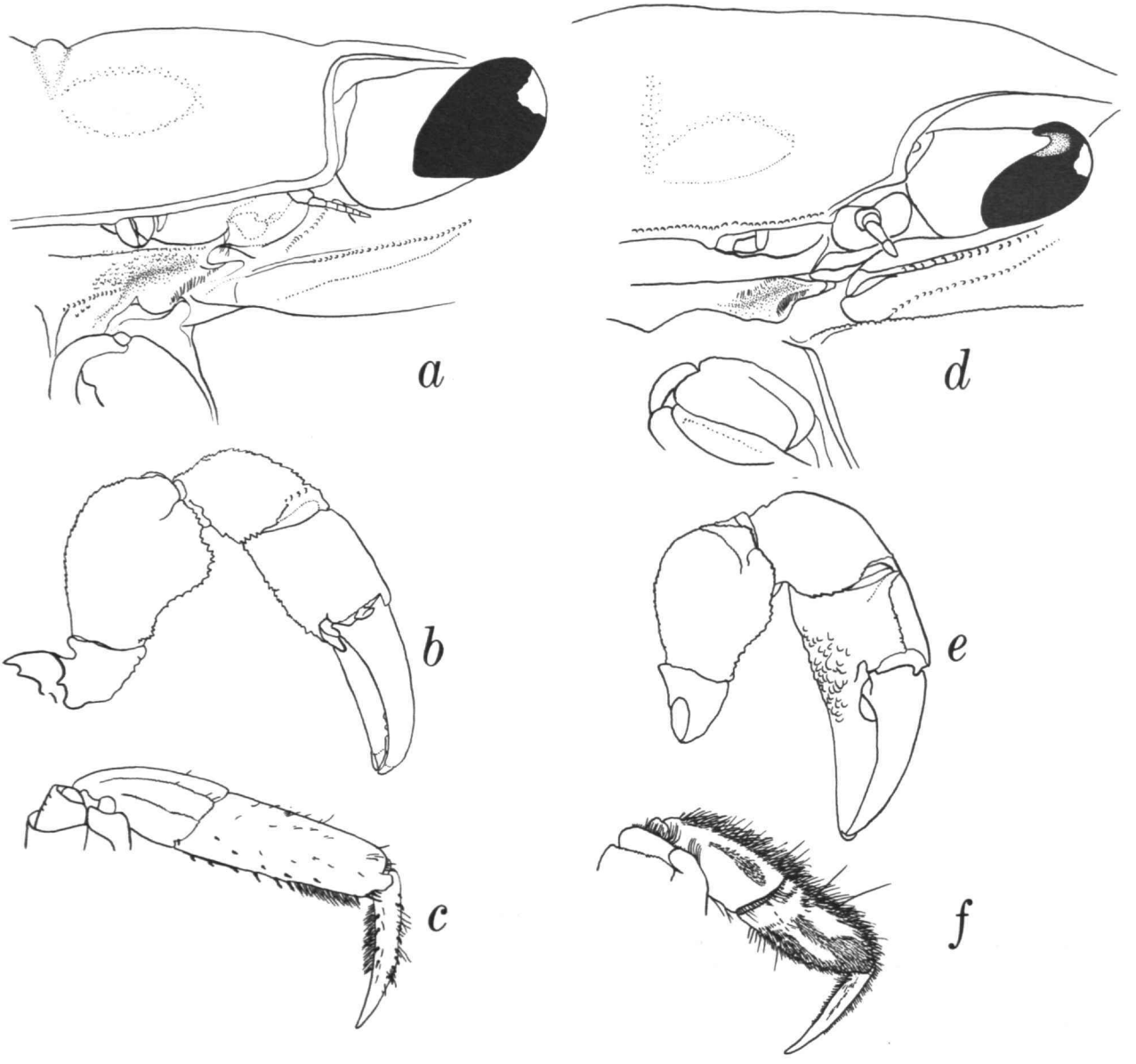


FIGURE 2.—*a–c, Armases cinereum; d–f, S. reticulatum. a, d,* Verwey's groove; *b, e,* male left chela; *c, f,* second walking leg.

Key to *Sesarma* and *Armases*, new genus

Dorsal surface of palm with carina composed of single row of sharp tubercles . . . . . ***Sesarma***

Dorsal surface of palm with scattered granules, no distinct carina . . . . . ***Armases,*** new genus

Key to the Western Atlantic Species of *Sesarma*

1. A distinct ridge posterior to outer orbital angle; walking legs broad, length distinctly less than twice width . . . . . ***rectum***
   A tooth posterior to outer orbital angle; walking legs with length greater than twice width 2
2. Anterolateral tooth weak, lacking a sinus cut into lateral margin of carapace . . . . . ***reticulatum***
   Anterolateral tooth strong, with sinus cut into lateral margin of carapace 3
3. Carapace with regions weakly defined, lacking granules, almost smooth, often with a fine pubescence . . . . . ***curacaoense***
   Carapace with regions defined, at least some granules present, pubescence (if present) confined to distinct small patches 4
4. Merus of walking legs with length about twice width . . . . . ***crassipes***
   Merus of walking legs with length about 3 times width (endemic to Jamaica) . . 5
5. Eyes greatly reduced . . . . . ***verleyi***
   Eyes normal 6
6. Third walking leg long, about 3 times carapace length; merus length about 4 times width . . . . . ***cookei***
   Third walking leg about 2.5 times carapace length; merus length about 3 times width 7
7. Dorsal margin of palm with a sharp continuous ridge; propodi and dactyli of walking legs without thick pubescence . . . . . ***jarvisi***
   Dorsal margin of palm with an irregular, broken ridge; propodi and dactyli of walking legs with thick pubescence . . . . . ***bidentatum***

Key to the Western Atlantic Species of *Armases*, new genus

1. Movable finger of male chela greatly expanded basally; distal three segments of walking legs with numerous, long, dark setae . . . . . ***benedicti***
   Movable finger of male chela not expanded; distal three segments of walking legs with few, short setae 2
2. Frontal region with lateral margins subparallel 3
   Frontal region widening distally 4
3. Front with very shallow median emargination in dorsal view; denuded gonopod terminating in very small, narrow endpiece . . . . . ***americanum***
   Front with deep emargination in dorsal view; denuded gonopod terminating in broad, V-shaped endpiece . . . . . ***roberti***
4. Endpiece of gonopod small, central, not armed . . . . . ***ricordi***
   Endpiece of gonopod subrectangular, directed distolaterally 5
5. Dactylus of fourth walking leg unarmed dorsally . . . . . ***miersii***
   Dactylus of fourth walking leg armed with short, black spines 6
6. Merus of fourth walking leg with length about 3 times width; gonopod blending smoothly into endpiece . . . . . ***angustipes***
   Merus of fourth walking leg with length about 2.6 times width; gonopod with small convex portion proximal to endpiece . . . . . ***cinereum***

Key to the Eastern Pacific Species of *Sesarma*

1. No anterolateral tooth posterior to outer orbital angle . . . . . ***rubinofforum***
   A distinct anterolateral tooth present posterior to outer orbital angle 2
2. Granules absent on dorsal surface of carapace; male gonopod slender; adult size about 13 mm cb . . . . . ***rhizophorae***
   Granules present on dorsal surface of carapace; male gonopod robust; adult size greater than 15 mm cb 3
3. Frontal region distinctly concave, joining midline at about 45° angle; female

gonopore with oblong-shaped operculum; adult size about 28 mm cb . . . . . *sulcatum*

Frontal region weakly concave, joining midline at about 70° angle; female gonopore with barbell-shaped operculum; adult size about 16 mm cb . . . . . *aequatoriale*

Key to the Eastern Pacific Species of *Armases*, new genus

1. Carapace length at midline greater than width . . . . . *angustum*
   Carapace length at midline equal to or less than width 2
2. Carapace width about equal to length (cl/cb about 0.95); merus of fourth pereiopod with length about 2.5 to 3.0 times width . . . . . *occidentale*
   Carapace width distinctly greater than length (cl/cb about 0.83); merus of fourth pereiopod with length about 2.0 to 2.5 times width 3
3. Extensor margin of dactylus of fifth pereiopods armed with black spines; palm smooth . . . . . *magdalenense*
   Extensor margin of dactylus of fifth pereiopods unarmed; palm granulate . . *gorei*

TABLE 1.—A List of the nominal species of *Sesarma* and *Armases*, new genus, reported from the Americas (* = type examined by the author).

Species	Status	Reference
*aequatoriale** Ortmann, 1894	valid	Abele, 1977b
africanum H. Milne Edwards, 1837	junior synonym of *huzardi*, erroneous report	Monod, 1956
americanum de Saussure, 1858	valid, senior synonym of *tampicense*	Chace and Hobbs, 1969
angustipes Dana, 1852	valid, senior synonym of *miersii iheringi*	Abele, 1972
*angustum** Smith, 1870	valid, senior synonym of *ophioderma*	Abele, 1977a
barbimanum Cano, 1889	junior synonym of *Nanosesarma minutum?*	Abele, 1979
benedicti Rathbun, 1897	valid	Holthuis, 1959
*bidentatum** Benedict, 1892	valid	Rathbun, 1918
*biolleyi** Rathbun, 1906	junior synonym of *occidentale*	Abele, 1977a
*bromeliarum** Rathbun, 1896	junior synonym of *roberti*	Rathbun, 1918
chiraga Ortmann, 1897	junior synonym of *benedicti*	Holthuis, 1959
cinereum Bosc, 1802	valid	Abele, 1973a
cookei Hartnoll, 1971	valid	Hartnoll, 1971
crassipes Cano, 1889	valid	Abele, 1979
curacaoense De Man, 1892	valid	Rathbun, 1918
*festae** Nobili, 1901	junior synonym of *occidentale*	Abele, 1977a
*gorei** Abele, 1981	valid	Abele, 1981
guerini H. Milne Edwards, 1853	junior synonym of *ricordi*	Rathbun, 1918
*hanseni** Rathbun, 1897	junior synonym of *dehaani*	Abele, 1975
*jarvisi** Rathbun, 1914	valid	Hartnoll, 1971
*magdalenense** Rathbun, 1918	valid	Rathbun, 1918
*miersii** Rathbun, 1897	valid	Abele, 1972
*miersii iheringi** Rathbun, 1918	junior synonym of *angustipes*	Abele, 1972
miniata de Saussure, 1858	junior synonym of *ricordi*	Rathbun, 1918
mulleri A. Milne Edwards, 1869	junior synonym of *rectum*	Rathbun, 1918
*occidentale** Smith, 1870	valid, senior synonym of *biolleyi* and *festae*	Abele, 1977a
*ophioderma** Nobili, 1901	junior synonym of *angustum*	Abele, 1977a
rectum Randall, 1840	valid, senior synonym of *mulleri*	Rathbun, 1918
reticulatum Say, 1817	valid	Rathbun, 1918
*rhizophorae** Rathbun, 1906	valid	Rathbun, 1918
ricordi H. Milne Edwards, 1853	valid	Rathbun, 1918
ricordi terrestris Verrill, 1908	junior synonym of *ricordi*	Rathbun, 1918
roberti H. Milne Edwards, 1853	valid	Abele, 1972
*rubinofforum** Abele, 1973b	valid	Abele, 1973b
stimpsonii Miers, 1881	junior synonym of *ricordi*	Abele, 1972
*subintegra** White, 1847	junior synonym of *rectum*	Abele, 1973b
*sulcatum** Smith, 1870	valid	Abele, 1977b
*tampicense** Rathbun, 1914	junior synonym of *americanum*	Chace and Hobbs, 1969
*verleyi** Rathbun, 1914	valid	Rathbun, 1918

Species of *Sesarma*

Sesarma reticulatum (Say, 1817)

FIGURES 1, 2*d-f*, 3*c*, 4*a*, 5*a*

Ocypode reticulatus Say, 1817:73, pl. 4: fig. 6.
Ocypode (Sesarma) reticulatus.—Say, 1818:442.
Sesarma cinerea.—DeKay, 1844:15.—White, 1847:38.
Sesarma reticulata.—Gibbes, 1850:180.—Stimpson, 1862:66.—Smith, 1870:156.—Ortmann, 1897:333.—Hay and Shore, 1918:448, pl. 36: fig. 12.
Sesarma (Sesarma) reticulata.—Rathbun, 1897a:89.
Sesarma (Sesarma) reticulatum.—Rathbun, 1918:290, pl. 77.—Williams, 1965:221, fig. 205.—1984:466, fig. 374.—Abele, 1973a:380, fig. 1D, E.
Sesarma reticulatum.—Humes, 1941:379.—Gray, 1957:34.—Teal, 1959:1.—Crichton, 1960:3.—Costlow and Bookhout, 1962:281.—Seiple, 1979:77.—Felgenhauer and Abele, 1983:187.—Abele and Kim, 1986:63, 673b.

MATERIAL EXAMINED.—Massachusetts: Woods Hole, 4♂, 2 ovigerous ♀, 10 Jul 1910, V.N. Edwards, USNM 45530; 1♂, USNM 32482; Wareham, 4♂, 1♀, 21 Jul 1887, USNM 12782; Acushnet River (New Bedford), 2♂, USNM 5784.

North Carolina: Near Beaufort, 10♂, 10♀, 1971, L.G. Abele.

Florida: Ft. Pierce, Pepper State Park, 2♀, 5 Nov 1977, L.G. Abele, R.H. Gore; Indian River, Sebastian Inlet Park, 13♂, 13♀ (1 ovigerous), 30 Jun 1977, L.G. Abele, R.H. Gore, K. Wilson, K. Rodman; Daytona Beach, 2♂, 6 Nov 1977, L.G. Abele, K. Heck; Sarasota Bay, 2♀, USNM 71169; Travertine Quarry, 3♂, 1♀, USNM 71302; Alligator Harbor (Franklin Co.), 1 ovigerous ♀.

DESCRIPTION.—Carapace broader than long cl/cb = 0.807±0.02 for males, 0.810±0.02 for females; dorsal surface punctate, regions well defined; lateral striae present. Outer orbital angle acute, margin slightly convex; low, weak tooth proximal to outer orbital angle; lateral margins converging toward midline. Interorbital region subdivided into four low lobes; iw/cb = 0.583±0.02 in males, 0.592±0.01 in females. Frontal region with lateral margins widening distally; anterior margin concave medially.

Eyes well developed, pigmented.

Chelipeds sexually dimorphic; female cheliped relatively smaller, not swollen, with fewer tubercles. Merus with posteromedial margin almost smooth forming arch at subdistal notch; anteromedial margin expanded distally with a few scattered low tubercles. Carpus granular, distinct medial border present slightly flared at anteromedial angle; tuft of setae in proximal medial portion and another at medioventral angle. Palm swollen, smoothly punctate on lateral surface, distinct row of granules dorsally and scattered large tubercles on medial surface; movable finger strongly arched with single proximal and single distal teeth; dorsal surface with about four to six tubercles. Immovable finger with row of three low and one large proximal teeth followed by concave region ending at small distal tooth; finger tips spooned, corneous; immovable one notched.

Walking legs relatively broad; ml/mw of third (fourth pereiopod) 2.05±0.24 in males, 2.16±0.17 in females; dorsal surface of carpus and dorsal and ventral surface of propodus and dactylus with a short, thick pubescence; propodus longer than dactylus.

Male abdomen subtriangular in outline; telson width subequal to length. Gonopod with subrectangular endpiece, curved laterally in distal region.

Female abdomen subcircular in outline; telson width slightly greater than length. Gonopore tear-shaped, level with sternum, widening away from suture; operculum raised above sternum increasing in height at wide end.

COLOR.—From various authors; Williams (1965:221):

> Carapace dark olive, nearly black or purple; dark plum colored or bluish-black speckles crowded on grayish background, grayish color showing little except on posterior part; upper part of chelipeds similarly colored but brighter, greater part of palm yellowish, tips of fingers white or yellowish; upper part of legs as carapace; under parts grayish.

MEASUREMENTS.—Males cb 7.1 to 27 mm; females cb 10.7 to 18.2 mm; ovigerous females cb 17.9 to 22.2 mm.

TYPE LOCALITY.—East coast of the United States.

TYPE.—Not extant.

DISTRIBUTION.—Woods Hole, Massachusetts, to at least Indian River County on the east coast of Florida; Sarasota County on the west coast of Florida to Texas. The species is apparently absent from the tip of peninsular Florida (Abele, 1973a).

HABITAT.—*Sesarma reticulatum* is common in burrows in low areas of *Spartina* marshes. Crichton (1960) gives notes on the habitat of *S. reticulatum* in Delaware. Seiple (1979) found *S. reticulatum* to prefer silty substrates of low salinity (16.2‰) in the eulittoral region of *Spartina* marshes. They occur in burrows in red mangrove swamps in the southern part of their range.

REMARKS.—Seiple (1979) studied this species in the vicinity of Beaufort, North Carolina. Ovigerous females occur from April through August. Crichton (1960) reported from 8 to 10,000 eggs per female. I examined 11 females (cb 17.9-22.2) and found from 1894 to 5723 eggs per female. Larval development has been described by Costlow and Bookhout (1962).

The harpacticoid copepod *Cancrincola plumipes* Humes, 1941, is common in the gill chambers of *S. reticulatum*.

As noted in the "Introduction," at least two taxonomic problems with this species require further study. First, Dr. Darryl L. Felder (University of Southwestern Louisiana, pers. comm.) has pointed out that two color forms of this species occur in the Gulf of Mexico, and each form probably represents a distinct species. The second problem is that populations of this species on the southeast coast of Florida include individuals that appear morphologically to be very similar to *S. curacaoense*. For example, among the 26 individuals of *S. reticulatum?* from Sebastian Inlet Park are small individuals that could be identified as *S. curacaoense*, whereas large individuals appear to be *S. reticulatum*. It is possible that both species actually are represented in this population, as the locality is approxiately the southern end of the range for *S.*

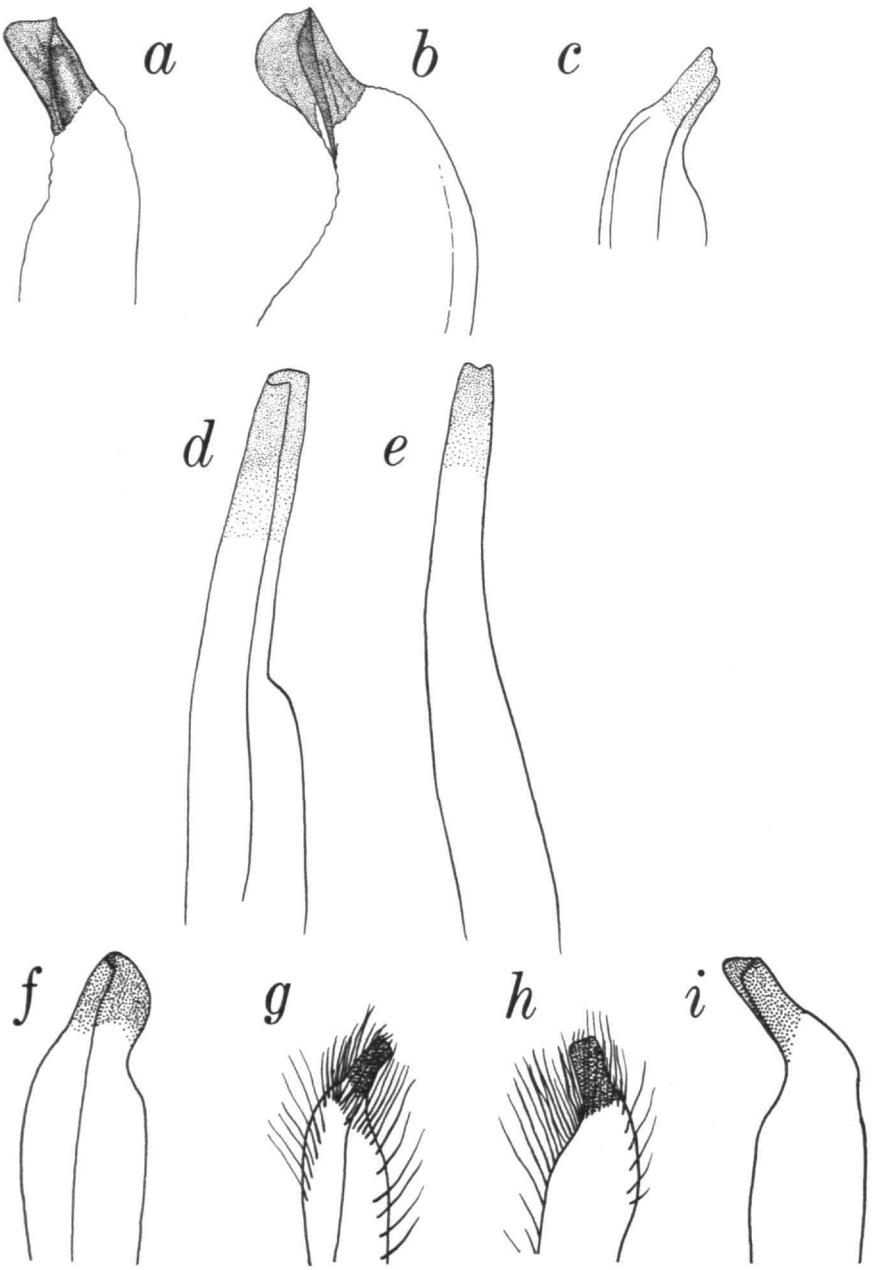


FIGURE 3.—Gonopods: *a*, *Sesarma curacaoense* (from Chace and Hobbs, 1969, fig. 62*p*); *b*, *S. rectum* (from Chace and Hobbs, 1969, fig. 62*j*); *c*, *S. reticulatum* (from Abele, 1973a, fig. 1); *d*,*e*, *S. rhizophorae*, Panama; *f*–*i*, *S. rubinofforum* (from Abele, 1973b, fig. 3).

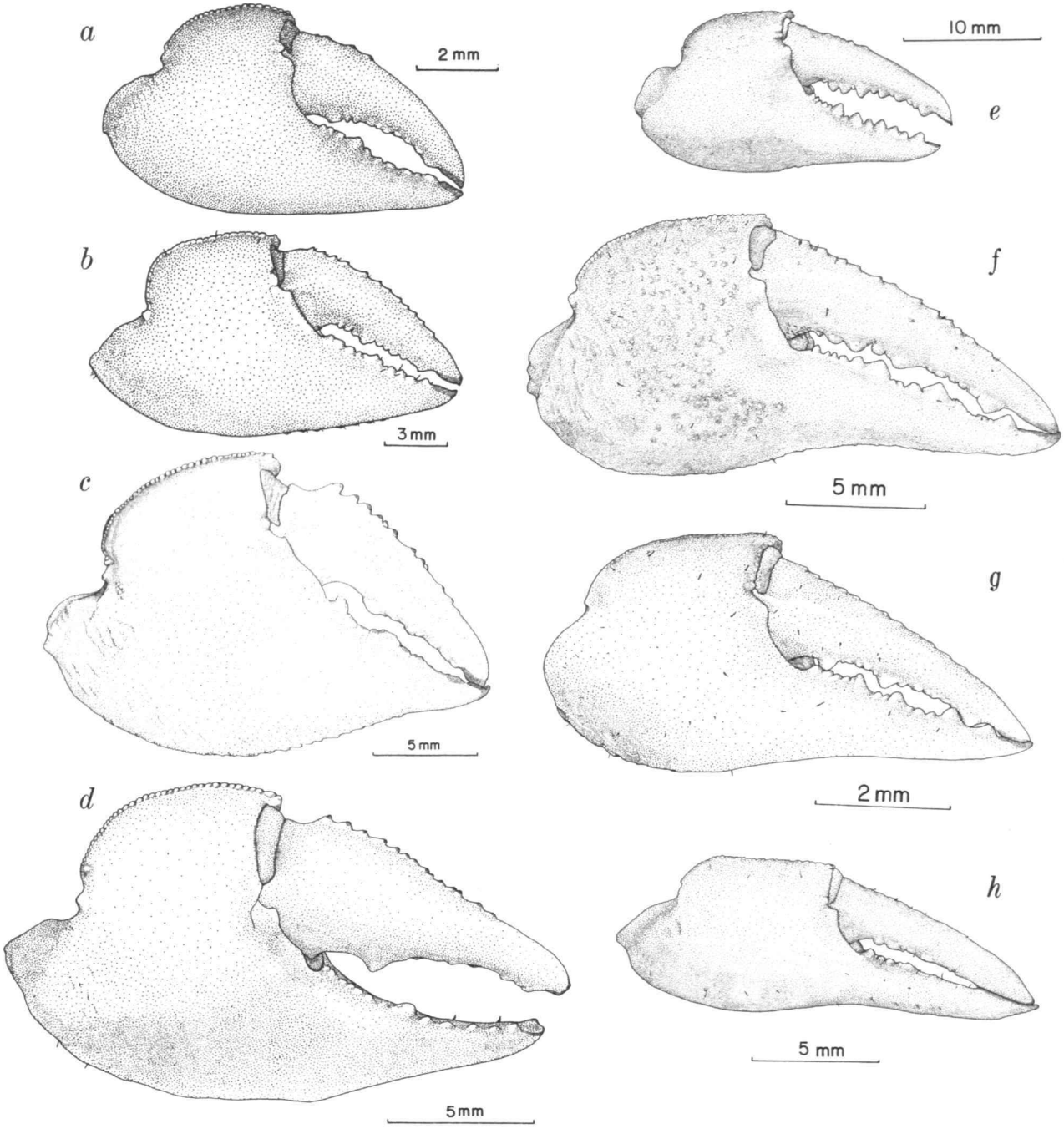


FIGURE 4.—Chelae: *a, Sesarma reticulatum; b, S. rectum; c, S. crassipes; d, S. aequatoriale; e, S. bidentatum; f, S. cookei; g, S. jarvisi; h, S. verleyi.*

reticulatum and the northern end of that for *S. curacaoense*. However, individuals appear to overlap morphologically, suggesting that additional study is needed.

Sesarma crassipes Cano, 1889

FIGURES 4*c*, 5*b*, 6, 7

Sesarma crassipes Cano, 1889:93.
Ses[arma]. crassipes.—De Man, 1892a:261.
Sesarma crassipes.—Rathbun, 1897a:90.
Sesarma (Sesarma s.s.) crassipes.—Tesch, 1917:142.
Sesarma (Sesarma) crassipes.—Rathbun, 1918:294.—Coelho and Ramos, 1972:204.
Sesarma crassipes Abele, 1979:178, figs. 1, 2.
?Sesarma crassipes.—Coelho and Ramos-Porto, 1981:178, fig. 1 [= *?S. curacaoense*].

MATERIAL EXAMINED.—Costa Rica: Tortuquero, about two miles [3.2 km] above the mouth of the Tortuquero River at Leós, 1♂, USNM 113280; Tortuquero, about two miles [3.2 km] above mouth of Tortuquero River, 1♀ (ovigerous), 1984, J. Rudloe.

DESCRIPTION.—Carapace broader than long (cl/cb = 0.89), indistinct granules, each with a small amount of pubescence, present on anterior and lateral regions of the carapace; sparse medially and posteriorly. Lateral margins widening slightly posteriorly. Interorbital region subdivided into four distinct lobes; median sinus deeper than submedial pair. Frontal region about 0.56 of carapace breadth; concave medially, oblique with a very small concave region to lateral margins, which flare very slightly. Distinct groove from lateral margin of frontal region extending posteriorly on the dorsal surface of carapace to about level of lateral tooth. Posterior orbital margin thickened, slightly sinuous, extending anteriorly forming a large acute, outer orbital angle. Distinct lateral tooth present on a higher level than outer orbital angle. About nine oblique granular ridges on lateral surface of carapace.

Eyes well developed, pigmented.

Basal antennular segment wide, short; palp slightly longer than width of basal segment. Basal antennal segment expanded laterally forming part of medioventral portion of orbit; ventrally forming part of Verwey's groove. Subtriangular area on pterygostomial region delimited dorsally by Verwey's groove. Suborbital region covered by short hairs.

Third maxillipeds gaping, exposing inner mouth parts; long setae present along medial edge; oblique row of pubescence on merus.

Male chelipeds strong, robust; in single specimen right slightly larger than left. Posterior mesial border of merus weakly toothed, ending in a distinct notch proximal to distal margin. Anterior mesial border strongly toothed, expanded distally. Two rows of pubescence present on mesial surface. Lateral border of merus toothed, ends in a notch proximal to distal margin. Mesial border of carpus delimited by row of tubercles at an acute angle; below angle two large and about three small tubercles; lateral border rounded and entire surface covered by short rugae. Dorsal surface of palm marked by distinct row of tubercles, extending beyond distal margin; lateral surface of palm smooth to very weakly marked by short rows of tubercles; mesial surface has about 10 large tubercles and 15 to 20 smaller tubercles that extend to and weakly delimit ventral border of palm; 8 to 12 tubercles on dorsal surface of movable finger extending from proximal margin, ending proximal to corneous, spooned tip of finger; ventrally a large, subbasal tooth and two to three smaller distal ones. Immovable finger armed with large basal tooth, subequal one distally and two weaker teeth proximal to corneous, spoon-shaped tip. Walking legs increasing in length from first, fourth, second, and third. For third walking leg (fourth pereopod) merus about twice length of carpus; carpus shorter than propodus; dactylus slightly shorter than carpus. Merus length about twice width; transverse rows of granules and large subdistal tooth on dorsal margin. Walking legs with ventral and dorsal row of thick pubescence extending from dorsal distal portion of carpus to distal margin of propodus where it extends as three narrow rows to distal portion of dactylus; ventrally row begins on distal portion of propodus and continues as three narrow rows on dactylus. Ventral surface of propodus armed with about three to five pairs of irregularly spaced dark-colored spines; on each side of ventral distal margin about four to five dark-colored spines.

Male abdomen subtriangular in outline; length and width of telson subequal. Endpiece of male gonopod short and subrectangular; shallow sinus on distolateral margin.

MEASUREMENTS.—The single available male is sexually mature and has a cb of 25.5 mm and cl of 22.2 mm. Cano (1889) stated that the male holotype has a cb of 22 mm and a cl of 18 mm. An ovigerous female has a cb of 23 and a cl of 20 mm.

TYPE.—The male holotype is presumed to be lost.

TYPE LOCALITY.—Pernambuco, Brazil.

DISTRIBUTION.—The species is known from near Tortuquero, Costa Rica, and Pernambuco, Brazil.

HABITAT.—The label accompanying the specimen from Costa Rica indicates that it was "dipnetted along shore" about two miles [3.2 km] above the mouth of the Tortuquero River at Leós (USNM 113280). Coelho and Ramos (1972) list the species from estuaries at Pernambuco. The female was found at almost exactly the same locality as the male. The surface salinity was 0‰, but the water at 3 m depth contained a marine fauna.

REMARKS.—Abele (1979) discussed the status of this species, which, based on information in the literature, appears to be rare. Coelho and Ramos-Porto (1981) listed this species from Brazil and illustrated a specimen they had identified as *S. crassipes*. Their illustration does not show *S. crassipes*. The general form suggests a juvenile *S. curacacaoense* but the absence of a dorsal tooth on the merus of the pereopods makes it questionable whether the specimen is even in the genus *Sesarma*.

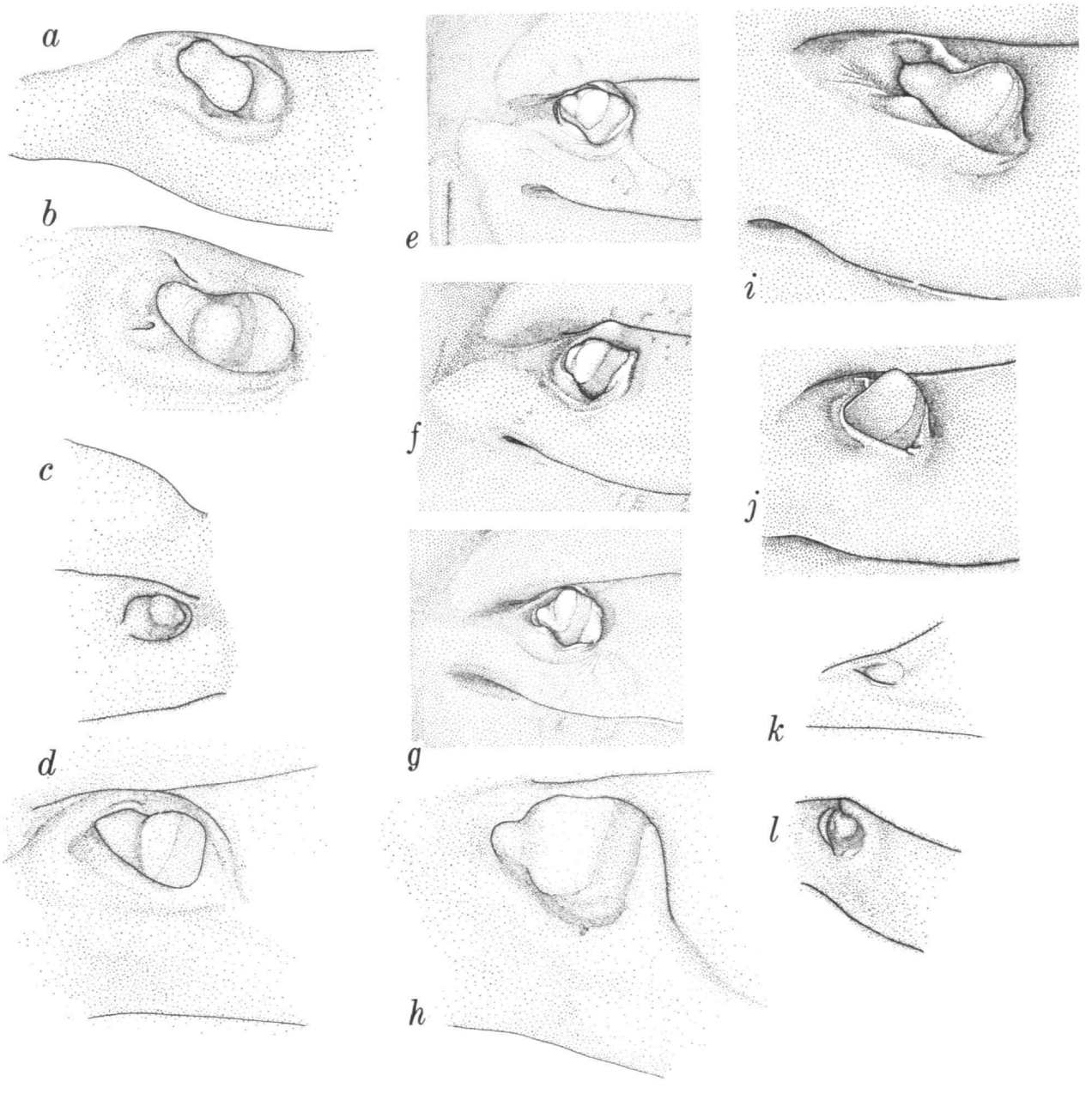


FIGURE 5.—Gonopores: *a, Sesarma reticulatum; b, S. crassipes; c, S. curacaoense; d, S. rectum; e, S. bidentatum; f, S. jarvisi; g, S. cookei; h, S. verleyi; i, S. aequatoriale; j, S. sulcatum; k, S. rhizophorae; l, S. rubinofforum.*

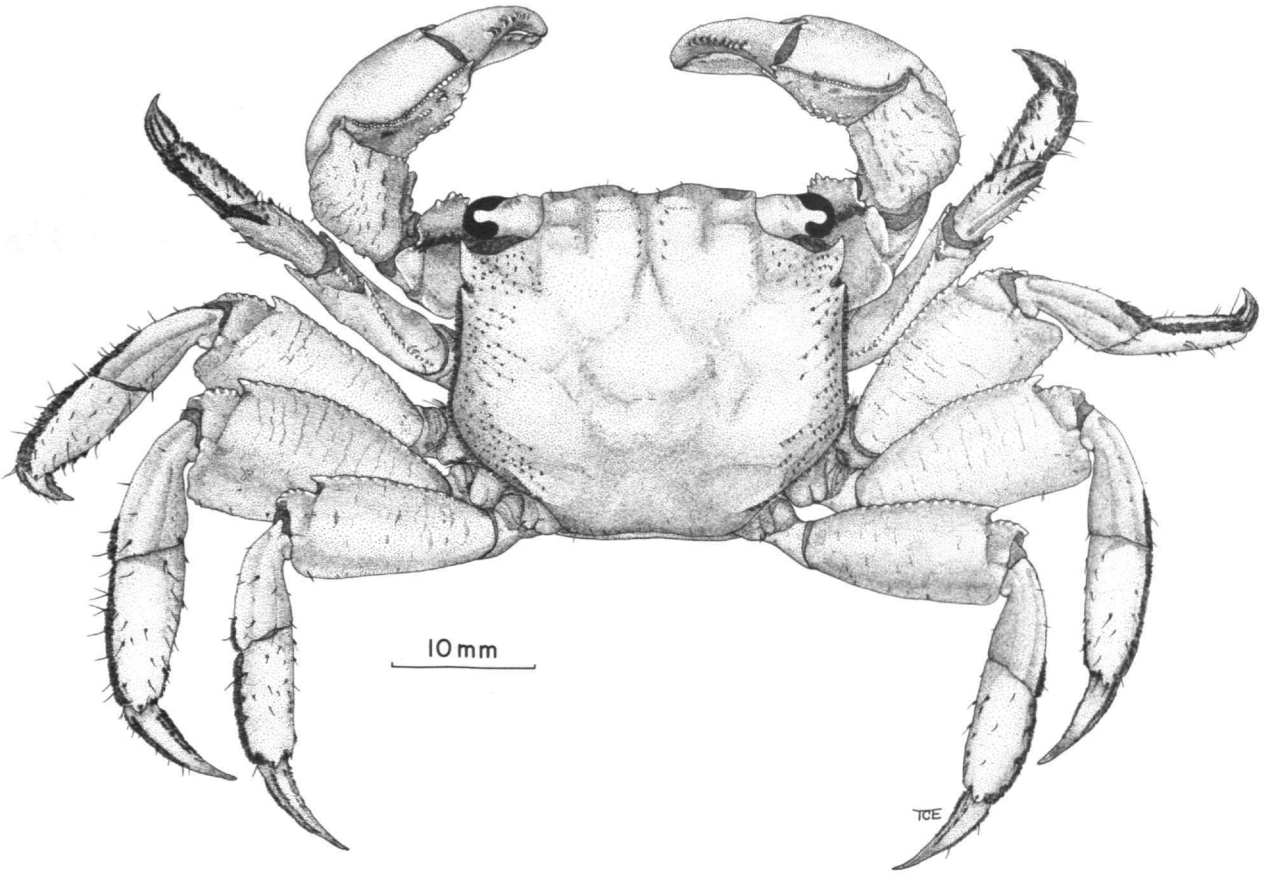


FIGURE 6.—*Sesarma crassipes*, male (USNM 113280).

Sesarma curacaoense De Man, 1892

FIGURES 3*a*, 5*c*, 8

Sesarma curacaoensis.—De Man, 1892a:257, pl. 10: fig. 6-6b.—Rathbun, 1897a:33.

Sesarma (Sesarma) curacaoensis.—Rathbun, 1897a:89.

Sesarma (Sesarma) curacaoense.—Rathbun, 1918:293, pl. 78: figs. 1, 2, pl. 160: fig. 3; 1933:90.—Holthuis, 1959:242, pl. XI: fig. 2.—Hartnoll, 1965:113, 139.—Chace and Hobbs, 1969:188, figs. 61, 62p.—Coelho and Ramos, 1972:203.—Abele, 1973a:380, figs. 1C, 1F.—Von Hagen, 1978:45, figs. 1b, 2b, 3b, 4b, 5b.

Sesarma (Sesarma s.s.) curacaoensis.—Rathbun, 1901:18.—Tesch, 1917:142.

Sesarma curacaoense.—Von Hagen, 1967:177.—Warner, 1969:381.—Abele, 1976:269.—Coelho and Ramos-Porto, 1981:178.—Rodriguez, 1980:382, fig. 105.—Abele and Kim, 1986:63, 673a.

?*Sesarma crassipes*.—Coelho and Ramos-Porto, 1981:178, fig. 1.

MATERIAL EXAMINED.—Florida: Jupiter, 5♂, 2♀, UMML; Coon Key, 3♂, 6♀, USNM 74850; Caximbas, Collier County, 2♂, 7♀, USNM 74859; Naples, 1♂, 1♀, UMML; Flamingo, 2♂, 3♀, USNM; Whitewater Bay, 3♂, UMML 32.1333, 32.13337; Miami, 2♂, 1♀, UMML; Key West, 1♂, USNM 74837.

Cuba: Cabanas, 1♂, 2 Jun 1900, W. Palmer, J.H. Riley, USNM 23814.

Puerto Rico: 1♂, *Fish Hawk* collections, USNM 24033.

Jamaica: 1♀, USNM 19419; Bogue Island, 1♂, C.B. Wilson, 20 Jun 1910, USNM 42890; Montego Bay, 1♂, 1♀, USNM 19422.

Curaçao: 3♂, 2♀, 2 juveniles, 10-14 Feb 1899, *Albatross* collections, USNM 17678.

Trinidad: Caroni Swamp, 3♂, 3♀, 2 ovigerous ♀, 1 juvenile, Oct 1971, J.M. Stanley, USNM 139298.

Panama: Galeta mangroves, 1 ovigerous ♀, 14 Jul 1969, L.G. Abele, USNM 139668.

Brazil: Mapelle, Bay of Bahia, 1 ovigerous ♀, R. Rathbun, USNM 40823.

DESCRIPTION.—Carapace broader than long (cl/cb = 0.824±0.36 in males, 0.811±0.11 in females), convex anterior to posterior; regions weakly defined with lateral striae. Fine pubescence often present dorsally. Anterolateral angle acute, followed posteriorly by deep sinus then distinct, acute anterolateral tooth set on higher level than anterolateral angle. Lateral margins of carapace converging posterior to anterolateral tooth. Interorbital region with four low lobes, iw/cb = 0.716±0.03 in males, 0.725±0.02 in females. Frontal

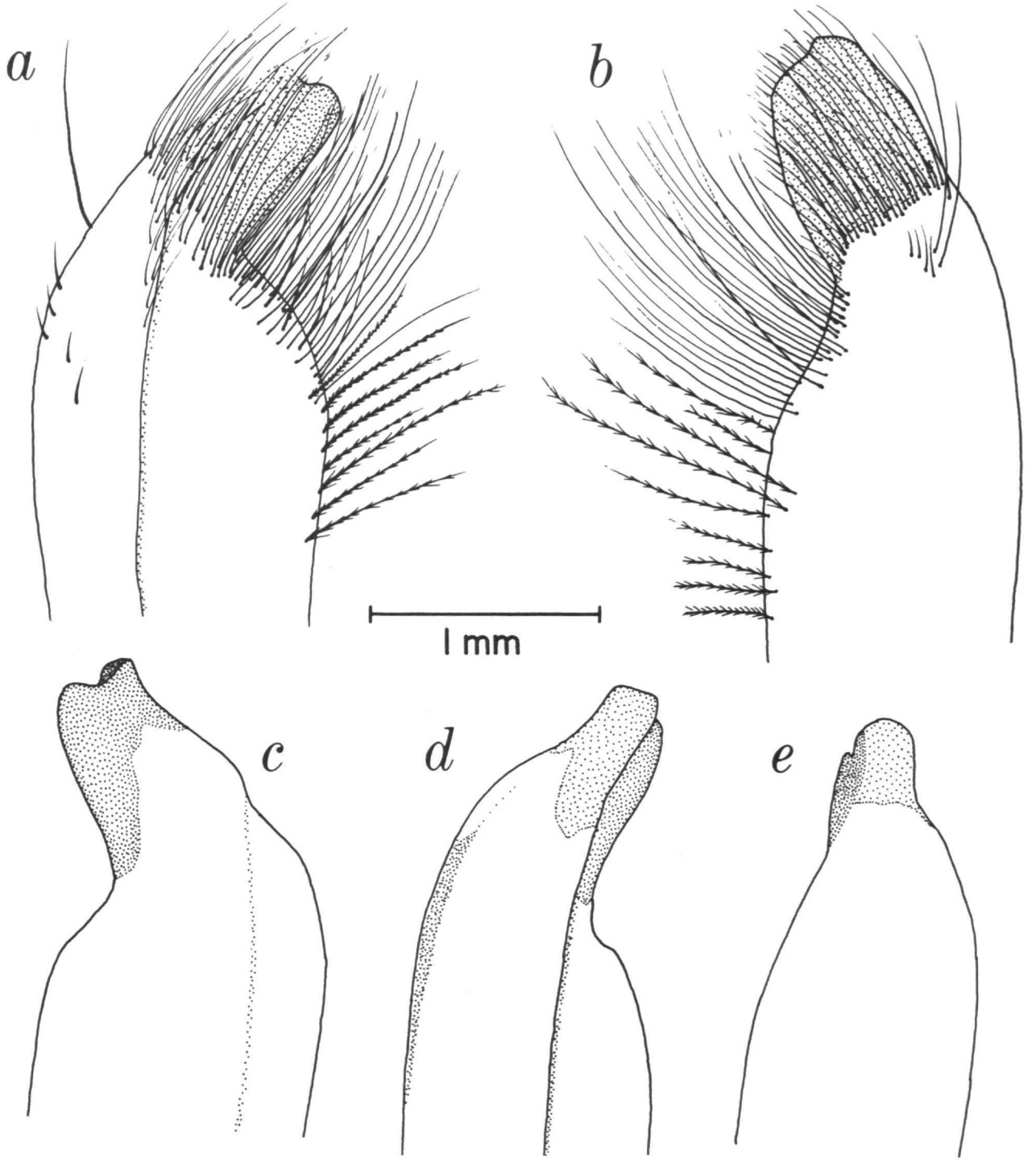


FIGURE 7.—*Sesarma crassipes*, gonopods (from Abele, 1979, fig. 3).

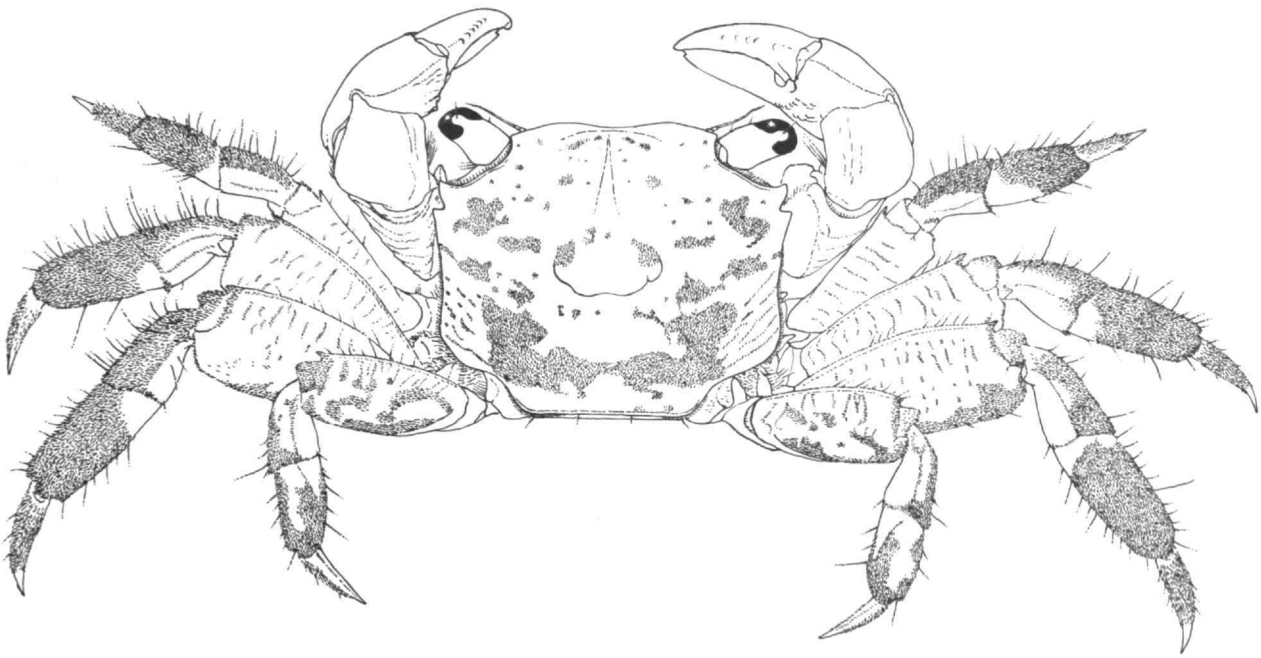


FIGURE 8.—*Sesarma curacaoense* (from Chace and Hobbs, 1969, fig. 61).

region slightly expanded at anterolateral margins; frontal margin arcuate in outline with median sinus.

Eyes well developed, pigmented.

Chelipeds sexually dimorphic, larger and more granular in males. Merus with medial posterior margin very weakly granulate, with subdistal notch, anterior margin with distinct tubercles; carpus unarmed; distinct rows of granules dorsally, narrow smoother area on mediointerior surface with tuft of setae proximally. Lateral surface of chela punctate, medial surface with a few tubercles; dorsal surface with distinct row of granules, indistinct row coming off proximally to distinct dorsal row. Movable finger with six to seven dorsal tubercles; three equally spaced distinct teeth. Immovable finger with basal tooth then concave area then another distinct tooth. Finger tips corneous and spooned.

Walking legs relatively slender, ml/mw of third about 1.99±0.47 in males, 2.19±0.11 in females; merus with distal, dorsal tooth. Fine pubescence present on carpus, propodus and dactylus, especially dense on dorsal surface.

Male abdomen subtriangular in outline; telson width at base subequal to length. Gonopod with subrectangular endpiece, relatively slender, bent laterally at base of endpiece.

Female abdomen subcircular in outline; telson width at base slightly greater than length. Gonopore recessed, oblong, roughly parallel to thoracic sutures; operculum raised especially laterally, similar in shape to gonopore.

MEASUREMENTS.—Males cb 13.5 to 17.9 mm, females cb 12.0 to 17.5 mm, ovigerous females cb 8.5 to 10.8 mm.

TYPE LOCALITY.—Curaçao.

TYPE.—The male holotype is deposited in the Nationaal Natuurhistorisch Museum, Leiden.

DISTRIBUTION.—Southern Florida to Estado da Bahia, Brazil. Coelho and Ramos-Porto (1981) list *S. crassipes* from several localities in Brazil and do not list *S. curacaoense*. However, their figure (fig. 1, p. 179) and ecological notes suggest that their material belongs to *S. curacaoense*.

HABITAT.—*Sesarma curacaoense* is common in mangrove swamps and among clumps of oysters and rocks on a mud substrate (Abele, 1973a). Warner (1969) found *S. curacaoense* to be most common in the landward portion of *Rhizophora* swamps and among *Avicennia* and *Laguncularia*.

REMARKS.—Abele (1973a) noted that secondary sexual characteristics appeared to develop over several molts. He noted that males achieved sexual maturity at about cb 11.0 mm and females at about the same size.

As mentioned under distribution, the status of this species and *S. crassipes* in Brazil requires examination. Coelho and Ramos (1972) listed both species from northern Brazil, but in 1981 they omitted *S. curacaoense*. Their figure, however, is suggestive of *S. curaceaoense* and is clearly not *S. crassipes* at least as currently recognized (see Abele, 1979).

Sesarma rectum Randall, 1840

FIGURES 3*b*, 4*b*, 5*d*, 9

Grapsus (Pachysoma) aff. *haematocheir*.—De Haan, 1835:62.

Sesarma recta Randall, 1840:123.—Kingsley 1880:217.—Ortmann, 1897:331, pl. 17: fig. 8.

Sesarma subintegra, n.s. White, 1847 [type locality, Brazil, nomen nudum, Abele, 1973b].

Sesarma mullerii A. Milne Edwards, 1869:29 [type locality Destero, Brazil].

Sesarma (Holometopus) recta.—Tesch, 1917:190.

Not *Sesarma mulleri*.—Miers, 1886:270, pl. 21: fig. 3 [= *Metasesarma rubripes* (Rathbun, 1897a)].

Not *Sesarma recta*.—De Man, 1892a:249, pl. 10: fig. 4 [= *Sesarma benedicti* Rathbun, 1897a].

Sesarma recta.—Rathbun, 1897a:90; 1900:137.

Sesarma (Holometopus) rectum.—Rathbun, 1918:298, pl. 82.—Holthuis, 1959:243, fig. 61, pl. 11: fig. 4.—Chace and Hobbs, 1969:182, fig. 62j.—Coelho and Ramos, 1972:203.

Sesarma rectum.—Coelho, 1966:244.—Fausto Filho, 1966:34.—Von Hagen, 1967:177.—Abele, 1973b:336.—Von Hagen, 1975:301, fig. 7.—Fimpel, 1975:1984.

Sesarma (Sesarma) rectum.—Von Hagen, 1978:45, figs. 1a, 2a, 3a, 4a, 5a.—Coelho and Ramos-Porto, 1981:178.

MATERIAL EXAMINED.—Trinidad: 1♂, 1♀, 30 Jan-2 Feb 1884, *Albatross* collections, USNM 19476; Caroni Swamp, mouth of Nariva River, 2♂, 1 ovigerous ♀, 22 May 1970, J.M. Stonley, USNM 13929.

Surinam: 1♀, 12 May 1957, L.B. Holthuis, *Coquette* collections (28), USNM 103276.

Brazil: Recife (Pernambuco), 1♂, 1876-77, R. Rathbun, USNM 40817; mangroves, 1♂, 1♀, 1 Aug 1899, Branner-Agassiz expedition, USNM 25711; Salvador (Bahia), Mapelle, 1♀, 1876-77, R. Rathbun, USNM 40819; Salt Lagoa, Caravellas, 1♀, 1876-77, R. Rathbun, USNM 40818; Paranqua, 1♂, 3 Oct 1925, W.L. Schmitt, USNM 71168; Rio de Janeiro, Terra de Masahe, 2♂, Jan 1912, E. Garbe, USNM 47862; Thayer expedition, 1♂, USNM 22839; Santos, Ilha Casquerinita, 1♂, 1♀, Jun 1913, H. Luederwaldt, USNM 47867; Pissaquera, 2♂, Jun 1913, H. Luederwaldt, USNM 47859; Iquape, 1♂, 1902, R. Krone, USNM 47827; São Francisco, 4♂, 1♀, 31 Oct 1925, W.L. Schmitt, USNM 71168.

DESCRIPTION.—Carapace slightly broader than long (cl/cb = 0.936±0.142 for males, 0.884±0.023 for females), moderately convex, with well-defined dorsal regions. Outer orbital angle acute; slight emargination present, indicated by ridge below angle with second stronger ridge below first. Lateral margins converging slightly posteriorly, striae present. Distinct depression posterior to orbital region; weak granules and tufts of pubescence present dorsally. Interorbital distance about 0.630 of carapace breadth (iw/cb = 0.630±0.01 in males, 0.613±0.02 in females), broad sinus medially.

Eyes well developed, pigmented.

Chelipeds distinctly sexually dimorphic. In males mediopos-

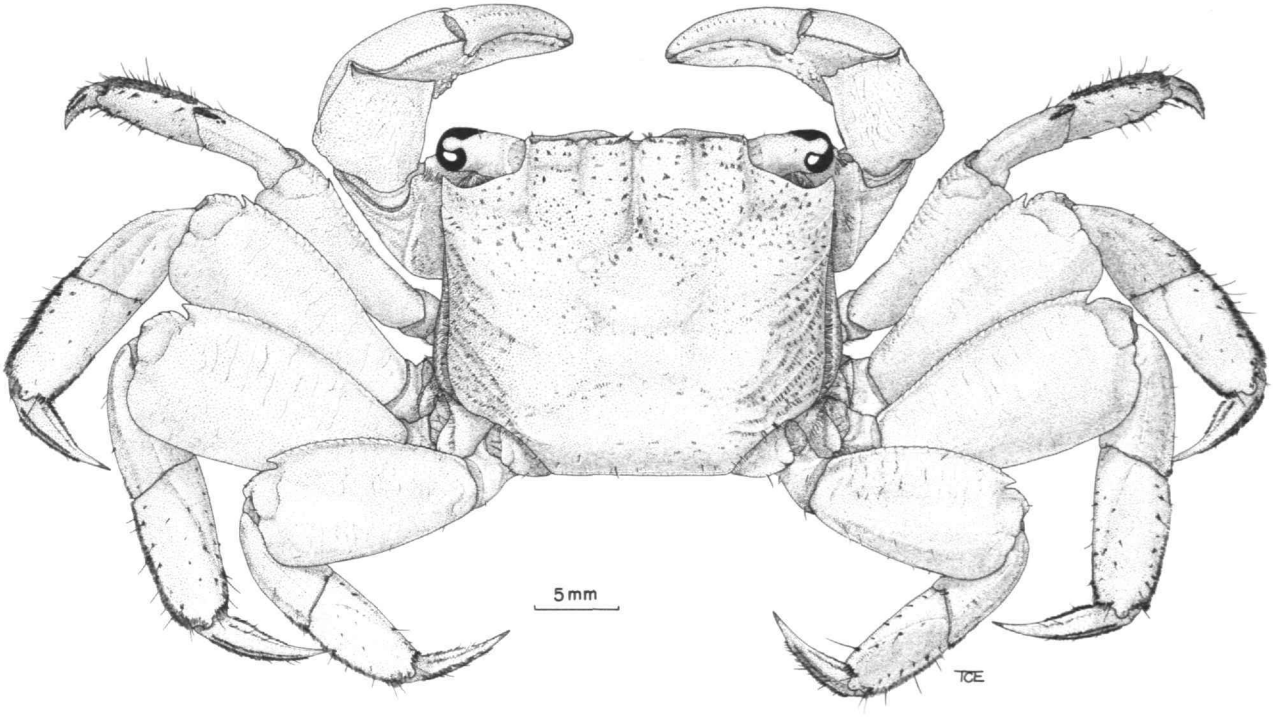


FIGURE 9.—*Sesarma rectum*, male, Trinidad.

terior margin of merus weakly granulate to subdistal notch, medioanterior region strongly toothed and expanded distally. Carpus granulate, armed with strong triangular tooth at medioanterior angle. Palm swollen, lateral margin almost smooth with low granules, medial margin with large tubercles present; dorsal surface with distinct tuberculate ridge extending beyond distal margin. Finger tips acute, weakly spooned; movable finger with about 14 to 16 dorsal tubercles along almost entire length. Female cheliped and that of immature males relatively smaller, with fewer and weaker tubercles.

Walking legs broad; ml/mw of fourth pereopod about 1.90±0.19 in males, 1.69±0.07 in females. Dactylus shorter than propodus and carpus; thick pubescence on dorsal surface of propodi and dactyli in both sexes; on ventral surface of dactyli in female and on ventral surface of propodi and dactyli in mature males.

Male abdomen subtriangular in outline; telson slightly longer than wide. Female abdomen subcircular in outline; telson broader than long.

Male gonopod simple, unarmed; endpiece unfolding, flared and directed laterally. Female gonopore set toward midline; oblong in shape with fold laterally; operculum raised above gonopore, high and expanded laterally narrowing and at a lower level medially.

MEASUREMENTS.—Mature males cb 16.8 to 30.4 mm, mature females cb 18 to 30 mm, ovigerous females cb 18 to 30 mm (Holthuis, 1959).

TYPE LOCALITY.—Surinam.

TYPE.—The male holotype is deposited in the Academy of Natural Sciences of Philadelphia.

DISTRIBUTION.—Trinidad, Tobago, Guyana, Surinam, Brazil south to Santa Catarina.

HABITAT.—*Sesarma rectum* is common in estuaries, where it digs burrows in the muddy banks (Holthuis, 1959; see von Hagen, 1975, fig. 7).

REMARKS.—The subgeneric status of this species was reviewed by von Hagen (1978), who showed that both *S. rectum* and *S. rubinofforum* belong to the *Sesarma* subgenus or species group. Von Hagen (1967, 1975) also provided information on the ecology of this species, including the mechanism and function of sound production.

Sesarma bidentatum Benedict, 1892

FIGURES 4*e*, 5*e*, 10, 11*s-x*

Sesarma bidentata Benedict, 1892:77.—Jarvis, 1897.—Rathbun, 1897c:33.
Sesarma-like.—Andrews, 1892:72.
Sesarma (*Sesarma* s.s.) *bidentata*.—Tesch, 1917:135.
Sesarma (Sesarma) bidentatum.—Rathbun, 1918:295, pl. 80.
Sesarma bidentatum.—Hartnoll, 1964b:159; 1965:113; 1971:260.—Abele and Means, 1977:91.—Guinot, 1988, 1988:8, fig. 1A.

MATERIAL EXAMINED.—Jamaica: St. Thomas Parish, stream adjacent to Bath Fountain Spa, elevation 135 m, 11♂, 10♀, 3 May 1976, L. Abele, B. Means; Portland Parish, 2.6 miles [4.2 km] W, SW of Ecclesdown on Project Road, Drivers River drainage, 650 m elevation, 12♂, 4♀, 1 ovigerous ♀, 5 May 1976, L. Abele, B. Means; Mabess River, N slope of Blue Mountains, 1♂, 21 July 1926, USNM 71170; same locality, 1932, W.G. Lynn, MCZ 12170; Mabess River above falls, 1♂, 2♀, 1932, W.G. Lynn, USNM 74849; Stony Valley River, 1♂, 20 Jun 1928, C.R. Orcutt, USNM 15539; tributary of Clyde River near Chester Vale House, 1♂, 1♀, 18 Jun 1936, W. Gardner Lynn, USNM 72772; Clyde River near Clydesdale, 1 ♂, 1♀, 28 Sep 1932, W.G. Lynn, USNM 74494; Clyde Spring, Blue Mountains, 5♂, 10♀, C.B. Wilson, USNM 42889; Clyde Spring near Cincliona, elevation 1300 m, 10 June 1910, USNM 41752; Clyde Spring, 1♂, 1♀, C.B. Wilson, MCZ 12169; St. Andrew Parish, near Kingston Harbor, 1♀ (holotype), T.H. Morgan, USNM 17281; Mountain Spring, 1♀, P.W. Jarvis, USNM 19053; Hardware Gap probably tributary of Buff Bay River, 1♀, 1 Jul 1932, W.R. Hatch, USNM 74825; St. Mary Parish, Lucky Hill Cooperative Farm, in stream inside cave, 400 m elevation, 3♂, 1♀, 6 May 1976, L. Abele, B. Means; Manchester Parish, Mandeville, 3♀, Henderson and Simpson, USNM 18573; St. Elizabeth Parish, Accompong, 1♂, P.W. Jarvis, USNM 19052; Trelawny Parish, small stream near Troy, elevation 1650 m, 4♂, 1♀, Nov 1905, W. Harris, USNM 32285.

DESCRIPTION.—Carapace broader than long (cl/cb = 0.834±0.023 in males, 0.882±0.057 in females), widening posteriorly. Outer orbital angle acute, lateral margin convex to strong anterolateral tooth. About nine transverse striae on lateral surface of carapace. Interorbital region subdivided into four lobes. Frontal region with margins subparallel, concave medially; iw/cb = 0.469±0.03 in males, 0.470±0.04 in females. Dorsal surface of carapace smooth; a few scattered setae on lateral surfaces.

Eyes well developed, pigmented.

Male chelipeds large, robust; merus with posteromedial margin granulate with a subdistal lobe, anteromedial margin with teeth, expanded subdistally; two rows of setae on medial surface. Carpus with granules becoming acute on anteromedial margin. Chelae swollen, granular with a few large acute granules on medial surface; dorsal surface with poorly defined row of granules ending in an acute granule; immovable finger with about seven large teeth; corneous tip asymmetrically bifid. Movable finger with about 10 to 12 small acute tubercles in poorly defined row; corneous tip acute. Female chelipeds similar though much less robust, lacking acute granules and carpus with tuft of setae on medioproximal angle.

Walking legs relatively long; ml/mw of third variable increasing to about 3.0 in large individuals. Dactyli with three dorsal and three ventral rows of pubescence; middle of ventral rows widest in males whereas ventral rows poorly defined in females. Propodus with dorsal pubescence, propodi of walking legs 1 and 2 with distinct ventral pubescence present on mature males, weak on large females; propodi of remaining legs with about five stout dark spines evenly spaced on inferior margin

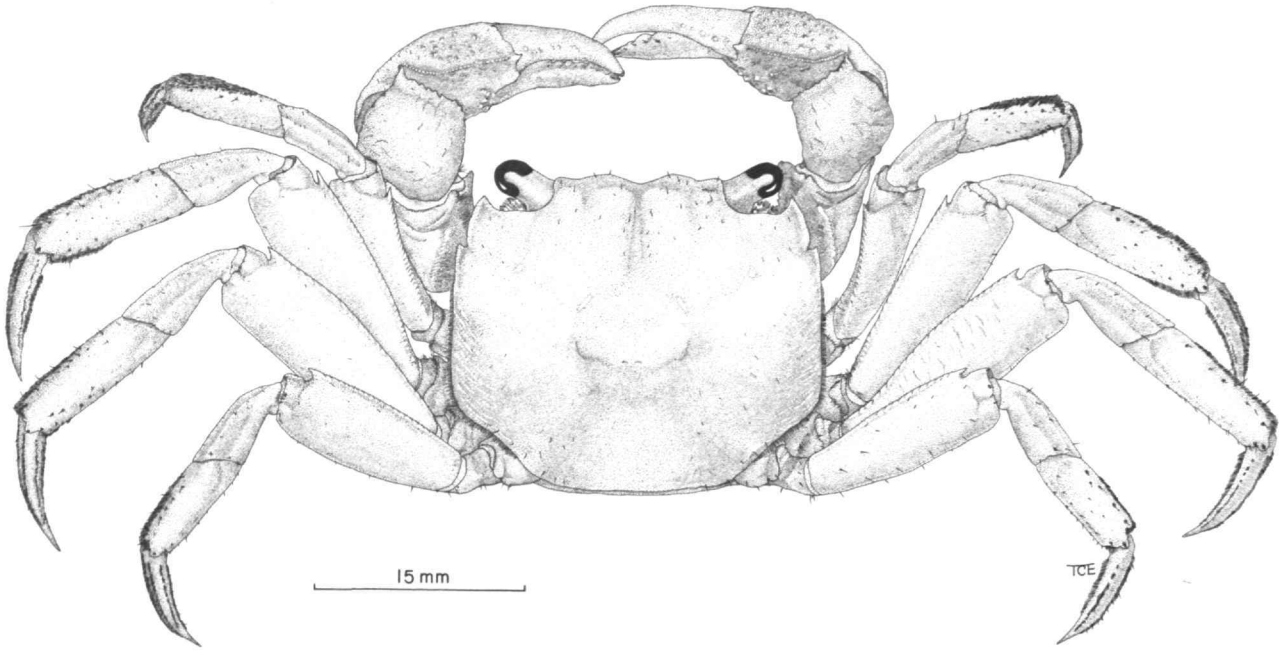


FIGURE 10.—*Sesarma bidentatum*, male, St. Thomas Paris, Jamaica.

and three to six on distal margin. Dactylus slightly shorter than propodus and longer than carpus.

Male abdomen subtriangular in outline; telson length and width subequal; distal margin lined with setae. Gonopod simple, unarmed distal region curved laterally at about 30° angle.

Female abdomen subcircular, telson length and width subequal. Female gonopore concave anterolaterally, notched posteriorly, narrowing and lengthening medially, operculum somewhat rectangular.

MEASUREMENTS.—Mature males cb 20.8 to 25.8 mm; mature females cb 20.5 to 23.7 mm, ovigerous females cb 20.5 to 23.2 mm. Males below cb 20 mm are immature, whereas females below cb 18.5 are immature (see Hartnoll, 1964b).

TYPE LOCALITY.—Kingston Harbour, Jamaica (Benedict, 1892). This is probably an error, as this species is freshwater and has never been collected near the harbor (Hartnoll, 1964b).

TYPE.—The female holotype is in the National Museum of Natural History, Smithsonian Institution (USNM 17281).

DISTRIBUTION.—This species is endemic to Jamaica and has been reported from the following localities (Hartnoll, 1964b): St. Thomas Parish (Bath Fountain, 130 m; Corn Puss Gap, 800 m); Portland Parish (John Crow mountains, 300 m; Clydesdale 1000 m; Section 1300 m; Clyde Spring, 1500 m); St. Andrew Parish (Mountain Spring, Yallahs River, Way Water Hermitage, 650 m); St. Mary Parish (Lucky Hill, 400 m); Manchester Parish (Mandeville); Trelawny Parish (Troy); St. Elizabeth Parish (Accompong). *Sesarma bidentatum* may not occur much above 1500 m, as I collected extensively on Blue Mountain in 1976 and was unable to find the species at higher altitudes.

HABITAT.—*Sesarma bidentatum* occurs in freshwater rivers, streams, and deep pools from about 100 (pers. obs.) to 1500 m elevation (Hartnoll, 1964b).

REMARKS.—Hartnoll (1964b) summarized what is known concerning the biology of this species including a description of the first zoea.

Sesarma jarvisi Rathbun, 1914

FIGURES 4*g*, 5*f*, 11*g–l*, 12

Sesarma (Sesarma) jarvisi Rathbun, 1914:124, pl. 7; 1918:286, pl. 81.
Sesarma (Sesarma s.s.*) jarvisi*.—Tesch, 1917:164.
Sesarma jarvisi.—Hartnoll, 1964b:145, 164 [part, specimens from John Crow = *S. cookei*]; 1965:113; 1971:258.—Abele and Means, 1977:91.—Guinot, 1988:5.
[*Sesarmoides*] *jarvisi*.—Serène and Soh, 1970:404.

MATERIAL EXAMINED.—Jamaica: St. Ann's Parish, Mount Diablo, 1♂ (holotype), P.W. Jarvis, USNM 24941; St. Ann's Parish, Mount Diablo, Hollymount (Henzell estate), 21♂, 20 ♀, 6 ovigerous ♀, 7 May 1976, L. Abele, B. Means, LGA 76-9; about four miles [6.4 km] below previous locality among rubble on side of road, 5♂, 1♀, 8 May 1976, L. Abele, B. Means, LGA 76-12; Manchester Parish, 3.75 miles [6.0 km] above Mile Gully, 9♂, 12♀, 10 May 1975, L. Abele, B. Means,

FIGURE 11.—Gonopods: *a–f, Sesarma cookei; g–l, S. jarvisi; m–r, S. verleyi; s–x, S. bidentatum.*

LGA 76-14.

DESCRIPTION.—Carapace broader than long (cl/cb = 0.932±0.04 in males, 0.905±0.03 in females), lateral margins subparallel. Outer orbital angle subacute, usually with small tuft of pubescence near apex; lateral margin straight to slightly convex to strong anterolateral tooth. Interorbital region subdivided into four lobes, median pair large, distinct, lateral pair shallow, poorly defined. Frontal region concave, lateral margins subparallel lacking distinct anterolateral angles, distinctly concave medially; iw/cb = 0.439±0.03 in males, 0.443±0.03 in females. Regions of dorsal carapace surface well defined; anterior portion with many small scattered tufts of pubescence.

Eyes well developed, pigmented.

Chelipeds not sexually dimorphic; merus with posteriomedial and anteriomedial margins granulate, former with subdistal

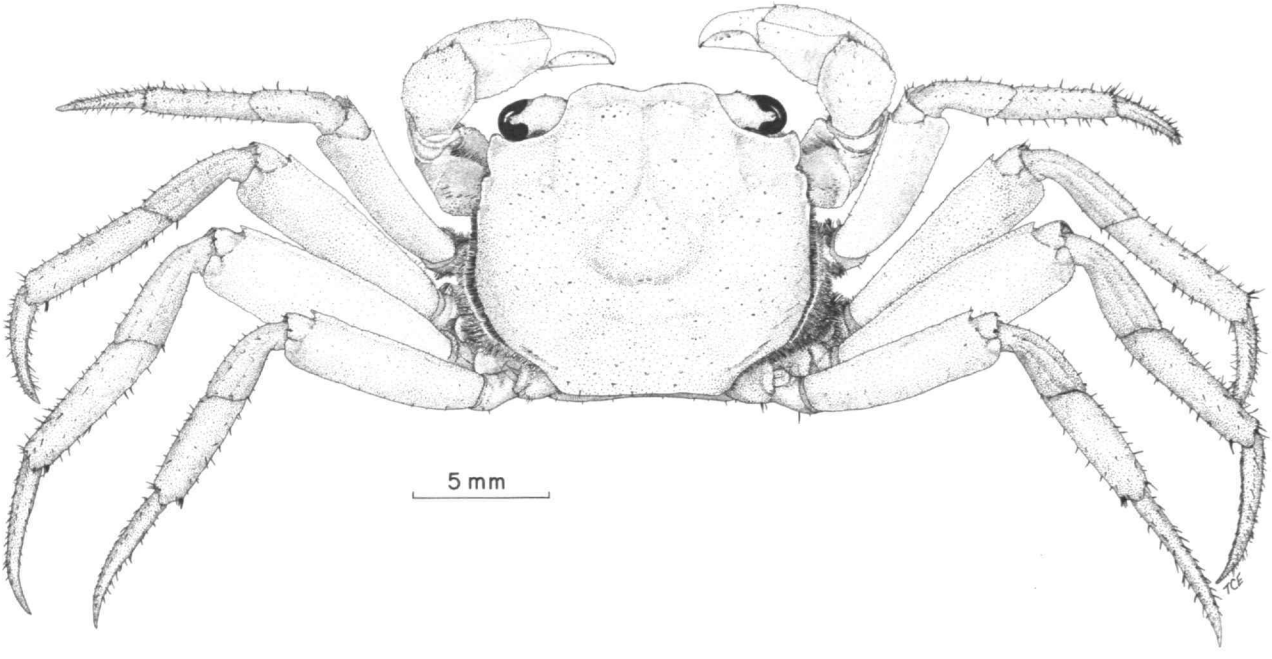


FIGURE 12.—*Sesarma jarvisi*, male, Holly Mount (Mount Diablo), Jamaica.

lobe; two rows of setae on medial surface, posterior row poorly developed. Carpus granulate, granules acute on anteriomedial margin; small tufts of setae dorsally. Chelae slightly swollen, covered with small granules, tending to be acute on larger specimens; dorsal margin with a distinct, continuous row of single granules; immovable finger with two proximal and two distal large teeth with smaller teeth between them; corneous tip acute, minutely and asymmetrically bifid. Movable finger with three large teeth, two proximal closer to each other than to distal tooth, smaller teeth between them; dorsal surface with 8 to 10 small acute tubercules; corneous tip acute.

Walking legs relatively long, slender; ml/mw = 3.01±0.22 in males, 3.30±0.48 in females. Dactylus and propodus with many, long, thick black setae present, a few dark spines on distal ventral margin of propodus. No fine pubescence on walking legs of either sex. Dactylus distinctly longer than propodus, which is longer than carpus.

Male abdomen subtrangular in outline; telson distinctly broader than long. Gonopod simple, unarmed, endpiece curved laterally with distinct subdistal constriction in caudal view.

Female abdomen subrectangular, relatively narrow, margins lined with setae, not extending beyond sternum; telson slightly broader than long. Gonopore oblong, slight concavity on posterior margin, narrowing medially; operculum raised well above sternum, oblong to subrectangular and narrowing medially. Eggs large (~1.32 mm) and few.

MEASUREMENTS.—Males cb 6.8 to 12.3 mm, females cb 6.8 to 12.4 mm, ovigerous females cb 10.2 to 12.4 mm. Both sexes appear to attain sexual maturity at about cb 10.0 mm.

TYPE LOCALITY.—Mount Diablo, St. Ann's Parish, Jamaica.

TYPE.—The holotype is a dry male, cb 12.0 mm, deposited in the National Museum of Natural History, Smithsonian Institution (USNM 24941).

DISTRIBUTION.—This Jamaican endemic has been reported from the following localities, all west of the Blue Mountains: St. Ann's Parish, Mount Diablo (Rathbun, 1914; Abele and Means, 1977); St. Elizabeth's Parish, Balaclava (Hartnoll, 1964b); Manchester Parish, Mile Gully (Abele and Means, 1977). The specimens from Portland tentatively referred to this species by Hartnoll (1964b) are, as he indicated in 1971, *Sesarma cookei*.

HABITAT.—*Sesarma jarvisi* is apparently restricted to limestone talus and rock rubble substrates on Jamaica west of the Blue Mountains between 300 and 900 m elevation. The crabs were common under limestone rocks in second growth forest. Two sites were talus slopes (one man-made along a road shoulder), three were old rock cairns piled up during coffee agriculture, and one was loose limestone rubble lying in the bed of a surface runoff gully. Leaf litter overlying the rocks was damp, but the underlying reddish clay substrate and the limestone rubble were dry. Juveniles, males, females, and ovigerous females were represented in this habitat.

REMARKS.—Ovigerous females were collected by Abele and Means (1977). Eggs early in development measured about 1 mm in diameter, reaching 1.32 mm immediately prior to hatching. Females carried 7 to 18 eggs, although some may

have been lost during handling. From each of seven eggs a large zoea emerged (measuring 3 mm total length and 1.36 mm across the yolk-filled carapace). The mouthparts are poorly developed, consisting of small lobes, suggesting that the zoea does not feed; all pereopods are present and larger than in the related *M. depressus*, a species with modified larval development (Hartnoll, 1964b). A search of the area where the females were collected failed to reveal any water, other than that in bromeliads, that could serve as a site for larval development. Abele and Means (1977) could have overlooked zoea in bromeliads but probably not females. Berried females from which zoea hatched were maintained in plastic bags with damp leaf litter and 5 to 10 ml of water in the bottom. Unfortunately, both females and larvae died within a few hours of hatching, before observations on development were possible.

Sesarma cookei Hartnoll, 1971

FIGURES *4f, 5g, 11a–f,* 13

Sesarma cookei Hartnoll, 1971:257, pl. 1.—Abele and Means, 1977:91.—Guinot, 1988:11.

MATERIAL EXAMINED.—Jamaica: Portland Parish, John Crow Mountains 2.5 miles [4 km] SW of Ecclesdown on Project Road, 6♂, 5♀, 4 May 1976, L. Abele, B. Means.

DESCRIPTION.—Carapace broader than long (cl/cb = 0.891±0.04 in males, 0.918±0.04 in females), widening posterirly. Outer orbital angle acute, lateral margin slightly convex to strong anterolateral tooth. Striae on lateral carapace surface weak. Interorbital region subdivided into four lobes; median sinuses strong, lateral sinuses weak. Frontal region with margins subparallel; concave medially, convex to anterolateral angles; iw/cb = 0.423±0.04 in males, 0.442±0.02 in females. Dorsal surface of carapace smooth, regions weakly defined with few scattered pubescent tufts.

Eyes relatively small, not filling orbital region.

Chelipeds of both sexes relatively long and narrow; merus with posteromedial margin granulate and subdistal lobe, anteromedial margin with teeth slightly expanded distally; two rows of comb setae on lateral surface, anterior row strong. Carpus granulate becoming acute on medial margin; anteromedial margin raised in males and expanding into a lobe distally in both sexes. Chelae granulate, no well-defined dorsal ridge on palm, granules large, acute on medial surface; male palm swollen compared to female. Fingers long, slender, about 1.6 times palm length; movable finger with about 9 to 12 acute granules dorsally, many fewer in females; about four large teeth present, two basal, one about midway, and one subdistal to corneous acute tip. Immovable finger with about three large teeth, about equidistant from corneous asymmetrical bifid tip.

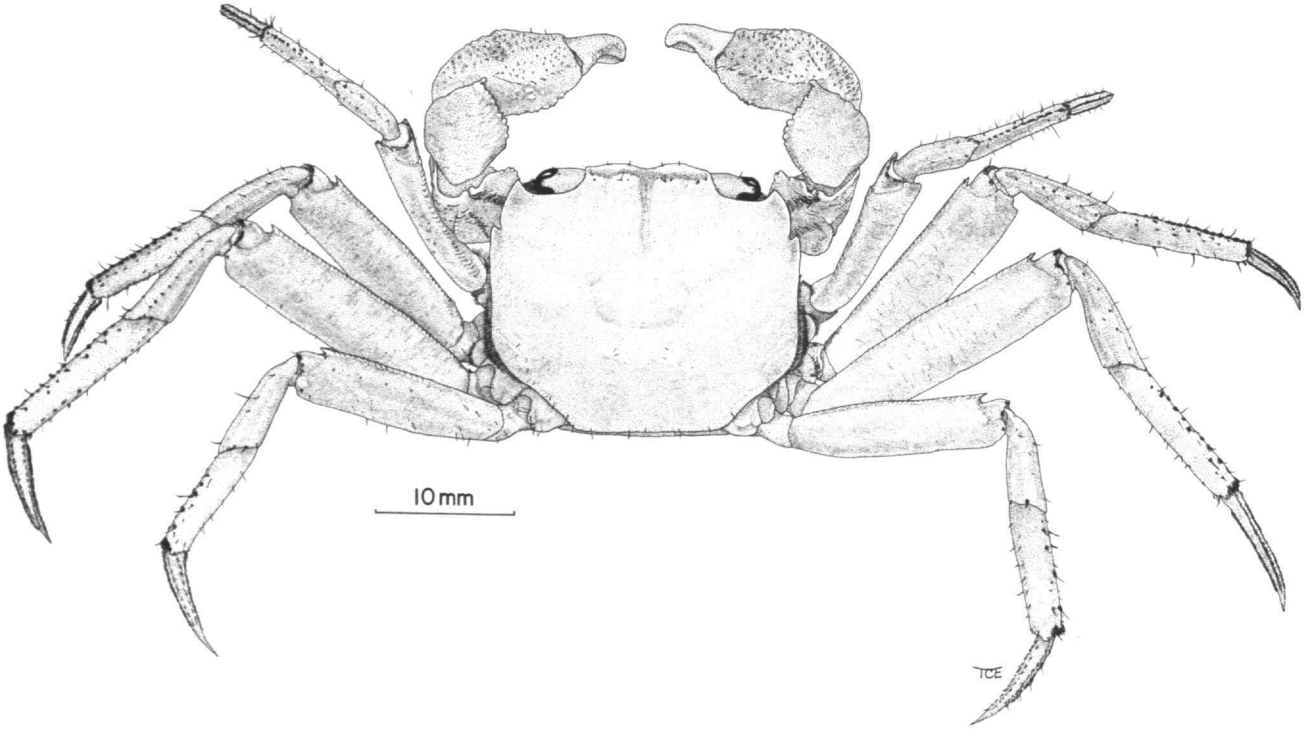


FIGURE 13.—*Sesarma cookei*, male, John Crow Mountains, Jamaica.

Walking legs long, slender; ml/mw of third 4.19±1.0 in males, 3.93±0.4 in females with ratio increasing with size in both sexes. Propodus of pereopods 2 and 3 with thick pubescence on distal half of ventral surface; scattered tufts on dorsal surface. Dactylus shorter than propodus with three dorsal and three ventral rows of pubescence.

Male abdomen subtriangular in outline; telson length and width subequal; distal margin lined with setae. Gonopod relatively short, simple, unarmed; distal region narrowing at amber-colored endpiece, slightly curved laterally.

Female abdomen subcircular in outline, not extending to coxae of pereopods, margins lined with setae; telson broader than long. Female gonopore almost subcircular with slight expansion toward pore posteromedially; operculum raised well above sternum, tilted toward midline, almost subrectangular in outline. Eggs large (1.25 mm diameter) and few.

HABITAT.—This species appears to terrestrial in habit. Individuals have been collected in dry limestone rubble and in a talus pile. The sites were shaded, but no standing water was in the collecting areas (Abele and Means, 1977).

REMARKS.—Abele and Means (1977) provide notes on the habitat and distribution of this species. They reported large eggs (diameter 1.25 mm) from the oviducts of a female and suggested that rapid larval development occurs in temporary pools of water formed by heavy rains.

MEASUREMENTS.—Males cb 8.5 to 17.4 mm, females cb 8.4 to 19.0 mm. Males above cb 9.4 mm and females larger than cb 9.9 mm appear to be sexually mature.

TYPE LOCALITY.—A few miles southwest of Ecclesdown in the John Crow Mountains, Portland Parish, Jamaica.

TYPE.—A mature female in the Natural History Museum, London, BM 1969:1085.

DISTRIBUTION.—*Sesarma cookei* is known only from the John Crow Mountains in eastern Jamaica from about 400 to 650 m elevation.

Sesarma verleyi Rathbun, 1914

FIGURES 4*h*, 5*h*, 11*m–r*, 14

Sesarma (Sesarma) verleyi Rathbun, 1914:123, pl. 6; 1918:288, pl. 76.—Hartnoll, 1965:113.—Chace and Hobbs, 1969:191.—Hobbs, Hobbs, and Daniel, 1977:146, figs. 69, 70.

Sesarma verleyi.—Hartnoll, 1964a:145, 164–166, 168, fig. 148; 1964b:78; 1965:113.—Chace and Hobbs, 1969:157.—Hartnoll, 1971:260–262.—Peck, 1975:308, 312, fig. 4.—Abele and Means, 1977:91.—Guinot, 1988:9, figs. 1B, 10, pl. 1, figs, 1, 2.

Sesarma.—Peck, 1974:34.

MATERIAL EXAMINED.—Jamaica: Saint Elizabeth Parish, Nudgrave (a small village in the cockpit country near Spanish (Ipswich), St. Elizabeth), 1♀ (holotype), Miss Verley, USNM 24920; St. Mary Parish, limestone cave at Lucky Hill, 1♂, 4♀, 6 May 1976, L. Abele, B. Means.

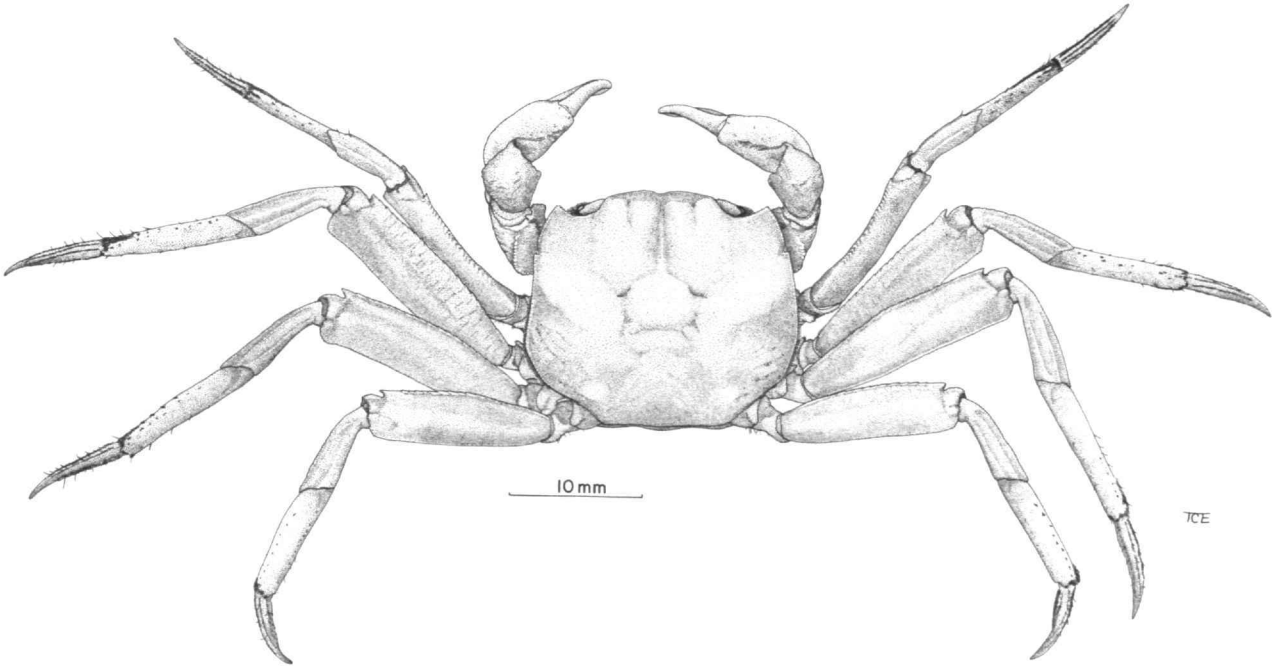


FIGURE 14.—*Sesarma verleyi*, male, Lucky Hill Cave, Jamaica.

DESCRIPTION.—Carapace broader than long (cl/cb = 0.89 in a male, 0.866±0.01 in females), distinctly wider posteriorly. Posterior orbital margin and acute outer orbital angle distinctly granular. Lateral margin oblique to blunt anterolateral tooth. Posterior portion of carapace strongly convex laterally. About nine weak striae laterally. Interorbital region subdivided into four low lobes. Frontal region with margins subparallel, no true lateral angles present; frontal margin concave medially; iw/cb = 0.475 in a male, 0.466±0.02 in females. Dorsal surface of carapace smooth, regions defined.

No obvious sexual dimorphism in chelipeds; long, slender in both sexes. Merus with posteromedial margin granulate with subdistal lobe, anteromedial margin with teeth; two rows of setae on medial surface, posterior one poorly defined. Carpus granulate, anteromedial margin produced into sharp angle. Chelae slender with a few striae dorsally on palm; movable finger slender without tubercles dorsally, armed with about five low teeth on cutting edge to corneous acute tip; immovable finger with about three low teeth on cutting edge to acute corneous tip.

Eyes greatly reduced.

Walking legs long, slender; ml/mw of third = 3.69±0.4 in males and females. Propodus of walking legs 1 and 2 with thick pubescence distally; dactylus with three ventral and three dorsal rows of pubescence. Distal inferior margin of propodus with zero to two stout black spines. Dactylus shorter than propodus, longer than carpus.

Male abdomen subtriangular in outline; telson length and width subequal. Gonopod simple, unarmed; endpiece with slight flare distally, turned laterally.

Female abdomen subcircular; telson slightly broader than long. Gonopore almost subcircular in outline but narrowing medially and with margin straight, not curved posteriorly; operculum oblique, set above sternum, subrectantular in outline with medial margin bilobed.

TYPE.—The dried female holotype (cb 21.9 mm) is extant in the National Museum of Natural History, Smithsonian Institution (USNM 24940).

DISTRIBUTION.—Endemic to Jamaican caves (Hartnoll, 1964a). Saint Elizabeth Parish, Mulgrave; Saint Mary Parish, Lucky Hill cave; Saint Catherine Parish, cave at Worthy Park, St. Claire Cave, Edwaston; Saint Ann Parish, Cricket Cave, Douglas Castle.

REMARKS.—Hartnoll (1964a, 1964b) presented notes on the biology of *S. verleyi*. He found that a male of cb 20.5 mm had partly mature gonads and that females attained sexual maturity between 18 and 21 mm. Although none of the females were ovigerous, examination of the ovaries revealed eggs greater than 1 mm in diameter. The ovaries of *S. verleyi* are little unusual in that they extend posteriorly and then join, in contrast to those of other grapsids, in which the arms do not join.

This species is very similar morphologically to *S. cookei*, a terrestrial species known only from the John Crow mountains of Jamaica. *Sesarma verleyi* can be distinguished from *S. cookei* most easily by the distinctly granular region of the posterior orbital margin and outer orbital angle of *S. verleyi*, which is smooth in *S. cookei*.

Sesarma aequatoriale Ortmann, 1894

FIGURES 4*d*, 5*i*, 15, 16, 17*b*,*d*

Sesarma aequatorialis Ortmann, 1894:722, pl. 23: figs. 14, 14k, 14z [type locality Ecuador].

Sesarma (Sesarma) aequatorialis.—Rathbun, 1897b:112.—Nobili, 1901:44.

Sesarma (Sesarma s.s.*) aequatorialis*.—Tesch, 1917:128.

Sesarma (Sesarma) aequatoriale.—Rathbun, 1918:292, fig. 146.

Sesarma (Sesarma) sulcatum.—Rathbun, 1918:289 [in part, see material examined].

Sesarma sulcatum.—Crane, 1947:86 [at least ovigerous female and juveniles from Golfito, male = *S. sulcatum*].—Abele, 1976:268 [in part, 1 male].

Sesarma aequatoriale.—Abele and Blum, 1977:246.—Abele, 1977b:495, figs. 1, 2, 5c,d; 1981:437.

MATERIAL EXAMINED.—Mexico: Guerrero, 3♂, 3♀, 4 Jan 1933, Velero, AHF 3-33; Acapulco, 1♀, Hassler Expedition, MCZ 6244.

Costa Rica: Boca de Jesus, 1♂, Apr 1905, Biolley and Tristan, USNM 32315; Golfito, 1 ovigerous ♀, 3 juveniles, 6–7 Mar 1938, Zaca, AMNH 13508.

Panama: El Real, 18♂, 11♀, 1 ovigerous ♀, 26 Oct 1966, R. Rish, USNM 125916 (4♂, 1♀), AHF 1967-88 (remaining specimens); Chucunaque River, 1♀, 26 Nov 1965, D. Quintero, USNM 119853; La Capitana (Canal Zone), 1♂, H. Pittier, USNM 45532; San Jose Island, Pearl Islands, river at Playa Grande, 1 ovigerous ♀, 20 May 1973, L. Abele, R. Dressler; Rey Island, Pearl Islands, 1♂, 3♀, coll., 19 May 1973, L. Abele, R. Dressler; Diablo mangrove swamp; 1♂, 18 Feb 1969, L. Abele; Albrook Air Force Base mangrove swamp; 2♂, 2♀, 6 May 1969, L. Abele; same locality, 1♂, 18 Jun 1974, L. Abele.

Ecuador: 2♂, 1♀ (syntypes), 1874, Reiss, MZ; Esmeraldas, 1♀, E. Festa, MIZS Cr. 114.

DESCRIPTION.—Carapace wider than long with low but distinct granules dorsally along with scattered tufts of pubescence (cl/cb ratio 0.834±0.02 for females). Ratio varies with size, about 0.78 in small males and 0.86 in large males; 0.83 in small females and 0.85 in large females. Lateral margins subparallel although posterior carapace may widen slightly in small specimens and narrow slightly in large males. Interorbital region subdivided into four low lobes; median sinus deeper than submedial pair. Frontal region concave medially; oblique laterally to lateral margins that flare slightly so that frontal region widens distally (iw/cb ratio is 0.597±0.02 in males and 0.588±0.02 in females). Outer orbital angle extended anteriorly and acute; distinct lateral tooth present posterior to outer orbital angle. Both outer orbital angle and lateral tooth variable in size, often larger and more acute than in syntype figured. About seven granular ridges on lateral surface of carapace.

Eyes well developed, pigmented.

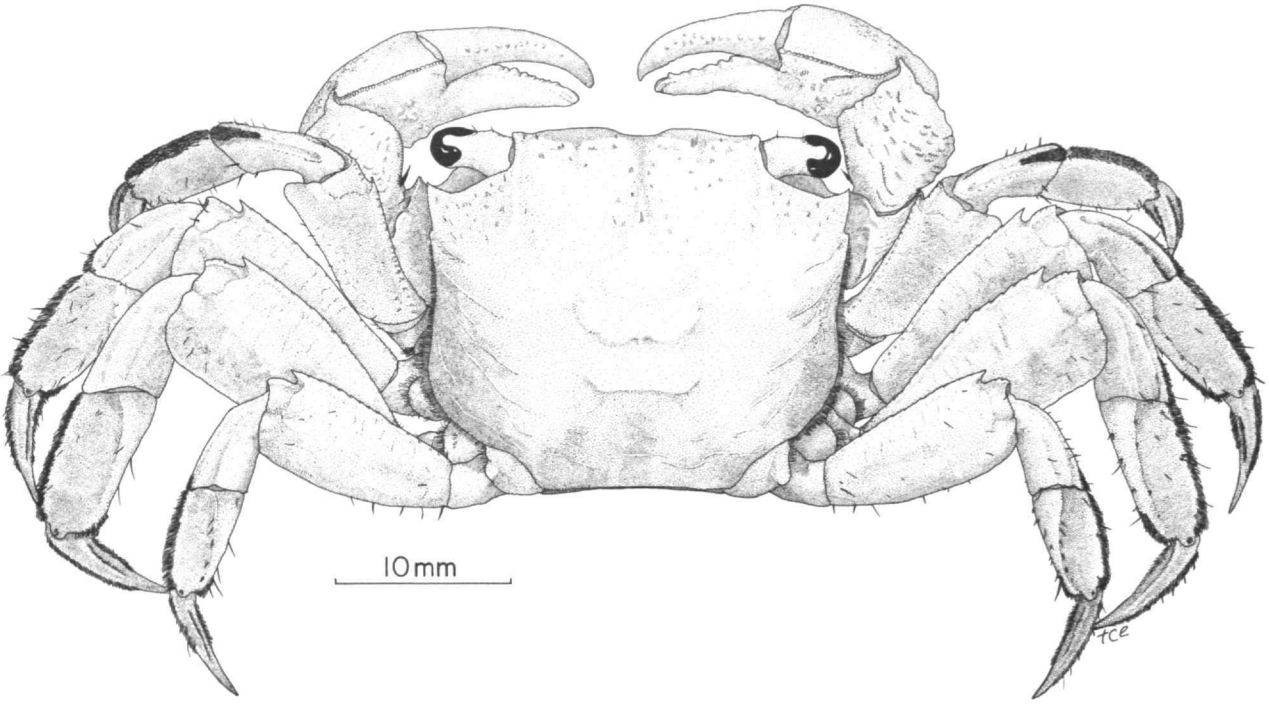


FIGURE 15.—*Sesarma aequatoriale*, syntype male (from Abele, 1977b, fig. 1).

Chelipeds sexually dimorphic, male chelipeds large, robust. Posterior mesial and lateral borders of merus weakly serrated; serrations of latter end proximal to distal margin, anterior mesial margin toothed. Carpus covered with short rows of granules. A distinct row of large granules along dorsal margin of palm; lateral surface smooth to punctate while mesial surface with about 10 large tubercles arranged in poorly defined dorsoventral row. Immovable finger narrows distally to corneous, spooned apex; about 7 to 13 unequal teeth present. Movable finger with row of 10 to 14 acute tubercles along dorsal margin; a large basal tooth and about eight smaller teeth proximal to a larger tooth present proximal to tip. Female chelipeds considerably smaller than those of equal-sized mature males. Palm lacks tubercles on mesial surface and movable finger has only five or six weak tubercles on dorsal margin.

Walking legs increase in length in order: first, fourth, second, and third. For third walking leg (fourth pereiopod) merus about 1.6 times length of carpus; carpus slightly shorter than propodus; dactylus about $^5/_6$ times length of propodus. Merus length about twice width (ml/mw = 2.19±0.13 in males, 2.06±0.12 in females); transverse rows of granules present and a large subdistal tooth on dorsal margin. Merus of fourth walking leg (fifth pereiopod) broader than that of third (ml/mw = 2.03±0.10). Walking legs with a ventral and dorsal row of thick pubescence extending from dorsal distal part of carpus to distal margin of propodus; it continues as three narrow rows on dorsal surface of dactylus; ventrally row begins on distal part of propodus and continues as three narrow rows on dactylus. Ventral surface of propodus armed with about five closely set pairs of spines in three indistinct rows, about six dark-colored spines on each side of ventral distal margin.

Male abdomen subtriangular in outline; length and width of telson subequal. Endpiece of male gonopod relatively long; sinus on distolateral margin. Form of sinus somewhat variable, may consists of only a concavity. In almost all (80%) specimens examined endpiece damaged to some extent along sinus margin.

Female abdomen semicircular in outline. Female gonopore and operculum figured (Figure 17).

MEASUREMENTS.—Males, cb 9.7 to 24.1 mm; females, cb 10.5 to 24.3 mm; ovigerous females cb 16.4 to 21.0 mm; males larger than about cb 19.0 appear to be sexually mature, whereas females appear to attain sexual maturity at about cb 16.0 mm.

TYPE LOCALITY.—Ecuador.

TYPE.—The syntypes (two males, two females) are extant in the Museo ed Istituto di Zoologica Sistematica, University of Torino, Italy.

DISTRIBUTION.—This species is known from Acapulco, Mexico, Costa Rica, Panama, and Ecuador.

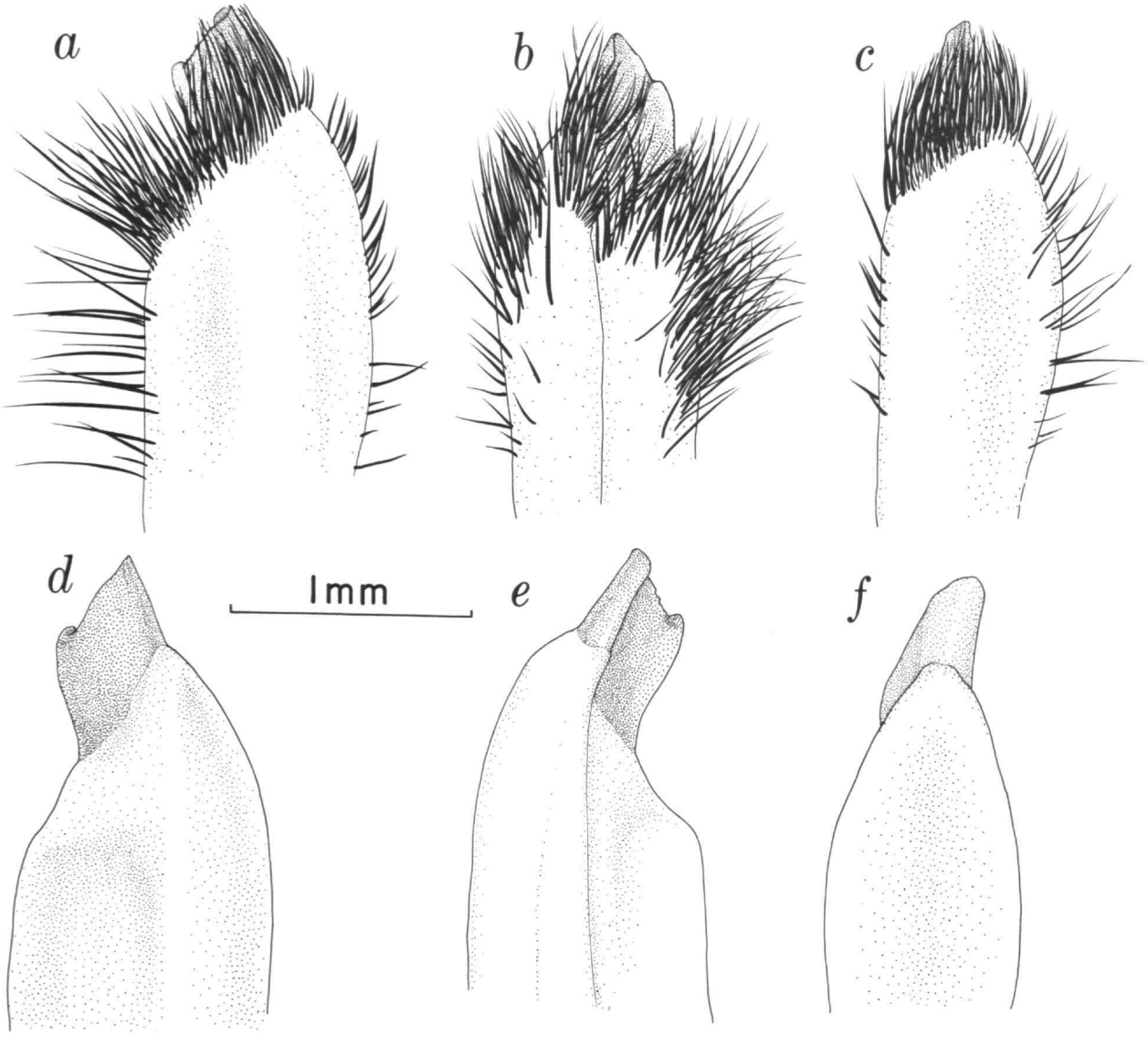


FIGURE 16.—*Sesarma aequatoriale*, gonopods (from Abele, 1977b, fig. 2).

HABITAT.—*Sesarma aequatoriale* is a semiterrestrial species that occurs in and adjacent to fresh and brackish water streams and rivers. Specimens of *S. aequatoriale* and pseudothelphusid crabs were collected from Rio Chepillo (actually a small stream) on Isla Rey in the Pearl Islands, Panama. An ovigerous female was collected from a large unnamed river that empties into Playa Grande, Isla San Jose, Pearl Islands, Panama. Specimens were also collected from mud flats adjacent to a brackish stream and in a brackish water mangrove swamp on the mainland of Panama. All of the specimens I collected were under rocks and debris; none was in a well-defined burrow. The salinity range of *S. aequatoriale* is 0 to 22.4 ‰ although the species appeared to be more common around lower salinity water. In freshwater streams *S. aequatoriale* occurs with pseudothelphusid crabs; at higher salinities it occurs at various localities with *S. sulcatum*, *S. rhizophorae* Rathbun, 1906, *S. rubinofforum* Abele, 1973b, and *A. occidentale* (Smith, 1870).

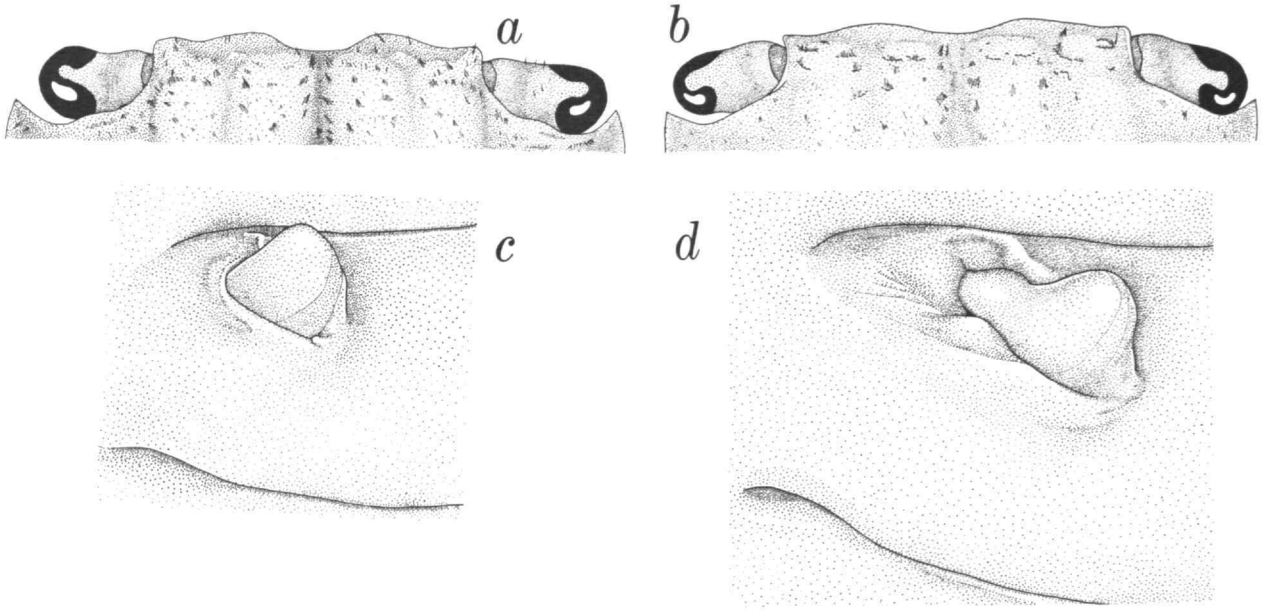


FIGURE 17.—*a–b*, front; *c–d*, gonopore. *a,c*, *Sesarma sulcatum*; *b,d*, *S. aequatoriale* (from Abele, 1977b, fig. 5).

REMARKS.—During the present study I examined two male and one female syntypes of *S. aequatoriale*, the female holotype of *S. sulcatum*, and all material referred to either species in the AHF, AMNH, MCZ, and USNM. With the exception of the syntypes, all material of *S. aequatoriale* was included under the name *S. sulcatum*. This problem accounts for the absence of records of *S. aequatoriale* in the literature and is understandable because the two species are morphologically very similar and are in part geographically and ecologically sympatric.

Rathbun correctly described and figured *S. sulcatum*, but specimens of *S. aequatoriale* were included in her "material examined" section (USNM 32315, 45532, 45569). The two species can be separated by the following characters: the carapace of *S. aequatoriale* has the frontal region weakly concave and the dorsal surface lightly grooved with widely scattered tufts of pubescence, whereas the carapace of *S. sulcatum* has the frontal region deeply concave and the dorsal surface deeply grooved and usually with close-set tufts of pubescence (compare Figures 15 and 18; 17*a* and 17*b*); the male gonopod of *S. aequatoriale* has a relatively longer endpiece and is less robust than the male gonopod of *S. sulcatum* (compare Figures 16 and 19); the female gonopore of *S. aequatoriale* differs from that of *S. sulcatum* (compare Figures 17*c* and 17*d*); *S. aequatoriale* is sexually immature at this size and does not appear to reach sexual maturity until approximately cb 23 to 30 mm.

Sesarma sulcatum Smith, 1870

FIGURES 5*j*, 17*a,c*, 18, 19

Sesarma sulcata Smith, 1870:156.—De Man, 1892a:260.
Sesarma (Sesarma) sulcata.—Rathbun, 1897a:90.
Sesarma (Sesarma s.s.*) sulcata*.—Tesch, 1917:200.
Sesarma (Sesarma) sulcatum.—Rathbun, 1918:289, pl. 78: figs. 3, 4 [part of material = *S. aequatoriale*].—Bott, 1955:62.—Von Hagen, 1978:46.
Not *Sesarma sulcatum*.—Crane, 1947:86 [part only].—Abele, 1976:268 [part of material only].
Sesarma sulcatum.—Crane, 1947:86.—Abele, 1977b:502, figs. 3, 4, 5a, 5b.—Brusca, 1980:302, fig. 20.11.—Abele, 1981:438.

MATERIAL EXAMINED.—Mexico: Gulf of California between Tiburon I. and Sonora mainland, 2♂, 1♀, 26 Oct 1969, P. Vreeland, AHF 1970-11; Gulf of California, Kino Bay, 1 ovigerous ♀, 4 Apr 1970, P. Pickens, C. Swift, AHF 1970-11; Nayarit, San Blas, 3♂, 1♀, H. Wright, AHF 1966-1; Concepcion Bay, 2♂, 28 Mar 1940, S.A. Glassell, 19 Jan 1932, USNM 110646; La Paz, 1♂, L. Beilding, USNM 4631; Puerto Escondido, 1♀, S.A. Glassell, USNM; San Blas, Tepio, 2♂, 1 ovigerous ♀, 14 Jun 1897, Nelson and Goldman, USNM 20653.

Nicaragua: Corinto; 1 ovigerous ♀ (holotype), J.A. McNiel, MCZ 6243 (transferred from the Peabody Academy of Science, November 1885).

Costa Rica: Golfito, 1♂, 6–7 Mar 1938, AMNH 13508.

Panama: Diablo Heights swamp, 3♂, 30 Jul 1967, H.O. Wright, USNM 125912, 125917; swamp near Albrook AFB,

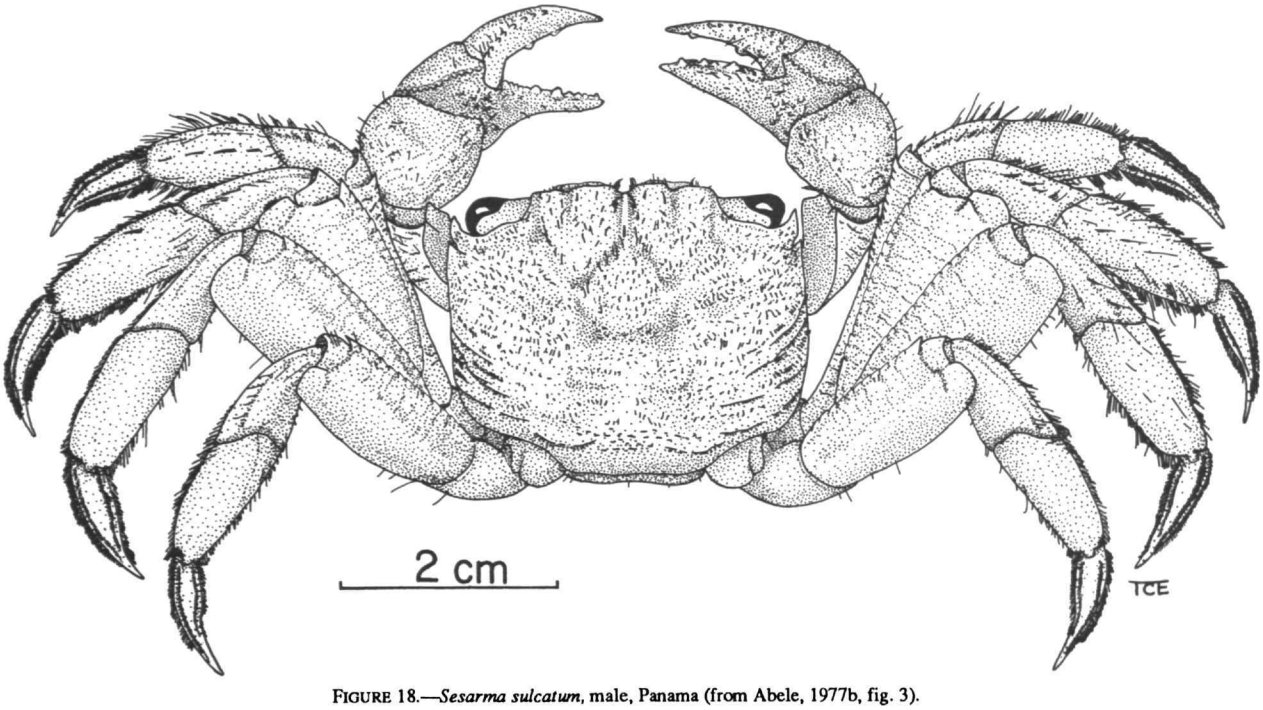


FIGURE 18.—*Sesarma sulcatum*, male, Panama (from Abele, 1977b, fig. 3).

1♂, 18 Jun 1974, L.G. Abele, USNM; Darien, El Real, 4♂, 1♀, 26 Oct 1966, R. Fish, USNM 125916.

Colombia: Port Utria, 1♂, 25 Jan 1935, AHF.

DESCRIPTION.—Carapace wider than long (cl/cb = 0.81±0.04 for males, 0.82±0.05 for females), covered dorsally with distinct tufts of setae. Carapace widens slightly posteriorly; tooth posterior to anterolateral angle, large acute and set higher and medial to anterolateral angle. Regions of carapace well defined especially in anterior portion where deep grooves mark interorbital region. Frontal region about 0.53 of carapace breadth (iw/cb = 0.53±0.02 for both sexes), sinuous with deep median portion.

Eyes well developed, pigmented.

Chelipeds sexually dimorphic, larger with more granules in males. Anterior medial border with about seven strong teeth, posterior border very weakly serrate with distinct lobe proximal to distal margin. Carpus covered with rows of granules, some acute at borders, and with a distinct impression on the anterolateral surface; medial surface with a few acute granules in males. Dorsal surface of palm with distinct row of granules extending slightly beyond distal margin; outer surface smooth to slightly punctate, inner surface with large granules in males, smooth in females. Movable finger with about 11 acute tubercles dorsally; ventrally with tuft of setae at base followed by one large tooth and about nine smaller ones to corneous spooned tip. Immovable finger with about 11 teeth proximal to corneous spooned tip.

Walking legs short, robust, ml/mw of third is 2.2±0.13 in males and 2.04±0.10 in females. Lateral rows of granules on merus with dorsal subdistal tooth. Rows of long dark setae beginning on carpus, extending onto dactylus as three ventral and three dorsal rows of thick setae. Pubescence particularly thick on propodus and dactylus of anterior two legs. About three or four pairs of short, thick black spines on distal margin of propodus.

Male abdomen subtriangular in outline; basal width of telson slightly greater than length at midline. Gonopod robust; amber-colored endpiece directed laterally bending at about a 45° angle.

Female abdomen semicircular in outline; basal width of telson slightly greater than length at midline. Gonopore oblong in outline; operculum longer than wide.

MEASUREMENTS.—Males cb 23.3 to 35.8 mm, large males to 50 mm (Brusca, 1980); females cb 24.7 to 30.7 mm; ovigerous females cb 30.2 to 30.5 mm.

TYPE LOCALITY.—Corinto, Nicaragua.

TYPE.—Ovigerous female (cb 30.5 mm) in the Museum of Comparative Zoology (MCZ 6243). Specimen is in poor condition.

DISTRIBUTION.—*Sesarma sulcatum* is known from the Pacific Coast of Mexico, Gulf of California, El Salvador, Nicaragua, Costa Rica, Panama, and Colombia.

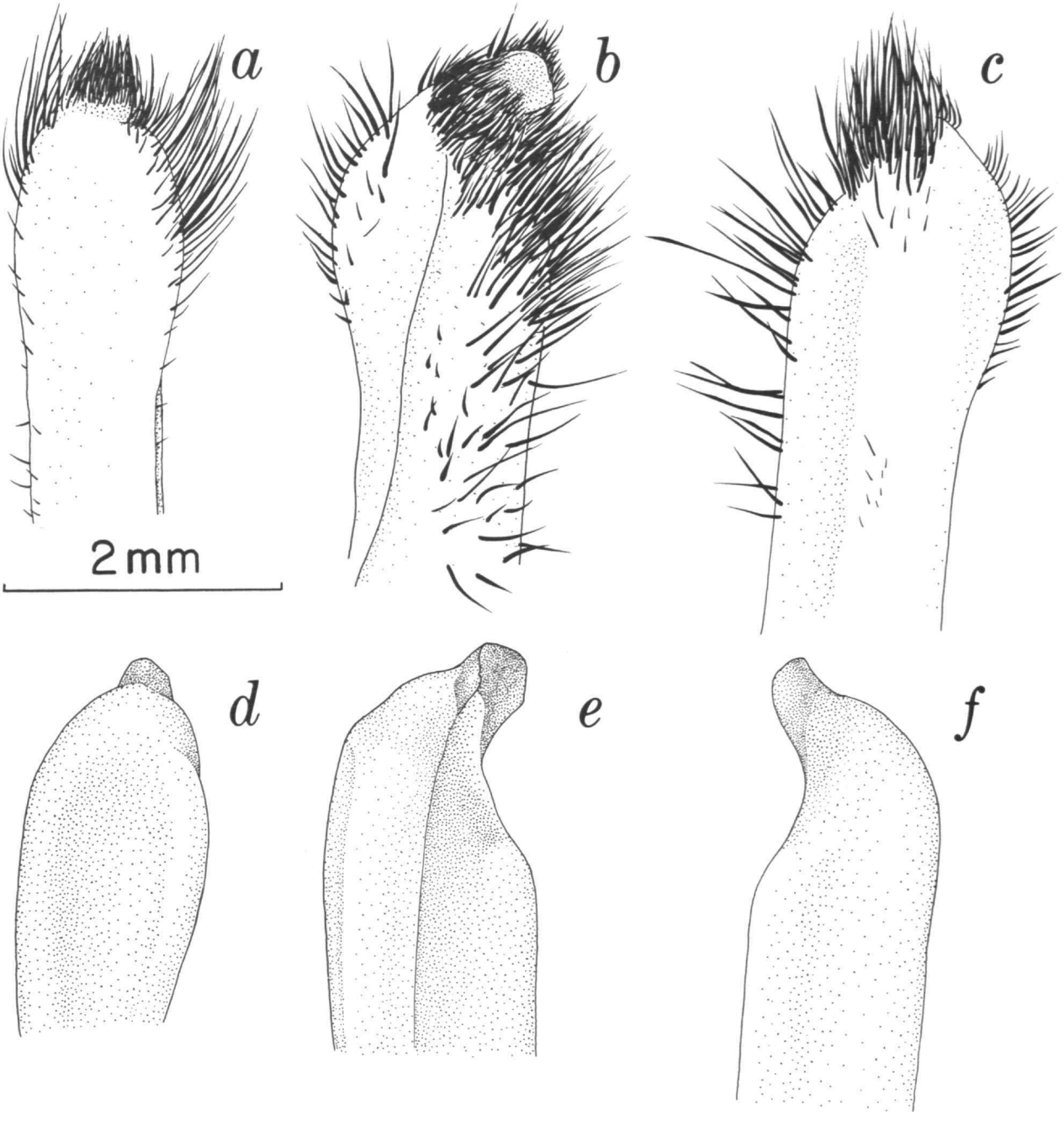


FIGURE 19.—*Sesarma sulcatum*, gonopods (from Abele, 1977b, fig. 4), Costa Rica.

HABITAT.—Individuals of this species were collected from burrows above the banks of a brackish water river (salinity 22‰) and in mangrove swamps. Although some specimens were collected in very low salinity water (4–6‰), the species appears to be more common in higher salinities. Some of data given on habitat by Crane (1947) refer to *S. aequatoriale*.

REMARKS.—See *S. aequatoriale*.

Sesarma rhizophorae Rathbun, 1906

FIGURES 3*d,e*, 5*k*, 20

Sesarma (Sesarma) rhizophorae Rathbun, 1906:99; 1918:294, pl. 79.—Von Hagen, 1978:46.
Sesarma rhizophorae.—Crane, 1947:86.—Abele, 1976:268.

MATERIAL EXAMINED.—Costa Rica: Boca del Jesus, 1♂ (holotype), Apr 1905, J.F. Tristan, USNM 32491.

Panama: Panama Province, swamp near Albrook AFB, 9♂, 2♀, 2 ovigerous ♀, 18 Jun 1974, L. Abele; same locality, 1♂, 4♀, 1 ovigerous ♀, 13 Mar 1977, L. Abele; adjacent to Miraflores locks, 2♂, 3♀, 13 Mar 1977, L. Abele; Diablo Heights mangrove swamp, 5♂, 2♀, 13 Mar 1977, L. Abele.

DESCRIPTION.—Carapace broader than long (cl/cb = 0.793±0.03 for males, 0.780±0.05 for females), convex anterior to posterior; regions weakly defined with about four rows of low granules on lateral surface. Anterolateral angle acute, followed posteriorly by a deep sinus and large tooth set laterally and on a higher level than anterolateral angle. Small indentation posterior to lateral tooth. Front slightly expanded distally about 0.534±0.01 of carapace breadth; frontal margin arcuate, weakly concave medially.

Eyes well developed and pigmented.

Chelipeds sexually dimorphic, larger and with more granules in males. Merus weakly serrate on anterior and posterior medial margins, a few tubercles on anterior margin. Carpus covered with short rows of granules. Palm distinctly punctate with row of granules on dorsal surface and larger scattered tubercles on medial surface of males. Movable finger with about eight acute tubercles on dorsal surface extending about half length of finger; ventral surface usually with two large teeth, one basal and one distal in location. Immovable finger similarly armed. Teeth very much reduced on females.

Walking legs relatively slender, ml/mw of third about 2.65±0.20. Merus armed on distal dorsal surface with thin acute tooth. Fine brown-colored pubescence present on walking legs, especially on the propodus, carpus, and dactylus; dactylus length about 0.75 of propodus length.

Male abdomen subtriangular in shape; telson width at base greater than length. Gonopod slender, almost straight, narrow-

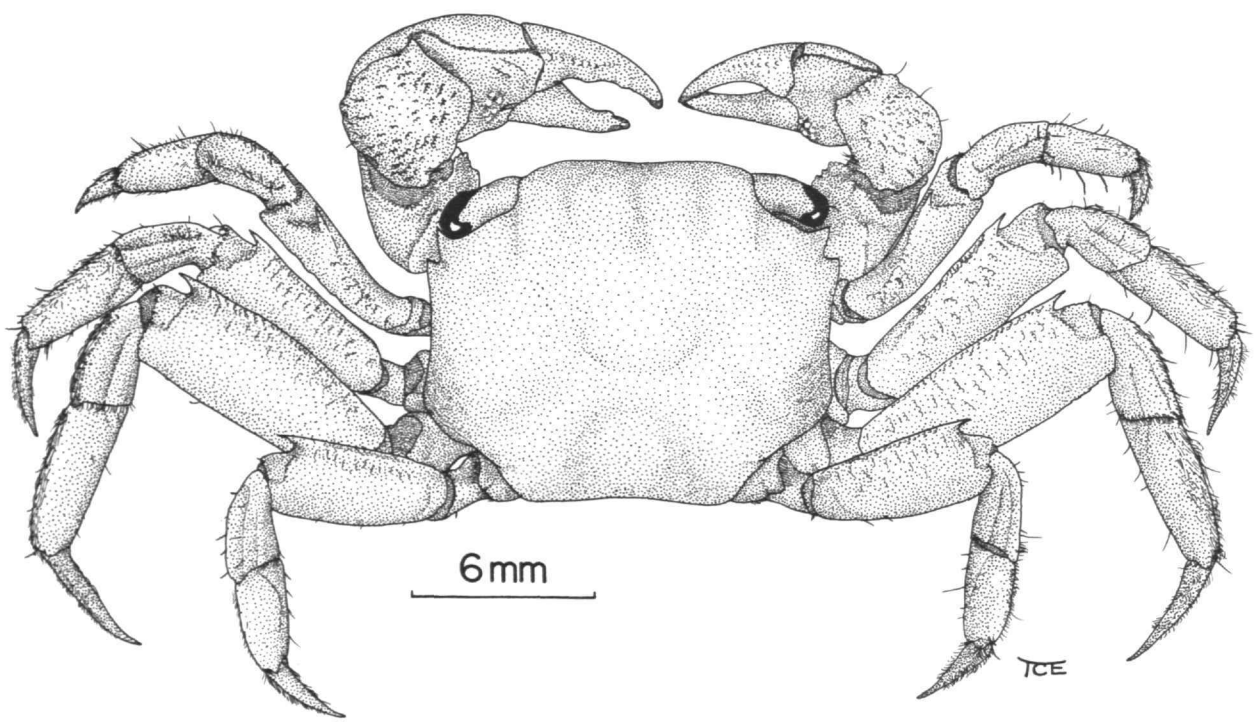


FIGURE 20.—*Sesarma rhizophorae*, male holotype.

ing distinctly in distal portion (about 0.15 of length). Amber-colored endpiece continuous with main shaft, not set off at an angle.

Female abdomen subcircular in outline; telson width at base greater than length. Gonopore recessed in sternum, oblong in lateral axis; operculum longer than wide.

MEASUREMENTS.—Males cb 9.3 to 13.7 mm; females cb 9.6 to 13.4 mm; ovigerous females cb 11.7 to 13.4 mm.

TYPE LOCALITY.—Boca de Jesus Maria, Costa Rica.

TYPE.—Male cb 13.7 mm, USNM 32491.

DISTRIBUTION.—Costa Rica, Boca del Jesus Maria, Puntarenase, Ballenas (Crane, 1947; Rathbun, 1918); Panama, common along Pacific Coast (Abele, 1976); Peru, Puerto Pizarro (von Hagen, 1978). See "Remarks."

HABITAT.—*Sesarma rhizophorae* is common in burrows in mangrove swamps. It was collected in salinities of 20 to 27‰.

REMARKS.—Abele (1976) noted the presence of this species on the Caribbean coast of Panama adjacent to the entrance of the Panama Canal. However, several subsequent attempt to collect the species at the very same site were unsuccessful, and it is possible that the original specimens were mislabeled. Until additional specimens of *S. rhizophorae* are collected from the Caribbean its presence there should be considered doubtful.

Sesarma rubinofforum Abele, 1973

FIGURES 3*f–i*, 5*l*, 21

Sesarma (Holometopus) rubinofforum Abele, 1973b:333.
Sesarma rubinofforum.—Abele, 1976:268.—Hagen, 1978:51.—Abele, 1981:438.

MATERIAL EXAMINED.—Panama: Pacific coast, Canal Zone, Diablo Heights, mangrove swamp on east bank of Panama Canal, 18 Feb 1969, L.G. Abele, LGA 69-30, 1♂ paratype, cb 6.7 mm, UPRC; 1 ovigerous ♀ paratype, cb 8.4 mm (illustrated, Figure 21), USNM; Panama, locality data as above, salinity 22.4‰, temperature 27.9°C, 25 Jan 1971, L.G. Abele, T.A. Biffar, LGA 71-5, male holotype, cb 8.8 mm, 5♂ paratypes, cb 3.3–10.4 mm, 4♀ paratypes, cb 6.0–8.8 mm, USNM; 1♂ cb 8.0 mm, 1♀, cb 7.8 mm (paratypes), RMNH; 1♂, cb 6.8 mm, 1♀, cb 7.0 mm (paratypes), AHF.

DESCRIPTION.—Carapace broader than long (cl/cb= 0.858±0.31 in males, 0.853±0.43 in females), narrowing posteriorly. Frontal region subparallel about 0.60 of carapace width; frontal margin sinuous with broad median depression.

Interorbital region with four distinct lobes; lateral (outer) lobes indistinctly subdivided into two lobes by two patches of pubescence. Regions of carapace distinct. Dorsal and lateral surfaces of the carapace with patches of short, brown pubescence. Outer orbital angle acute; no tooth or lobe posterior to it. About four granular ridges on lateral surfaces of carapace.

Eyes well developed and pigmented.

Merus of chelipeds with margins distinctly serrate; subdistal lobe present on lateral margin. Many subacute granules along border of carpus and dorsal surface; no tooth or lobe at medial angle. A strong granulate ridge extends length of dorsal surface of palm; weakly bifurcate proximally. Other poorly defined rows of granules arise from this ridge and extend onto medial surface of palm. Lateral surface of palm smooth except for a few scattered granules. Movable finger subequal in length to palm; about seven strong, acute tubercles along dorsal surface of finger, median ones strongest.

Walking legs robust with the third (fourth pereiopod) being longest. Length of merus of third about 1.9 times width; superior borders with minute widely spaced teeth and a strong, acute subdistal tooth; inferior border smooth. Short horizontal rows of granules present on meri of walking legs. Carpus with scattered setae on dorsal surface of propodus and less on ventral surface; three pairs of strong, black spines on distal inferior margin. Dactylus with three dorsal and two ventral poorly defined rows of pubescence. Merus slightly less than twice length of carpus; carpus subequal in length to propodus. Dactylus slightly shorter than both propodus and carpus.

Male abdomen subtriangular in shape, narrowing distally from third segment. Telson broadly rounded; length and width subequal. Male gonopod simple, unarmed; endpiece (amber-colored apex) rectangular, directed laterally and covered with simple setae. Female abdomen subcircular in outline. Gonopore small, crescent-shaped area adjacent to operculum.

VARIATION.—Females have less pubescence on the carapace than males; the female chelae are not as robust as those of males, the tuberculation is weaker, and there are three or four rather than seven or eight tubercles on the dorsal surface of the movable finger.

MEASUREMENTS.—Immature males have a cb of about 3.3 mm; immature females, cb 6.0 to 6.3 mm; mature males, cb 6.2 to 10.4 mm; mature females, cb 7.0 to 8.4 mm; ovigerous females, cb 8.8 to 9.0 mm; eggs small and numerous, diameter 0.3 to 0.5 mm.

TYPE LOCALITY.—Pacific coast of Panama on the east bank of the Panama Canal in a mangrove swamp near Diablo Heights, Canal Zone.

TYPE.—The male holotype is deposited in the National Museum of Natural History.

DISTRIBUTION.—Pacific coast of Costa Rica and Panama.

HABITAT.—The specimens were collected from damp areas beneath litter deep inside a mangrove swamp composed primarily of *Rhizophora mangle* L. Salinity in the swamp varies from 16‰ to 24‰. Air temperature varies from about 27°C to 29°C.

REMARKS.—Although Abele (1973b) placed this species in the subgenus *Holometopus*, von Hagen (1978) showed that it belongs to the subgenus *Sesarma*. This species appears to be the Pacific analog of *S. rectum* Randall, 1840. It can be distinguished from *S. rectum* by the following characters: There is a slight emargination posterior to the outer orbital

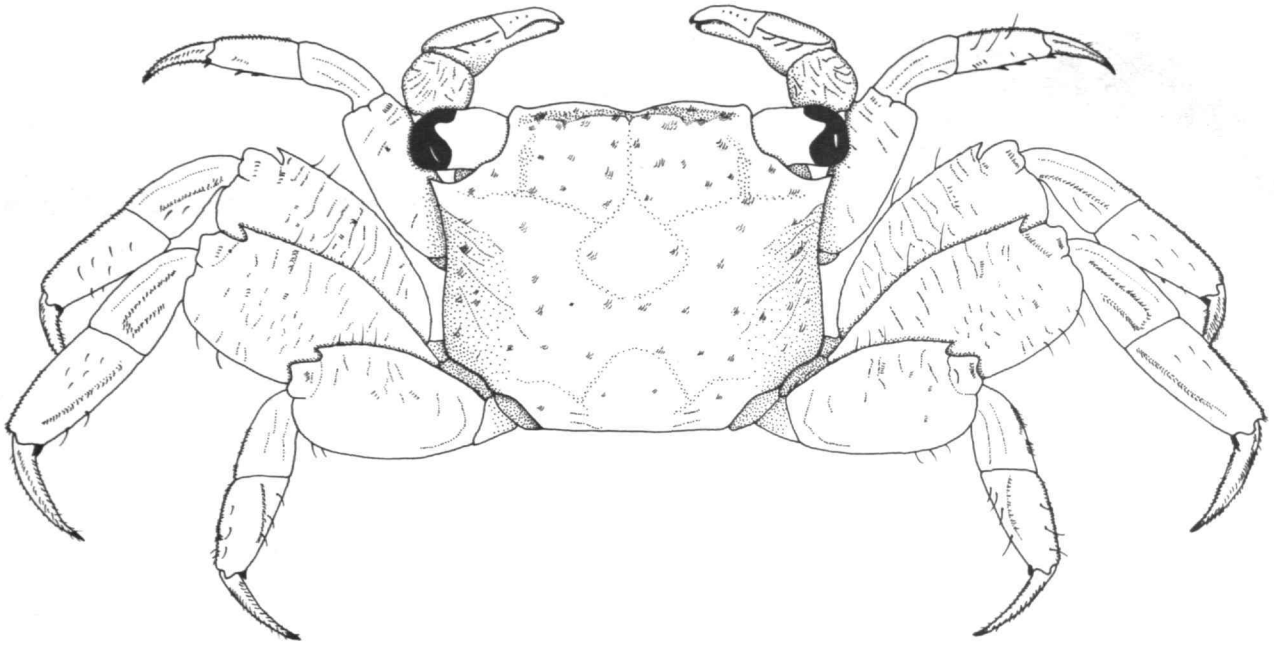


FIGURE 21.—*Sesarma rubinofforum*, paratype female, cb 8.4 mm (from Abele, 1973b, fig. 1).

angle in *S. rectum*, which is lacking in *S. rubinofforum;* the carpus of the cheliped of *S. rectum* is armed with a sharp tooth at the medial angle, whereas that of *S. rubinofforum* is rounded; the movable finger of the chela of *S. rectum* is armed with 14 to 16 acute tubercles, whereas that of *S. rubinofforum* is armed with 3 to 8; the endpiece of the gonopod of *S. rectum* is somewhat flared, whereas that of *S. rubinofforum* is not flared; adult cb of *S. rectum* ranges from 13 to 44 mm, whereas adult cb of *S. rubinofforum* ranges from 6 to 10 mm.

Species of *Armases*, new genus

Armases cinereum (Bosc, 1802), new combination

FIGURES 2*a-c*, 22*a*, 23*b*, 24, 25

Grapsus cinereus Bosc, 1802:204, pl. 5: fig. 1 [type locality *"la Caroline"*].—Latreille, 1806:72.—Say, 1818:442.—Bosc, 1828:258, pl. 5: fig. 1.

Sesarma cinerea.—H. Milne Edwards, 1837:75.—Gibbes, 1850:180.—H. Milne Edwards, 1853:182.—Stimpson, 1862:65.—Smith, 1870:157.—Ortmann, 1897:329 [in part].—Hay and Shore, 1918:449, pl. 36: fig. 11.

Sesarma (Holometopus) cinerea.—Rathbun, 1897a:90.—Tesch, 1917:141.

Sesarma (Holometopus) cinereum.—Rathbun, 1918:300, fig. 149, pl. 83.—Williams, 1965:222, fig. 206.—Abele, 1973a:377, figs. 1B, 1H.

Sesarma cinereum.—Abele and Kim, 1986:63, 671d.

Sesarma (Chiromantes) cinereum.—Williams, 1984:465, fig. 373.

MATERIAL EXAMINED.—Maryland: Arundel-on-the-Bay, Chesapeake Bay, 1♂, 5♀, W.P. Hay, USNM 22158.

North Carolina: Morehead City, 25♂, 15♀, 1971, L. Abele.

Florida: Apalachicola, 5♂, 4♀, USNM 49910; Alligator Harbor 6♂, 12♀, 5 ovigerous ♀, UMML; Cedar Keys, 32♂, 49♀, USNM 6413; Sarasota Bay, 1♂, 1♀, USNM 71160; Gasparilla Island, Tampa, 1♀, USNM 15261; Tampa Bay, 1 ♂, 4♀, USNM 26113; Inglewood, 3♀, USNM 74545; Naples, Collier County, 5♂, 6♀, USNM; Daytona, 1 ♀, USNM 71158; Jupiter, 1♂, 5♀, UMML.

Mexico: Vera Cruz, 9♂, USNM 99827.

DESCRIPTION.—Carapace wider than long (cl/cb = 0.875±0.041 in males, 0.874±0.025 in females), slightly convex medially, more so laterally. Granules dorsally, some with tufts of pubescence especially laterally where granules form short rugae. Interorbital region subdivided into four lobes, median pair slightly larger than lateral. Frontal region with lateral margins straight to slightly expanded; distal margin sinuous with median sinus. Frontal region 0.573±0.027 carapace breadth in males, 0.577±0.012 in females.

Eyes well developed, pigmented.

Chelipeds sexually dimorphic, larger, with palm more inflated in males. Posterior medial margin of merus granulate; anterior margin toothed, expanded distally. Carpus covered with low granules. Low rows of granules on chelae; large and prominent on medial surface in males. Movable finger slightly widened at proximal margin in males, less so in females. Tips of fingers spoon-shaped.

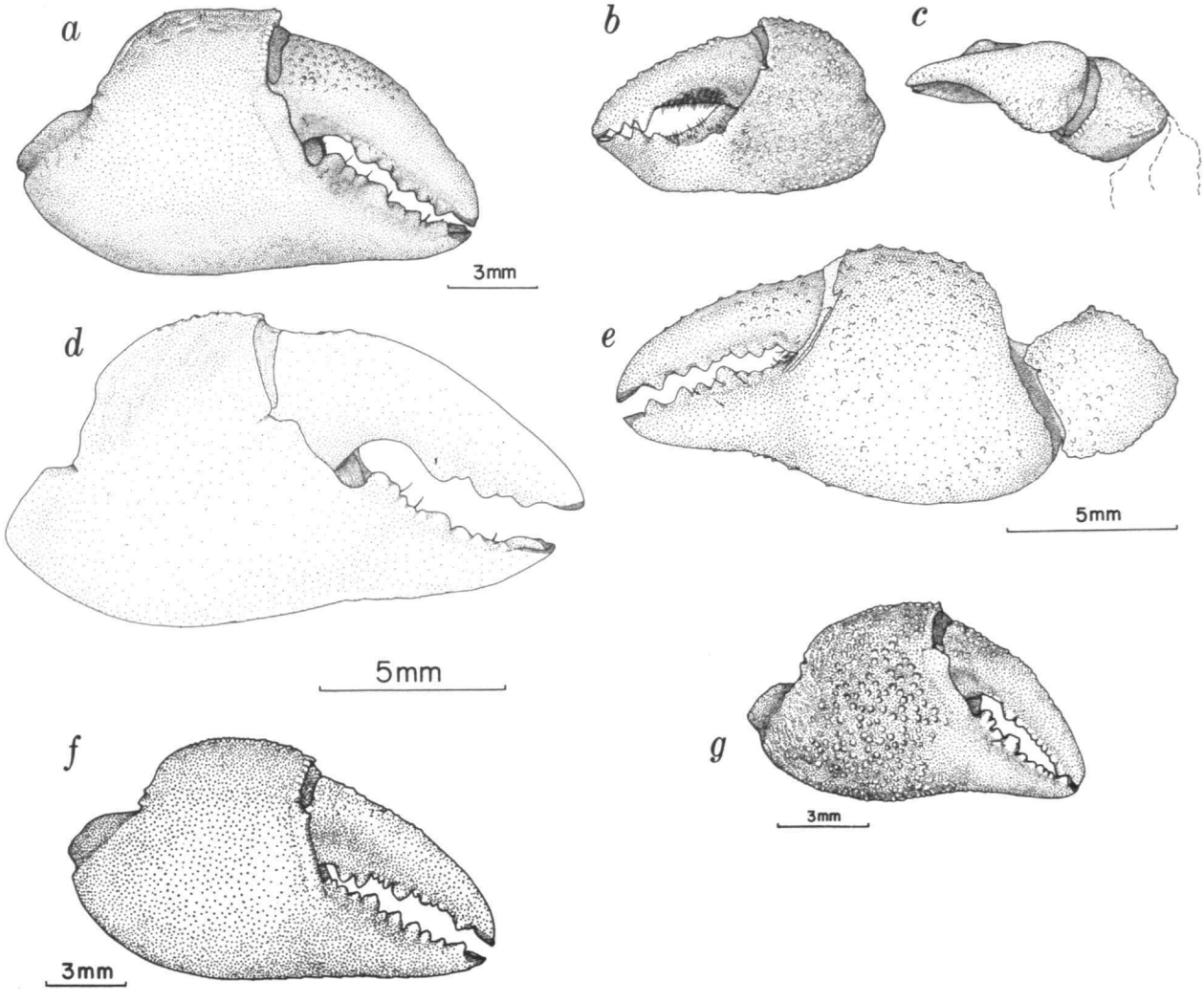


FIGURE 22.—Chelae, *a-b, d-g*, outer view; *c*, dorsal view: *a, Armases cinereum; b,c, A. benedicti; d, A. magdalenense*, paratype; *e, A. angustum; f, A. americanum; g, A. occidentale*.

Walking legs long and relatively slender, merus of third (fourth pereiopod) with l/w ratio 2.65±0.11 in males and 2.65±0.14 in females. Third leg with merus slightly more than twice as long as carpus; propodus about 0.6 merus length, slightly longer than dactylus. Propodi and dactyli of last two legs armed with short black spines on ventral margin of propodus and ventral and dorsal margins of dactylus.

Male abdomen subtriangular in outline; length and width of telson subequal. Female abdomen subcircular in outline; telson slightly wider than long.

Male gonopod relatively short and robust; simple, unarmed and curves laterally proximal to amber-colored endpiece. Distinct (but variable in size) expansion on medial surface of gonopod just proximal to endpiece. Female gonopore distinctly raised above level of sternum. Medial portion greatly expanded distally and raised above rim of gonopore.

MEASUREMENTS.—Mature males cb 10.0 to 18.0 mm; mature females cb 11.2 to 17.2 mm, which was also the size range of ovigerous females.

TYPE.—The type is presumably no longer extant (Rathbun, 1918).

TYPE LOCALITY.—*"la Caroline"* (Bosc, 1802).

DISTRIBUTION.—Magothy River, Chesapeake Bay, Maryland, to Palm Beach County on the east coast of Florida; Collier

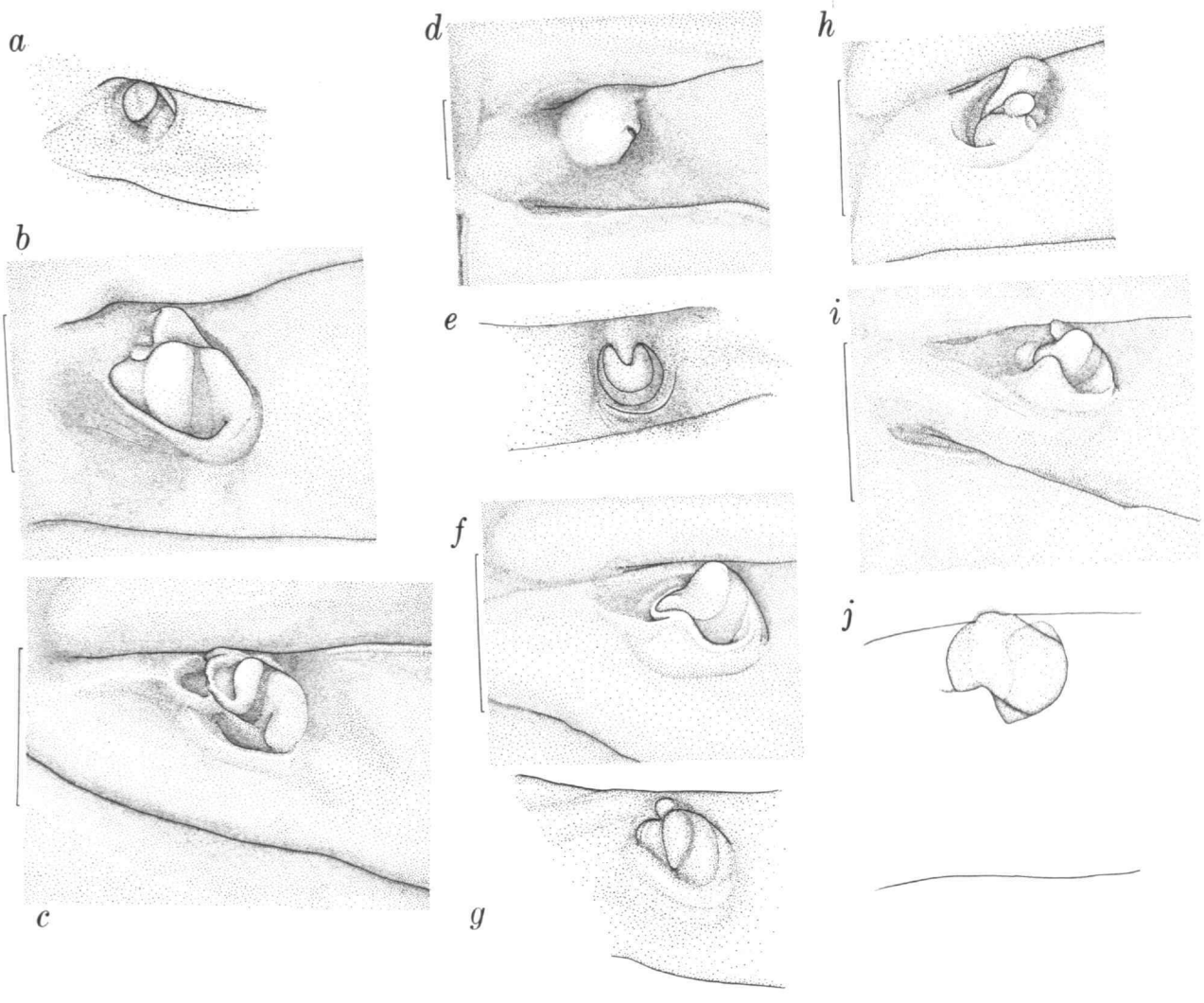


FIGURE 23.—Gonopores: *a, Armases benedicti,* right, Venezuela (USNM 197365); *b, A. cinereum,* Dauphin Island; *c, A. ricordi,* Honduras; *d, A. americanum,* Panama; *e, A. roberti,* Dominica (USNM 126897); *f, A. angustipes,* Brazil; *g, A. miersii,* Bahamas (type, USNM 11372); *h, A. angustum,* Panama; i, A. occidentale, Panama; *j, A. magdalenense,* Peru.

County on the west coast of Florida to Vera Cruz, Mexico. Records of this species from the West Indies and elsewhere were based on misidentified material (Abele, 1973a).

HABITAT.—*Armases cinereum* occurs from the high intertidal to more than 50 m inland in a wide variety of habitats. Individuals are common among rubble and litter above the intertidal, in high areas in *Spartina* and in drier areas of *Rhizophora* swamps. Specimens were also collected from the edge of a pine woods and in grassy areas adjacent to marshes.

Armases ricordi (H. Milne Edwards, 1853), new combination

FIGURES 23*c*, 26, 27

Sesarma Ricordi H. Milne Edwards, 1853:183.
Sesarma guerini H. Milne Edwards, 1853:183.
Sesarma miniata de Saussure, 1858:442.
Sesarma angustipes.—Stimpson, 1858:106; 1859:66; 1862:66.—Smith, 1870:159.—Kingsley, 1880:214 [part, not Brazilian material].—De Man, 1892a:253, pl. 10: fig. 5.—Stimpson, 1907:136.

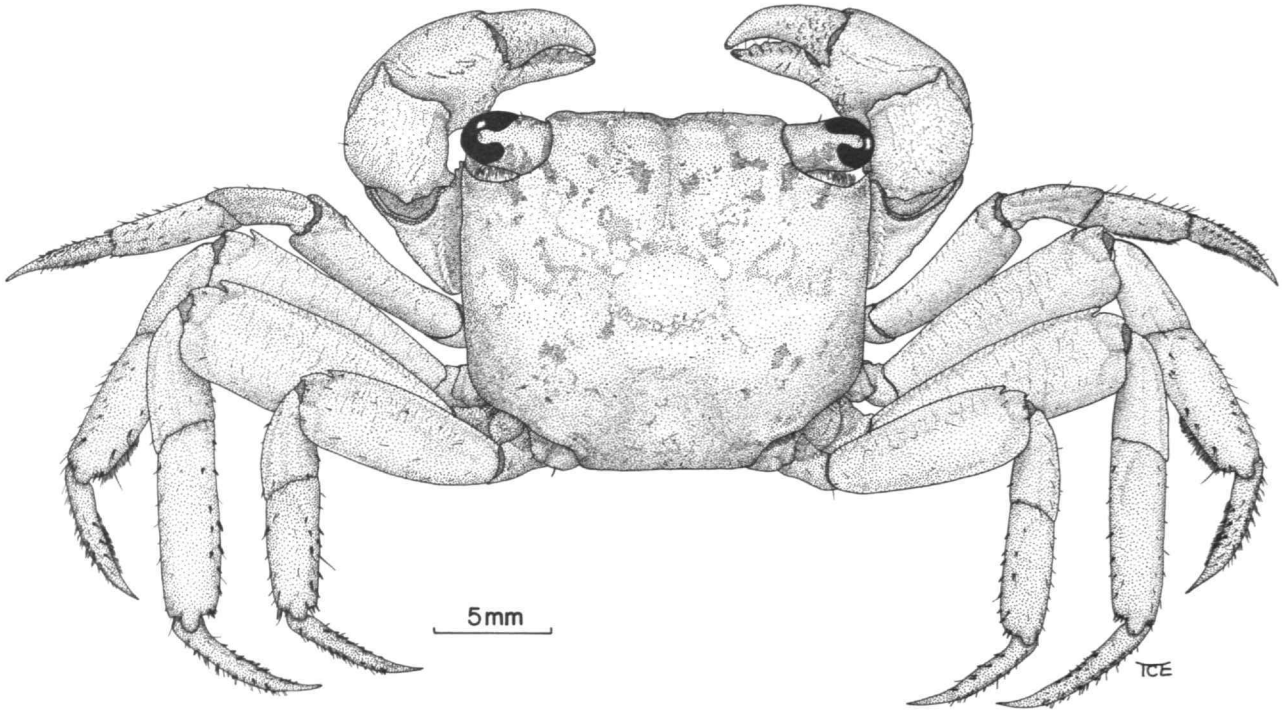


FIGURE 24.—*Armases cinereum*, male, Dauphin Island, Alabama.

?Sesarma angustipes.—Smith, 1869:37 [part, not Brazilian material].

Sesarma ricordi.—Von Martens, 1872:110.—Ortmann, 1894:719.—Diaz and Ewald, 1968:225.—Von Hagen, 1977:37.—Fimpel, 1975:190 [part = *S. angustipes*].—Rodriguez, 1980:384, lam. 60, fig. 107.—Abele and Kim, 1986:63, 671b.

Sesarma stimpsonii Miers, 1881:70 [not *S. stimpsonii* Miers, 1886].

Sesarma cinerea.—Ives, 1891:181.—Heilprin, 1888:320.

Sesarma Ricordi var. *terrestris* Verrill, 1908a:119; 1908b:328, pl. 11: fig. 3.

Sesarma (Holometopus) ricordi.—Rathbun, 1897a:91.—Tesch, 1917:191.—Rathbun, 1918:308, pl. 89 [part, not Brazilian material].—Holthuis, 1959:246, pl. 11: fig. 3.—Hartnoll, 1965:113, 133, figs. 10A, 11A,C, 12.—Chace and Hobbs, 1969:183, fig. 62k.—Abele, 1973a:378, fig. 1j.

Not *Sesarma ricordi*.—Sattler and Sattler, 1965:411, figs. 3, 4 [= *S. angustipes*].

Sesarma ricordi.—Von Hagen, 1967:178; 1968:139; 1975:301.

Not *Sesarma (Holometopus) ricordi*.—Coelho and Ramos 1972:203 [= *?S. angustipes*].

MATERIAL EXAMINED.—Bermuda: Hamilton Island, 7♂, 10♀, MCZ 9116; Hungry Bay, 1♀, MCZ 9121; 1 ovigerous ♀, MCZ 6221; 2♂, 1♀, AMNH 4593, 10833, 89.

Florida: Shell Key off St. Petersburg, Pinellas Co., 5♂, USNM 75554; Naples, Collier Co., 2♂, 3♀, USNM; Key Biscayne, Dade Co., 4♂, 2♀, 1 ovigerous ♀, UMML; Coconut Grove, Dade Co., 1♂, 5♀, USNM 58430; Bahia Honda, Monroe Co., 1♂, USNM 48581; Key West, Monroe Co., 11♂, 6♀, 2 ovigerous ♀, USNM 71151, 71166, 71295, 71298; Key West, Monroe Co., 14♂, 16♀, 1 ovigerous ♀, 1 juvenile, MCZ 6214, 6215, 6218, 9151; Tortugas, 3♂, 1♀, 2 ovigerous ♀, MCZ 6217.

Bahamas: Andros Island, 1♀, MCZ 8640; Alicetown, 1♀, MCZ 11678; Bimini, 5♂, 1♀, 2 ovigerous ♀, AMNH 10834, 1412; 3♂, 1♀, 1 ovigerous ♀, AMNH 2299, 6648.

West Indies: Cuba: Cienfuegos Bay, 1♀, MCZ 8410; Paradones, 2 ovigerous ♀, AMNH 3161; 2♂, 1♀, AMNH 3172.

Jamaica: 1♂, MCZ 1414.

Hispaniola: Aux Cayes, 3♂, 1♀, MCZ 6220; Santa Barbara de Samana, 1♂, MCZ 9845; Porta Playa, 1♂, 1♀, 1 juvenile, MCZ 9864; 1♂, 2♀, 1 ovigerous ♀, AMNH 2430.

Puerto Rico: 9♂, 1♀, 3 ovigerous ♀, 3 juveniles, AMNH 2586, 2700, 2749, 2989, 2778, 2766.

Saint Thomas: 7♀, MCZ 6222.

Saint John: Hurricane Hole, 2♂, 4♀, AMNH 13096; May Creek, 1♂, 1♀, AMNH 13087; 1♀, AMNH 13052.

Saint Croix: Salt River, 4♂, 1♀, 5 ovigerous ♀, AMNH 13042.

Tobago: Doctor's River, Speyside, 1♀, AMNH 13855.

Trinidad: 1♀, MCZ 9563.

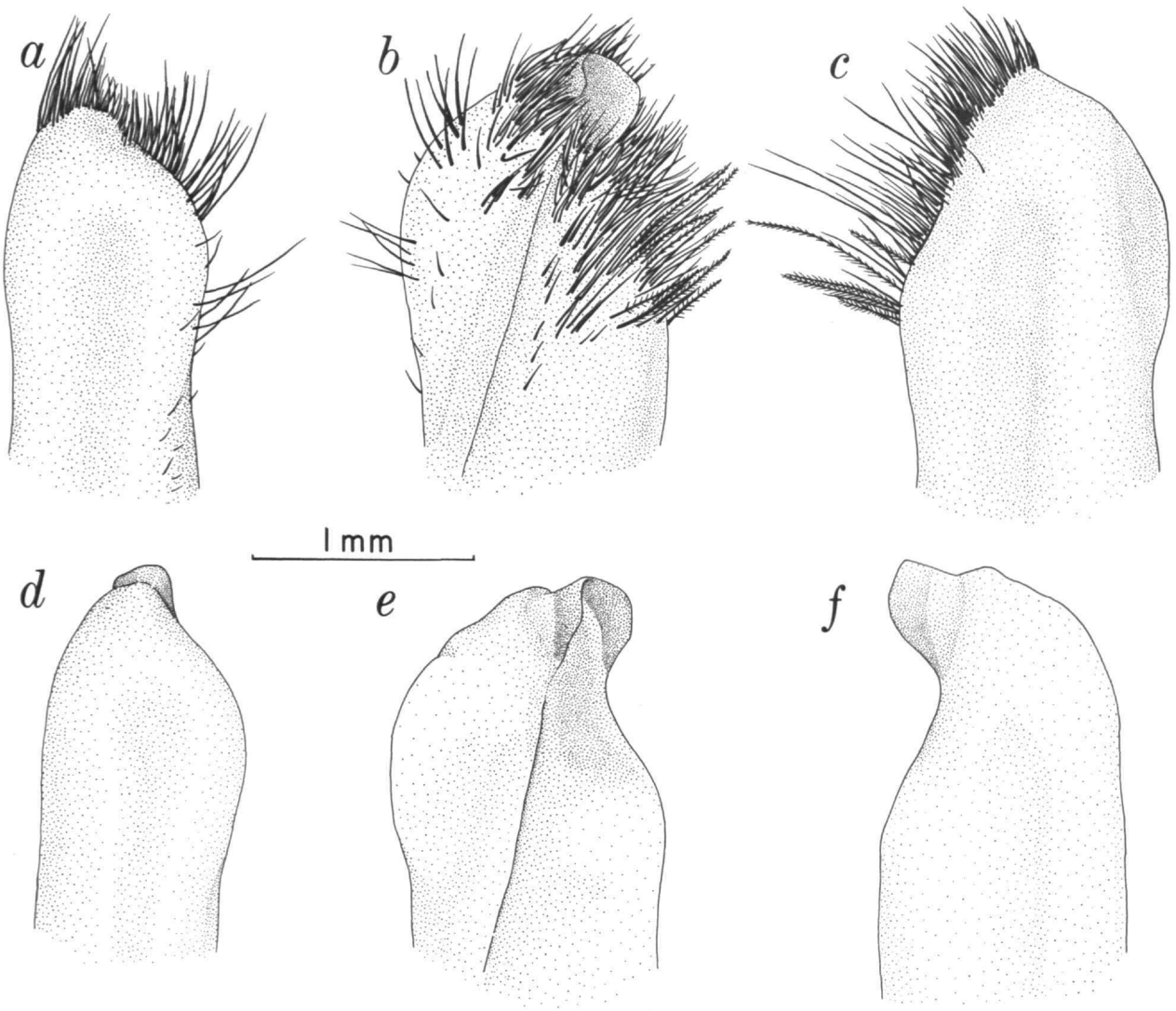


FIGURE 25.—*Armases cinereum*, gonopods.

Nicaragua: ?Corinto (note in jar has ? as to locality; almost certainly not this locality, which is eastern Pacific), 1♀ (ovigerous), MCZ 6223.

Panama: Colon, 1♂, 1♀, MCZ 1307; Fort San Lorenzo, 1♂, 1♀, USNM; Galeta Island, 11♂, 9♀, USNM; Maria Chiquita 2♂, USNM.

Colombia: Turbo, 1 ovigerous ♀, MCZ 1347; 1♀, AMNH 2570.

Guyana: 1♂, AMNH 2632.

DESCRIPTION.—Carapace slightly wider than long; cl/cb = 0.951±0.012 for males and 0.933±0.019 for females. Carapace narrows slightly posterior to anterolateral angle then widens; sides subparallel posteriorly. Carapace almost flat in midline, convex laterally giving slightly inflated appearance. Some specimens with dorsal surface covered with widely spaced pubescence tending to form clumps anteriorly; other specimens with carapace naked. Interorbital region subdivided into four lobes. Frontal region distinctly widens distally; 0.542±0.06 of carapace breadth in males, 0.523 ±0.10 in females.

Eyes well developed and pigmented.

Chelipeds sexually dimorphic; smaller and weaker in

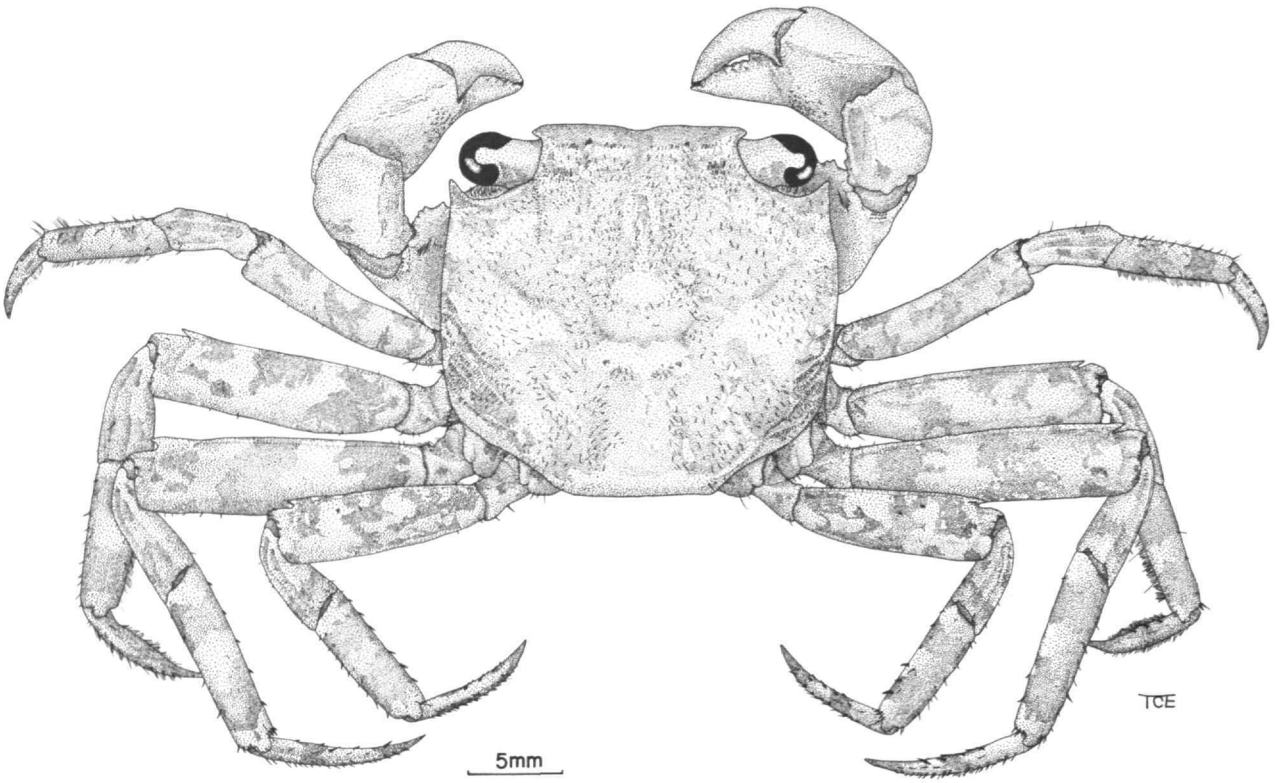


FIGURE 26.—*Armases ricordi*, female, Honduras.

females. Posterior medial edge of merus roughly granular; anterior edge toothed, expanded distally. Carpus weakly granular on distal surface. Palm smoothly punctate with few granules on medial surface. Movable finger widens proximally in males.

Walking legs long, relatively slender; ml/mw ratio varies with size; about 2.55 to 2.70 in small animals; in large animals about 3.0. Third leg (fourth pereiopod) with carpus about 0.5 length of merus; propodus distinctly longer than carpus; dactylus slightly shorter than propodus. Propodi and dactyli armed with small, black spines; on ventral margin of propodus and on both ventral and dorsal margin of dactylus.

Male abdomen subtriangular in outline; telson slightly longer than wide. Female abdomen subcircular in outline; length and width of telson subequal.

Male gonopod simple, unarmed. Endpiece short, blunt, terminating slightly lateral to midline of gonopod. Female gonopore slightly raised from sternum. Two depressions at base; one posterior, one medial. Operculum roughly saddle-shaped to compressed barbell shape.

MEASUREMENTS.—Mature males, cb 10.7 to 18.6 mm; mature females, cb 10.0 to 18.1 mm; cb of ovigerous females ranged from 15.1 to 17.0 mm.

TYPE LOCALITY.—Haiti.

TYPE.—The type specimen is in the Muséum National d'Histoire Naturelle, Paris.

DISTRIBUTION.—Southern Florida north to Fort Pierce on the east coast and to St. Petersburg on the west coast; Bermuda; Bahamas; West Indies; coast of Central America and South America to Surinam. Records of this species from other localities were based on misidentified material (see Abele, 1972, 1973a).

HABITAT.—*Armases ricordi* is one of the more terrestrial species in this group. It occurs among supratidal litter to several hundred meters inland. Specimens were collected from dry areas above mangrove swamps, in pinewoods on islands in Dade County, Florida, in grass above sandy beaches and among limestone rubble at the edge of a reef flat. Verrill (1908a,b) records a "variety" of this species from dry upland fields in Bermuda but doesn't say how far these were from water.

REMARKS.—The identification of this species has been difficult in the past and it has been confused with several other *Armases* species. Males cannot be confused with any other species now that the gonopod has been adequately illustrated

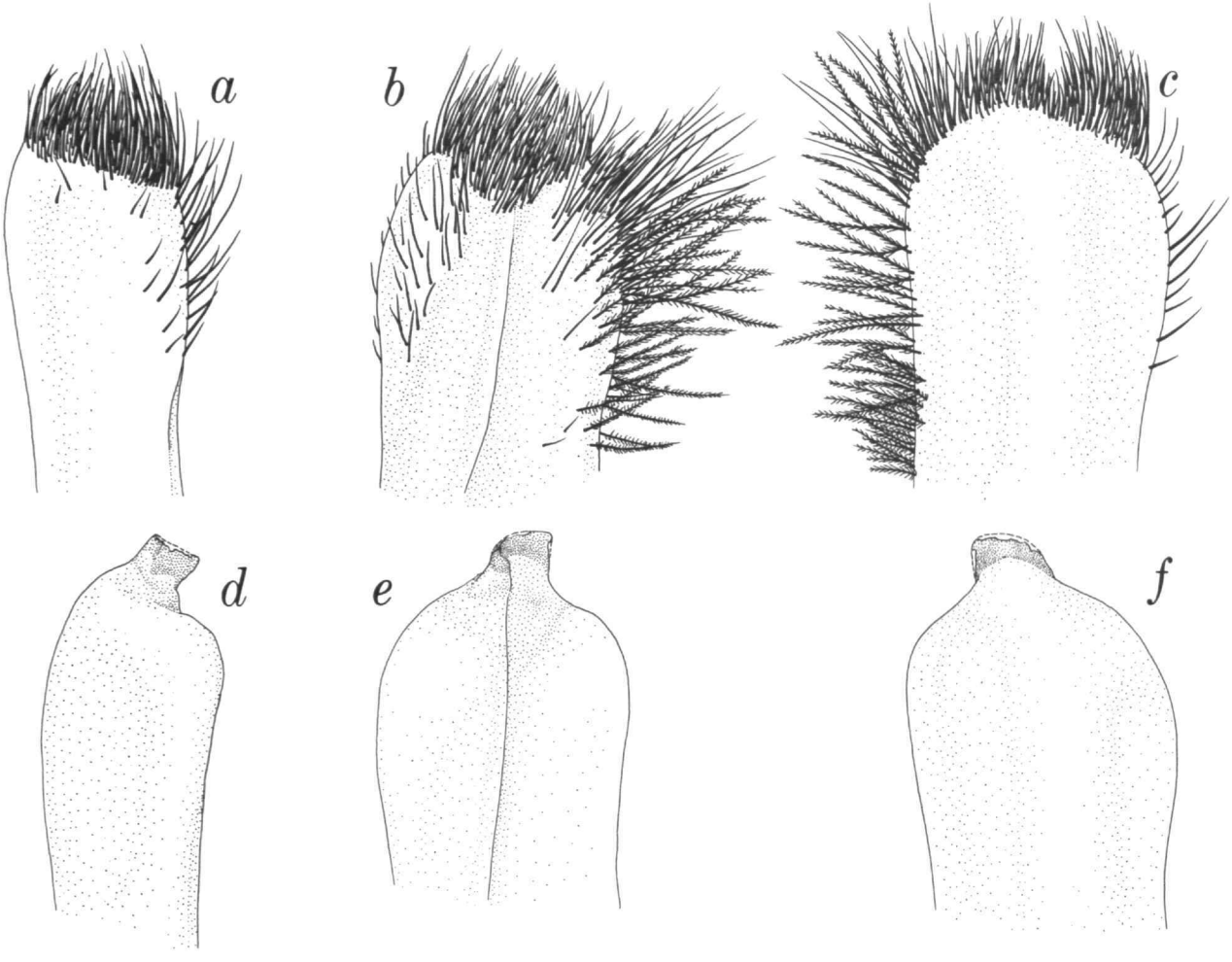


FIGURE 27.—*Armases ricordi*, gonopods, Panama.

by several authors. The female gonopore, figured here, will also serve to distinguish *S. ricordi* from other species.

Armases americanum (de Saussure, 1858), new combination

FIGURES 22*f*, 23*d*, 28*a-c*, 29

Sesarma americana de Saussure, 1858:441 [type locality: Saint Thomas].

Sesarma (Holometopus) tampicense Rathbun, 1914:124, fig. 4, pl. 8 [type locality: Tampico, Mexico].

Not *Sesarma americana*.—Pocock, 1889:7 [= *Sesarma roberti* H. Milne Edwards].—Tesch, 1917:130 [= *Sesarma roberti*].—Rathbun, 1918:311 [= *Sesarma roberti*].

Sesarma (Holometopus) tampicense.—Rathbun, 1918:307, fig. 151, pl. 88.

Sesarma (Holometopus) americanum.—Chace and Hobbs, 1969:178, fig. 62a-f.

MATERIAL EXAMINED.—Mexico: Tampico, 4♂ (includes holotype of *Sesarma tampicense*), 1 Jun 1910, Edward Palmer, USNM 45794.

Honduras, Belize: 2♀, F.E. Meehling, USNM 3286; Rio Sartoon I 20 miles above mouth, 1♂, 1♀, 29-30 Apr 1947, Miller and Holloway, USNM Acc. 174756; Rio Aquan, ~0.5 mile [~1.0 km] from mouth, 1♂, 1♀, 16 Aug 1969, C. Swift.

Guatemala: Isabal, 1.5 miles [2.4 km] W of Livingston, 1♀, Cueva de la Coche, 21 Aug 1969, S. and J. Peck, USNM 128415.

Costa Rica, Caribbean coast, Rio Grand: 1♀, AMNH 2337; 1♀, AMNH 2603.

Panama, Caribbean coast: small stream adjacent to old fort at Portobelo, 1♂, 1 specimen, 14 May 1969, L. Abele, J. Graham; same locality, 16♂, 13♀, 2 ovigerous ♀, 14 Mar 1977, L. Abele, K. Heck; in Panama Canal, dock at Barro Colorado Island, 1♂, 20 Jul 1969, T. Zaret; small stream adjacent to

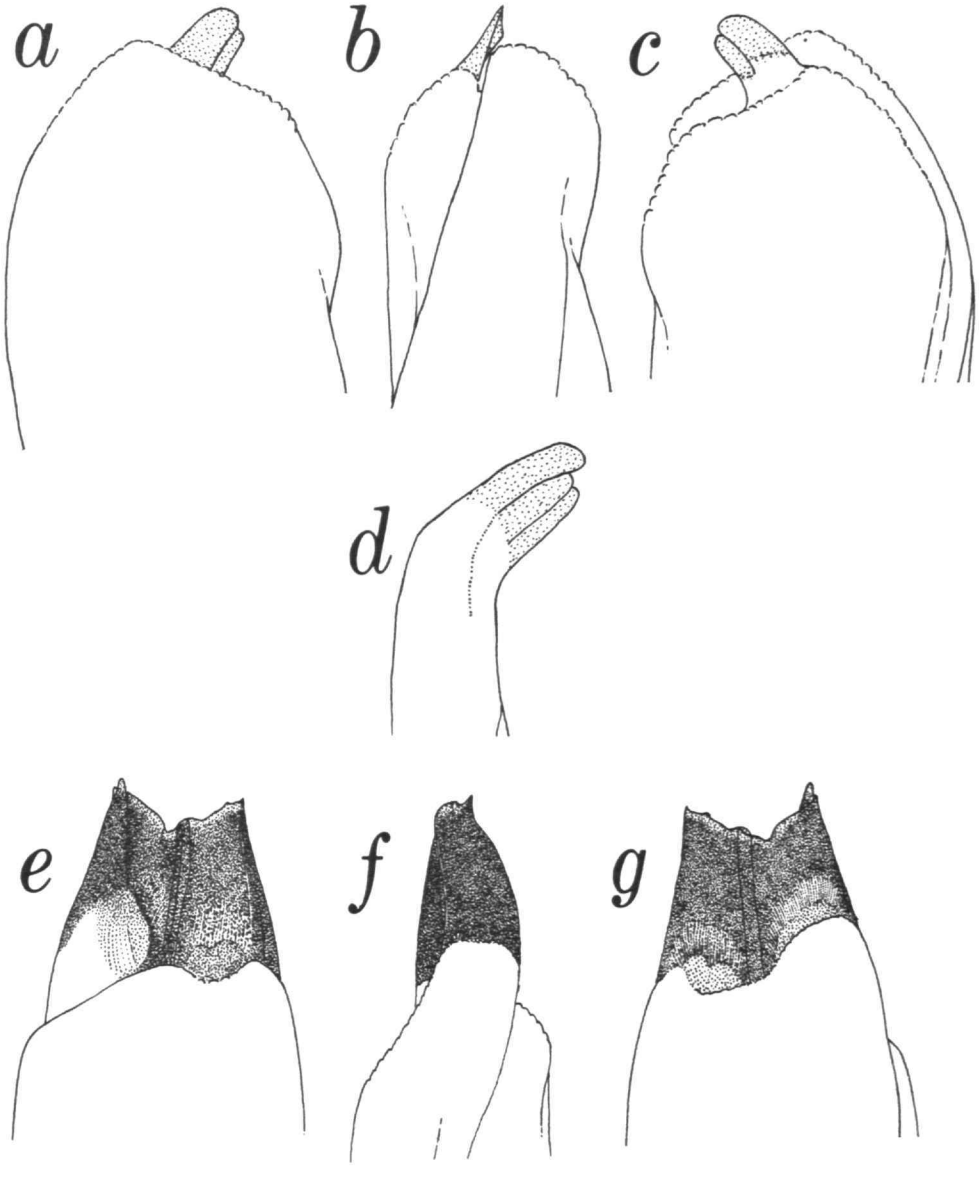


FIGURE 28.—Gonopods: *a–c, Armases americanum* (from Chace and Hobbs, 1969, fig. 62*a–c*); *d, A. benedicti,* Brazil (from Abele, 1973a, fig. 1g); *e–g, A. roberti* (from Chace and Hobbs, 1969, fig. 62*l–m*).

Gatun Locks of Panama Canal, 3♀, 31 Jan 1971, L. Abele, T. Biffar; small stream adjacent to Fort San Lorenzo, 1♂, 15 Jul 1969, L. Abele.

DESCRIPTION.—Carapace slightly wider than long (cl/cb of males 0.950±0.016, and 0.914±0.051 in females. Carapace increases slightly in width posteriorly with a slight emargination posterior to outer orbital angle; slightly convex laterally and medially. Low but distinct granules on the dorsal surface, especially in center. Laterally granules form about six or seven oblique ridges. Interorbital region subdivided into four lobes, medial pair larger than lateral. Lateral margins of frontal region subparallel and at the widest point iw/cb = 0.525±0.008 in males and 0.540±0.016 in females.

Chelipeds sexually dimorphic. In both sexes merus with medial posterior and anterior edge serrated, especially in males. Carpus covered with granules, acute along margins in mature males. Chelae of both sexes granulate; in mature males chelae swollen with subacute granules on medial surface. Fingers

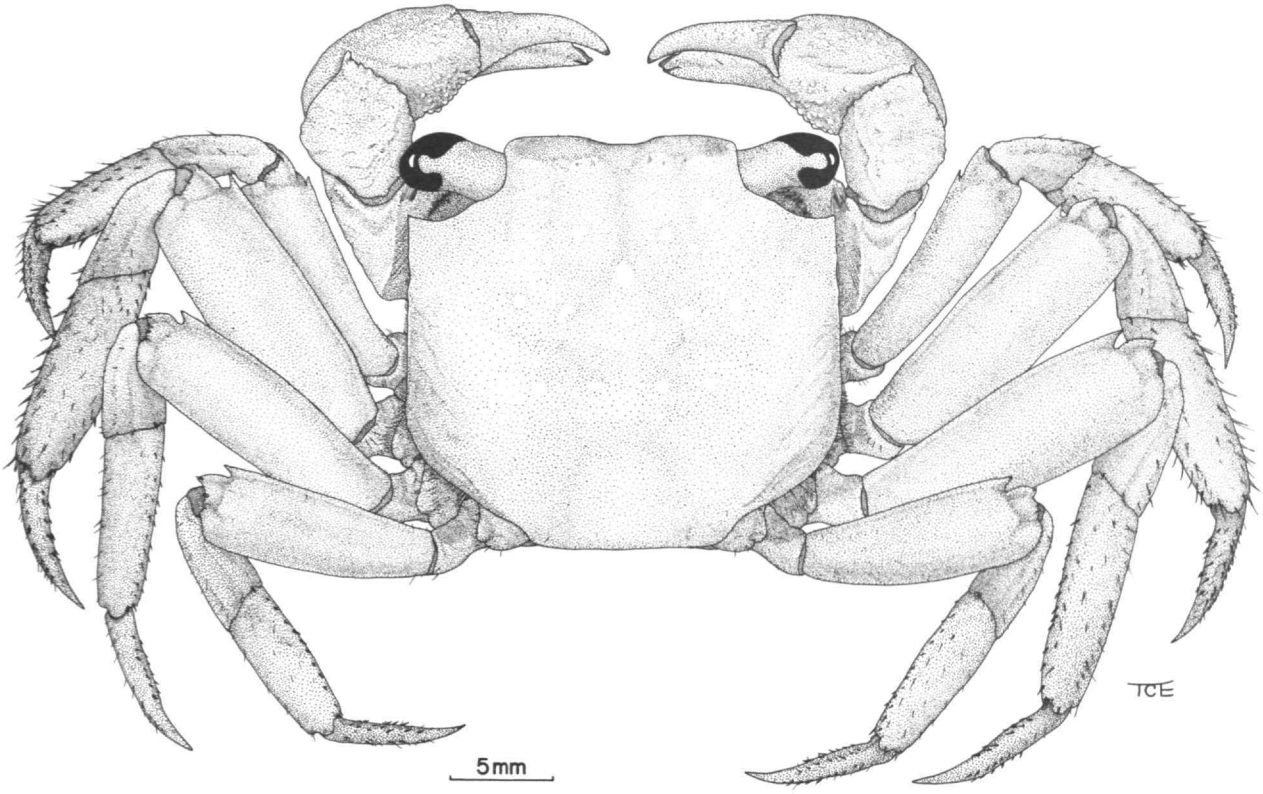


FIGURE 29.—*Armases americanum*, male, Barro Colorado Island, Panama.

come together at narrow spoon-shaped tips.

Walking legs are long and relatively slender, l/w ratio of third walking leg varies with size; about 3.0 in large males and 2.70 in females, swollen in smaller individuals of both sexes. Merus of fourth pereopods about three times as long as carpus; carpus shorter than propodus; dactylus about 0.7 length of propodus.

Male abdomen subtriangular in outline; telson length slightly greater than breadth. Mature female abdomen subcircular in outline.

Male gonopod simple, unarmed; amber-colored end piece small, partially recessed. Female gonopore slightly elevated with a short, lateral suture.

MEASUREMENTS.—Mature males 12.8 to 22.6 mm; mature females 12.7 to 21.0 mm; ovigerous females 18.5 to 18.6 mm.

TYPE LOCALITY.—St. Thomas (probably in error).

TYPE.—Syntypes are deposited in the Museum d'Histoire Naturelle in Geneva, Switzerland (Chace and Hobbs, 1969).

DISTRIBUTION.—Tampico, Mexico; Honduras; Caribbean coast of Costa Rica and Panama.

HABITAT.—The species has been reported from "soft mud of river banks" (Rathbun, 1918:308). In Panama *A. americanum* is common among and under rocks and rubble and among vegetation in small freshwater streams flowing into the Caribbean. Large adults were collected from burrows and crevices in the banks of streams, but it is not known whether the crabs formed the burrows. Most of the streams were less than two meters in width and 0.25 meter depth in shaded areas. A large male was collected on the boat dock at Barro Colorado Island in the Panama Canal, which is adjacent to a small stream.

Crabs were very common from approximately 150 m above the mouth of the stream. The male collected at Barro Colorado was about 5 km from the sea, and a specimen from Honduras was said to have been collected 20 miles [32 km] from the river mouth. Based on my collections the species appeared to be most common from about 150 m to 1 km above the mouth of the stream. Specimens from Portobelo were found with pseudothelphusid crabs. The eggs are small and numerous, suggesting an estuarine or marine larval development.

REMARKS.—*Armases americanum* is similar morphologically and ecologically to *A. roberti*. They can be easily distinguished by the male gonopods and female gonopores (see illustrations and key). Both species are much more variable in their carapace features than was previously thought. There are

specimens of *A. americanum* from Guatemala (USNM 128415) that externally are nearly identical to *A. roberti* but based on the more reliable gonopods and gonopores are clearly *A. americanum.*

Reexamination of maternal in various museums has shown all mainland material identified as *A. roberti* actually to be *A. americanum,* and all West Indian material identified as *A. americanum* to be *A. roberti.* At present *A. americanum* appears to be absent from the West Indies and *A. roberti* absent from the mainland. Although de Saussure (1858) listed Saint Thomas as the type locality, the species has never been reported from that island. Chace and Hobbs (1969) figured the gonopod of a male syntype of *A. americanum* leaving no doubt that this is the common mainland species.

Armases roberti (H. Milne Edwards, 1853), new combination

FIGURES 23*e*, 28*e-g*, 30

Sesarma roberti H. Milne Edwards, 1853:182.—Guinot, 1988:8.
Sesarma americana.—Pocock, 1889:7 [not *S. americanum* de Saussure].
Sesarma bromelium Rathbun, 1896:143.
Sesarma (Holometopus) roberti.—Rathbun, 1897a:90.—Tesch, 1917:193.—Rathbun, 1918:312, pl. 91.—Monod, 1956:443, figs. 602-604.—Chace and Hobbs, 1969:184, figs. 60, 621-62n.
Sesarma (Holometopus) angustipes.—Rathbun, 1918:311, pl. 90.—Hartnoll, 1965:113, 115, 131-133, 144, 146, figs. 10B, 11B,D, 15A,B [not *S. angustipes* Dana].
Sesarma miersi.—Rodriguez, 1980:383, fig. 106 [see p. 493].
Sesarma angustipes.—Rodriguez, 1980:393, fig. 108 [see p. 493].

MATERIAL EXAMINED.—Jamaica: Montego Bay, 1♂, 20♀, 29 Aug 1910, E.A. Andrews, USNM 42878; 8♂, 13♀, 3 Aug 1910, E.A. Andrews, USNM 42876; near Meneague, 1♂, W.G. Lynn, USNM 74544; Gray's Inn, 1♂, 1♀, 1928, C.R. Orcutt, USNM 61367.

St. Lucia: Port Castries, 1♂, USNM 22108.

Cuba: Bahia Honda, 2♂, 1♀, 1 ovigerous ♀, USNM 48580; Soledad, Cienfuegos, 1♂, J. Welsh, USNM 63312; Belmonte Brook, 1♂, 2♀, 23 Aug 1930, R. Dow, MCZ 8990.

Barbados: St. Joe's River, 3♂, 4♀, 20 Apr 1937, Smithsonian-Hartford Expedition, USNM 73317.

Haiti: Near Grant Anse River, 2♂, 2♀, W. Faxon, USNM 81357; same locality, 20♂, 29♀ (3 ovigerous), MCZ 6226; Diquini, 2♂, 3♀ (2 ovigerous), Nov 1912, W. Mann, MCZ 8939; Jeremie, 7♂, 3♀, D.F. Weinland, MCZ 1582.

Trinidad: 3♂, 2♀ (1 ovigerous), Oct 1971, J.M. Stonley, USNM 139302.

Santo Domingo: River 7 km SE of Porto Playa, Jul 1937, W.J. Clench, MCZ 9870; same locality, 1♂, 2♀ (2 ovigerous), MCZ 9865; Barbour Harbor, 3♀ (1 ovigerous), AMNH 10045.

Tobago: Speyside, Doctor's River, 2♂, AMNH 13835.

DESCRIPTION.—Carapace subquadrate (cl/cb = 0.98±0.01), length approximately equal to breadth; slightly convex anteriorly and laterally; lateral striae present; lateral margins converging slightly anteriorly; interorbital region subdivided into four distinct lobes, deep sinus medially, iw/cb = 0.54±0.005; lateral margins of frontal region parallel, anterior margin concave medially.

Eyes well developed, pigmented.

Chelipeds sexually dimorphic, female chelae relatively smaller and smoother than male. Posterior medial margin of merus weakly granular, anteromedial toothed, expanded distally; tuft of setae on distal interior surface. Carpus granular, granules large, sharp on flexor margin. Palm granular, medial surface with large, acute granules. Movable finger granular dorsally; both fingers with corneous spooned tips.

Walking legs long, relatively slender; merus of fourth pereiopod with length about three times width (ml/mw = 2.97±0.09). Propodus and dactylus with long black setae; propodus with short black spine ventrally; dactylus with short black spines on ventral and dorsal surfaces. Females with few setae and spines compared to males. Dactylus slightly shorter than propodus.

Male abdomen triangular in outline; width of telson subequal to length. Male gonopod straight; endpiece flattened with deep sharp sinus distally (V-shaped).

Female abdomen subcircular in outline; width of telson slightly greater than length. Female gonopore subcircular with small projection anteriorly; operculum raised with U-shaped portion around projection. Eggs small and numerous.

COLOR IN LIFE.—From Chace and Hobbs (1969:184-185):

Ground color of carapace tan to dark brown with cream to straw markings: hepatic and protogastric regions with one to four small subcircular cream spots, and protogastric region with larger spot adjacent to posteromesial margin; branchial regions with four or five spots, often smaller than those on hepatic and protogastric regions; mesogasric region often with pair of small spots forming transverse row with large posteromesial spots in protogastric region. Grooves delimiting mesogastric portion of carapace pale, particularly along posterior margin. Anterolateral and, to more marked degree, posterolateral portions of branchial region with series of subparallel, very thin, light lines directed parallel to posterolateral margin of carapace, lines short anteriorly but increasing in length posteriorly. Front dark brown to black.

Eyestalks dark red; cornea chartreuse, often with dark brown spot posterodorsally. Third maxillipeds cream with dark brown to buff fringes of setae. Chelipeds darker above than below; merus magenta fading ventrally to pinkish cream; carpus reddish purple above fading to pinkish mauve below; propodus purple on palm with gradation along base of immovable finger to orange, lower surface diluted with cream or white; dactyl mostly orange with bright red triangular spot at base of mesial surface. Pereiopods dark grayish brown above, bluish gray below; merus and carpus with irreular and variable darker brown and tan splotches; tip of dactyl yellowish straw; setae dark red. Sternum, basal podomeres of legs, and abdomen pinkish cream with reticulate pattern of bluish gray; sternal plate between chelipeds with mauve suffusion; margin of telson orange.

The females of this species seem to have a more regularly banded pattern on the walking legs than do the males, and even the chelipeds bear conspicuous bands and irregular markings.

MEASUREMENTS.—Males, cb 14.8 to 27.0 mm; females, cb 12.5 to 22.3 mm, ovigerous females cb 17.5 to 23.5 mm.

TYPE LOCALITY.—Goree, Senegal (almost certainly an error, Monod 1956).

TYPE.—Seven syntypes are in the Muséum National

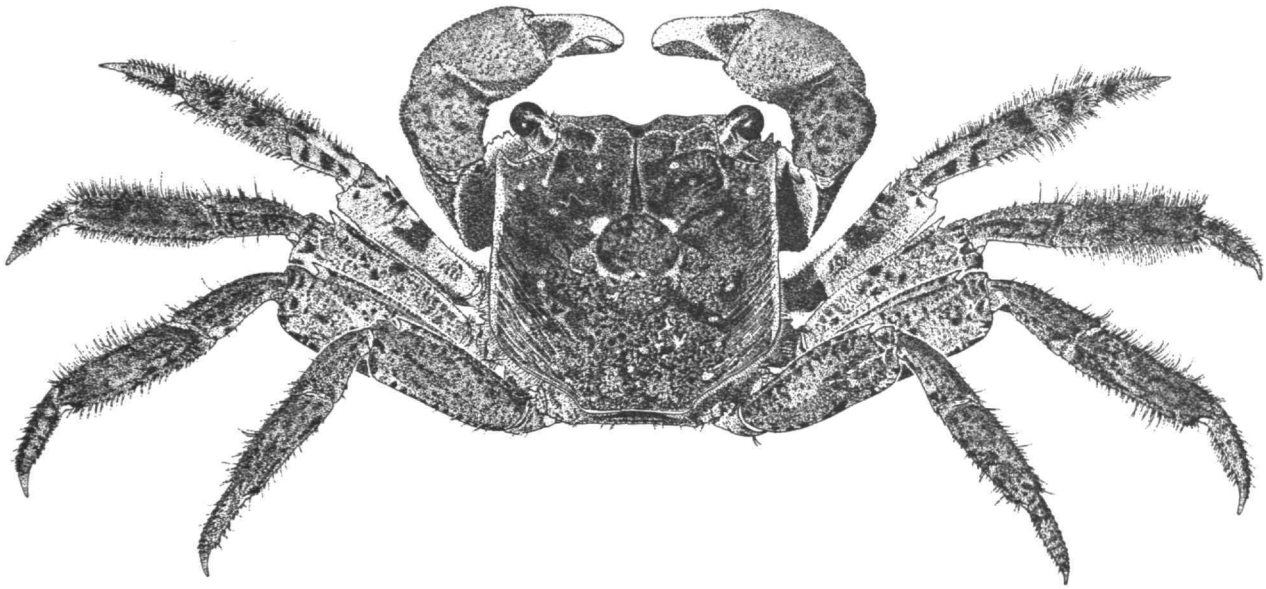


FIGURE 30.—*Armases roberti* (from Chace and Hobbs, 1969, fig. 60).

d'Histoire Naturelle, Paris (J. Forest, personal comm.); two syntypes are in the National Museum of Natural History, Smithsonian Institution.

DISTRIBUTION.—West Indies (Cuba, Jamaica, Hispaniola, St. Lucia, Barbados, Tobago, Trinidad). All of the material from the mainland of Central and South America reported to be this species belongs to other species. I have not seen any specimens collected on the mainland.

HABITAT.—*Sesarma roberti* is an extremely common semiterrestrial crab occurring along the banks of freshwater streams and seepage areas. Chace and Hobbs (1969) report them from just above sea level to about 330 m elevation. The same authors report ovigerous females at least 2.5 km upstream from the mouth of the Layou River on Dominica.

REMARKS.—There has been some confusion surrounding the nomenclatural status of this species. Monod (1956) and Chace and Hobbs (1969) have reviewed the problem.

Armases angustipes (Dana, 1852), new combination

FIGURES 23*f*, 31, 32*a-d*

Sesarma angustipes Dana, 1852:353; 1855, pl. 22: figs. 7a-c.—(?)Smith, 1869:37 [in part, reference to Brazil only].—Kingsley, 1880:214 [in part, reference to Brazil only].—Von Hagen, 1968:139; 1977:38.

Sesarma miersii Rathbun, 1897a:91 [in part, Brazilian material only].

Sesarma (Holometopus) miersii.—Rathbun, 1900:138; 1918:303 [in part, Brazilian material only].

Sesarma (Holometopus) miersii iheringi Rathbun, 1918:304, pl. 85.

Sesarma (Holometopus) ricordi.—Rathbun, 1918:308 [in part, Brazilian material only].

Sesarma ricordi.—Sattler and Sattler, 1965:411, figs. 3-4.—Fimpel, 1975:190 [part].

Sesarma miersii.—McWilliams, 1969:80, 3 pls.—Fimpel, 1975:190.

Sesarma (Holometopus) angustipes.—Abele, 1972:168, figs. 1A,D, 2A,D; 1973c:123, fig. 1.—Von Hagen, 1978:46.

Not *Sesarma angustipes*.—Stimpson, 1858:106 [= *Sesarma ricordi* H. Milne Edwards]; 1859:66 [? = *Sesarma ricordi*].—Smith, 1870:159 [= *Sesarma ricordi*].—Cunningham, 1871:493 [= *Metasesarma rubripes* Rathbun).—De Man, 1892a:253, pl. 10: fig. 5 [= *Sesarma ricordi*].—Rodriguez, 1980:393, fig. 108 [see p. 493].

Not *Sesarma angustipes?*—Miers, 1881:70 [= *Metasesarma rupripes*].

Not *Sesarma (Holometopus) angustipes*.—Rathbun, 1918:311, pl. 90 [= *Sesarma roberti* H. Milne Edwards].—Hartnoll, 1965:113, 115, 131-133, 144, 146, figs. 10B, 11B,D, 15A,B, table 6 [= *Sesarma roberti*].

Not *Sesarma miersi*.—Rodriguez, 1980:383, fig. 106 [see p. 493].

MATERIAL EXAMINED.—Bahamas: Andros Island, freshwater sinkhole (Uncle Charlies), 3♂, 2♀, G. Warner, Aug 1981, BMNH.

Mexico: Yucatan, Las Coloradas: On unpaved road from Rio Lagartos/San Felipe junction, under rock on margin of nearly dry salina about 1-2 km from sandy beach on Straits of Yucatan, 1♂, 1♀, 2 Mar 1981, D.L. Felder, S. Snatic, W.W. Foreman, University of Southwestern Louisiana.

Trinidad: Toco, mouth of Salybea River, under coconut husks, 3♂, 3♀, 23 Jul 1966, H. von Hagen, USNM 137890.

Brazil: Rio de Janeiro, 1♀, USNM 40822; Itaparica, State of Bahio, 1♀, USNM 40821; Cabedelo, State of Paraiba, 1♂, USNM 25712; State of São Paulo; 4♂, 3♀, USNM 47830, 122790; Desteoro (Florianopolis), 1♂, USNM 20312; Salvador, 1♂, USNM 48299 (holotype of *Sesarma (Holometopus)*

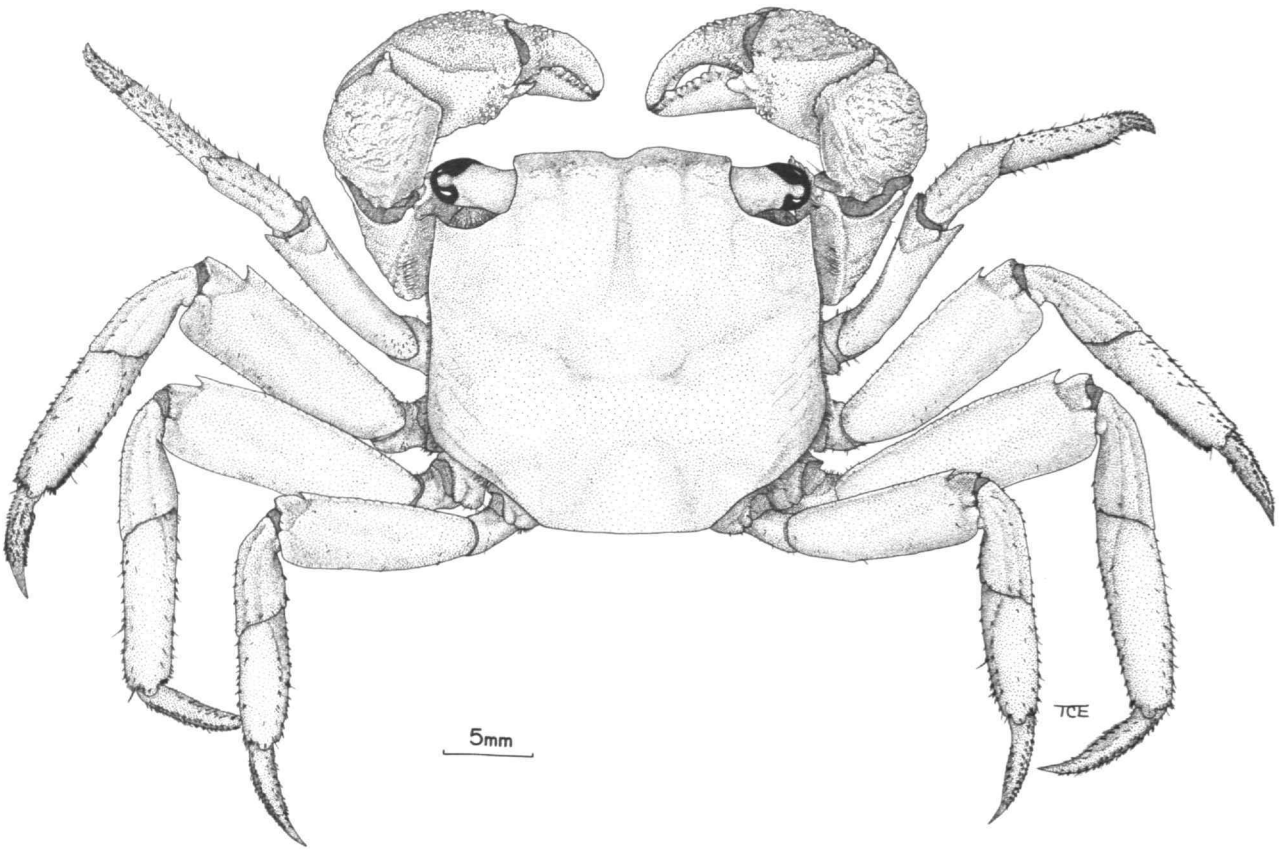


FIGURE 31.—*Armases angustipes*, male holotype of *Sesarma (Holometopus) miersii iheringi* Rathbun, Brazil.

miersii iheringi Rathbun, 1918).

DESCRIPTION.—Carapace slightly wider than long (cl/cb = 0.940±0.026 for males and 0.944±0.031 for females) with subparallel lateral margins; slightly convex laterally and medially with distinct regions. Carapace covered with low granules forming rugae laterally. Interorbital width slightly more than 1/2 carapace width (iw/cb = 0.532±0.032 for males and 0.545±0.025 for females); subdivided into four lobes, median pair being largest. Lateral margins of frontal region expanded distally; frontal margin concave medially. Carapace not inflated.

Eyes well developed, pigmented.

Chelipeds sexually dimorphic, although less so than in other species of genus. Posterior medial margin of merus serrated; anterior margin expanded with well-developed teeth. Carpus covered with closely packed granules forming raised rugae. Chela is covered with distinct granules larger medially than laterally, in a poorly defined ridge on dorsal surface. Male chelae more inflated than female and proximal portion of the movable finger wider in males than in females. Fingers meet in narrow spoon-shaped tips.

Walking legs long, relatively slender: ml/mw ratio of fourth pereopod 2.88±0.140 in males and 2.87±0.265 in females with larger individuals having larger ratios. Merus about twice length of carpus and about 1.25 times length of propodus; propodus slightly longer than dactylus. Propodi and dactyli armed with small black spines on ventral margin of propodus and on ventral and dorsal margin of dactylus; each with three rows of approximately 15 to 18 dorsal spines and two ventral rows of 6 to 10.

Male abdomen subtriangular in outline; length and width of telson subequal. Female abdomen semicircular in outline; telson wider than long.

Male gonopod simple, unarmed, curved laterally in distal portion. Amber-colored endpiece subrectangular in outline and, except for slight basal sinus medially, following outline of gonopod base; deep sinus at endpiece base laterally. Female gonopore distinctly elevated extending anteriorly. Rim of gonopore with lobe medially; operculum narrow medially and expanded laterally.

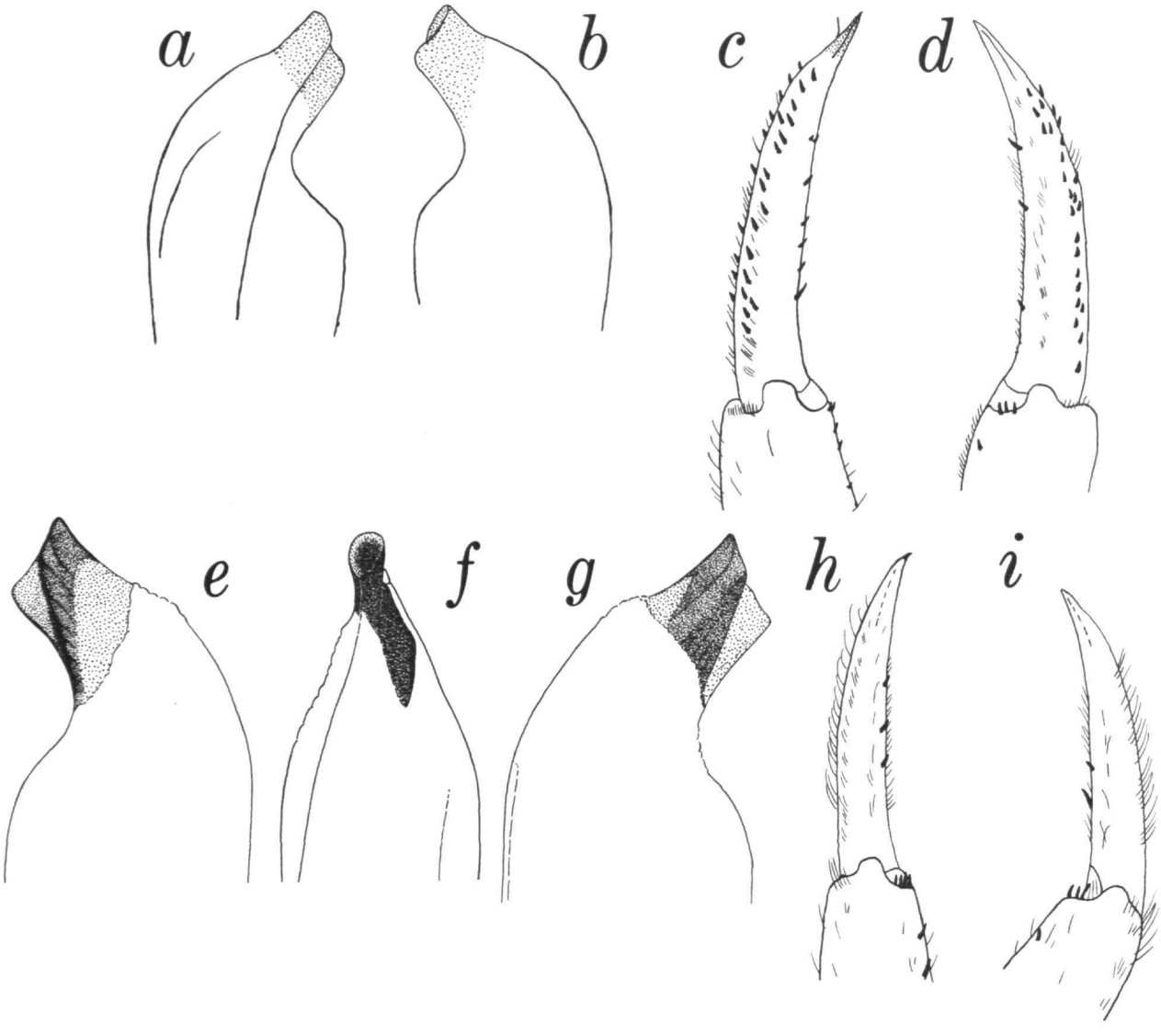


FIGURE 32.—*a,b,e,f,g*, gonopods; *c, d, h, i*, dactyls: *a–d, A. angustipes*, (USNM 48299); *e–i, A. miersii* (*e–g* from Chace and Hobbs, 1969, fig. 62; *a–d, h–i* from Abele, 1972, figs. 1, 2).

MEASUREMENTS.—Males, cb 16.2 to 24 mm; females, cb 14.8 to 18 mm.

TYPE LOCALITY.—South America (Dana, 1852) probably near Rio de Janeiro, Brazil (Smith, 1869; Chace and Hobbs, 1969).

TYPE.—No longer extant (Abele, 1972).

DISTRIBUTION.—Mexico, Yucatan; Bahamas, Andros Island; Trinidad; lower coast of Brazil.

HABITAT.—The species has been reported from the water of the basal leaves (tanks) of the following bromeliads: *Neoregelia cruenta* (R. Graham) L.B. Smith, *Wittrockia superba* Lindman, *Aechmea coelestis* (C. Koch) E. Mor, and *A. pectinata* Baker. The bromeliads were growing in partial shade on granite boulders along brackish streams. Data accompanying some other material from Brazil (Rathbun, 1900) indicates that the species were collected from mangrove areas. In 1982 I received some specimens that had been collected from a freshwater sinkhole in Andros Islands in the Bahamas and some additional specimens that had been collected from a nearly dry salina in Yucatan, Mexico.

Although bromeliads related to those listed above occur in Trinidad, the only data accompanying the specimens from that place indicated that they were collected under coconut husk at the mouth of the Rio Salybea at Toco. The habitat is similar to that described for the Brazilian material from bromeliads, but no bromeliads are mentioned. Von Hagen (1977) reviewed some aspects of the biology of *A. angustipes* and reported that crabs have been taken from tanks of bromeliads in Cocos Bay, Trinidad, but the specific identity of the crabs has not yet been determined.

The stomach contents of specimens collected from bromeliads include chitinous parts of insects, detritus, plant material, and many stellate trichomes, characteristic of bromeliads, suggesting that the crabs feed on the bromeliads. When disturbed the crabs moved quickly backwards into a leaf axis and could be removed from the plant only with difficulty. If the crabs were removed from the plant they would return immediately upon release (Sattler and Sattler, 1965).

McWilliams (1969) notes the adult specimens as having bluish black carapaces with orange markings on the dorsal surface and abdomen. Zahl (1975) presents a color photograph of this species.

REMARKS.—The taxonomic status of *A. angustipes* has been reviewed by Abele (1972, 1973c) and will be summarized here.

Dana (1852, 1855) in his report of the crustaceans of the United States Exploring Expedition described and illustrated *Sesarma angustipes* as a new species with the type locality as "South America." Smith (1869) pointed out that there can be little doubt that Dana's material of *S. angustipes* was collected at Rio de Janeiro, Brazil. Cunningham (1871) referred a specimen from Rio de Janeiro to *S. angustipes*. Miers (1881) doubtfully referred a male specimen from Rat Island, Montevideo, Uruguay, to *S. angustipes*. Miers examined Cunningham's specimen and concluded that his specimen and Cunningham's were identical. Miers was reluctant to refer his specimen positively to *S. angustipes* because he had received from the Smithsonian Institution material from Florida that had been identified as *S. angustipes*, and his specimen was "certainly not identical" with those from Florida. Miers believed that the Florida material had been identified by Dr. Stimpson. He then (p. 70) stated: "If the Florida species be not the true *S. angustipes*, Dana it may be designated *S. stimpsonii*." The specimens from Florida then became the type material of *S. stimpsonii* Miers, 1881. Miers later (1886:270) stated in a footnote: "I have proposed the name (Proc. Zool. Soc. Lond., p. 70, 1881) *Sesarma stimpsonii* as an alternative name for specimens [there is only a single specimen in the British Museum from this locality] from Monte Video." This, however, is incorrect as his earlier (1881) statement is quite clear as to the specimens to which the name *S. stimpsonii* referred. Rathbun (1897a) also recognized that Miers (1881) intended the name *S. stimpsonii* for the specimens from Florida, and correctly determined that *Sesarma ricordi* H. Milne Edwards, 1853, and *S. stimpsonii* Miers, 1881, were synonymous. (She had examined the types of both species.)

In the collections of the National Museum of Natural History, Smithsonian Institution, Washington, D.C., there is a large amount of material identified as *Sesarma angustipes* Dana, 1852. Hartnoll (1965) examined some of this material and additional material from Jamaica and concluded that *Sesarma angustipes* Dana, 1852, was a senior synonym of *S. roberti* H. Milne Edwards, 1853. Chace and Hobbs (1969) disagreed and kept the two species distinct until specimens with the distinctive frontal and pleopodal characters of the Caribbean species were found on the eastern or southeastern coast of South America.

The pertinent parts of Dana's description are as follows: frontal margin very slightly excavate at middle; carpus, hand and upper finger granulate, granules not serrate; hand entire above; eight posterior feet narrow, third joint three times as long as broad; tarsus elongate and spinulous. His figures show these characters. This description fits, in part, several species of *Armases* in the western Atlantic; notably *A. roberti*, *A. americanum* de Saussure, 1858, *A. ricordi* H. Milne Edwards, 1853, and *A. miersii iheringi* Rathbun, 1918. In their work on the West Indian decapods, Chace and Hobbs (1969) established the identity of *A. tampicense* Rathbun, 1914 (a junior synonym of *A. americanum*) and presented diagnoses and illustrations of three of the above-mentioned species. With this solid foundation it is possible to reexamine the status of *A. angustipes*. *Armases ricordi* and *A. roberti* are excluded as possible synonyms of *A. angustipes* because *A. ricordi* lacks granules on the hand, and the granules of *A. roberti* are serrate. *Sesarma americanum* is excluded because the dactylus, although there are a few spines present, cannot be considered spinulose. The species known today as *Armases miersii iheringi* seems to fit the description as well as possible and is the only species of the group that is known to occur in Brazil.

The diversity of habitats from which this species has been reported includes bromeliads, mangroves, an area adjacent to a river, a salt sinkhole, and a freshwater sinkhole. Unfortunately, only one or a few specimens are available from each habitat, yielding little information on morphological variation within and between sites. There are some morphological differences among the specimens, but it will take more material to determine whether one or more than one species is involved in the *angustipes-miersii* complex.

Armases miersii (Rathbun, 1897), new combination

FIGURES 23*g*, 32*e-i*, 33

Sesarma (Holometopus) miersii Rathbun, 1897a:91 [in part, material from Bahamas and Swan Island only].—Tesch, 1917:174.—Rathbun, 1918:303, pl. 84 [not material from Brazil].—Chace and Hobbs, 1969:180, figs. 59, 62g-i.—Abele, 1972:166, 167, figs. 1B,C, 2B,C; 1973a:380, fig. 1I.

Sesarma miersii.—Abele and Kim, 1986:63, 671c.—Guinot, 1988:8.

Not *Sesarma miersii*.—Rathbun, 1900:138 [= *S. angustipes*].—Verrill, 1908b:331 [= *S. ricordi*].—Hartnoll, 1965:133 [= *S. ricordi*].—McWilliams, 1969:80, 3 pls. [= *S. angustipes*].—Fimpel, 1975:190 [*S. angustipes*].

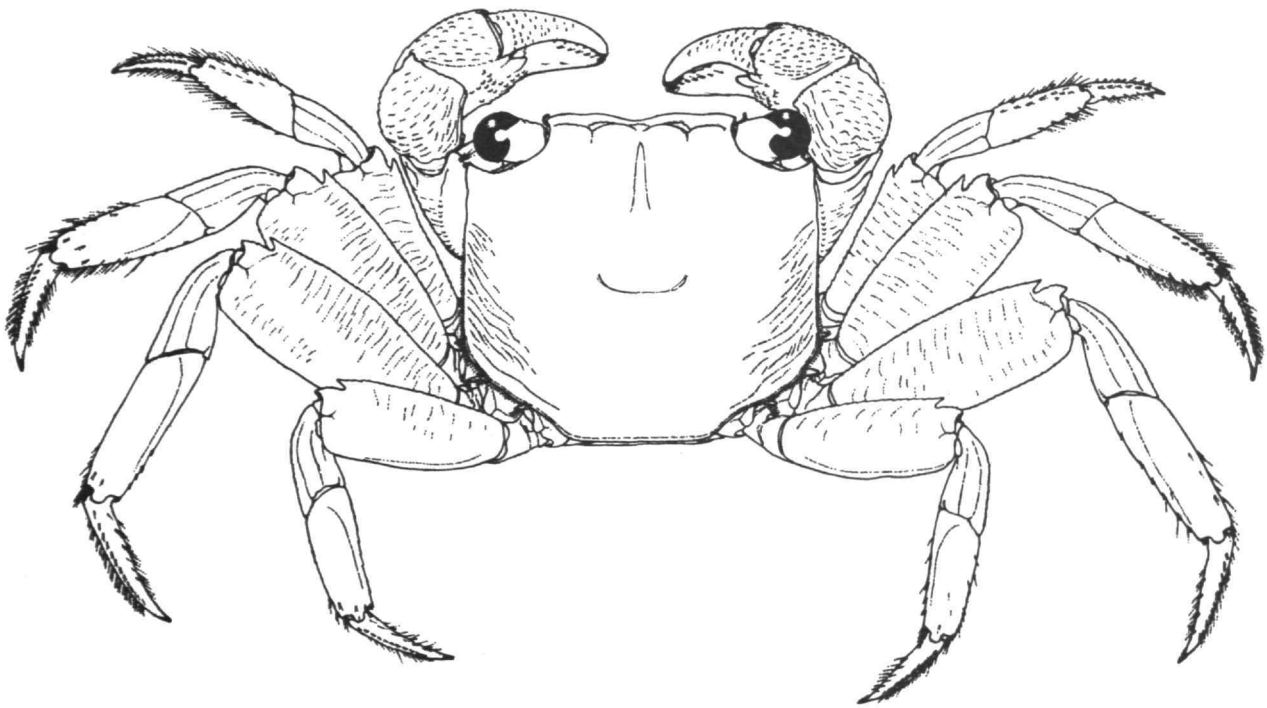


FIGURE 33.—*Armases miersii* (from Chace and Hobbs, 1969, fig. 59).

MATERIAL EXAMINED.—Florida: Key West, 1♂, 2♀, USNM 74536, 74554; exact locality unknown (Florida from L. Agassiz), 1♂, MCZ 6228.

Bahamas: Great Abaco Island, 9♂, 9♀ (1♂ lectotype and 8♂, 9♀ paralectotypes), USNM 11372; San Salvador, 1♂, 4♀, USNM 11414.

Cuba: Isla de Pinos, 1♀, USNM 23815; Santa Clara, Danuge River, 2♂, 1♀, AMNH 3163.

Jamaica: St. Ann's Parish, Runaway Bay, Runaway caves, 1♂, 29 Dec 1972, S. and J. Peck, USNM 18166.

Hispaniola: Dominica, 1♂, USNM 126865.

Caribbean Sea: Swan Island, 1♂, 3♀, USNM 14556; 7♂, 5♀, MCZ 839.

DESCRIPTION.—Carapace slightly wider than long (cl/cb = 0.917 for males and 0.887 for females), moderately convex, dorsal regions distinct; lateral margins diverging posteriorly, lateral striae present. Interorbital width slightly greater than half carapace width (iw/cb about 0.539) subdivided into four lobes; front with shallow median sinus, lateral margins slightly expanded distally.

Eyes well developed, pigmented.

Chelipeds with slight sexual dimorphism; male cheliped with posterior medial margin of merus serrated; anterior margin expanded distally with teeth. Carpus with low granules forming weak striae. Chelae with low granules, stronger on medial surface; poorly defined ridge of granules on dorsal surface of palm; finger spoon-tipped, movable finger with very small tubercles on dorsal surface. Female cheliped similar but with fewer granules and relatively smaller palm.

Walking legs relatively broad; ml/mw ratio of fourth pereiopod about 2.5; merus length slightly less than twice carpal length; propodus longer than dactylus; propodi and dactyli armed with small black spines on ventral surface; dactylus unarmed dorsally.

Male abdomen subtriangular in outline; length and width of telson subequal. Female abdomen semicircular in outline.

Male gonopod simple, unarmed; endpiece subrectangular; distal portion with sinus proximal to endpiece, directed laterally. Female gonopore distinctly elevated medially with deep depression; rim with medial lobes above depression; operculum widening laterally.

COLOR (from Chace and Hobbs, 1969:181).—

Carapace of immature male pigmented in shades of brown, tan, and cream. Submarginal band of cream extending across carapace behind postfrontal lobes and continuing onto eyestalks; light band followed posteriorly by rectangular area of dark brown; three pairs of elongate, subtriangular bands radiating from rectangle with apices on rectangle: anterior pair extending horizontally to lateral margin of carapace and bearing cream spot at level of cornea of retracted eye, second extending posterolaterally to margin and fusing posteriorly with massive dark area in posterior half of carapace, third pair extending posteriorly to cardiac region with narrow light area separating them; one pair of white spots

laterally between first and second dark bands, a second pair in posterior portion of light area separating second and third dark bands, and third pair in dark area posterior to third bands; posterior portion of carapace with pair of light areas posterolaterally and light spot on median line between them; anterolateral spines cream and lateral border tan with dark brown spots.

Eyestalks brown with cream dorsal longitudinal stripe; cornea black. Cheliped cream to tan basally; merus darker with purple markings; carpus tan with irregular purple markings; propodus purplish tan with yellow-tipped finger; dactyl purplish at base and yellow distally. Basal podomeres of remaining pereiopods cream and tan with few brown marks; distal podomeres orange tan with brownish markings, large spots or transverse bands, latter particularly noticeable on propodus; dactyl orange tan with corneous tips.

MEASUREMENTS.—Males, cb 11.2 to 21.1 mm; females, cb 9.3 to 19.5 mm.

TYPE LOCALITY.—Great Abaco Island, Bahamas.

TYPE.—The male lectotype is deposited in the National Museum of Natural History (USNM 11372).

DISTRIBUTION.—Key West, Florida; Bahamas; Cuba; Hispaniola; Swan Island; Jamaica.

HABITAT.—Chace and Hobbs (1969) reported a single male collected from the bank of a large mudflat south of the Indian River at Portsmouth, Dominica. Abundant plants in the area were *Pterocarpus officinalis, Montrichardia arborescens,* and the fern *Acrostichum daneaefolium.* A single specimen was collected in a cave in Jamaica by S. and J. Peck.

REMARKS.—The nomenclatural history of this species was reviewed by Abele (1972). In the original description Rathbun (1897a) indicated Rat Island, Montevideo, as the type locality for this species, indicating that this was a new name for specimens tentatively determined by Miers (1881) as *A. angustipes.* In the same paper she gave additional notes on this species based on specimens from Abaco in the Bahamas. Unfortunately the specimens from Montevideo belong to *Metasesarma rubripes* (Rathbun, 1897a), and those from the Bahamas to *A. miersii.* However, in 1918 Rathbun selected a lectotype for *A. miersii* from the Abaco material and indicated that her earlier designation of Montevideo as the type locality was in error.

Hartnoll (1965:133) indicated that Jamaican specimens of *S. ricordi* and material from the Bahamas (*A. miersii,* USNM 11414) had identical gonopods but that the female genital apertures were slightly different. This is probably an error resulting from Hartnoll's apparently not wishing to modify the USNM material by denuding the gonopod. It is almost impossible to identify species of *Armases* without removing the setae from the gonopod endpiece. All material in the Natural History Museum of Jamaica and my own collections from Jamaica indicate that Hartnoll is correct in concluding that *A. ricordi* is an abundant species there. A single specimen of *A. miersii* is known from Jamaica, and that individual was collected from a nearshore cave.

Armases angustum (Smith, 1870), new combination

FIGURES 22*e*, 23*h*, 34, 35

Sesarma angusta Smith, 1870:159.—Rathbun, 1897a:91.

S[esarma]. ophioderma Nobili, 1901:44.

Sesarma (Holometopus) angustum.—Rathbun, 1910:590; 1918:314, pl. 92.—Bott, 1955:64, fig. 5.—Abele, 1977a:637, figs. 3i–3m, 4, 5.

Sesarma (Holometopus) angusta.—Tesch, 1917:130.

Sesarma (Sesarma) ophioderma.—Rathbun, 1910:590; 1918:297.

Sesarma angustum.—Holthuis, 1954:37.—Von Hagen, 1977:56.—Abele and Blum, 1977:246.

MATERIAL EXAMINED.—Ecuador: Esmeraldas, 1♀ (holotype of *S. ophioderma*), E. Festa, MIZS Cr 138.

Panama, Pearl Islands: Rey Island, 8♂, 3♀, 3 Feb 1973, L.G. Abele; Canas Island, 1♂, 1♀, 18 May 1973, L.G. Abele; Senora Island, 10♂, 6♀, 30 Jan 1971, L.G. Abele, T.A. Biffar; Saboga Island, 9♂, 3♀, 5 Jan 1973, L.G. Abele; Mina Island, 4♀, 13 Jun 1973, L.G. Abele, R. Dressler; Pacheca Island, 1♂, 3♀, 5 Jan 1973, L.G. Abele; Pedro Gonzales Island, 1♀, 13 Jun 1973, L.G. Abele, R. Dressler; 1♀ (holotype of *S. angustum,* YPMNH), F.H. Bradley. Chiriqui Province, Rio Tinat (3 mi [4.8 km] west of Rio Tabasara on Sona-Remedios Road), 1♀, 11 Nov 1961, H.L. Loftin, E.S. Tyson.

Costa Rica: Cocos Island, 1♂, 12 Aug 1973, L.G. Abele.

DESCRIPTION.—Carapace slightly longer at midline than wide (cl/cb = 1.04±0.03 in males and 1.00±0.02 in females). Ratio somewhat biased if cl measurement is taken at midline because front is concave at that point, and the carapace is actually longer on either side of midline. Small males and especially females tend to have cl/cb ratio closer to unity. Lateral margins of carapace about equidistant throughout length; outer orbital angle acute with two distinct emarginations posterior to it. Dorsal surface of carapace covered with depressed granules, subacute on interorbital region. Interorbital region subdivided into four lobes; median pair large and distinct, separated by deep sinus. Lateral lobes low with granules present. Frontal region about 0.50 of carapace breadth and distinctly concave; median sinus and two smaller lateral ones present along distal margin. Frontal region does not increase in width distally. Carapace not inflated.

Eyes well developed, pigmented.

Basal antennular segment swollen, granulated, placed beneath frontal margin. Basal antennal segment arises at lateral portion of antennula forming a portion of lower orbit fitting up against a narrow triangular lobe. A groove (Verwey's groove; von Hagen, 1978) extends from exhalent opening along pterygostomial region to about posterior margin of orbit. An oblique groove extends from each end of Verwey's groove meeting beneath it and forming wide triangular region.

Chelipeds sexually dimorphic; in general male chelipeds more robust than female. In both sexes medial posterior edge and lateral inferior edge serrated. Medial anterior border armed with teeth, expanded distally, especially in males. Carpus covered with acute granules. Chelae of both sexes covered with granules; low on lateral surface but acute on medial surface and margins and on dorsal surface of movable finger. Dorsal surface of palm with a poorly defined row of acute tubercles. Males tend to have four teeth on immovable finger and five

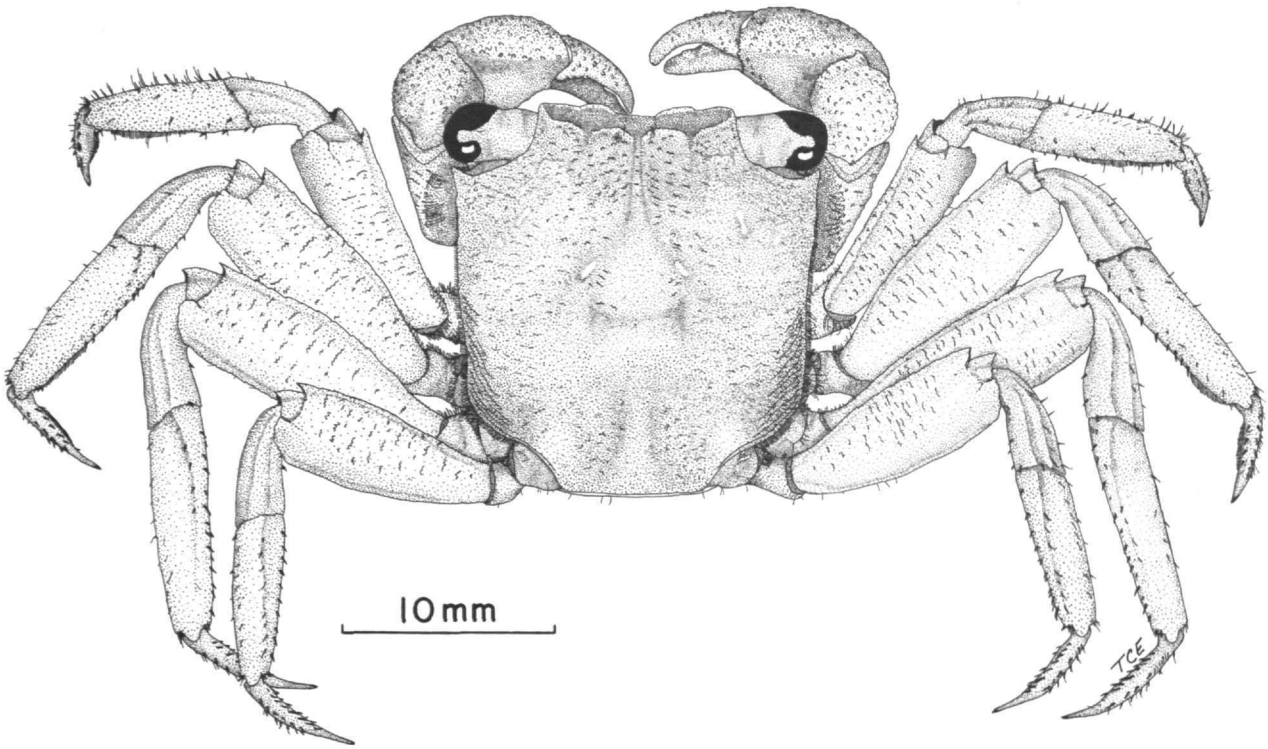


FIGURE 34.—*Armases angustum*, male, Isla Rey, Panama (from Abele, 1977a, fig. 5).

teeth on movable one; tips somewhat spooned but do not meet evenly. Females tend to have five teeth on immovable and six on movable finger; tips are spooned and fit evenly together.

Walking legs long, relatively slender. Merus length to width ratio of third ranges from 2.50 to 3.0 (2.78±0.14); ratio increases with increasing size; greater in males than females.

Merus is slightly less than twice carpal length, about 1.3 times length of propodus, and about twice as long as dactylus. Thick, dark pubescence present along ventral border of propodus and dactylus of first and second male walking legs, absent in females. Propodi and dactyli of walking legs armed with small, black spines; on ventral margin of propodus and on both margins of dactylus. For propodus, 10+2 indicates that 10 spines, each a member of a separated pair, are on ventral border and two paired spines on distal margin. For dactylus 4/3 indicates two poorly defined dorsal rows of four spines each and two poorly defined ventral rows of three spines each.

Male abdomen subtriangular in outline; telson length slightly greater than width. Female abdomen semicircular in outline.

Male gonopod unique among American species of *Armases*. Amber-colored endpiece consists of two unequal lobes laterally compressed with a large sinus. Portions of the shaft are membranous or weakly calcified.

Female gonopore set deep in sternum with an anterior and posterior extension enclosing medial portion.

MEASUREMENTS.—Males, cb 4.9 to 20.9 mm; females, cb 7.5 to 17.8 mm. Males larger than about 11.0 mm appear to be sexually mature, whereas females appear to attain sexual maturity at about 12.0 mm. No ovigerous females were observed during the present study.

TYPE LOCALITY.—Pearl Islands, Gulf of Panama, Panama.

TYPE.—The male holotype is deposited in the YPMNH.

DISTRIBUTION.—This species occurs on the Pacific coast from Tenacatita Bay, Mexico, to Ecuador.

HABITAT.—*Armases angustum* is common in and on the banks of freshwater coastal streams, especially on islands. It was not collected more than 100 m upstream from the mouth of any stream.

REMARKS.—Type material of both *A. angustum* and *A. ophioderma* were examined during the present study. Nobili (1901) placed *S. ophioderma* in the subgenus *Sesarma* because of the presence of two small lobes posterior to the outer orbital angle. Nobili's statement on this character led Rathbun (1918) also to place *ophioderma* in the subgenus *Sesarma*. The presence of anteriolateral lobes plus Nobili's statement that the length and breadth of the carapace are subequal has led to the difficult in identifying this species. However, as Holthuis

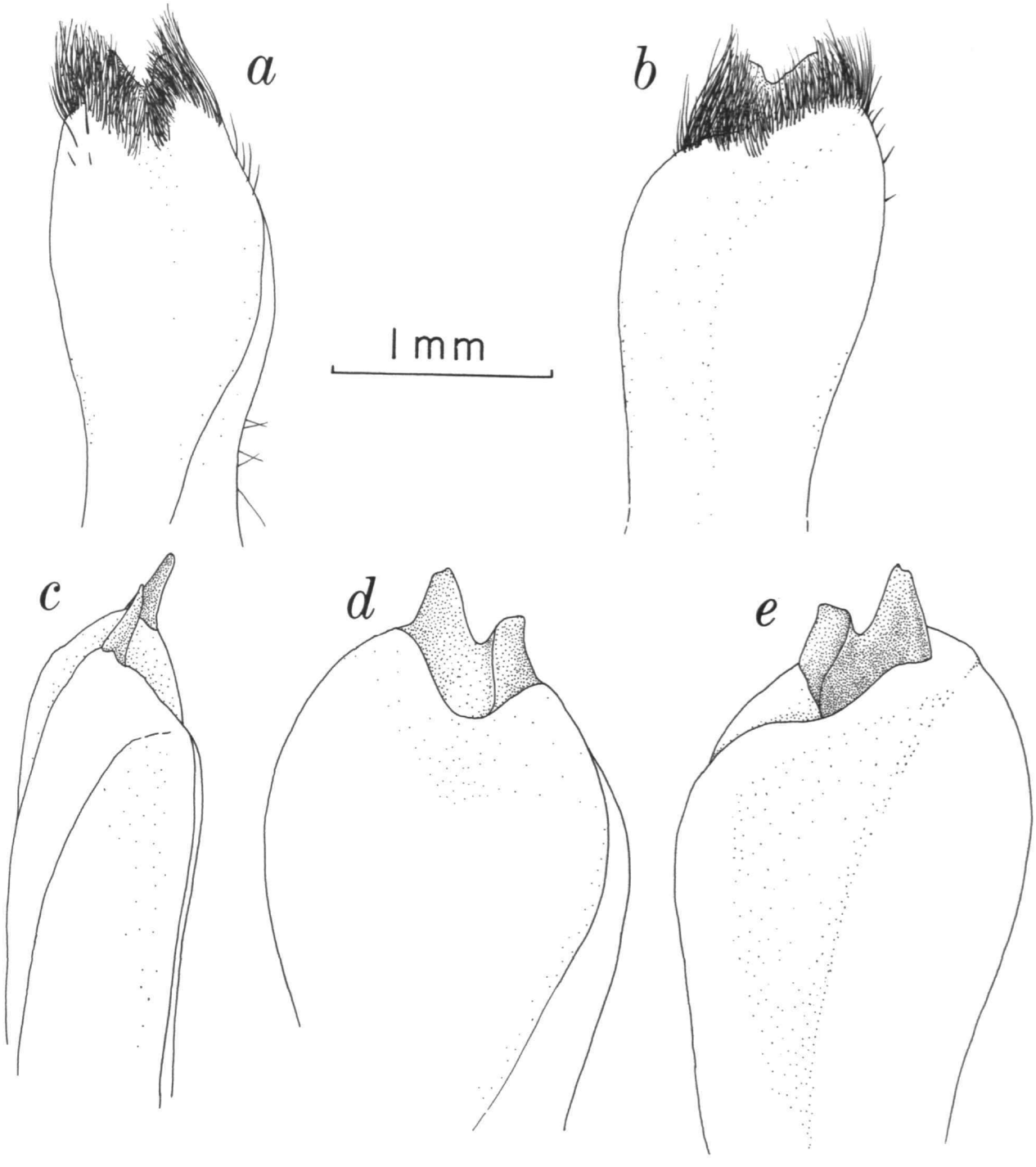


FIGURE 35.—*Armases angustum*, gonopods (from Abele, 1977a, fig. 3).

(1954) has previously noted, there are anterolateral lobes present on *A. angustum*. They are somewhat variable in their development, but they are quite distinct in smaller individuals. In addition smaller specimens, especially females, tend to have the carapace length and breadth subequal. Thus, based on the characters just mentioned and comparison of a series of specimens, it is concluded that *Sesarma ophioderma* Nobili is a junior synonym of *A. angustum* (Smith).

Armases occidentale (Smith, 1870), new combination

FIGURE 23*i*, 36, 37

Sesarma occidentalis Smith, 1870:158.
Sesarma (Holometopus) occidentalis.—Rathbun, 1897a:90.—Nobili, 1901:42.—Tesch, 1917:179.—Bott, 1955:63.
Sesarma (Holometopus) festae Nobili, 1901:42.
Sesarma (Holometopus) biolleyi Rathbun, 1906:100; 1918:299, fig. 148.—Abele, 1977a:632, figs. 1, 2, 3a-3h.
Sesarma (Holometopus) festae.—Rathbun, 1910:590; 1918:313.

MATERIAL EXAMINED.—Ecuador: Esmeraldas, 3♀ (coll. no. 5) (paratypes of *S. festae*), E. Festa, MIZS Cr 198.

Colombia: Tumaco, 3♂, 4♀ (coll. no. 3) (syntype of *S. festae*), E. Festa, MIZS Cr 91.

Panama: Pacific coast, Naos Island, 4♂, 3♀ (coll. no. 2), L.G. Abele, 10 Jun 1969; Albrook Air Force Base, swamp, 1♂ (10 Jun 1969); 3♂, 6♀ (coll. no. 4, 23 Aug 1972), 3♀ (6 Dec 1968), 2♂ (6 May 1969), L.G. Abele; Pearl Islands, Mina Island mangrove swamp, 5♂ (coll. no. 1), L.G. Abele; Pearl Island, Contadora Island mangrove swamp, 2♂, 3♀, L.G. Abele; Rio Mar above beach, 1♂, L.G. Abele.

Costa Rica: Boca del Jesus Maria, 1♂ (holotype of *S. biolleyi*), Jan 1906, P. Biolley and J.F. Tristan, USNM 32490.

El Salvador: Acajutla, 2♂ (syntypes of *S. occidentale*), F.H. Bradley, YPMNH 545.

DESCRIPTION.—Carapace not inflated, slightly wider than long (cl/cb is 0.95±0.02 in males and 0.93±0.02 in females). Carapace increases in width posteriorly, a very slight emargination posterior to outer orbital angle; dorsal surface covered with low but distinct granules. Interorbital region subdivided into four low lobes. Frontal region widens slightly distally (more apparent in larger specimens); about 0.55 of cb.

Basal segment of antennula large, granulated, and located beneath the frontal margin. Basal antennal segment forming portion of lower orbit fitting up against a triangular lobe. A groove (Verwey's groove; von Hagen, 1978) extends from exhalent opening along pterygostomial region parallel to lower orbital margin; a weaker groove runs at an oblique angle from each end of Verwey's groove, delimiting a triangular area below orbit.

Chelipeds sexually dimorphic. In both sexes merus has medial posterior edge serrated; anterior edge expanded with well-developed teeth (especially in mature males) continuing to distal margin. Carpus covered with acute granules, especially along borders. Chelae of both sexes covered with acute tubercles; in males chelae swollen with large process or protuberance on medial surface of palm at base of dactylus. Dactylus broader at base in males than in females.

Walking legs long, relatively slender; ratio of merus length to width varies among legs and with size and sex of animal; ratio of fourth leg (fifth pereiopod) of small males about 2.5, for large males about 3.0. For a series of males ratio of third (longest) leg ranged from 2.6 to 3.0; in females it ranged from 2.6 to 2.9. Ratio increases with increasing size in both sexes. For longest leg merus length slightly less than twice carpus length; about 1.3 times propodus length and slightly less than twice dactylus length. Mature males with row of thick pubescence along ventral portion of propodus and dactylus; also pubescence along dorsal portion of propodus, but the hairs more robust.

Propodi and dactyli armed with small, black spines, on ventral margin of propodus and on both ventral and dorsal margins of dactylus. About five spines in widely separated pairs along ventral portion of propodus with two more pairs on distal margin. Spines of dactylus in two poorly defined rows on dorsal and ventral surface; number and strength of spines increase with increasing size. Spines present in females but reduced in number.

Male gonopod simple and unarmed; endpiece (amber-colored apex) relatively small and set at an oblique angle to main axis of gonopod. Gonopod with distinct expanded portion proximal to endpiece.

Female gonopore raised from sternum and flanked anteriorly and posteriorly by extensions of sternum; between these is a barbell-shaped process.

MEASUREMENTS.—Males, cb 7.3 to 22.0 mm; females, cb 7.3 to 15.0 mm; ovigerous females, cb 10.1 to 14.8 mm. Males larger than about cb 11.0 mm appear to be mature, whereas females appear to attain sexual maturity at about 10.0 mm.

TYPE LOCALITY.—Acajutla, El Salvador.

TYPE.—Two male syntypes are deposited in the YPMNH.

DISTRIBUTION.—The species is widely distributed in the eastern Pacific from Esmeraldas, Ecuador, to at least Acajutla, El Salvador.

HABITAT.—*Armases occidentale* is semiterrestrial and occurs in a wide variety of habitats up to 80 m from water. Individuals were collected from under litter along the edge of a brackish water stream, from a dried river bed along the edge of a red mangrove swamp and from among piles of lumber in back of the bunker of the Smithsonian Tropical Research Institute at Naos Island, Panama.

REMARKS.—Type material of *Sesarma occidentale* Smith, 1870, *S. festae* Nobili, 1901, and *S. biolleyi* Rathbun, 1906, was examined, and in the author's opinion they are conspecific. Bott (1955) had previously suggested that *S. biolleyi* might be a synonym of *S. occidentale*, but he had not examined any type material. The material of *S. occidentale* consists of two males in the Yale Peabody Museum of Natural History (YPMNH 545; cb 17.6 and 13.1 mm). Although Rathbun (1918:300)

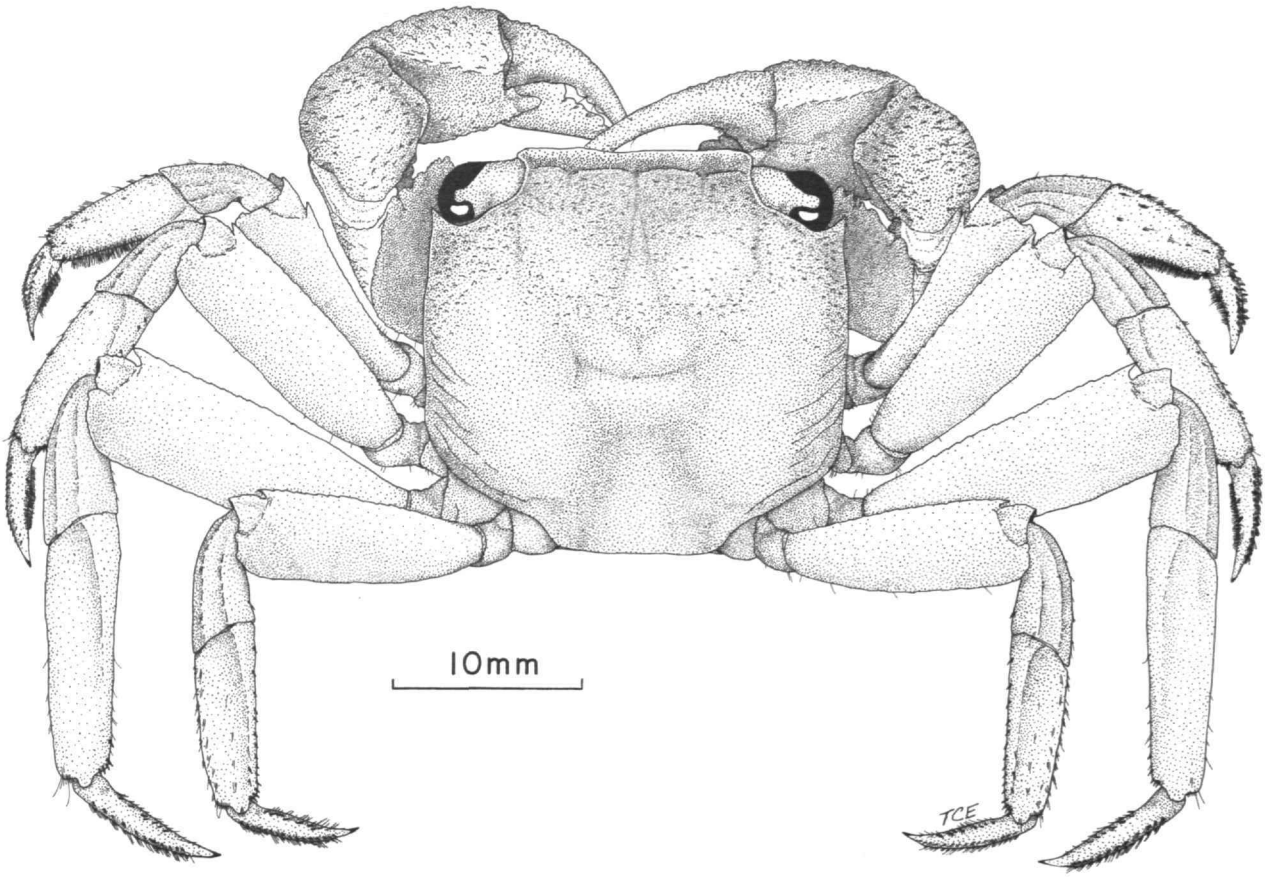


FIGURE 36.—*Armases occidentale*, holotype of *Sesarma biolleyi*, male, Boca del Jesus Maria, Costa Rica (from Abele, 1977a, fig. 1).

indicates that the larger specimen is a holotype, there is no indication of this status in the jar. The specimens were examined in December of 1971 at Yale, but unfortunately the specimens now seem to have been misplaced (W. Hartman, pers. comm.). The material of *S. festae* consists of two lots, three females from Esmeraldas, Ecuador (Cr 198, MIZS) and three males and four females from Tumaco, Colombia (Cr 91, Turin Museum). The later material is indicated to be the type material, and therefore the type-locality is restricted to Tumaco. The material of *S. biolleyi* consists of a large holotype male (cb 20.2 mm, USNM 32490) from Salinas de Caldera, Boca del Jesus Maria, Costa Rica.

There are clear differences among the type material of the three nominal species, but these are due, I believe, to differences in size. The morphological differences listed by Rathbun (1918) in her key are (1) the frontal region does not widen distally in *S. festae*, whereas it does widen in *A. occidentale* and *S. biolleyi*, and (2) the merus of the third leg in *S. biolleyi* has the length about three times the width, whereas it is less than three times the width in *A. occidentale*. There are also some differences between *S. festae* from Ecuador and *A. occidentale* from Panama in the strength of the tubercles on the chelae; the former have stronger tubercles. The differences in the form of the front and in the length-width ratio of the merus are size related. Small specimens have relatively wider legs and a front that does not widen distinctly distally; a size series of specimens from a single locality will contain individuals that bridge the differences listed by Rathbun (1918). The differences in strength of the tubercles seem to depend on the stage of the molt cycle. Newly molted individuals seem to have more acute tubercles than individuals that appear ready to molt.

Armases gorei (Abele, 1981), new combination

FIGURES 38, 39*i-l*

Sesarma gorei Abele, 1981:435, figs. 3, 4A–4D.

MATERIAL EXAMINED.—Peru: Puerto Pizzarro, 1 holotype

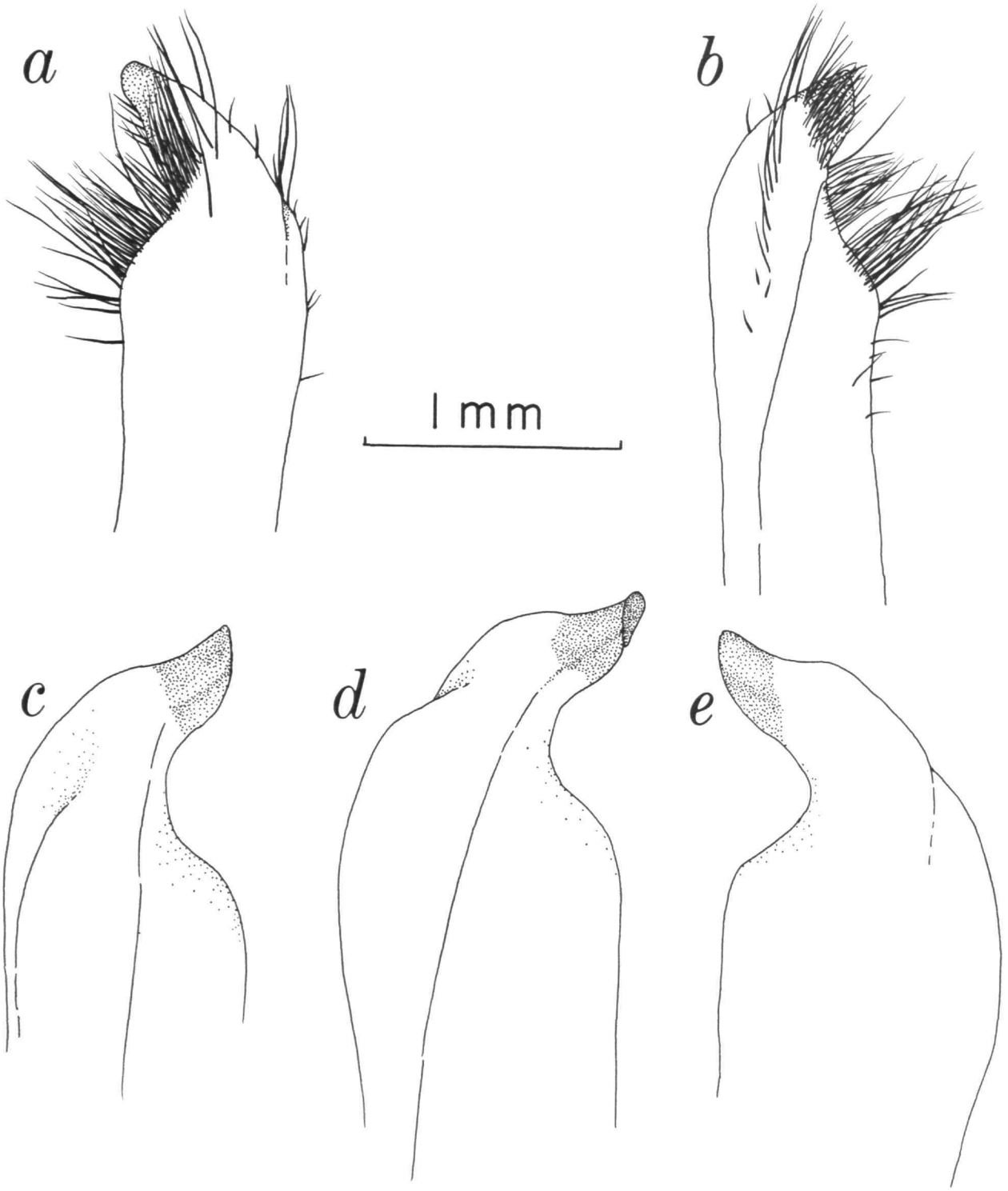


FIGURE 37.—*Armases occidentale*, gonopods, Pearl Islands, Panama (from Abele, 1977a, fig. 3).

♂, 3 Jun 1972, E. del Solar, B-411, AHF Cat. no. 723.

DESCRIPTION.—Carapace broader than long (cl/cb = 0.845), narrowing posteriorly. Outer orbital angle acute with a very slight posterior emargination. Interorbital region subdivided into four low lobes. Frontal region smooth; distal margin concave medially and slightly sinuous to lateral margins, which widen slightly at distolateral angles. Ratio of iw to cb is 0.619. Dorsal surface of carapace smooth; a few striae on lateral surface.

Eyes well developed and pigmented.

Male chelipeds large and robust; posterior medial margin of merus granulate; anterior margin serrate and expanded distally. Dorsal surface of carpus granular with distinct row of granules on medial surface. Palm covered with low indistinct granules; scattered small tubercles on medial surface. Low, acute granules on proximal superior surface of movable finger. Finger tips corneous, spooned; immovable one extends slightly beyond movable one.

Walking leg relatively short; ml/mw of third (fourth pereiopod) about 2.5. Dactylus about as long as greatest length of propodus; carpus about 3/4 of propodus length and half merus length. Very long, widely spaced hairs on walking leg from distal portion of carpus to end of dactylus. Long, dark spines present on distal ventral portion of propodus continuing on flexor margin of dactylus; extensor margin of dactylus has long hairs but no spines present.

Male abdomen subtriangular in outline; telson wider than long.

Male gonopod simple and unarmed; distal portion strongly curved laterally so that amber-colored endpiece almost at right angle to base of gonopod.

MEASUREMENTS.—Male holotype, cb 11.8, cl 10 mm.

TYPE LOCALITY.—Puerto Pizarro, Peru.

HABITAT.—The specimen was collected from mangrove muds.

REMARKS.—*Armases gorei* is very similar to *A. magdalenense* but can be distinguished by the following characters. In *A. gorei* the lateral surface of the palm is covered by low granules, in *A. magdalenense* it is smooth; in *A. gorei* the extensor margin of the dactylus of the walking legs is unarmed, in *A. magdalenense* it is armed with a few long black spines; in *A. gorei* the distal portion of the gonopod is curved laterally almost 90° from the base, in *A. magdalenense* it is only slightly curved.

This is the second species of *Armases* to be reported from Peru. Cano (1889) described *S. barbimanum* from Paita (as Payta), Peru, and subsequent authors (e.g., del Solar, Blancas,

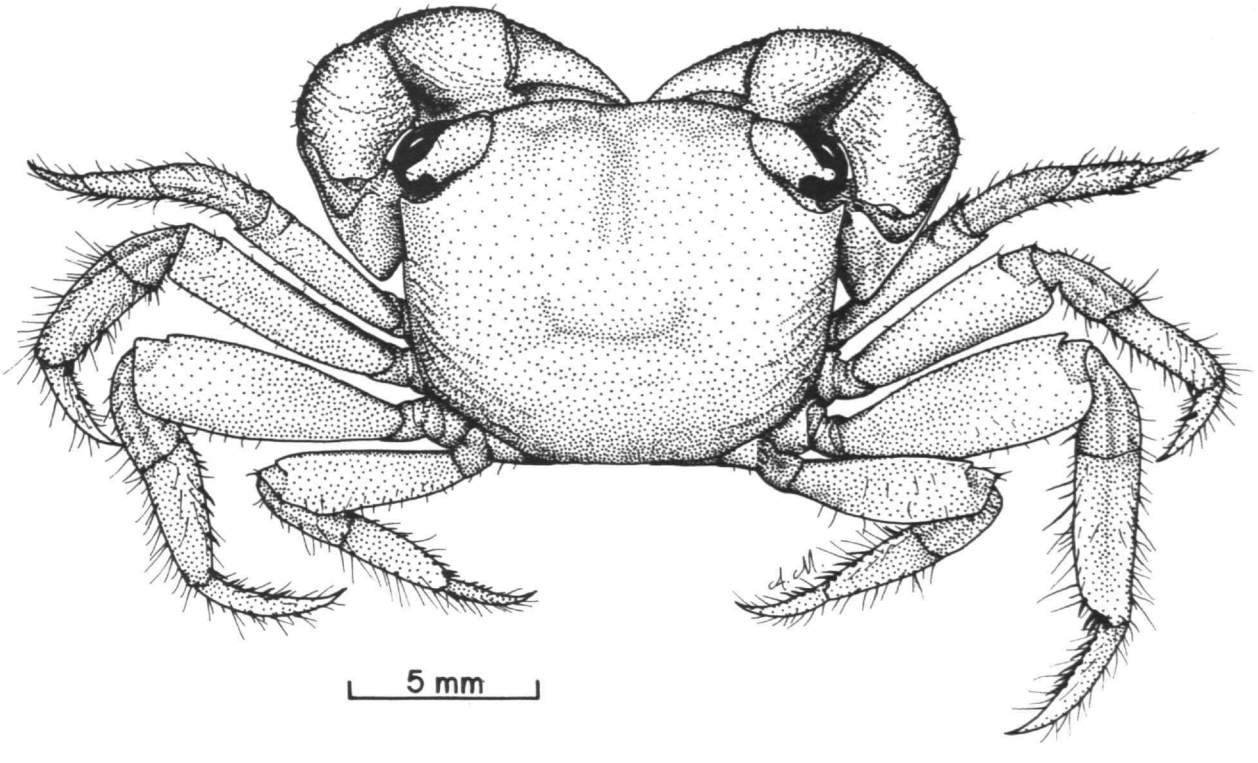
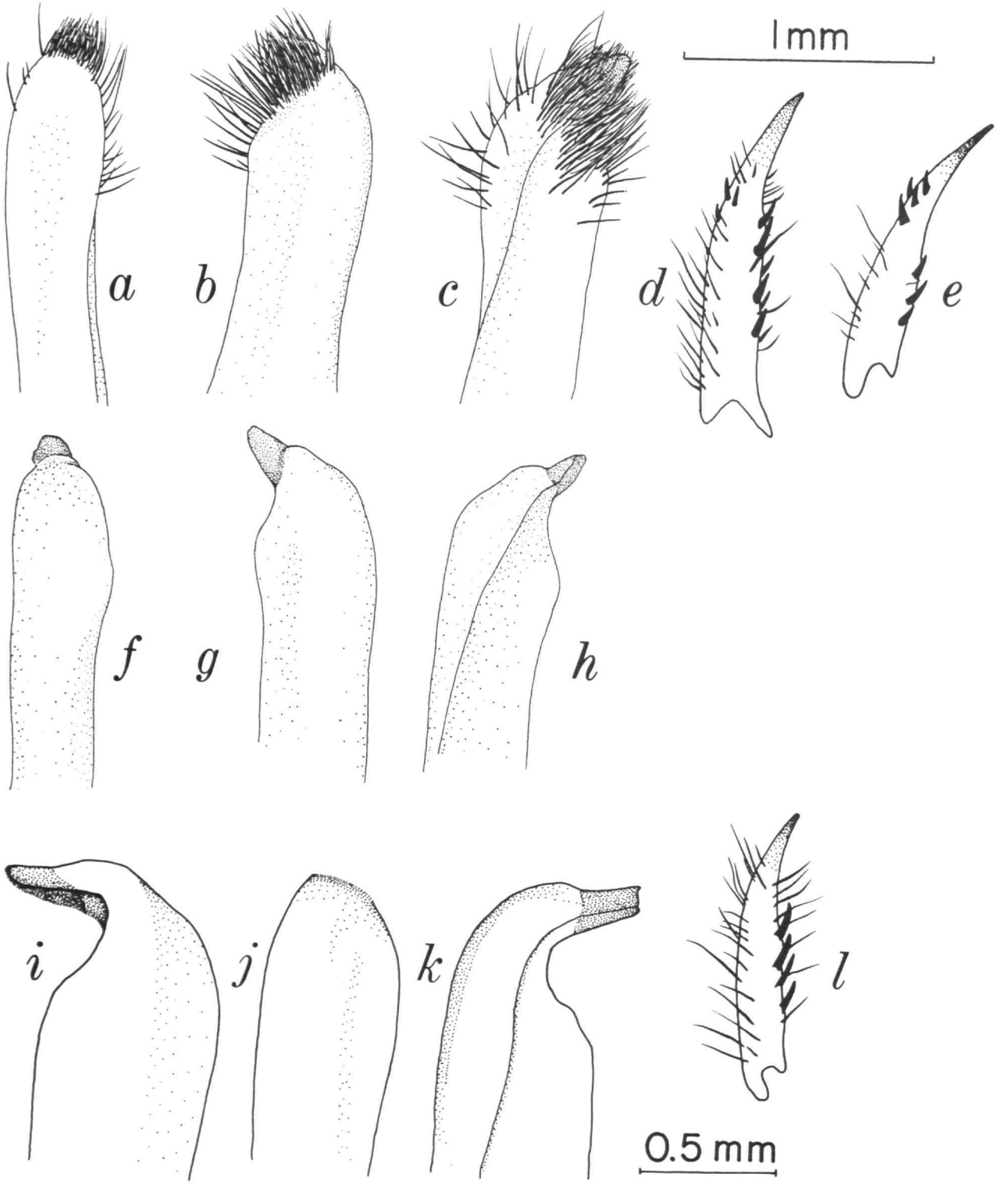


FIGURE 38.—*Armases gorei*, holotype male, Puerto Pizzaro, Peru (from Abele, 1981, fig. 3).


1mm
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and Mayta, 1970) have listed the species as part of the Peruvian fauna. However, Rathbun (1910) pointed out that many of the species Cano listed from Payta are actually Indo-West Pacific species, and Tweedie (1950) assigned *barbimanum* to the Indo-West Pacific genus *Nanosesarma*. Subsequently Abele (1979) suggested that *N. barbimanum* was based on a specimen of *Nanosesarma minutum* (De Man, 1887) that was incorrectly listed as having been collected at Payta. For the present then *A. gorei* is the only representative of the genus *Armases* known from Peru.

Armases magdalenense (Rathbun, 1918), new combination

FIGURES 22*d*, 23*j*, 39*a-h*, 40

Sesarma (Holometopus) magdalenense Rathbun, 1918:305, pl. 86.
Sesarma magdalenense.—Abele, 1981:433, figs. 1, 2, 4E-G.—Villalobos-Hiriart et al., 1989:94.

MATERIAL EXAMINED.—Mexico: Baja California, Magdalena Bay, Eastern Pacific, Mangrove Island; 1 holotype ♂, 1 paratype ♂, 1 paratype ♀, 20 Mar 1911, *Albatross* collection, USNM 45793.

DESCRIPTION.—Carapace broader than long (cl/cb = 0.818±0.005) narrowing posteriorly. Outer orbital angle acute with a slight posterior emargination. Interorbital region almost smooth with only slight indications of subdivisions. Frontal region smooth; distal margin slightly sinuous; lateral margins widen slightly at distolateral angles. Ratio of iw to cb is 0.591±0.012. Dorsal surface of carapace smooth; a few striae on lateral surface.

Eyes well developed and pigmented.

Chelipeds sexually dimorphic; those of female weaker and smaller; medial posterior margin of merus granulate; anterior margin serrate and expanded distally. Dorsal surface of carpus granular with distinct row of granules on medial surface. Male palm swollen with broken rows of granules dorsally; laterally punctate but smooth; scattered small tubercles present medially. Superior proximal portion of movable finger granular; finger tips narrow and spooned.

Walking legs relatively short; ml/mw ratio of third (fourth pereiopod) about 2.45, of fourth about 2.20. Dactylus of third about as long as greatest length of propodus; propodus distinctly longer than carpus; carpus about one-half length of merus. Long, widely scattered setae on walking legs, beginning in distal portion of carpus and extending onto dactylus. Long, dark spines present on ventral surface of propodus and continuing onto flexor margin of dactylus; a few spines present on extensor margin of dactylus (Figure 40*d,e*).

FIGURE 39 (facing page).—*a-c, f-h, i-k*, gonopods; *d, e, l*, dactyls of fifth legs: *a-c, f-h*, gonopods of *A. magdalenense* (from Abele, 1981, fig. 2); *d-e*, dactyls of fifth leg of *A. magdalenense* (from Abele, 1981, fig. 4); *i-k*, gonopods of *A. gorei* (from Abele, 1981, fig. 4); *l*, dactyl of fifth leg of *A. gorei* (from Abele, 1981, fig. 4).

Male abdomen subtriangular in outline; telson wider than long. Female abdomen subcircular in outline; telson wider than long.

Male gonopod (Figure 40*a-c, f-h*) simple, unarmed, and curving laterally in distal portion; amber-colored endpiece small, narrowing distally and set on distolateral angle of gonopod. Female gonopore (Figure 25*j*) large and raised from sternum. Distinct subtriangular extension (obtuse distally) along the rim of gonopore. Operculum a knob-like process extending beyond rim and subtriangular process.

MEASUREMENTS.—Mature male, cb 14.2 mm; mature female, 9.6 mm.

TYPE LOCALITY.—Mangove Island, Magdalena Bay, Baja California, Mexico.

DISTRIBUTION.—Known only from the type locality.

HABITAT.—Unknown, but probably mangroves.

REMARKS.—See *A. gorei*.

Armases benedicti (Rathbun, 1897), new combination

FIGURES 22*b,c*, 23*a*, 28*d*, 41

Sesarma recta.—De Man, 1892a:249, pl. 10: fig. 4 [not *Sesarma rectum* Randall].
Sesarma (Holometopus) benedicti Rathbun, 1897a:90.—Ortmann, 1897:371.—Tesch, 1917:132.—Rathbun, 1918:316, pl. 93.—Holthuis, 1959:248, fig. 62.—Coelho and Ramos, 1972:203.—Abele, 1973a:379, figs. 1A, 1G.—Von Hagen, 1978:46.
Sesarma benedicti.—Rodriguez, 1980:382.—Abele and Kim, 1986:63, 671a.
Sesarma chiragra Ortmann, 1897:331.—Tesch, 1917:249.

MATERIAL EXAMINED.—Florida: Key West, 1♀, A.S. Packard (?1881), MCZ 6236.

Venezuela: Guayo, Bayo Delta del Orinoco, 1 ♀, 23 Dec 1952, J. Paján, USNM 95991; same locality, 1♂, 17 Dec 1952, USNM 95990; Guanoco dock, 7♂, 6♀, 3 ovigerous ♀, 3 juveniles, 1942, AMNH 13686 (juvenile *Sesarma rectum* and *S. curacaoense* in same jar).

Guyana: 12♂, 4♀, 1 ovigerous ♀, AMNH 463, 4262, 4645, 4643, 4630, 4628, 4639 identified as *Sesarma rectum*.

Brazil: Para, 1♂, 2♀, 1 ovigerous ♀, Oct 1859, MCZ 1615; same locality, 1♂, 1♀, W. Fletcher, MCZ 6237; same locality, 1♀, Agassiz and Bourget, Thayer expedition, MCZ 6224; same locality, 3♂, 4♀ Jul-Oct 1964, P.J. Humphrey, USNM Acc. no. 256380; Tajapource, 40♂, 26♀, 13 ovigerous ♀, Thayer expedition, MCZ no number; 1♂, 1♀, USNM 22838; Rio de Janeiro, 1♀, Thayer expedition, MCZ 6239.

DESCRIPTION.—Carapace broader than long (male cl/cb = 0.933±0.023, female cl/cb = 0.927±0.009), outer orbital angle acute with slight lobe posterior. Interorbial region subdivided into four distinct lobes with groove between median lobes deepest. A few tubercles present lateral to medial lobes. Frontal region depressed posterior to distal margin; margin concave medially, slightly sinuous to parallel distolateral margins. Male iw/cb ratio = 0.666±0.016, females 0.667±0.013. Carapace regions well marked; scat-

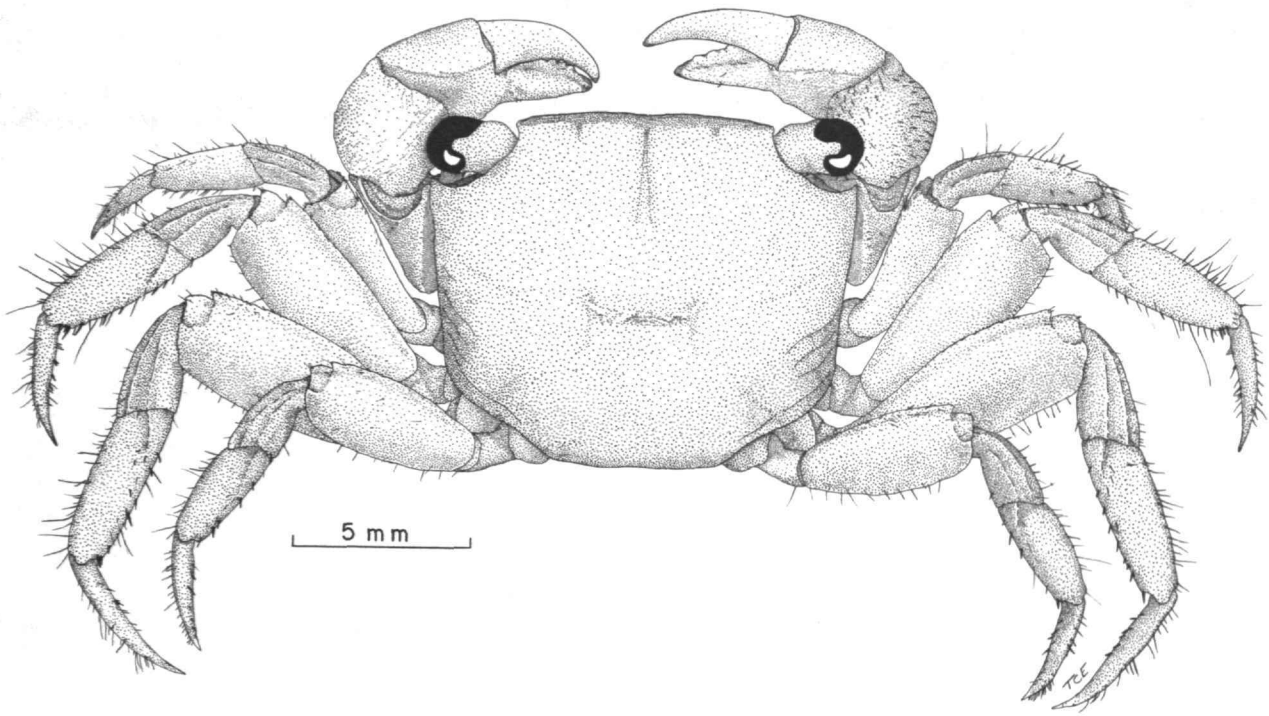

FIGURE 40.—*Armases magdalenense*, holotype male, Magdalena Bay (from Abele, 1981).

tered pubescence dorsally, well marked striae laterally.

Eyes well developed, pigmented.

Chelipeds markedly dimorphic. In mature males merus with medial posterior border roughly granular; anterior margin expanded distally, armed with a series of tubercles. Carpus roughly granulate dorsally, dorsal median margin marked by ill-defined row of granules with distinct row of granules below it; anterior medial margin with about five large tubercles. Palm granulate; dorsal margin marked by ill-defined row of granules, some larger granules on medial surface. Immovable finger greatly expanded, concave with hairs present on proximal half; distal half begins with a large triangular tooth set at lateral angle to main axis of finger. Tooth followed by two smaller, triangular teeth proximal to corneous spooned tip. Movable finger granulate dorsally and greatly expanded laterally in proximal half; concave in ventral half with hairs in concavity; distally armed with three unequal triangular teeth proximal to corneous spooned tip. Chelae of females and immature males not expanded proximally, smaller than those of mature males.

Walking legs relatively short; ml/mw ratio of third (fourth pereiopod) = 2.01±0.049 in male and 1.90±0.106 in females. Dactylus shorter than propodus; propodus longer than carpus; merus about twice length of dactylus. Long widely scattered hairs on walking legs beginning on carpus and extending onto dactylus. A thick pubescence present on ventral borders on distal portion of propodus and dactylus of first two pereopods in sexually mature males. Black spines present on distal, ventral border of propodus and on dorsal and ventral borders of dactylus.

Male abdomen subtriangular in outline; telson slightly wider than long. Female abdomen subcircular in outline with long hairs along marign; telson distinctly broader than long.

Male gonopod simple, unarmed, curves laterally proximal to amber-colored endpiece. Endpiece unique among those of American species; folded over on itself twice, major fold fused, second fold partially fused forming a narrow opening on distal margin. Female gonopore small, simple, with subcircular operculum.

MEASUREMENTS.—Males, cb 12.4 to 18.4 mm; females, cb 9.7 to 16.2 mm. Males reach sexual maturity at about cb 15 mm, females at about cb 10 mm. Ovigerous females cb 10.7 to 16.1 mm.

TYPE LOCALITY.—Surinam.

TYPE.—Nationaal Natuurhistorisch Museum, Leiden (Holthuis, 1959).

DISTRIBUTION.—There is a single record of this species from Key West, Florida, based on a female collected by A.S. Packard probably in 1881. No other records exist despite much collecting in southern Florida (Abele, 1973a). All other records indicate that the species occurs in South America. Specimens

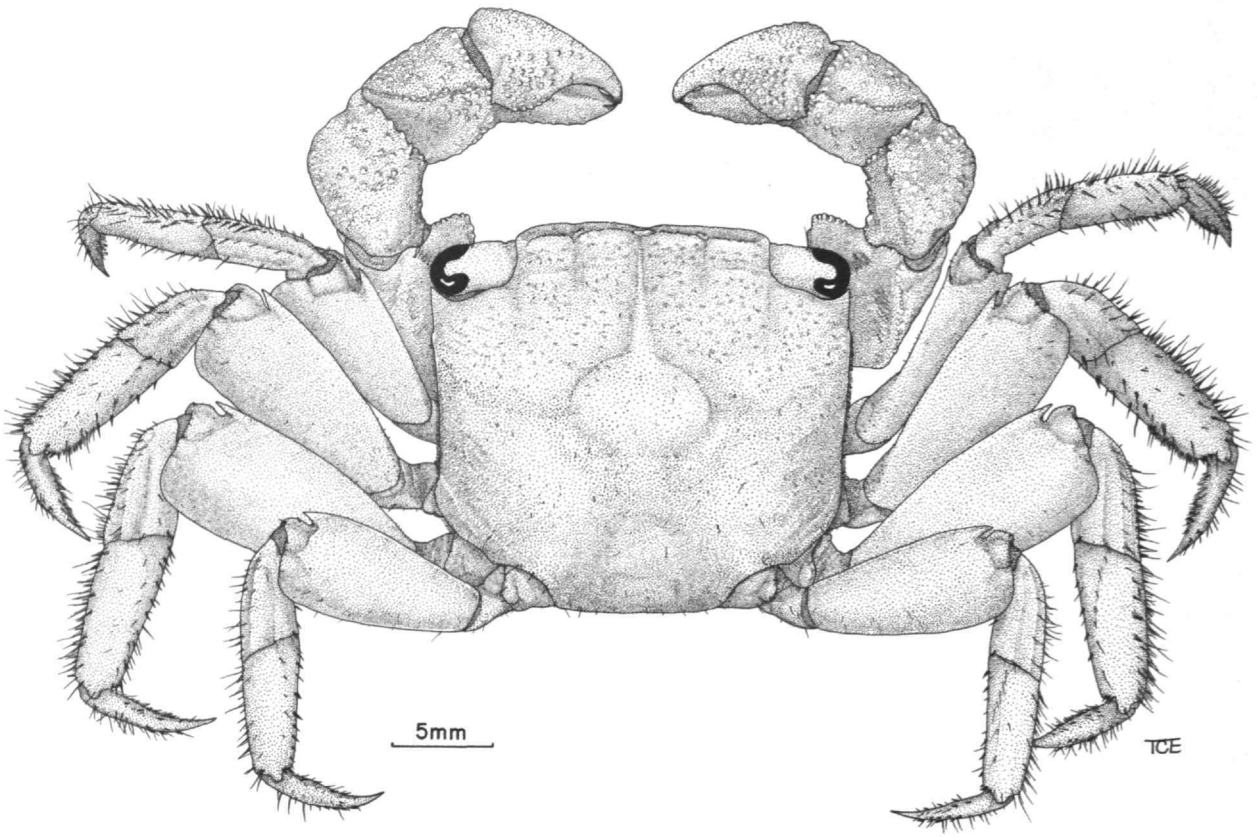

FIGURE 41.—*Armases benedicti*, male, Belem, Brazil.

are known from Venezuela, Guyana, Surinam. The North American record needs verification.

HABITAT.—*Armases benedicti* occurs under wood and stones on the banks of brackish to almost freshwater rivers in Surinam (Holthuis, 1959).

REMARKS.—De Man (1892a) first listed this species including good illustrations and a description. He tentatively referred the specimens to *Sesarma rectum* Randall. Both Rathbun (1897a) and Ortmann (1897) independently concluded that De Man's material was not *S. rectum*, and both authors proposed new names: *S. chiragra* by Ortmann and *S. benedicti* by Rathbun. As Rathbun's paper was published on 26 April and Ortmann's on 20 July, Rathbun's name has priority as noted by Ortmann (1897:371; see Holthuis, 1959).

Ecological Notes

The American species of *Sesarma* and *Armases* occur in a wide variety of habitats that include the tanks of bromeliads, fresh waters of caves, rivers, and streams, mangroves, marshes, dry slopes (terrestrial) of mountains miles from the sea, and the high intertidal zone. Notes on the habitat of each species are given in the systematic section, and here only a summary will be given.

None of the species would be classified as typically subtidal marine, as all are active at least some of the time on land. Three species occur supratidally in marine areas, although they can occur more than 100 m from the shore: *A. cinereum*, *A. ricordi*, and *A. occidentale*. One species, *S. reticulatum*, is common in marshes of eastern North America and the Gulf coast, whereas three other species are common in tropical mangrove forests: *S. rubinofforum*, *S. rhizophorae*, and *S. curacaoense*. Two additional species, *A. gorei* and *A. magdalense*, that appear to be rare have been reported from mangroves. Some species are distributed very roughly along a salinity gradient within estuaries, and these can also be found along the banks in mangroves. *Sesarma aequatoriale* occurs in fresh water out to about 22‰, whereas *S. crassipes*, *S. rectum*, *A. benedicti*, and *S. sulcatum* occur in very low salinities to almost full seawater in estuaries.

Three species, *A. angustum*, *A. roberti*, and *A. americanum*, occur in coastal freshwater streams, especially just landward of

the area where the stream enters the sea. These species almost certainly have larvae that undergo development in the sea. In contrast *S. bidentatum* occurs in streams and rivers far from the sea and completes its life cycle in fresh water. This species is part of a radiation that apparently occurred on Jamaica and that includes the cavernicolous *S. verleyi* and the completely terrestrial species *S. cookei* and *S. jarvisi* (see Hartnoll, 1964a,b, 1965, 1971).

Specimens of *A. angustipes* have been taken in a diversity of habitats, but at least in Brazil the species is common in the tanks of bromeliads (Abele, 1973c). Specimens have also been reported from fresh-brackish sinkholes. A closely related species, *A. miersii,* has been found in a coastal marine cave on Jamaica and on a large mudflat on Dominica.

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