

THE UNIVERSITY OF MIAMI

THE SYSTEMATICS AND DISTRIBUTION OF THE DEEP-SEA GENUS
MUNIDOPSIS (CRUSTACEA, GALATHEIDAE) IN THE WESTERN ATLANTIC OCEAN

by

Barbara Shuler Mayo

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Subject

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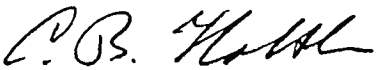
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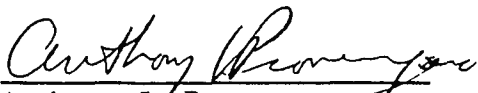
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TABLE OF CONTENTS

	Page
ACKNOWLEDGMENTS	iv
LIST OF DISTRIBUTION PLOTS	viii
LIST OF FIGURES	ix
LIST OF DIAGRAMS AND TABLES	xii
INTRODUCTION	1
REVIEW OF THE LITERATURE	3
MATERIALS AND METHODS	14
<u>Munidopsis</u> Whiteaves, 1874	17
Summary of bathymetric ranges	27
KEY TO WESTERN ATLANTIC SPECIES OF THE GENUS MUNIDOPSIS	32
SPECIES ACCOUNTS	
<u>Munidopsis abbreviata</u> (A. Milne Edwards, 1880)	42
<u>Munidopsis abdominalis</u> (A. Milne Edwards, 1880).	53
<u>Munidopsis alaminos</u> Pequegnat and Pequegnat, 1970.	62
<u>Munidopsis armata</u> (A. Milne Edwards, 1880)	72
<u>Munidopsis bermudezi</u> Chace, 1939	83
<u>Munidopsis bradleyi</u> Pequegnat and Pequegnat, 1971	92
<u>Munidopsis brevimanus</u> (A. Milne Edwards, 1880)	102
<u>Munidopsis crassa</u> Smith, 1885	114
<u>Munidopsis cubensis</u> Chace, 1942.	125
<u>Munidopsis erinaceus</u> (A. Milne Edwards, 1880)	133
<u>Munidopsis geveri</u> Pequegnat and Pequegnat, 1970	144
<u>Munidopsis gilli</u> Benedict, 1902	155
<u>Munidopsis granulens</u> Mayo, 1972	162
<u>Munidopsis impolita</u> , new species	169

	Page
<u>Munidopsis</u> <u>latifrons</u> (A. Milne Edwards, 1880)	178
<u>Munidopsis</u> <u>livida</u> (A. Milne Edwards and Bouvier, 1900)	186
<u>Munidopsis</u> <u>longimanus</u> (A. Milne Edwards, 1880)	196
<u>Munidopsis</u> <u>nitida</u> (A. Milne Edwards, 1880)	208
<u>Munidopsis</u> <u>platirostris</u> (A. Milne Edwards and Bouvier, 1894)	216
<u>Munidopsis</u> <u>polita</u> (Smith, 1883)	225
<u>Munidopsis</u> <u>ramahtaylorae</u> Pequegnat and Pequegnat, 1971	237
<u>Munidopsis</u> <u>riveroi</u> Chace, 1939	245
<u>Munidopsis</u> <u>robusta</u> (A. Milne Edwards, 1880)	255
<u>Munidopsis</u> <u>rostrata</u> (A. Milne Edwards, 1880)	266
<u>Munidopsis</u> <u>serratifrons</u> (A. Milne Edwards, 1880)	279
<u>Munidopsis</u> <u>sigsbei</u> (A. Milne Edwards, 1880).	288
<u>Munidopsis</u> <u>similis</u> Smith, 1885	299
<u>Munidopsis</u> <u>simplex</u> (A. Milne Edwards, 1880).	312
<u>Munidopsis</u> <u>spinifer</u> (A. Milne Edwards, 1880)	324
<u>Munidopsis</u> <u>spinocolata</u> (A. Milne Edwards, 1880).	335
<u>Munidopsis</u> <u>spinosa</u> (A. Milne Edwards, 1880).	345
<u>Munidopsis</u> <u>squamosa</u> (A. Milne Edwards, 1880)	356
<u>Munidopsis</u> <u>subspinocolata</u> Pequegnat and Pequegnat, 1971.	367
<u>Munidopsis</u> <u>transtridens</u> Pequegnat and Pequegnat, 1971.	375
<u>Munidopsis</u> <u>serricornis</u> (Lovén, 1852)	387
LITERATURE CITED	405
APPENDIX	422

LIST OF DISTRIBUTION PLOTS

Distribution plot	Page
1. <u>Munidopsis abbreviata</u> (A. Milne Edwards, 1880)	42a
2. <u>Munidopsis abdominalis</u> (A. Milne Edwards, 1880)	54
3. <u>Munidopsis alaminos</u> Pequegnat and Pequegnat, 1970	63
4. <u>Munidopsis armata</u> (A. Milne Edwards, 1880)	73
5. <u>Munidopsis bradleyi</u> Pequegnat and Pequegnat, 1971	93
6. <u>Munidopsis crassa</u> Smith, 1885	115
7. <u>Munidopsis erinaceus</u> (A. Milne Edwards, 1880)	135
8. <u>Munidopsis latifrons</u> (A. Milne Edwards, 1880)	179
9. <u>Munidopsis longimanus</u> (A. Milne Edwards, 1880)	197
10. <u>Munidopsis platirostris</u> (A. Milne Edwards and Bouvier, 1894) .	217
11. <u>Munidopsis polita</u> (Smith, 1883)	226
12. <u>Munidopsis ramahtaylorae</u> Pequegnat and Pequegnat, 1971. . . .	237a
13. <u>Munidopsis riveroi</u> Chace, 1939	246
14. <u>Munidopsis robusta</u> (A. Milne Edwards, 1880)	256
15. <u>Munidopsis rostrata</u> (A. Milne Edwards, 1880)	267
16. <u>Munidopsis serratifrons</u> (A. Milne Edwards, 1880)	279a
17. <u>Munidopsis sigsbei</u> (A. Milne Edwards, 1880)	290
18. <u>Munidopsis simplex</u> (A. Milne Edwards, 1880)	313
19. <u>Munidopsis spinifer</u> (A. Milne Edwards, 1880)	325
20. <u>Munidopsis spinoculata</u> (A. Milne Edwards, 1880)	336
21. <u>Munidopsis spinosa</u> (A. Milne Edwards, 1880)	345a
22. <u>Munidopsis serricornis</u> (Lovén, 1852)	390

LIST OF FIGURES

Figure	Page
1. <u>Munidopsis abbreviata</u> (A. Milne Edwards, 1880)	43
2. " " " " " "	44
3. <u>Munidopsis abdominalis</u> (A. Milne Edwards, 1880)	55
4. <u>Munidopsis alaminos</u> Pequegnat and Pequegnat, 1970	64
5. " " " " " "	65
6. <u>Munidopsis armata</u> (A. Milne Edwards, 1880)	75
7. " " " " " "	76
8. <u>Munidopsis bermudezi</u> Chace, 1939	84
10. <u>Munidopsis bradleyi</u> Pequegnat and Pequegnat, 1971	94
11. " " " " " "	95
12. <u>Munidopsis brevimanus</u> (A. Milne Edwards, 1880)	103
13. " " " " " "	104
14. <u>Munidopsis crassa</u> Smith, 1885	116
15. " " " "	117
16. <u>Munidopsis cubensis</u> Chace, 1942	126
17. " " " "	127
18. <u>Munidopsis erinaceus</u> (A. Milne Edwards, 1880)	136
19. " " " " " "	137
20. <u>Munidopsis geyeri</u> Pequegnat and Pequegnat, 1970	145
21. " " " " " "	146
22. <u>Munidopsis gilli</u> Benedict, 1902	156
23. <u>Munidopsis granulens</u> Mayo, 1972	163
24. " " " "	164
24a. <u>Munidopsis impolita</u> new species	170
24b. " " " "	171

Figure	Page
25. <u>Munidopsis</u> <u>latifrons</u> (A. Milne Edwards, 1880)	180
26. <u>Munidopsis</u> <u>livida</u> (A. Milne Edwards and Bouvier, 1900).	187
27. " " " " " " " "	188
28. <u>Munidopsis</u> <u>longimanus</u> (A. Milne Edwards, 1880).	198
29. " " " " " "	199
30. <u>Munidopsis</u> <u>nitida</u> (A. Milne Edwards, 1880).	209
31. <u>Munidopsis</u> <u>platirostris</u> (A. Milne Edwards and Bouvier, 1894).	218
32. <u>Munidopsis</u> <u>polita</u> (Smith, 1883)	227
33. " " " "	228
34. <u>Munidopsis</u> <u>ramahtaylorae</u> Pequegnat and Pequegnat, 1971.	238
35. <u>Munidopsis</u> <u>riveroi</u> Chace, 1939.	247
36. " " " "	248
37. <u>Munidopsis</u> <u>robusta</u> (A. Milne Edwards, 1880)	257
38. " " " " " "	258
39. <u>Munidopsis</u> <u>rostrata</u> (A. Milne Edwards, 1880).	268
40. " " " " " "	269
41. <u>Munidopsis</u> <u>serratifrons</u> (A. Milne Edwards, 1880).	279b
42. " " " " " "	279c
43. <u>Munidopsis</u> <u>sigsbei</u> (A. Milne Edwards, 1880)	291
44. " " " " " "	292
45. <u>Munidopsis</u> <u>similis</u> Smith, 1885	300
46. " " " "	301
47. " " and <u>Munidopsis</u> <u>nitida</u>	302
48. " "	303
49. <u>Munidopsis</u> <u>simplex</u> (A. Milne Edwards, 1880)	314
50. <u>Munidopsis</u> <u>spinifer</u> (A. Milne Edwards, 1880)	326
51. " " " " " "	327

Figure	Page
52. <u>Munidopsis spinocolata</u> (A. Milne Edwards, 1880	337
53. <u>Munidopsis spinosa</u> (A. Milne Edwards, 1880)	346
54. " " " " " "	347
55. <u>Munidopsis squamosa</u> (A. Milne Edwards, 1880).	357
56. " " " " " "	358
57. <u>Munidopsis subspinocolata</u> Pequegnat and Pequegnat, 1971 . . .	368
58. <u>Munidopsis transtridens</u> Pequegnat and Pequegnat, 1971	376
59. " " " " " "	377
61. <u>Munidopsis serricornis</u> (Lovén, 1852).	391
62. " " " "	391a
63. " " " "	392
64. " " " "	393
65. " " " "	394
66. " " " "	395

LIST OF DIAGRAMS AND TABLES

Diagram	Page
1. Generalized <u>Munidopsis</u> , external morphology	24a

Table	
1. Comparison of characters in three species of <u>Munidopsis</u> . . .	344

INTRODUCTION

Extensive collections of deep-sea decapod crustaceans were made during cruises of the R/V GERDA and the R/V JOHN ELLIOTT PILLSBURY as part of a long-term faunal survey of the tropical western Atlantic Ocean by the University of Miami. The GERDA (May 1962 - August 1970) worked principally in the Straits of Florida, the Bahamas and adjacent waters as far south as Arrowsmith Bank in the Caribbean. Although the PILLSBURY (May 1964 - July 1971) made important expeditions to West African waters, Bermuda and the Gulf of Panama, a large part of her work was done in the Caribbean: off Yucatan, Honduras and Panama, along the north coast of South America from Colombia to Surinam, in the Lesser Antilles from Trinidad to the Virgin Islands, and from Puerto Rico to Haiti and Jamaica.

The material of the benthic galatheid genus Munidopsis collected during cruises of these vessels in the western Atlantic is the basis for this study. Of 48 species of Munidopsis now known from the western Atlantic, 35 species are represented in the GERDA and PILLSBURY collections. In this paper, an account is given of each of these species, including complete synonymies, diagnoses, detailed descriptions, figures and distribution charts as well as information about sexual dimorphism, parasites, bathymetric range, habitat and coloration when available. In addition, locality records found in the literature are presented. The relationships of each species to other western Atlantic species and to species of Munidopsis from other regions are discussed. Accounts of the 13 western Atlantic species not collected by the GERDA and PILLSBURY are not included here, but will appear in the final report of the genus. The present location of the holotype is noted in the cases where it

could be determined. Most of the type material is housed at the Museum of Comparative Zoology of Harvard University, Cambridge, Massachusetts, and at the National Museum of Natural History, Smithsonian Institution, Washington, D. C.

REVIEW OF THE LITERATURE

J. F. Whiteaves began the history of the genus Munidopsis in the western Atlantic with his description of Munidopsis curvirostra (1874: 212-213) as a new genus and species. Whiteaves' report of M. curvirostra from the Gulf of St. Lawrence in 180-220 fm was repeated by S. I. Smith (1879:54) in his account of the Stalk-Eyed Crustaceans of the Atlantic Coast of North America, north of Cape Cod.

The variety of galatheid crustaceans in the tropical western Atlantic was indicated in A. Milne Edwards' (1880) preliminary report on the crustaceans collected by the BLAKE during the first major trawling expeditions into the Gulf of Mexico and Caribbean. In addition to new species of Galathea, Munida, Diptychus and Ptychogaster, A. Milne Edwards named 22 new species which he assigned to four new genera: Galacantha (two species), Galathodes (ten), Elasmonotus (four), and Orophorhynchus (six). All of these new genera have subsequently been combined in the genus Munidopsis. A. Milne Edwards gave only brief descriptions and no illustrations of these animals, and the formal report of the BLAKE galatheids did not appear until several years later (A. Milne Edwards and Bouvier, 1897).

In the meantime, Smith was working on material collected by the BLAKE off the eastern coast of the United States. Smith found the range of Galacantha rostrata A. Milne Edwards extended north to the coast of New England, and that of Munidopsis curvirostra Whiteaves south to the coast of North Carolina (1882:21). He pointed out that the latter species might be identical with one of the ten species of Galathodes described by A. Milne Edwards, but that such synonymy could not be determined from

the brief description alone.

Smith (1883:50-55) published a very detailed description of Anoplo-
notus politus, new genus and species, complete with drawings of the en-
tire animal as well as all the mouth parts. This species also has sub-
sequently been assigned to the genus Munidopsis. Smith indicated that
he had hesitantly referred this new species to Elasmonotus since A.
politus agreed well with the brief diagnosis of that genus given by A.
Milne Edwards (1880:60), but that after seeing figures of Elasmonotus
vallantii (A. Milne Edwards, 1883: fig. 13) from the eastern Atlantic,
he decided that politus was generically as well as specifically distinct.

The report of the first galatheids collected by the ALBATROSS during
its early dredging off the east coast of the United States, was given by
Smith in 1884. He recorded more specimens of Galacantha rostrata and
Munidopsis curvirostra, and described a new species, Galacantha bairdii
from deep water (1497 fm). Smith indicated that the new species was
more like Munidopsis than Galacantha in some of its characters, and con-
sidered it possible that the two genera should be united. In a subse-
quent paper, Smith (1885:493) referred these three species as well as
two new species, M. crassa and M. similis, to Munidopsis on the basis of
"a careful examination of the structural characters."

In a more complete report of the ALBATROSS collections, Smith (1886)
repeated the descriptions and included clear illustrations of M. bairdii,
M. crassa, M. similis and M. rostrata. Data for the most recent stations
at which these, M. curvirostra, and M. rostrata were taken were listed
also. The first part of Smith's paper contained an interesting list of
decapods collected from this region off the northeastern U. S. coast,
including the bathymetric range of each and a statement of the nature of

the eyes; the Galatheoidea, represented by these five species of Munidopsis, made up one section of this list.

Henderson (1885), in a preliminary report giving diagnoses of new galatheids collected during the CHALLENGER expedition in the Pacific, synonymized A. Milne Edwards' Galathodes with Munidopsis, and erected a new subgenus, Galathopsis, for species intermediate between those of Munidopsis and Elasmonotus. In the final report of the CHALLENGER Anomura, Henderson (1888:148) united A. Milne Edwards' Orophorhynchus with Munidopsis, and made an important observation about members of the genus which has subsequently been supported by various authors and substantiated by additional material: "The species vary widely among themselves in the form of those parts which in other Crustacea afford generic characters; and yet it is impossible to effect a natural subdivision, or one which is not founded on a single character to the exclusion of others." In the same paper, he suppressed Galathopsis and Anoplnotus as synonyms of Elasmonotus. The genus Galacantha was maintained however, since Henderson disagreed with Smith's union of Munidopsis and Galacantha, and doubted that the species Smith called G. bairdii should be assigned to Galacantha. Henderson reported three western Atlantic species of Munidopsis in this account, and one species of Elasmonotus.

In Faxon's (1893) preliminary descriptions of new species collected by the ALBATROSS off the western coasts of Central and South America, he included Galathodes, Orophorhynchus, Elasmonotus and Anoplnotus in Munidopsis, but treated Galacantha separately.

A. Milne Edwards and Bouvier (1894) attempted to clarify the increasingly confusing situation in this group of galatheids (Galathéens non flagellés) in their paper, "Considérations générales sur la famille

des Galathéides. All four of A. Milne Edwards' original genera were maintained, although they were greatly modified; species were rearranged among these, and many species were referred to Munidopsis. The BLAKE material served as the basis for their study, along with that collected by the TRAVAILLEUR and the TALISMAN mainly from the eastern Atlantic. The classification used in their account differed from that in current use mainly in the rank of the taxa. In A. Milne Edwards and Bouvier's paper, the family Galathéides was divided into three subfamilies: the Galathéines, the Diptycinés, and the Agléinés. The first subfamily included two tribes: the Galathéens and the Porcellaniens. The Galathéens were then divided into sections: the Galathéens flagellés (Galatea, Munida and Pleuroncodes) and the Galathéens non flagellés (Galacantha, Munidopsis, Galathodes, Elasmonotus and Orophorhynchus). Keys to all known species were given for each genus, and a quantity of general information about morphology and taxonomy was presented along with bathymetric and zoogeographical considerations. The redistribution of West Indian species into genera, and the inclusion of those from the northeast coast of the United States, resulted in two species of Galacantha, seventeen Munidopsis, three Galathodes, four Elasmonotus (one species suppressed, one transferred from Orophorhynchus) and two Orophorhynchus.

The final report by Faxon of the eastern Pacific stalk-eyed crustaceans collected by the ALBATROSS was published in 1895. The account of the genus Munidopsis contained his assessment of the status of Munidopsis, in which he briefly outlined the reasons for uniting the other four genera with Munidopsis, followed by a summary and an appraisal of A. Milne Edwards and Bouvier's (1894) treatment of the

classification. Because of its continued applicability to the problem, part of Faxon's discussion is quoted below:

All of the genera proposed by the senior author in 1880 are retained, although transformed almost beyond recognition by the imposition of new diagnoses and new limitations. Galathodes is restricted to the species characterized by a broad, flat, triangular rostrum, often carinated on its upper side, and armed towards its anterior end with a pair of prominent lateral spines or teeth, in front of which the distal extremity of the rostrum suddenly contracts. This new diagnosis of the genus Galathodes eliminates eight of the ten species upon which the genus was originally based, leaving G. latifrons and G. tridens alone in Galathodes, the other eight being transferred to Munidopsis. So of the six species of Orophorrhynchus (sic) of the original paper three are now transferred to Munidopsis, one to Elasmonotus, one (O. spinosus) is ignored, leaving but one of the original species, O. aries, in Orophorrhynchus, of which genus it becomes the type.

The difficulty encountered by Prof. Milne Edwards in distributing his own species among his own genera would seem clearly to show the artificial nature of the genera proposed, and amply to vindicate the course of those naturalists who have refused to adopt them.

It is true, as Milne Edwards and Bouvier maintain, that the most characteristic of the species ranged by them in the genera Orophorrhynchus and Elasmonotus differ from the more typical species of Munidopsis as much or more than the species

assigned to the genus Galacantha. But there is this difference: the species of Galacantha, although they differ but slightly in structure from Munidopsis, yet form a sharply defined and natural group disconnected from the latter genus in the absence of transitional species. Galathodes, Orophorrhynchus and Elasmonotus, on the contrary, are bound by a perfectly graduated series of numerous connecting forms with the typical species of Munidopsis. . . . (Faxon, 1895:82-83).

A. Milne Edwards and Bouvier in 1897 published the final report of the BLAKE dredgings in the Gulf of Mexico and Caribbean Sea, including some material collected by the HASSLER. Because their report contained more detailed descriptions and illustrations of the majority of western Atlantic galatheids known at that time, it has remained a basic reference for the group. It is unfortunate that many of the plates apparently were prepared with as much or more consideration for their symmetry and artistic appeal than for the taxonomic information they might convey. However, the drawings are useful and, combined with the descriptions, permit the identification of most species of galatheids as well as chirostylids (Diptycinés) known from this area. The classification followed therein was the same as that used in their 1894 publication.

"The Stalk-eyed Crustacea of British Guiana, West Indies and Bermuda" by Charles Yound, was published in 1900. The section on galatheids, with keys and brief descriptions, was the first work in English dealing with the West Indian species. The information appears to be a superficial summary of A. Milne Edwards and Bouvier's work,

with the interesting exception that Galathodes was suppressed, with no explanation, and the two species which the French authors had retained in that genus were assigned to Munidopsis. Eleven species of Munidopsis, four Elasmonotus and one Galacantha were treated, but no new locations and no illustrations were included.

Galatheids taken by the FISH HAWK expedition to Puerto Rico were reported by Benedict (1901), but only one species of Munidopsis, M. platirostris (A. Milne Edwards and Bouvier), was collected on that cruise.

Alcock (1901) agreed with Faxon that Elasmonotus, Galathodes and Orophorhynchus could not be separated into well-defined genera, distinct from each other and from Munidopsis, but he arranged the Indian species of Munidopsis in five groups (the four above plus Bathyankyristes) which he treated as subgenera.

Benedict's major work on galatheids in the collections of the U. S. National Museum was published in 1902. He described 46 new species principally from the expeditions of the ALBATROSS along both American coasts and in the western Pacific. Of the fourteen new species of Munidopsis, six are western Atlantic: of these, three are considered valid and two are treated as synonyms of M. serricornis (= M. tridentata) in this paper. Perhaps Benedict's greatest contribution to the literature is the last part of this 1902 paper, in which he compiled a world list of galatheids presented alphabetically by genus, with synonymies and general remarks about distributions. He submerged Elasmonotus, Galathodes and Orophorhynchus in Munidopsis, and maintained Galacantha as a separate genus. Of seven nominal species of Galacantha, he listed two from the western Atlantic; of 101 nominal

species of Munidopsis, he listed 31 from the western Atlantic.

Doflein and Balss (1913), in their report of the galatheids of the German deep-sea expedition, brought Benedict's list up to date by adding five species of Munidopsis described by various authors, and by describing five new species of Munidopsis and one of Galacantha, none of which are represented in the western Atlantic. Munidopsis, Orophorhynchus, Galathodes and Elasmonotus are ranked as subgenera. They suppressed or ignored some of the species from Benedict's world list, since their tabulations contained only six species of Galacantha and 106 species of Munidopsis (Doflein and Balss, 1913:174). Much consideration was given to bathymetric and zoogeographical distribution in their paper, and a useful compilation of this information for all known species was presented in tabular form. The bathymetric distributions of the 31 West Indian and U. S. east coast species were presented in table VI (p. 177-179) of that paper, but there are several errors in the tabulation which must be pointed out: Munidopsis polita (Smith) was known at that time from material collected off Martha's Vineyard, on the east coast of the U. S., rather than from western Europe, as indicated on p. 177; the geographical locations for M. depressa Faxon (p. 177) and M. tanneri Faxon are incorrectly indicated as West Indian, whereas both of these species are from the Pacific coast of the Americas.

The sexual dimorphism displayed in the abdomen of galatheids was studied in detail by Perez (1927). He gave information about certain characteristics of the telson of many species in the family, including 11 species now recognized as western Atlantic species of Munidopsis.

Other than Lee Boone's (1927) description of a new species of Galacantha collected on the PAWNEE from the Bahamas, no new species were discovered in the western Atlantic for almost 40 years after Benedict's work.

In Schmitt's (1935) report on the macruran and anomuran crustaceans of the Scientific Survey of Porto Rico and the Virgin Islands, only seven species of Munidopsis were treated. A key to their determination was presented, as well as synonymies and a notation of the type locality. The distribution listed for each was based primarily on the BLAKE galatheids rather than on new material, although locations which could not be found elsewhere in the literature were mentioned for two species, M. longimanus and M. platirostris.

The ATLANTIS expeditions in the Bahamas and off the coasts of Cuba in 1938 and 1939 were the next to obtain large collections of galatheids from this region. These were reported in two papers by Chace; a preliminary report in 1939, and the final report in 1942. The latter also included some material taken by the ATLANTIS off the northeast coast of Florida, and supplementary notes on BLAKE specimens in the Museum of Comparative Zoology. Of the 115-120 species of Munidopsis known to him, Chace enumerated 38 from the western Atlantic including three new species. His key to these 38 species was the first comprehensive key limited to but including all species of this geographical area, and thus it has been far more useful than many which preceded it. In his account of Munidopsis, Chace discussed the problems encountered in subdividing the large genus into more manageable genera or subgenera. He reported his unsuccessful attempt to separate Galacantha from Munidopsis based on the presence or absence of epipods on the

ambulatory legs. He concluded that this character must be considered of specific importance only, and he used the arrangement of epipods throughout his key. Chace further analyzed the attempts made by Milne Edwards and Bouvier (1894) to base a division of the genus on the form of the rostrum (Galacantha and Galathodes), the lack of lateral armature of the carapace (Elasmonotus) and the robust form and short chelipeds (Orophorhynchus) of certain species. He agreed that using this system might allow the separation of several groups: Galacantha, with its "abnormal" development of carapacial spines; Galathodes, with a flat tridentate rostrum; Orophorhynchus, with robust and short clawed species; Elasmonotus, with rounded anterolateral angles and carinate abdominal tergites; possibly Anoplomotus; and Bathyankyristes, with subchelate ambulatory legs. However, he observed that at least six similar groupings would be necessary for other species complexes, which would still leave almost one-third of the old Munidopsis species unaccounted for. Many of these not included in the groups mentioned are unique and would have to be placed in monotypic genera, while others are intermediate between groups, which would make the limits of these taxa questionable. He concluded, therefore, that Smith was probably correct when he suppressed Galacantha in 1894, although most authors have continued to recognize the genus as distinct, and he refers to Faxon's (1895) synopsis (see above). Chace reported new locations near Cuba in the accounts of 21 species.

The only reports of western Atlantic galatheids during the next 30 years were those by Springer and Bullis (1956:15) and Bullis and Thompson (1965:9), all based on identifications by Chace, listing stations made by U. S. Fish and Wildlife vessels, principally the

OREGON, at which Munidopsis were taken.

The galatheoids collected by the ALAMINOS in the Gulf of Mexico were reported by the Pequegnats in 1970. The included information on the distribution of 23 species of Munidopsis known from the Gulf of Mexico, of which the ALAMINOS collected material of 14 species including three new species. Chace's (1942) keys, which unfortunately had become unavailable, were reproduced in their paper with slight modifications to include the new species. Additional material from the Gulf of Mexico and the Caribbean Sea taken in deep water by the ALAMINOS and the OREGON was presented by the Pequegnats (1971) in a paper dealing only with the genus Munidopsis. Chace's key was further modified therein to include the five new species they described and two species not recorded previously from the region, thus bringing the total number of western Atlantic nominal species to 48.

Mayo's (1972) description of a new species from Arrowsmith Bank in the Caribbean is the most recent addition to the genus in the western Atlantic.

MATERIAL AND METHODS

The material on which this study is based was collected during oceanographic cruises of the research vessels JOHN ELLIOTT PILLSBURY and GERDA of the Rosenstiel School of Marine and Atmospheric Science, University of Miami, Florida. The letters P- and G- in stations numbers refer to the PILLSBURY and GERDA, respectively. Station data are presented in the appendix. The majority of the material was collected using 6-foot, 10-foot and 41-foot otter trawls, although some samples were taken with a 5-foot or 10-foot Blake trawl. Material of a few species was borrowed from the Museum of Comparative Zoology of Harvard University, Cambridge, Massachusetts (MCZ) and the National Museum of Natural History in Washington (USNM) for comparison and study. Much of this collection has been accessioned into the Invertebrate Museum of the Rosenstiel School of Marine and Atmospheric Science (UMML); the remainder has been sent to the USNM and to the Rijksmuseum van Natuurlijke Historie, Leiden (RMNH).

Measurements of specimens were made to the nearest 0.1 mm using Mitutoyo dial calipers. The standard measurement is carapace length, abbreviated cl, and defined as the distance measure from the frontal margin posterior to the eye, excluding the rostrum, directly to the posterior margin (as shown in diagram 1). Carapace width, cw, is measured at the widest point. Cheliped length is measured from the articulation of the basis and coxa to the tips of the fingers. Illustrations were prepared using a Wild M-5 stereomicroscope with camera lucida attachment. Color notes were made from slides taken of fresh material of several species; most of this information is new and is

presented in the species accounts.

The map of the Caribbean, Straits of Florida and Bahama Islands used in the species distribution plots was redrawn from U. S. Naval Oceanographic Chart 410; an approximation of the 100 fm (183 m) contour is indicated by a stippled line. The station locations for each species were plotted on a grid of the appropriate size using a Calcomp 563 plotter and a program for this operation; these points were subsequently transferred to the printed maps.

This project, as originally conceived, was somewhat broader in scope and included consideration of all genera of the galatheoid families Galatheidae and Chirostylidae. One aim of the larger project was an analysis of distributions and occurrences of species collected by the GERDA and PILLSBURY using Recurrent Groups Analysis, a method developed by E. W. Fager (1957). This method has been used to define species groups or benthic assemblages of fishes (Staiger, 1970) and fishes and invertebrates (Bayer, Voss and Robins, 1970), in addition to its first use in dealing with species groups of zooplankton (Fager and McGowan, 1963). A basic operation in this method is the calculation of an index of affinity between species pairs. The index of affinity is defined as the geometric mean of the proportion of joint occurrences, corrected for sample size. Its mathematical expression is $\left[\frac{J}{(N_a N_b)^{1/2}} - \frac{1}{2} (N_b)^{1/2} \right]$, in which J is the number joint occurrences of species a and b; N_a is the number of occurrences of species a; N_b is the number of occurrences of species b; and N_a is less than or equal to N_b (Fager and McGowan, 1963:454). An IBM 360/65 computer program was used to calculate this index from data obtained for Munida as well as that for Munidopsis, in a preliminary attempt to determine the effectiveness

of the method when used for a relatively limited taxonomic group. Although the study subsequently became restricted to the genus Munidopsis as the need for a complete systematic account of this large group became obvious, the indices of affinity between each pair of species of Munidopsis had been calculated for all species. It is recognized that there are several problems connected with this approach; however, the information expressed by this index is useful, in that species associations suspected after general consideration of joint occurrences are evaluated mathematically. This allows for more objective comparisons and analyses, as well as enabling the observer to predict joint occurrences in some cases. Therefore, indices of affinity between pairs of species of Munidopsis greater than 0.2 are presented in the species accounts.

Munidopsis Whiteaves, 1874

Munidopsis Whiteaves, 1874:212.-- Smith, 1882:21; 1885:493-494; 1886:644.--Henderson, 1885:414; 1888:148.--Faxon, 1893:81 (footnote indicating inclusion of Galatodes (sic), Orophorhynchus, Elasmonotus, and Anoplomotus); 1895:81-83.--Alcock, 1894:328; 1901:247-251, 248 (as subgenus or group), 249-250 (key to species in subgenus or group).--Alcock and Anderson, 1894:166 (key to Indian species).--A. Milne Edwards and Bouvier, 1894:271-276, 275 (key to species); 1897:8 (key), 63-64; 1899:82; 1900:312.--Young, 1900:399(key), 406-407 (key to species).--Benedict, 1901:148; 1902:275-277 (key to species), 315 (list).--Fowler, 1912:574.--Doflein and Balss, 1913:131 (table), 148-149, 174, 177-179 (table of species).--Selbie, 1914:80, 80-81 (key to Irish species).--Schmitt, 1921:167.--Bouvier, 1922:47 (also as subgenus).--Laurie, 1926:139.--Perez, 1927:285.--Yokoya, 1933:66.--Schmitt, 1935:178, 178-179 (key to species).--Makarov, 1938 (1962):80 (key), 96-98.--Chace, 1942:29 (key), 69-72, 72-75 (key to W Atlantic species).--Haig, 1955:39.--Tirmizi, 1966:211(genus), 211 (in key as subgenus), 218 (as subgenus).--Zariquley Alvarez, 1968:268, 268-269 (key to Iberian species).--Glaessner, 1969:R482.--Pequegnat and Pequegnat, 1970:126 (key), 138, 138-140 (key to W Atlantic species); 1971:3, 4-7 (key to W Atlantic species).

Type species: Munidopsis curvirostra Whiteaves, 1874 by monotypy.

Gender: feminine.

Galacantha A. Milne Edwards, 1880:52.--Henderson, 1885:418; 1888:166-167.--Perrier, 1886:294.--A. Milne Edwards and Bouvier, 1894:261,

268-270, 270-271 (key to species); 1897:55-56; 1900:308.--Alcock and Anderson, 1894:173.--Faxon, 1895:78.--Young, 1900:399 (key), 417.--Alcock, 1901:274-275 (key to Indian species).--Benedict, 1902:304 (list.--Fowler, 1912:575.--Doflein and Balss, 1913:131 (table), 147, 174.--Perez, 1927:285.--Tirmizi, 1966:174 (key), 206 (key to Indian species).

Type species: Galacantha rostrata A. Milne Edwards, 1880, by subsequent designation, Fowler (1912:575). Gender: feminine.

Galathodes A. Milne Edwards, 1880:53.--Sars, 1890:162-170, tab. 4 (larvae and juveniles).--Perrier, 1886:294.--A. Milne Edwards and Bouvier, 1894:261, 276-279, 279 (key to species); 1897:94; 1899:83; 1900:331.--Caulley, 1896:390.--Alcock, 1901:249 (as subgenus or group), 250 (key to Indian species in subgenus or group).--Doflein and Balss, 1913:148 (as subgenus).--Bouvier, 1922:48 (as subgenus).--Perez, 1927:287.--Tirmizi, 1966:211 (in key as subgenus), 228 (as subgenus).

Type species: Galathodes erinaceus A. Milne Edwards, 1880, by subsequent designation, Fowler (1912:574). Gender: masculine.

Orophorhynchus A. Milne Edwards, 1880:58.--Perrier, 1886:294.--A. Milne Edwards and Bouvier, 1894:264-267, 283-287, 287 (key to species); 1897:110-111; 1899:85-86; 1900:336.--Alcock, 1901:249 (as subgenus of group), 250 (key to Indian species in subgenus or group).--Benedict, 1901:148 (as subgenus).--Doflein and Balss, 1913:148 (as subgenus).--Perez, 1927:288.--Tirmizi, 1966:211 (in key as subgenus), 216 (as subgenus).

Type species: Orophorhynchus aries A. Milne Edwards, 1880, by subsequent designation, Faxon (1895:82). Gender: masculine.

Elasmonotus A. Milne Edwards, 1880:60.--Henderson, 1885:416; 1888:158-159.--Perrier, 1886:294.--Alcock, 1894:333; 1901:249 (as subgenus or group), 251.--A. Milne Edwards and Bouvier, 1894:262, 264-267, 279-283, 282 (key to species); 1897:98; 1900:333.--Young, 1900:399 (key), 413-414, 414 (key to species).--Doflein and Balss, 1913:148 (as subgenus).--Perez, 1927:288.--Tirmizi, 1966:211 (in key as subgenus), 213 (subgenus, key to Indian species).

Type species: Elasmonotus longimanus A. Milne Edwards, 1880, by subsequent designation, Fowler (1912:574). Gender: masculine.

Anoplomotus Smith, 1883:50.

Type species: Anoplomotus politus Smith, 1883, by monotypy.

Gender: masculine.

Galathopsis Henderson, 1885:417, as a subgenus intermediate between Munidopsis and Elasmonotus.

Type species: Galathopsis laevigata Henderson, 1885 (first species). (Not fixed in original publication, subsequent designation not determined). Gender: feminine.

Bathvankyristes Alcock and Anderson, 1894:173.--Alcock, 1901:249 (subgenus or group), 251 (key to Indian species in subgenus or group).--Doflein and Balss, 1913:148 (as subgenus).--Tirmizi, 1966:211 (in key as subgenus).

Type species: Bathvankyristes spinosus Alcock and Anderson, 1895, by subsequent designation, Fowler (1912:574).

Gender: masculine.

The terminology used herein is in accordance, as far as possible, with that used in the Treatise on Invertebrate Paleontology (Moore, ed, 1969:R401-R418); several terms have been slightly modified from

those of Pike (1940) and A. Milne Edwards and Bouvier (1894).

Diagnosis.--Body not laterally compressed, usually dorsoventrally compressed; integument strongly calcified; transverse ciliated lines on carapace feeble or absent; abdomen and uropods symmetrical; abdominal epimera well developed; abdomen more or less bent under carapace, but not strongly flexed against cephalothorax; second abdominal segment of males with appendages; gill phyllobranchiate, 10 arthrobranchs present in normal position; pleurobranch on fifth pereopods; antenna with 4-segmented peduncle lacking scale; exopod of first maxillipeds without flagellum; third maxillipeds with epipods; first pereopod chelate, second through fourth pereopods not chelate; fifth pereopod differing from third in size, length and shape; last thoracic sternite free.

Description.--Integument of body hard, well-calcified. Carapace usually longer than broad (cw/cl usually 0.80 - 0.95), generally quadrangular; dorsal surface with regions usually well-defined and frequently inflated, particularly gastric region; cervical groove usually distinct centrally posterior to gastric region as short transverse channel curving forward laterally and bifurcating or branching separately into anterior and posterior branches: anterior branch separating hepatic and epibranchial regions (hepatic region herein not equal to hepatic region of Pike, 1940:9; latter equivalent to epibranchial, as used herein), lateral termination marked on lateral margin by notch; posterior branch of cervical groove extending obliquely and posteriorly to lateral marginal notch, or intersecting lateral part of postcervical groove; gastroorbital groove continuing forward from cervical groove to frontal margin, separating gastric and hepatic regions.

Metagastric area prominent (fig. 10) or completely reduced (fig. 23), bordered posteriorly by distinct transverse postcervical groove; lateral extensions of postcervical groove separating mesobranchial from metabranchial regions and often intersecting posterior branch of cervical groove at or near lateral margins. Cardiac region usually somewhat triangular in shape, bounded laterally by branchiocardiac groove and with posterior point close to or approximating transverse marginal groove and adjacent marginal rim. Regions of carapace unarmed, sculptured with tubercles, squamae and/or striae, or armed with spinules, spines or tuberosities; sculpturing, when present, generally symmetrical, often arranged in irregular transverse rows and with associated setae; sculpturing coarser on metabranchial regions; spines, when present, usually consisting of at least one anterior gastric pair, occasionally median gastric spine and/or median or paired spines on anterior ridge of cardiac region.

Front of carapace projected between eyes into rostrum, usually more than $1/4$ carapace length; shape of rostrum varying from slender or triangular spine to broad, spade shape or trident; rostrum dorsally carinate, excavate or smooth; lateral margins convex, concave, parallel or acuminate, smooth or armed with sharp lateral spines or weakly serrate distally; rostrum horizontal in lateral view, weakly decurved or gently or strongly upturned in distal portion; tip usually acute, but occasionally blunt or rounded. Frontal margin between eye and anterolateral angle smooth or with post-antennal lobe or spine, never with strong supraorbital spine. Anterolateral angle (defined as occurring mesially or anteriorly of lateral termination of anterior branch of cervical groove) usually armed with spine or tooth, or unarmed.

lateral margins nearly straight to distinctly convex, smooth or armed; spines, when present, usually located posterior to carapacial grooves. Posterior marginal rim smooth, beaded, granulate or armed with one or more spines, frequently transversely bicarinate.

Abdomen broad, well-developed, usually flexed with only anterior 3 somites and part of fourth somite visible in dorsal view. First abdominal segment small, usually smooth, partially hidden beneath carapace; postolateral angles projected as articular flanges, latter occasionally sculptured or armed. Second through fourth segments smooth anteriorly, fitting beneath anterior segment with abdomen extended, usually with transverse carinae; carinae sometimes dorsally projected, frequently armed with paired or median spines; occasionally with spine on pleuron. Pleuron of second segment usually broad, pleura of posterior segments frequently narrowed laterally and smooth anteriorly, fitting beneath pleuron of preceding segment with abdomen flexed. Fifth and sixth segments generally smoother.

Sternum usually smooth, occasionally with tubercles and less frequently with small spines on sternite between bases of chelipeds; intersegmental ridges and grooves distinct or obscure, usually with row of short setae; median longitudinal indentation or groove often present, usually more distinct posteriorly. Sternite of fifth pereopods narrow but well-formed, not fused to others but freely articulated.

Eyestalks short, fused to front of carapace and rostrum or freely movable; eyes sometimes partially hidden beneath rostrum; cornea same diameter as eyestalk or inflated, usually chalky white, sometimes translucent or red-orange in life, usually devoid of pigment and faceting; eyes unarmed or eyestalk projected beyond cornea mesially and/or later-

ally to form spine, or cornea with terminal eyespine.

Basal segment of antennular peduncle usually enlarged, with lateral swelling often sculptured, and armed distally with usually 2 sharp spines, one above other. Second and third segments slender, flexed; extended antennule often reaching beyond rostrum.

Antennal peduncle consisting of 4 segments. Basal segment broad, immovable, usually armed with lateral spine and ventromesial projection. Second and third segments usually smaller, frequently armed with lateral or mesial spines. Distal margin of fourth segment usually with dorso-lateral projection. Antennal flagellum short (less than carapace length) of medium length, or extremely long, reaching well beyond chelipeds; flagellum with or without setae.

Exopod of first maxilliped without flagellum.

Endopod of third maxilliped with epipod. Well-developed crista dentata on mesial edge of ischium. Merus serrate, weakly toothed, or with distinct spines on ventral flexor margin and dorsal spine on distal margin. Carpus sometimes armed or sculptured. Propodus and dactylus smooth.

Pereiopods usually sculptured, often spinous, particularly on meral segments. Arrangement of epipods varying from absent on all pereiopods to present on anterior 4 pereiopods; when present on second, third or fourth pereiopod, also present on all preceding pereiopods.

First pereiopod chelate; length varying from short (slightly less than carapace length) to more than 4 times carapace length. Claw often flattened dorsoventrally, with fingers toothed on opposing margins and spooned distally; more proximal segments subcylindrical or quadrate in cross section; carpus usually armed on distal margin; merus armed dis-

tally and on mesial surface. Second, third and fourth pereopods usually quite similar: dactylus usually terminating in curved brown corneous tip, followed on flexor margin by serration, of which each tooth armed with short stiff seta or corneous spinule. Fifth pereopods chelate, slender, weak; merus and carpus elongate, flexed.

Paired pleopods present on first 5 abdominal somites of male; anterior 2 pairs greatly modified for copulation; posterior 3 pairs usually weak and rudimentary. Paired pleopods present on second through fifth abdominal somites of female.

Fourteen phyllobranchiate gills on each side: 5 pairs of arthrobranchs (on third maxilliped, first through fourth pereopods) and 4 pleurobranchs (on second through fifth pereopods).

Protopod of uropod usually with 2 lobes on posterolateral margin, separated by notch between attachment of exopod and endopod: posterior lobe often with serrate margin, additional notch and/or spines. Exopod usually smooth, exposed surface occasionally with sculpturing in form of tubercles or minute spinules: lateral and posterior margins with long plumose setae and short, closely-spaced spinules, spinules sparser on lateral margin. Endopod with few simple setae on usually straight lateral margin; posterior margin with long plumose setae; exposed surface often with sculpturing.

Telson generally hexagonal, subdivided by lines of weaker calcification into 7 to 10 symmetrical plates (following terms according to Pike, 1940:26, based on Perez, 1927:275): broad medial plate, smaller anterolateral pair of plates, lateral and posterior plates most distinct; often central plate distinct or discernible posterior to medial plate, and small intermediate plates mesial to lateral plates. Margins

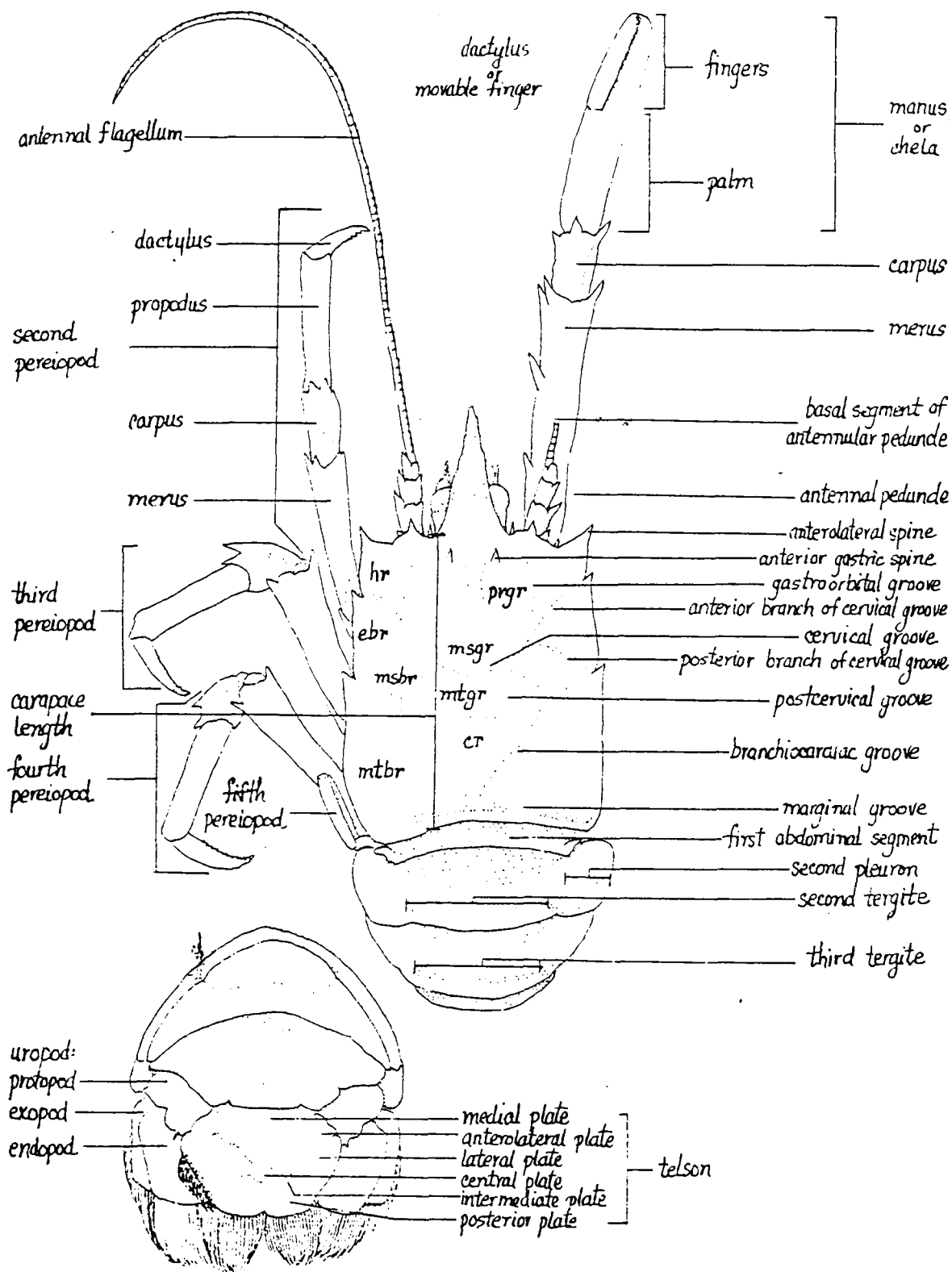


Diagram 1.--Generalized Munidopsis, external morphology. Abbreviations of carapacial regions as follows: prgr, protogastric region; msgr, mesogastric region; mtgr, metagastric region; cr, cardiac region; hr, hepatic region; ebr, epibranchial region; msbr, mesobranchial region; mtbr, metabranial region.

of lateral plates each usually with fringe, "comb" or tuft of thick setae in males, sometimes deep golden or amber color; marginal setae lacking or sparse, never forming dense fringe, in this location on females. Posterior margin of telson with medial indentation, long, plumose marginal setae.

Geographic range.--Representatives of the genus Munidopsis have been taken from benthic habitats in deep water from the Atlantic, Pacific and Indian Oceans. Of the 48 species now known from the western Atlantic, 6 of the deepest dwelling species can be considered amphi-Atlantic (M. bermudezi Chace, M. crassa Smith, M. livida (A. Milne Edwards and Bouvier), M. serricornis (Lovén) and M. sundi Sivertsen and Holthuis); the first 5 of these are represented in the collection reported herein. In addition, specimens from the Indian Ocean have been identified as M. rostrata and M. tridentata (Esmark) (= M. serricornis).

Material collected in the western Atlantic by the GERDA and PILLSBURY was taken from the Straits of Florida (19 of 35 species), the Bahama Islands (9 species), the Greater Antilles --Cuba, Jamaica, Haiti, Puerto Rico --(20 species), the Lesser Antilles --Virgin Islands to Tobago--(17 species), the north coast of South America (13 species), the coast of Panama and Central America (7 species) and Arrowsmith Bank (3 species). The most thorough collecting was done in the Straits of Florida, and all species previously reported from this area were collected there except one, M. expansa Benedict, the type of which was reported from the north coast of Florida. Only M. riveroi Chace, M. bradleyi Pequegnat and Pequegnat, M. ramahtaylorae and M. serratifrons (A. Milne Edwards) seem to be restricted to the Caribbean, having

neither been collected as far north as the Straits of Florida nor reported thus far from the Gulf of Mexico. M. gilli, known only from the Bahamas and the Straits of Florida to date, M. granulens from Arrowsmith Bank, and M. cubensis from the Straits of Florida and Cuba may have somewhat restricted ranges, but as yet these species are known from too few specimens to conclude much about their actual distribution.

Bathymetric distribution.--Munidopsis is a deep-water genus with most of its species occurring below 500 m. Material in the GERDA and PILLSBURY collections was taken from depths between approximately 150 and 5200 m, although the range of any single species is much narrower. Bathymetric range is expressed in two ways in this paper, to account for the variations in depth sometimes encountered during a single trawl: possible depth range is the maximum possible depth range of the stations from which material was collected, from the least depth at the shallowest station to the greatest depth at the deepest station; calculated depth range is a narrower range, from the greatest depth at the shallowest station to the least depth at the deepest station. The latter depth range is quite significant in that it is certain that the species has been taken between the depths indicated. It must be kept in mind, however, that it is also quite possible that a given species occurs shallower or deeper than this calculated depth range.

The bathymetric ranges of species taken by the GERDA and PILLSBURY are as follows:

<u>Species</u>	<u>Calculated range (m)</u>	<u>Possible range (m)</u>
<u>M. platirostris</u>	207-390	92-842
<u>M. granulens</u>	347-353	same
<u>M. squamosa</u>	366-390	339-395
<u>M. spinifer</u>	421-522	203-604
<u>M. robusta</u>	324-622	same
<u>M. riveroi</u>	431-531	373-686
<u>M. abdominalis</u>	480-622	458-648
<u>M. ramahtaylorae</u>	not determined	408-648
<u>M. bradleyi</u>	not determined	476-711
<u>M. alaminos</u>	558-715	457-842
<u>M. impolita</u>	585-715	585-787
<u>M. polita</u>	134-755	129-807
<u>M. subspinoculata</u>	558-777	457-823
<u>M. serratifrons</u>	770-824	715-897
<u>M. erinaceus</u>	311-827	316-1574
<u>M. spinosa</u>	724-878	597-1050
<u>M. cubensis</u>	not determined	759-869
<u>M. brevipanus</u>	not determined	878-906
<u>M. longimanus</u>	576-1052	408-1281
<u>M. latifrons</u>	677-833	659-1089
<u>M. spinoculata</u>	724-1135	597-1267
<u>M. abbreviata</u>	724-1318	597-1345
<u>M. serricornis</u>	695-1373	570-1446
<u>M. armata</u>	906-1373	796-1446
<u>M. transtridens</u>	1201-1373	1162-1446
<u>M. sigsbei</u>	805-1442	595-1629

<u>Species</u>	<u>Calculated range (m)</u>	<u>Possible range (m)</u>
<u>M. gilli</u>	not determined	1638-1757
<u>M. rostrata</u>	1848-2626	1464-2669
<u>M. similis</u>	1885-2628	1885-2681
<u>M. simplex</u>	1116-3477	1088-3971
<u>M. nitida</u>	1903-3477	1766-3971
<u>M. geyeri</u>	not determined	3111-3496
<u>M. crassa</u>	2532-4415	2514-4415
<u>M. livida</u>	not determined	3111-3496
<u>M. bermudezi</u>	2751-5179	2745-5184

Parasites.--The genus Munidopsis is host to two major groups of crustacean parasites: isopods of the family Bopyridae; and rhizocephalans of the family Peltogastridae.

The isopods are carried in either the left or right branchial chambers, and usually produce a conspicuous swelling on the metabranchial region of the carapace. All of the bopyrids extracted from the GERDA and PILLSBURY material were identified by John C. Markham as belonging to the genus Pseudione. None of these were identified to species and most are probably undescribed, according to Dr. Markham.

The rhizocephalans are attached beneath the abdomen, usually to the second, third or fourth segment. Most of these were identified by the author as belonging to one of three genera: Tortugaster, Galatheascus, and Cyphosaccus. These genera are described by Reinhard (1958) who gives accounts and figures of many of the species encountered. Several Sacculina spp. were found also, and are the first representatives of this genus to be recorded from Munidopsis (see account of M. simplex).

Relationships.--Although the relationships among the species of Munidopsis are complex, as indicated in the Review of the Literature and in individual species accounts, the genus, in the broadest sense, is well defined by the characters listed in the diagnosis. Munidopsis can be distinguished from all other genera in the family, and has been placed in its own subfamily, Munidopsinae Ortmann, 1892 by many authors including Doflein and Balss (1913), Yokoyo (1933) and Chace (1942). The well-calcified integument, usually without distinct transverse striae, and the lack of a flagellum on the exopod of the first maxilliped serve to separate Munidopsis from members of the subfamily Galatheinae, which includes Galathea Fabricius, Baba's (1969) new genera: Liogalathea, Phylladorhynchus, Allogalathea and Sadayoshia, Munida Leach, Pleuroncodes Stimpson, Cervimunida Benedict, and Bathymunida Balss.

While there seem to be too many intermediate forms to allow a subdivision of Munidopsis into genera or even subgenera (Chace, 1942:69-72), several complexes of morphologically similar species are found in the species of Munidopsis taken by the GERDA and PILLSBURY. The Galacantha group, with huge carapacial spines, contains M. spinosa and M. rostrata. The transitional species, M. gilli, M. bradleyi and M. cubensis lead to a pair of robust species closely related to each other, M. geyeri and M. crassa. M. abbreviata is intermediate between M. crassa and two additional groups: one containing the type species of the genus, M. curvirostra (a northern Atlantic species not reported here) along with M. simplex and M. sigsbei, all with a long, simple spine-like rostrum; and another pair, M. robusta and M. riveroi. The latter species, with its hood-like excavate rostrum, provides a smooth transition to the Elasmodonotus group, which is characterized by rounded anterolateral angles and

projected abdominal carinae and which contains M. brevimanus and M. longimanus. M. reynoldsi (not reported here), M. similis, and M. nitida are intermediate between the simplex-sigsbei types and a group of short-clawed species with eyespines containing M. spinocolata, M. subspinocolata, and M. ramahtaylorae. There are similarities between M. ramahtaylorae and M. platirostris, but the latter has been more closely associated with the Orophorhynchus group, which may contain M. livida, and to which M. aries and probably M. sundi belong (latter two species not reported here). M. serratifrons, although quite special, shows some features intermediate between M. robusta and M. alaminos. M. spinifer and M. erinaeus, with spine-like, laterally armed rostra are quite close. Considering primarily the shape of the rostrum, M. latifrons, with the lateral spines of its tridentate rostrum directed anterolaterally, can be viewed as somewhat transitional between the latter pair of species and the western Atlantic species in the Galathodes group: M. serricornis, M. trans-tridens, M. acuminata and M. tridens (latter two species not reported here). M. polita and M. impolita appear to form a group of species having a generally quadrate, unarmed carapace and short rostrum which includes M. espinis and possibly M. gulfensis (latter two species not reported herein), although the chelipeds of the first two species are much longer than those of the latter two; also, the eyes are movable in the first pair of species, and are fused to the carapace in the second pair. M. squamosa and M. barbarae (not reported herein) are also close to each other but seem to lack affinities with other members of the genus, except perhaps with M. granulens, which has the general form of the carapace, rostrum and eyes somewhat similar, although the chelipeds in the latter species are quite different from those of M. squamosa. The

analyses of relationships indicated here are based primarily on the general shape of the carapace, sometimes the nature of the abdominal sculpturing or length of the chelipeds, but, as has been stated previously, an arrangement can not be made which does not rely on a few features to the exclusion of many others which may be equally important and striking.

KEY TO WESTERN ATLANTIC SPECIES OF THE

GENUS MUNIDOPSIS

1. Abdomen armed 2
 Abdomen lacking distinct spines on any segments 20
2. Dorsal surface of carapace with distinct spines on gastric region 3
 Dorsal surface of carapace with sculpturing on gastric region, but
 without spines 16
3. Fourth abdominal tergite armed with at least one spine 4
 Fourth abdominal tergite unarmed 13
4. Rostrum armed laterally with 1 - 3 pairs of spines, or many spinules
 on dorsal and lateral surfaces 5
 Rostrum unarmed laterally, at most minutely serrate on dorsal and
 lateral surfaces. 10
5. Eyestalk with large distal spine on cornea mesially, or several
 spinules. 6
 Eyestalk without large distal spine or spinules on cornea 7
6. Eyestalk with large distal spine on cornea mesially; rostrum armed
 with 1-3 pairs sharp lateral spines
 M. colombiana Pequegnat and Pequegnat, 1971
 Eyestalk without large distal spine on cornea (often with several
 spinules); rostrum without distinct pairs of lateral spines
 (but with many spinules on dorsal and lateral surfaces) . . .
 M. alaminos
7. Second, third and fourth abdominal tergites with a single median
 spine 8

- Second, third and fourth abdominal tergites with more than one spine 9
8. Huge spine projecting dorsally from posterior gastric region of carapace; cardiac region with 1 sharp spine on anterior ridge M. rostrata
- No unusually large spine on posterior gastric region; cardiac region with 2 blunt spines on anterior ridge M. gilli
9. Posterior margin of carapace unarmed; 2 pairs of gastric spines; 2 pairs of spines on second, third and fourth tergites M. erinaceus
- Posterior margin of carapace with 3-5 pairs of spines; 3 pairs of gastric spines; 3 spines on second and third abdominal tergites, 1 spine on fourth tergite M. spinifer
10. Posterior margin of carapace armed 11
- Posterior margin of carapace unarmed 12
11. Posterior margin of carapace with 1 mesial spine or tooth; second and third abdominal tergites each with only 1 large mesial spine M. robusta
- Posterior margin of carapace with 2 sharp spines; second and third abdominal tergites with smaller spine on either side of mesial spine M. serratifrons
12. Carapace with huge spine projecting dorsally from posterior gastric region, 2 anterior gastric spines and 3 median cardiac spines M. spinosa
- Carapace without unusually large spines, but with denticulate tubercles M. abbreviata
13. Rostrum armed laterally with 1 pair of spines 14

Rostrum unarmed laterally 15

14. Posterior margin of carapace armed with at least 1 pair of spines; gastric region with at least 3 prominent spines; second and third abdominal tergites each with 1 pair of medial spines M. bradleyi

p. 92

Posterior margin of carapace unarmed; gastric region with only 1 pair of spines; second and third abdominal tergites each with a single median spine M. cubensis

15. Rostrum more than 2/3 carapace length, strongly upcurved; antennal peduncle unarmed M. curvirostra Whiteaves, 1874

Rostrum approximately 1/2 carapace length, not strongly upcurved; antennal peduncle spinose M. simplex

p. 812

16. Second abdominal segment with distinct spine or protuberance near pleural margin 17

Second abdominal segment without distinct spine or protuberance near pleural margin 18

17. Rostrum broad and flat, terminally tridentate; third and fourth abdominal tergites unarmed M. latifrons

p. 77

Rostrum excavate dorsally, not tridentate; third and fourth abdominal tergites each armed with expanded median tooth M. longimanus

p. 130

18. Rostrum dorsally excavate, lateral margins subparallel at base between eyes, tapering distally; no anterolateral or lateral spines on carapace; no epipods on pereopods 19

Rostrum not dorsally excavate, lateral margins tapering directly from base; sharp anterolateral spine and lateral spine on carapace; epipods on chelipeds and first 2 pairs of ambulatory

legs M. abbreviata
 (See description; this entrance in key is to account for
 specimens in which gastric spination is obscure).

19. Dorsal surface of carapace strongly arched transversely; raised
 portions coarsely tuberculate or scabrous M. riveroi
- Dorsal surface of carapace not strongly arched transversely; raised
 portions only moderately tuberculate or granulate
 M. brevimanus
20. Dorsal surface of carapace with distinct spines, or at least 1
 pair of tubercles on gastric region 21
- Dorsal surface of carapace without distinct spines or pair of
 tubercles on gastric region 36
21. Eyestalk and cornea unarmed and without granular overgrowth . . 22
- Eyestalk or cornea with at least 1 spine, protuberance or granular
 overgrowth 25
22. Rostrum tridentate 50
- Rostrum not tridentate 23
23. Rostrum narrow, simply spine-like or with distal constriction and
 obtuse teeth at base of constriction; frontal margin of cara-
 pace without post-antennal spine 24
- Rostrum broad, spade-shaped; frontal margin of carapace with post-
 antennal spine M. platirostris
24. Rostrum not simply spine-like, but with distal constriction, often
 with obtuse teeth at base of constriction; gastric region of
 carapace without distinct pair of sharp spines, but with pair
 of obscure tubercles or spinules; lateral submarginal depres-
 sions distinct on carapace M. armata
- Rostrum simply spine-like; gastric region with distinct pair of

sharp spines; no distinct submarginal depressions on carapace
 M. reynoldsi (A. Milne Edwards, 1880)

25. Posterior margin of carapace armed with sharp spines or distinct
 tubercles 26

Posterior margin of carapace not armed with sharp spines or dis-
 tinct tubercles 29

26. Eyestalk with sharp conical spine projection from mesial surface of
 cornea; no epipods on pereopods 27

Eyestalk without sharp conical spine projecting from mesial surface
 of cornea (but with toothed or squamous protuberance); epipods
 on chelipeds and first 2 pairs of ambulatory legs 28

27. Rostrum without lateral spines; frontal margin of carapace with
 small post-antennal tooth M. sharreri (A. Milne Edwards, 1880)

Rostrum with 3 pairs of lateral spines; frontal margin without
 post-antennal spine M. bairdi (Smith, 1884)

28. Dorsal surface of carapace covered with regularly arranged, short,
 sharp spines; frontal margin of carapace with post-antennal
 spine M. barbarae (Boone, 1927)

Dorsal surface of carapace not covered with spines, but with dis-
 tinctive tuberosities, squamous, sometimes sharply granulate;
 frontal margin of carapace without post-antennal spine . . .
 M. squamosa

29. Eyestalk with blunt tooth or granular overgrowth on mesial sur-
 face of cornea 30

Eyestalk with sharp conical spine projecting from mesial surface
 of cornea 31

30. Rostrum spade-shaped, constricted between eyes, lateral margins

p. 35b

granulate; granular overgrowth on mesial surface of cornea; epipods on chelipeds and first pair of ambulatory legs M. granulens

Rostrum broadly triangular, not constricted between barely visible eyes, lateral margins serrate; blunt mesial protuberance on eyestalk; no epipods on pereopods M. aries (A. Milne Edwards, 1880)

31. Body covered with dense pubescence, or carapace spinulate with no prominent gastric spines; cornea small 32

Body not covered with unusually dense pubescence; carapace with at least 1 distinct pair of gastric spines; cornea not unusually small 33

32. Carapace not densely pubescent, without distinct gastric spines; anterior half of carapace with many small spinules distributed evenly over dorsal surface; base of rostrum between eyes broader than length of rostrum; no epipods on chelipeds M. sundi Sivertsen and Holthuis, 1956

Carapace densely pubescent, with 1 pair distinct gastric spine; carapace not spinulate; base of rostrum between eyes narrower than length of rostrum; epipods on chelipeds . . M. bermudezi p. 8

33. Carapace relatively smooth except for single pair of gastric spines; eyestalks usually with large mesial spine and shorter lateral spine on cornea 34

Carapace with many spines or flattened, denticulate tubercles; eyestalks usually with mesial spine, but without lateral spine on cornea 35

34. Carapace with anterolateral spine slightly smaller than post-antennal spine; lateral margin with 4 spines posterior to anterolateral; chelipeds approximately twice carapace length M. similis p. 27

Carapace with anterolateral spine much smaller than post-antennal spine; lateral margin with 3 spines posterior to anterolateral; chelipeds approximately same length as carapace . . . M. nitida p. 27

35. Carapace with pair of large anterior gastric spines and several smaller spines; lateral margin with as many as 9 spines posterior to anterolateral spine M. crassa p. 27

Carapace with pair of large anterior gastric spines only (other sculpturing on gastric region distinct, but not spinous); lateral margin usually with 4 (1 large and 3 small) teeth posterior to anterolateral spine M. geveri p. 144

36. Eyestalks armed with at least 1 conical spine, protuberance or spinule on mesial, distal or lateral surface of cornea . . . 37

Eyestalks not armed with spines, protuberances or spinules on any surface of cornea 41

37. Eyespine located centrally on distal surface of cornea 38

Eyespine located on mesial or lateral surface of cornea, not centrally 40

38. Anterolateral angle of carapace with small tooth or spine; frontal margin with slight rounded projection posterior to antenna, rarely bearing spine; length of eyespine less than 1/2 diameter of cornea; sternum armed with only 1 pair of sharp spines between coxae of chelipeds; second abdominal tergite with 2 transverse carinae M. subspinoculata p. 35

Anterolateral angle of carapace without tooth or spine; frontal margin with small sharp post-antennal spine; length of eyespine at least 1/2 diameter of cornea; sternum armed with 2 pairs of sharp spines between coxae of chelipeds; second abdominal tergite with 1 transverse carina 39

39. Lateral margins of rostrum straight, tapering directly from base to apex; rostrum with medio-longitudinal carina; carapace with irregular transverse sculpturing, setae arranged in transverse rows; length of eyespine almost equal to diameter of cornea M. spinoculata p. 335

Lateral margins of rostrum subparallel proximally, slightly convex distally; rostrum acarinate; carapace smooth, no sculpturing or striae, setae not arranged in distinct transverse rows; length of eyespine approximately 1/2 diameter of cornea M. ramahtaylorae p. 237

40. Rostrum bluntly triangular; eyes armed with small lateral protuberance; no epipods on chelipeds 48

Rostrum broad, margins subparallel in proximal half, tapering distally; eyes armed with mesial, sometimes bifurcate, spine and lateral spinule; epipods on chelipeds M. livida p. 186

41. Rostrum with sharp lateral spines or somewhat constricted in distal portion 42

Rostrum without sharp lateral spines (sometimes minutely serrate), usually triangular or spine-like and not constricted in distal portion 46

42. Rostrum with pair of sharp laterally-projecting spines; epipods present on first pair of ambulatory legs

. M. expansa Benedict, 1902

- Rostrum without sharp laterally-projecting spines, but constricted in distal portion or tridentate; epipods not present on first pair of ambulatory legs 43
43. Rostrum broad and flat, terminally tridentate 44
- Rostrum not particularly broad and flat, not terminally tridentate, but constricted in distal portion, with or without teeth at base of constriction 45
44. Epipods on chelipeds M. acuminata Benedict, 1902
- No epipods on chelipeds M. serricornis
45. Rostrum slightly constricted distally; spine lateral to eye beneath frontal margin of carapace almost as long as eyestalk; submarginal depressions not distinct on carapace; second and third abdominal tergites not unusually carinate . . . M. abdominalis
- Rostrum abruptly constricted distally, usually with obtuse teeth at base of constriction; spine lateral to eyes beneath frontal margin of carapace short compared to long eyestalks; lateral submarginal depression distinct on carapace; second and third abdominal tergites with strong rounded transverse carina M. armata
46. Rostrum sharp, spine-like; posterior margin of carapace with 3-5 sharp spines; epipods on chelipeds only M. sigsbei
- Rostrum bluntly triangular; posterior margin of carapace unarmed; epipods on chelipeds and first 2 pairs of ambulatory legs, or not present on any pereopods 47
47. Eyes movable; no epipods on chelipeds or ambulatory legs . . . 48

- Eyes fused to rostrum; epipods on chelipeds and first 2 pairs of ambulatory legs 49
48. Rostrum horizontal; antennular spines long, sharp, widely separated in dorsal view; distinct protuberance beneath frontal margin lateral to eye M. impolita p. 169
- Rostrum slightly decurved; antennular spines adjacent or overlapping in dorsal view; no distinct protuberance beneath frontal margin lateral to eye M. polita p. 22
49. Anterolateral tooth broad, directed anterolaterally, reaching base of rostrum; lateral margin with bifid tooth posterior to anterolateral tooth; dorsal surface of carapace punctate; chelipeds narrow (width approximately 1/10 length).
 M. espinis Benedict, 1902
- Anterolateral tooth small, directed anteriorly, not reaching base of rostrum; lateral margin without bifid tooth posterior to anterolateral tooth; dorsal surface of carapace not punctate; chelipeds massive (width 1/5 length)
 M. gulfensis Pequegnat and Pequegnat, 1970
50. Chelipeds usually less than 2 1/2 times carapace length; manus broad with respect to length (length of manus = 4 times width); merus with 1 or 2 mesial spines proximally
 M. tridens (A. Milne Edwards, 1880)
- Chelipeds usually more than 3 times carapace length; manus narrow with respect to length (length of manus = 6 times width); (smaller individuals with shorter, but more slender chelipeds) merus with 3 or 4 mesial spines prximally . . . M. transtridens p. 2

Munidopsis abbreviata (A. Milne Edwards, 1880)

Figures 1, 2

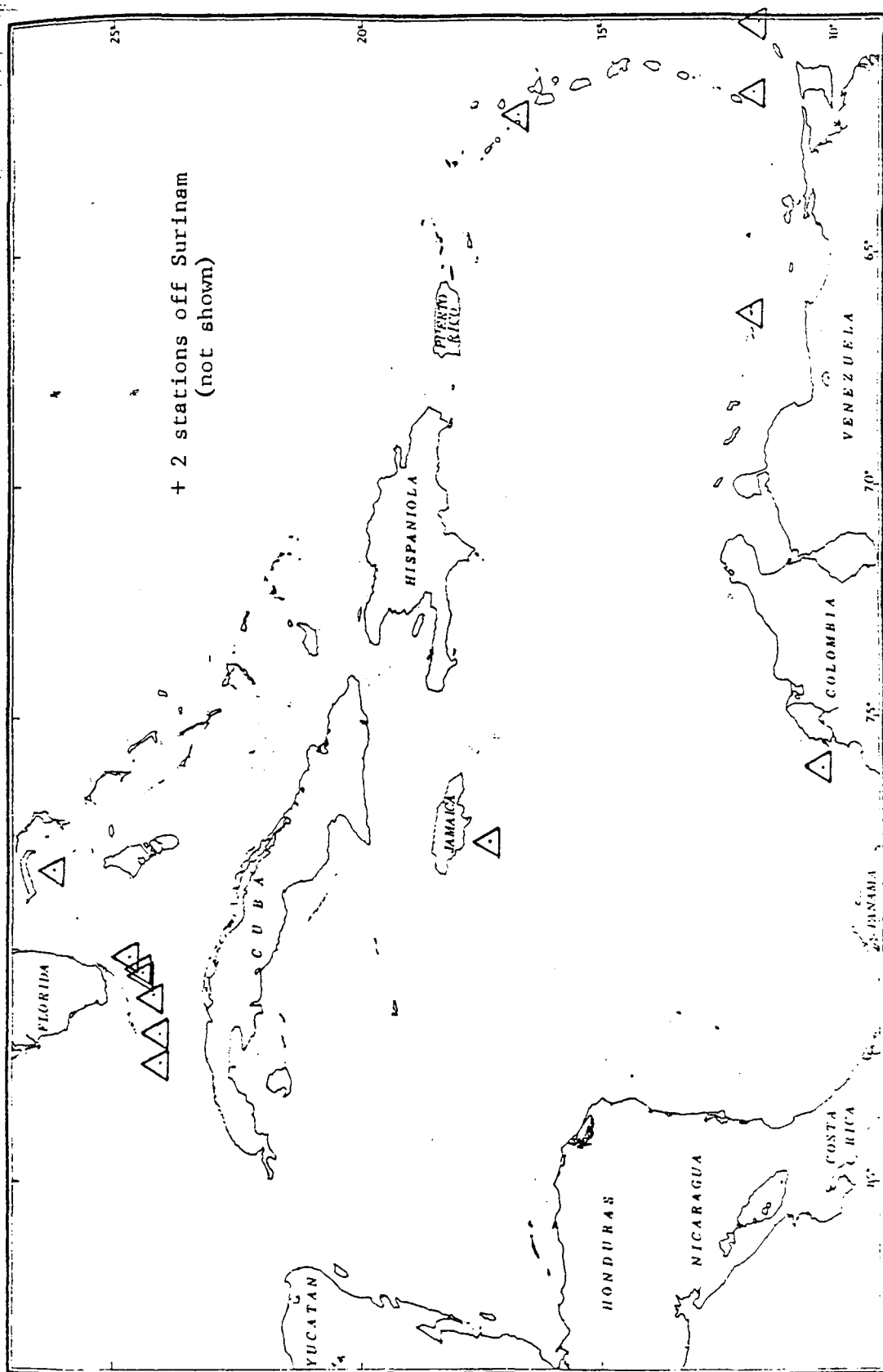
Galathodes abbreviatus A. Milne Edwards, 1880: 55.

Munidopsis abbreviata: A. Milne Edwards and Bouvier, 1894b: 275 (key);
 1897: 91-93, pl V, fig. 1.--Young, 1900: 407 (key), 410.--Benedict,
 1902: 277 (key), 315 (list).--Doflein and Balss, 1913: 174 (list),
 177 (table).--Chace, 1942: 72 (key), 77-78.--Pequegnat and Peque-
 gnat, 1970* 138 (key), 140, table 5-2; 1971: 4 (key).*

Munidopsis abbreviatus: Perez, 1927: 287.

Material examined.--Bahama Islands: G-193, 1190-1080 m, 1 ♀, 6.5 mm,
 (USNM).--Straits of Florida: G-222, 824 m, 1 ♀, 12.6 mm, UMML 32:5207;
 G-225, 805 m, 1 ♀, 17.6 mm, (USNM); G-226, 802-805 m, 1 ♀, 15.2 mm,
 (RMNH); G-443, 729-829 m, 1 ♂, 20.0 mm, (USNM); G-860, 755-724 m, 2 ♀,
 14.9, 19.0 mm, (RMNH); G-870, 807-755 m, 1 ♂, 21.5 mm, 1 ♀, 12.7 mm,
 UMML 32:5208.--Off Atlantic coast of Colombia: P-381, 724-597 m, 2 ♂,
 18.4, 31.8 mm, 1 ovigerous ♀, 18.7 mm, (USNM).--Off Surinam: P-675,
 1235-1272 m, 1 ♂, 17.8 mm, (RMNH); P-682, 1318-1345 m, 1 ♀, 18.8 mm,
 (USNM).--Off Venezuela (S of Orchilla): P-741, 1052-1067 m, 1 ♂, 20.7 mm,
 (RMNH).--Off Tobago: P-847, 733-1281 m, 2 ♂, 14.3, 11.8 mm, 1 ♀, 16.2 mm,
 UMML 32:5209; P-850, 800-924 m, 1 ♀, 5.0 mm, UMML 32:5210.--Off Guade-
 loupe: P-946, 733-833 m, 2 ♂, 10.5, 13.6 mm, 1 ovigerous ♀, 21.7 mm,
 UMML 32:5211.--S of Jamaica: P-1262, 805-1089 m, 1 ♂, 8.6 mm (with bran-
 chial parasite), UMML 32:5212. See distribution plot 1.

Diagnosis.--Rostrum long, triangular, spine-like, slightly upturned dis-
 tally; gastric region of carapace with several pairs of tubercles ar-



Distribution plot 1.--*Munidopsis abbreviata* (A. Milne Edwards) collected by the GERDA and PILLSBURY.

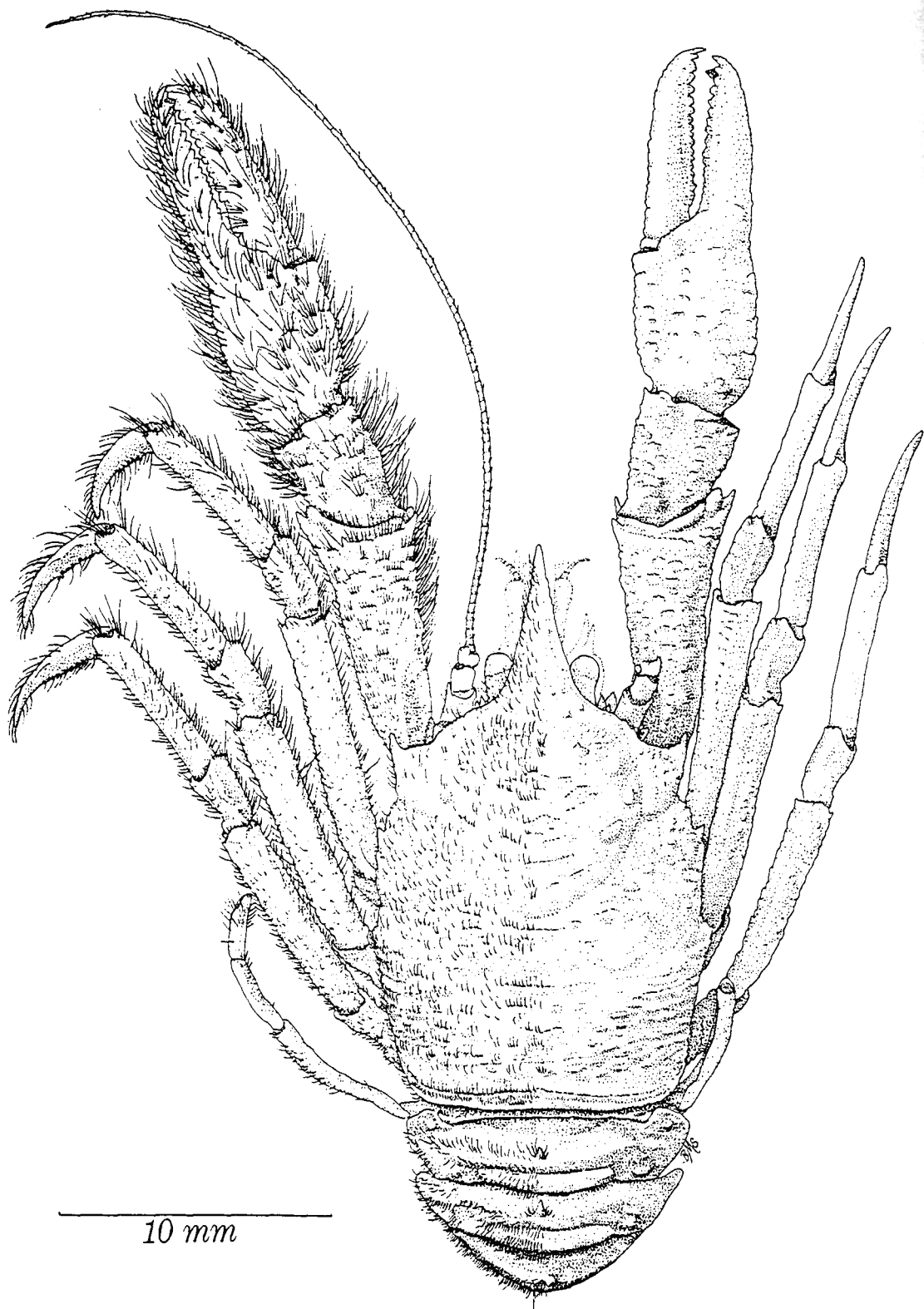


Figure 1. --*Munidopsis abbreviata* (A. Milne Edwards, 1880), ♂, cl. 14.3 mm, P-847, dorsal view.

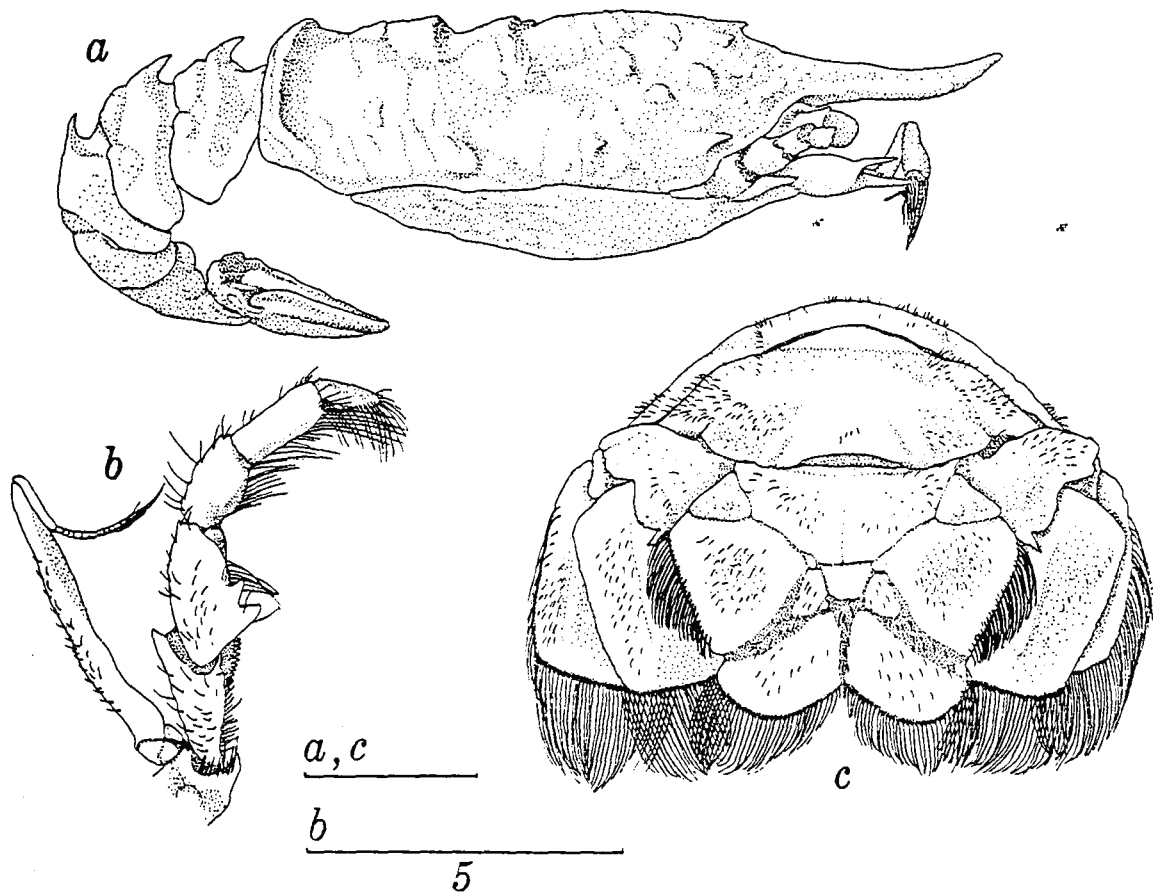


Figure 2. --Munidopsis abbreviata (A. Milne Edwards, 1880). ♂, cl. 14.3, P-847: a, lateral view of carapace and abdominal tergites, setae not shown; b, right third maxilliped. ♂, cl. 20.7 mm, P-741: c, posterior abdominal tergites, uropods and telson. Scales in mm.

arranged symmetrically; frontal margin unarmed; anterolateral spine sharp; 1 spine and 1 tubercle on lateral margin; posterior margin unarmed; second, third and fourth abdominal tergites each with sharp median spine on anterior edge of first transverse carina; eyestalk without eyespines; epipods on chelipeds and first 2 pairs of ambulatory legs.

Description.--Carapace longer than broad ($cw/cl = 0.85-0.90$); gastric region inflated, defined posteriorly by broad cervical groove extending across central $1/2$ of carapace; postcervical groove shorter, slightly* more distinct, separating metagastric and cardiac regions centrally; branchiocardiac grooves less distinct; anterior margin of cardiac region with raised ridge. Anterior gastric region with 1 pair of small tubercles at base in front of swelling followed by several small tubercles on front part; largest pair of widely-spaced tubercles anteriorly, occasionally developed into small spines; 3 or 4 other pairs arranged around gastric region; 1 distinct protuberance near center of each metabranchial region; occasionally tubercles and spines obscure or absent (especially on larger specimens); sculpturing variable, usually many short transverse striae, minutely tuberculate, more distinct in branchial regions near lateral margins. Rostrum approximately $1/3$ carapace length, broad at base, with rounded dorsal carina often extending posteriorly onto gastric region; rostrum tapering distally with obscure constriction at slight upturn about $2/3$ distance to apex, slightly sinusoidal in lateral view. Frontal margin without prominent spine between base of rostrum and anterolateral spine, irregularly and minutely dentate behind antenna. Lateral margin with 1 spine between branches of cervical groove, and protuberance behind lateral termination of posterior branch. Anterior margin

of raised posterior rim minutely tuberculate but otherwise unarmed.

Short setae arranged evenly over most surfaces.

Second, third and fourth abdominal tergites with sharp median spine on anterior transverse carina; second and third tergites with additional transverse carina; fifth and sixth tergites and posterior part of fourth tergite smooth; short setae on most surfaces, particularly edges and margins of carinae. Anterior lobe of pueron of second tergite with small rounded protuberance; similar, larger protuberance mesial to this near posterior margin of second, third and fourth segments.

Sternum unarmed; short setae on distinct intersegmental ridges and scattered evenly on segments.

Eyestalks movable, unarmed; slightly broader at base; cornea not inflated; short setae dorsally near base of cornea.

Sharp conical tooth projecting anteriorly from intersection of bases of eyestalk, antennule and antenna.

Basal segment of antennular peduncle with lateral swelling, scattered small protuberances on anterior part of swelling, 2 sharp spines, 1 above the other, projecting from dorsolateral surface of segment anteriorly, most dorsal spine more slender, often with slight inward curve, distal ventromesial margin dentate. Antennular peduncle when extended reaching just beyond tip of rostrum.

Basal segment of antennal peduncle broad with blunt triangular ventromesial tooth projecting forward. Second segment with blunt conical lateral spine on distal margin, and small lobe mesiad. Distal margin of third segment dentate dorsoventrally and mesially. Fourth segment with dorsolateral projection and ventrolateral margin dentate. Antennal flagellum nearly 3 times carapace length.

Carpus of endopod of third maxilliped with several setae associated with low rounded protuberances on extensor margin. Merus with 2 sharp teeth on proximal flexor margin, distal and extensor margins with low rounded protuberances. Dorsal and ventral angles at distal margin of ischium sharp, but not expanded into prominent teeth; mesial margin dentate.

Pereiopods with low sculpturing similar to that of carapace. Epiopods on chelipeds and first 2 pairs of ambulatory legs.

Chelipeds 1 1/2 to 2 times carapace length. Dactylus more than 1/2 length of manus. Fingers straight, abutting or nearly abutting dorsally along entire margin in all but largest males, toothed on opposing margins, teeth increasing in size distally; palm slightly inflated, broader than width of fingers, mesial surface with small tuberculate crests, lateral edge with several small protuberances, but no distinct spines. Carpus approximately 1/3 length of chela; distal margin with sharp triangular tooth at ventral articulation; dorsal surface usually with 1 small tooth or spine in center of short tuberculate ridge on dorsal surface between sharp mesial and lateral spines; dorsomesial edge slightly inflated, moderately sculptured, small protuberance on dorsolateral surface, Merus slightly more than twice length of carpus, shorter than chela; sharp spine at each of 4 angles near distal margin: 1 sharp spine ventromesially near middle of segment. Ischium with dorsal protuberance near distal margin.

Second, third and fourth pereiopods similar. Tip of dactylus of second pereiopod reaching to fingers of chela; dactylus of third and fourth pereiopods each reaching beyond distal margin of propodus of preceding leg. Dactylus gently curved with corneous tip; 8 or 9 small

teeth on proximal half of flexor margin with corneous spinule or short stiff seta emerging from distal edge of each tooth, decreasing in size proximally. Propodus only slightly longer than dactylus, somewhat laterally compressed; distal ventral margin with 2 small movable spines emerging from pair of lobes, small protuberances arranged over all surfaces of segment, but no spines. Carpus approximately 1/2 length of propodus; single sharp dorsal spine on each distal margin of second and third pereopods, reduced to minute tooth or absent on fourth pereopod, dorsal and dorsolateral edges raised slightly. Merus longer than propodus; distal margin with mesial toothed crest, smooth dorsal lobe and lateral tooth (less distinct on fourth pereopod). Second and third pereopod each with blunt projection dorsally on distal margin of ischium.

Fifth pereopods with merus slightly expanded; exposed surface sculptured with small protuberances.

Uropod with posterolateral margin of protopod scalloped, small notch and sharp tooth posteriorly. Posterior margins of endopod and exopod with denticles at bases of marginal setae.

Telson consisting of 10 plates, smooth, maximum width greater than length.

Color.--The color of a large ovigerous female before preservation was generally light yellowish tan on the dorsal surface of the carapace, at the lateral edges of the abdominal segments and on the tailfan. The rostrum and all pereopods were orange-tan. The anterior edges of the tergites (which fit beneath preceding segment) and the ventral surface of the thorax were white. The eggs were deep translucent orange.

Size.--Specimens collected by the GERDA and PILLSBURY had the following size ranges: ♂, cl. 8.6 - 31.8 mm,
 ♀, cl. 5.0 - 21.7 mm, and
 ovigerous ♀, cl. 18.7 - 21.7 mm.

Specimens reported previously, collected by the BLAKE and ATLANTIS fall within these ranges.

Sexual dimorphism.--Large males (cl. greater than 10 mm) have the characteristic row of thick golden setae on the margin of the lateral plates of the telson, while small males and females have few, in any, regular marginal setae in this location. Perez (1927:287) mentioned a female having a fringe of plumose setae (the row of thick setae on males of other species is referred to as a "comb" in his work). The smallest male, cl. 8.6 mm, examined has no setae on this margin; a larger one, cl. 10.5 mm, has a row of short thick setae; on the largest males, the setae are thick, dense and longer.

While most males and females have the fingers of the cheliped abutting along their entire margins (no gape), the 2 largest males (cl. 31.8, 21.5 mm) have the fingers slightly gaped at the base; a smaller male (cl. 20.7 mm) has no gape, nor does the largest female specimen (cl. 21.7 mm).

Habitat.--At stations in the Straits of Florida where M. abbreviata was taken, the bottom type was pteropods, shells and rocks with alcyonarians and sponges. The bottom was fine white mud at the GERDA station in the Bahamas, and green-brown mud at the PILLSBURY station near Colombia.

Types.--Deposition of the holotype not determined; perhaps at Paris

Museum. ♀, one of syntypes, cl. 11 mm (from lit.).

Type locality.--BLAKE station 195, Martinique, 917 m (first station listed).

Geographic range.--Munidopsis abbreviata is known in the western Atlantic from the Straits of Florida and the Bahamas south to Surinam, in the Caribbean along the north coast of South America, and in the northwestern Gulf of Mexico.

In addition to the type locality and the locations listed for the material examined, M. abbreviata has been reported in the literature from the following localities: off Guadeloupe (A. Milne Edwards and Bouvier, 1897:93); north coast of Cuba (Chace, 1942:77); and from the northwestern Gulf of Mexico (Pequegnat and Pequegnat, 1970:140).

Bathymetric range.--The possible depth range for material in this collection is 597-1345 m; calculated range is 724-1318 m. The possible range recorded previously was 917-1347 m.

Parasites.--A small male specimen taken at PILLSBURY station 1262 had a small bopyrid parasite in the left branchial cavity. This was identified as Pseudione sp., similar (but not identical) to P. galacanthae Hansen.

Associates.--Munidopsis abbreviata was taken at 15 stations by the GERDA and PILLSBURY, and at 6 of these stations Munidopsis sigsbei was also collected.

Relationships.--Munidopsis abbreviata bears some resemblance to M. simplex also from the western Atlantic, but the latter is a much smaller

species with sharp dorsal spines on the carapace, a narrower rostrum and no epipods on the pereopods. M. abbreviata shares several characters with M. gilli from the Bahamas: epipods on the chelipeds and first 2 pairs of ambulatory legs, a central spine on the second, third and fourth abdominal tergites, and irregular armature of the carapace. M. gilli is a larger species having the rostrum more strongly upturned with distinct lateral spines; however, M. abbreviata may be more closely related to M. gilli and some other species with 3 pereopodial epipods (M. cubensis and M. camelus) than to the superficially more similar species having different arrangements of the epipods (M. abbreviata has the rostrum upturned and occasionally armed see remarks).

M. abbreviata also looks somewhat like M. chuni Doflein and Balss from the west coast of Africa, but the latter has sharp carapacial spines rather than denticulate tubercles.

A. Milne Edwards and Bouvier (1897:93) and Faxon (1895:87) have referred to the apparent close relationship of M. abbreviata and M. villosa Faxon from the Gulf of Panama. Faxon listed the differences between the 2 species as follows: in Munidopsis villosa

"...the tubercles and ridges of the carapace are more pronounced and the whole surface of the animal more hairy. The frontal border is armed on each side with a sharp spine, which is wanting in M. abbreviata. The median dorsal spine on the fourth abdominal somite is obsolete, while the fifth somite bears a well-developed acute spine, like those on the second and third somites. In M. abbreviata the fifth somite is unarmed. The distal half of the rostrum is curved upward much more strongly in M. villosa than

it is in M. abbreviata.

"Munidopsis villosa is represented by a single specimen in the "Albatross" collection. It is very much larger than the type specimen of M. abbreviata from the "Blake" dredgings, and it is possible that the peculiarities above specified may be due to age or individual variation. But I think it more probable that we have to do with two closely allied or representative species "on the Atlantic and Pacific sides of the continent."

A large specimen (cl. 31.8 mm) of M. abbreviata in this collection demonstrates that the above differences are not due to age, but are consistent between the species.

Remarks.--The degree of upturn of the rostrum varies among the individual specimens from nearly horizontal to distinctly flexed distally. This character does not appear to be related consistently to size or sex. A few specimens have a small spine on one side of the rostrum near the upturn.

The size and nature of the gastric tubercles also varies among individuals from a pair of small distinct gastric spines to obscure tubercles; the pair of tubercles or knobs on the front slope of the gastric swelling are more constant.

Munidopsis abdominalis (A. Milne Edwards, 1880)

Figure 3

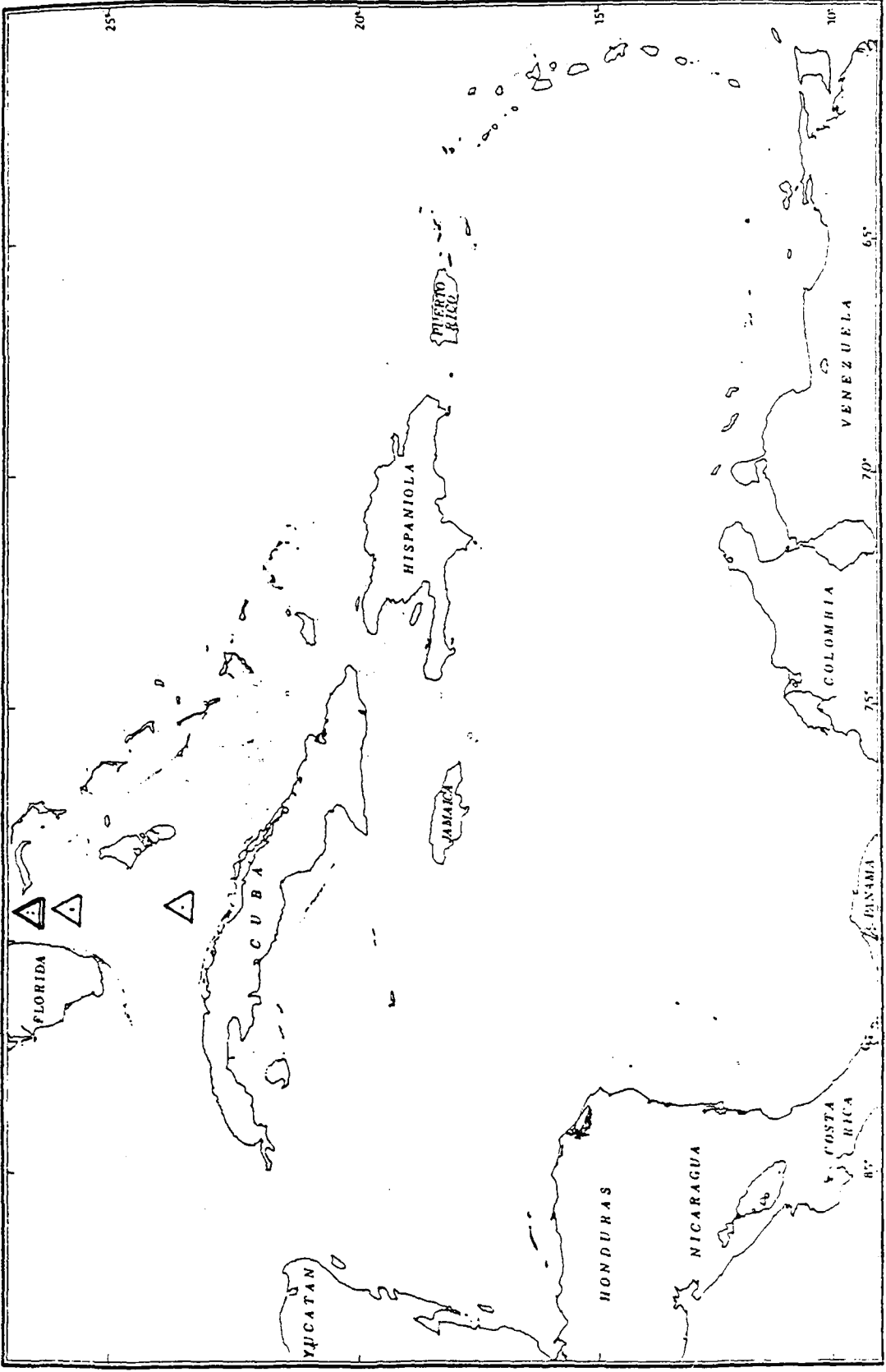
Elasmonotus abdominalis A. Milne Edwards, 1880: 61.--A. Milne Edwards and Bouvier, 1894b: 280, 281, 282 (key); 1897: 101-103, pl. VIII, figs. 7-10.--Young, 1900: 414 (key), 415.--Perez, 1927: 288.

Munidopsis abdominalis: Benedict, 1902: 315 (list).--Doflein and Balss, 1913: 174 (list), 177 (table).--Chace, 1942: 75 (key), 98-99.--Pequegnat and Pequegnat, 1970: 140 (key); 1971: 6 (key).

Material examined.--Straits of Florida: G-158, 531-540 m, 1 ♂, 8.5 mm, 3 ovigerous ♀, 7.0-9.8 mm, UMML 32:5213; G-301, 622-648 m, 1 ♀, 5.7 mm, UMML 32:5214; G-635, 458-480 m, 1 ♀, 6.7 mm, UMML 32:5215.--Santaren Channel: G-1015, 516-525 m, 1 ♀, 4.0 mm, UMML 32:5216. Distribution plot 2.

Diagnosis.--Rostrum long, unarmed, spine-like, broad basally with distal constriction and sharp point, slightly upturned distally; gastric region of carapace unarmed; frontal margin unarmed but with long spine beneath frontal margin between eyestalk and antenna; anterolateral spine small but distinct; lateral and posterior margins unarmed; abdomen unarmed; eyestalks unarmed; no epipods on chelipeds or ambulatory legs.

Description.--Carapace length approximately equalling maximum width, generally quadrangular, slightly wider anteriorly; dorsal surface densely granulate or tuberculate, height of tubercles varying, tubercles frequently with dentate anterior edge; transverse grooves not distinct across carapace, more visible near lateral margins; regions of carapace discernible but not well-defined; gastric, metagastric and cardiac



Distribution plot 2.--*Munidopsis abdominalis* (A. Milne Edwards, 1880) collected by the GERDA.

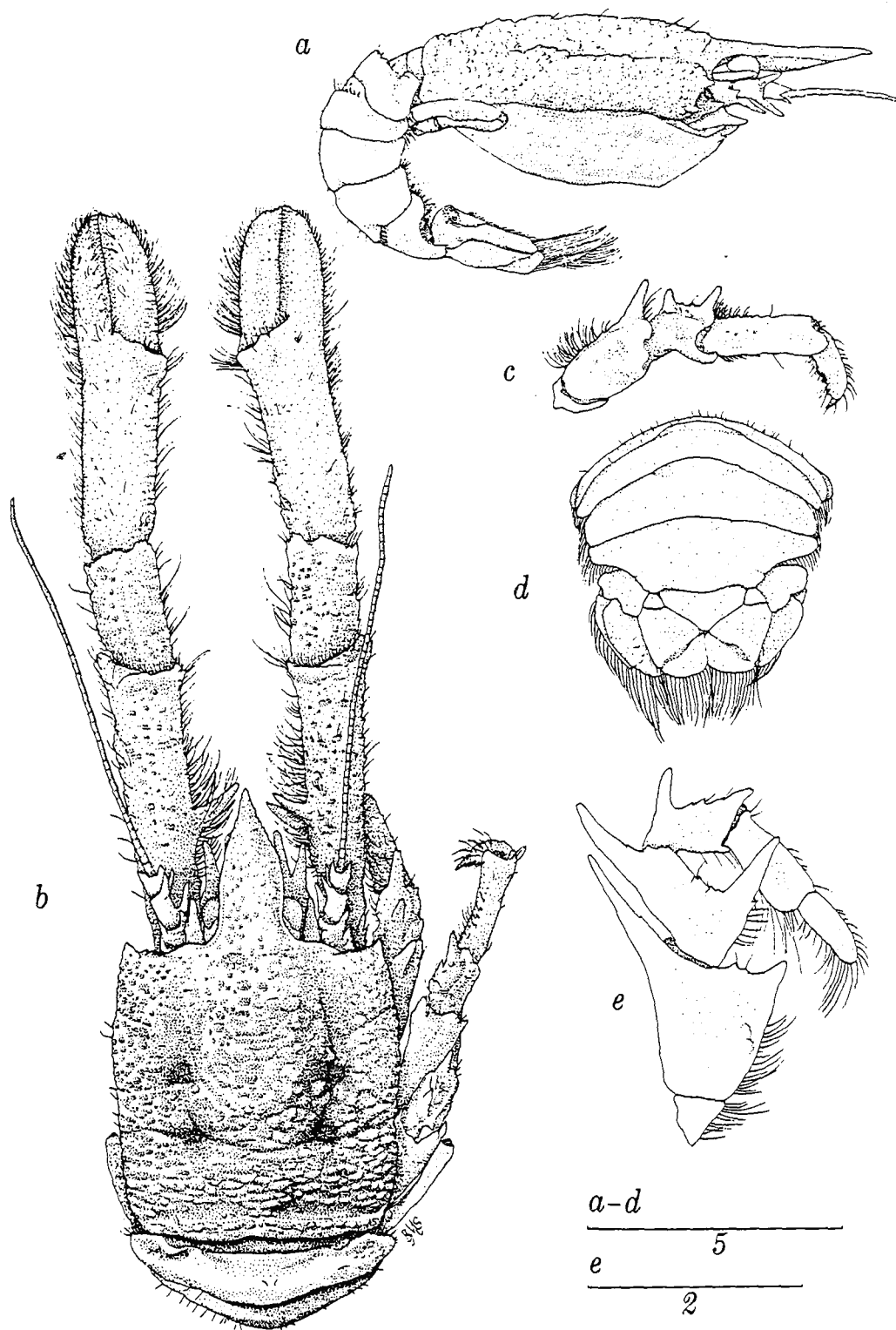


Figure 3. --Munidopsis abdominalis (A. Milne Edwards, 1880). ♀, cl. 5.7 mm, G-301: a, lateral view of carapace and abdominal tergites; b, dorsal view; c, right third pereopod, lateral view; d, posterior abdominal tergites, uropods and telson. ♀, cl. 7.0 mm, G-158: e, endopod of right third maxilliped. Scales in mm.

regions slightly inflated, appearing as continuous medial convexity; 4 rounded deep depressions without sculpturing in surface of carapace: 1 on either side of posterior mesogastric region, and 1 on either side of mesogastric region; depressions giving slightly swollen appearance to surface of carapace lateral and posterior to them; smooth areas preceding posterior margin on either side of midline. Rostrum approximately $\frac{2}{3}$ carapace length; width at base slightly more than $\frac{1}{4}$ carapace width, lateral margins smooth, parallel to slightly concave in proximal half; lateral margins denticulate in distal half tapering to acute apex, with smooth gentle upward flexure, more pronounced in females and larger specimens; upper surface with flattened tubercles in proximal half, becoming slightly carinate toward apex; ventral surface smooth with low rounded carina. Frontal margin curving smoothly from base of rostrum to behind antenna, unarmed, but with long sharp immovable spine emerging from between bases of antenna and eyestalk; this spine curved mesially, with denticle on lateral surface $\frac{1}{2}$ distance to apex; lateral $\frac{1}{4}$ of frontal margin forming sharp denticulate edge. Anterolateral tooth small, distinct; surface beneath and behind spinulate. Lateral margins rounded, sculptured but unarmed, nearly straight except for obscure indentations at lateral terminations of cervical grooves. Posterior margin slightly concave, sculptured but unarmed; transverse ridge interrupted at midline.

Second abdominal tergite with smooth transverse carina extending nearly to lateral margins, anterior half of pleuron with spiniform granules. Transverse carina on anterior part of third tergite not as distinct; pleura smooth. Fourth, fifth and sixth tergites smooth.

Sternum unarmed, tuberculate on anterior projection between bases of chelipeds; intersegmental grooves distinct.

Eyes small, colorless, movable; cornea no wider than eyestalk.

Basal segment of antennular peduncle with 2 long spines distolaterally and 2 short small spines ventromesially on distal edge. Several denticles on ventrolateral surface. Extended flagellum barely reaching apex of rostrum.

Basal segment of antenna with short lateral spine and long ventral projection. Second segment with short lateral spine and long ventromesial spine. Third segment longer, with long ventral and dorsomesial spines. Last segment with shorter ventromesial and dorsolateral spines. Antennal flagellum longer than carapace, usually reaching to articulation of carpus and manus of cheliped.

Carpus of endopod of third maxilliped with conical spine dorsally near distal margin, longer spine near articulation with merus and mesial tuft of setae. Merus with long distal spine on extensor margin; ventral (flexor) margin with long sharp spine basally and several denticulate tubercles distally and on ventrolateral surface, occasionally 1 tubercle developed into major or minor spine. Ischium with long slender spine at dorsal angle of distal margin, broader spine at ventral angle; mesial margin dentate; ventroalteral surface with several low denticulate tubercles near ventral angle.

Pereiopods with denticulate tubercles, sculpturing more distinct on dorsal and lateral surfaces and on proximal segments. No epipods on chelipeds or ambulatory legs.

Chelipeds 2 to 3 1/2 times carapace length, slightly flattened dorsoventrally. Width of manus in male more than 1/3 length; width in female approximately 1/4 length at widest point near articulation with dactylus. Dactylus less than 1/2 length of manus. Fingers toothed on

opposing margins with slight gape proximally, but abutting most of length dorsally in female; gape pronounced in male; fingers hollowed out ventrally, tips curved, strongly spooned, dense fringe of short setae on lateral margins of fingers. Manus and carpus sculptured but unarmed, projection on carpus at articulation with propodus distinctly dentate in male. Carpus approximately $1/3$ length of chela. Merus approximately same length as carapace, distal margin with small sharp ventromesial tooth; proximal part of mesial surface with many long setae and 1 to 6 or 7 (frequently 3) sharp conical spines, often extending in irregular row along dorsal edge of segment. Ischium with heavy dorsal tooth; sharp spine on ventral projection often followed by smaller spines or teeth proximally.

Second, third and fourth pereopods similar, short, broad. Dactylus almost as long as propodus, curved, with corneous brown tip followed on ventral margin by series of blunt teeth with broad corneous spinules projecting from anterior edge of each; longitudinal marginal band of short plumose setae. Propodus tuberculate on extensor surface; flexor margin with dense band of short plumose setae originating near distal end of segment, becoming thicker proximally; setae extending over much of mesial surface of second pereopod. Tuft of similar setae on distoventral lobe of carpus; carpus approximately $1/2$ length of propodus, with prominent spine near distal end on dorsal (extensor) margin; second prominent spine near proximal end with several spinulate tubercles between spines and several more proximal to second spine; longitudinal denticulate ridge lateral to dorsal edge. Merus approximately same length as propodus, with prominent distal spine on expanded dorsal edge followed by series of small teeth decreasing in size to obscurity proximally; lateral

surface rounded, with denticulate tubercles.

Merus of fifth pereopods expanded ventrally, exposed surface tuberculate.

Uropods with posterolateral margin of protopod scalloped, surface smooth. Endopod and exopod with low tubercles and/or short immovable calcified setae on exposed surfaces.

Telson consisting of 7 plates, smooth, obscurely punctate; posterior margin with deep medial indentation.

Color.--The specimens examined were preserved in alcohol and had no traces of pigment. No records of color for this species were found in the literature.

Size.--Specimens collected by the GERDA showed the following sizes:

♂, cl. 8.5 mm,

♀, cl. 4.0-9.8 mm, and

ovigerous ♀, cl. 7.0-9.8 mm.

Sexual dimorphism.--The male examined (cl. 8.5 mm) has the characteristic "comb" of thick golden setae on the lateral margins of the telson; setae are sparse and slender in this location on the females. (Perez, 1927:288, described the females as having flexible plumose setae in this location; he had not seen males). The cheliped of the male is broader and generally more setose than those of the females; the fingers are distinctly gaped basally in the male, while they are in contact along most of their length dorsally in females. The male and the 2 smallest females (cl. 4.0, 5.7 mm) have the rostrum nearly straight, while the larger females have the rostrum gently flexed upward.

Habitat.--The bottom at 2 of the stations where M. abdominalis was collected was characterized by sea urchins at one, and corals and alcyonarians at the other.

Types.--One of the ovigerous female syntypes is housed at the MCZ; the deposition of the other was not determined, but it is probably at the Paris Museum. One of the syntypes has cl. approximately 8.0 mm.

Type locality.--BLAKE sta. 291, Barbados, 366 m (200 fm).

Geographic range.--Munidopsis abdominalis is known in the western Atlantic from the Straits of Florida south to St. Kitts, and in the Caribbean off Cuba and the Lesser Antilles.

The only records of this species besides the type locality and the locations of the material presented herein are those given by Chace (1942:98-99) based on material from near the north and south coasts of Cuba and off St. Kitts.

Bathymetric range.--The possible depth range for material in this collection is 458-648 m; calculated range is 480-622 m which extends the range somewhat deeper than previous reports of 366-458 m.

Parasites.--None of the material examined showed any external evidence of branchial or abdominal parasites. No records of such parasites on this species were found in the literature. The male specimen (cl. 8.5 mm) from G-158 had several epizoans attached to the third maxilliped and tip of the cheliped; these were identified as hydrozoans, probably belonging in the family Campanulariidae.

Associates.--Munidopsis abdominalis was collected by the GERDA at only

4 stations; no significant association was observed between this and other species of Munidopsis.

Relationships.--A. Milne Edwards and Bouvier (1897:103) mention close affinity between M. abdominalis and M. miersii (Henderson) from Fiji in the western Pacific, but they point out that the latter species has a shorter rostrum, gastric tubercles and different armature on the merus of the third maxilliped. The arrangement of epipods in M. miersii could not be determined from the literature.

Among western Atlantic species, M. abdominalis superficially resembles M. granulens Mayo, but the latter can be distinguished easily by the shorter, differently-shaped rostrum, sculptural differences, the presence of epipods on the pereopods and many other characters.

Remarks.--Chelipeds are equal in all 4 complete specimens examined (in contrast to those of the female described by A. Milne Edwards and Bouvier, 1897:102).

The ovigerous females carried the following numbers of eggs:

cl. 9.8 mm, approximately 40 eggs, all about 1 mm in diameter,

cl. 9.2 mm, approximately 25 eggs, all smaller than 1 mm,

cl. 7.0 mm, with 9 eggs, all smaller than 1 mm in diameter.

Munidopsis alaminos Pequegnat and Pequegnat, 1970

Figures 4, 5

Munidopsis alaminos Pequegnat and Pequegnat, 1970: 140 (key), 142-145, figs. 5-1, 5-5 - 5-7, tables 5-2, 5-4; 1971: 6 (key), 18, fig. 11.

Material examined.--Off Atlantic coast of Panama, Gulfo de los Mosquitos:

P-447, 657-673 m, 1 ♂, 9.2 mm, 1 ovigerous ♀, 11.2 mm, UMML 32:5221.--

Off Yucatan, Mexico: P-607, 715-787 m, 2 ♂, 4.5, 8.6 mm, 1 ovigerous ♀, 9.9 mm, (USNM).--Off Guadeloupe: P-920, 531-733 m, 3 ♀, 5.9-7.5 mm. (2

with branchial parasites, 1 with abdominal parasite), UMML 32:5217.--

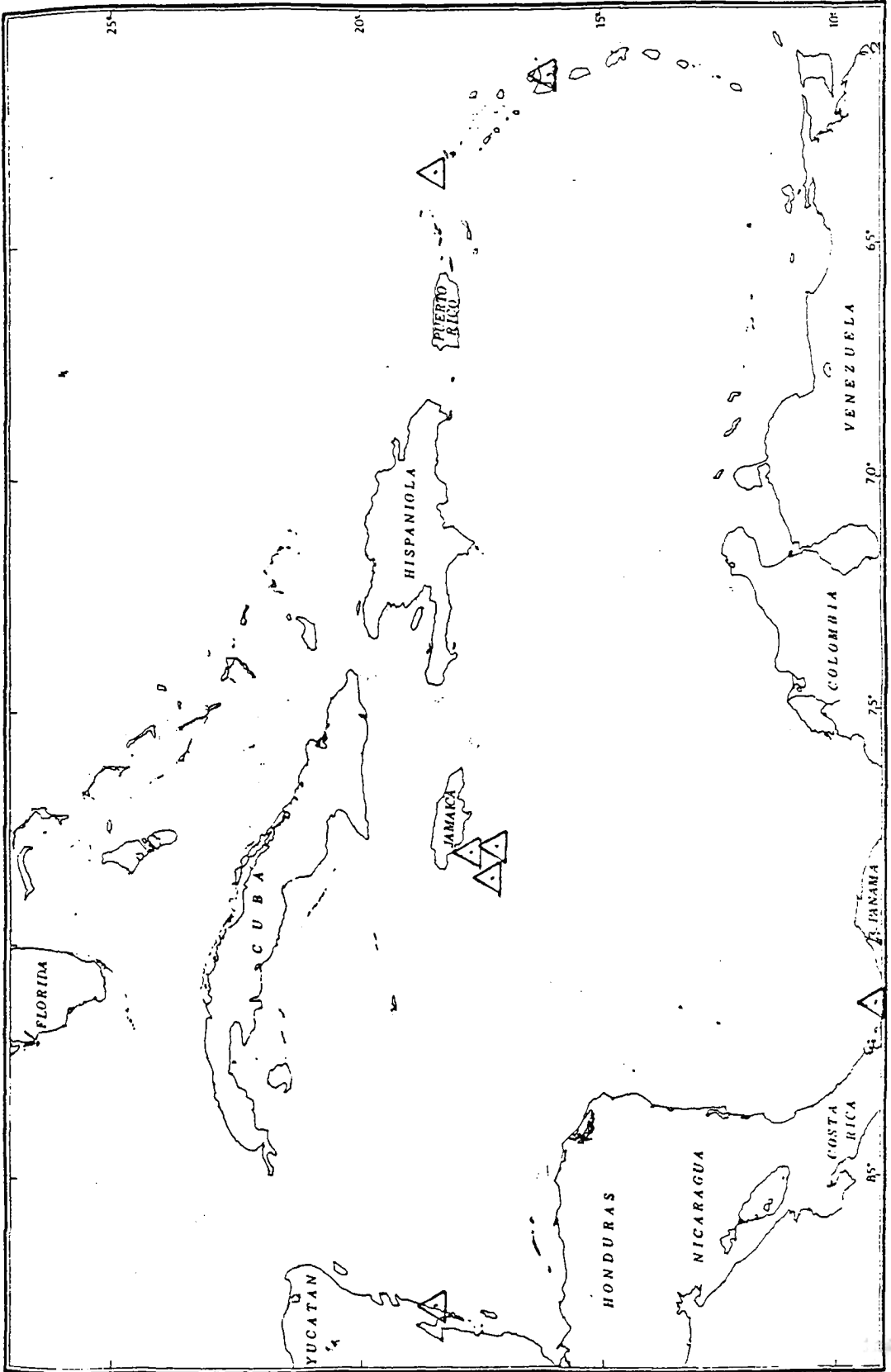
NW of Anguilla: P-988, 686-724 m, 2 ♂, 7.0, 418 mm (with abdominal parasite), 1 ♀, 8.2 mm (with abdominal parasite), UMML 32:5218.--S of Jamai-

ca: P-1225, 457-558 m, 1 ovigerous ♀, 7.5 mm, UMML 32:5219; P-1255, 622-823 m, 1 ♀, 7.9 mm, (RMNH); P-1261, 595-824 m, 1 ♀, 10.0 mm (RMNH).

See distribution plot 3.

Diagnosis.--Rostrum horizontal; triangular, armed with many spinules or denticles on dorsal and lateral surfaces; dorsal surface of carapace with many sharp spinules; frontal margin with spinulate lobe behind antenna, but no large spine; posterior margin spinulate; abdominal segments spinulate, second and third each with medial expansion; eyestalks with several spinules, cornea small; no epipods on chelipeds or ambulatory legs.

Description.--Carapace slightly longer than broad ($cw/cl = 0.90$), generally quadrangular, dorsal surface spinulate; gastric and cardiac regions inflated, with central conical swellings; smooth transverse depression anterior to gastric region accentuating irregular transverse swellings on either side of midline in anterior gastric region; hepatic and



Distribution plot 3.--Munidopsis alaminos Pequegnat and Pequegnat, 1970 collected by the PILLSBURY.

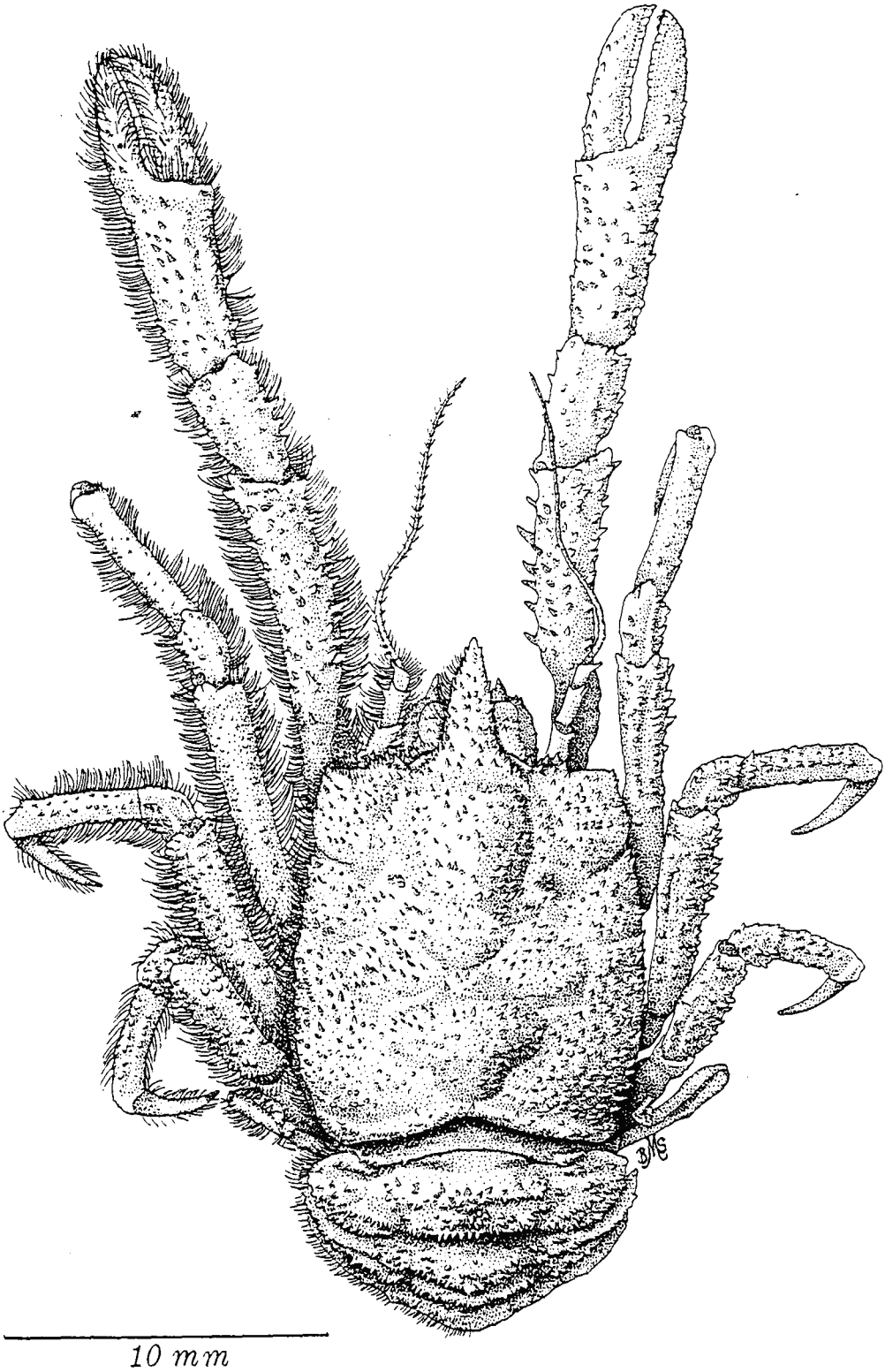


Figure 4. --Munidopsis alaminos Pequegnat and Pequegnat, 1970, ovigerous ♀, cl. 11.2 mm, P-447, dorsal view.

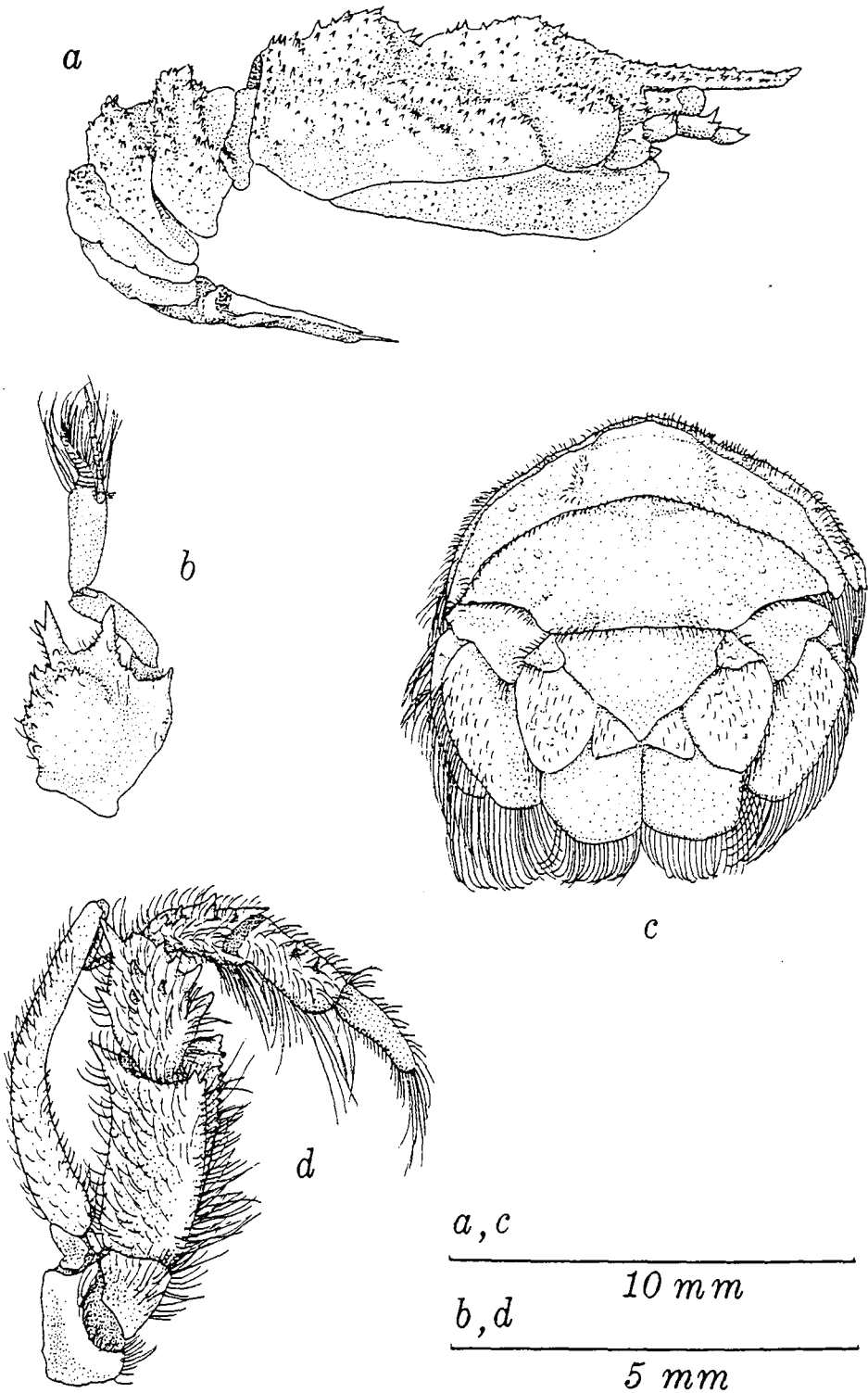


Figure 5. --Munidopsis alaminos Pequegnat and Pequegnat, 1970. ♂, cl. 9.2 mm, P-447: a, carapace and abdomen, lateral view, setae not shown; d, right third maxilliped, ventrolateral view. Ovigerous ♀, cl. 11.2 mm, P-447: b, right antennular peduncle, ventrolateral view; c, posterior abdominal tergites, uropods and telson, not all setae shown.

metabranhial regions inflated to lesser degree than central swellings; lateral branches of cervical groove more distinct than central portion; depressions distinct on either side of metagastric region and anterolateral to cardiac inflation. Rostrum in shape of isosceles triangle, apex frequently somewhat rounded; horizontal or slightly upturned distally; lateral margins rounded, spinulate with fringe of fine setae. Frontal margin with small expanded lobe behind antenna, spinulate but without larger, distinct post-antennal spine. Spinule at anterolateral angle of carapace frequently larger or broader than others. Lateral margins straight or slightly convex posteriorly, spinulate. Narrow posterior rim slightly raised or not at all inflated, spinulate, slightly concave with medial indentation.

Carapace and appendages with dense covering of fine setae on most surfaces.

First abdominal tergite smooth centrally, posterolateral projection with several spinules; 2 transverse swellings indistinct across second and third tergites with median spinulate knob or lobe projecting slightly forward; swollen pleura sculptured, knobs at lateral termination of transverse swelling spinulate; pleura narrowing laterally. Fourth tergite with 1 transverse swelling anteriorly, spinulate on forward edge, posterior surface smooth. Fourth and fifth tergites with smooth inflation, sixth flattened. Fifth and sixth segments with 2 or 3 small, widely-set punctations on lateral part of segment.

Thoracic sternites smooth, intersegmental depressions barely visible with indistinct rows of fine setae behind them.

Eyes colorless, movable, small; cornea reaching approximately 1/2 length of rostrum, often smaller in diameter than eyestalks; eyestalks

with scattered spinules, mesial surface concave.

Basal segment of antennular peduncle with lateral swelling spinulate, terminating in 2 sharp distal spines: 1 above and slightly laterad; spines occasionally bifurcate or with accessory spinule. Distal margin of swollen ventromesial projection serrate. Peduncle reaching beyond tip of rostrum.

Small conical tooth emerging from between bases of eyestalk and antenna.

Basal segment of antennal peduncle with blunt ventral projection. Second segment with sharp lateral spinule on distal margin. Third segment with sharp dorsal and lateral spine on distal margin. Fourth segment with dorsolateral projection. Antennal flagellum short, reaching beyond merus of cheliped.

Exopod of third maxilliped with long second segment broader at base. Endopod with ischium terminating in sharp tooth dorsally, blunter tooth ventrally. Merus with 2 to 4 broad teeth on ventral margin, basal tooth largest; dorsal spine distally. Carpus and propodus with several scattered granules or spinules on lateral surfaces. Dactylus slender.

Lateral setae on pereopods longer, many plumose, forming fringe. No epipods on chelipeds or ambulatory legs.

Chelipeds approximately twice carapace length, maximum width $1/8$ to $1/10$ cheliped length. Dactylus approximately $1/2$ length of manus, fingers not widely gaped on dorsal margin; opposing margins abutting in small specimens, slightly apart in larger ones. Tips spooned, toothed along dorsal opposing margins; manus slightly compressed dorsoventrally, especially in males. Dorsal surface of manus evenly spinulate or spinate, spines sharp, arranged in indistinct longitudinal rows. Carpus

less than 1/2 length of manus, also spinulate. Merus approximately equal in length to propodus, spinate; spines on mesial surface larger, more distinct. Ischium with large conical tooth dorsally, spinate ventral projection. Ventral surfaces relatively smooth or sparsely granulated.

Second, third and fourth pereopods similar: dactylus approximately 1/2 length of propodus, with very sharp corneous tip, otherwise unarmed. Propodus with 3 or 4 indistinct longitudinal rows of spines, carpus and merus with similar spination. Carpus approximately 1/3 length of propodus. Merus approximately same length as propodus in second and third pereopods, proportionately shorter and with more spines in fourth. Ventral and mesial surfaces of these appendages rounded, smooth than dorsal and lateral surfaces. Merus of fifth pereopods expanded, exposed lateral surface spinulate, setose.

Uropods and telson smooth, flat, unarmed, with dense covering of fine short setae.

Telson consisting of 9 plates; small anterolateral plate with central punctation, similar to those on posterior abdominal segments; several other punctae arranged symmetrically on telson.

Color.--The specimens examined are preserved in alcohol and are devoid of color except for the pale brown tips on the ambulatory legs and, in some specimens, the pale golden translucent corneae and yellowish thicker setae.

Size.--The following size ranges were found in the PILLSBURY material:

♂, cl. 4.5-9.2 mm,

♀, cl. 5.9-11.2 mm, and

ovigerous ♀, cl. 7.5-11.2 mm.

Sexual dimorphism.--The most striking difference between mature males and females is the size and shape of the chelipeds; males have longer, broader chelipeds with a noticeable gape between the fingers, while females have shorter, more slender chelipeds, often spinier, with only a slight gape.

Males also have the comb of short stiff golden bristles on the lateral margins of the telson, which is reduced to a fringe of fine setae in females.

In the material examined, a greater swelling of the anterolateral regions of the carapace in males (as stated by Pequegnat and Pequegnat, 1970, figure 5-6) was not apparent; in fact, the females seemed to have this area slightly more inflated. The median swellings in the gastric and cardiac regions, however, were more pronounced and sharper in males than in females.

The differences in degree of spination and pubescence, and in breadth of rostrum between individual specimens were not consistent with the sexes.

Habitat.--The bottom type was observed at one of the seven PILLSBURY stations where M. alaminos was captured, as rubble with pteropod shells.

Types.--Holotype, ♂, cl. 11 mm, USNM 128810; allotype, ovigerous ♀, USNM 128811.

Type locality.--NW Gulf of Mexico, ALAMINOS Sta. 68-A-13-4, 25°38.4'N, 96°18.3'W, 512 m (280 fm).

Geographic range.--This species is known from near Anguilla south to French Guiana in the western Atlantic, from the Gulf of Mexico and the

Caribbean Sea. Previous records include: NW and N Gulf of Mexico (Pequegnat and Pequegnat, 1970:142); and off Dominica and French Guiana (Pequegnat and Pequegnat, 1971:18).

Bathymetric range.--Possible depth range for specimens collected by the PILLSBURY is 457-842 m; calculated range is 558-715 m. Previously known range is 504-828 m; calculated range based on previous reports is 512-810 m.

Parasites.--The abdominal parasites on specimens from station P-920 and P-988 are peltogastrid rhizocephalans, tentatively identified as Tortugaster fistulatus Reinhard.

The branchial parasite on another specimen from P-920 is a bopyrid isopod, identified as Pseudione sp., probably an undescribed species.

Also epizoans were found on this species --mainly hydrozoans and foraminiferans.

Associates.--No significant associations between M. alaminos and other species of Munidopsis were observed.

Relationships.--Munidopsis alaminos most closely resembles M. townsendi Faxon from the southeastern Pacific: they agree in general armature, body shape and proportion, however the latter species has the carapace tuberculate rather than spinulate, and several larger protuberances on the carapace; also M. alaminos has a greater number of smaller spinules on the pereopods. The other Pacific species having a quadrate carapace, M. quadrata Faxon and M. carinipes Faxon, show some similarities to M. alaminos, but the rostrum is broader at the base in these species, the

decoration on the carapace is either tuberculate or granulate rather than spinulate, and the abdominal segments have a larger median projection than in M. alaminos.

Among western Atlantic species, M. alaminos has its greatest affinities with M. riveroi Chace, M. longimanus (A. Milne Edwards) and M. brevimanus (A. Milne Edwards); all the latter three have the broader rostrum excavated to some degree, and lack the carapacial spinulation, in addition to many other differences.

Munidopsis armata (A. Milne Edwards, 1880)

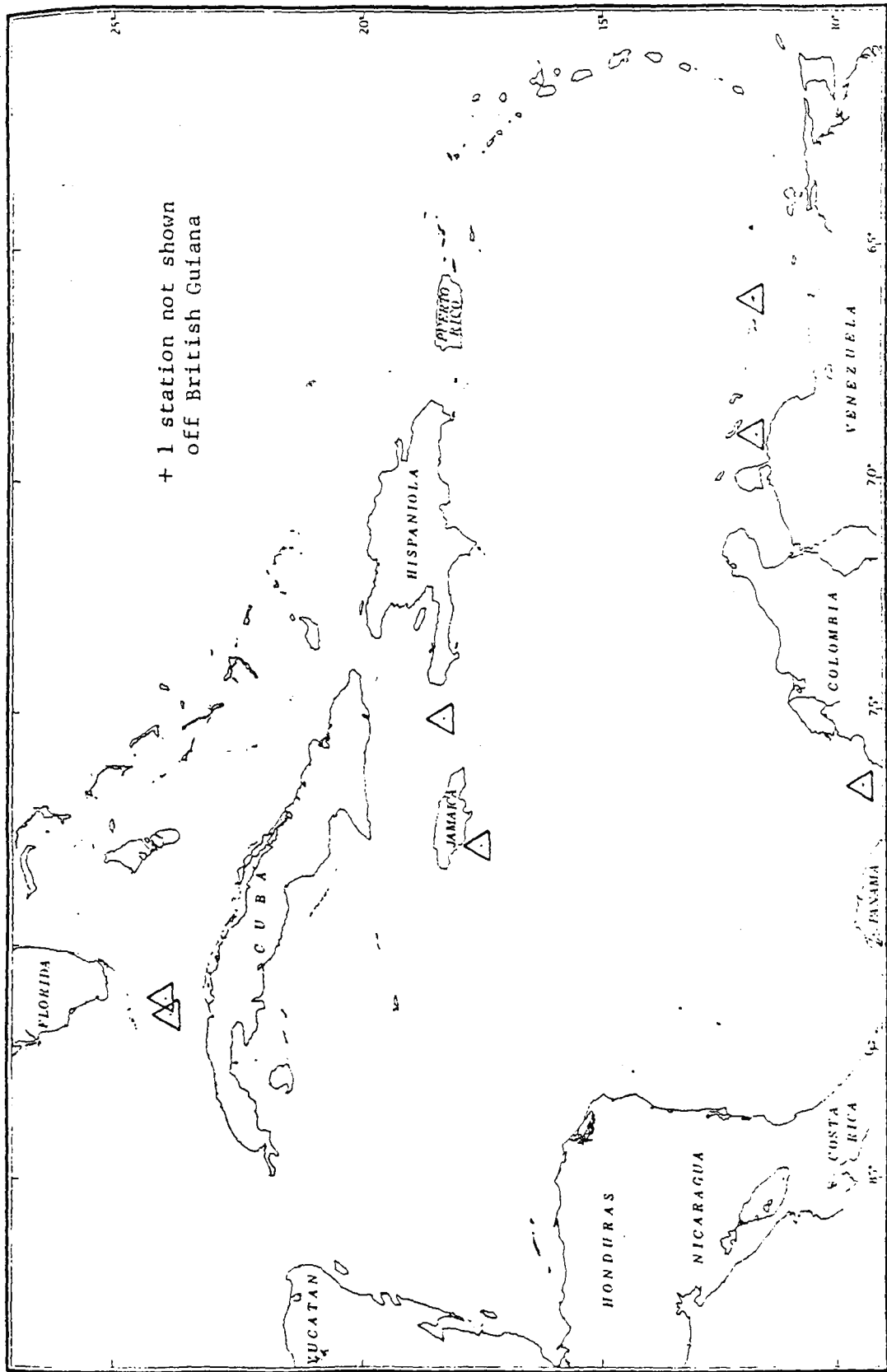
Figures 6, 7

Elasmonotus armatus A. Milne Edwards, 1880:61.--Handerson, 1888:159, pl. XIX, fig. 5.--A. Milne Edwards and Bouvier, 1894b:263, 281, 282 (key), fig. 33; 1897:104-106, pl. VIII, figs. 11-14.--Young, 1900: 414 (key), 415-416.

Munidopsis armata: Benedict, 1902:276 (key), 316 (list).--Doflein and Balss, 1913:175 (list), 177 (table).--Schmitt, 1935: 179 (key).--Chace, 1942: 74 (key), 90.--Pequegnat and Pequegnat, 1970: 140 (key) 145, table 5-3; 1971: 6 (key).

Material examined.--Straits of Florida: G-130, 1021 m, 2 ♂, 8.1, 8.8 mm, 1 ♀, 8.7 mm UMML 32:5222; (?)G-132, 275-302 m (see Remarks), 1 ♂, 6.5 mm, (RMNH); P-636, 1003-1336 m, 1 ♂, 11.4 mm, UMML 32:5224.--Off Atlantic coast of Colombia: P-364, 924-950 m, 4 ♀, 6.5-13.5 mm, UMML 32:5223.--Off British Guiana: P-689, 1373-1446 m, 1 ♀, 11.1 mm, 1 oöigerous ♀, 10.8 mm, (USNM).--Off Venezuela (S of Orchilla): P-741, 1052-1067 m, 1 ♂, 6.2 mm, with abdominal parasite, (USNM); (S of Curacao): P-755, 796-1006 m, 1 ♀, 9.15 mm, UMML 32:5225.--W of Haiti: P-1187, 1034 m, 3 ♂, 5.2-10.9 mm, 1 ♀, 8.7 mm, UMML 32:5226.--S of Jamaica: P-1224, 878-906 m, 1 ♀, 11.5 mm, (RMNH). See distribution plot 4.

Diagnosis.--Rostrum nearly horizontal, with abrupt constriction distally, with obtuse teeth at base of constriction; dorsal surface of carapace unarmed; distinct submarginal depressions laterally; frontal and posterior margins of carapace unarmed; second and third abdominal segments with strong rounded transverse carina; eyes unarmed; no epipods on



Distribution plot 4. -- *Munidopsis armata* (A. Milne Edwards, 1880) collected by the CERDA and PILLSBURY.

pereiopods.

Description.--Carapace longer than broad (cw/cl approximately 0.88); lateral margins raised, forming prominent rim, convex, broadest just behind middle; gastric region inflated, with pair of obscure tubercles anteriorly; cervical groove visible centrally behind gastric region, obscure laterally; broad, smooth postcervical groove separating metagastric and cardiac regions. Well-defined patterns of curved setae on very smooth dorsal surface of carapace: over entire gastric region except for bare area on either side of midline, in triangular area posterior to hepatic region laterally, in transverse row on ridge behind cervical groove; smooth area anterior to cardiac region followed by many short transverse rows of setae, tubercles at bases laterally; extensive smooth area anterior to posterior margin except for several groups of setae along midline; posterior margin with 2 or 3 rows of setae. Rostrum $1/2$ to $3/4$ carapace length, slightly upturned, margins subparallel, slightly convex laterally with lateral fringe of short curved setae in basal portion; distal half constricted, tapering to apex; obtuse or small teeth at base of constricted portion. Frontal margin curved behind antenna, no post-antennal spine; notch mesial to sharp anterolateral spine.

First abdominal tergite barely visible beneath posterior margin of carapace. Posterior margin of second and third tergites with strong transverse carina projected triangularly to medial crest, usually rounded, but not spined; forward edge of crest with row of curved setae on central third. Fourth, fifth and sixth tergites smooth, not carinate; fourth and fifth with curved setae; setae extending onto sixth tergite as patches on either side of midline.

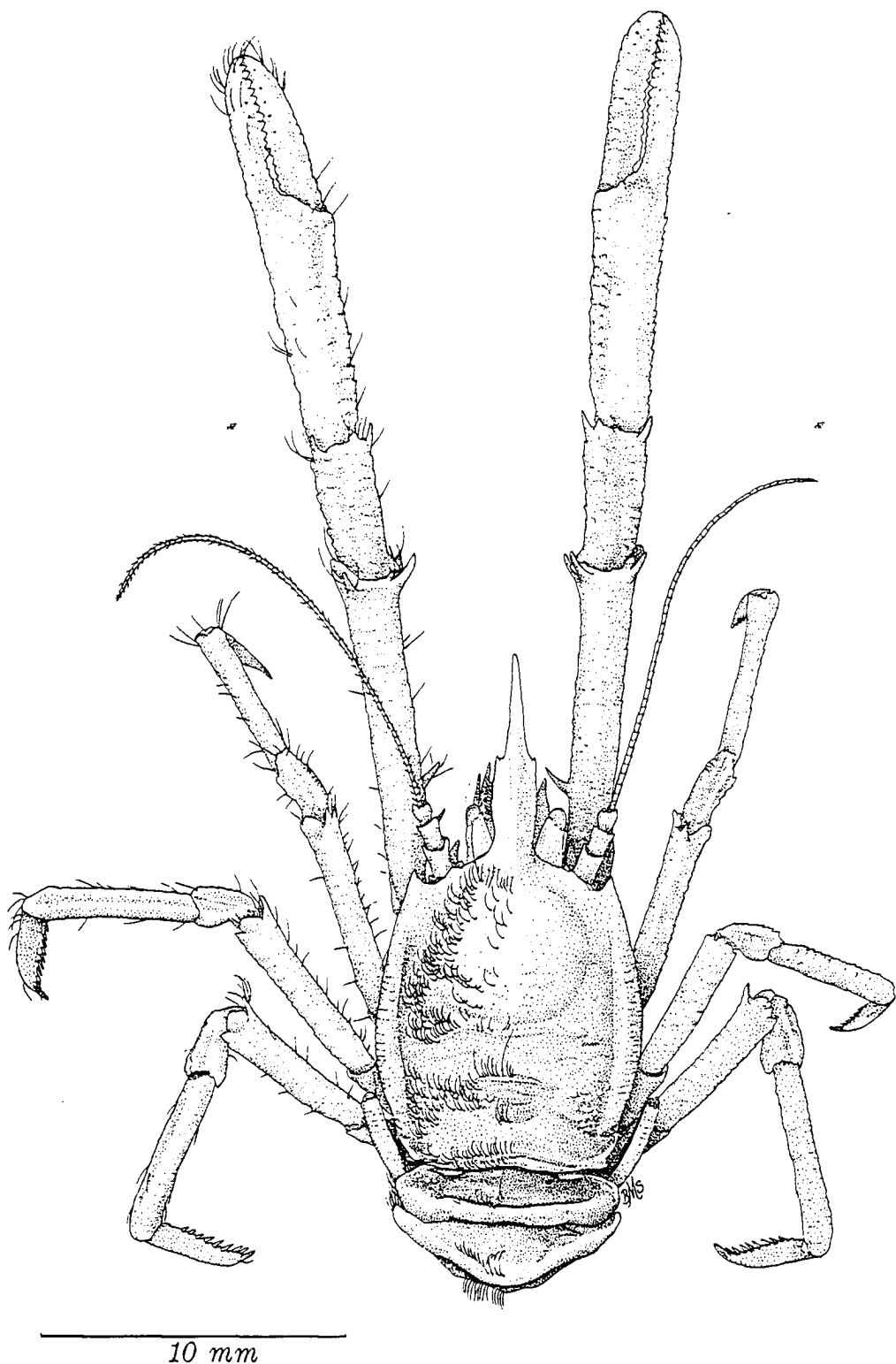


Figure 6. --Munidopsis armata (A. Milne Edwards, 1880), ♀, cl. 9.5 mm, P-755, dorsal view, setae on right side omitted.

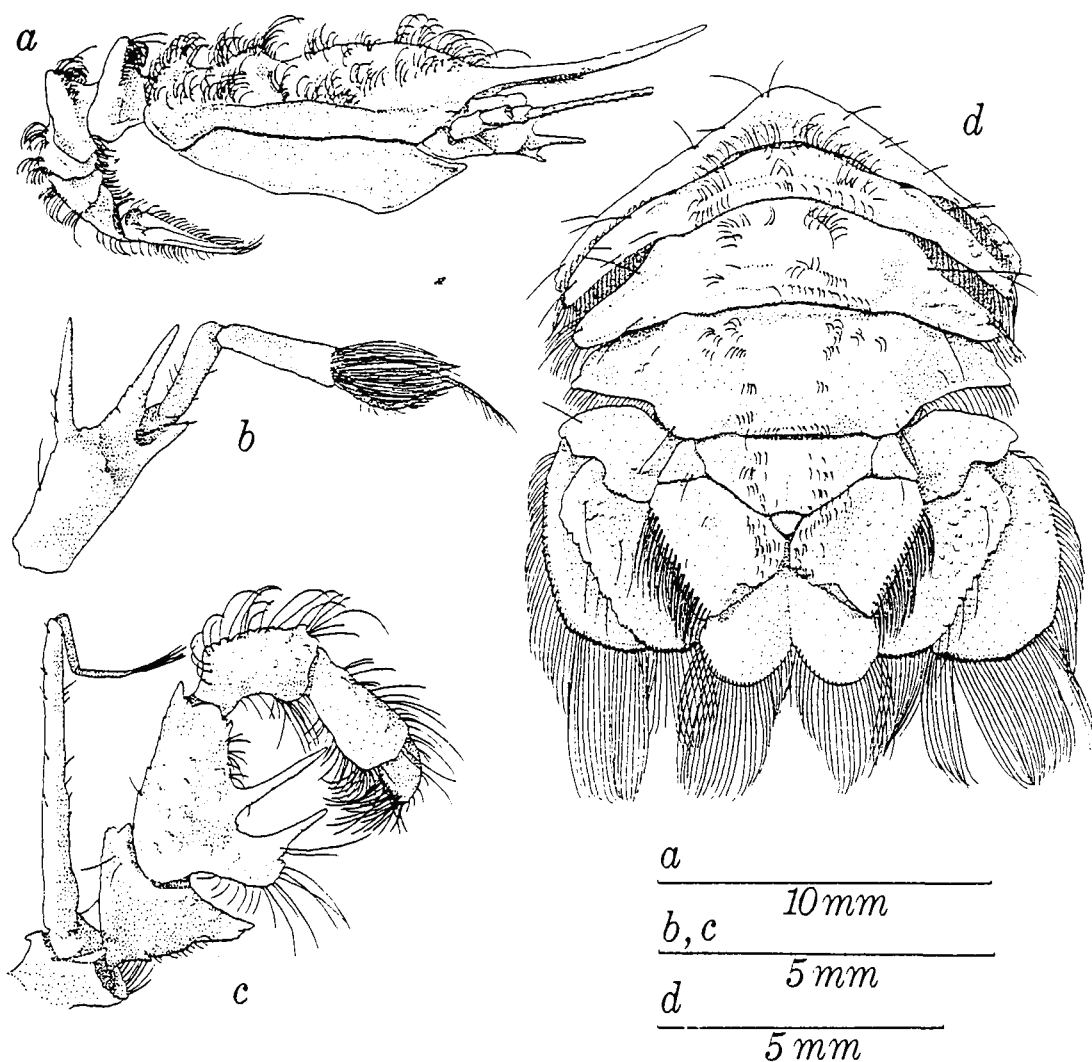


Figure 7. --*Munidopsis armata* (A. Milne Edwards, 1880). ♀, cl. 9.5 mm, P-755: a, carapace and abdomen, lateral view. ♀, cl. 13.5 mm, P-364: b, right antennular peduncle, ventrolateral view; c, right third maxilliped, ventrolateral view. ♂, cl. 11.4 mm, P-636: d, posterior abdominal tergites, uropods and telson.

Sternum unarmed; intersegmental ridges and grooves distinct.

Eyes unarmed; long movable eyestalks wider at base; cornea slightly elongate, small, diameter not greater than diameter of eyestalk, reaching approximately $1/3$ length of rostrum.

Small irregular projection beneath frontal margin emerging from intersection of bases of eyestalk, antennule and antenna.

Basal segment of antennular peduncle with rounded ventrolateral swelling, armed with long slender dorsal spine and more distally with 1 dorsolateral spine; distal margin with small ventromesial and mesial projections; extended antennular peduncle reaching nearly to end of rostrum.

Basal segment of antenna with small lateral projection and large triangular ventral projection. Second segment with blunt lateral tooth. Third segment with distal margin slightly projected mesially. Distal segment with dorsolateral projection distally. Antennal flagellum reaching well beyond distal margin of carpus of cheliped.

Ischium of endopod of third maxilliped with short triangular tooth dorsally on distal margin, large curved flattened tooth ventrolaterally. Merus with short dorsal tooth on distal margin; flexor margin with 2 large sharp spines, proximal spine broadest, with setae along curved lower margin. Carpus with several curved setae on extensor margin.

No epipods on chelipeds or ambulatory legs.

Chelipeds 3 to 4 times carapace length; sculpturing and dentate tubercles on most surfaces, fine setae associated with some tubercles. Manus not quite $1/2$ length of cheliped, width of manus approximately $1/4$ length. Dactylus less than $1/2$ length of manus; mesial margins roughened with short denticulate ridges, but no major spines; both

dactylus and fixed finger toothed along opposing margins, teeth large at spooned tips; dorsal opposing margins nearly abutting in females and small males, distinct gape in larger males; dactylus of larger males with several rounded teeth on inner margin near base extending into gape; fixed finger with outward flexure at base forming gape, minutely toothed on inner margin of gape; ventral surface of manus and carpus smoother than other surfaces. Carpus approximately $1/3$ length of manus; distal margin with at least 2 distinct spines: 1 dorsolateral spine, 1 dorsomesial spine, usually with denticulate projection mesial to dorsomesial spines, occasionally similar projection mesial to dorsomesial spine; dorsal surface with smoother shallow longitudinal depression centrally, with denticulate projections along either side. Merus approximately same length as dactylus; distal margin with large sharp spine at ventromesial, dorsomesial and dorsolateral angles; ventrolateral angle with smooth lobular projection; often smaller spine adjacent to distal margin beneath dorsoalteral spine; merus smoother than more distal segments, except for 2 sharp spines on ventromesial margin proximally. Ischium with small conical spine dorsally.

Second, third and fourth pereopods similar. Tip of dactylus of second pereopod reaching distal margin of carpus of cheliped; third and fourth pereopods slightly shorter. Tip of dactylus curved, corneous; bluntly toothed flexor margin with short corneous spinule projecting from forward edge of each tooth. Dactylus approximately $1/2$ length of propodus. Propodus unarmed except for calcified setae on ventral margin near distal end. Carpus with denticles and low tubercles on dorsal margin in longitudinal rows, and small distal tooth or projection, but no large spines. Merus longer than propodus with sharp dorsal spine

on distal margin. Exposed surface of merus of fifth pereopod punctate with 2 small tubercles on leading edge.

Uropod with posterolateral margin of protopod scalloped, no distinct teeth. Notch at insertion of endopod followed by minutely denticulate lobe. Lateral margin of endopod denticulate.

Telson consisting of 8 plates, narrowed posteriorly, with deep median indentation in posterior margin.

Color.--Specimens examined were preserved in alcohol and devoid of pigment except for the golden color of larger setae and the corneous brown tips of the ambulatory legs. No color records were found in previous reports.

Size.--Specimens collected by the GERDA and PILLSBURY show the following size ranges:

- ♂, cl. 5.2-11.4 mm,
 ♀, cl. 6.5-13.5 mm, and
 ovigerous ♀, cl. 10.8 mm.

Sizes reported for specimens collected by the BLAKE and the CHALLENGER fall within these ranges.

Sexual dimorphism.--The chela is broader and gaped in larger males (the smallest male with a gape had cl.=8.1 mm; the largest male with ungaped chelae had cl.=6.7 mm). The characteristic fringe of thicker golden setae was present on the lateral margins of the telson of all males except the very smallest (cl. 5.2 mm).

Habitat.--The bottom types and characteristic epifauna at several PILLSBURY stations where Munidopsis armata was collected were varied: sponges,

mud and rubble, hard brown mud covered by siliceous sponges and branching madreporarians. Henderson (1888:159) reported pteropod ooze as the bottom type at the two CHALLENGER stations where this species was taken.

Type.--Holotype, ♀, cl. approximately 10 mm, MCZ 4758.

Type locality.--Fredericksted (St. Croix, Virgin Islands), BLAKE Sta. 137, 1144 m (625 fm).

Geographic range.--*Munidopsis armata* is known from the Caribbean and from the Straits of Florida south to British Guiana in the western Atlantic. In addition to the type locality and localities listed herein for material examined, *M. armata* has been reported in the literature from off Sombrero and Culebra Island, West Indies (Henderson, 1888:159), and from the north coast of Cuba and Martinique (Chace, 1942:90).

Bathymetric range.--The possible depth range for material in this collection is 796-1446 m; calculated range is 906-1373 m. One damaged specimen is labeled as collected at G-132 (275-302 m), but this is excluded from consideration here because of the likelihood of contamination from G-130 (1021 m), the poor condition of the specimen, and the great gap between the depth at G-132 and all other bathymetric records for this species. The possible depth range recorded previously was 677-1217 m (370-665 fm); the calculated range, based on earlier records, is 715-979 m (390-535 fm).

Parasites.--A small female collected by the PILLSBURY at station 741 has a large peltogastrid rhizocephalan parasite attached to the under-

side of the abdomen. This was tentatively identified as belonging to the genus Galatheascus, but the species was undetermined and may be new.

Associates.--Munidopsis armata was collected at 8 stations by the GERDA and PILLSBURY; at 6 of these stations, Munidopsis sigsbei was also collected. The index of affinity, based on these data, between M. armata and M. sigsbei is 0.25.

Relationships.--The shape of the rostrum, the raised rims on the lateral margins, and the carinae on the second and third abdominal tergites serve to separate this species from all described species. It bears little similarity to any other species which have, from time to time, been placed in the genus Elasmonotus. A. Milne Edwards and Bouvier (1897:106) suggested an affinity between M. armata and both M. abdominalis (A. Milne Edwards) and M. quadrata Faxon, but M. abdominalis lacks prominent carinae, M. quadrata has a blunt medial spine, the rostra are different in all three, and neither of the latter two have the raised marginal rims characteristic of M. armata.

Remarks.--The size of the gastric tubercles varies from small but distinct spines on several of the smaller specimens to very obscure swellings, frequently hidden by curved setae. Occasionally there is a distinct spine beneath the anterolateral spine of the carapace.

The proximal spines on the merus of the cheliped are consistently 2 in number, with the single exception of one large female with 3 spines in that location.

Some variation exists in the projection of the transverse abdominal carinae; in some specimens, the expansion is somewhat triangular, while

in others it is more rounded. This seemed to be unrelated to sex, size or the depth at which the specimen was taken.

Although the stiff curved setae are often broken off from body surfaces, the patterns usually remain quite distinct on the carapace and abdominal tergites.

Munidopsis bermudezi Chace, 1939

Figure 8

Munidopsis bermudezi Chace, 1939: 46; 1942: 73 (key), 83-85, figs. 29-30.--Sivertsen and Holthuis, 1956: 44, pl. IV, fig. 3.--Pequegnat and Pequegnat, 1970: 139 (key), figs. 5-1, 5-8, table 5-2; 1971: 5 (key) 22.

Munidopsis: Murray and Hjort, 1912: 420.

Material examined.--Bahama Islands, S of Acklins Island: P-1138, 2745-2751 m, 1 ♂, 13.3 mm, UMML 32:5229.--Atlantic Ocean, N of Virgin Islands: P-1376, 5179-5184 m, 1 ♀, 31.5 mm (with abdominal parasites, (USNM).

Diagnosis.--Rostrum nearly horizontal, unarmed; anterior gastric region of carapace with 1 pair of heavy spines (occasionally reduced to tubercles in large specimens); frontal margin with post-antennal spine; posterior margin unarmed; abdominal tergites unarmed; eyes armed with large blunt spine on mesial surface of small cornea; epipods on chelipeds but not on ambulatory legs.

Description.--Carapace longer than broad ($cw/cl = 0.90-0.95$), slightly convex transversely, densely covered with short curved setae, most plumose, on dorsal surface except for 2 pairs of depressed areas at muscle attachment; gastric region with 1 pair triangular spines anteriorly; mesogastric region slightly more inflated with several inconspicuous swellings arranged symmetrically. Cervical groove distinct across center of carapace and in both anterior and posterior branches. Slightly inflated metagastric region with distinct striation centrally; postcervical groove separating metagastric and cardiac regions, latter with

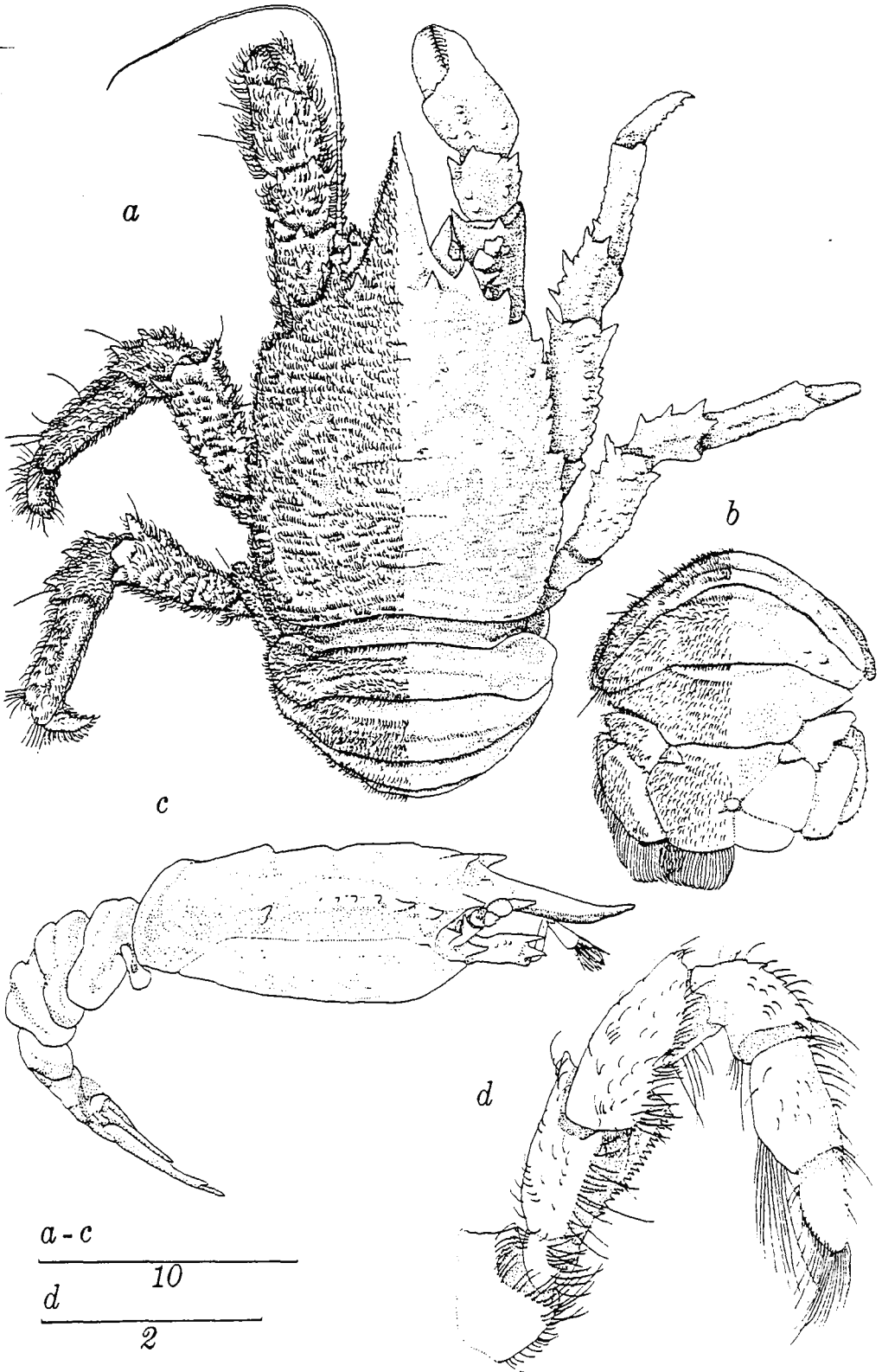


Figure 8. --*Munidopsis bermudezi* Chace, 1939, juvenile ♂, cl. 13.3 mm, P-1138: **a**, dorsal view, both second pereiopods missing, setae on right side omitted; **b**, posterior abdominal tergites, uropods and telson, setae on right side omitted; **c**, lateral view, setae shown on antennular flagellum only; **d**, right third maxilliped, lateral view. Scales in mm.

similar striation on ridge anteriorly; branchial regions depressed to margins, several striations and small tubercles in this region and on or near raised lateral margins. Rostrum more than $1/3$ length of carapace, nearly horizontal, slight upturn distally, broad at base, tapering evenly to apex, forming isosceles triangle with blunt median carina; 2 pairs of low tubercles near base. Frontal margin with triangular post-antennal tooth. Anterolateral angle with large tooth just in front of termination of anterior branch of cervical groove; another slightly smaller tooth posterior to this followed by 4 or 5 much smaller spinules; larger spine just behind posterior branch of cervical groove. Raised rim of posterior margin unarmed.

Abdomen unarmed, pubescent; second, third and fourth tergites each with 2 rounded transverse carinae, more distinct on anterior tergites; fifth and sixth tergites flattened. Pubescence lacking on anterior part of pleura of third through sixth tergites.

Sternum unarmed, not pubescent; setae only along intersegmental striae.

Eyes colorless, practically immovable; cornea very small; eyestalk short, extended distally over dorsomesial margin of cornea forming large sharp spine; lateral margin unarmed or with small obscure tooth.

Basal segment of antennular peduncle with several rounded tubercles on forward edge of lateral inflation; dorsal margin with rounded carina terminating in sharp distal spine, larger conical spine projecting beneath; mesial carina terminating in small blunt tooth; distoventral margin projecting slightly; distal margin of segment bearing flagellum when extended not reaching apex of rostrum; flagellum short, barely reaching beyond tip of rostrum.

Basal segment of antenna with expanded ventromesial tooth and smaller lateral tooth. Distal margin of second segment with broad lateral spine and small mesial spine. Third segment with setae on distal margin but no spines. Fourth segment with broad dorsolateral spine and small ventrolateral lobe distally. Antennal flagellum approximately same length as carapace.

Merus of endopod of third maxilliped with 2 or 3 teeth on ventral margin; 1 small distal tooth on dorsolateral margin. Ischium with ventral carina terminating in triangular tooth, dorsolateral margin with small blunt tooth at distal corner; serrate mesial margin without distal tooth or spine.

Epipods on chelipeds but not on ambulatory legs.

Chelipeds approximately same length as carapace and $3 \frac{1}{2}$ times maximum width of manus; short curved plumose setae distributed densely over all surfaces except ventral surface of propodus and carpus; longer setae on mesial surfaces. Length of manus slightly less than twice maximum width; dactylus approximately $\frac{1}{2}$ length of manus. Tips of fingers spooned, dentition extended on tips and along abutting margins dorsally; margins of fingers rounded and gaped ventromesially. Propodus with longitudinal crest of several teeth on lateral margins near distal end and small blunt tooth on mesial margin; dorsal surface with several tubercles. Carpus less than $\frac{1}{2}$ length of manus; distal margin with 4 spines or teeth: 1 conical dorsomesial spine, 1 smaller dorsal tooth, 1 triangular lateral spine, and 1 large triangular spine ventrally; lateral spine followed by several rounded tubercles on dorsolateral surface; several similar tubercles dorsomesially. Merus approximately same length as manus; distal margin with 4 spines: 1 dorsal, 1 dorsomesial, 1 ventro-

mesial and 1 ventrolateral ; 4 spines in dorsal row posterior to distal spine, decreasing in size proximally; small sharp spine on mesial margin proximal to ventomesial spine; lateral and ventral surfaces with several rounded tubercles. Ischium with 1 dorsolateral spine and 1 spine immediately posterior to ventromesial projection on distal margin.

Second pereiopods missing on specimen examined. Chace's (1942: fig. 29) illustration of the holotype shows second and third pereiopods similar, with propodus armed with 2 small sharp spines on dorsomesial ridge, and carpus armed with 4 or 5 sharp spines decreasing in size proximally.

Third and fourth pereiopods similar. Ventral margin of dactylus with 6 to 8 spines behind curved, tan-colored corneous tip; each spine with short stiff seta projecting from distal edge. Propodus of third pereiopod with sharp spine and tubercle on dorsomesial edge; row of tubercles on dorsolateral and ventrolateral edges and 2 movable spines on small ventral lobes near distal edge of third and fourth pereiopods. Propodus of fourth pereiopod without dorsal spination. Carpus more than 1/2 length of propodus; dorsomesial edge with 3 or 4 sharp spines including 1 on distal margin; small spine or tubercle between most proximal and next spine; smaller spine lateral to this on distal margin followed by longitudinal row of tubercles on dorsal ridge; several denticles on distal edge of ventrolateral lobe. Distal margin of merus with large sharp spine on either side of dorsal lobe; spine followed on dorsomesial edges by longitudinal row of 5 or 6 spines, decreasing in size proximally; several low tubercles in line between these spines; several spines following dorso-lateral tooth, reduced to tubercles on fourth pereiopod; ventral surface with scattered tubercles. Ischium short with small dorsal tooth and several scattered tubercles.

Fifth pereopods with setae, but no distinct sculpturing or spines.

Protopod of uropod with posterolateral margin scalloped and with sharp spine posteriorly. Exopod with several widely-spaced movable spinules on surface near lateral margin; similar spinules on lateral and posterior margins; endopod with few spinules on exposed surface near posterior margin; posterior margin bordered with spinules. Exposed surfaces of uropods pubescent.

Telson consisting of 8 plates, broader than long; posterior margin with medial indentation; pubescent, but no distinct spinules.

Color.--The specimens examined were preserved in alcohol and had no traces of color. There are no records of color for this species.

Size.--The 2 specimens in this collection are a male, cl. 13.3 mm, and a female, cl. 31.5 mm.

Size ranges for specimens reported previously are:

♂, cl. 23 to approximately 30 mm (cl. + rostrum = 69 mm),

♀, cl. 10 to approximately 30 mm (cl. + rostrum = 40.2 mm), and

ovigerous ♀, cl. 28.0 mm.

The male collected by the PILLSBURY is the smallest male recorded thus far.

Morphological differences between the large and small specimen are discussed in the Remarks section.

Sexual dimorphism.--The small male does not have the characteristic fringe of golden setae on the lateral margins of the telson, but this may be due to its size and apparent immaturity. The 2 specimens examined were so different in size that no attempt was made to relate differences in morphology to sex.

Habitat.--The bottom at the station where M. bermudezi was collected in the Bahamas was characterized by sponges and a few solitary corals; the bottom type north of the Virgin Islands was clay.

Type.--The holotype is an ovigerous ♀, cl. 28.0 mm, cl. + rostrum = 37.7 mm; MCZ 10231.

Type locality.--South coast of Cuba, ATLANTIS Sta. 2976 B, 2434-3020 m.

Geographic range.--This species is known from both the east and west sides of the Atlantic Ocean. Apart from the locations reported here and that of the holotype, the following records are found in the literature: Caribbean Sea: N coast of Cuba (Chace, 1942: 83); eastern Atlantic Ocean: N of Azores (Sivertsen and Holthuis, 1956: 44); Gulf of Mexico (Pequegnat and Pequegnat, 1970: 145; 1971: 22).

Bathymetric range.--The depths from which M. bermudezi has been collected by the PILLSBURY are approximately 2750 and 5180 m (from the Bahamas and north of the Virgin Islands, respectively). The possible range, based on previous records was 2434-3300 m; calculated range was 2654-3300 m.

Parasites.--The large female specimen was heavily parasitized by rhizocephalans of the family Peltogastridae, probably an undescribed species of Cyphosaccus Reinhard, 1958.

Associates.--There were no other galatheid crustaceans collected with M. bermudezi by the PILLSBURY. The literature reviewed did not indicate that other specimens have been taken with this species in the same sample.

Relationships.--Munidopsis bermudezi appears to belong in the Atlantic

deep-water complex of species including M. crassa and M. geveri. These species are large, heavily calcified galatheids with short chelipeds, a triangular rostrum, distinct eyespines, gastric spines, an unarmed abdomen and epipods on the chelipeds. M. bermudezi is more pubescent than the others, and its corneae are quite small, each with a long blunt mesial tooth. The carapacial spination and sculpturing on M. bermudezi is different from that of M. crassa and M. geveri: the latter two have many spines or flattened denticulate tubercles in addition to the distinct pair of gastric spine; M. bermudezi usually has only the gastric spines distinct and other rounded tubercles, but no additional spines. (The large female presents a slightly different pattern, with gastric spines reduced to tubercles, and other tubercles, particularly marginal ones, enlarged and sometimes pointed). M. similis, also from the western Atlantic, is somewhat similar but in that species the chelipeds are longer than in M. bermudezi and they lack epipods; the cornea is not as small, and there is usually a small lateral eyespine in M. similis.

Chace (1942:85) pointed out the similarity between M. bermudezi and the figure of M. ceratophthalma Alcock from the Indian Ocean, but said that the lateral spine behind the posterior branch of the cervical groove is much larger in the ATLANTIS specimens and the gastric spines are lacking in Alcock's (1901) species. In addition, the shape of the rostrum and chelipeds is different in the two species.

Munidopsis aculeata Benedict from the Indian Ocean and M. subcucumosa Henderson from Japan are also in this species complex and thus are somewhat similar to M. bermudezi. Both have a greater number of distinct gastric spines, more carapacial sculpturing and more slender chelipeds.

Munidopsis barnardi Kensley from South Africa is related to these

species, but has more spines on the gastric region of the carapace and the rostrum more upwardly directed than does M. bermudezi.

Remarks.--The large female specimen is different from the juvenile male as follows: on the female there is no distinct pair of gastric spines on the carapace, rather several scattered tubercles; spines on the lateral margin are directed laterally, and pubescence, although present, does not obscure sculpturing on body surfaces; the rostrum is broader at the base and has a slight distal upturn.

There is some question as to whether this female specimen belongs to M. bermudezi since it differs from the original description of that species as indicated above and was collected from considerably deeper water (approximately 5000 m) than other specimens (approximately 3000 m). It is necessary to compare this with the other specimens of similar size before finally deciding whether or not it is specifically distinct. For the present, the differences from the other specimens are considered only to be individual or phenotypical, possibly due to depth.

The juvenile male is closer to the description of the holotype, and has been used as the basis for the redescription.

Munidopsis bradleyi Pequegnat and Pequegnat, 1971

Figures 10, 11

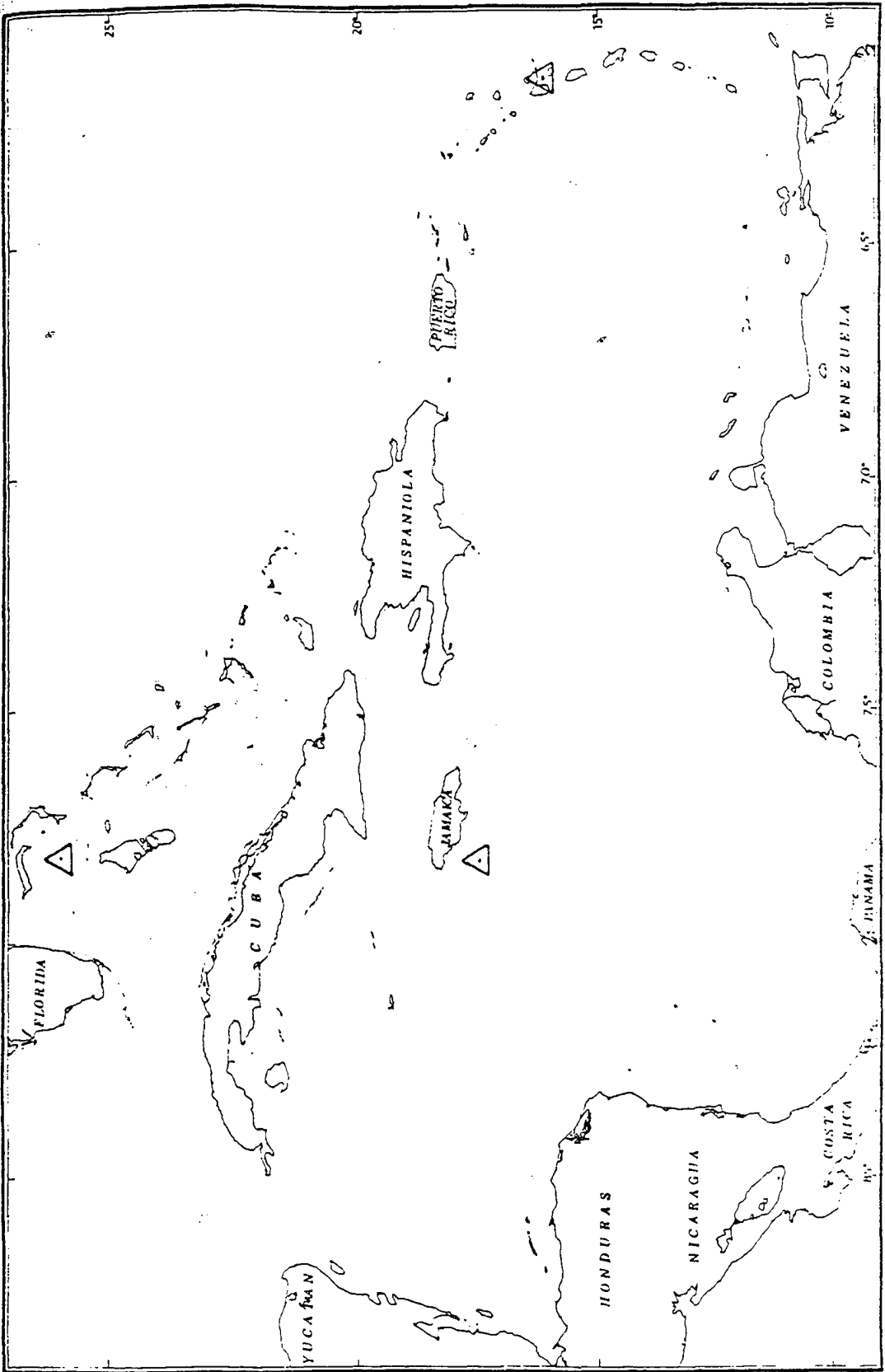
Munidopsis bradleyi Pequegnat and Pequegnat, 1971: 6 (key), 7-9, figs.

1, 2.

Material examined.--Bahama Islands: G-679, 595-711 m, 1 ♂, 12.6 mm, UMML 32:5227.--Off Guadeloupe: P-923, 476-686 m, 1 ♀, 20.0 mm, (RMNH).--S of Jamaica: P-1256, 521-658 m, 1 ♂, 6.1 mm UMML 32:5228. Distribution plot 5.

Diagnosis.--Rostrum nearly horizontal, armed with 1 pair anterolaterally-projecting spines; gastric region with 1 pair spines anteriorly followed by at least 1 median spine; frontal margin with prominent post-antennal spine; posterior margin of carapace with at least 1 pair of spines near midline; second and third abdominal tergites with median pair of spines; fourth tergite without spines; eyes unarmed; epipods on chelipeds but not on ambulatory legs.

Description.--Carapace longer than broad ($cw/cl = 0.90-0.95$), vaulted transversely; mediolongitudinal swelling interrupted by 2 transverse channels: cervical groove posterior to mesogastric region extending to lateral margins of carapace; postcervical groove separating metagastric and cardiac regions; anteriorly-projecting ridges posterior to grooves each with 1 distinct median spine, smaller rounded tooth lateral to spines; anterior gastric region with 1 pair of large spines; posterior on midline, 2 well-marked spines, 1 behind other, with minute rounded tooth laterally at bases of spines (total of 4 distinct median spines on carapace). Dorsal surface elsewhere with scattered granules, symmetrically arranged, frequently with anterior edge moderately serrate; metabranchial regions



Distribution plot 5.--*Munidopsis bradleyi* Pequegnat and Pequegnat, 1971 collected by the GERDA and PILLSBURY.

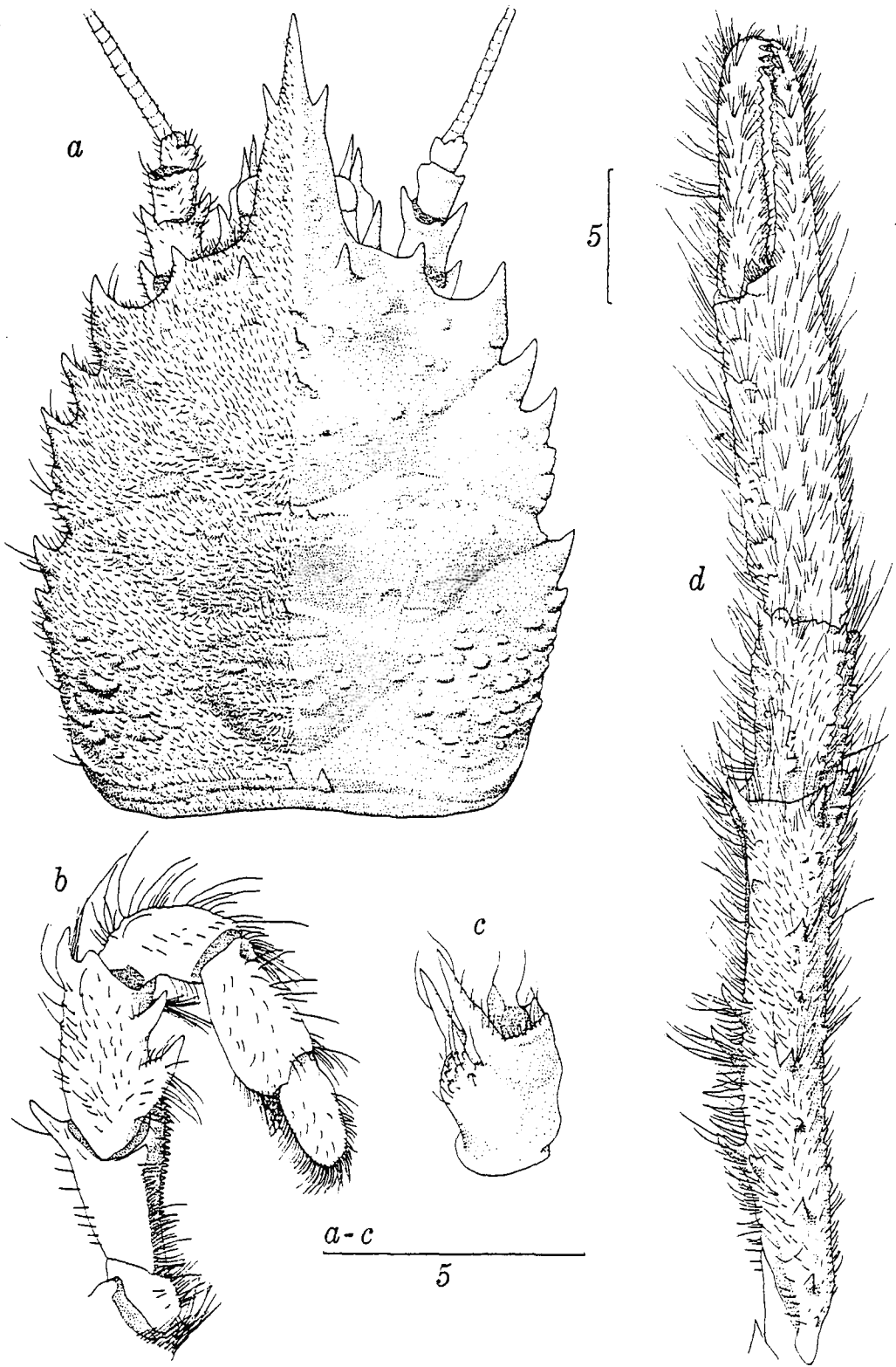


Figure 10. --Munidopsis bradleyi Pequegnat and Pequegnat, 1971, ♀, cl. 20.2 mm, P-923: a, dorsal view of carapace; b, ventrolateral view of right third maxilliped; c, lateral view of right antennule; d, dorsal view of right cheliped. Scales in mm.

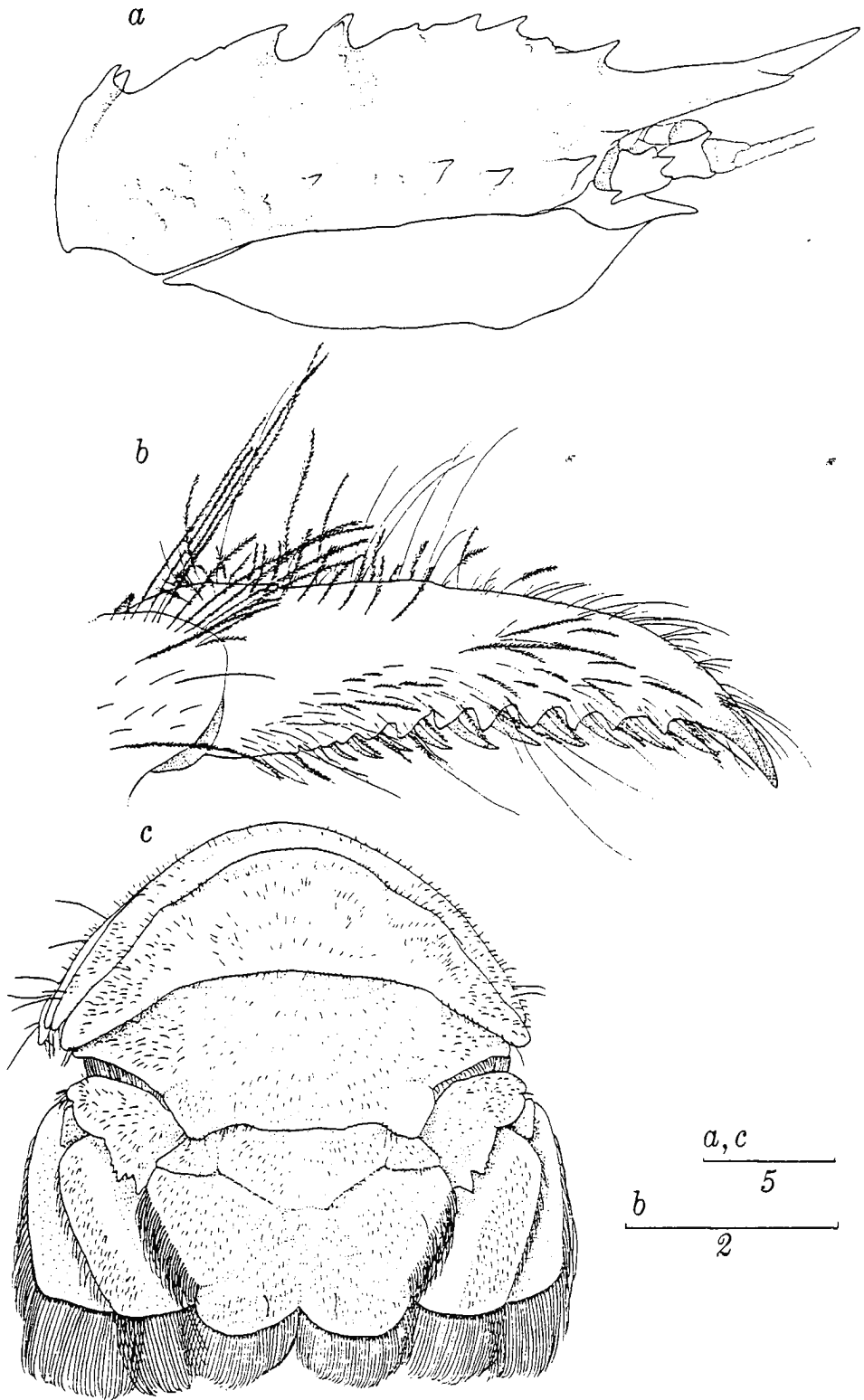


Figure 11. --Munidopsis bradleyi Pequegnat and Pequegnat, 1971. ♀, cl. 20.2 mm, P-923: a, lateral view of carapace; b, dactylus of second pereiopod, lateral view. ♂, cl. 22.4 mm, OREGON Sta. 10844: c, posterior abdominal tergites, uropods, and telson. Scales in mm.

of carapace rugose with such protuberances. Short fine setae over most dorsal and exposed surfaces. Rostrum nearly horizontal, between $1/3$ and $1/2$ carapace length, broad at base, tapering distally, slightly carinate with pair of anterolaterally-projecting spines approximately $1/3$ distance from distal end. Frontal margin with distinct post-antennal spine. Lateral margin with 4 large curved spines, anterolateral spine slightly larger; posterior lateral spine with 1 much smaller spine behind it and several minute teeth diminishing in size posteriorly. Ridge bordering posterior margin of carapace with median pair of spines.

Abdomen with median pair of spines on transverse ridges of second and third tergites; transverse groove behind ridge; fourth tergite with 1 anterior transverse ridge; last 2 segments smooth.

Sternum unarmed and smooth; intersegmental ridges distinct.

Eyes colorless, unarmed and movable; cornea very slightly larger than eyestalk.

Sharp conical spine projecting from beneath carapace emerging from intersection of bases of antennule, antenna and eyestalk; base of spine partly fused to basal segment of antenna.

Basal segment of antunnular peduncle inflated, swelling with several tubercles; 2 distolateral spines, most distal spine slightly longer.

Basal segment of antenna broad with 2 large spines: 1 lateral, 1 ventromesial. Second segment with 1 lateral and 1 mesial spine distally; small lobe just mesial to lateral spine on dorsal edge; transverse indentation in dorsal surface of segment. Third segment with distal margin slightly raised. Distal segment with small denticulate projection dorso-laterally. Flagellum extending beyond cheliped distally by approximately $1/3$ length of flagellum.

Merus of endopod of third maxilliped armed with 1 distinct dorsolateral spine near distal margin; 2 large spines on ventral margin, proximal spine slightly larger. Ischium with ventral carina terminating in spine, mesial border serrate, large distal spines on dorsolateral margin.

Pereiopods slightly sculptured, usually with tubercles, some denticulate; most surfaces covered with scattered setae of various lengths, many plumose. Epipods on chelipeds but not on ambulatory legs.

Chelipeds measured from articulation of coxa and basis, less than 2 1/2 times as long as carapace, excluding rostrum. Maximum length of dactylus less than 1/2 length of propodus; length of chela approximately 6 times maximum width. Propodus oval in cross section, devoid of spines; tips of fingers spooned, dentate, teeth continuing proximally along abutting margins. Carpus less than 1/3 length of propodus; 3 small spines on distal margin: 2 dorsal, 1 ventral. Merus approximately same length as propodus, 4 spines arranged around distal margin; 4 equal spines in longitudinal row behind dorsodistal spine; 3 spines in row behind distal spine on dorsomesial margin, alternately spaced with those in dorsal row, first and third very small, second approximately same size as dorsal spines; frequently tubercles or denticle between spines: 2 strong spines mesioventrally on proximal half of segment forming row with distal spine; ventrolateral surface of merus unarmed. Ischium with dorsal spine at articulation with merus.

Second, third and fourth pereiopods similar. Dactylus of second pereiopod reaching distal margin of carpus of cheliped; dactylus of third and fourth pereiopods each reaching distal margin of propodus of preceding leg. Dactylus with corneous brown tip; row of 7 to 9, usually 8, denticles on ventral margin, diminishing in size to small denticulate

tubercles proximally; thick corneous spinule, gold-colored in preservation, projecting from anterior edge of each denticle or tubercle, 12 to 14 spinules on each dactylus. Distal margin of propodus with row of minute blunt teeth, ventrally divided by median gap with 1 larger denticle near each end resembling very short calcified seta; otherwise, propodus unarmed. Carpus less than $1/2$ as long as propodus, with single dorsal spine on distal margin; low, slightly tuberculate longitudinal ridge dorsolaterally and shallow concavity. Merus slightly longer than propodus; 3 spines on distal margin: 2 dorsal, 1 ventral; expanded lobe between dorsal spines; second and third pereopods with longitudinal row of 4 spines and 1 tubercle on proximal half of raised dorsal margin behind mesial dorsal spine; only 3 spines in this location on fourth pereopod, with tubercle lateral, and slightly anterior, to 2 proximal spines; frequently tubercles in line between spines, particularly on distal half of segment; longitudinal row of tubercles and/or small spines behind dorsolateral spine; ventrolateral margin with scattered denticulate tubercles. Distal margin of ischium with 1 dorsal spine and ventrolateral serration.

Fifth pereopods with merus expanded, external surface tuberculata.

Protopod of uropod with posterior margin notched, spinule and smaller denticles on each side of notch. Exopod and endopod with granular denticles on lateral margins; similar denticles on surface of exopod between raised area and lateral margin, and on surface of endopod at posterolateral corner; surfaces appearing very smooth.

Telson consisting of 10 plates, central and intermediate plates often indistinct; posterior margin deeply scalloped.

Color.--All specimens examined were preserved in alcohol and showed no

traces of color except for the corneous brown tips of the ambulatory legs and the golden color of thicker setae.

Size.--Specimens examined in this collection have the following sizes:

♂, cl. 6.1-12.6 mm,

♀, cl. 20.0 mm.

The largest male recorded is 31 mm cl.; the largest female (ovigerous) is 33 mm cl. (Pequegnat and Pequegnat, 1971: 9).

Sexual dimorphism.--The only apparent sexually dimorphic character in this species is the dense fringe of golden setae on the lateral margins of the telson in males; females have only a few shorter fine setae in this location.

Habitat.--The bottom type of GERDA Sta. 679 in the Bahamas was composed of soft mud and cinders with debris bottles and copper pieces. Data were not available for other stations at which Munidopsis bradleyi was collected.

Type.--The holotype is an ovigerous ♀, cl. 33 mm, USNM 138227.

Type locality.--Caribbean Sea off Colombia, OREGON Sta. 4854, 11°10.8'N, 74°28.5'; 549 m.

Geographic range.--This species is known in the western Atlantic from the Bahamas south to Guadeloupe in the Lesser Antilles, and in the Caribbean Sea. In addition to the type locality, records in the literature included the following localities: north coast of Haiti, and the Lesser Antilles from St. Barthélemy to Dominica (Pequegnat and Pequegnat, 1971: 7).

Bathymetric range.--The possible depth range for specimens in this collection is 476-711 m; calculated range could not be determined. The previously recorded possible range was 549-914 m; calculated range was 549-860 m.

Parasites.--There is no external evidence of parasitism in any of the specimens examined.

Associates.--At 2 or the 3 GERDA and PILLSBURY stations where M. bradleyi was taken, M. erinaceus was also collected.

Relationships.--Munidopsis bradleyi can be distinguished easily from all species described from the western Atlantic. Of these, it appears to be most closely related to M. cubensis Chace, M. gilli Benedict, and M. expansa Benedict. The median and lateral spines on the carapace, relatively horizontal rostrum (not strongly upturned), paired spines on the abdominal segments, chelipeds twice as long as the carapace, and lack of epipods on the ambulatory legs serve to distinguish this species from M. cubensis. M. expansa and M. gilli have epipods on the first pair, and first and second pairs of ambulatory legs, respectively, have the rostrum upturned, and do not have paired spines on the second and third abdominal segments. There are some similarities between M. bradleyi and M. trifida tomentosa (Benedict) from the western Pacific redescribed by Baba (1969), but the latter lacks medial spination on the carapace and abdomen. M. bradleyi is extremely close to M. camelus (Ortmann) from Japan. The specimens of M. bradleyi examined are identical in morphology to that redescribed for M. camelus by Miyake and Baba (1967) except that M. camelus has epipods on the chelipeds and first 2 pairs of ambulatory legs,

1 pair of small spines behind the bifurcation of the cervical groove (instead of none), a mesial as well as a lateral spine distally on the second segment of the antennal peduncle; the proximal spine on the merus of the third maxilliped is much stronger than the distal spine, and there are 2 rows of small spines rather than 1 on the carpus of the cheliped. There appear to be other minor differences, particularly in the spination of the pereopods, but using the literature available on M. camelus, it was not possible to compare details of this spination.

Discussion.--Chace (1942) pointed out that the genus Galacantha must be merged with Munidopsis due to several factors, one of which is the unreliability of the Galacantha-like rostrum as a primary character. M. bradleyi and M. camelus, in addition to M. gilli, M. expansa and M. cubensis mentioned by Chace, have the rostrum intermediate between the Galacantha-type rostrum of M. spinosa and M. rostrata and the horizontal rostrum present in most other species of Munidopsis. The close similarities between M. bradleyi and M. camelus, despite the quite different arrangement of pereopodial epipods, point out the apparent variability of the latter character among species. This renders the arrangement of epipods less useful in determining relationships above the species level.

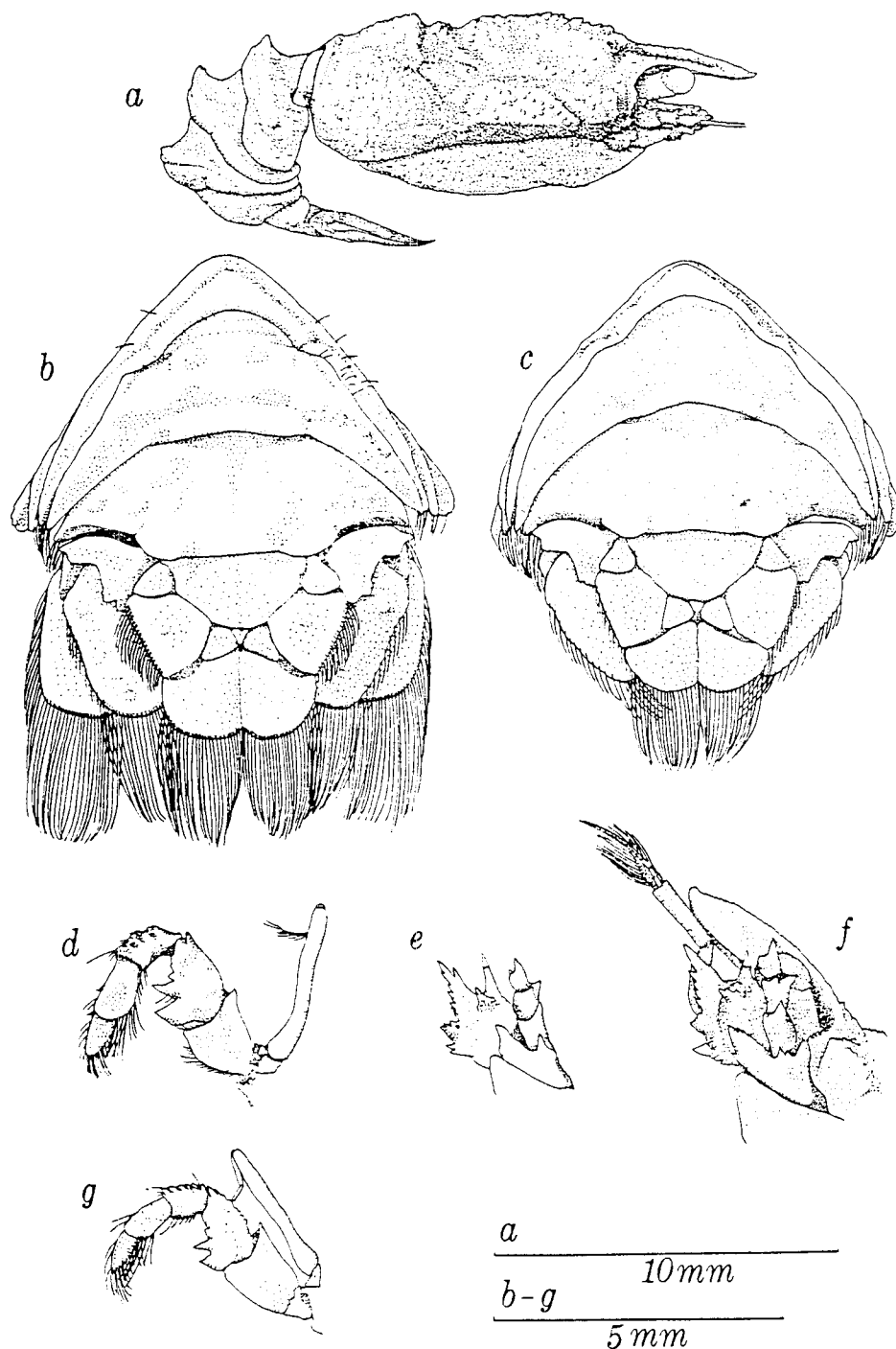


Figure 13. --*Munidopsis brevimanus* (A. Milne Edwards, 1880). ♂, cl. 9.0 mm, P-1224: a, carapace and abdomen, lateral view; b, posterior abdominal tergites, uropods and telson; d, left third maxilliped, ventrolateral view; f, left antennule, antennal peduncle beneath rostrum and eye, ventrolateral view. ♂, cl. 7.3 mm, BLAKE Sta. 291, (holotype): c, posterior abdominal tergites, uropods and telson; e, left antennular peduncle, ventrolateral view; g, left third maxilliped, ventrolateral view.

well-defined, appearing centrally as depression separating meso- and metagastric regions; lateral termination of anterior branch distinct as sharp oblique groove behind anterolateral angle of carapace; posterior branch less distinct; postcervical groove broader and deeper between small metagastric region and swollen cardiac region.

Dorsal surface of carapace with 4 depressions: 1 on either side of posterior mesogastric region, and 1 slightly more mesial on either side of metagastric region; shallow depression extending obliquely posterior to lateral margins from anterior depression (posterior branch of cervical groove), narrow sharper groove extending obliquely forward to lateral margins, terminating at same point. Gastric region elongate inflation, bordered anteriorly by pair of transverse depressions; anterior gastric region with granulation more distinct on either side of midline, but with neither spines nor distinct pair of gastric tubercles. Rostrum broad at base, tapering to apex; lateral margins vaguely sinusoidal, slightly convex anterior to corneae, tip drawn out slightly to moderate point; dorsal surface with medial concavity, low granules scattered near lateral margins. Base of rostrum curving smoothly to depressed dentate lobe on frontal margin. Anterolateral angle rounded, granulate, but unarmed. Lateral margins rounded, granulate, with notch anteriorly at termination of anterior cervical groove, convexity noticeable between notch and indentation at termination of posterior cervical groove. Posterior margin smoothly concave, rim raised only slightly, sculpturing obscure.

First abdominal tergite with smooth knob at articulation with second tergite. Second tergite with small dorsal projection at midline

on raised anterior transverse rim; large rounded tubercle at lateral termination of rim; pleuron with transverse row of several tubercles near margins; most lateral tubercles well-developed. Third tergite slightly more projected dorsally with triangular tubercle at midline similar to that on second tergite. Third and fourth tergites similar; pleura narrowed laterally and curved forward. Fifth tergite with 2 pairs of obscure depressions arranged around broad center; pleura narrowed laterally, with several tubercles on dorsal surface. Sixth tergite smooth, with slight longitudinal median depression; posterolateral lobe distinct.

Sternum unarmed except for several obscure granules anteriorly between bases of chelipeds; obscure sculpturing centrally on either side of midline; sternites punctate laterally near margins; distinct intersegmental ridges following groove.

Eyes small, unarmed, movable; usually partially concealed beneath rostrum; cornea not wider than eyestalk; eyestalk sometimes with small obscure swellings laterally.

Small minutely tuberculate projection emerging from between bases of eyestalk and antenna.

Basal segment of antennular peduncle with several conical tubercles on anterior part of lateral projection, largest one slightly dorsal, ventrolateral surface of enlarged portion flattened; anterior sharp spine with several spinules on ventral margin; larger projection, spines or tubercles more proximally on segment; occasionally accessory spinule on dorsal edge of spine. Extended flagellum reaching beyond rostrum.

Basal segment of antenna with large ventral projection terminating in 2 spinules, often with another spinule ventral to them; small lateral

projection with spine. Second segment with sharp lateral spine and mesial distal margin slightly projected. Third segment with conical lateral and dorsal spines and smaller mesial spine. Fourth segment with small dorsolateral tooth-like projection and smaller dorsomesial projection.

Ischium of endopod of third maxilliped with sharp dorsal spinule on distal margin; ventral angle sharp, terminating bluntly or in sharp right angle or triangle, but without projected spine. Flexor margin of merus with large flattened tooth with rounded ventral edge near base of segment, adjacent sharp spine with 1 or 2 additional spinules more distally; distal margin with 1 or 2 dorsal spines or teeth, sometimes several spinules along extensor margin. Carpus with several (6 or 7) spinules on dorsal (extensor) surface.

Pereiopods with slightly more sculpturing (rounded or flattened tubercles) on meral segments than on other segments. No epipods on chelipeds or ambulatory legs.

Chelipeds approximately $3 \frac{1}{2}$ times carapace length in male, less than $2 \frac{1}{2}$ times carapace length in females. Manus dorsoventrally flattened; dorsal surface quite smooth in male, female with several tubercles; width of manus in male approximately $\frac{1}{4}$ length; width of manus slightly less than $\frac{1}{3}$ length in females. Dactylus approximately $\frac{1}{3}$ length of manus in male; dactylus of female proportionately longer; mesial margin flattened, straight, hollow at base on mesial margin, followed by straight row of teeth. Fixed finger of male with outward curve near base forming gape; fingers abutting only in distal $\frac{1}{4}$; fingers of female without curve or gape; fingers toothed and abutting along entire margin; tips spooned, dentate, gaped ventrally. Lateral

and mesial edges of manus with scattered rounded tubercles, extending onto fixed finger as sharp longitudinal ridge on lateral margin. Carpus short, dorsomesial edge tuberculate, terminating in denticulate triangle; dorsal surface smooth with irregular longitudinal rows of tubercles dorsolaterally; lateral surface with flattened tubercles; ventral surface smooth. Merus shorter than manus; evenly-spaced conical tubercles on all surfaces; mesial surface slightly flattened distally; distal margin with sharp ventromesial spine and spinulate or spinate lateral projection behind distolateral lobe; short transverse tuberculate ridge near distal margin dorsally. Ischium with conical dorsal projection; ventromesial margin with series of spines decreasing in size proximally.

Second, third and fourth pereopods similar, short; tip of dactylus of second pereopod reaching approximately middle of merus of cheliped. Dactylus approximately 1/2 length of propodus; sharp tip curved, corneous, followed on flexor margin by series of 6 or 7 triangular teeth, decreasing in size proximally each with slender corneous spinule on anterior edge; setae of various lengths scattered about surfaces. Propodus with extensor margin slightly flattened, mesial edge with irregular row of short conical spines, dorsal edge with projections less prominent; lateral surface with 2 irregular rows of tubercles on proximal 2/3 of segment, becoming larger proximally; ventromesial surface smooth, rounded; 2 corneous spinules on either side of notch at distal flexor margin. Carpus short, broad, with crest of conical tubercles on expanded extensor margin, most distal tubercle triangular, prominent, spine-like on second pereopod; ridge of smaller rounded tubercles laterally and irregular area of larger tubercles below. Extensor

margin of merus expanded into sharp dorsal crest, obscurely dentate in distal portion; longitudinal depression on lateral surface below crest, ventrolateral edge with irregular row of conical tubercles and smaller tubercles above; mesial surface with longitudinal concavity below dorsal crest, mesial surface relatively smooth with several scattered tubercles; fourth pereopod with more tubercles on merus. Short ischium with several tubercles on distal margin and on dorsolateral surface.

Fifth pereopods not present in male specimen examined. Females with several irregular rows of conical tubercles on expanded area on distal 2/3 of segment.

Protopod of uropod with conical anterolateral tooth followed by rounded lobe; posterior projection with notch between 2 small rounded processes.

Telson as broad as long, narrowing posteriorly; anterior plate with rounded posterior margin, small triangular central plate separated from anterior plate by fissure; lateral plates with obscure small swelling centrally; endopod with several similar swellings on exposed surface; posterior margin of telson indented.

Color.--All specimens examined were preserved in alcohol and were devoid of pigment. No records of color were found in the literature.

Size.--The specimen collected by the PILLSBURY at station 1224 is the first male of this species to be recorded, and it is the largest specimen reported thus far, cl. 9.0 mm. The two females examined are ovigerous and have cl. 6.5 mm (ATLANTIS Sta. 3435) and 7.3 mm (holotype). There are no other records of sizes or measurements in the literature.

Sexual dimorphism.--The male specimen has the characteristic fringe of thick golden setae on the lateral margins of the telson; marginal setae in this location on females are short, very fine and sparse. Females have shorter chelipeds (Cheliped length / cl. = 2.3, 2.1) than does the male (3.6), and slightly narrower, although they are broader with respect to length. The females have the abdominal tergites slightly more rounded than the male, and the carinae are not as strongly projected in the females.

Habitat.--The bottom type has not been noted at any of the locations from which this species has been collected.

Type.--The holotype is an ovigerous ♀, cl. 7.3 mm, MCZ 2630.

Type locality.--Off Barbados, BLAKE Sta. 291, 366 m (200 fm).

Geographic range.--Munidopsis brevimanus has been collected infrequently from scattered locations in the western Atlantic: from the north coast of Cuba, Jamaica and Barbados. All locations reported previously are listed under Material examined.

Bathymetric range.--The depth at which the single specimen of M. brevimanus in our collection was taken was 878-906 m. The previously recorded possible depth range was 366-549 m; calculated previous depth range was 366-466 m (200-255 fm). Calculated depth range based on current and previous records remains 366-878 m.

Parasites.--There have been no reports of parasites on M. brevimanus.

Associates.--No statement is made concerning associated species due to

the single occurrence of M. brevimanus in this collection.

Relationships:--Munidopsis brevimanus is a member of the Elasmonotus group containing M. alaminos Pequegnat and Pequegnat, M. riveroi Chace and M. longimanus (A. Milne Edwards) also from the western Atlantic. Of these, it is most closely related to M. longimanus; these two are quite similar morphologically, and identification of specimens belonging to either species must be made with care using relative characters. M. brevimanus has the abdominal tergites less strongly projected dorsally than does M. longimanus, the rostrum broader, slightly shorter, less triangular and more acuminate at the tip; in addition, M. brevimanus has slightly shorter, broader and less ornate chelipeds, the lateral margins of the carapace are more convex, the posterior margin less concave and the rim less prominent. Also the antennal peduncle is broader with more distinct spines in M. brevimanus, the antennular peduncle is more ornate, the pleura of the second abdominal tergite are not as ornate, and the telson has the posterior medial projection of the central anterior plate separated or articulated with the main part of the plate. Of the other closely related species, M. alaminos has the carapacial sculpturing spinulate, the rostrum narrower and not excavate, and the chelipeds shorter; M. riveroi is more robust with the carapace more convex and coarse sculpturing on raised areas, the chelipeds narrower and longer, and the rostrum more distinctly excavate dorsally and sinuous. Pacific species with some relationship to this group include M. quadrata Faxon, M. carinipes Faxon and M. miersii Henderson. All three of these have the rostrum drawn out to a sharper point than M. brevimanus; the first two have narrower chelipeds, and

there is medial armature on the abdominal carinae; M. miersii has prominent gastric tubercles and only faint abdominal carination.

Remarks.--As Chace mention (1942: 98), the rostrum of the holotype is more attenuate, less rounded than in the ATLANTIS specimens; also, the abdominal carinae are more prominent in the holotype. Chace illustrated the holotype (1942: fig. 33); one of the ATLANTIS females is figured in this paper as well as the telson, antennular and antennal peduncles of the holotype.

Discussion.--Chace (1942) revived the name Munidoosis brevimanus after it had disappeared from the literature subsequent to Faxon's suggestion (Milne Edwards and Bouvier, 1894b: 283) that Elasmonotus brevimanus might be only the female of E. longimanus. A. Milne Edwards and Bouvier pointed out at that time that they had examined a male and a female of E. longimanus and found them almost identical except that the female had the chelipeds shorter and more slender than the male, whereas the female specimen Milne Edwards had described as E. brevimanus had the chelipeds shorter and broader than those of E. longimanus. Despite this observation, Milne Edwards and Bouvier followed Faxon's opinion, and their final report of the BLAKE material (1897) did not include E. brevimanus. Chace felt that the holotype of M. brevimanus and a series of specimens taken by the ATLANTIS showed differences from Milne Edwards and Bouvier's figure of M. longimanus which were "not entirely sexual." Chace (1942: 97-98) went on to specify that

"In M. brevimana the carapace is broader (despite Milne Edwards statement to the contrary) and the lateral margins are more

convex, not subparallel as in M. longimana; the rostrum is slightly shorter and broader, less triangular and less rounded at the tip, although in the two "Atlantis" specimens it is not drawn out to a sharp point as in the figured type; the carinate lobes on the second, third and fourth abdominal somites are not so narrowly and strongly produced outwards, although this character is somewhat variable; and the chelipeds are shorter and stouter. . . ."

Now that males and females of both species have been examined, it is possible to further substantiate Milne Edwards' original suspicion and Chace's opinion that two species are involved. The two species present some problems however, since their characters overlap and are somewhat variable. Although the abdominal carinae of females of M. longimanus are not quite as prominent as those of males, males and females both have these carinae more prominent than either sex of M. brevismanus. Both males and females of M. longimanus have the chelipeds longer and narrower than males and females of M. brevismanus.

Correct spelling of the species name.--Benedict (1902), in his list of species, incorrectly feminized the species name of M. brevismanus. The species name is a noun, not an adjective, and as such the ending does not change with a change in gender of the generic name. Thus M. brevismanus as well as M. longimanus are the correct spellings.

Munidopsis crassa Smith, 1885

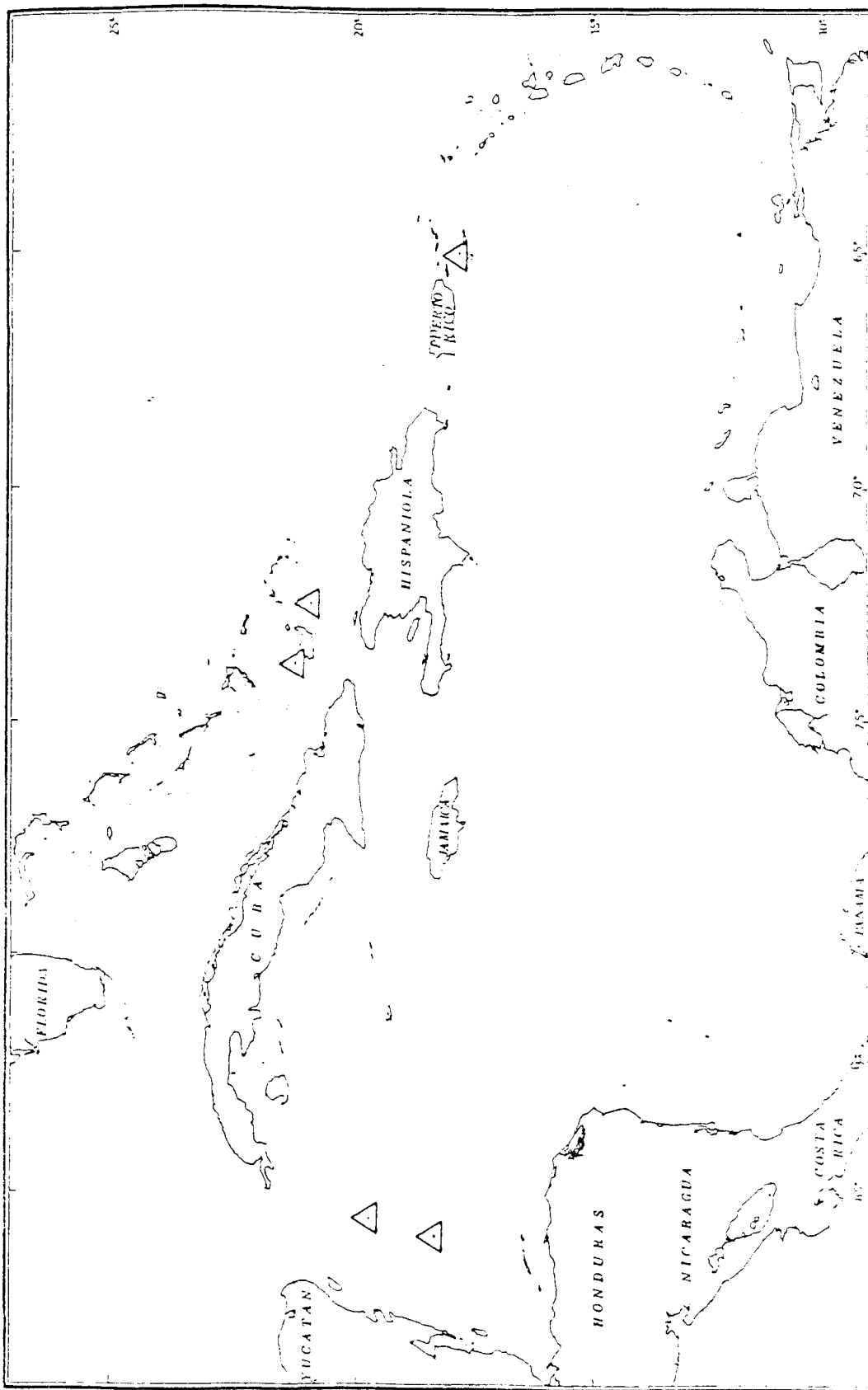
Figures 14, 15

Munidopsis crassa Smith, 1885: 494-496; 1886: 645-647, pl. 4.--A. Milne Edwards and Bouvier, 1894b: 275 (key); 1899: 82.--Benedict, 1902: 276 (key), 318 (list).--Murray and Hjort, 1912: 62, (as "chalk-coloured crab").--Doflein and Balss, 1913: 176 (list), 177 (table).--Chace, 1942: 73 (key).--Gordon, 1955: 237-245, text figs. 1A, 2A, 2A', 3A, pl. 1.--Sivertsen and Holthuis, 1956: 46-47, pl. IV, fig. 1.--Zariquiey Alvarez, 1968: 268 (key), 269-271, fig. 95b.--Miyake and Baba, 1970: 93-94 (list).--Pequegnat and Pequegnat, 1970: 139 (key); 1971: 5 (key), 18-19.--Fowler, 1912: 574.

Munidopsis Munidopsis crassa: Bouvier, 1922: 47-48, pl. I, fig. 5.--Nobre, 1936: 117.

Material examined.--Western Caribbean Sea: NW of Swan Island, P-631, 4355-4393 m, 1 ovigerous ♀, 36.3 mm, UMML 32:5232; S of Yucatan Channel, P-577, 4415 m, 1 ♂, 18.1 mm, UMML 32:5231.--St. Croix Basin, Virgin Islands: P-1401, 4226-4133, 1 ♂, 23.0 mm, (USNM).--Southern Bahama Islands: S of Caicos, P-1426, 3965-4096 m, 2 ♂, 33.0, 36.0 mm, 2 ♀, 30.0 mm (with rhizocephalan parasite), 23.7 mm, UMML 32:5233; W of Great Inagua, P-1429, 2532-2515 m, 1 ♀, 17.5 mm, (RMNH). See distribution plot 6.

Diagnosis.--Rostrum unarmed, nearly horizontal with slight distal upturn; gastric region of carapace with 1 pair of sharp spines anteriorly and several smaller spines; frontal margin with distinct post-antennal spine; posterior margin and abdominal tergites unarmed; eyes with sharp conical spine extending from dorsomesial surface of cornea; epipods on



Distribution plot 6. -- *Munidopsis crassa* Smith, 1885 collected by the PILLSBURY.

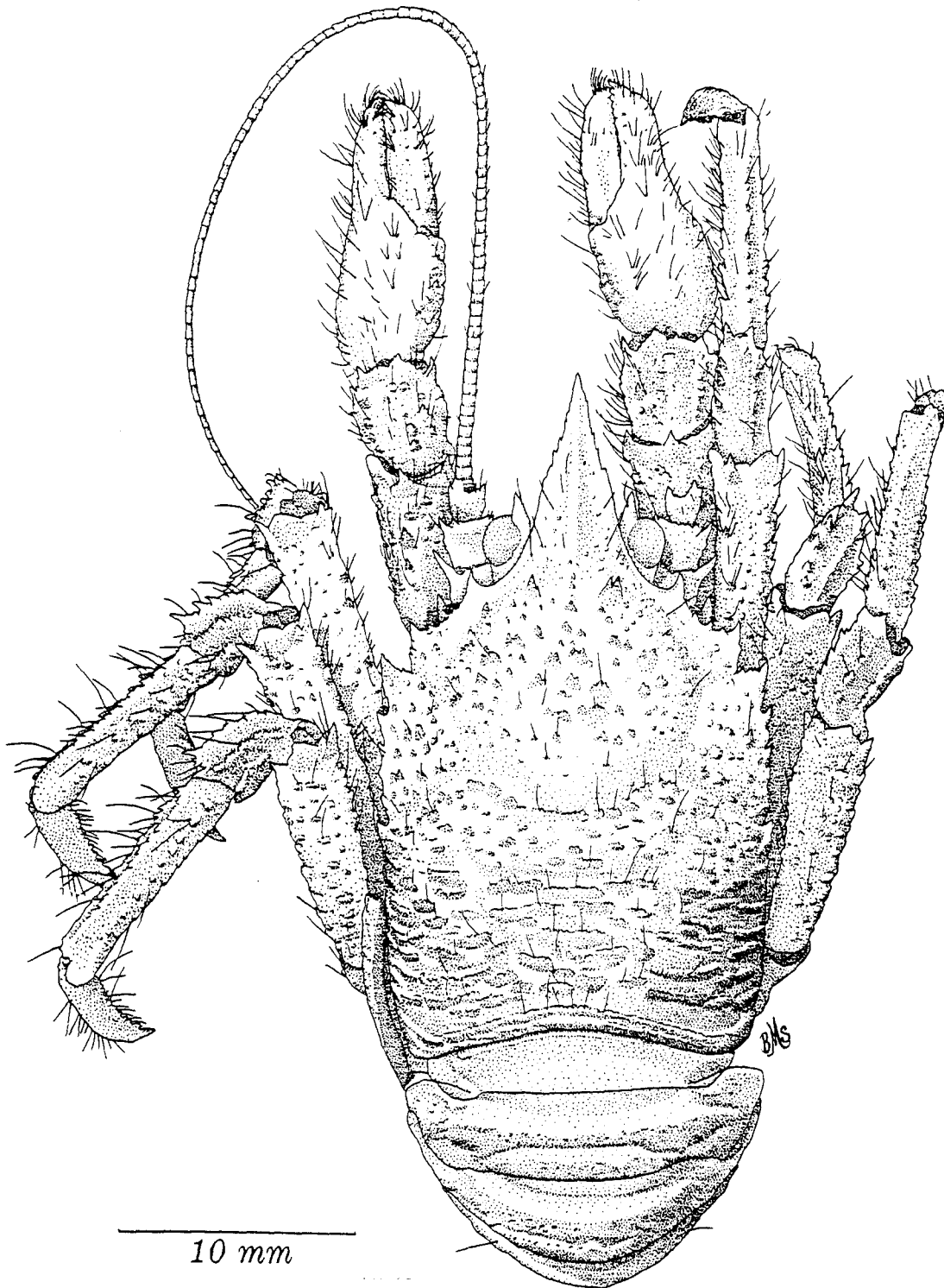


Figure 14. --*Munidopsis crassa* Smith, 1885, ♂, cl. 18.1 mm, P-577, dorsal view.

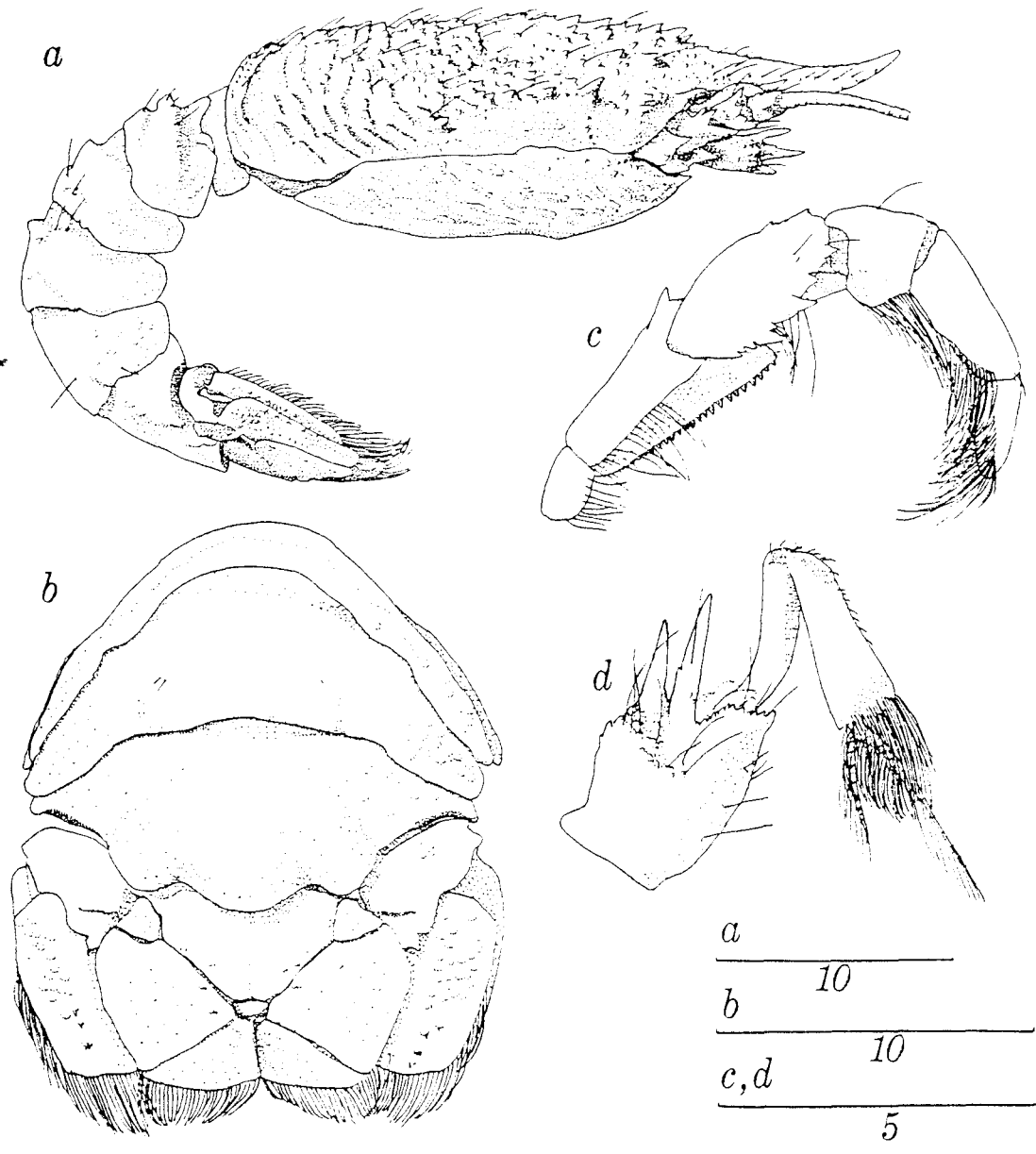


Figure 15. --*Munidopsis crassa* Smith, 1885, ♂, cl. 18.1 mm, P-577:
a, lateral view of carapace and abdominal tergites; b, posterior abdominal tergites, uropods and telson; c, right third maxilliped, ventrolateral view; d, right antennule. Scales in mm.

chelipeds but not on ambulatory legs.

Description.--Carapace slightly longer than broad (cw/cl - 0.80-0.85); transversely convex; lateral margins nearly parallel. Cervical groove smooth, conspicuous behind mesogastric region, anterior and posterior lateral branches distinct. Slightly curved postcervical groove distinct between cardiac and metagastric region. Anterior gastric region with 2 sharp conical spines slightly larger than others, 1 on each side of midline; remainder of prominent gastric region, epibranchial lobes, metagastric region and mesobranchial region armed with many sharp spines and tubercles, arranged somewhat symmetrically; cardiac and metabranchial regions with interrupted crenulate or spinulate transverse rugae; smooth areas between rugae; several short setae scattered along raised forward edge of sculpturing, edge often projected to form toothed ridge. Posterior carapacial margin raised, with crenulate crest on anterior edge and transverse row of tubercles posteriorly. Rostrum broad, tapering to triangle; length, from base of eyestalk, about 1/2 of maximum carapace width; rostrum nearly horizontal, distal part slightly upcurved, more so in larger specimens; dorsal side with strong mediolongitudinal carina, surface roughened with small tubercles; distolateral margins sharp, with several minute spines; ventral side smooth. Frontal margin with 1 sharp spine immediately over base of antenna; another sharp spine at anterolateral angle; epibranchial lobe projecting beyond this laterally, armed at anterior angle with large, toothlike spine, and slightly upcurved; several spines posterior to this on anterior half of lateral margin, decreasing in size posteriorly except for prominent spine at anterior angle of metabranchial region.

Abdomen unarmed; second and third abdominal tergites somewhat similar, each with 2 roughened transverse crests rising behind smooth anterior part of segment; fourth tergite with 1 distinct ridge; fifth and sixth tergites without transverse ridges, sixth with prominent median lobe projecting from posterior margin and smaller lobe on each side; exposed parts of all pleura with scattered tubercles, second pleuron broadest, with anterior edge turned up to form convexity anterior to lateral extension of transverse crest.

Sternum unarmed; anterior edge at insertion of chelipeds serrate; area between chelipeds with several tubercles and tufts of setae; similar but less distinct sculpturing on each segment near lateral margins; intersegmental indentations distinct, ridges prominent.

Eyes colorless, barely movable, armed on dorsomesial edge with sharp conical spine projecting from eyestalk beyond cornea; mesial surface of spine often with minute denticle near tip or more proximally beneath rostrum; protuberance on ventromesial surface of eyestalk infrequently with small tubercle or tooth.

Basal segment of antennular peduncle with lateral tuberculate inflation, tubercles often spinulate; 2 sharp distolateral spines, dorsal spine slightly shorter; ventromesial part of distal margin projected, spinulate. Extended flagellum barely reaching tip of rostrum.

Basal segment of antenna broad, with large dentiform process ventromesially and sharp ventrolateral spine. Second segment with large sharp conical spine distolaterally; adjacent dorsal surface with smaller rounded projection with apical denticle; ventromesial toothed protuberance often with smaller adjacent teeth. Third segment with 4 teeth

or groups of small teeth around distal margin; mesial and lateral teeth most prominent. Toothed lobe on mesial and dorsolateral margins of dissegment. Flagellum long, approximately 3 times length of carapace.

Merus of endopod of third maxilliped armed with 4 to 6 teeth on ventral margin, middle or proximal 2 usually larger, occasionally with small tooth between; usually small tooth dorsolaterally on distal margin. Ischium with ventral carina; mesial carina serrate; spine on distal dorsolateral margin.

Pereiopods evenly sculptured with tubercles, projections and spines; setae sparsely scattered over most surfaces. Epipods on chelipeds, but not on ambulatory legs.

Chelipeds, measured from ischial fracture, approximately same length as carapace including rostrum. Length of dactylus approximately 1/2 length of propodus. Tips of dactylus and propodus spooned, dentate; teeth continuing proximally along upper edge of abutting margins; narrow gape proximally. Longitudinal ridge along lateral edge of fixed finger distally; sculpturing sparse on dorsal surface of propodus, several protuberances, some with denticles, on mesial and lateral edges of flattened palm arranged in indistinct longitudinal rows. Carpus less than 1/2 length of chela; several spines on distal margin: mesial spine sharp, conical, followed by 3 similar spines in oblique row; 2 other rows of spines on dorsolateral and lateral edges with tubercles scattered in between. Merus shorter than chela; 4 spines on distal margin; conspicuous row of similar spines on dorsal edge of segment; other rows of spines and tubercles around segment, particularly following large distal spines. Ischium with prominent dorsal spine, ventromesial ridge with spines.

Second, third and fourth pereiopods similar. Dactylus of second pereiopod reaching beyond cheliped; dactylus of third pereiopod almost reaching tips of cheliped fingers. Dactylus with corneous brown tip, unarmed except for serrate ventral margin and tufts of setae in rows on dorsal edge. Propodus with 4 longitudinal sculptured ridges: dorsomesial ridge with 6 to 10 conspicuous spines, increasing in size proximally; spines on other ridges reduced; lateral 2 ridges close together; surface with distinct longitudinal groove. Carpus less than 1/2 length of propodus; dorsolateral surface with 3 longitudinal ridges: most dorsal ridge with row of approximately 6 sharp spines including spine on distal margin: spines reduced on middle ridge; third row of protuberances laterally less distinct. Merus approximately same length as propodus; surfaces angulated, with rows of low tubercles and spines separating faces; dorsal ridge with sharp spines terminating in large spine distally; another spine distolaterally; lateral surface with tubercles and spines in indistinct rows. Ischium with dorsal spine and ventrolateral serration on distal margin of second and third legs; fourth pereiopods unarmed.

Fifth pereiopod with merus expanded, external surface roughened; several small protuberances on ventrolateral edge, medial one conspicuous.

Prctopod of uropods with posterolateral margin notched, with sharp spinules mesially and serrations laterally.

Telson broader than long, consisting of 8 plates; telson and uropods with tubercles scattered over surfaces, some posterior tubercles with short calcified setae.

Color.--The specimens examined are preserved in alcohol and are chalky white with no traces of pigment. Bouvier (1922: 48) described the color of a living specimen of M. crassa as milky white with a rusty tint on the legs, and Murray and Hjort (1912: 62) described the specimen collected by the 1910 MICHAEL SARS Expedition as a "chalk-coloured crab."

Size.--Specimens in this collection have the following sizes:

♂, cl. 18.1-36.0 mm,
♀, cl. 17.5-36.3 mm, and
ovigerous ♀, cl. 36.3 mm.

All specimens previously reported fall within these ranges, with the exception of the ovigerous female holotype with cl. approximately 45 mm.

Sexual dimorphism.--The males of this species have a distinct row of short golden setae on the lateral margins of the telson; this fringe is completely lacking in females. These setae in M. crassa are not as distinctive as the fringe of thick, often long, setae found on males of many other species of Munidopsis. The chelipeds do not differ appreciably between the males and females; both sexes have the opposing toothed margins abutting along their entire length dorsally.

The difference in curvature of the rostrum and ocular spination between males and females mentioned by Bouvier (1922: 47) appear to be individual variations rather than sexual ones.

Habitat.--The bottom at 2 of the stations where M. crassa was collected was characterized by sponges at one and coral and cinders at the other. The bottom type at stations of the type series ranged from Globigerina

ooze to gray mud and sand.

Type.--The holotype is an ovigerous female with cl. approximately 45 mm; USNM 8563.

Type locality.--Western North Atlantic, ALBATROSS Sta. 2224, 4710 m.

Geographic range.--Munidopsis crassa is known from both sides of the North Atlantic, from the eastern, southern and western Caribbean Sea, and from the Bahama Islands. Records in the literature include the following: western North Atlantic, off coast of United States (Smith, 1885: 494); eastern North Atlantic: between Portugal and the Azores (A. Milne Edwards and Bouvier, 1899: 82), north of Canary Islands (Gordon, 1955: 239), and Bay of Biscay (Sivertsen and Holthuis, 1956: 46); middle North Atlantic, west of mid-Atlantic ridge (Bouvier, 1922: 47); Caribbean Sea, Yucatan Basin and Colombian Basin (Pequegnat and Pequegnat, 1971: 18).

Bathymetric range.--Calculated depth range for material in this collection is 2532-4415 m. One station (P-1429) at depths of 2514-2532 m is the shallowest record for M. crassa. All previous depth records fall within the calculated depth range of the type series, 3188-4795 m.

Parasites.--One female specimen from P-1426 was parasitized by many pelto-trid rhizocephalans of the genus Cyphosaccus, probably an undescribed species related to C. chacei Reinhard.

There are no reports of parasitism on other specimens of M. crassa.

Associates.--Munidopsis crassa is the only galatheid crustacean collected from PILLSEBURY stations listed for it. Munidopsis geveri was collected with M. crassa in the Colombia Basin (Pequegnat and Pequegnat, 1971: 19).

Relationships.--Munidopsis crassa is closely related to M. geveri, also from the western Atlantic, but can be distinguished from that species by the carapacial spination: M. crassa has several small spines on the gastric region in addition to the single pair of large spines of M. geveri; there are as many as 9 lateral spines posterior to the anterolateral spine on M. crassa in contrast to usually only 4 lateral spines on M. geveri. M. bermudezi and M. similis are other western Atlantic species which bear some resemblance to M. crassa, but both lack carapacial spines other than a single gastric pair; M. bermudezi is more hirsute, and M. similis lacks epipods on its comparatively longer chelipeds.

Gordon (1955: 244) has discussed in depth the relationship of M. crassa to M. subsquamosa Henderson and its varieties M. subsquamosa aculeata Henderson and M. subsquamosa pallida Alcock from both sides of the Pacific Ocean and from the Indian Ocean. She compared the specimen of M. crassa from the Canary Islands with the CHALLENGER specimens of M. subsquamosa from off Yokohama and M. subsquamosa aculeata from between Marion Island and the Crozets and from west of Patagonia. She states that the specimen of "M. crassa has a longer, more upcurved rostrum, a more pronounced supra-antennal spine and a shorter spine on the eyestalk than in any of the CHALLENGER specimens." Furthermore, she observed that M. crassa and the M. subsquamosa material differ with respect to length of fingers on the chela, spination of the carpus of P_1 and spination on P_4 . She preferred to keep the two species separate, based on material examined, but pointed out the possibility that they might subsequently have to be regarded as one widely distributed and very variable species.

Munidopsis cubensis Chace, 1942

Figures 16, 17

Munidopsis cubensis Chace, 1942: 72 (key), 78-80, fig. 27.--Pequegnat and Pequegnat, 1970: 138 (key); 1971: 4 (key).

Material examined.--Straits of Florida: GERDA Sta. 114, 869-759 m, 1 ♀, 18.2 mm, UMML 32:5234.

Diagnosis.--Rostrum upturned, armed at end of horizontal portion with pair of lateral spines; 1 pair spines on anterior gastric region of carapace; frontal margin unarmed; posterior margin with pair of small spines near midline; second and third abdominal tergites each armed with median spine on anterior ridge, second tergite with smaller median spine on posterior ridge, fourth tergite with slight median tuberosity but no distinct spine; eyes unarmed; epipods on chelipeds and first 2 pairs of ambulatory legs.

Description.--Carapace longer than broad (cw/cl approximately 0.90-0.95); vaulted transversely; gastric region slightly inflated, armed with 1 pair of distinct spines anteriorly, dorsal surface elsewhere transversely rugose and granulate; central gastric ruga ridge-like with median denticle. Cervical groove distinct behind gastric region; postcervical groove separating metagastric and cardiac regions broader than cervical groove; ridges posterior to grooves sharp, serrate, but otherwise unarmed. Short curved setae over most dorsal and exposed surfaces, usually associated with protuberances. Rostrum carinate, approximately 1/2 length of carapace, distal half upturned at angle of approximately 45° from horizontal, tapering distally, armed at end of broader horizontal portion with pair

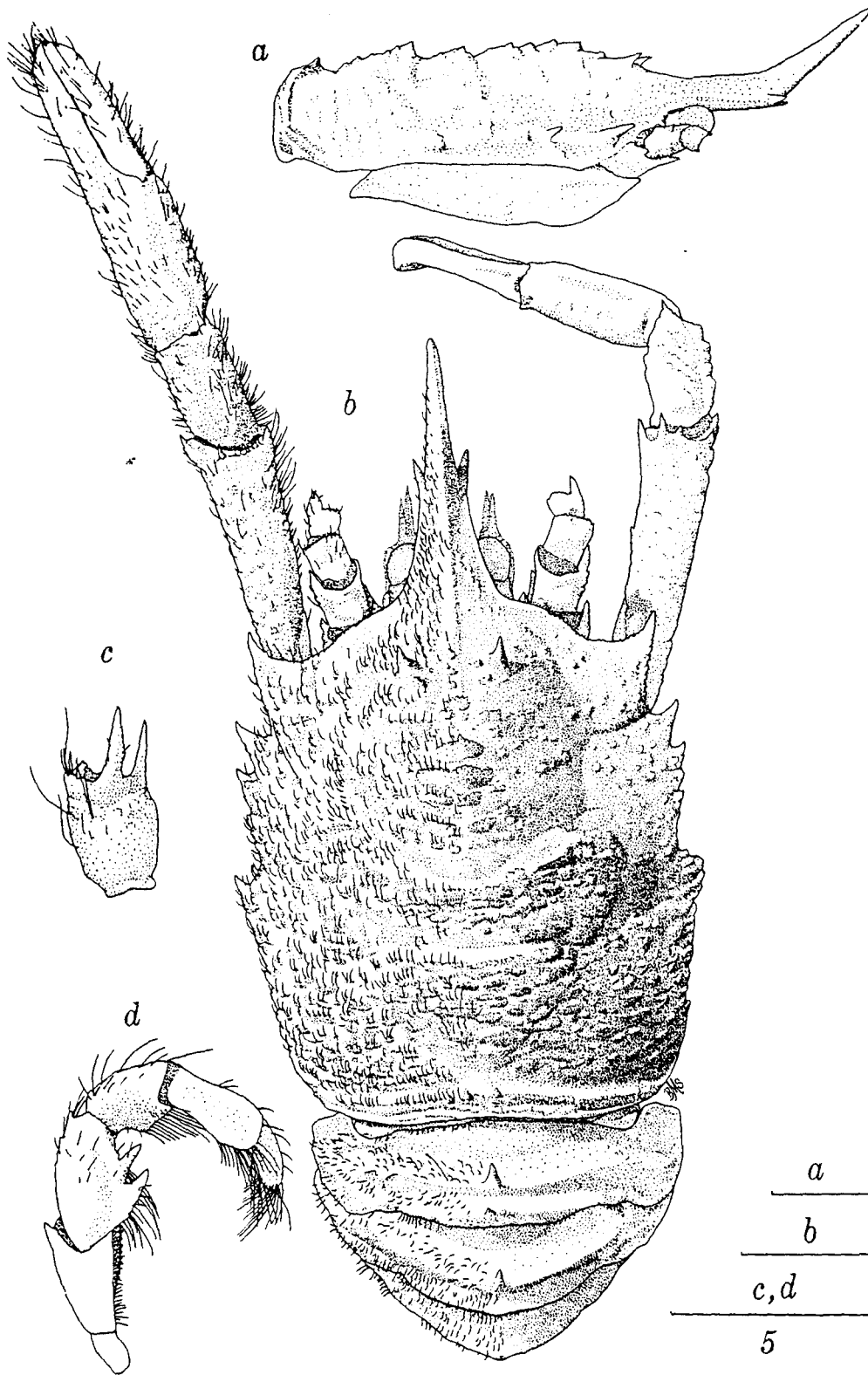


Figure 16. --Munidopsis cubensis Chace, 1942. ♀, cl. 18.2 mm, G-114:
a, carapace, lateral view, setae omitted; b, dorsal view, setae shown
on left side only; c, left antennular peduncle, ventrolateral view;
d, right third maxilliped, ventrolateral view. Scales in mm.

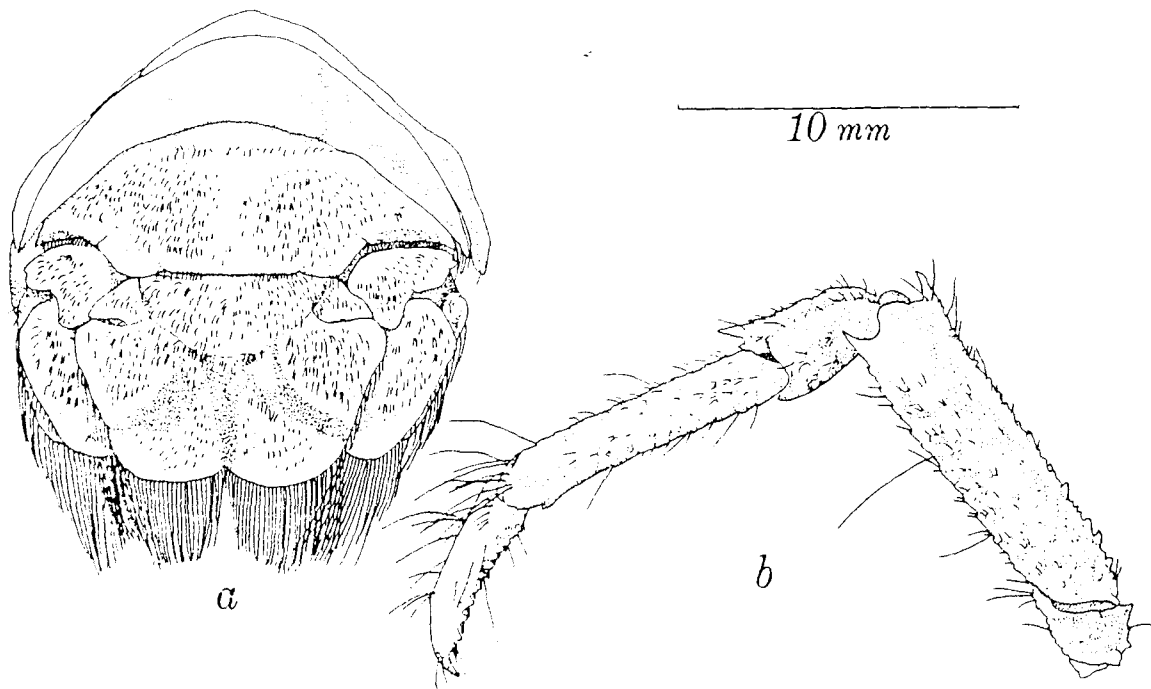


Figure 17. --Munidopsis cubensis Chace, 1942. ♀, cl. 18.2 mm, a, posterior abdominal tergites, uropods and telson; b, left pereiopod.

of spines. Frontal margin minutely serrate but unarmed. Lateral margin with 3 or 4 spines: anterolateral spine largest, broad at base, 1 or 2 smaller spines behind anterior branch of cervical groove; very small spine behind posterior branch. Ridge bordering posterior margin of carapace with small but distinct pair of spines medially and occasionally additional smaller spines or tubercles.

Abdomen with 1 median spine on anterior transverse ridge of second and third abdominal tergites; small median spine on posterior ridge of second tergite; fourth tergite with slight median swelling on anterior ridge; fifth and sixth segments relatively smooth.

Sternum with several low tubercles between bases of chelipeds, obscurely serrate ridges with setae posterior to distinct intersegmental grooves.

Eyes colorless, unarmed and movable; diameter of cornea slightly wider than eyestalk.

Small tuberculate projection emerging from beneath frontal margin at intersection of bases of antenna, antennule and eyestalk.

Basal segment of antennular peduncle inflated; surface of swollen areas lightly sculptured; 2 sharp distolateral spines, most distal spine slightly broader; distal margin minutely serrate with small triangular projection mesially.

Basal segment of antenna broad with expanded triangular tooth ventromesially and small tuberculate lateral tooth. Second segment with sharp lateral spine. Third segment with distal margin serrate, otherwise unarmed. Distal segment with small dorsolateral lobe on distal margin. Flagella missing on specimen examined; flagella exceeding 3 times length of cheliped on drawing of holotype (Chace, 1942: fig. 27).

Merus of endopod of third maxilliped armed with small dorsolateral spine near distal margin; 2 larger spines on ventromesial margin, proximal spine broader at base. Ischium with ventral carina terminating in triangular tooth, mesial border serrate, small distal spine on dorsolateral margin.

Pereiopods with tubercles, often multidentate, over most exposed surfaces, more distinct and heavier on more proximal segments. Epipods on chelipeds and first 2 pairs of ambulatory legs.

Chelipeds approximately 1 1/2 times carapace length. Dactylus slightly longer than 1/2 length of propodus; dactylus slightly longer than 4 times maximum width; tips of fingers slightly broadened, spooned, dentate; opposing margins obscurely toothed, abutting along entire dorsal face of chela, lengthwise excavation between fingers ventrally. Carpus more than 1/3 length of propodus; distal margin with small dorsomesial spine, dorsal serrate ridge and small ventral spine; slight mediolongitudinal swelling on dorsal surface with distinct tubercles. Merus approximately same length as propodus; 4 small spines arranged around distal margin; denticulate tubercles slightly more prominent in lengthwise row along dorsal surface and ventromesial surface; 1 ventromesial spinule. Ischium with dorsal spine at articulation with merus.

Second, third and fourth pereiopods almost identical. Dactylus with corneous brown tip followed by 10 or 11 small triangular spines, each bearing 1 corneous spinule on forward edge. Propodus less than 2 times length of dactylus; distal margin with serrations ventrally, but unarmed except for rows of tubercles on dorsal and lateral surfaces. Carpus less than 1/2 length of propodus, single sharp dorsal spine on distal margin followed by indistinct raised row of tubercles; shallow

concavity lateral to this separating dorsal crest from low tuberculate ridge. Merus slightly longer than propodus; distal margin with sharp dorsal spine; dorsal margin with low tuberculate ridge and several small blunt teeth; ventral spine on distal margin followed by denticulate tubercles; lateral face tuberculate; mesial face smooth. Ischium with small dorsal tooth on distal margin, ventrolateral serration and ventral projection.

Fifth pereopods with merus expanded, exposed surface tuberculate.

Protopod of uropods with indentation in posterolateral margin and 2 small lobes posteriorly. Most exposed surfaces of telson and uropods with short setae, usually small swellings at bases of setae.

Telson with 7 plates distinct; central and intermediate plates less distinct; posterior plates well-separated by non-calcified regions; posterior margin with median indentation.

Color.--The specimen examined is preserved in alcohol and is completely devoid of color except for pale yellow color of thicker setae and cornuous light brown tips of dactyli. No records of color in this species were found.

Size.--♂, cl. 20.0 mm (holotype);

♀, cl. 18.2 mm (material examined).

Sexual dimorphism.--The only difference observed between the description and illustration of the male holotype and the female specimen examined is the heavy, but not conspicuous, fringe of setae on the lateral margins of the telson of the male; this fringe is absent entirely from the female.

Substratum.--There were large rocks on the bottom at station 1-11-1.

Type.--The holotype is a male, cl. 2010 mm; MCE 11731.

Type locality.--Eastern Cuba, ATLANTIS Sea. 3300, northwest of Puerto Cayo Moa, Oriente Province: 20°46'N, 74°59'W; 1144 m.

Geographic range.--The type from off Cuba and the specimen from the Straits of Florida are the only ones thus far recorded.

Bathymetric range.--The depth at which the specimen reported herein was collected was 759-869 m. The depth at which the type was taken was 1144 m.

Parasites.--The specimen examined shows no external evidence of parasitism; no parasites were reported for the type.

Associates.--It is difficult to determine the significance of the single joint occurrence of M. longimanus with M. cubensis.

Relationships.--Of western Atlantic species, Munidopsis cubensis appears to be most closely related to M. expansa Benedict and M. gilli Benedict, both with laterally armed, upturned rostra, but differs from both in having only 1 pair of well-developed gastric spines on the carapace. In addition, M. cubensis and M. gilli both have epipods on the first 3 pairs of pereopods; however M. gilli has 2 large gastric tuberosities, less distinct lateral spination and sculpturing on the carapace, and a distinct median tooth on the fourth abdominal tergite. M. expansa is more heavily sculptured on the carapace, lacks gastric and abdominal spines; and lacks epipods on the third pereopods. M. brasili Pequegnat and

Pequegnat is quite similar to M. cubensis, but has the rostrum less upturned, epipods only on the chelipeds, more gastric spines, and paired abdominal spines.

The morphology of M. cubensis is quite similar to that of the Japanese species, M. camelus Ortmann, with epipods on the first 3 pairs of pereopods, but the latter species has 5 gastric spines, paired abdominal spines and longer chelipeds. Munidopsis trifida tomentosa (Henderson), also from the western Pacific, looks somewhat like M. cubensis, but has no pereopodial epipods, no abdominal spines and longer chelipeds.

Remarks.--The specimen of M. cubensis taken by the GERDA constitutes the first record of a female of the species, and the only record other than the one based on the holotype.

Munidopsis erinaceus (A. Milne Edwards, 1880)

Figures 18, 19

Galathodes erinaceus A. Milne Edwards, 1880: 53-54.Munidopsis erinacea: Henderson, 1888: 149, pl. 16, fig. 4.--A. Milne

Edwards and Bouvier, 1894b: 275 (key); 1897: 67-69, pl.VII, figs.

9-12.--Young, 1900: 407 (key), 411-412.--Benedict, 1902: 77 (key),

320 (list).--Doflein and Balss, 1913: 175 (list), 176 (list), 177

(table).--Schmitt, 1935: 179 (key).--Boone, 1927: 60.--Chace, 1942:

74 (key), 90-91.--Pequegnat and Pequegnat, 1970: 140 (key), 146-

147, table 5-2, fig. 5-1.

Munidopsis erinaceus: Perez, 1927: 287.--Pequegnat and Pequegnat, 1971:

6 (key).

Material examined.--Straits of Florida: G-221, 604-586 m, 2 ♂, 12.0,

13.5 mm (USNM); G-830, 342 m, 1 ♀, 10.7 mm, (USNM); G-870, 807-755 m,

1 ♀, 14.5 mm, 1 ovigerous ♀, 9.5 mm, UMML 32:5235; P-1309, 311 m, 1 ♀,

10. mm (USNM).--Santaren Channel: G-815, 618 m, 1 ♂, 8.4 mm, 1 ♀, 7.5mm (RMNH).--Northwest Providence Channel: G-917, 659-706 m, 1 ♂, 11.1mm, 1 ovigerous ♀, 8.1 mm, UMML 32:5236.--Off Atlantic coast of Colom-bia: P-374, 434-373 m, 2 ovigerous ♀, 813, 12.3 mm (USNM); P-381, 724-

597 m, 1 damaged ovigerous ♀, 16 mm, UMML 32:5237; P-394, 416-634 m,

1 ♂, with abdominal parasite, 8.3 mm, 1 ovigerous ♀, 11.0 mm (RMNH);

P-776, 408-576 m, 1 ♂, 9.1 mm, 1 ♀ with branchial parasite, 10.4 mm,

UMML 32:5241; P-781, 531-567 m, 1 ♀, 14.0 mm (USNM); P-784, 567-715 m,

1 ♂, 13.8 mm, UMML 32:5242.--Off Venezuela(W of Tortuga Island): P-740,

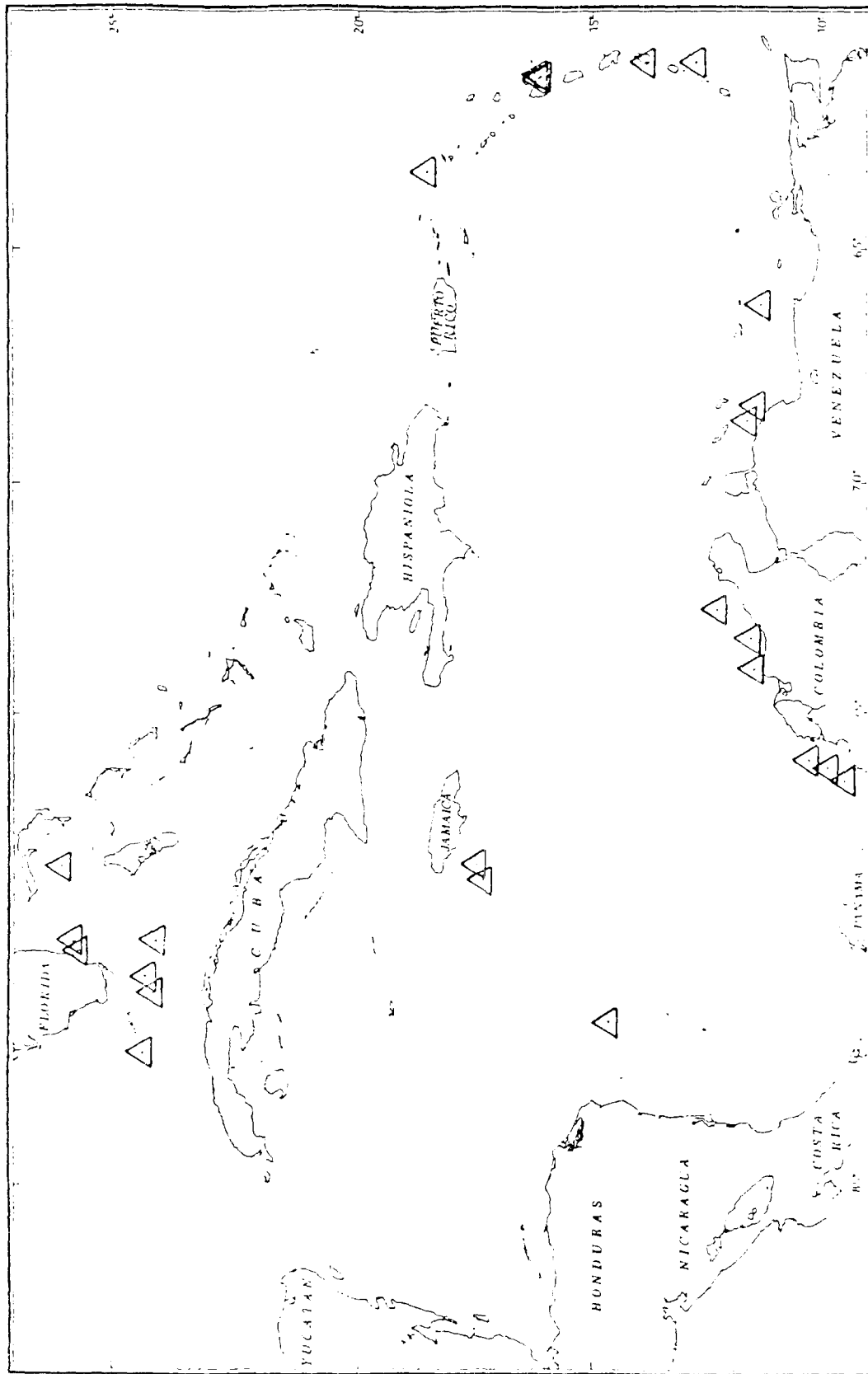
827-924 m, 1 ♂, 18.5 mm, UMML 32:5238; (N of Golfo de Trieste): P-753,

384-607 m, 1 ♂, 9.8 mm with abdominal and branchial parasites, 1 ♀,

12.8 mm with branchial parasite, UMML 32:5239; P-754, 684-1574 m, 1 ♂, 16.8 mm, UMML 32:5240.--E of Grenadine Islands: P-861, 357-586 m, 3 ♂, 6.0-7.5 mm, 1 ovigerous ♀, 10.0 mm, UMML 32:5243.--Off St. Lucia: P-904, 589-439 m, 1 ♂, 14.4 mm, 2 ovigerous ♀, 8.1, 9.3 mm, UMML 32:5244.--Off Guadeloupe: P-919, 683-733 m, 2 ovigerous ♀, 8.1, 9.8 mm (USNM); P-920, 683-733 m, 1 ovigerous ♀, 11.9 mm (RMNH); P-923, 476-686 m, 36 ♂, 9.2-14.5 mm (6 with branchial parasites), 38 ♀, 8.2-13.4 mm (28 ovigerous, 8.4-13.4 mm), 3 of non-ovigerous with branchial parasites, 9.6-10.5 mm (USNM).--NW of Anguilla: P-989, 664-706, 1 ♂, 9.5 mm (RMNH).--S of Jamaica: P-1255, 622-823 m, 1 ♀, 8.7 mm (RMNH); P-1256, 521-658 m, 2 ♂, 9.3, 11.7 mm, UMML 32:5245.--Off Honduras: P-1355, 450-576 m, 8 ♂, 9.1-16.8 mm (16.8 mm with 2 abdominal parasites), 13 ♀, 9.0-16.1 mm (6 ovigerous, 11.2-16.1 mm), 13.1 mm non-ovigerous with 2 abdominal parasites) (RMNH). See distribution plot 7.

Diagnosis.--Rostrum almost horizontal, with 1 pair of divergent lateral spines; gastric region of carapace with 2 pairs of spines; frontal margin with sharp post-antennal spines; posterior margin unarmed; second, third and fourth abdominal tergites armed, but no spines on midline; no eyespines; no epipods on pereopods.

Description.--Carapace longer than broad (cw/cl approximately 0.80), lateral margins slightly convex. Gastric region inflated, armed with 2 pairs of sharp curved spines: anterior pair largest, situated in line with eyes; 2 pairs of spines on cardiac region; (total of 4 pairs of spines on carapace centrally, arranged widest apart anteriorly, rows converging posteriorly). Each metabranchial area with 1, 2 (usually) or 3 spines. Cervical groove narrow, distinct across center of carapace



Distribution plot 7.--*Munidopsis erinaccus* (A. Milne Edwards, 1880) collected by the GERDA and PILLSBURY. 135

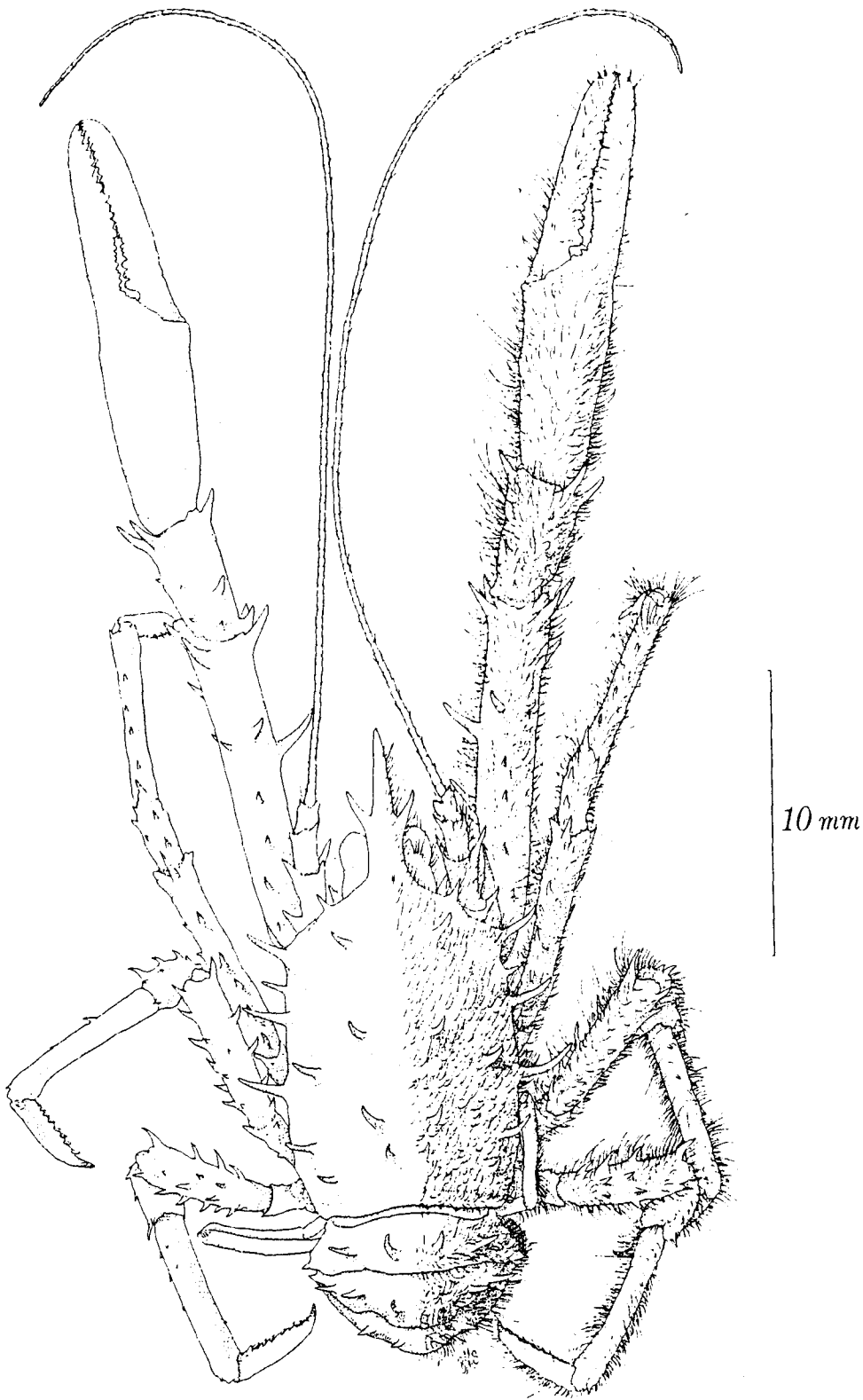


Figure 18. --*Munidopsis erinaceus* (A. Milne Edwards, 1880). Ovigerous ♀, cl. 10.8 mm, P-923, dorsal view, setae shown on right side only.

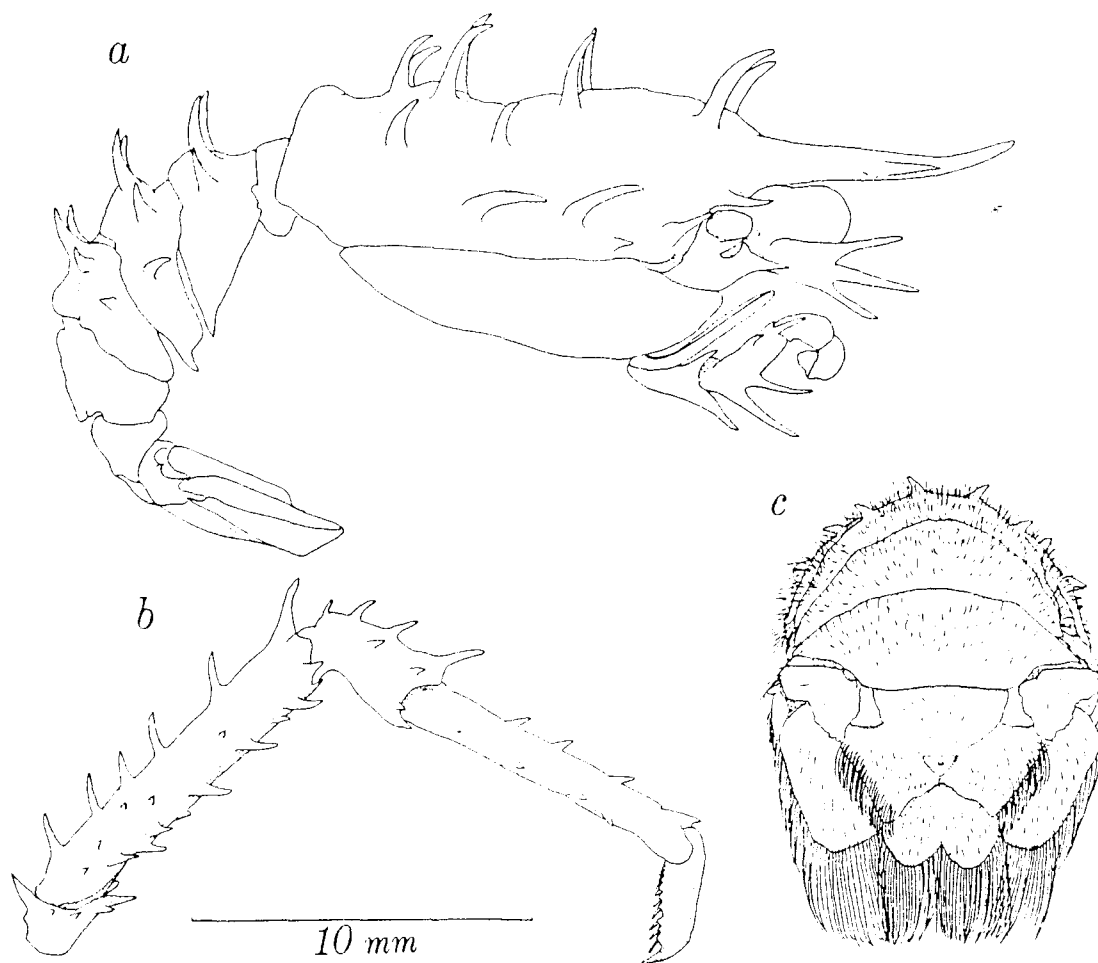


Figure 19. --Munidopsis erinaceus (A. Milne Edwards, 1880). Ovigerous ♀, cl. 13.3 mm, P-1355: a, carapace and abdomen, lateral view, setae not shown. ♀, cl. 14.0 mm, P-1355: b, right second pereiopod, fine dense setae not shown. ♂, cl. 13.5 mm, P-1355: c, posterior abdominal tergites, uropods and telson.

and in both lateral branches. Postcervical groove deep and broad across central 1/3 of carapace between metagastric and cardiac regions. Surface covered with stiff, curved setae; smooth between spines except for fine sculpturing on metabranchial regions and branchiostegites.

Rostrum 1/2 carapace length or less, narrow, conical, almost horizontal, slightly upcurved distally; armed with 1 pair of sharp curved lateral spines diverging at 45° angle from rostral spine approximately 1/2 distance from base. Frontal margin armed with 1 slender spine slightly mesial to antenna. Anterolateral spine large, sharp, diverging at 45° angle from midline, followed by 1 smaller more divergent spine, and 2 large spines with forward-curving tips set at almost 90° angle to midline. Posterior margin transversely carinate, but unarmed.

First abdominal tergite smooth, obscure rounded transverse carina anteriorly. Second tergite with 2 pairs of sharp curved spines spaced evenly across central transverse carina. Third and fourth segments each with 3 pairs of spines; central 2 pairs in line with those of second tergite, third pair located laterally. Pleura of second and third tergites narrowed laterally to form sharp spine. Fifth and sixth segments without spines. Curved setae abundant on abdominal segments, particularly from middle of second segment to middle of fourth segment; posteriorly, setae shorter and fewer, sometimes absent.

Sternum unarmed; intersegmental ridges and depressions distinct.

Eyes colorless, cornea noticeably wider than eyestalk, unarmed, movable; base of cornea with small dorsal and large mesial emarginations and many long setae.

Small sharp spine projecting from plate beneath frontal margin of carapace between eyestalk and bases of antennule and antenna.

Basal segment of antennular peduncle with ventrolateral denticulate swelling, dorsal surface of swelling with sharp spine, 1 or more accessory spinules proximally on larger specimens, lower distal spine larger. Ventromesial angle with sharp spine; mesial angle with spinule. Antennular flagellum extending, by length of third segment, beyond tip of rostrum.

Basal segment of antenna broad; 1 sharp lateral and ventromesial spine. Second segment with 2 long sharp spines on distal margin: 1 lateral, 1 ventromesial. Distal margin of third segment with long ventromesial spine, shorter dorsomesial spine, and lateral spinule. Fourth segment with dorsolateral ventrolateral and ventral denticles. Antennal flagellum approximately 4 times length of carapace, extending beyond chelipeds.

Ischium of endopod of third maxillipeds triangular in cross section; mesial margins serrate, ventral and lateral angles each with sharp distal spine. Ventral margin of merus with 2 long curved spines: dorsal margin with smaller sharp distal spine.

No epipods on pereopods.

Chelipeds $2 \frac{1}{2}$ to 3 times carapace length. Dactylus fully $\frac{1}{2}$ length of chela; gape at base of fingers variable: wide in large specimens, narrow in small specimens and some females. Fingers toothed along opposing margins; in males distal $\frac{1}{3}$ to $\frac{1}{2}$ with margins abutting; tips spooned, dentate. Maximum width of chela $\frac{1}{4}$ length; manus with 2, occasionally 3, small teeth on mesial margin; 1 or 2 on dorsolateral margin proximally. Carpus short, less than $\frac{1}{3}$ length of chela; 4 sharp spines on distal margins: 1 dorsomesial, 1 dorsolateral, 1 lateral and 1 ventrolateral; dorsomesial and ventrolateral surfaces each with smaller spine; 3 or 4 teeth on dorsal surface. Merus not quite as long as chela,

with 4 sharp spines at distal angles; dorsal surface with 4 or 5 sharp spines in longitudinal row, often 1 or 2 smaller spines lateral to these distally; 2 or 3 large ventromesial spines and 5 smaller ventrolateral spines. Ischium with 2 spines on ventral projection, distal spine longer; 3 to 6 small teeth or spines on ventral surface, 1 heavy spine on dorsal surface. Surfaces of all pereopods smooth between spines, with dense covering of long fine stiff setae.

Second, third and fourth pereopods similar; dorsal and lateral surfaces densely covered with long, curved setae. Dactylus of second pereopod reaching distal margin of carpus of cheliped, curved tip brown, corneous, followed by 8 to 12 sharp ventral teeth, decreasing in size proximally, forward edge of each tooth with movable corneous spine. Propodus approximately twice length of dactylus, dorsal surface with row or 3 to 5 small spines; distal margin with 1 spine at dorsolateral edge and 2 small movable spines ventrally; lateral surface with row or 2 to 4 widely-spaced smaller teeth. Dorsal edge of carpus with 4 sharp spines, distal spine largest; 2 or 3 spinules on dorsolateral face, and 1 spinule on lateral surface near distal margin. Merus with 5 or 6 sharp spines dorsally; ventral edge with more, slightly smaller spines, most distal spine placed slightly laterally; lateral surface with 4 or 5 spinules in row or arranged irregularly; 2 or 3 small spines on ventromesial edge, distinct on second pereopod, sometimes absent on third and fourth pereopods. Distal margin of ischium with small dorsal tooth, 3 small ventral spines.

Fifth pereopods with merus setose and with 3 spinules on ventral margin.

Posterolateral margins of protopod of uropod scalloped; posterior lobe with obscure notch, serrate on lateral side, 1 or 2 denticles mesially.

Telson consisting of 8 plates, narrowing posteriorly; posterior margin in 2 lobes.

Color.--All the specimens in our collection are preserved in alcohol and are chalky white. There are no records of color for this species.

Size.--The following ranges of size were found based on the material examined:

♂, cl. 6.0-18.5 mm,

♀, cl. 7.5-16.1 mm, and

ovigerous ♀, cl. 8.1-16.1 mm.

Sexual dimorphism.--Perez (1927) noted the light fringe of plumose setae on the lateral margins of the telson of females (contrasted to the "comb" of stiff yellow setae present on males). A. Milne Edwards and Bouvier (1897) stated the sexual differences are the same as those of M. spinifer (rostrum a little more upturned in males, 2 longer and sharper lateral spines) but the chelae in the females are completely unarmed. These characters were not consistent in a large series of males and females; most large females had denticles on the mesial surface of the manus and the rostrum slightly curved upward.

Habitat.--The bottom type at stations where M. erinaceus was collected varied from pteropod coze to mud, clay and coral rubble with sponges. The data did not indicate that the species occurred on one of these types more than another.

Type.--♂, cl. ?. The location of all of the type material is not known; some of the syntypes are at the MCZ.

Type locality.--Near St. Lucia, BLAKE Sta. 222, 422 fm (approximately 773 m).

Geographic range.--This species is known from the Straits of Florida south to Brazil, from the Gulf of Mexico and from the Caribbean Sea. Previous western Atlantic records include: Caribbean Sea: Nevis, Fredericksted (St. Croix), St. Vincent, St. Lucia (A. Milne Edwards and Bouvier, 1897: 68); Pernambuco, Brazil (Henderson, 1888: 149); north coast of Cuba (Chace, 1942: 90-91); and northwest Gulf of Mexico (Pequegnat and Pequegnat, 1970: 147).

Bathymetric range.--The possible depth range for material in this collection is 311-1574 m; calculated range is 311-827, which falls within the previously recorded range of 276-1016 m.

Parasites.--Two male specimens and a female specimen from P-1355, and 1 male from P-394, each had 2 specimens of Cyphosaccus cornutus Reinhard, 1958 attached to ventral surfaces of the abdomen. A male from P-753 was the host of 3 specimens of this rhizocephalan parasite (family Peltogastridae), as well as an isopod Pseudione sp., probably new, (family Bopyridae) in the branchial cavity. Pseudione were also found parasitizing 6 males and 3 females from P-923, and 1 female from P-776. Reinhard (1958) described the type of Cyphosaccus cornutus from material provided by a female specimen of M. erinaceus reported by Chace (1942) as having "abdominal parasites."

No other records of parasitism in this species were found.

Associates.--At 7 or the 25 stations at which M. erinaceus was collected, Munidopsis polita was also taken in the same sample, and M. riveroi was collected with M. erinaceus at 5 stations. The indices of affinity between M. erinaceus and these species, based on these data, are 0.34 and 0.32, respectively.

Relationships.--Munidopsis erinaceus is superficially similar to the less common M. spinifer, also from the western Atlantic. The two can be separated easily, however, by the unarmed posterior margin of the carapace, 2 pairs of gastric spines and the absence of medial abdominal spines on M. erinaceus, as opposed to the presence of 3 to 5 pairs of posterior carapacial spines, 3 pairs of gastric spines and mesial spines on the abdominal segments of M. spinifer.

The relationship of these 2 species to the Pacific species is presented in the discussion of the relationships of M. spinifer.

Remarks.--Specimens of M. erinaceus show individual variations: e.g., there may be either 2 or 3 spinules on the dorsal margin of the merus of the third maxilliped, extra spines may be present on the branchial regions of the carapace and occasionally a spine is found on the pleural margin of the fourth abdominal segment.

Correct spelling of the species name.--The species name erinaceus is from Latin, meaning "hedgehog." Since the name is a noun in apposition, its ending does not change with the gender of the generic name; thus, Henderson and others were incorrect in their spelling, and erinaceus is correct.

Munidopsis geyeri Pequegnat and Pequegnat, 1970

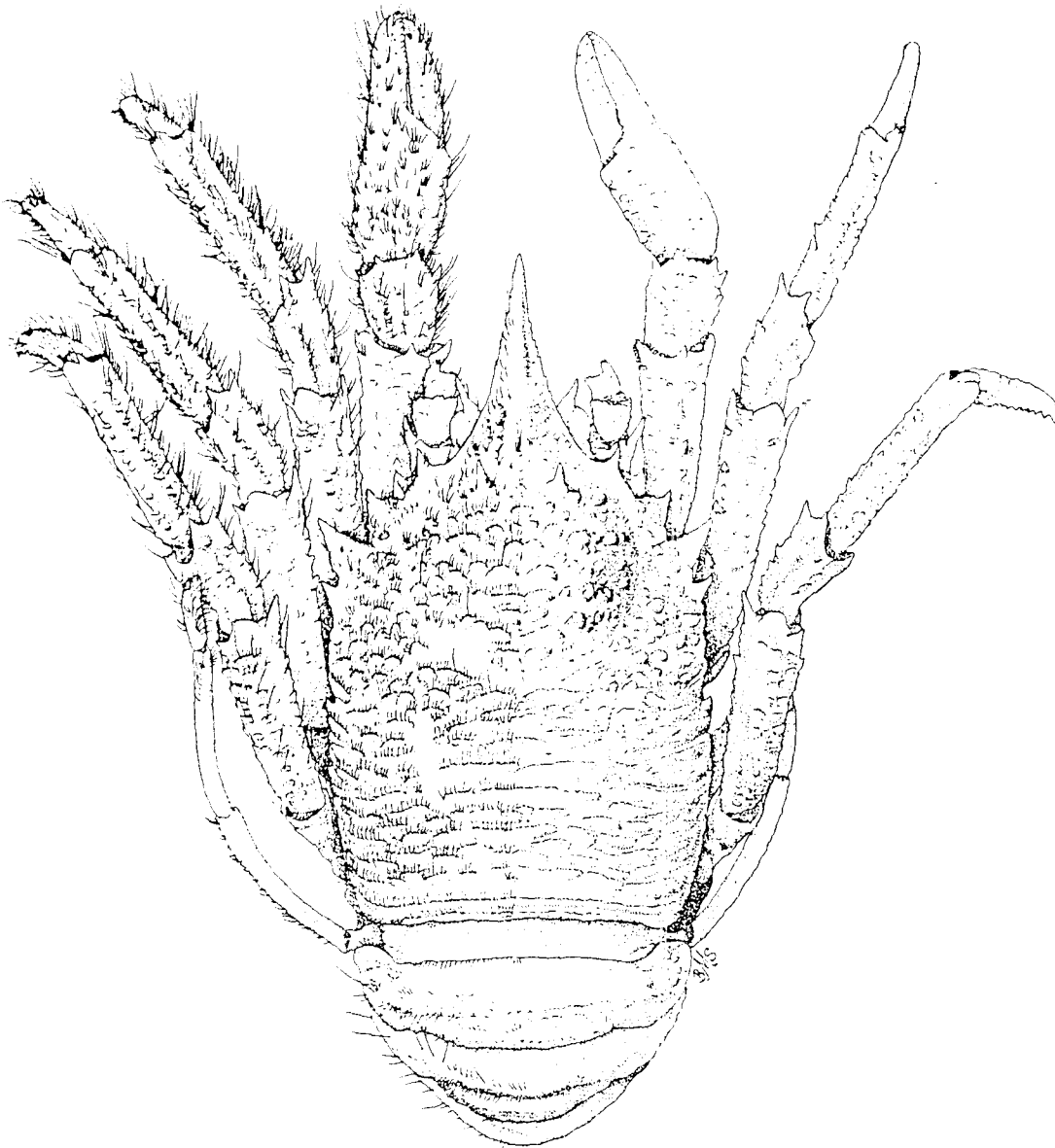
Figures 20, 21

Munidopsis geyeri Pequegnat and Pequegnat, 1970: 139 (key), 149-151, figs. 5-1, 5-9, 5-10, table 5-2; 1971: 5 (key), 19.

Material examined.--Gonave Bay, Haiti: P-1180, 3111-3496 m, 1 ♂, 21.3 mm, 1 ♀, 27.1 mm, 1 juvenile, 19.9 mm (gonopores not developed, pleopods not modified), UMML 32:5246.

Diagnosis.--Rostrum unarmed, with upward flexure distally; gastric region of carapace with only 1 pair of distinct spines; frontal margin with post-antennal spine; posterior margin of carapace and abdominal tergites unarmed; eyestalks with dorsomesial spine; epipods on cheliped but not on ambulatory legs.

Description.--Carapace slightly longer than broad (cw/cl - 0.82-0.87); transversely convex; lateral margins nearly parallel. Central portion, anterior and posterior lateral branches of cervical groove well-defined. Transverse, straight postcervical groove separating cardiac and metagastric regions on medial third of carapace, extending posteromedially as branchiocardiac grooves, but not reaching smooth posterior marginal groove. Anterior gastric region with only 1 pair of distinct conical spines; remainder of gastric region with large raised squamae; squamae arranged somewhat symmetrically with anterior margin spinulate; smaller squamae on epibranchial region between lateral branches of cervical groove; posterior half of carapace with squamae transversely expanded to form interrupted rugae; occasionally complete rugae across cardiac region; evenly-spaced, short setae in continuous row along forward edge of



10 mm

Figure 20. --Munidopsis geyeri Pequegnat and Pequegnat, 1970, ♀, cl. 19.1 mm, P-1180, dorsal view, setae shown on left side only.

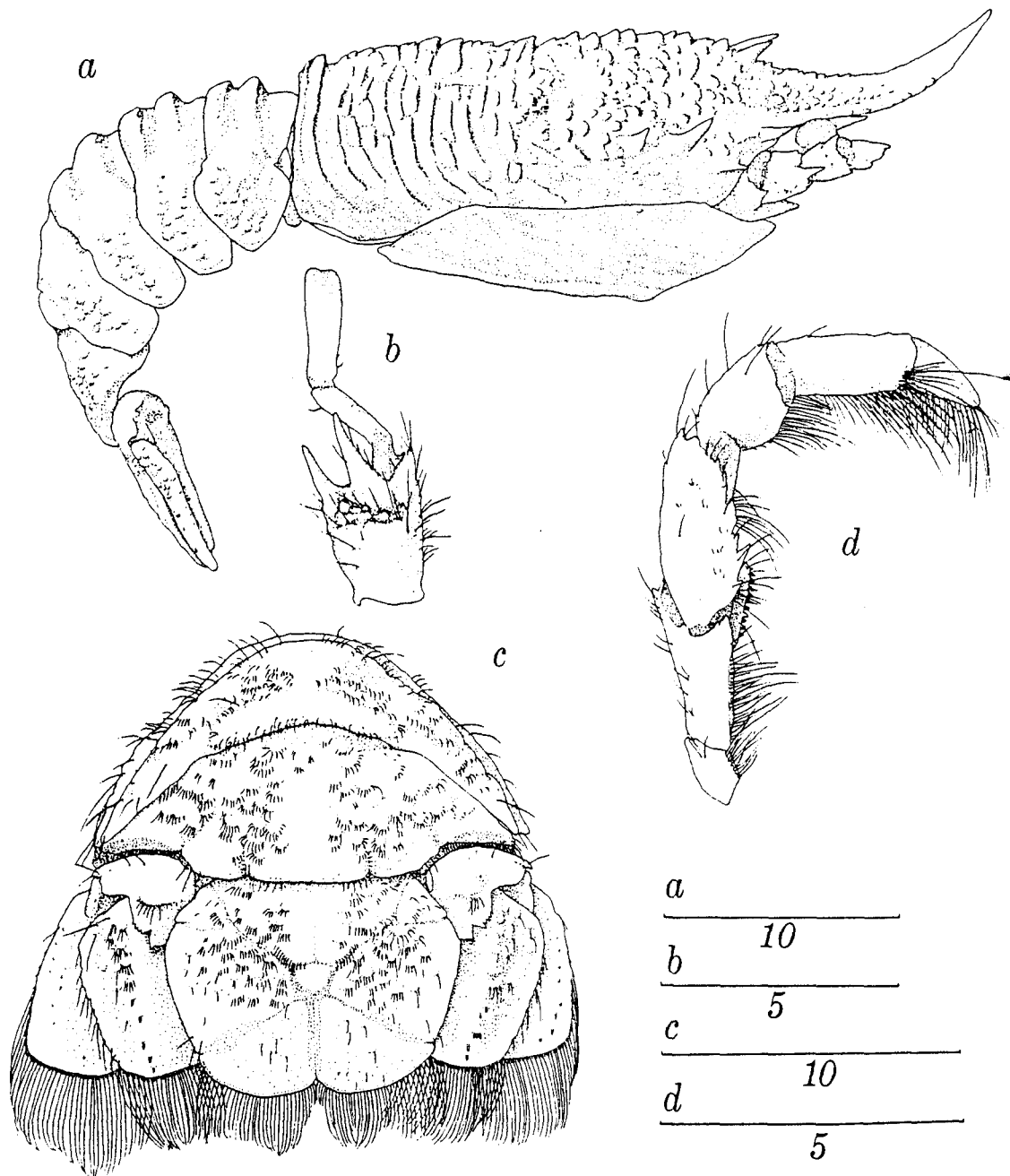


Figure 21. --*Munidopsis geyeri* Pequegant and Pequegnat, 1970, ♀, cl. 19.1 mm, P-1180: a, lateral view, setae omitted; b, right antennular peduncle; c, posterior abdominal tergites, uropods and telson; d, endopod of right third maxilliped. Scales in mm.

sculpturing; central seta of row often larger. Posterior marginal rim with spinulate crest on forward edge and additional transverse ruga posterior to it. Rostrum broad, tapering to triangle, length from base of eyestalks approximately 1/2 maximum carapace width, nearly horizontal with smooth upward flexure distally; mediolongitudinal carina distinct dorsally with small squamae more distinct proximally; area between carina and marginal rim of rostrum with larger flattened tubercles; many small teeth on lateral margin of rostrum beyond eyes; ventral surface smooth. Frontal margin with sharp post-antennal spine and small spinulate ridge lateral to base of spine; margin spinulate mesial to small anterolateral spine. Largest marginal tooth originating just behind anterior branch of cervical groove; smaller tooth posterior to this; lateral margins irregular due to carapacial sculpturing, but no other distinct spines present except for small curved tooth just behind posterior branch of cervical groove.

Abdomen unarmed; second, third and fourth abdominal segments similar, each with 2 punctate transverse carinae rising behind smooth anterior part of segment, separated by transverse furrow across tergite; small rounded tubercles in depressions with setae, anterior carina on each segment extending nearly to lateral margin of pleuron and merging with large rounded tubercles; posterior carina extending across tergite only, with very slight median projection; fifth and sixth plates without transverse ridges, but with regular short setae projecting from posterior edges of scattered obscure squamae. Broad median lobe on posterior margin of sixth segment not projected; smaller lobe on each side.

Sternum unarmed; anterior margins between insertion of chelipeds serrate; several low tubercles with setae on surface of sternite between

chelipeds; intersegmental transverse depressions and ridges distinct.

Eyes colorless, practically immovable, armed on dorsomesial edge with large, sharp, conical spine projecting anterolaterally from eyestalk beyond cornea; minute denticles with setae projecting from base of denticle on mesial surface of spine; often several small tubercles with short setae on dorsal and lateral margins of eyestalk near base of cornea.

Basal segment of antennular peduncle with tuberculate lateral inflation; 2 sharp distolateral spines, ventral spine slightly heavier, longer; ventromesial part of distal margin slightly projected, denticulate. Setae of extended flagellum barely reaching tip of rostrum.

Basal segment of antenna broad, with sharp triangular projection ventromesially and broader denticulate lobe projected ventrolaterally. Second segment with sharp conical spine on distolateral margin; smaller lobe with apical denticles just mesial to this; mesial surface with sharp tubercles, forming small ventromesial projection distally. Third segment with small groups of denticles around distal margin, usually larger denticle in lateral and mesial groups; 2 tubercles on each of dorsal, mesial and lateral surfaces of segment; dorsolateral margin of distal segment with apically denticulate projection; dorsomesial margin with distal row of denticles, smaller group of denticles ventrolaterally. Flagellum long, approximately 4 times carapace length.

Merus of endopod of third maxilliped armed with several irregular teeth on ventral margin, 2 usually larger than others, small tooth dorsolaterally on distal margin. Ventral carina of ischium terminating in small tooth distally; mesial carina serrated; small spine on distal dorsolateral margin.

Pereiopods evenly sculptured with tubercles, projections and spines; setae associated with most sculpturing. Epipods on chelipeds, but not on ambulatory legs.

Chelipeds, measured from ischial fracture, approximately 1 1/2 times carapace length, or nearly equal to total carapace length including rostrum. Width of chela from 1/3 to 1/2 length of chela, lateral margin with slight indentation between palm and fixed finger, giving claw curved appearance. Length of dactylus slightly less than 1/2 length of propodus; tips of dactylus and propodus spooned, dentate; teeth continuing but becoming obscure proximally along upper abutting margins; very narrow gape between proximal halves of fingers. Mesial and lateral edges of flattened palm with several flattened tubercles with setae on anterior denticulate margins; dorsal surface with evenly-spaced groups of short setae, but chela otherwise unarmed. Carpus approximately 1/3 length of chela; distal margin with 4 distinct spines: 1 lateral, 1 dorsolateral, 1 mesially adjacent to propodal articulation, and 1 mesial; occasionally a sharp dorsomesial spine or larger tubercle well behind mesial spine; dorsal surface with many small flattened anteriorly denticulate tubercles and associated setae; ventral surface relatively smooth. Merus shorter than chela; sharp spine at each of 4 distal angles; dorsal spine followed by longitudinal row of several, usually 4 spines, most distal spine largest, others decreasing in size proximally; squamose tubercles on dorsolateral surfaces best developed, becoming obscure proximally. Ischium with prominent dorsal spine, typical ventral projection, small ventrolateral tooth distally, and scattered tubercles principally on lateral surfaces.

Second, third and fourth pereopods similar. Dactylus of second pereopod reaching beyond cheliped; dactyli of each of following legs reaching distal margin of propodus of preceding leg. Dactylus with corneous brown curved tip, unarmed except for low swellings on dorsal surface distally and ventral row of approximately 13 denticles, each with corneous spinule projecting from anterior edge. Propodus approximately twice length of dactylus; several raised longitudinal rows of small tubercles on all but ventral surfaces, dorsal and mesial ridges most distinct; indentations between rows relatively smooth; several proximal spines in mesial row: usually 2 on second pereopod, 1 on third and 1 or none on fourth, but number variable; mesial ridge also with even fringe of plumose setae associated with sculpturing. Carpus less than 1/2 length of propodus; large sharp spine at dorsomesial angle of distal margin, usually followed by row of 3 smaller spines with smallest spine in middle; smaller spine lateral to large spine on distal margin and, slightly lateral to this, distinct ridge of tubercles; lateral surface with denticulate flattened tubercles, ventral surface relatively smooth except for small tooth on distal margin. Merus slightly longer than propodus, with large sharp dorsomesial spine on distal margin; lateral spine similar on second pereopod, smaller on third and still smaller on fourth; dorsomesial ridge with 6 or 7 prominent spine decreasing in size proximally; dorsolateral surface with flattened tubercles and setae: 2 indistinct rows of such tubercles on ventral surface. Ischium with blunt dorsal tooth on second pereopod; third and fourth with projection only.

Fifth pereopod with merus expanded, sculptured laterally with low tubercles and several small blunt teeth on ventral margin, medial tooth

conspicuous.

Protopod of uropod with posterolateral margin in 3 lobes; posterior lobe with group of denticles and 2 sharp teeth separated by notch; posterior surface with 1 or 2 flattened squamae, posterior edge denticulate, with setae (as in carapacial sculpturing).

Telson consisting of 8 plates; telson and uropods with squamose tubercles with setae scattered over surfaces; exposed posterior areas on endopod with several short calcified setae.

Color.--The specimens examined are preserved in alcohol and are chalky white; setae are pale golden. There are no color records for this species.

Size.--Specimens in this collection had the following sizes:

♂, cl. 21.8 mm,

♀, cl. 27.1 mm, and 1 juvenile, cl. 19.1 mm.

No ovigerous females have been collected.

The male holotype is the only other specimen whose size (cl. 17 mm) has been reported to date.

Sexual dimorphism.--There are no obvious differences between the male and female specimens. The male specimen (cl. 21.8 mm) has the lateral margins of the telson with a distinct but not dense fringe of setae which is lacking in the large female and in the juvenile. The rostrum of the male is curved upward to a slightly greater degree than that of the female.

Habitat.--The bottom at P-1180 in Gonave Bay consisted of yellow clay mud with vegetable debris and rotten logs.

Type.--The holotype is a male with cl. 17 mm; USNM 128812.

Type locality.--SW Gulf of Mexico, ALAMINOS Sta. 69-A-11-92, 23°30'N, 95°32'W; 2928-3001 m.

Geographic range.--This species is known from the western Atlantic in the NW Gulf of Mexico and the Caribbean Sea. In addition to the new location near Haiti listed herein and the type locality, it has been collected in the Colombian Basin and south of Jamaica by the ALAMINOS (Pequegnat and Pequegnat, 1971: 19).

Bathymetric range.--Calculated depth range for this species is 2790-4151 m. Possible depth range is 2650-4151 m.

Parasites.--There is no external evidence of branchial or abdominal parasites in any of the specimens examined, and no records of parasitism exist. All specimens examined have microscopic filamentous epizoans, possibly fungi, but as yet unidentified, attached to body surfaces, appendages and setae. These are less than 0.5 mm in length and approximately 0.01 mm in diameter. The gastric mill of one specimen was filled with fibers, some of them straight, some curved into a circle. The length of some longer fibers which appeared to be complete is approximately 4 or 5 mm; their diameter is less than 0.03 mm.

Associates.--Munidopsis livida was collected at P-1180 along with M. geyeri. The ALAMINOS collected these two species together at the station south of Jamaica, and M. colombiana, M. crassa, M. sundi and M. reynoldsi with M. geyeri in the Colombian Basin.

Relationships.--Munidopsis geveri is quite similar to the specimen of M. subsquamosa Henderson from the western Pacific as described and illustrated in the literature. The characteristics mentioned by Pequegnat and Pequegnat (1970: 150) as distinguishing M. geveri from M. subsquamosa (with movable eyes, punctations on the abdominal somites and only 3 denticulate spines on the merus of the third maxilliped of the latter) are not sufficient to separate these species. Henderson (1888: 152-153) described the eyes as possessing "but slight mobility" and the merus of the third maxilliped as being armed on the inner margin with a series of short irregular teeth; the illustration of the third maxilliped (pl. XVII, 4a) shows at least 4 teeth on this margin. The western Pacific species, however, does appear to have a few more spines on the gastric region of the carapace and on the pereopods, and to have the rostrum more nearly horizontal. Thus there is some question as to the distinctness of M. geveri from M. subsquamosa and it is possible that the former will prove to be a subspecies of the latter. Until more material of both species is available, it seems best to use the name M. geveri for the West Indian material.

Among western Atlantic species, M. geveri is most closely related to M. crassa, but can be distinguished from it easily by the greater number of dorsal and lateral spines on the carapace of M. crassa. It appears that M. geveri differs from M. crassa in somewhat, though not exactly, the same manner as M. subsquamosa Henderson differs from M. subsquamosa aculeata Henderson (the latter was raised to species rank by Benedict, 1902). Thus the western Atlantic species M. crassa and M. geveri are somewhat analogous to the western Pacific species,

M. aculeata and M. subsquamosa, respectively; the exact relationship of the species of each pair remains to be determined. It should be emphasized that there is no question that M. geyeri is distinct from M. crassa. (See relationships of M. crassa for further discussion.)

Munidopsis gilli Benedict, 1902

Figure 22

Munidopsis gilli Benedict, 1902: 276 (key), 283-284, 320 (list), fig. 27.

--Doflein and Balss, 1913: 176 (list), 177 (table).--Chace, 1942:

72 (key).--Pequgnat and Pequgnat, 1970: 138 (key); 1971: 4 (key).

Material examined.--Straits of Florida: P-634, 1638-1757 m, 1 ovigerous ♀, damaged, cl. approximately 25 mm, (USNM).

Diagnosis.--Rostrum carinate, upturned distally, armed at end of broad horizontal portion with 1 pair of divergent spines; gastric region of carapace with 1 pair of large blunt spines anteriorly, and 1 large central spine; several groups of smaller rounded protuberances arranged symmetrically over surface of carapace; frontal margin without distinct spine; posterior margin armed with several tubercles; second, third and fourth abdominal tergites each armed with large blunt median tooth and several smaller protuberances laterally; eyes unarmed; epipods on chelipeds and first 2 pairs of ambulatory legs.

Description.--Carapace slightly longer than broad, transversely convex; gastric region slightly inflated, armed with 3 large spiniform tubercles spaced equidistant: anterior pair behind and mesial to antennae, third spine on midline; several pairs of smaller tubercles arranged symmetrically over gastric region and carapace; surface slightly inflated around base of each protuberance. Cervical groove distinct with anterior and posterior lateral branches shallower than postcervical groove between metagastric and cardiac regions; inflation behind each groove with small protuberance on either side of midline; cardiac protuberances spiniform,

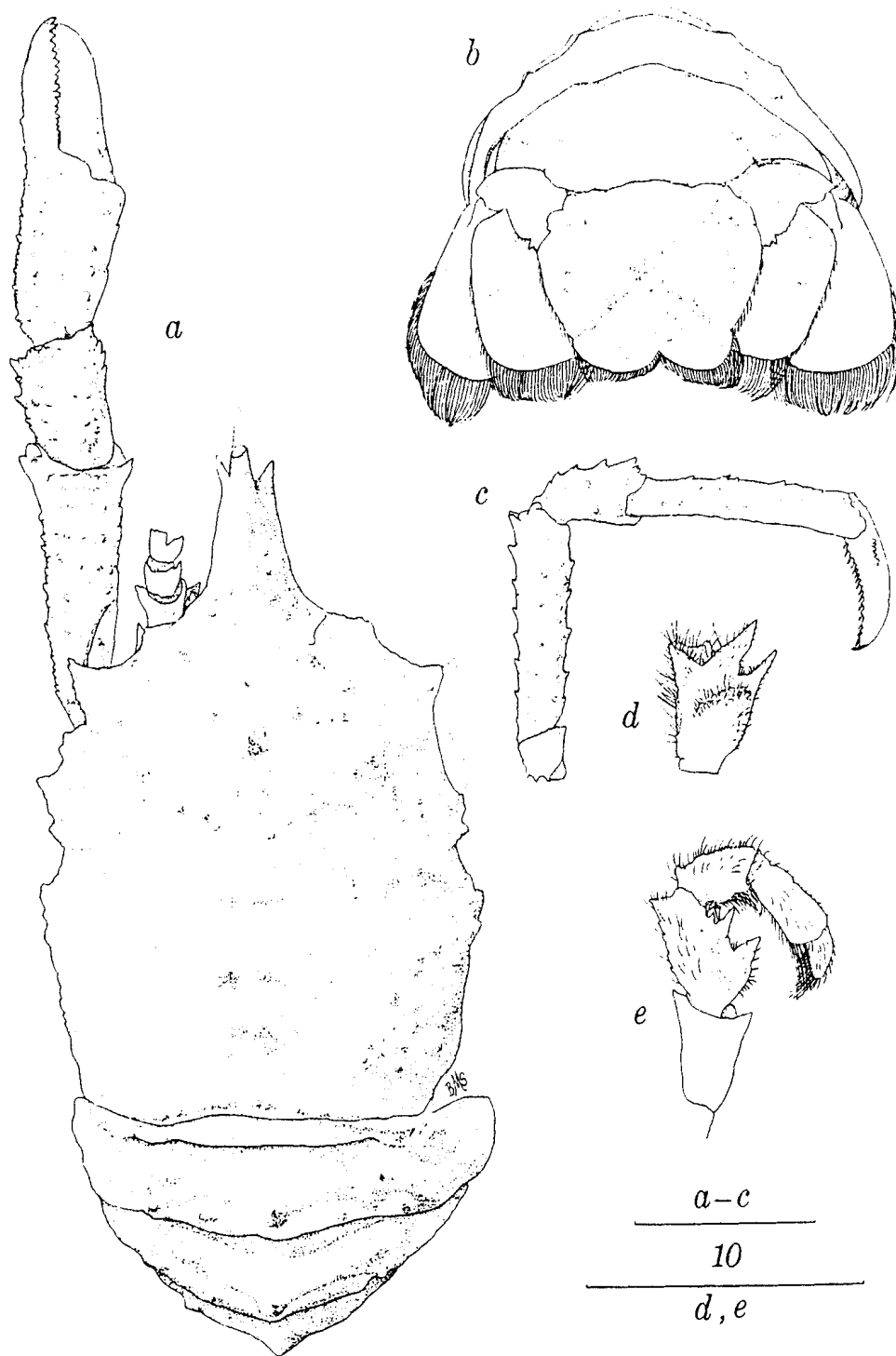


Figure 22. --Munidopsis gilli Benedict, 1902, ovigerous ♀, cl. 25.0 mm, damaged: a, dorsal view, setae not shown; b, posterior abdominal tergites, uropods and telson, setae shown only on posterior margins of tailfan; c, right fourth pereiopod, setae omitted; d, left antennular peduncle, ventrolateral view; e, right third maxilliped. Scales in mm.

followed by pair of smaller tubercles. Metabranial regions with many tubercles of various sizes. Short, fine setae arranged over most dorsal and exposed surfaces of carapace, abdomen and appendages. Rostrum approximately $1/3$ length of carapace, broad at base, tapering distally, upturned distally, armed with pair of divergent lateral teeth at end of horizontal portion approximately $1/3$ distance from distal end, triangular in cross section at that point; dorsal surface with several tubercles on each side of rounded medial carina. Frontal margin with roughened angle posterior to antennae, but no well-formed tooth; margin concave between slight projection and broad anterolateral tooth. Lateral margins irregular: 2 projections between notches at lateral termination of anterior and posterior branches of cervical groove; tubercular projection behind posterior indentation. Ridge with several pairs of tubercles bordering carapacial margin.

Abdomen with large blunt central spine and 3 small lateral tubercles on second, third and fourth tergites; fifth and sixth tergites unarmed except for small lateral granules.

Sternum unarmed; intersegmental ridges and grooves distinct.

Eyes missing on material examined: corneae appearing small on roughened eyestalks in drawing of type specimen (Benedict, 1902, fig. 27).

Bifurcate conical protuberance beneath frontal margin emerging from intersection of bases of antennule, antenna and eyestalk.

Basal segment of antennular peduncle inflated, 2 distolateral spines, most distal spine broader at base, distal margin dentate.

Basal segment of antenna broad with lateral triangular tooth and broad, blunt ventromesial spine. Second segment with blunt lateral spine and 2 ventromesial projections distally. Third segment with

distal margin obscurely dentate. Distal segment with 3 dentate lobes distally: 1 dorsolateral, 1 dorsomesial, and 1 ventral. Flagella not present on material examined.

Merus of endopod of third maxilliped armed with 1 distinct dorsolateral tooth near distal margin, other very small teeth along dorsal margin; 2 sharp conical teeth on mesial ventral margin, small tooth just distal to second tooth, several other small tubercular teeth on ventrolateral surface. Ischium with ventral and dorsolateral carinae each terminating in broad tooth; mesial margin with corneous denticles.

Pereiopods with spiniform, denticulate and blunt tubercles arranged over surfaces, usually widely spaced in irregular rows. Epipods on chelipeds and first 2 pairs of ambulatory legs.

Chelipeds less than 1 1/2 times carapace length; maximum length of dactylus more than 1/2 length of propodus; fixed finger with slight lateral bend at base; opposing margins of fingers toothed, abutting along entire length; tips spooned, dentate; chela without major spines but with many distinct tubercles; length of chela approximately 3 times maximum width. Carpus less than 1/3 length of manus; small conical tooth at distolateral angle; lateral margins and dorsomesial surface with several distinct tubercles. Merus not as long as propodus; distal margin with sharp mesial and ventromesial tooth, tuberculate lateral projection adjacent to rounded protuberance distally; dorsal transverse ridge near distal margin dentate; distinct dorsal row of approximately 6 larger tubercles; ventromesial margin with 2 large spiniform tubercles. Ischium with dentate dorsal projection.

Second, third and fourth pereiopods similar; surfaces tuberculate. Dactylus with corneous brown tip followed on ventral margin by row of

as many as 14 teeth, each armed on anterior edge with corneous spinule; dactylus more than 1/2 length of propodus. Propodus with several irregular rows of distinct tubercles, but no major spines. Carpus with 4 spiniform tubercles on dorsal edge. Merus with dentate triangular projection on dorsal margin distally, smooth protuberance between this and smaller ventrolateral lobe; dorsal edge slightly expanded, with row of denticulate tubercles; mesial surface flattened, with fewer tubercles.

Fifth pereopos with merus expanded, tuberculate on outer surface and on ventral margin.

Protopod of uropod with posterior margin notched, denticles on either side of notch larger mesially. Exopod smooth, endopod with several granules on exposed dorsal surface.

Telson with 1 small tubercle in center of each anterolateral plate, 3 or 4 in longitudinal row on each lateral plate and several granules in row on posterior plates; telson consisting of total of 10 plates.

Color.--The specimen examined is preserved in alcohol and is chalky white. There is no mention in the literature of coloration in this species.

Size.--♂, holotype, cl. 24 mm,

ovigerous ♀, material examined, cl. 25 mm.

Sexual dimorphism.--Only the female of this species was examined; the lateral margins of the telson have no thick setae, and the opposing margins of the fingers of the cheliped are abutting along their entire length.

Habitat.--The bottom at PILLSBURY Sta. 634 was characterized as mud with large rocks.

Type.--The holotype is a male, cl. 24 mm, USNM 20562.

Type locality.--Off Bahama Islands, ALBATROSS Sta. 2629, 2139 m.

Geographic range.--Munidopsis gilli has been collected only from the western North Atlantic east of Florida. The specimen reported herein is the first to be recorded since the type.

Parasites.--The PILLSBURY specimen shows no external evidence of parasitism; no parasites were reported for the type.

Associates.--The specimen was the only galatheid crustacean in the sample.

Relationships.--Munidopsis gilli appears to be closely related to 3 species from the western Atlantic: M. bradleyi Pequegnat and Pequegnat, M. cubensis Chace, and M. expansa Benedict. It differs from all these in having only 3 major spines on the gastric region of the carapace. It can be distinguished further from M. bradleyi by the presence of epipods on the first 2 pairs of ambulatory legs, by the shorter, broader chelipeus, the more strongly upturned rostrum, and by having a single median spine on the second, third and fourth abdominal segments. The upturned rostrum and the arrangement of epipods is the same as those in M. cubensis, but M. cubensis has smaller, sharper lateral and gastric spines which are more forwardly directed, has the carapace more transversely rugose, with fewer prominent protuberances, and lacks a distinct median spine on the fourth abdominal tergite. Munidopsis expansa differs from M. gilli in general appearance, sculpturing and shape of the carapace, and has no epipods on the second pair of ambulatory legs. M. gilli also bears some resemblance to M. camelus (Ortmann) from Japan, but the latter species

has 5 distinct gastric spines, paired abdominal spine, and longer chelipeds. Munidopsis trifida Henderson from the IndoPacific may be in this species complex, but it lacks epipods on all pereopods and has the abdomen devoid of spines.

Remarks.--The female Munidopsis gilli taken by the PILLSBURY is badly damaged with parts of the specimens missing, but there is no difficulty in determining its identity. This specimen, with its one egg, constitutes the first record of a female of the species.

Munidopsis granulens Mayo, 1972

Figures 23, 24

Munidopsis granulens Mayo, 1972: 531-534, figs. 3, 4.

Material examined.--Northwest Caribbean Sea, Arrowsmith Bank: P-584, 347-353 m, 1 ♂, holotype, 6.2 mm, USNM 140190.

Diagnosis.--Rostrum spade-shaped, constricted between eyes, fused to granular overgrowths covering mesial part of corneae; carapace densely granulate, with pair of anterior gastric protuberances; frontal margin with triangular post-antennal projection; abdominal segments and posterior margin of carapace granulate but unarmed; epipods on chelipeds and first pair of ambulatory legs.

Description.--Carapace, measured from base of eyes, slightly longer than broad, generally quadrangular; dorsal surface densely granulate; deep grooves separating distinct areas of carapace; gastric, cardiac, meso-branchial and lateral part of metabranchial regions inflated; posterior margin of carapace swollen; gastric region with pair of protuberances posterior to and in line with eyes. Rostrum spade-shaped; lateral margins concave in proximal half between eyes, tapering to apex from widest point at distal margin of cornea; distolateral margins of rostrum also concave; shallow longitudinal depression in midline of rostral projection, posterior extension bifurcated by irregular row of granules forming obscure carina; depression or carina not extending to gastric protuberances. Frontal margin between rostrum and anterolateral angle of carapace indistinct due to contiguous granular overgrowth on eyestalk; front transverse between triangular projection behind antenna and anterolateral angle.

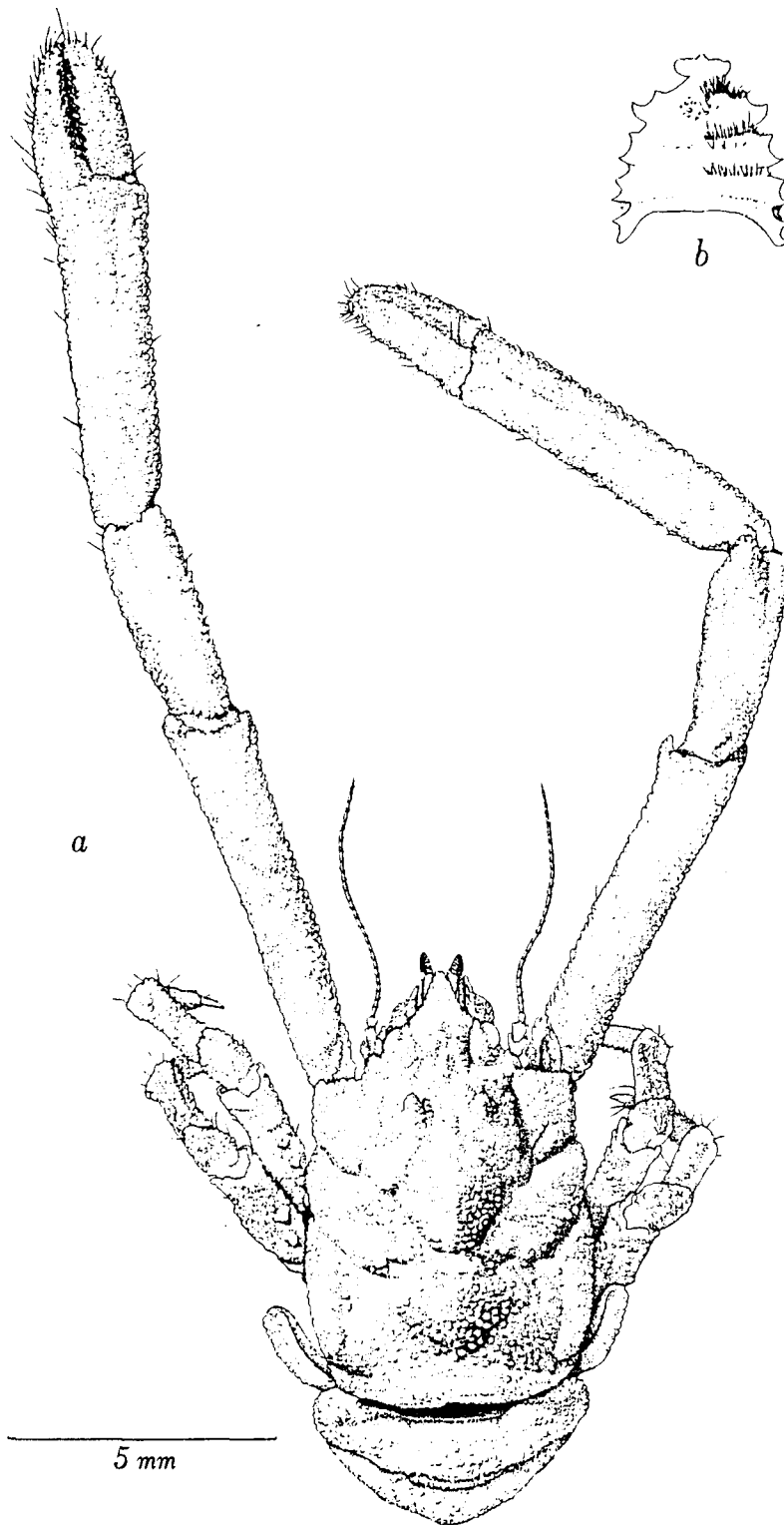


Figure 23. --Munidopsis granulens Mayo, 1972, ♂, cl. 6.2 mm, P-584 (holotype): a, dorsal view; b, thoracic sternites, ventrolateral view, setae shown on left side only.

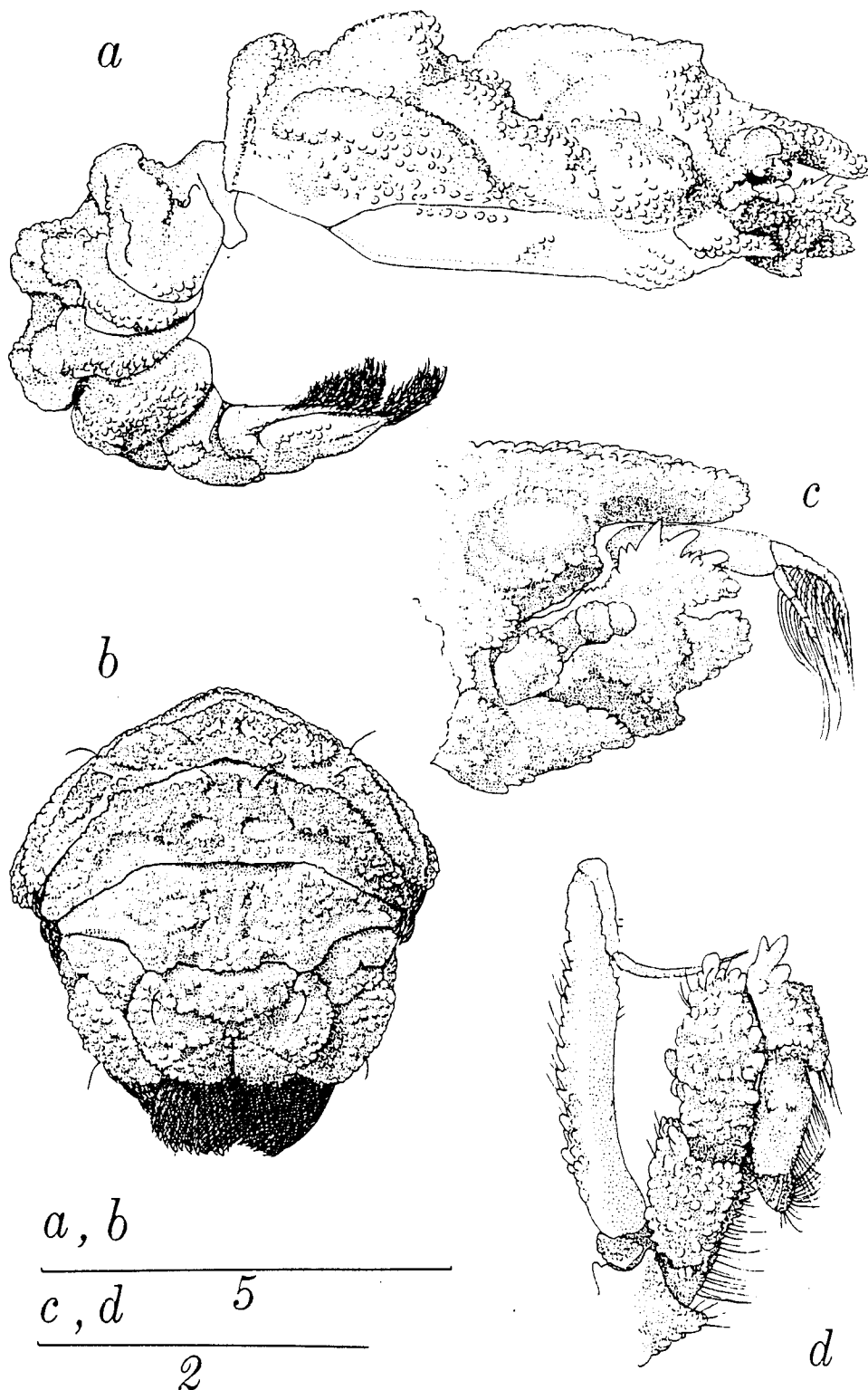


Figure 24. --*Munidopsis granulens* Mayo, 1972, ♂, cl. 6.2 mm, P-584 (holotype): a, carapace and abdomen, lateral view; b, posterior abdominal tergites, uropods and telson; c, right antennule, basal part of antenna and anterior carapace, ventrolateral view; d, right third maxilliped, ventrolateral view. Scales in mm.

Lateral margins nearly stright except for convexities at swollen hepatic and branchial regions. Posterior margin slightly convex with small medial indentation.

First abdominal tergite smooth with low ridge, barely visible in dorsal view. All other abdominal segments, telson, and uropods with dorsal surfaces granulate. Second and third segments with prominent transverse carina densely granulate; third, fourth and fifth segments with medial sculpturing increasingly elaborate posteriorly; sixth tergite with sculpturings and swellings, but without distinct transverse ridge; several pairs of obscure setae distributed over surface of abdomen.

Thoracic sternum unarmed, smooth except for several granules on each side of segment bearing chelipeds; intersegmental ridges distinct, with anteriorly-directed setae.

Eyes colorless, small; granulate overgrowths covering posteromesial part of corneae dorsally and ventrally.

Basal segment of antennular peduncle ornate; entire surface granulate except smooth area adjacent to anteroventral extension of base of antenna; dorsal projection with 5 spines: posterior 1 or 2 small, other 3 or 4 slightly curved, with additional small spines between distal 2; granulate distal projection extending from swollen base just mesial to dorsal projection; another shorter projection ventrally bearing distal segments of antennule.

Basal segment of antennal peduncle with large granulate projection ventrally, extending almost to base of antennal flagellum; small blunt lateral projection. Second segment with several granules forming distolateral projection. Third segment with granules on distal margin. Last segment small. Antennal flagellum almost reaching to articulation of

merus and carpus of cheliped.

Exopod of maxilliped with granulation on dorsolateral surface of long second segment. Endopod granulose, several rounded tooth-like projections on dorsal and ventral margins near distal ends of ischium and merus. Large rounded tooth dorsally near base of carpus projecting anteriorly. Propodus and dactylus smooth with long setae on mesial borders. Distal 3 segments flexed against concave mesial surfaces of ischium and merus. Ischium with sharp toothed carina on mesial margin.

Pereiopods granulose on all surfaces. Epipods on chelipeds and first pair of ambulatory legs.

Chelipeds more than 3 times length of carapace, without wide gape. Manus slightly compressed dorsoventrally. Dactylus less than 1/3 length of propodus including fixed finger. Carpus about 1/2 length of propodus. Merus slightly shorter than entire propodus; several larger tubercles on dorsal surface near proximal end.

Second, third and fourth pereiopods similar. Second pair when extended not reaching distal end of merus of cheliped. Dactylus with corneous brown tip; row of minute corneous spinules on ventral margin. Merus with several large tubercles or raised groups of granules on dorsal border. Dactylus and carpus about 1/2 length of propodus and ischium.

Fifth pereiopods with granulation on lateral surface of merus.

Telson and uropods with granules on dorsal surfaces. Telson and propod of uropod sculptured, with several swellings. Telson ovate, broader than long, with medial indentation on posterior margin. Plumose setae on telson and uropods posteriorly.

Color.--The holotype is preserved in alcohol and is chalky white except

for golden setae and the pale brown corneous tips on dactyli of ambulatory legs.

Size.--The holotype is small, with a carapace length of only 6.2 mm.

Sexual dimorphism.--The male lacks the gape between the fingers of the cheliped and the tuft or "comb" of thick setae on the posterolateral margins of the telson characteristic of males of many species. It is not known whether this individual is fully mature; however, the pleopods appear to be modified completely in the male condition. No females have been collected thus far.

Habitat.--The bottom at P-584 was characterized by the presence of sponges.

Type.--The male holotype is deposited in the National Museum of Natural History, USNM 140190.

Type locality.--PILLSBURY Sta. 584, Arrowsmith Bank in the northwestern Caribbean Sea, 347-353 m.

Geographic and bathymetric distribution.--This species is known thus far only from the type locality.

Parasites.--There is no evidence of branchial or abdominal parasites on the specimen.

Associates.--Munidopsis granulens was the only species of Munidopsis collected at P-584.

Relationships.--Munidopsis granulens is distinguished from all other

species in the genus by the following combination of characters: carapace evenly granulate, eyes with granular overgrowths at the base of the corne, but without spines; chelipeds approximately 3 times length of carapace, epipods on chelipeds and first pair of ambulatory legs, and abdomen granulose and sculptured. M. squamosa (A. Milne Edwards) appears to be its closest relative in the western Atlantic, but that species has many large protuberances on the carapace, a mesial projection on the eyes, chelipeds less than twice the carapace length, and epipods on the second pair of ambulatory legs. M. granulata Miyake and Baba and M. granosa Alcock from Indopacific waters resemble this species in some features, but both lack epipods on the chelipeds and ambulatory legs, and neither have decoration on the eyes.

M. abdominalis (A. Milne Edwards), also from the western Atlantic, bears some resemblance to M. granulens, particularly in the rectangular shape of the carapace and granular sculpturing, but the former species has a long sharp rostrum, no epipods on the pereopods, and smooth abdominal tergites.

Munidopsis impolita, new species

Figures 24A, 24B

Material examined.--Off Yucatan, Mexico: PILLSBURY Sta. 607, 715-787 m, 1 ♂, 7.4 mm(paratype), 1 ♀, 8.1 mm(holotype) (USNM).--Straits of Florida: G-160, 585 m, 1 ovigerous ♀, 7.0 mm, UMML 32:5247.

Diagnosis.--Rostrum short, triangular, bluntly spine-like, unarmed, horizontal; carapace without spines, regions swollen and distinct, anterior gastric region with distinct medial indentation; frontal margin of carapace only slightly projected; small distinct protuberance beneath frontal margin emerging from intersection of bases of eyestalk, antennule and antenna; eyes unarmed except for obscure lateral protuberance near base of eyestalk; no epipods on pereopods.

Description.--Carapace longer than broad ($cw/cl = 0.85-0.87$), lateral margins slightly convex, broadest just behind middle; dorsal surface without spines, but regions well-defined; gastric region inflated, defined posteriorly and posterolaterally by smooth, deep cervical groove; anterior branch of groove continuing obliquely forward to lateral margins as shallow depression, more distinctive laterally; posterior branch deeper, extending from depression on either side of posterior gastric region to lateral margin. Postcervical groove quite broad and deep centrally, connecting 2 depressions on either side of cardiac region and continuing laterally to separate meso- and metabranchial regions. Anterior part of gastric region in 2 prominent swellings, separated by posterior continuation of median rostral carina; front part of swellings sculptured with irregular tubercles followed by transverse striation or

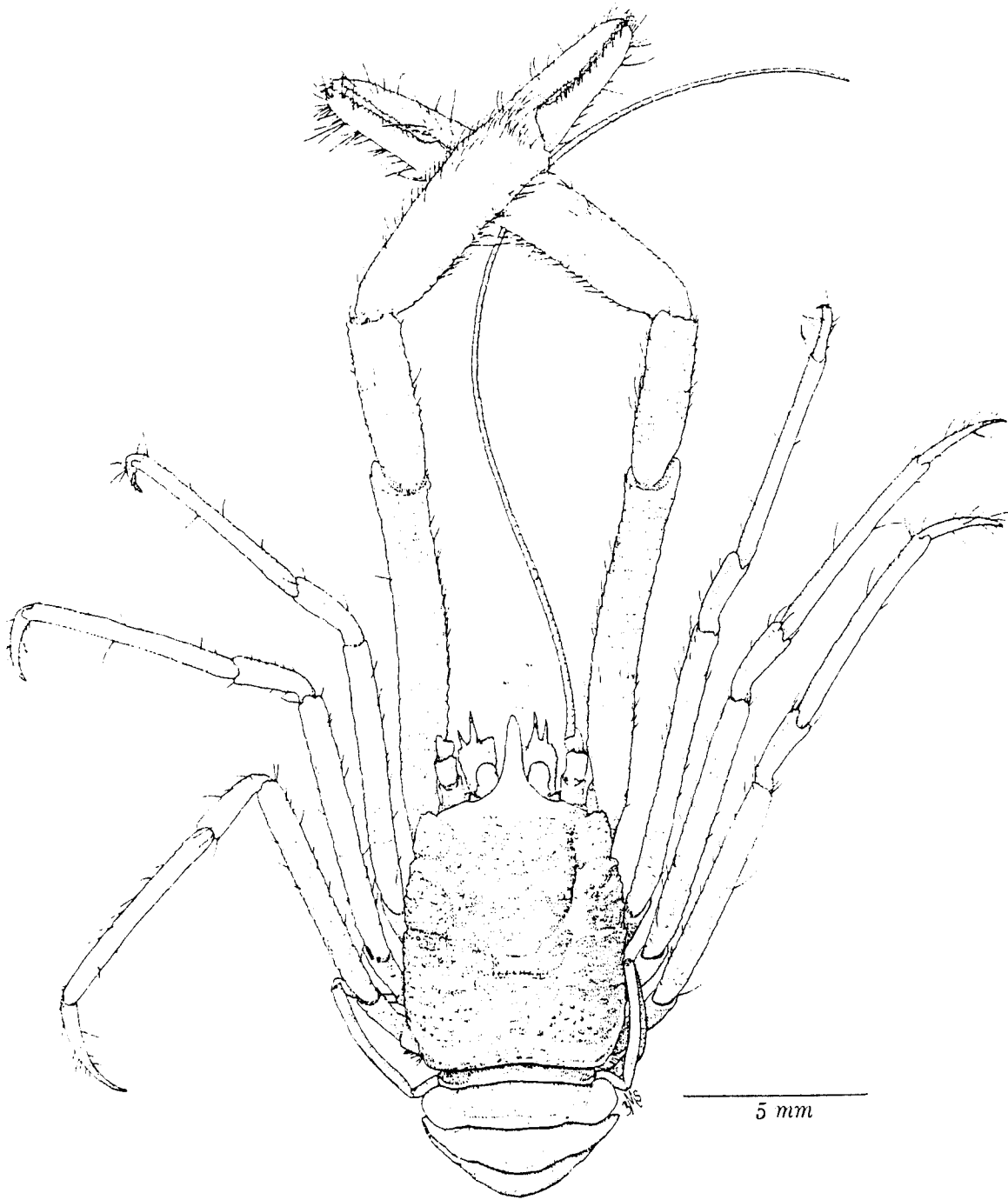


Figure 24a. --Munidopsis impolita, new species. ♂, holotype, cl. 7.4 mm, P-607.

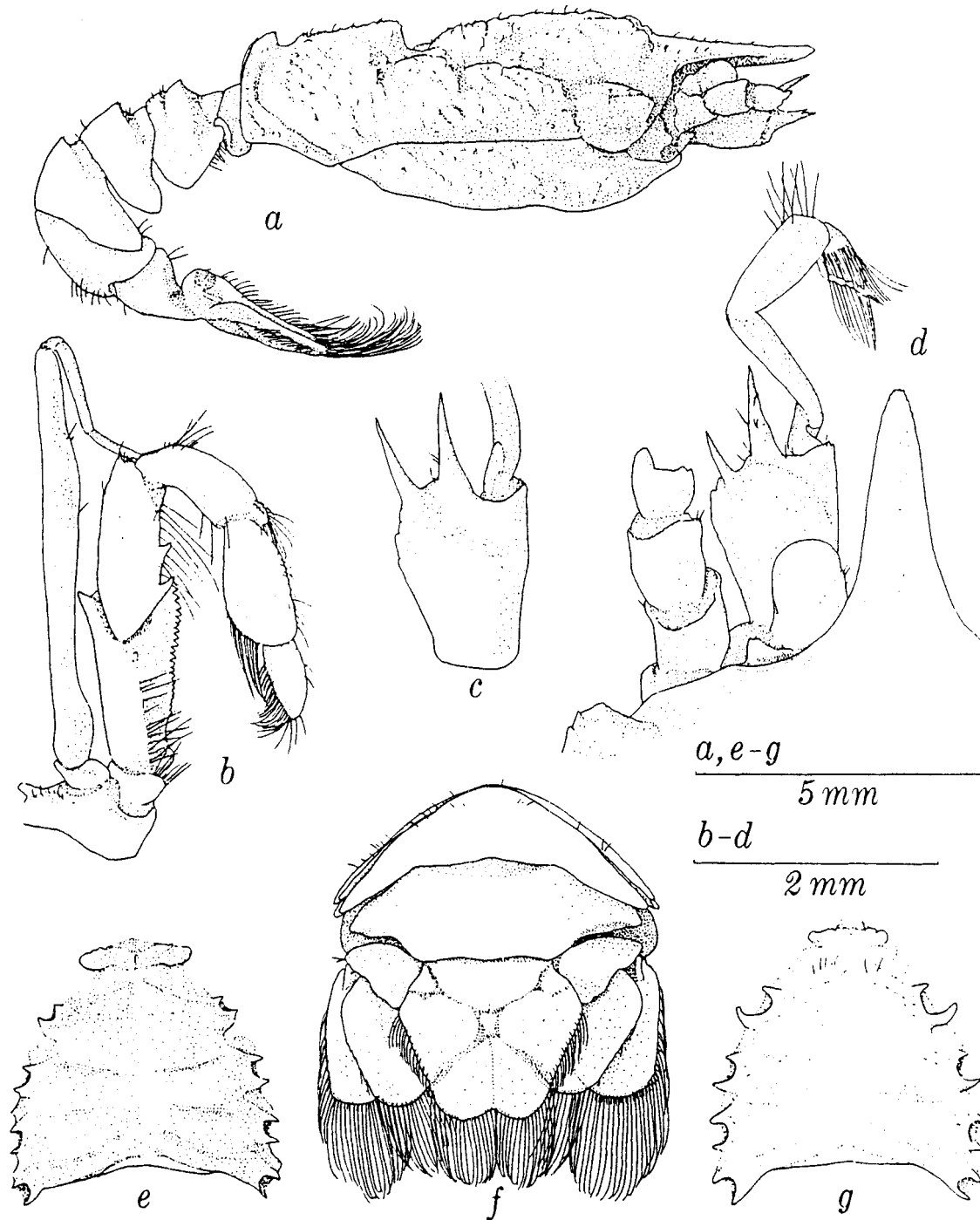


Figure 24b. --*Munidopsis impolita*, new species. ♂, holotype, cl. 7.4 mm, P-607: a, carapace and abdomen, lateral view; b, right third maxilliped, ventrolateral view; c, right antennular peduncle, ventrolateral view; d, frontal margin of carapace, rostrum, eye, antennule and antenna, dorsal view; e, sternal plate, ventral view; f, posterior abdominal segments, uropods and telson. *Munidopsis polita* (Smith, 1883), ♂, cl. 7.7 mm, P-923: g, sternal plate, ventral view, showing proportionately larger sockets for articulation of basal segment of cheliped.

series of short, beaded striae; sculpturing on remainder of gastric region consisting of irregular transverse rows of minute tubercles; lateral part of gastric region with longitudinal series of coarse, rounded tubercles and 1 tubercle posteromesially; another large tubercle on mesial part of hepatic region lateral to anterior tubercles. Anterior margin of cardiac region elevated, ridge-like; anterior border of metabranchial region similarly ridge-like or appearing as interrupted line of short transverse striae; smooth channel mesial to mesobranchial region leading from posterior depression to anterior depression, and separating distinctive swollen areas posterolateral to gastric region. Sculpturing on hepatic and branchial regions consisting of short rows of minute tubercles on swellings, irregularly transverse or oblique; tubercles well-separated on metabranchial region; several coarse tubercles near posterolateral margins of cardiac region. Rostrum in shape of narrow isosceles triangle, horizontal, more than $1/3$ carapace length; dorsal surface smooth on either side of rounded, minutely tuberculate carina, extending posteriorly between and beyond anterior swelling of gastric region; lateral margins of rostrum with smooth rims becoming weakly serrate and obscure distally. Frontal margin with post-antennal lobe obscure; deep depression between frontal margin and inflated hepatic region projecting to form anterolateral angle. Anterolateral angle less than 90° , armed with widely-spaced minutely denticulate tubercles, but not spines. Lateral margin notched behind hepatic region at termination of anterior branch of cervical groove; some of lateral tubercles projecting outward slightly, but no spines. Posterior margin slightly concave; raised marginal rim carinate, beaded anteriorly, followed by scattered groups of minute granules.

Second, third and fourth abdominal tergites with raised sharp rim anteriorly, followed on second tergite by shorter less distinctive transverse carina. Posterior part of third and fourth tergites smooth; fifth and sixth tergites smooth. Posterolateral lobes on sixth tergite obscure.

Sternum unarmed, but with several granules on broad anterior plate between chelipeds; anterior margin and intersegmental ridges beaded, smooth medially; sockets for articulation of basal segments of chelipeds narrow.

Eyes small, movable; cornea barely reaching middle of basal segment of antennular peduncle, narrower than dorsoventrally-compressed eyestalks; eyestalk with small lateral projection near base.

Minutely beaded blunt projection emerging beneath frontal margin from plate at intersection of bases of antennule, antenna and eyestalk.

Basal segment of antennular peduncle enlarged, armed anteriorly with 2 slender spines: dorsolateral spine shorter, more slender, ventral spine reaching beyond tip of rostrum; spines well-separated in dorsal view; lateral swelling with scattered tubercles.

Basal segment of antenna with ventromesial projection; distal margin with lateral denticulation, but not projected. Second and third segments unarmed except for minute distolateral tooth on second, and beaded distal margin of third. Fourth segment with dorsolateral lobe on distal margin. Antennal flagellum more than 3 times carapace length, reaching well beyond chelipeds.

Endopod of third maxilliped with ventral angle of ischium not cristate, terminating distally in several minute denticles; dorsolateral edge sharper with conical distal tooth. Merus with 2 spinules on proximal

half of flexor margin, and occasionally distal tubercle; lateral surface and extensor margin with several tubercles; small tooth distally.

Pereiopods long and slender, with even sculpturing consisting of tubercles and short beaded swellings. No epipods on chelipeds or ambulatory legs.

Chelipeds approximately 3 to 3 1/2 times carapace length. Manus dorsoventrally compressed, less than 1/2 length of cheliped; width almost 1/6 length in both male and female specimens examined. Dactylus less than 1/2 length of manus; mesial margin with large blunt tooth proximally, followed by series of small teeth. Fingers abutting along entire dorsal opposing margins, spooned distally with larger teeth, gaped ventrally. Palm inflated, with obscure longitudinal depression on dorso-mesial surface. Carpus approximately 1/3 length of manus; tubercles coarser mesially; mesial surface slightly flattened. Merus shorter than manus, slightly flexed outward from middle; distal margin with small ventromesial tooth; mesial surface with longitudinal channel. Ischium with small dorsal tooth.

Second, third and fourth pereiopods similar: long, slender; second, third and sometimes fourth pereiopods reaching beyond carpus of cheliped. Dactylus approximately 1/2 length of propodus, curved, terminating in very sharp extensive corneous tip, unarmed on flexor margin. Propodus, carpus, merus and ischium unarmed.

Merus of fifth pereiopods lightly sculptured on exposed lateral surface; flexor margin cristate, with several small median projections.

Posterolateral margin of protopod of uropod nearly straight, minutely serrate on either side of small marginal indentation; decoration sometimes obscure except for small posterior projection. Uropods smooth.

Telson consisting of 8 plates, broader than long, narrower posteriorly.

Color.--All specimens examined were preserved in alcohol and were devoid of pigment.

Size.--♂, cl. 7.4 mm,
♀, cl. 7.2 mm, and
ovigerous ♀, cl. 6.8 mm.

Sexual dimorphism.--The male has the characteristic fringe of long thick golden setae on the posterolateral margins of the telson; females have only a few short fine setae in this location.

The chelipeds are virtually the same in both male and female specimens examined. It is possible that larger males (as yet not collected) have the chelipeds gaped as in M. polita. In M. impolita, the chelae of the female are not unusually narrow as they are in females and small males of M. polita.

Habitat.--The bottom at P-607 was characterized by rubble, pteropod shells and fine sediments.

Type.--The holotype is a female, cl. 7.2 mm, USNM 000000.

Type locality.--Western Caribbean, off Yucatan, Mexico, PILLSBURY Sta. 607, 715-787 m.

Geographic range.--Munidopsis impolita has been collected from only 2 locations in the western Atlantic: from the Straits of Florida and off Yucatan, Mexico. It is unlikely, but possible, that some material

reported as M. polita by Smith (1883: 54) and the Pequegnats (1970:155; 1971: 21) is actually this species.

Bathymetric range.--Possible depth range for M. impolita is 585-787 m; calculated range is 585-715 m.

Parasites.--There is no external evidence of branchial or abdominal parasites in the material examined.

Associates.--Munidopsis alaminos and M. serratifrons were collected with M. impolita at the type locality.

Relationships.--Munidopsis impolita is almost identical to M. polita (Smith), but varies from it as follows: The rostrum is distinctly carinate dorsally, with the ridge extending posteriorly between 2 swellings on the anterior gastric region. These swellings are more prominent on M. impolita than on M. polita. The post-antennal lobe is less noticeable on the frontal margin and the frontal area is armed instead with a projection beneath the frontal margin lateral to the eyes of M. impolita; this projection is not present in M. polita. The anterolateral angles are sharper in M. impolita, although they are unarmed in both species. The nature of the carapacial sculpturing is subtly different in the 2 species: the swellings posterolateral to the gastric region are much more prominent in M. impolita, with the channel separating them from the mesobranchial regions more distinct; the arrangement of larger low tubercles on the lateral margins of the gastric region and mesial part of the metabranchial regions is different, and all tubercles appear more separate and distinct in M. impolita. The articular sockets on the sternite between the chelipeds are narrower in M. impolita, and the anterior

aded margin of that plate is straighter. The antennular peduncle has the basal segment enlarged in M. impolita, with the spines widely-spaced, slender and long, reaching beyond the apex of the rostrum, whereas M. polita has this segment smaller, with the spines closer together, often overlapping in dorsal view, and not reaching the tip of the rostrum. The male of M. impolita has the chelipeds very similar to those of a male M. polita of comparable size, but the female holotype of M. impolita has the chelipeds much broader than females of M. polita. The posterior margin of the protopod of the uropod is different in M. impolita: the mesial lobe is quite straight, with an obscure notch and serrations, and it is projected further posteriorly, whereas in M. polita this lobe is scalloped or rounded.

The relationships of both M. polita and M. impolita to other species are discussed in the appropriate section in the account of M. polita.

Munidopsis latifrons (A. Milne Edwards, 1880)

Figure 25

Galathodes latifrons A. Milne Edwards, 1880: 57.--A. Milne Edwards and Bouvier, 1894b: 279 (key); 1897: 94-96, pl VIII, figs. 2,3.--Young, 1900: 413.

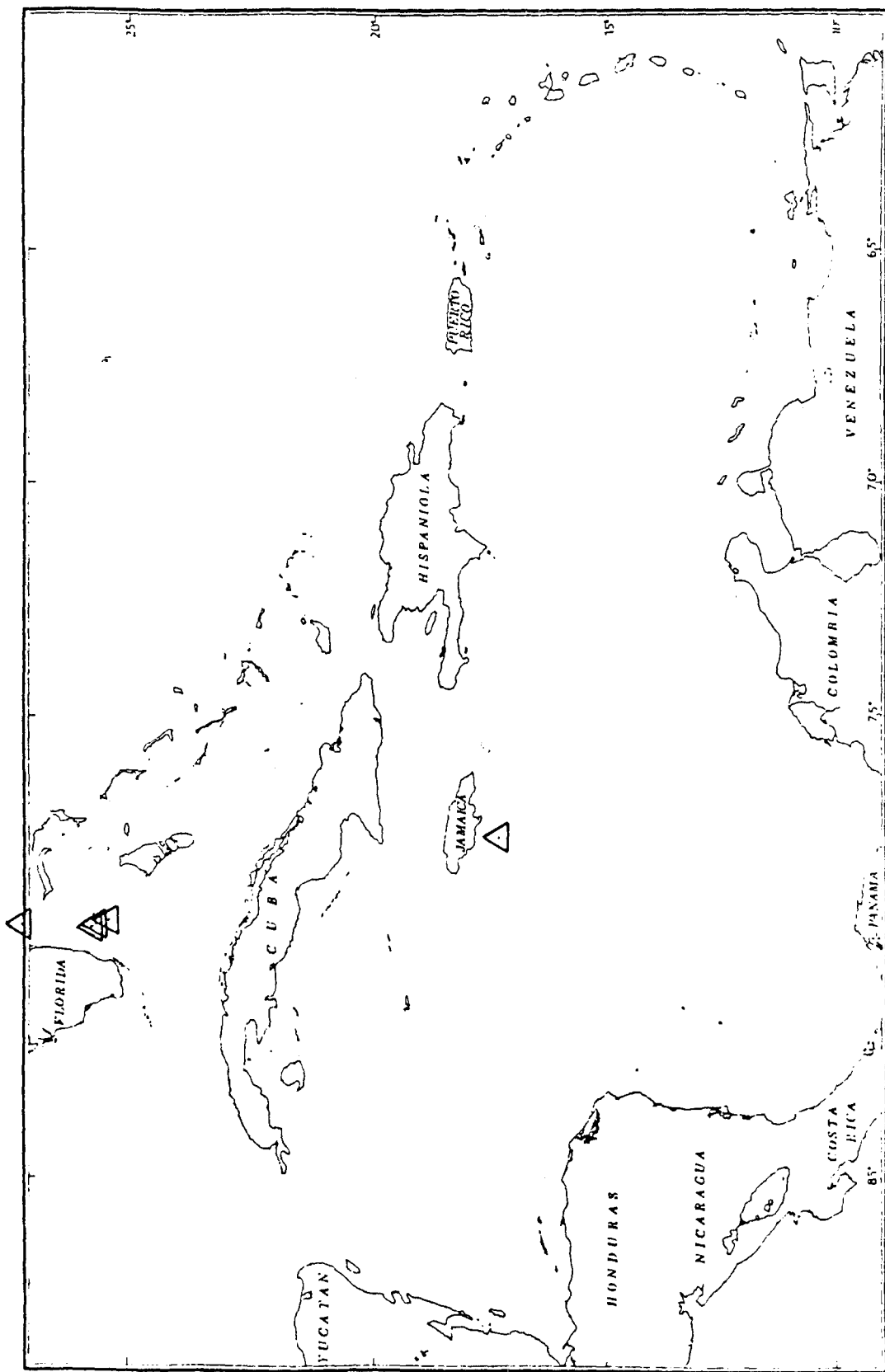
Munidopsis latifrons: Benedict, 1902: 276 (key), 321 (list).--Doflein and Balss, 1913: 175 (list), 177 (table).--Chace, 1942: 74 (key), 87-88.--Pequegnat and Pequegnat, 1970: 139 (key), 152-153, table 5-3; 1971: 5 (key).

Not Elasmonotus latifrons Henderson, 1885: 416; 1888: 160, pl. 19, fig. 1 (= M. latirostris Faxon, 1895).

Not Orophorhynchus latifrons A. Milne Edwards and Bouvier, 1894b: 287 (key) (= M. latirostris Faxon, 1895).

Material examined.--Straits of Florida: G-170, 659-677 m, 1 ♂, 9.6 mm, UMML 32:5248; G-295, 842-833 m, 1 ♂, 6.5 mm, UMML 32:5249; G-311, 805-787 m, 2 ♀, 6.0, 7.5 mm, 2 ovigerous ♀, 5.5, 6.5 mm (USNM); G-354, 805-830 m, 1 ovigerous ♀, 7.0 mm (RMNH).--Caribbean Sea, S of Jamaica: P-1262, 805-1089 m, 1 ♀, 5.5 mm UMML 32:5250. See distribution plot 8.

Diagnosis.--Tridentate rostrum; gastric region of carapace unarmed; frontal margin with post-antennal spine; longitudinal series of 4 or 5 sharp spines just above lateral margin behind cervical groove; entire animal covered with curved setae, pairs of longer, thicker setae arranged over carapace, abdomen and legs; second abdominal tergite with 1 pair of medial spines; 1 submarginal spine on second and third pleura; no eyespines; no epipods on chelipeds or ambulatory legs.



Distribution plot 8.--*Munidopsis latifrons* (A. Milne Edwards, 1880) collected by the GERDA and PILLSBURY.

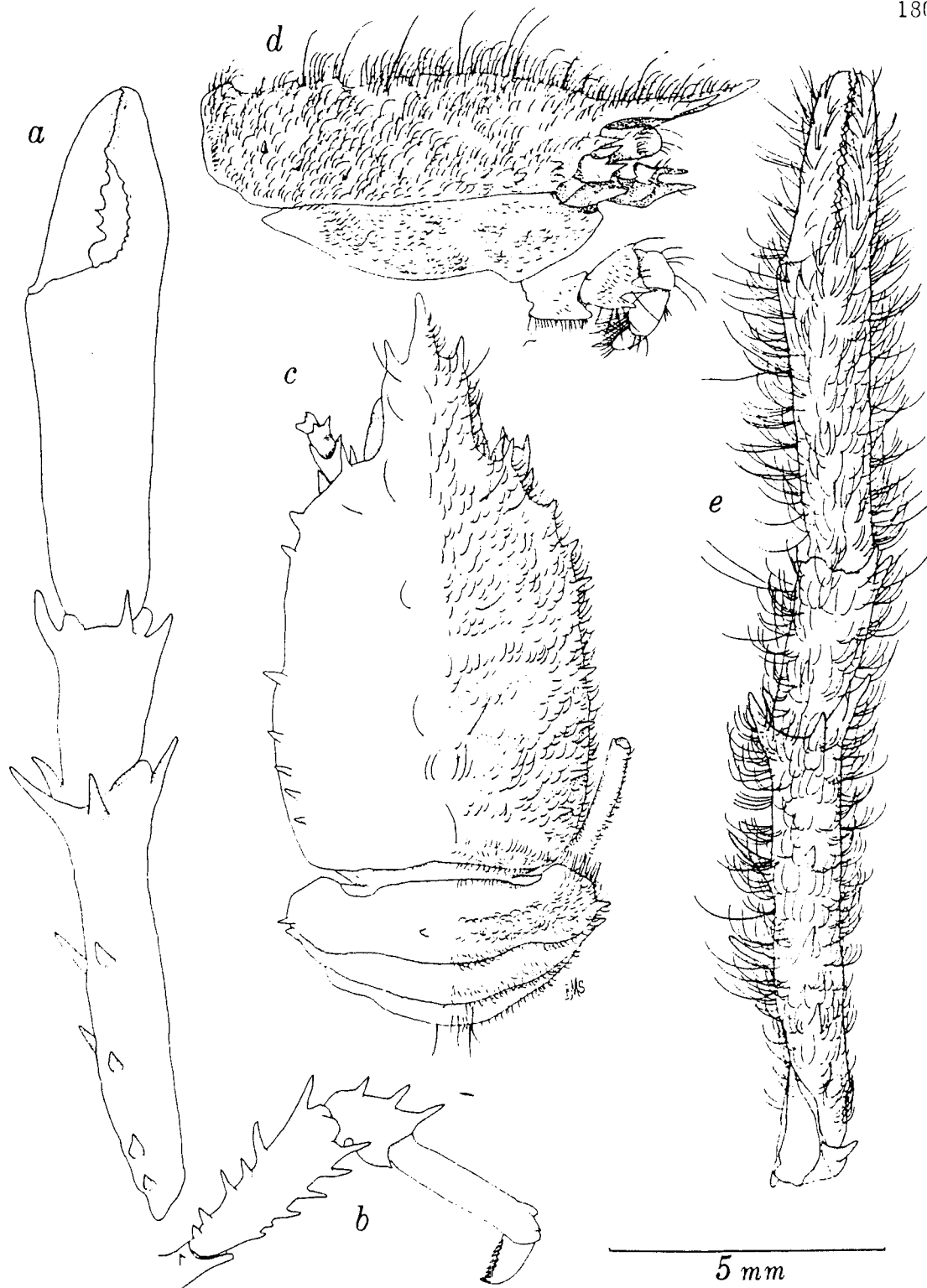


Figure 25. --*Munidopsis latifrons* (A. Milne Edwards, 1880). ♂, cl. 6.5 mm, G-295: a, right cheliped; b, right second pereopod, setae not shown. Ovigerous ♀, cl. 7.0 mm, G-354: c, dorsal view, setae, except major ones, omitted from left side; d, lateral view, showing right third maxilliped; e, right cheliped, dorsal view.

Description.--Carapace longer than broad ($cw/cl = 0.75-0.79$), transversely convex; gastric region slightly inflated, unarmed. Cervical groove marked by smooth indentation; postcervical groove and posterior marginal groove deeper across middle of carapace than cervical groove. Carapace and most surfaces covered with heavy curved setae, projecting outward before curving anteriorly. Several pairs of longer setae arranged over dorsal surface, particularly on either side of midline. Rostrum broad at base (approximately $1/3$ carapace width), almost horizontal, slightly upcurved from base; lateral margins convex; length approximately $2/5$ carapace length, terminating in 3 sharp teeth: central tooth longer, lateral teeth slightly or distinctly divergent. Frontal margin between base of rostrum and anterolateral spine sloping (approximately 45° to transverse line), with long, sharp post-antennal spine slightly mesial to antenna. Anterolateral spine blunt, followed by 1 to 3 sharp, laterally-projecting spines on lateral margin anterior to cervical groove; 3 to 5 sharp spines behind cervical groove just mesial to lateral margin.

First abdominal tergite smooth. Second tergite with 1 pair of medial spines on central transverse carina; occasionally 1 or more spines at this location on third tergite; second and third segments with 1 sharp submarginal spine on pleuron. All segments densely setose.

Sternum smooth; several setae at anterior margin between chelipeds and several intersegmental setae. Slight indentations between segments, no strong ridges or grooves; longitudinal groove between fourth pereopods.

Eyes small, movable, partly covered by rostrum.

Sharp conical spine emerging from intersection of bases of eyestalk,

antenna and antennule just below and mesial to post-antennal spine.

Basal segment of antennular peduncle inflated, armed with 2 sharp spines distally; ventral spine slightly heavier and sometimes longer. Distal margin with several denticles ventromesially, and 1 small mesial tooth. Second and third segments short. Proximal margin of flagellum when extended reaching tip of rostrum.

Basal segment of antenna broad, with 1 broad lateral tooth and expanded ventromesial projection terminating in triangular tooth. Second segment with short lateral and mesial teeth distally. Third segment with short mesial spine and dorsal projection or blunt tooth. Fourth segment with distolateral projection. Antennal flagellum approximately $1 \frac{1}{2}$ times carapace length.

Ischium of endopod of third maxilliped triangular in cross section; mesial margin toothed; distal margin expanded into triangular tooth at dorsal and ventral angle. Merus with small tooth dorsodistally; flexor (ventral) margin with 2 sharp spines, proximal spine slightly broader at base; occasionally small tooth or denticle near distal end.

Pereiopods with short and long curved setae arranged over most surfaces, particularly on chelipeds. No epipods on pereiopods.

Length of cheliped approximately $2 \frac{1}{2}$ to 3 times length of carapace. Manus unarmed, approximately $\frac{1}{2}$ length of cheliped, broader in middle at articulation of dactylus. Fingers less than $\frac{1}{2}$ length of manus. Fixed finger of males arched to form gape proximally, expanded distally forming spooned tip; opposing margins toothed; rounded teeth on proximal $\frac{1}{2}$ of dactylus larger. Carpus short, with 3 sharp spines distally: 1 spine at each of dorsomesial, dorsolateral and lateral angles; small tooth at articular knob ventrally. Merus approximately same length as

manus; 4 long spines on distal margin: 1 at each angle; dorsolateral spine followed by 4 sharp spines on proximal half of segment; 2 large spines spaced evenly along mesial surface. Ischium with sharp spine ventromesially just posterior to distal termination and 1 sharp tooth dorsally.

Second, third and fourth pereopods similar. Second pereopod not reaching distal margin of merus of cheliped. Dactylus less than or equal to 1/2 length of propodus; tip curved, corneous, followed by 6 to 8 corneous spinules on flexor margin. Propodus with distal, dorsolateral and ventromesial denticle, otherwise unarmed. Carpus approximately length of dactylus; dorsal margin expanded, armed with 3 sharp spines. Merus with sharp dorsal and ventral spine on distal margin, followed by 5 sharp spines on both dorsal and ventral margins of second pereopod, 4 on third and fourth pereopods; lateral face setose but unarmed on second and third pereopods; several short spines on exposed surfaces of fourth pereopod; ventromesial edge of merus of all pereopods with several short spines. Ischium with several small blunt spines around distal margin.

Merus of fifth pereopods with 3 sharp triangular teeth on ventral margin.

Protod of uropods with posterolateral margins scalloped, posterior lobe with serrations, sometimes obscure, followed by notch and small tooth. Width of telson anteriorly same as length, much narrower posteriorly; telson composed of 7 plates (no separate central plate); several pairs of conspicuous thicker setae projecting upward from surfaces and margins of telson and endopods of uropods.

Color.--Specimens preserved in alcohol are off-white; setae are pale yellow; tips of dactyli are corneous brown. There are no color records for this species in the literature.

Size.--♂, cl. 6.5-9.6 mm,
♀, cl. 5.5-7.5 mm, and
ovigerous ♀, cl. 5.5-7.0 mm.

Sexual dimorphism.--The chela is broader and gaped in large males, and there is a fringe of short thick setae on the lateral margins of the telson, while the female has opposing margins of the fingers in contact, and no lateral fringe of setae on the telson. The abdomen is slightly broader in mature females.

Habitat.--The bottom at some stations where M. latifrons was taken consisted of coral rubble and sponges.

Type.--The holotype is an ovigerous female, cl. approximately 7 mm; deposition of this specimen is unknown. The type could not be located at the MCZ.

Type locality.--Off Barbados, BLAKE Sta. 288, 730 m (399 fm).

Geographic range.--Munidopsis latifrons has been collected in the Straits of Florida, in the Caribbean Sea, south of Jamaica, and off Barbados. In addition to the type locality and locations listed for material examined, M. latifrons has been collected near the north coast of Cuba (Chace, 1942: 87).

Bathymetric range.--The calculated depth range for material in this

collection is 677-833 m; possible range is 659-1089 m. Previously reported possible range was 677-1107 m.

Parasites.--None of the specimens in this collection show external evidence of parasitism; there are no previous records of parasites occurring in this species.

Associates.--Munidopsis latifrons was taken by the GERDA and PILLSBURY at 5 stations; at 4 of these, M.serricornis was also collected.

Relationships.--Munidopsis latifrons can be distinguished easily from the other species with tridentate rostra by the armature of the second and third abdominal tergites and several other characters. It is perhaps most closely related to the setose species, M. crinita Faxon from Panama, but differs from that species in lacking gastric spines and having abdominal spines. The pereopods are spinier than in most species in the complex having tridentate rostra; M. acuminata Benedict is almost as spinose, but differs from M. latifrons in having epipods on the chelipeds, in addition to characters already mentioned.

Remarks.--Spination is subject to a degree of individual variation: one specimen has the merus of the cheliped lacking the proximal dorsal spines, one has 1 small gastric spine, another has only 1 of the pair of medial spines on the second abdominal tergite, and another has a spine on the third tergite with the other spine placed half way to the pleural margin. The spines on the lateral margins of the carapace may vary in number, but their lateral projection and the position of the posterior spines above the lateral margins are fairly consistent.

Munidopsis livida (A. Milne Edwards, 1886)

Figures 26, 27

Elasmonotus lividus A. Milne Edwards, in Perrier, 1886: fig. 242, no. 9.

Orophorhynchus lividus: A. Milne Edwards and Bouvier, 1894b: 199, 209,

224, 231, 232, 287 (key), fig. 12, 208; 1900: 343-346, pl. IV, fig.

3 (color), pl. XXXI, fig. 17-22.

Munidopsis livida: Benedict, 1902: 322 (list).--Doflein and Balss, 1913:

176 (list), 178 (table).--Miyake and Baba, 1970: 94 (list).--Peque-

gnat and Pequegnat, 1971: 6 (key), 19-21, fig. 12 a.

Material examined.--W of Haiti (Gonave Channel): P-1180, 3111-3496 m,

4 ♂, 8.7-12.7 mm, 2 ♀, 8.8, 14.3 mm UMML 32:5251.

Diagnosis.--Rostrum broad proximally, tapering beyond eyes to apex; nearly horizontal, upcurved distally in large specimens; dorsal surface of carapace unarmed; frontal margin with small post-antennal tooth; anterolateral tooth small; broad tooth behind anterior branch of cervical groove on lateral margin followed by 2 or 3 smaller teeth; posterior margin of carapace and abdomen unarmed; eyes armed with prominent mesial and smaller lateral tooth; epipods on chelipeds but not on ambulatory legs.

Description.--Carapace longer than broad ($cw/cl = 0.86-0.88$); dorsal surface tuberculate, rugose laterally, but not armed with spines or distinct pairs of tubercles on gastric region. Central part and anterior branch of cervical groove defining moderately inflated gastric region; posterior branch of cervical groove distinct, extending obliquely to lateral margins; postcervical groove distinct across central third of

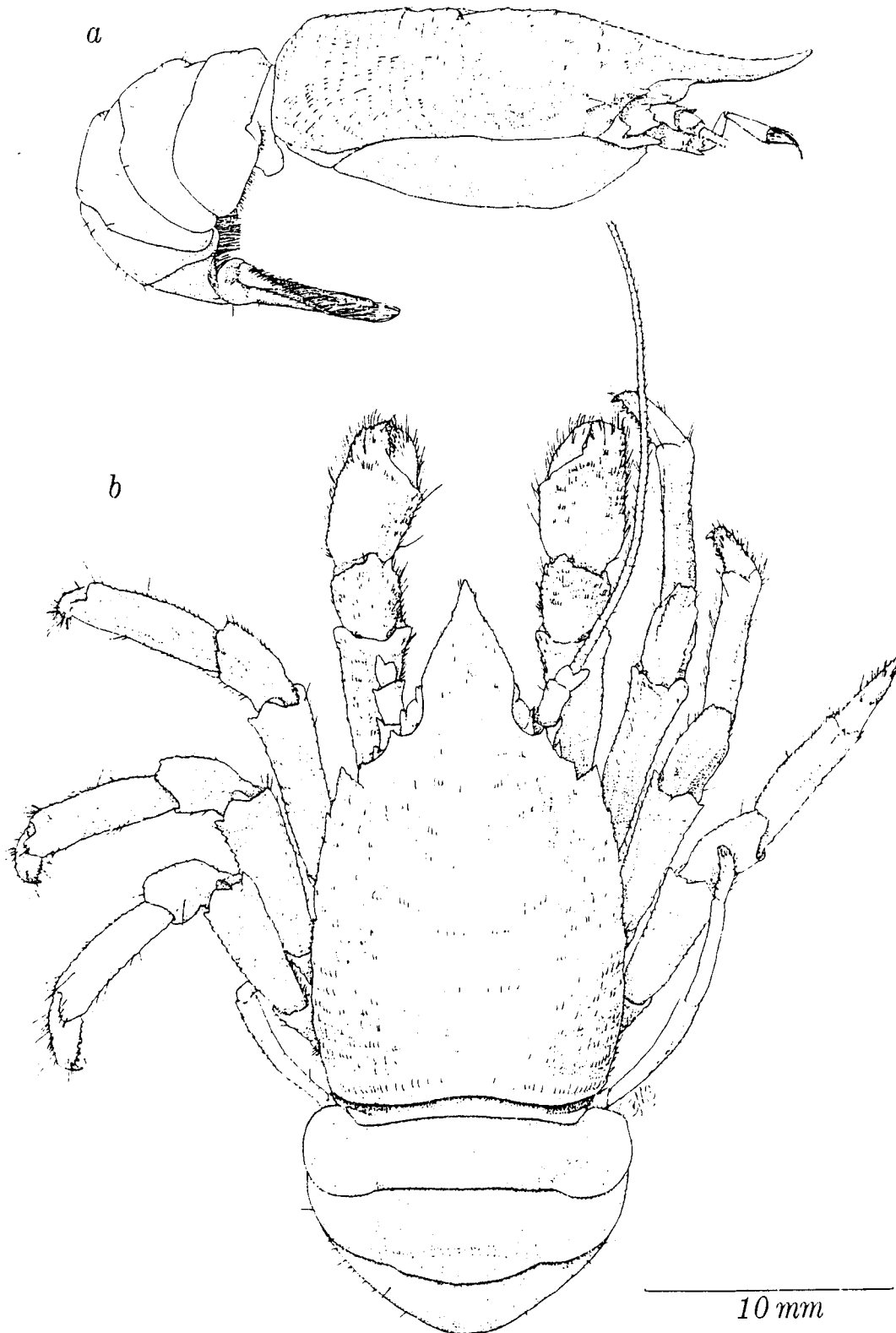


Figure 26. --*Munidopsis livida* (A. Milne Edwards and Bouvier, 1894), ♀, cl. 14.3 mm, P-1180: a, lateral view of carapace and abdomen; b, dorsal view.

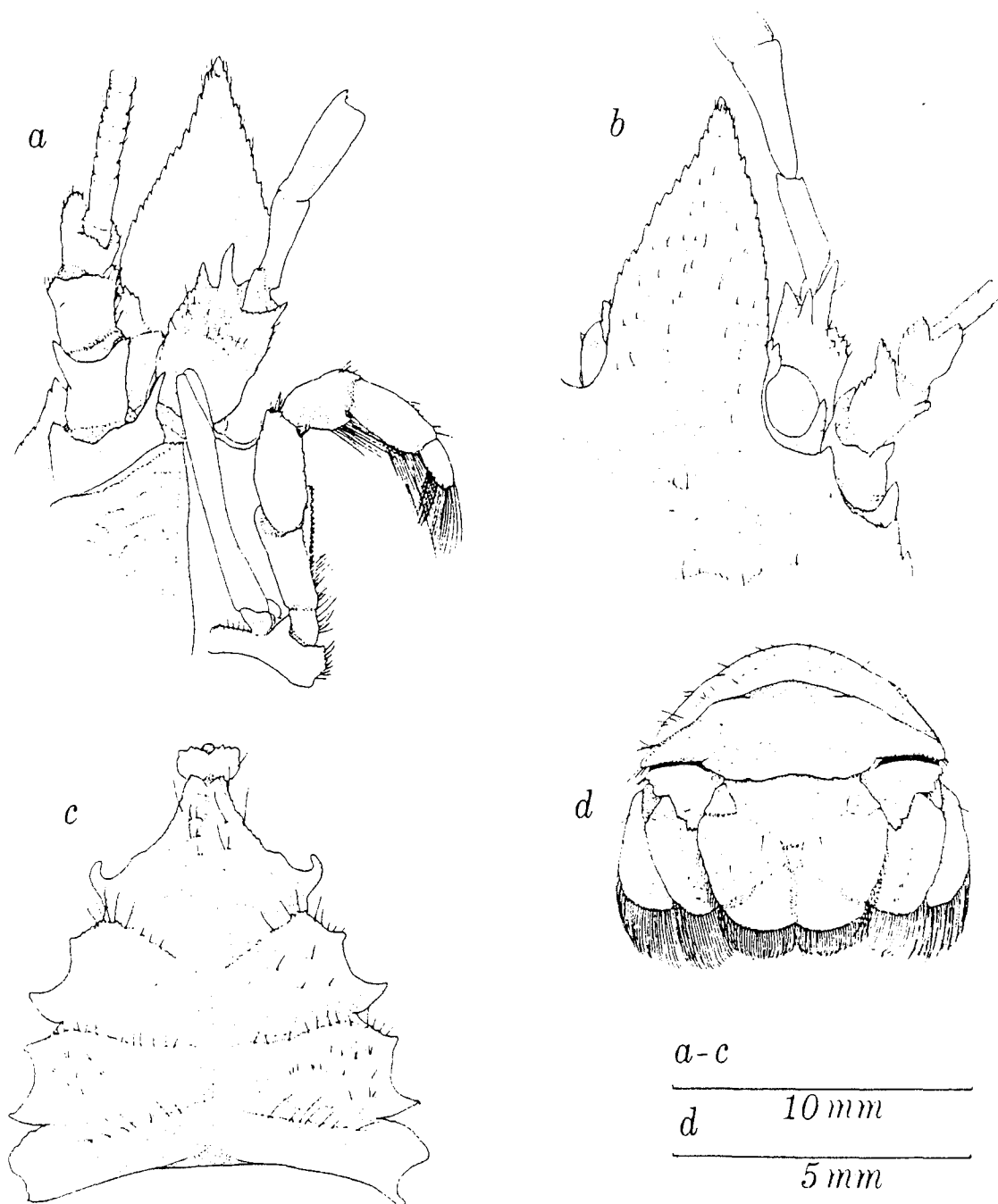


Figure 27. --*Munidopsis livida* (A. Milne Edwards and Bouvier, 1894), ♂, cl. 12.7 mm, P-1180: a, rostrum, right antennule, antenna and third maxilliped, ventrolateral view; b, rostrum, right eye, antennule and antenna, dorsolateral view; c, sternal plate, ventral view; d, posterior abdominal segments, uropods and telson.

carapace. Rostrum less than 1/2 but more than 1/3 carapace length, broad; width at base approximately 1/3 anterior carapace width; lateral margins subparallel or slightly concave, smooth in proximal 1/4 or 1/3, serrate distally, tapering from just beyond eyes to acute tip; dorsal surface with rounded longitudinal carina extending from apex to anterior gastric region; ventral surface almost smooth with faint median carina; rostrum nearly horizontal or gently flexed downward with distal upcurve. Frontal margin with small triangular post-antennal tooth; anterolateral tooth small or obscure, followed by notch at lateral termination of anterior branch of cervical groove; large sharp triangular tooth lateral to notch, followed by 2 or 3 small teeth on lateral margin, decreasing in size posteriorly; small tooth or tubercle just behind lateral termination of posterior branch of cervical groove. Posterior margin unarmed; raised rim slightly concave.

Abdomen unarmed, exposed surface punctate; second and third tergites each with 2 transverse carinae; anterior carina sharper, extending almost to pleuronal margins, blunt on pleuron; posterior carina rounded, not reaching to pleuronal margins. Anterior swelling discernible on fourth tergite, posterior one obscure. Fifth and sixth tergites smooth.

Sternum with anterior margins and intersegmental striae minutely denticulate; plate between chelipeds with scattered denticulate squamae, less distinct squamae on posterior sternites.

Eyes small, immovable. eyestalk with mesial denticulate, often bifid anterior projection extending beyond cornea, and with shorter lateral projection.

Basal segment of antennular peduncle enlarged; lateral swelling tuberculate anteriorly; 2 dorsolateral teeth, most ventral tooth longer,

broader; distal margin serrate ventromesially, with small mesial or dorsomesial tooth. Extended flagellum reaching beyond tip of rostrum.

Basal segment of antenna with denticulate triangular lateral tooth and long sharp ventromesial tooth. Distal margin of second segment with conical lateral tooth, occasionally small mesial tooth or denticle. Third segment elongate; distal margin denticulate, with mesial projection. Fourth segment with distolateral projection and distal margin denticulate. Antennal flagellum 1 to 2 times total carapace length, reaching well beyond chelipeds.

Endopod of third maxilliped slender; ischium unarmed except for serrate mesial edge. Merus with flexor margin denticulate but with no prominent teeth; lateral extensor margin with several obscure tubercles along distal part.

Epipods on chelipeds but not on ambulatory legs.

Chelipeds short, approximately same length as carapace or very slightly longer. Manus broad (width approximately 1/2 length), dorsoventrally compressed; length less than 1/2 cheliped length; dorsal surface tuberculate, with short setae; tubercles on mesial and lateral surfaces expanded to denticulate squamae with longer associated setae; mesial margin expanded slightly, with longitudinal depression laterally. Dactylus less than 1/2 length of manus. Fingers abutting along bluntly toothed opposing margins, or with narrow gape; teeth larger at spooned tips; fingers gaped ventrally and armed with large tufts of setae distally; distolateral margin of fixed finger expanded into row of small teeth. Carpus short, distal margin irregularly denticulate, small tooth at dorsal articulation; dorsomesial edge expanded, terminating in small tooth on distal margin; dorsal surface flattened, squamose; squamae

larger laterally. Merus approximately same length as manus, subtriangular in cross section; surfaces squamose or tuberculate; dorsal angle sharp, cristate proximally. Ischium cristate dorsally, with minute tooth near distal margin.

Second, third and fourth pereopods similar. Dactylus of second pereopod reaching beyond cheliped. Dactylus approximately 1/2 length of propodus; curved corneous tip followed on flexor margin by series of approximately 10 triangular teeth diminishing in size proximally, each armed on anterior edge with slender curved corneous spinule. Propodus with extensor margin expanded, cristate, denticulate; mesial surface with longitudinal depression; lateral surface with 2 longitudinal swellings: most dorsal distinct, tuberculate; ventral surface rounded with 2 movable spinules on distal margin separated by notch. Carpus approximately same length as dactylus; extensor margin expanded into ridge and armed with denticulate tubercles, terminating in transverse denticulate crest on distal margin; lateral surface with narrow denticulate ridge; ventrolateral surface with irregular row of large squamae. Merus approximately twice length of carpus in second pereopod; length of merus proportionately shorter in third and fourth pereopods; extensor margin expanded, cristate, crest sharper proximally, terminating distally in denticulate triangle on second pereopod, tooth-like and more prominent on third and fourth pereopods; lateral surfaces squamose with ventral triangle on distal margin.

Exposed surface of merus of fifth pereopods lightly sculptured, expanded centrally, with several denticles on cristate flexor margin.

Protopod of uropod with posterior lateral lobe notched; several denticles lateral to notch, 2 or 3 small teeth or 1 bifid tooth mesial to

notch. Exposed surface of endopod punctate with longitudinal series of spinules.

Telson slightly broader than long; generally rectangular, smooth, punctate, consisting of 8 plates; posterior margin with moderate medial indentation.

Color.--All specimens examined were preserved in alcohol and were devoid of color except for the pale brown corneous tips of the ambulatory dactyli and some thicker golden setae. The colored illustration of a specimen from near the Canary Islands (A. Milne Edwards and Bouvier, 1900: pl. IV, fig. 3) show the carapace and abdomen pinkish white, the pereopods faintly yellow, and the corneae red-orange, as is stated in the text (A. Milne Edwards and Bouvier, 1900: 346).

Size.--♂, cl. 8.7-12.7 mm,

♀, cl. 8.8-14.3 mm.

Pequegnat and Pequegnat (1971: 21) give a size range of 7 to 19.8 mm (including rostrum) for all specimens, and 9 to 10 mm for ovigerous females.

Sexual dimorphism.--Males have a series of short thick setae on the posterolateral margins of the telson, but these do not form the prominent "comb" characteristic of males of many species of Munidopsis. Females have no marginal setae in this location. The largest female (cl. 14.3 mm) has the abdomen noticeably broader than other specimens examined. No other differences were observed between males and females aside from primary sexual characters. The features described by Milne Edwards and Bouvier (1900: 346) for the female they examined are apparently

attributable to her large size rather than to sex.

Habitat.--The bottom at P-1180 consisted of yellow clay mud with vegetable debris and rotten logs.

Type.--The holotype is a male with cl approximately 9 mm. Present disposition of the type was not determined; possibly it is located at the Paris Museum.

Type locality.--Cap Ghir, TALISMAN Sta. 41, 30°01'N, 14°06'W (near the Canary Islands), 2115 m.

Geographic range.--This species is known from both sides of the Atlantic Ocean: in the east near the Canary Islands (type locality), and in the west from the NE Gulf of Mexico and from the Caribbean S of Jamaica (Pequegnat and Pequegnat, 1971: 20).

Bathymetric range.--The PILLSBURY collection extends the possible depth range for this deep-water species from 2070-2790 m to 3496 m. Calculated depth range based on all reports is 2115-3111 m.

Parasites.--No external evidence of branchial or abdominal parasites was found in the material examined. In addition to several foraminiferans, many specimens have microscopic filamentous epizoans, possibly fungi but as yet unidentified, attached to body surfaces, appendages and setae. These were also found on specimens of M. geyeri taken in the same sample (see parasite section of M. geyeri for more information).

Associates.--Munidopsis geyeri was the only other galatheid crustacean collected at P-1180 along with M. livida. The ALAMINOS also collected

M. geyeri with M. livida at a station south of Jamaica (Pequegnat and Pequegnat, 1971: 20).

Relationships.--As pointed out by A. Milne Edwards and Bouvier (1900: 346), M. livida appears to be most closely related to M. platirostris (A. Milne Edwards and Bouvier), also from the western Atlantic. It is interesting that the depth ranges of these two species are near the extremes of the genus: M. livida is a deep-water species (from depths greater than 2000 m), while M. platirostris is one of the shallowest (usually less than 500 m). Both are in the Orophorhynchus species complex, which includes M. aries (A. Milne Edwards). M. livida can be immediately distinguished from M. platirostris by the rostral carina, the lack of gastric tubercles and the presence of epipods on M. livida. M. aries has the carapace and rostrum shaped differently than that of M. livida, lacks epipods on the pereopods, lacks a lateral eyespine, and has a pair of gastric protuberances.

Munidopsis marginata (Henderson) and M. latirostris Faxon (= M. latifrons Henderson) from the western Pacific bear some resemblance to M. livida. The former is most similar to M. livida, but the pereopods are spinier and the frontal margin of the carapace and carapacial sculpturing are different. M. latirostris has the rostrum shorter and shaped differently, and has the chelipeds much longer.

Munidopsis granosa Alcock and M. edwardsi (Wood-Mason) from the Indian Ocean are in the Orophorhynchus complex also. M. edwardsi is quite similar to M. livida, but has the rostrum more triangular and distinct spines on the meri and carpi of the ambulatory legs. M. granosa has the abdominal tergites armed with a short median tooth, lacks epipods

on the chelipeds, and has the rostrum broadly triangular.

Munidopsis parfaiti (A. Milne Edwards) from the eastern Atlantic is related to these species also, but is somewhat closer to M. aries; M. parfaiti can be separated easily from M. livida by its more granulate sculpturing and the median tubercles arming the abdomen.

Munidopsis longimanus (A. Milne Edwards, 1880)

Figures 28, 29

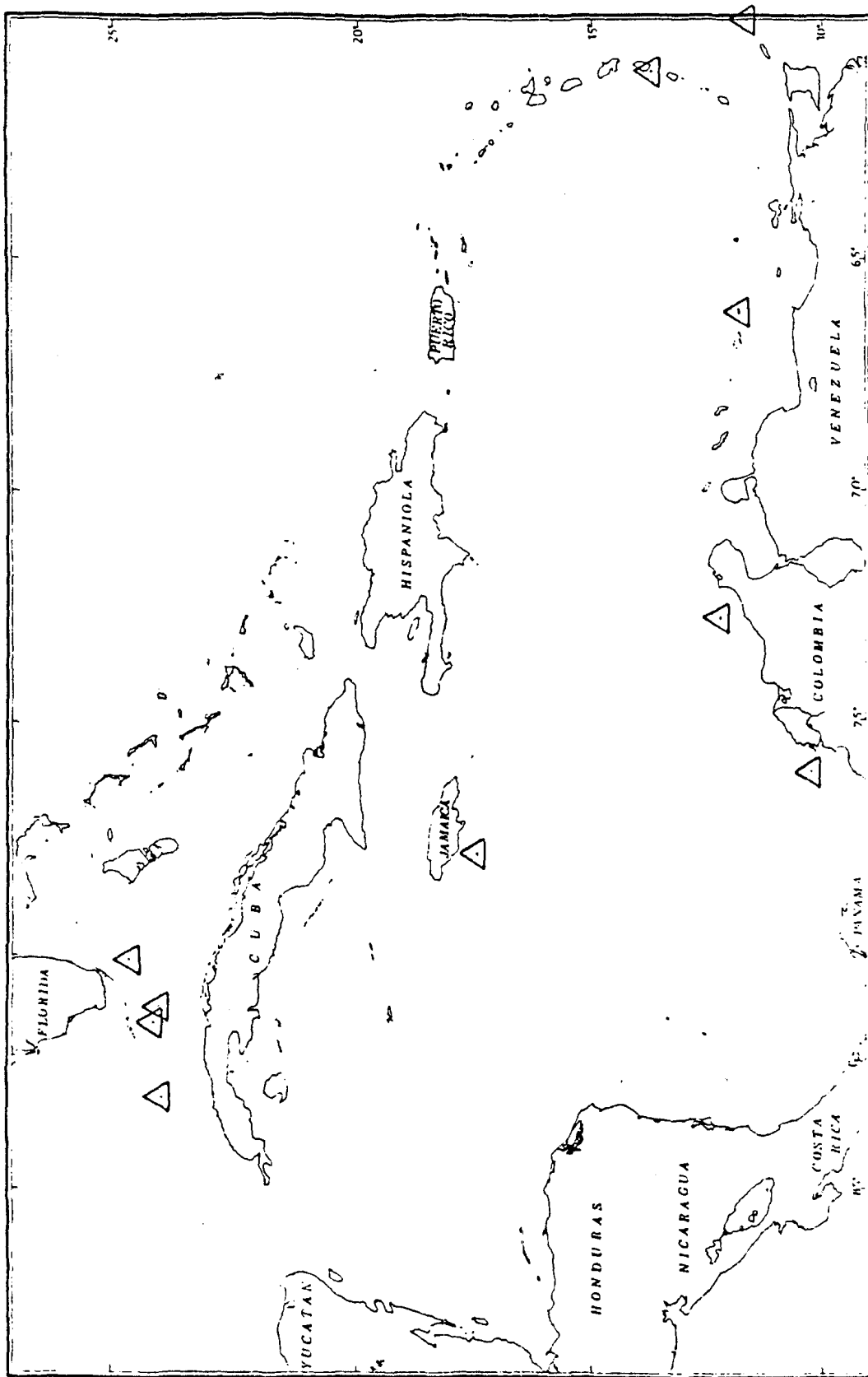
Elasmonotus longimanus A. Milne Edwards, 1880: 60.--A. Milne Edwards and Bouvier, 1894b: 282 (key), 283; 1897: 106-110, pl IX, figs. 1-6.-- Young, 1900: 414 (key), 416.--Perez, 1927: 288.

Munidopsis longimana: Benedict, 1902: 277 (key), 322 (list).--Doflein and Balss, 1913: 175, 176 (lists), 177 (table).--Schmitt, 1935: 179 (key), 179-180.--Chace, 1942: 75 (key), 95-96.

Munidopsis longimanus: Pequegnat and Pequegnat, 1970: 140 (key), 153, fig. 5-1, table 5-2; 1971: 6 (key).

Material examined.--Straits of Florida: G-114, 869-759 m, 1 ♂, 7.5 mm, (USNM); G-226, 802-805 m, 1 ♀, 10.5 mm with branchial parasite, UMML 32:5252; G-365, 672 m, 1 ♂, 7.7 mm, UMML 32:5253; G-368, 961-1016 m, 1 ♀, 6.7 mm (USNM).--Off Atlantic coast of Colombia: P-388, 814-1050 m, 1 ♂, 9.9 mm (RMNH); P-776, 408-576 m, 1 ♂, 7.4 mm, UMML 32:5254.--Off coast of Venezuela (S of Orchilla): P-741, 1052-1067 m, 1 ♂, 9.3 mm, (USNM).--Off Tobago: P-847, 733-1281 m, 1 ♀, 10.6 mm, UMML 32:5255.--Off St. Lucia: P-904, 589-439 m, 1 ♂, 5.0 mm, 1 ovigerous ♀, 6.0 mm, (RMNH).--S of Jamaica: P-1224, 878-906 m, 1 ♂, 9.2 mm, (USNM). Distribution plot 9.

Diagnosis.--Rostrum broadly triangular, unarmed, horizontal, slightly excavate medially, tip usually rounded; tubercles on dorsal surface of carapace, but no spines; frontal and posterior margins unarmed; second, third and fourth abdominal tergites strongly projected dorsally, each usually with median tubercle or blunt tooth, but no sharp spine; eye-stalks unarmed; no epipods on pereopods; chelipeds usually more than



Distribution plot 9.--*Munidopsis longimanus* (A. Milne Edwards, 1880) collected by the GERDA and PILLSBURY.

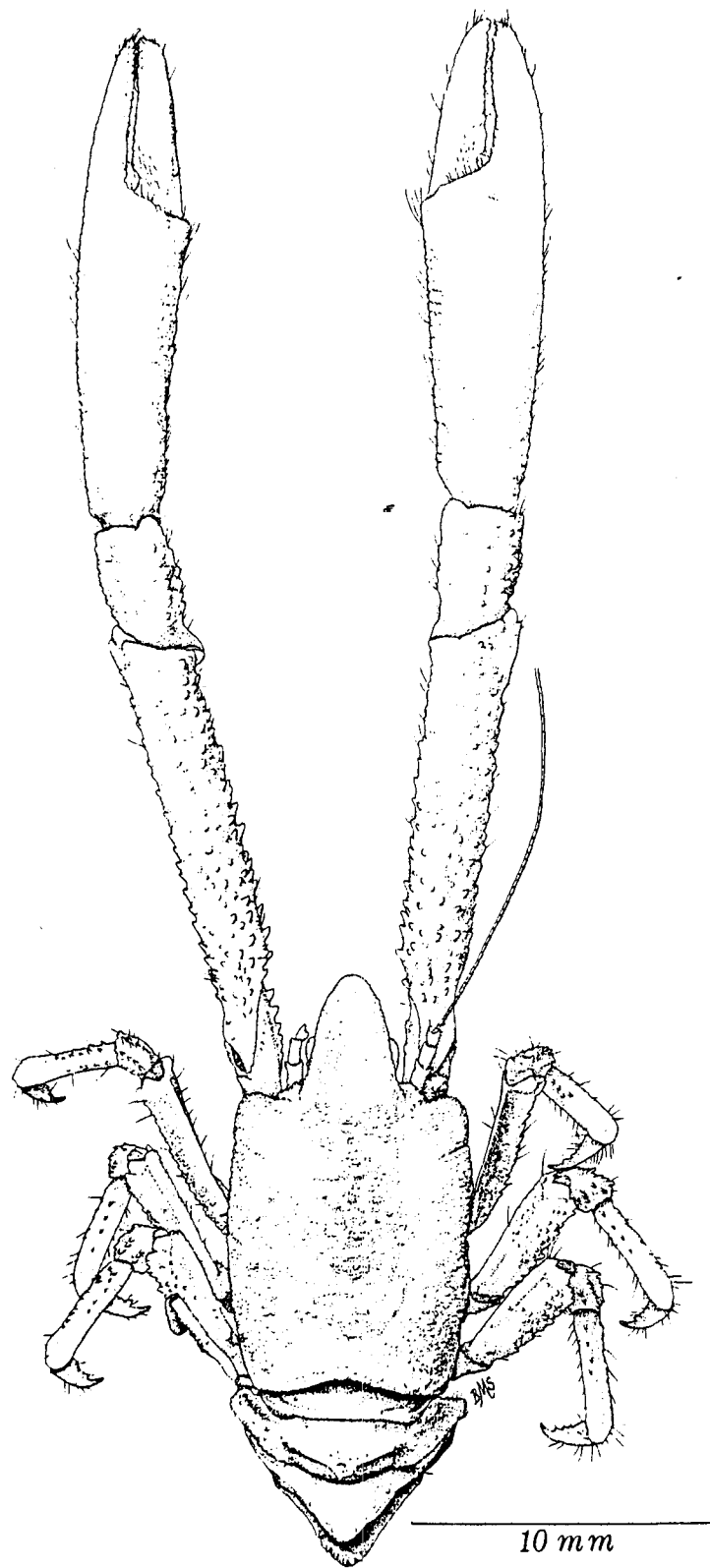


Figure 28. --Munidopsis longimanus (A. Milne Edwards, 1880), ♂, cl.
9.2 mm, P-1224, dorsal view. ↙

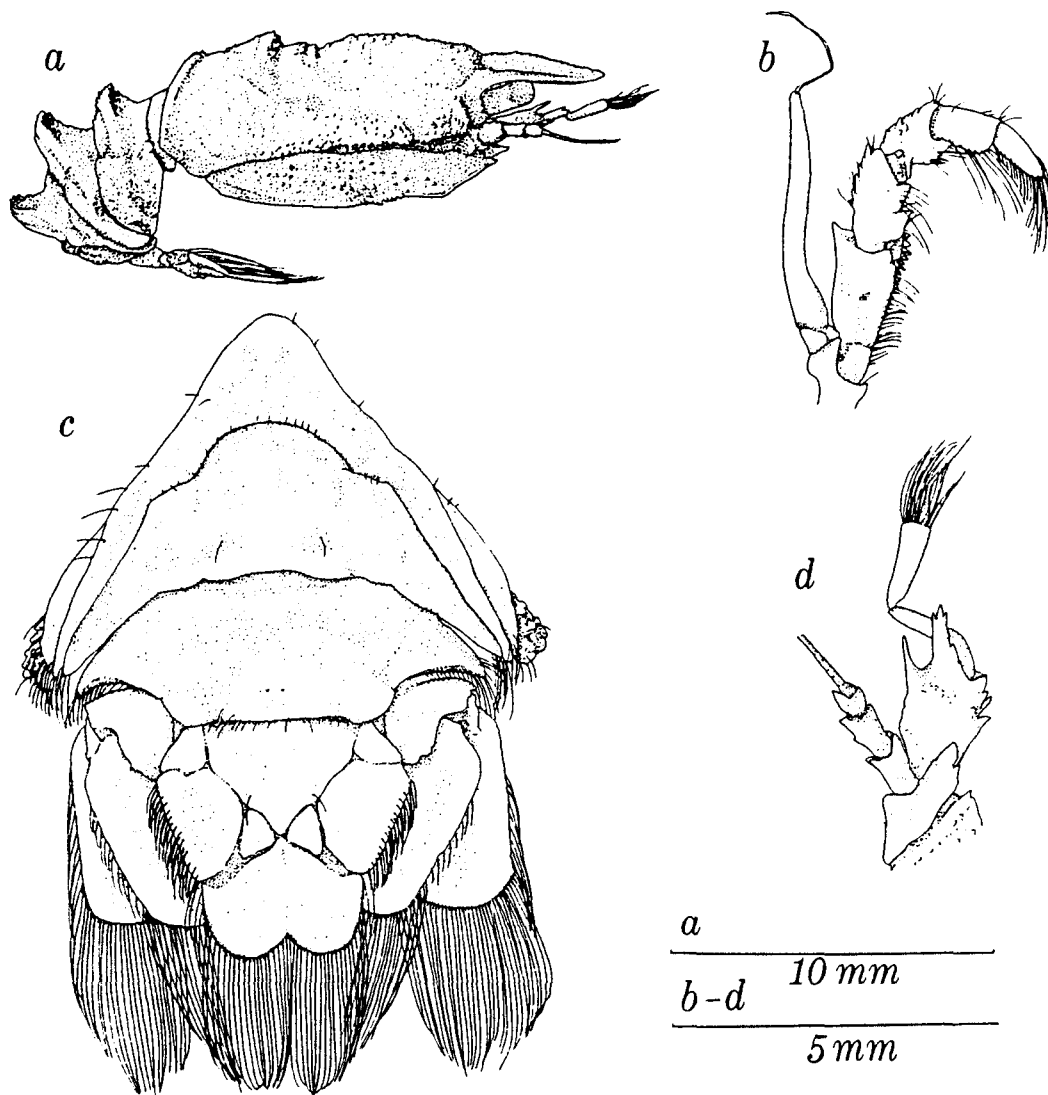


Figure 29. --Munidopsis longimanus (A. Milne Edwards, 1880), ♂, cl. 9.2 mm, P-1224: a, carapace and abdomen, lateral view; b, right third maxilliped, ventrolateral view; c, posterior abdominal tergites, uropods and telson; d, right antennule and antenna, ventrolateral view.

3 times carapace length.

Description.--Carapace longer than broad ($cw/cl = 0.85-0.90$), generally quadrate, slightly wider anteriorly; dorsal surface granulate or minutely tuberculate, decoration often obscure in small specimens; sculpturing often arranged in irregular transverse rows, particularly along middle of carapace and in metabranchial regions; transverse grooves not distinct across carapace; cervical groove visible as short channel separating meso- and metagastric regions at midline and at lateral termination, anterior branch distinctive as oblique groove; postcervical groove broader. Gastric region inflated but lateral margins not well-defined; anterior margin defined by transverse depression across base of rostrum; sculpturing larger, more distinct in center of gastric region, metagastric region and on small cardiac swelling. Surface of carapace with 4 depressions without setae or sculpturing: 1 on either side of posterior mesogastric region, and 1 more mesial on either side of metagastric region. Rostrum in form of broad isosceles triangle, lateral margins tapering evenly to rounded apex, or slightly convex just anterior to eyes; dorsal surface with central excavation; center of depression smooth, without granules. Frontal margin with depressed post-antennal lobe lateral to base of rostrum; forward edge with several enlarged granules, but no major spine. Anterolateral angle rounded, slightly projected, densely granulate, but unarmed. Lateral margins rounded, granulate, interrupted anteriorly by channel at lateral termination of anterior branch of cervical groove, slightly convex between this point and indentation marking posterior branch of cervical groove. Posterior margin raised only slightly, unarmed, but with granulation more distinct

medially; smoothly concave.

First abdominal segment with several granules on rounded flange at posterolateral margin. Second tergite with conical granulate dorsal projection in center of segment, granules more distinct on forward edge; narrow transverse ridge extending laterally on either side 1/2 distance to lateral margins; anterolateral surface and margin of pleuron with granules developed into broad spinules; posterolateral margin swollen, slightly projected laterally. Third tergite more strongly projected dorsally; projection curved anteriorly with several tubercles on forward edge and surface; posterior surface of tergite smooth; similar transverse ridge extending laterally, several tubercles anterior to ridge; pleuron narrowed laterally and curved forward with distinct depression fitting beneath pleuron of second tergite. Fourth segment with strong dorsal projection, not quite as acute as that on third tergite; projection giving abdomen distinctive triangular appearance in dorsal view with abdomen in normal tucked position; forward (upper) edge of projection with several sharp tubercles, slightly raised triangular area on posterior (lower) surface of projection; pleuron extremely narrow laterally. Fifth tergite without granules or tubercles; 4 shallow oval depressions in pairs on either side of midline. Sixth tergite smooth, with obscure depression centrally, posterolateral lobes distinct.

Sternum concave anteriorly in largest specimens, unarmed except for punctations and obscure flattened granules evenly covering surface between bases of chelipeds and on ridges following distinct intersegmental grooves.

Eyes small, often hidden beneath rostrum; eyestalks movable, unarmed, with several obscure granules on ventrolateral surface. Cornea slightly

elongate, approximately same length as eyestalks, very slightly inflated;

Obscure spinules projecting from between bases of eyestalk and antenna.

Large basal segment of antennular peduncle with lateral swelling, slender dorsal spine and longer spine more distally usually with accessory spinules near tip and on ventral margin; ventromesial edge projected with several spinules increasing in size proximally.

Basal segment of antennular peduncle immovable, with strong ventral projection as blunt tooth, obscure lateral projection small. Second segment with obscure dorsal projection or blunt tooth near proximal margin; blunt lateral tooth on distal margin. Third segment with several tubercles or blunt teeth on surfaces; distal margin with 3 blunt spinules, 1 on each side smaller than dorsal spinule. Distal segment with blunt lateral tooth and broad mesial projection with sharp tip. Flagellum reaching distal margin of merus of cheliped.

Ischium of endopod of third maxilliped with small sharp dorsal spine on distal margin; ventromesial edge projected as broad flattened protuberance with slight outward curve; distal end of protuberance smooth or obscurely dentate. Merus broad, flattened curved tooth proximally on flexor margin; medium-sized adjacent tooth followed by spinule distally on larger specimens; extensor margin with 2 or 3 sharp spinules followed by sharp spine distally. Carpus with 6 or 7 spinules on extensor (dorsal) surface.

Pereiopods with sculpturing on merus more distinct than on other segments. No epipods on chelipeds or ambulatory legs.

Chelipeds usually 3 to 4 times carapace length; in females not less than 2 1/2 times carapace length. Manus dorsoventrally flattened;

width of manus in females approximately $1/6$ length; width of manus in male at widest point approximately $1/4$ length. Dactulus less than $1/2$ length of manus, very straight on lateral and mesial margins; fingers toothed on opposing margins; gape variable in males, abutting in distal $1/3$ in largest specimens, abutting entire length in females. Tips spooned, with distinct ventral hollow. Manus smooth on dorsal and ventral surfaces with few scattered obscure tubercles; slightly expanded mesial margin with many small granules and fine setae of various lengths; lateral edge with similar sculpturing extending distally as ridge forming sharp margin between dorsal and ventral surfaces of curved fixed finger. Carpus short, dorsomesial margin slightly swollen, granulate; 2 irregular longitudinal rows of tubercles dorsolaterally; mesial and lateral surfaces sculptured; ventral surface smooth. Merus approximately same length as manus; sculpturing distinctive; all surfaces with evenly-spaced coarse tubercles enlarging proximally to form blunt spines; segment generally quadrangular in cross section; mesial surface with longitudinal indentation distally; distal margin denticulate dorsally, with no major spines; projection at ventromesial angle tooth-like, often with several blunt spinules at tip. Ischium with large somewhat tooth-like dorsal projection at distal margin; all surfaces with blunt spines, ventral projection with large toothed projection mesially near distal margin followed by longitudinal row of blunt teeth, decreasing in size proximally.

Second, third and fourth pereopods similar, short. Tip of second pereopod reaching approximately $1/2$ length of merus of cheliped. Dactylus approximately $1/2$ length of propodus; sharp curved corneous tip followed on flexor margin by series of projections becoming smaller and

more tooth-like proximally, each armed on anterior edge with slender corneous spinule; ventral and mesial surfaces with many setae of various lengths, singly and in tufts. Propodus setose on flexor margin; dorsal surface smooth distally with irregular longitudinal row of blunt teeth on proximal 2/3 of segment, increasing in size proximally; similar rows dorsolaterally and laterally. Carpus short, broad, with crest on expanded extensor margin armed with 5 or 6 blunt teeth; lateral ridge with obscure tubercles, and several additional tubercles in irregular row below. Extensor margin of merus expanded into sharp dorsal crest, minutely dentate; longitudinal depression on lateral surface below crest; lateral surface with scattered tubercles, ventrolateral edge with irregular row of broad blunt teeth; mesial surface below dorsal crest with longitudinal concavity, mesial surface relatively smooth. Short ischium with several low blunt teeth on dorsal, lateral and ventral surfaces.

Expanded merus of fifth pereopods with 3 irregular longitudinal rows of broad blunt spinules on distal 2/3 of segment.

Protopod of uropod with smooth surface; posterolateral margin with 1 or 2 obscure teeth. Telson approximately as long as broad, narrowing posteriorly; telson consisting of 9 plates: anterior plate with posterior acute tip of margin continuous with plate, not separated by fissure or articulation; posterior margin of telson deeply indented medially.

Color.--The specimens examined had been preserved in alcohol and are chalky white. No records of color in this species have been found in the literature.

Size.--Specimens collected by the GERDA and PILLSBURY had the following ranges of size:

♂, cl. 5.0-9.9 mm,

♀, cl. 6.0-10.6 mm, and

ovigerous ♀, cl. 6.0 mm.

Sexual dimorphism.--The most consistently dimorphic character is the comb of thick golden setae on the posterolateral margins of the telson in males; this comb is not present in females. Males have the manus of the cheliped broader (approximately 1/4 length of manus) than females (width of manus is approximately 1/6 length). The gape between fingers on the cheliped on the males varied from no gape (cl. 5.0 mm) to a distinct gape (cl. 7.4-9.9 mm), but 2 males with cl. 7.5 and 7.7 mm have the fingers abutting along the entire length as do most females. The largest female examined (cl. 10.6 mm) has a small gape.

Habitat.--The bottom type at the 2 stations where that information was recorded was characterized as consisting of pteropods at one and of heavy brown clay at the other.

Type.--The holotype is a male with cl. approximately 8.5 mm. Present deposition of the specimen was not determined; it is probably at the Paris Museum. A specimen labeled COTYPE is at the MCZ, number 2646.

Type locality.--Martinique, BLAKE Sta. 195, 918 m (502 fm).

Geographic range.--Munidopsis longimanus has been collected throughout the tropical western Atlantic, from the Straits of Florida through the Caribbean Sea as far south as Barbados, and from the Gulf of Mexico. Localities recorded in the literature include the following: Caribbean Sea: Fredericksted (St. Croix), Dominica, Martinique, St. Lucia (A.

Milne Edwards, 1880: 60; A. Milne Edwards and Bouvier, 1897: 109); N and S coasts of Cuba (Chace, 1942: 96); NE and NW Gulf of Mexico (Pequegnat and Pequegnat, 1970: 153). Schmitt (1935: 180) gives a location off Cape Catoche, Yucatan, apparently based on previous records, which, however, could not be found elsewhere in the literature.

Bathymetric range.--The possible depth range for material collected by the GERDA and PILLSBURY is 408-1281 m; calculated range is 576-1052 m. Possible range based on previous records was 512-1281 m; calculated previous range was 681-1263 m. If the depth given by Schmitt (1935: 80) is correct, the possible depth range is 44-1281 m.

Parasites.--The branchial parasite carried by the female from G-226 is a bopyrid isopod of the genus Pseudione; the species is undetermined and may be undescribed. The unidentified branchial parasite reported by Chace (1942: 96) on a female from the north coast of Cuba is the only other record of parasitism in this species found in the literature. A few unidentified foraminiferans adhering to the body surfaces of some specimens were the only epizoans observed.

Associates.--At the 10 stations where M. longimanus was collected, M. sigsbei was also taken. The index of affinity calculated from these data for these two species is 0.23.

Relationships.--Munidopsis longimanus most closely resembles M. brevis (A. Milne Edwards) also from the western Atlantic. It can be distinguished from the latter, although with some difficulty, by its more rounded rostrum, longer, more ornate chelipeds (which are also broader in males and proportionately narrower in females), and more

strongly dorsally-projected abdominal carinae. Also M. longimanus has the lateral carapacial margins straighter, a tuberculate or spinulate projection on the second abdominal pleuron, no ventromesial spine near the distal margin of the merus of the cheliped, the posterior medial projection of the anterior plate of the telson contiguous with the plate (not separated by a fissure), and the fifth and sixth abdominal tergite with more distinctive sculpturing centrally. See relationship and discussion sections of the account of M. brevimanus for more information.

Munidopsis nitida (A. Milne Edwards, 1880)

Figures 30, 47b

Orophorhynchus nitidus A. Milne Edwards, 1880: 59.Orophorhynchus spinosus A. Milne Edwards, 1880: 58.

Munidopsis nitida: A. Milne Edwards and Bouvier, 1894b: 275 (key); 1897: 74-75, pl VI, figs. 6, 7.--Young, 1900: 407 (key), 409.--Benedict, 1902: 276 (key), 323 (list).--Doflein and Balss, 1913: 176 (list), 177 (table).--Chace, 1942: 73 (key).--Pequegnat and Pequegnat, 1970: 139 (key), 153-155, figs. 5-1, 5-12, table 5-2; 1971: 6 (key).

Material examined.--Gonave Bay, Haiti: P-1178, 1766-1903 m, 2 ♀, 11.0, 11.6 mm, 1 ovigerous ♀, 17.2 mm, UMML 32:5256.--St. Croix Basin, Virgin Islands: P-1304, 3477-3971 m, 1 ♂, 13.6 mm, 1 ♀ (damaged), 14.0 mm, (USNM).

Diagnosis.--Rostrum simple, triangularly spine-like, very slightly upturned; 1 pair of spines on anterior gastric region of carapace; frontal margin with distinct post-antennal spine, anterolateral spine much smaller; 3 lateral spines; posterior margin unarmed; abdominal tergites unarmed; eyes armed with large mesial spine distally, and lateral denticle, occasionally bifurcate; epipods on chelipeds only; chelipeds approximately same length as carapace.

Description.--Carapace length measured from behind eyes greater than maximum width (cw/cl = approximately 0.90), transversely convex; gastric region with 1 pair of distinct spines anteriorly; posterior to these, short, sparsely setose striations arranged in 5 or 6 irregular transverse rows. Striae distinct on anterior ridge of metagastric

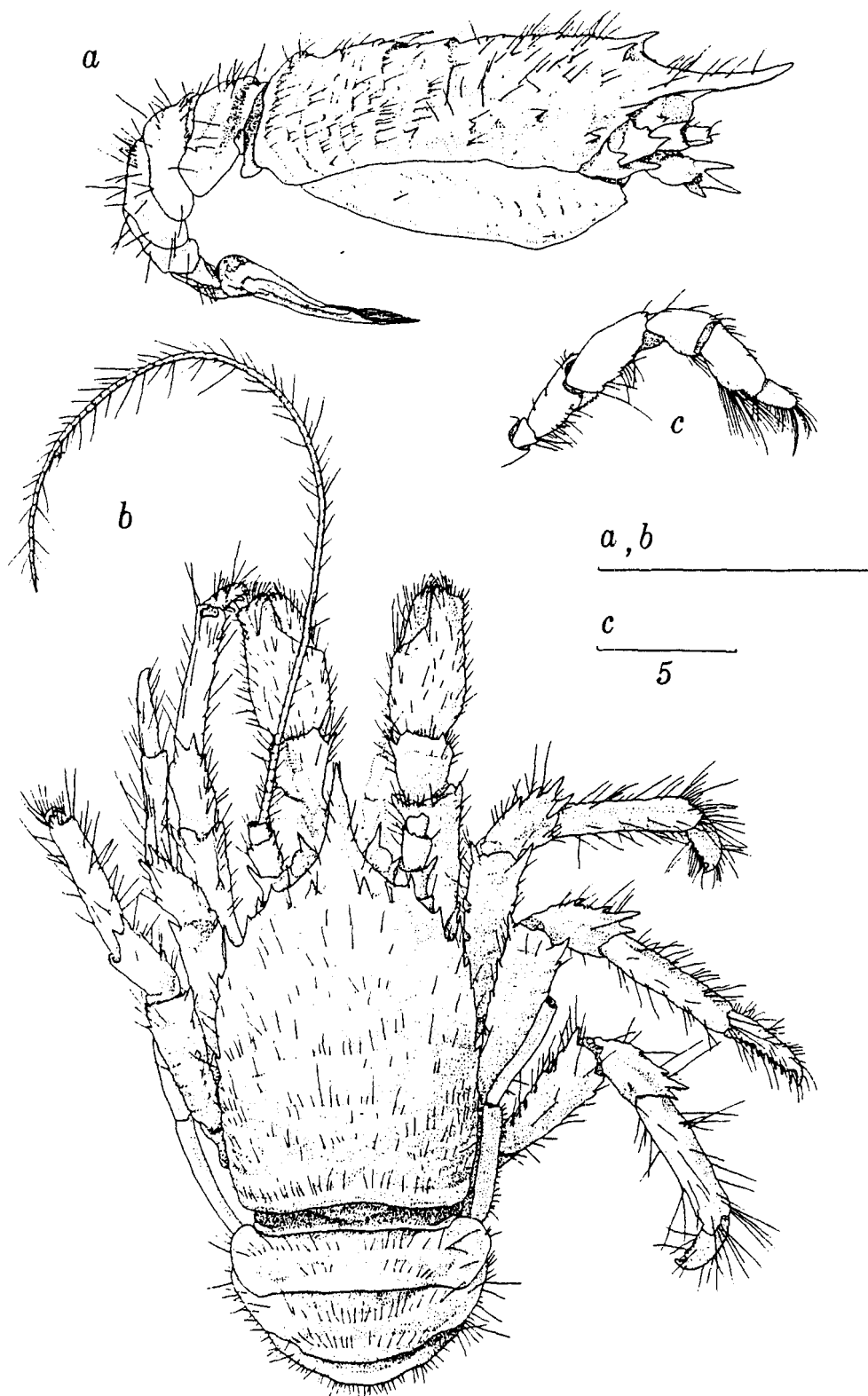


Figure 30. --*Munidopsis nitida* (A. Milne Edwards, 1880). ♀, cl. 11.6 mm, P-1178: a, lateral view; b, dorsal view; c, right third maxilliped. Scales in mm.

and cardiac regions; metagastric region smoother than metabranchial region; cardiac and branchial regions sculptured with distinct but interrupted transverse striae. Rostrum $1/3$ to $2/5$ carapace length; width of rostrum between eyes approximately $1/2$ length, tapering distally, with several lateral denticles; rostrum almost horizontal with very slight distal upturn in larger specimens. Frontal margin of carapace with distinct post-antennal spine approximately same size as gastric spines; margin depressed to short anterolateral spine just posterolateral to antennal basis. Lateral margin with 3 distinct spines: anterior spine largest (larger than gastric spine), distinct smaller spine posteriorly, and spine equal in size to the second at lateral termination of cervical groove; occasionally denticle in space between second and last spines. Posterior margin of carapace unarmed.

Abdomen unarmed; second, third and fourth tergites each with 2 transverse carinae: anterior carina behind depressed front edge of tergite sharper, extending laterally almost to margins of pleura; posterior carina rounded dorsally, extending only across tergite, bending to terminate at posterior margin of segment; fifth tergite with swelling in position and shape of posterior carina, but without anterior ridge; sixth tergite with short setae in row extending from near center of segment toward posterolateral margin, followed by shallow depression. Most margins of carinae and swellings with sparse rows of short setae.

Sternum unarmed; several short rows of setae on striae between coxae of chelipeds, but no spines.

Eyes colorless, barely movable; eyestalk short, expanded distally over mesial margin of cornea to form prominent sharp spine directed anterolaterally, eyestalk expanded laterally to form smaller antero-

lateral spine (2 such spines on large female specimen); eyestalk projected laterally at base, projection armed with 1 or several denticles. Larger specimens with ventromesial denticle on swollen distal margin of eyestalk.

Basal segment of antennular peduncle broad, with denticulate lateral swelling; 2 dorsolateral spines: smaller dorsal spine above large conical distal spine; 1 denticle on serrate distomesial margin. Second peduncular segment not reaching rostral apex. Distal tuft of setae on third segment of antennular peduncle extending beyond distal carpal margin of cheliped.

Basal segment of antenna with triangular ventromesial spine and lateral tooth with terminal denticle. Distal margin of movable second segment with sharp lateral spine and small lobe just mesially; ventromesial projection with small denticle. Third segment with serrate distal margins, small mesial and lateral tooth. Distal margin of fourth segment minutely denticulate, with small dorsolateral projection. Flagellum 3 to 4 times carapace length.

Merus of endopod of third maxilliped small, with 3 or 4 very small irregular teeth on ventromesial margin; 1 minute tooth on distolateral margin. Ischium with blunt ventral carina terminating in 1 minute tooth distally.

Epipods on chelipeds, but not on ambulatory legs.

Chelipeds approximately same length as carapace; broad dorsal surface of manus lightly sculptured, setae of various lengths sparsely scattered over surface of segments. Width of manus more than 1/2 length; dactylus less than 1/2 length of manus. Cross section of manus ovally flattened. Abutting margins of fingers toothed dorsally, gaped

ventrally. Carpus approximately $1/2$ length of manus; distal margin obscurely denticulate, with sharp mesial spine, slightly smaller dorsolateral spine, and sharp spinule dorsally at propodal articulation; broader spine at ventral articulation. Merus extending only $1/2$ distance from base of rostrum to tip; distal margin with 4 spines: 1 lateral, 1 ventromesial, and smaller spines dorsally and ventrally; 3 or 4 spines in longitudinal line behind dorsal spine, decreasing in size proximally. Ischium with small distodorsal tooth and sharp ventrolateral spine; row of denticles near base of ventromesial projection.

Second, third and fourth pereiopods quite similar. Second pereiopod reaching beyond tip of cheliped by at least $1/2$ length of dactylus; dactylus of third and fourth pereiopods each reaching distal propodal margin of preceding leg. Tip of dactylus curved, pale brown; ventral margin with row of 10 denticles decreasing in size proximally, 1 short spinule projecting from distal edge of each denticle. Propodus approximately twice length of dactylus; distal ventral margin with 2 sharp movable spinules mounted on outer edges of 2 small denticulate lobes; second pereiopod with similar small spinule on ventral margin approximately $1/3$ distance from distal margin to base of segment; dorsal, mesial and lateral faces of propodus flattened or slightly concave, angles between surfaces distinct, ventral margins rounded. Carpus less than $1/2$ length of propodus; angle between dorsal and mesial faces acute, armed with 3 sharp distally-directed spines, largest on distal margin with slightly smaller spine laterally; low longitudinal crest on segment dorsally; ventrolateral lobe with denticulate distal margin. Merus with dorsomesial ridge armed with 6 to 7 spines, including sharp distal spine, decreasing in size proximally; second sharp spine on

distal margin lateral to dorsal lobe, spine smaller on fourth pereopod; ventrolateral surface with several denticulate ridges and associated setae. Ischium unarmed.

Fifth pereopods unarmed.

Protopod of uropod in 3 lobes, posterior lobe with denticles lateral to notch and triangular spine mesial to notch. Exopod and endopod with granular denticles on lateral and posterior margins; similar denticles or small movable spinules on exposed surface of exopod, and larger ones, occasionally in pairs or with setae, on endopod.

Width of telson approximately 1 1/2 times length; telson consisting of 10 plates, posterolateral margins of intermediate plates indistinct.

Color.--The specimens examined were preserved in alcohol and are chalky white except for the brown corneous tips of the dactyli.

Size.--♂, cl. 12.0-13.6 mm,

♀, cl. 11.0-17.2 mm, and

ovigerous ♀, cl. 13.0-17.2 mm.

The specimens examined are within the previously reported size range, cl. 9-18 mm (Pequegnat and Pequegnat, 1970: 155).

Sexual dimorphism.--There are no remarkable differences between the chelipeds of the male and the females examined. The only noticeable sexual difference other than those associated with the gonopores and pleopods, is the single row of thick medium-length golden setae on the posterolateral margin of the telson of the male; this fringe is not present on the females.

Habitat.--The bottom at P-1178 was characterized as yellow clay mud with

much log debris.

Type.--The holotype is a male with cl. approximately 9.0 mm; MCZ 6341.

Type locality.--Off Guadeoupe, BLAKE Sta. 163, 1407 m.

Geographic range.--Munidopsis nitida is known from the Caribbean Sea and from the Gulf of Mexico. The type locality and BLAKE Sta. 180, off Dominica, 1787 m, are the only previous records of M. nitida from the Caribbean. Several specimens were taken by the ALAMINOS from the southwestern Gulf of Mexico. The extension of the range of M. nitida to the Pacific as recorded by Milne Edwards and Bouvier (1897: 75) is an error based on their consideration of M. brevimanus Henderson, 1888, as a synonym.

Bathymetric range.--Possible depth range for PILLSBURY specimens is 1766-3971 m; calculated range is 1903-3477 m. Previous range reported was 1373-2133 m, bringing the calculated range, including all reports, to 1373-3477 m.

Parasites.--The material examined showed no external evidence of parasitism. No reports of parasites were found in the literature.

Associates.--Munidopsis simplex occurred at P-1304 with M. nitida. In the other PILLSBURY sample M. nitida was the only galatheid taken. At 1 of the 3 ALAMINOS stations where M. nitida was collected, M. simplex and M. spinoculata were also taken.

Relationships.--Munidopsis nitida shows the closest similarities with M. spinoculata (A. Milne Edwards), M. subspinoculata Pequegnat and Pe-

quegnat, M. ramahtaylorae Pequegnat and Pequegnat, M. similis Smith, and M. reynoldsi (A. Milne Edwards) of the western Atlantic species. It differs from the first three in having a pair of spines on the gastric region of the carapace and a small spine on the distolateral margin of the cornea; from the latter two species, it differs in having shorter chelipeds, and it differs from all five in having epipods on the chelipeds. Munidopsis crassa Smith shares this last character, but has several smaller spines on the gastric region in addition to the principal pair, a broader rostrum and heavier sculpturing overall.

Munidopsis nitida is quite similar to specimens identified as M. ciliata Wood-Mason from the eastern Pacific by Faxon (1895). Faxon compared the type of M. nitida with his material and stated that the major differences between the two are the pubescence, heavily sculptured carapace (with squamiform ridges) and prominent transverse furrows across the tergites of M. ciliata. Faxon indicated the possibility that these differences might not be specific, but retained the name M. ciliata for the Indopacific form. M. vicina Faxon, from the eastern Pacific, is similar to, but smaller than the previous two species, and exhibits several differences in sculpturing and spination.

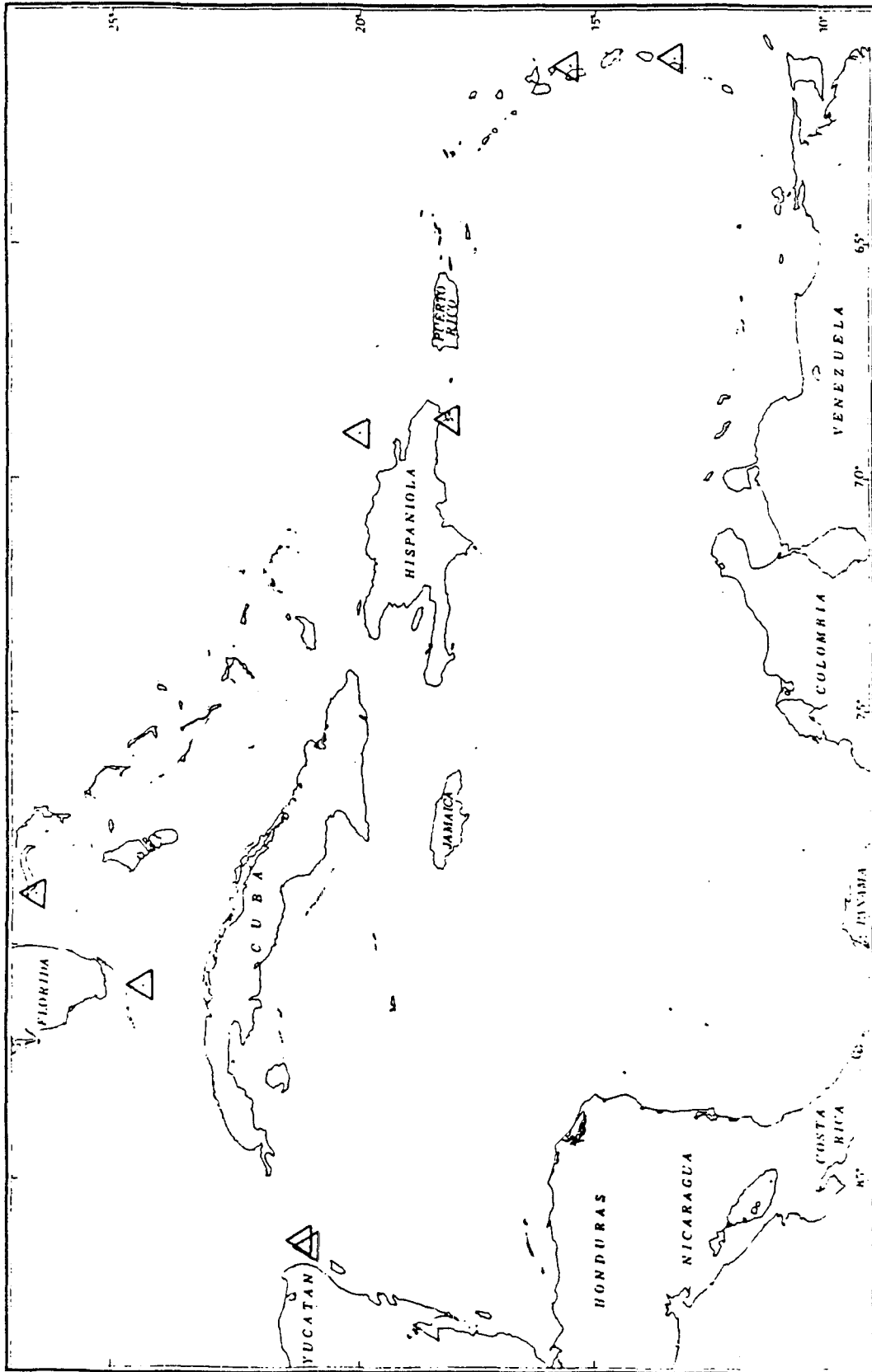
Munidopsis platirostris (A. Milne Edwards and Bouvier, 1894)

Figure 31

Orophorhynchus platirostris A. Milne Edwards and Bouvier, 1894b: 287

(key), 286; 1897: 114-116, pl. IX, figs. 12-15, pl. X, fig. 3.

Munidopsis (Orophorhynchus) platirostris: Benedict, 1901: 148.Munidopsis platirostris: Benedict, 1902: 276 (key), 324 (list).--Doflein and Balss, 1913: 175 (list), 178 (table).--Schmitt, 1935: 178 (key), 180.--Chace, 1942: 75 (key).--Pequegnat and Pequegnat, 1970: 140 (key); 1971: 6 (key).Material examined.--Straits of Florida: G-493, 183-549 m, 1 ♂, 3.1 mm, UMML 32:5257; G-972, 231-221 m, 1 ♀, 3.8 mm, (USNM).--Arrowsmith Bank (Yucatan Channel): G-952, 586-92 m, 1 ♂, 2.8 mm, 1 ♀, 5.5 mm, (USNM); G-880, 101-329 m, 1 ♂, 6.0 mm, 1 ♀, 4.2 mm, UMML 32:5258; G-894, 174-207 m, 2 ♂, 3.6 mm each, 1 ♀, 5.8 mm, (RMNH).--Off St. Vincent: P-876, 231-258 m, 1 ovigerous ♀, 5.5 mm, (RMNH).--Off Dominica: P-931, 146-494 m, 2 ♂, 3.9, 6.5 mm, UMML 32:5259.--N of Dominican Republic: P-1160, 201-842 m, 1 ♂, 4.0 mm, (USNM).--S of Dominican Republic: P-1396, 390-395 m, 1 ovigerous ♀, 5.5 mm, (USNM). See distribution plot 10.Diagnosis.--Rostrum spade-shaped, unarmed, slightly upturned; 1 pair of tubercles or small spines on anterior gastric region of carapace; frontal margin with large triangular post-antennal spine; posterior margin of carapace, abdominal segments and eyes unarmed; no epipods on pereopods.Description.--Carapace length measured from base of rostrum approximately same as carapace width at widest point near middle, occasionally broader



Distribution plot 10.--*Munidopsis platirostris* (A. Milne Edwards and Bouvier, 1894)
collected by the GERDA and PILLSBURY.

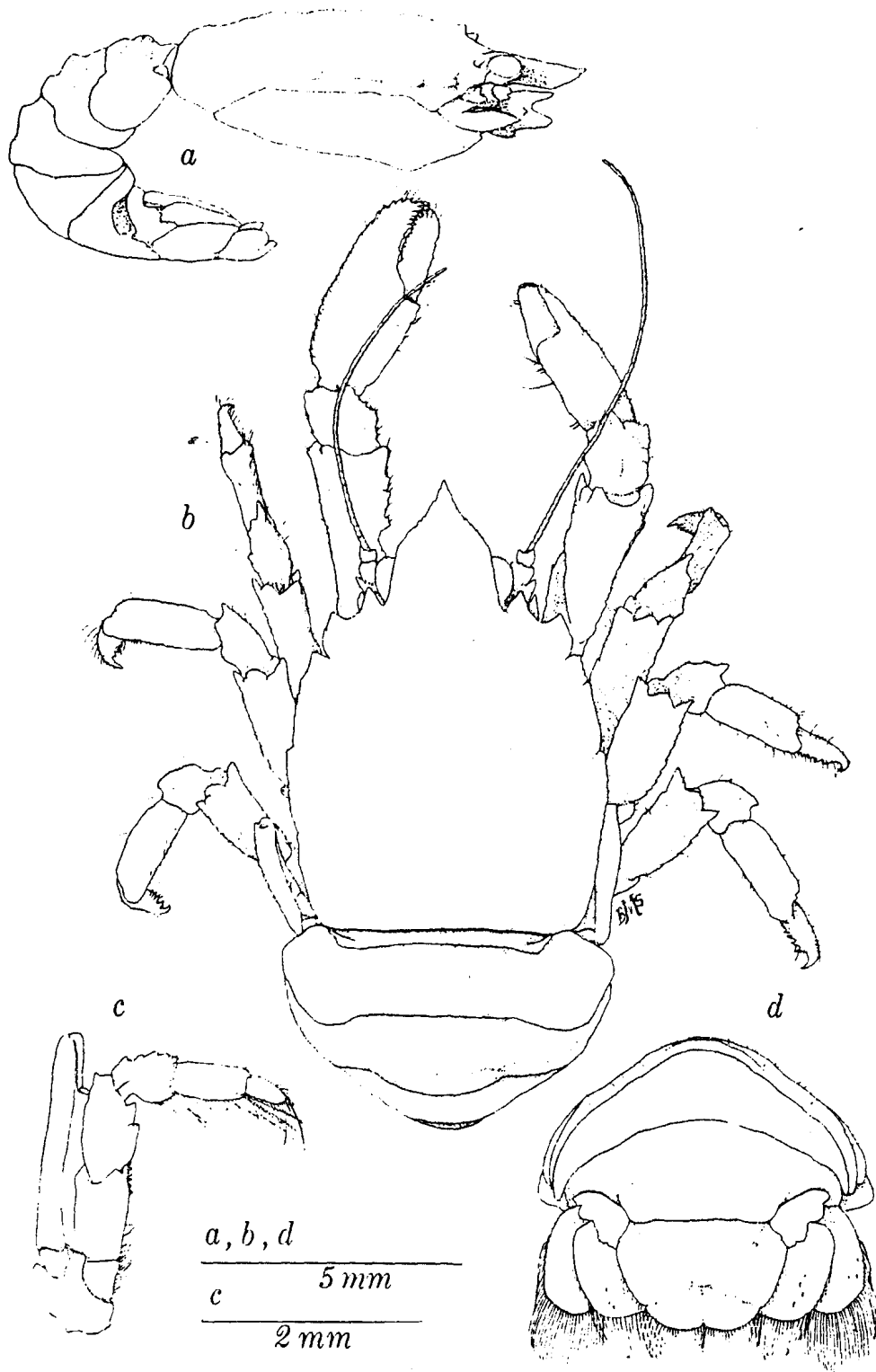


Figure 31. --Munidopsis platirostris (A. Milne Edwards and Bouvier, 1894). ♀, cl. 5.8 mm, G-894: a, lateral view of carapace and abdomen, setae omitted; b, dorsal view; d, posterior abdominal tergites, uropods and telson. ♂, cl. 6.0 mm, G-880: c, right third maxilliped, ventro-lateral view.

an long; dorsal surface smooth or with scattered evenly-spaced tubercles; surface covered with minute punctations usually visible only with magnification; carapacial regions and grooves usually ill-defined or obscure; gastric region smoothly inflated, armed with single pair of rounded tubercles or spines anteriorly; carapace in front of gastric region sometimes with slight transverse indentation or channel delimiting base of rostrum; cervical groove obscure, centrally adjacent to obscure post-cervical groove, cardiac and metabranchial regions very slightly inflated. Rostrum approximately 1/2 carapace length, broad; lateral margins subparallel from base to just beyond eyes, serrate distally, tapering to point, apex acuminate; dorsal surface flat or barely excavate (lateral margins slightly raised), smooth or with scattered obscure tubercles; ventral surface with round medial carina distally. Frontal margin with large triangular post-antennal tooth, minutely dentate on margins. Anterolateral tooth broad, margins finely dentate; distinct notch posteriorly followed by 1 smaller tooth; lateral margins convex, sharply carinate, obscurely dentate, with small notch approximately 1/2 distance to posterior margin. Posterior margin very slightly concave, with smooth raised rim.

Abdomen unarmed; second, third and fourth tergites each with 2 transverse carinae; anterior carina sharper, extending across tergite of second segment and to lateral margins on third and fourth segments; posterior swelling rounded, not extending as far laterally; fifth and sixth segments smooth; pleura of third to sixth segments narrowed laterally.

Sternum slightly convex antero-posteriorly, unarmed; intersegmental channels narrow.

Eyes movable, retractable beneath lateral margins of rostrum; cornea

e with distinctive faceting, reaching $1/2$ length of rostrum.

Basal segment of antennular peduncle enlarged, distinctive, with 2 large teeth distally: dorsal tooth slightly lateral to one beneath, both finely dentate on margins; lateral swelling with small conical tooth; ventromesial projections on distal margin tooth-like. Extended peduncle reaching apex of rostrum, flagellum extending beyond.

Basal segment of antenna projected ventromesially as unusually long triangular tooth, as long as antennal peduncle; smaller curved tooth laterally. Second segment with blunt lateral spine and smaller mesial tooth. Third segment unarmed or irregularly dentate on distal margin. Distal segment of peduncle with small lateral and smaller mesial projection. Flagellum reaching to manus of cheliped or beyond.

Ischium of endopod of third maxilliped with ventromesial angle terminating in triangular spine or rounded tooth; termination of dorsal carina tooth-like or blunt. Merus flattened, flexor margin with 2 small teeth, extensor margin with small tooth distally. Carpus with several coarse tubercles on extensor surface.

No epipods on chelipeds or ambulatory legs.

Chelipeds approximately twice carapace length in large males (cl. 6.5 mm), usually about $1 \frac{1}{3}$ times carapace length in females and smaller males. Manus broad, dorsoventrally flattened; manus of large males as long as carapace length; dorsal surface with evenly-spaced low tubercles, or smooth; width of manus approximately $2/5$ length. Dactylus less than $1/2$ length of manus. Fingers of large males with slight outward curve producing small gape; females with less curvature and narrow gape

Fingers abutting dorsally along entire toothed margins; teeth larger at spooned tips, fingers gaped ventrally. Lateral and mesial margins

of manus expanded into sharp edges proximally, armed with irregular tubercles or small dentate projections; lateral ridge becoming cristate distally on fixed finger; tubercles or projections becoming dentate. Carpus short, dorsomesial edge cristate, terminating in denticulate triangle on distal margin; dorsal surface slightly depressed; dorsolateral surface raised with several irregular tubercles; ventral surface smooth, with triangular projection at distal articulation. Merus shorter than manus, subquadrate in cross section; distal margin with blunt spines at dorsomesial and ventromesial angles and with ventrolateral projection; dorsal surface with tubercles forming rounded longitudinal crest, sharper proximally; dorsomesial edge with row of tubercles or projections. Ischium with large triangular dorsal projection or spine.

Second, third and fourth pereopods similar. Tip of dactylus of second pereopod reaching base of manus of cheliped. Dactylus approximately $1/2$ length of propodus, sharp corneous tip curved, followed on flexor margin by series of 6 or 7 slender sharp spines decreasing in size proximally, each armed on anterior edge with long slender corneous spinule, several long setae on either side of row. Propodus with extensor margin cristate, minutely serrate; ventromesial surface with corneous spinule, near distal margin and one about $1/3$ distance to base; lateral surface with faint longitudinal swelling; all other surfaces smooth, ventral margin rounded. Carpus more than $1/2$ length of propodus; extensor margin sharply cristate, with prominent triangular spine distally; lateral surface with narrow longitudinal swelling and distal projection, sometimes tooth-like. Merus approximately twice length of carpus, triangular in cross section; extensor margin cristate, terminating in distal projection, increasingly spine-like on third and fourth pereopods;

lateral surface flattened, smoother on anterior pereopods, tuberculate on fourth pereopod; lateral edge of flexor margin somewhat cristate, terminating in sharp tooth distally; mesial flexor edge sharp. Ischium short, with small dorsal tooth.

Merus of fifth pereopods expanded centrally; distal half of exposed surface and flexor margin with denticles.

Protopod of uropod with lateral margin in 3 lobes; posterior lobe with several denticles on each side of small notch. Exposed surface of endopod with several spinules on raised area just lateral to telson.

Telson broader than long; generally trapezoidal, narrowing posteriorly, smooth consisting of only 7 articulated plates; posterior margin with small medial indentation.

Color.--All specimens examined were preserved in alcohol and were devoid of pigment. No records of color were found in the literature.

Size.--♂, cl. 3.1-6.5 mm,

♀, cl. 3.8-5.8 mm, and

ovigerous ♀, cl. 4.5-5.5 mm.

Sexual dimorphism.--The largest male specimen (P-931, cl. 6.5 mm) has the chelipeds much longer (twice carapace length) and broader than the ovigerous females, with a small gape not found in other specimens. In addition, the rostrum of this specimen is proportionately longer than others examined. Larger females have the abdomen slightly broader than males. Males have heavier setae along the posterolateral margins of the telson than do females, but this is not developed into the "comb" characteristic of many species.

Habitat.--Information about the characteristics of the bottom was recorded at half the stations where M. platirostris was collected; it consisted variously of rocks, algae, coral conglomerate, pumice stone and other sediments.

Type.--The holotype is a male, cl. 4.8 mm, M Z 4762.

Type locality.--Off Barbados, HASSLER, 183 m (100 fm). (No other station information given except date, 27-30 december 1871.)

Geographic range.--This species is now known in the western Atlantic from the Straits of Florida, Arrowsmith Bank in the northwest Caribbean, north and south of the Dominican Republic, and in the Lesser Antilles (southeastern Caribbean) from Dominica to Barbados. The new locations presented herein are the first to be reported since Benedict (1901: 148) recorded it from the FISH HAWK collections off the east coast of Puerto Rico. Schmitt (1935: 180) reported Curacao in the distribution of M. platirostris; however, the record of this location could not be found elsewhere in the literature although apparently Schmitt's report was not based on new information.

Bathymetric range.--Munidopsis platirostris is one of the species of the genus found at the shallowest depths. The possible depth range for material in this collection is 101-842 m; calculated range is 207-390 m. Calculated range including depths previously reported is 183-458 m.

Parasites.--No external evidence of branchial or abdominal parasites was found in the material examined. There are no records of parasitism in this species.

Associates.--At 7 of the 8 stations where M. platirostris was collected, it was the only species of the genus taken. Munidopsis squamosa was taken in the same haul with M. platirostris south of the Dominican Republic. It is interesting to note that these two species were the only Munidopsis collected from Arrowsmith Bank, although they were not collected together at any one station in that area.

Relationships.--Munidopsis platirostris bears most resemblance to M. livida (A. Milne Edwards, 1886), and falls into the Orophorhynchus group of species which also includes M. aries (A. Milne Edwards, 1880). M. platirostris has the rostrum flat dorsally and carinate ventrally, the carapace relatively smooth with prominent gastric tubercles, unarmed eyes and no epipods on the pereopods, while M. livida has the rostrum of a different shape with dorsal carination, less prominent gastric tubercles on a more heavily sculptured carapace with more distinct grooves, mesial and lateral eyespines, and epipods on the chelipeds. M. aries has the chelipeds shorter and proportionately broader than M. platirostris, with the rostrum more triangular and dorsally carinate, the carapace broader anteriorly with more distinct sculpturing and grooves, post-antennal and anterolateral teeth weaker, and with a small mesial eyespine.

Remarks.--The 2 males from Dominica (P-931), particularly the larger one (cl. 6.5 mm) differ slightly from the other specimens in the degree of sculpturing. Low tubercles are scattered evenly over the dorsal surface of the carapace, and are distinct everywhere but on the rostrum. The cervical groove is discernible and the postcervical groove is more distinct. The right cheliped of the larger specimen is longer (twice carapace length) with a very broad manus; the left is shorter and slenderer.

Munidopsis polita (Smith, 1883)

Figures 32, 33

Anoplnotus politus Smith, 1883: 50-55, pl. 2, fig. 1, pl. 3, figs. 1-

5a.--A. Milne Edwards and Bouvier, 1894b: 283.--Verrill, 1885: 558.

Munidopsis polita: Benedict, 1902: 276 (key), 324 (list).--Doflein and

Balss, 1913: 175 (list, 177 (table).--Chace, 1942: 75 (key).--Peque-

gnat and Pequegnat, 1970: 140 (key), 155, fig. 5-1, table 5-2; 1971:

6 (key), 21.--Fowler, 1912: 575.

Material examined.--Straits of Florida: G-460, 207-247 m, 1 ♂, 5.4 mm,

(USNM); G-657, 216-201 m, 2 ♂, 6.5, 6.6 mm, (RMNH); G-815, 618 m, 1 ♀,

9.0 mm, (USNM); G-870, 807-755 m, 1 ♀, 6.1 mm, (RMNH); G-970, 512 m,

1 ovigerous ♀, 8.6 mm, (USNM).--Off Atlantic coast of Colombia: P-375,

34-129 m, 1 ♂, 8.3 mm, UMML 32:5260; P-776, 408-576 m, 1 ♀, 6.3 mm,

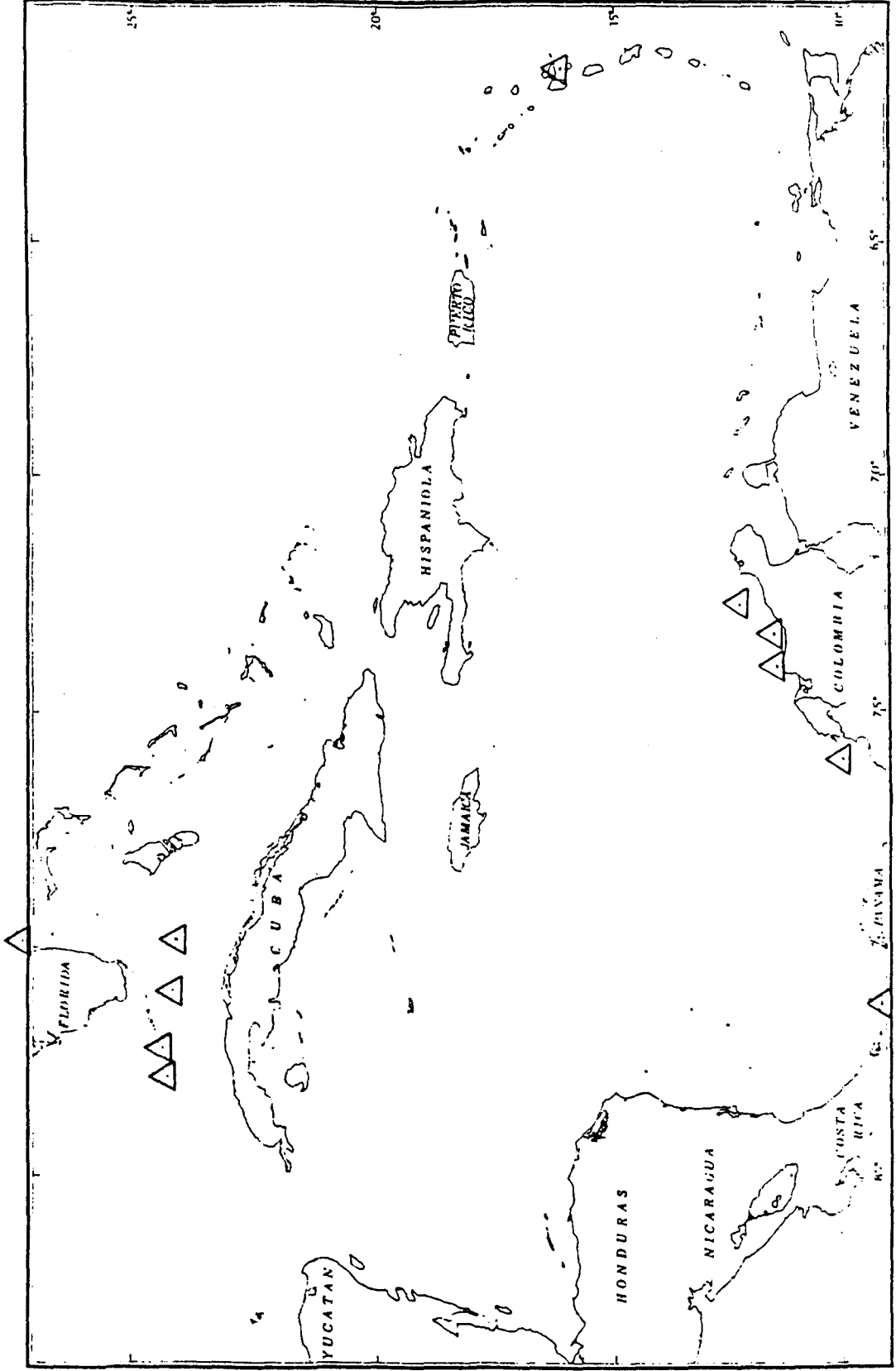
UMML 32:5262; P-781, 567-531 m, 1 ♂, 10.7 mm, (USNM); P-784, 567-715 m,

1 ♂, 6.4 mm, (RMNH).--Off Atlantic coast of Panama: P-447, 657-673 m,2 ♂, 7.0, 8.6 mm, 1 ovigerous ♀, 7.2 mm, UMML 32:5261.--Off Guadeloupe:

P-923, 476-686 m, 1 ♂, 7.7 mm, (USNM). See distribution plot 11.

Diagnosis.--Rostrum short, bluntly triangular, spine-like, unarmed, slightly flexed downward; carapace and abdomen completely without spines; anterior gastric region without distinct medial division; frontal margin of carapace with rounded post-antennal lobe; no spine or protuberance beneath frontal margin mesial to eye; eyes unarmed except occasionally for small lateral protuberance near base of eyestalk; no epipods on pereopods.

Description.--Carapace longer than broad (cw/cl = 0.90), generally



Distribution plot 11.--*Munidopsis polita* (Smith, 1883) collected by the GERDA and PILLSBURY.

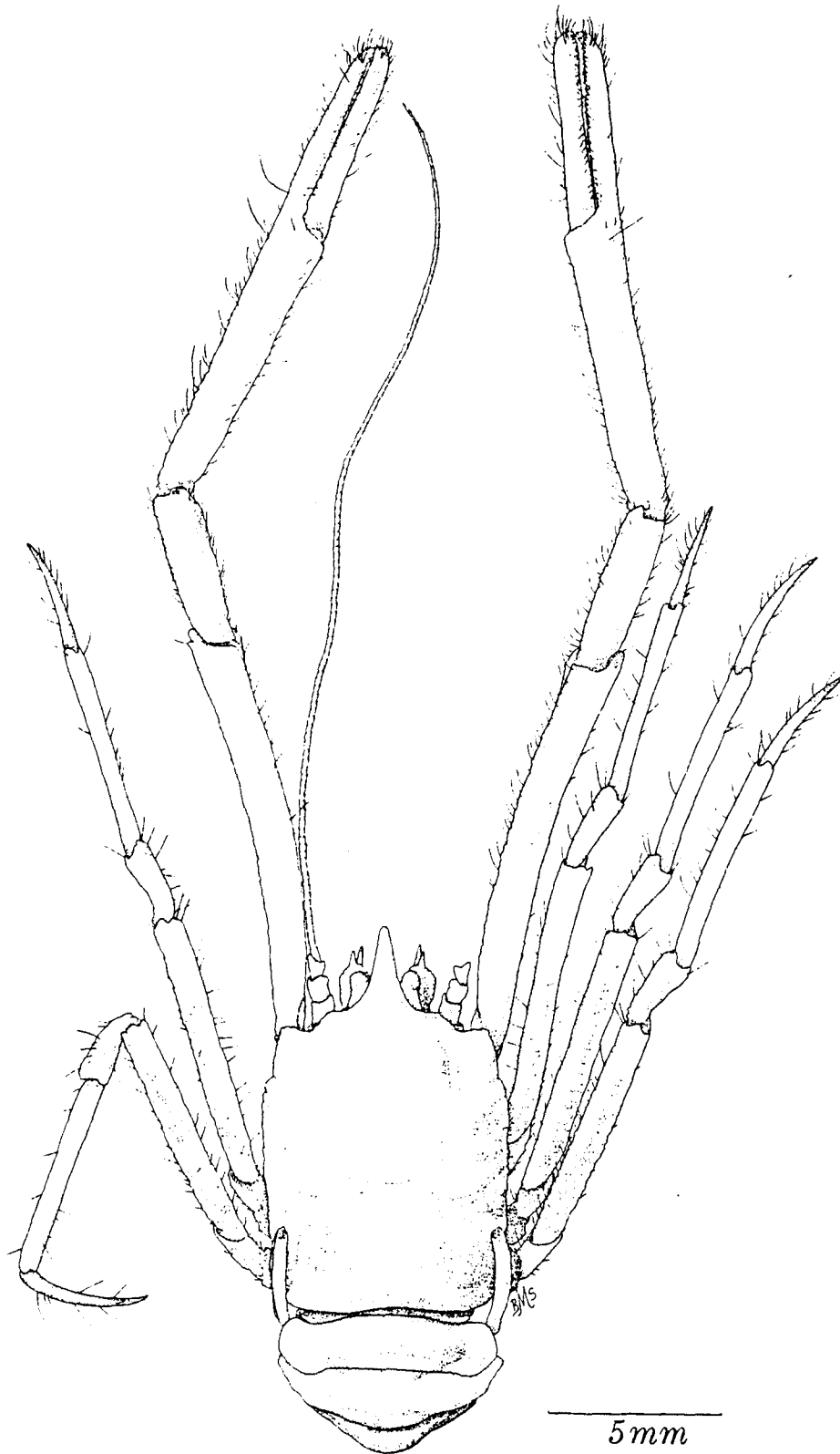


Figure 32. --Munidopsis polita (Smith, 1883), ♀, cl. 8.6 mm, G-970: dorsal view.

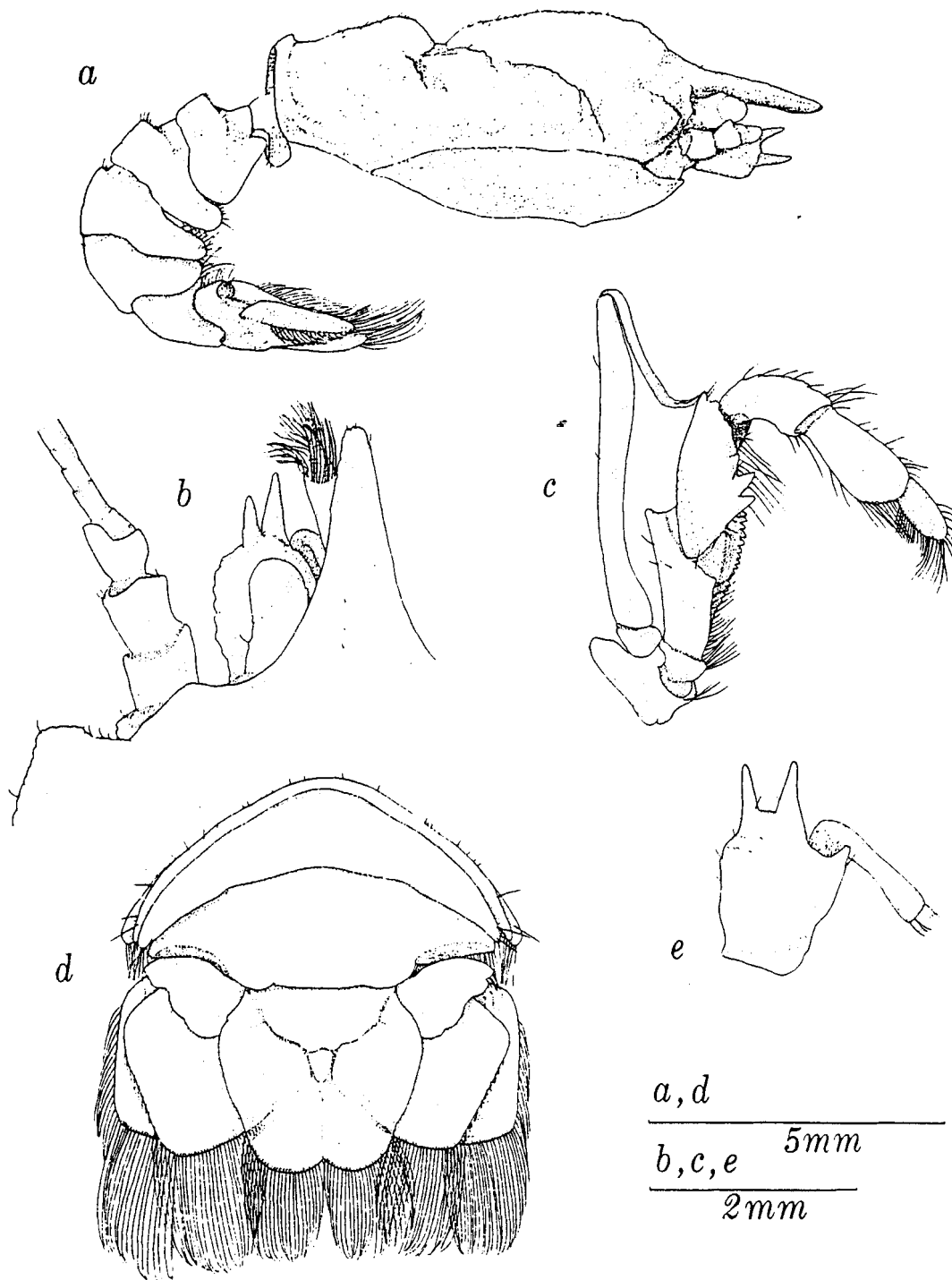


Figure 33. --Munidopsis polita (Smith, 1883). ♂, cl. 7.0 mm, P-447: a, carapace and abdomen, lateral view. ♀, cl. 8.6 mm, G-970: b, frontal margin of carapace, rostrum, eye, antennule and antenna, dorsal view; c, right third maxilliped, ventrolateral view; d, posterior abdominal tergites, uropods and telson; e, right antennular peduncle, ventrolateral view.

quadrate, lateral margins slightly convex, broadest near middle; dorsal surface devoid of spines; gastric region inflated, defined laterally and posteriorly by smooth indentation; cervical groove distinct with anterior and posterior branches delimiting swollen epibranchial region; postcervical groove in form of deep channel, most prominent feature of carapace and curving posteriorly then anteriorly separating inflated meso- and epibranchial regions; triangular cardiac region further defined on its posterolateral margin by distinct branchiocardiac groove, separating it from tuberculate metabranchial region. Sculpturing consisting primarily of minute flattened obscure tubercles, arranged in 1 pair of transverse lines on anterior part of gastric region; sculpturing very fine on rostrum and on gastric and cardiac regions, coarser laterally, becoming rugose and forming small transverse ridge on anterior margin of metabranchial region; 2 closely-set larger rounded tubercles near lateral margin of gastric region, 1 mesial and posterior to these on each side, and 1 lateral to these on mesial part of hepatic region. Rostrum short, blunt, in shape of isosceles triangle, $1/4$ to $1/3$ carapace length; dorsal surface finely tuberculate with broadly rounded carina narrowing posteriorly in front of gastric region; rostrum with downward flexure; lateral margins tapering evenly to apex with narrow border continuing in smooth curve posterior to eyes to post-antennal lobe on frontal margin; lobe sometimes denticulate. Anterolateral angle at 90° , granulate or tuberculate, but unarmed. Lateral margin with distinctive notch at termination of anterior branch of cervical groove. Posterior margin slightly concave; raised rim broadest medially, with fine sculpturing.

Second, third and fourth abdominal tergites with anterior transverse rim, followed on second tergite by shallow groove, and barely

perceptible on third and sometimes fourth tergites. Fifth and sixth segments smooth.

Sternum concave and punctate anteriorly; pair of curved projections at each coxal articulation; intersegmental groove followed by ridges, distinct towards lateral margin, obscure medially.

Eyes small, movable; cornea reaching 1/2 length of rostrum, slightly dilated from dorsoventrally flattened eyestalk, facets not visible; minor projection or tubercle laterally near base of eyestalk.

Plate at intersection of bases of eyestalk, antennule and antenna unarmed.

Basal segment of antennular peduncle enlarged with tuberculate lateral swelling; 2 distal spines located one above other, most ventral spine largest and slightly mesial, reaching to or just beyond apex of rostrum. Second segment as well as distal segment and flagellum extending beyond rostrum.

Basal segment of antenna with small ventromesial projection, denticulate on distal margin laterally, but not projected. Second and third segments unarmed except for occasional denticle or spinule distolaterally on second segment. Fourth segment with distolateral projection sometimes denticulate.

Endopod of third maxilliped with ventral angle of ischium not sharp, terminating distally in several denticles; dorsolateral edge more carinate, with distal tooth. Merus with 2 large teeth, occasionally third smaller, on flexor margin; extensor margin with obscure tubercles along edge and small tooth distally.

Pereiopods long, slender, subcylindrical, generally smooth, sculpturing in form of low rounded tubercles, more distinct on mesial sur-

faces of proximal segments; no epipods on chelipeds or ambulatory legs.

Chelipeds approximately $3 \frac{1}{4}$ to $3 \frac{3}{4}$ times carapace length. Manus slightly dorsoventrally-flattened; width of manus in large males (cl. more than 8.0 mm) approximately $\frac{1}{4}$ to $\frac{1}{5}$ length; width of manus $\frac{1}{7}$ to $\frac{1}{8}$ length in females. Dactylus slightly less than $\frac{1}{2}$ length of manus, subcylindrical, very straight; mesial margin with large blunt tooth near base, followed by even row of small teeth, increasing in size distally. Fixed finger of larger males toothed along entire mesial margin, with outward curve forming gape at base, fingers abutting in distal $\frac{1}{2}$ to $\frac{2}{3}$; females and smaller males (cl. less than 7.5 mm) without curve or gape; tips spooned, dentate, gaped ventrally. Carpus approximately $\frac{1}{3}$ length of manus; dorsomesial margin rounded, slightly inflated near distal and proximal ends. Merus shorter than manus, distal half with slight outward flexure; distal margin with conical ventromesial tooth and longitudinal groove on mesial surface. Ischium with small dorsal tooth.

Second, third and fourth pereopods similar, long slender; tip of third pereopod often reaching beyond tip of second pereopod to manus of cheliped; fourth often reaching middle of carpus of cheliped. Dactylus more than $\frac{1}{2}$ length of propodus, curved, terminating in very sharp corneous tip, unarmed on flexor margin. Propodus and carpus unarmed. Merus long, unarmed except for small lateral tooth on distal margin, and tubercles becoming more distinct proximally, especially on fourth pereopod. Ischium with small dorsal tooth decreasing to obscurity from second to fourth pereopod.

Middle of merus of fifth pereopods expanded, finely tuberculate; several small teeth or tubercles on ventral margin.

Posterolateral margin of protopod of uropod in 2 lobes, each with

small notch in middle. Lateral margin of exopod and endopod very straight.

Telson broader than long, narrowing posteriorly; lateral plates with slight central concavity; posterior margin with medial indentation.

Color.--All specimens examined were preserved in alcohol and were devoid of pigment. No records of color were found in the literature.

Size.--Specimens collected by the GERDA and PILLSBURY showed the following ranges of size:

♂, cl. 5.4-10.7 mm,

♀, cl. 6.1-9.0 mm,

ovigerous ♀, cl. 7.2-8.6 mm.

Sexual dimorphism.--Males have the characteristic fringe of thick golden setae on the lateral margins of the telson; few, if any, marginal setae are present in this location on females. Large males have the manus much broader than females and smaller males. Males with cl. 6.7 mm or more have the manus width $1/4$ to $1/6$ length with a gape near the base of the fingers increasing proportionately to carapace length; females and smaller males have the width of the manus equal to only $1/7$ or $1/8$ length and have the fingers closely abutting along their entire opposing margins.

Habitat.--The bottom type or characteristics were recorded at 4 GERDA and PILLSBURY stations where M. polita was collected: 2 stations had pteropod shells and mud, 1 had thick green-brown mud, and 1 had sponges on the bottom. At the 5 FISH HAWK stations off Martha's Vineyard, the bottom was muddy at 4 stations and had hard sand and sponges at one.

Type.--Designation of holotype not indicated in Smith, 1883. Subsequent designation not determined.

Type locality.--Western North Atlantic (off Martha's Vineyard), FISH HAWK Sta.

Geographic range.--Munidopsis polita has been collected in the northern Atlantic Ocean near Cape Cod, in the Gulf of Mexico, in the southern and northern Straits of Florida, in the Caribbean along the north coast of South America, Nicaragua and off Guadeoupe in the Lesser Antilles.

(Except for the FISH HAWK Sta. 941, where 16 specimens were collected, 3 is the maximum number of specimens taken in an individual haul.) In addition to the type locality, the following locations are reported in the literature: NW Gulf of Mexico (Pequegnat and Pequegnat, 1970: 155); E of Nicaragua (Pequegnat and Pequegnat, 1971: 21).

Bathymetric range.--The possible depth range for material collected by the GERDA and PILLSBURY is 129-807 m; calculated depth range is 134-755 m. Possible depth range including previous records is 129-860 m.

Parasites.--There is no external evidence of branchial or abdominal parasites in any of the material examined. No records of parasitism in this species were found in the literature.

Associates.--Other species of galatheids were collected with M. polita at 8 of the 11 stations of the GERDA and PILLSBURY. M. erinaceus was collected at 7 of these, and M. riveroi at 5, giving them an index of affinity with M. polita of 0.32 and 0.25, respectively. Several other species occurred with M. polita at 1 station only.

Relationships.--Munidopsis polita is very closely related to M. impolita, a new species, also from the western Atlantic, with which it may be easily confused. Both species have the rostrum, carapace and abdomen the same general shape and size, similar pereopods, arrangement of epipods, and most other characters. M. polita, however, has the rostrum distinctly flexed downward, the terminal spines on the basal segment of the antennular peduncle appearing adjacent or overlapping in dorsal view, a more distinct post-antennal lobe, and no spine or tubercle emerging from the plate at the intersection of the bases of the eye, antennule and antenna; also, the regions of the carapace are less distinct and sculpturing is generally finer in M. polita than in M. impolita (see discussion of the relationships of M. impolita).

Two other western Atlantic species, M. espinis Benedict and M. gulfensis Pequegnat and Pequegnat, bear some resemblance to M. polita in general appearance, but both have epipods on the first 3 pairs of pereopods, the eyes fused to the rostrum, and the chelipeds not more than twice carapace length.

Munidopsis inermis Faxon, from the eastern Pacific, resembles M. polita in many ways, but the rostrum of the former species is broader basally, narrower distally, and more strongly decurved; the carapace is longer and narrower in M. inermis, and the propodi of the ambulatory legs are proportionately shorter. It is interesting that M. polita, M. impolita, M. espinis and M. inermis are among the few species of the genus which lack ventral spinules or teeth on the dactyli of the ambulatory legs. It seems likely that if the genus Munidopsis is subdivided, this Anoplomotus complex, including these 5 species and others with this general appearance and unarmed dactyli, may form a natural group.

The relative significance of the arrangement of epipods is questionable in this group, since M. polita and M. impolita definitely lack epipods on any pereopods while M. espinis and M. gulfensis have epipods on the chelipeds and first 2 pairs of ambulatory legs. The arrangement of epipods in M. inermis could not be determined from the literature.

Discussion.--Pequegnat and Pequegnat (1971: 21) reported differences between specimens collected from deeper waters in the Gulf of Mexico and Caribbean and the type material from the North Atlantic. It appears that the differences they observed fall within the range of variation of Munidopsis polita, and may be due to individual variation as much as to their deeper occurrence. Specimens from 134-807 m display the following variation; eyes both larger and smaller with both shorter, narrower and longer, wider eyestalks than the type material; basal segment of the antennule with short spines not reaching the apex of the rostrum and with long slender spines reaching well beyond the rostrum; the merus of the cheliped shorter than the total carapace length in a specimen from 567-531 m, and longer than the carapace in a specimen from 134-129 m; rostrum both narrower and broader than type material. The rounded post-antennal lobe varies somewhat among specimens, but apparently the amount of projection is not absolutely correlated to the depth at which they live, although the specimens from the shallowest stations (C-460, G-657, P-375) all have the post-antennal lobe as prominent as that shown on the illustration of the type (Smith, 1883: pl.2, fig. 1). This is an important character in distinguishing M. polita from M. impolita which has the lobe almost obscure and a small projection or spine emerging from beneath the frontal margin; it should be pointed out that specimens

of M. polita with a distinct post-antennal lobe have been collected from depths even greater (618-807 m) than one at which M. impolita has been collected (585 m).

Munidopsis ramahtaylorae Pequegnat and Pequegnat, 1971

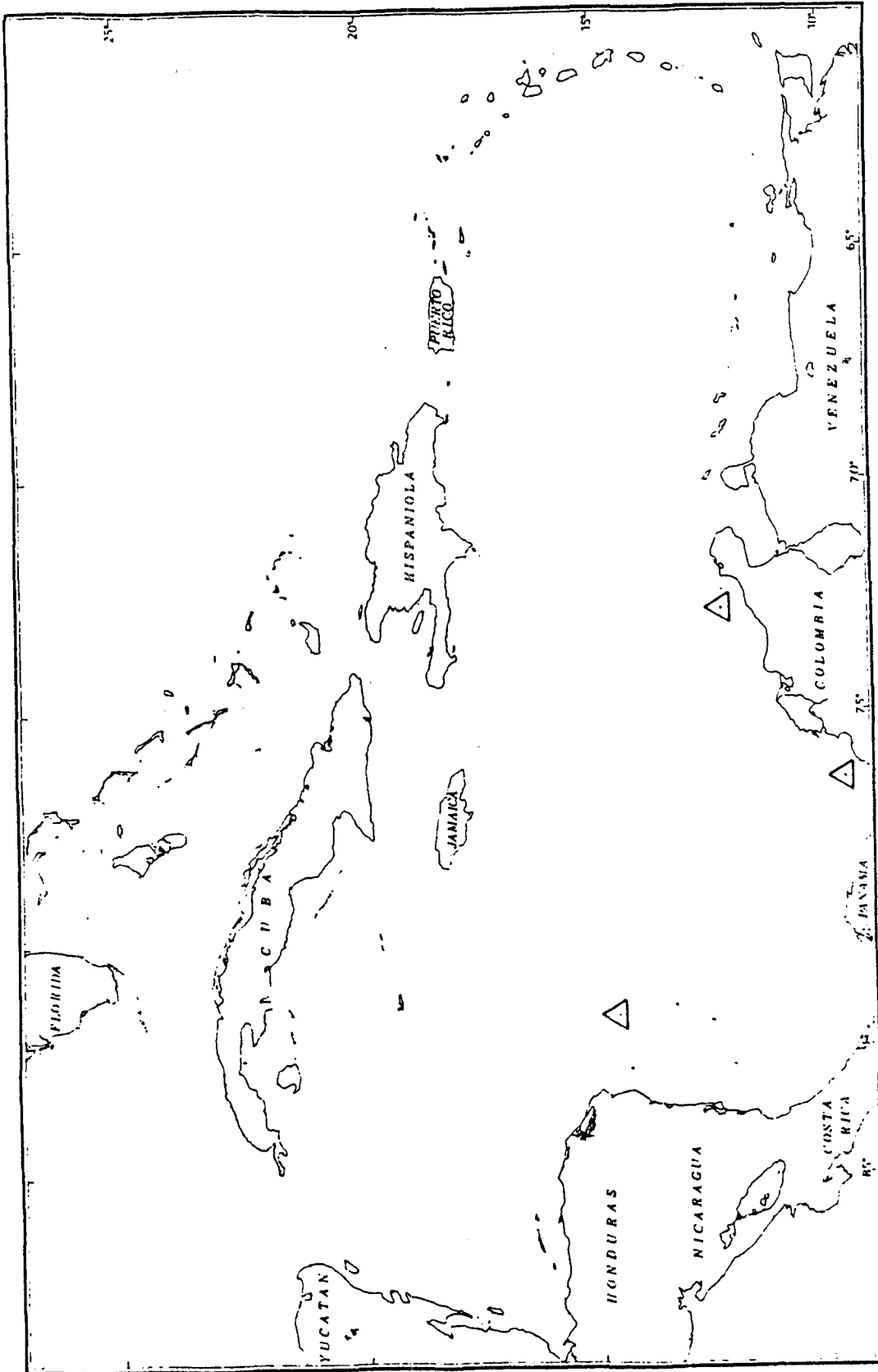
Figure 34

Munidopsis ramahtaylorae Pequegnat and Pequegnat, 1971: 7 (key), 11-13, figs. 5, 6.

Material examined.--Off Atlantic coast of Colombia: P-394, 416-834 m, 2 ovigerous ♀, 7.4, 7.8 mm, 1 ♀, 8.4 mm, UMML 32:5263; P-776, 408-576 m, 1 ♂, 8.4 mm, (USNM).--Off Honduras: P-1355, 450-576 m, 1 ovigerous ♀, 11.0 mm, (USNM). Distribution plot 12.

Diagnosis.--Rostrum unarmed, acarinate, decurved distally; lateral margins subparallel at base, slightly convex distally; gastric region of carapace unarmed, unsculptured; frontal margin with distinct post-antennal spine, but no spine at anterolateral angle; posterior margin of carapace and abdominal tergites unarmed; length of eyespine approximately 1/2 diameter of cornea; no epipods on pereopods; sternum armed with 2 pairs of slender spines; coxa of chelipeds unarmed.

Description.--Carapace longer than broad ($cl/cl = 0.87-0.91$), longitudinally and transversely convex. Cervical groove shallower medially; anterior branch distinct, delimiting slightly inflated gastric region; postcervical groove separating metagastric and cardiac region. Regions of carapace not prominent, dorsal surface unarmed, pubescent, short setae arranged in irregular discontinuous transverse rows posteriorly, giving posterior third of carapace slightly striated appearance. Rostrum acarinate, slightly decurved distally, transversely convex at base, flatter distally; length, measured from point even with base of cornea, 1/4 to 1/3 carapace length; width at base approximately 2/5



Distribution plot 12.--*Munidopsis ramahtaylorae* Pequegnat and Pequegnat, 1971
collected by the PILLSBURY.

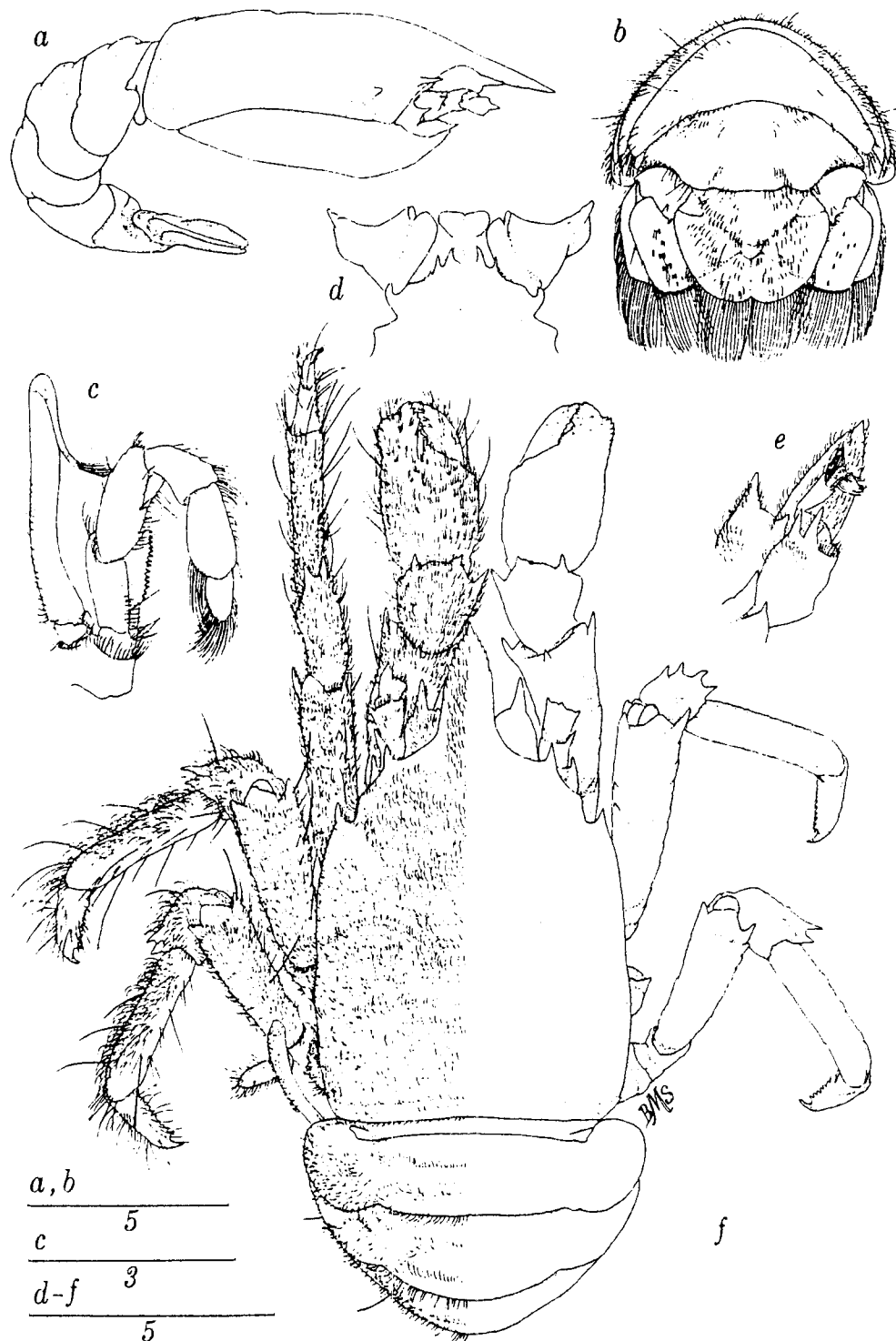


Figure 34. --*Munidopsis ramahtaylorae* Pequegnat and Pequegnat, 1971. Ovigerous ♀, cl. 7.4 mm, P-394: a, carapace and abdomen, lateral view, setae omitted; b, posterior abdominal tergites, uropods and telson; f, dorsal view, setae omitted on right side, antennae and left third pereopod missing. Ovigerous ♀, cl. 11.0 mm, P-1355: c, right third maxilliped, ventrolateral view; d, anterior sternites and coxae of chelipeds, setae omitted; e, right antennular peduncle, eye and rostrum, ventrolateral view. Scales in mm.

length of rostrum; margins subparallel in basal half, convex and serrate distally, apex acute, often with apical spinule. Frontal margin with distinct sharp post-antennal spine; no tooth at anterolateral angle; notch lateral to angle; triangular tooth at anterior termination of slightly convex lateral margins; otherwise, margins of carapace unarmed.

Abdomen pubescent except on most prominent surfaces of swellings and on surfaces sliding beneath preceding segment, unarmed. Second, third and fourth tergites each with blunt transverse ridge, followed by shallow groove on second and third tergites. Fifth and sixth tergites without sculpturing.

Sternum armed with 4 sharp spines between coxae of chelipeds: central 2 spines curved mesially; lateral spines smaller, with denticles laterally.

Eyes colorless; 1 large spine projecting anteriorly from center of cornea; length of eyespine less than diameter of cornea, but more than 1/2 diameter; smaller sharp spine on ventromesial part of cornea projecting from distal margin of eyestalk. Calcification, with setae, covering large part of corneal surface.

Basal segment of antennular peduncle swollen; 2 distolateral spines, ventral spine longer, broader at base; 1 small tooth on distomesial margin.

Basal segment of antenna with lateral spine and broad ventromesial tooth. Second segment with lateral spine and small ventromesial tooth; transverse indentation in dorsal surface. Third segment with lateral and mesial tooth distally. Dorsolateral lobe of distal segment with denticle distally. Flagellum approximately twice carapace length.

Endopod of merus of third maxilliped with 2 small teeth or spines

on ventromesial margin: 1 proximal, 1 in middle of segment; occasionally 1 or 2 minute teeth distally. Ischium with blunt ventral carina with 1 small tooth distally; mesial border serrate with approximately 18 teeth.

Pereiopods lightly sculptured, dorsolateral surfaces of proximal segments scabrous; dorsal surfaces with many short setae; dactylus of ambulatory legs and both fingers of chelipeds noticeably lacking pubescence found on other segments; several larger longer, non-plumose, setae scattered mainly on mesial and ventral surfaces. No epipods on chelipeds or ambulatory legs.

Chelipeds short, broad, slightly longer than total carapace length. Manus and half of carpus only extending beyond apex of rostrum; width of manus $1/2$ length. Dactylus less than $1/2$ length of propodus. Propodus and carpus dorsoventrally flattened; double row of small rounded teeth on distolateral margin of fixed finger; tips of fingers spooned, dentate; teeth continuing proximally on abutting dorsal margins, gape between margins ventrally. Carpus less than $1/2$ length of propodus; 1 small tooth on distal margin dorsally; another on mesial margin near distal end of segment. Merus subtriangular in cross section; distal margin with 1 small tooth dorsally and 1 large tooth at each angle; dorsal surface expanded with row of 5 or 6 smaller teeth diminishing in size proximally. Ischium with several teeth on distal margin: largest tooth dorsal, 1 or 2 ventrolateral; ventromesial prolongation with small tooth on mesial margin.

Second, third and fourth pereiopods similar. Second pereiopod extending beyond cheliped by $1/2$ length of dactylus; dactylus of third and fourth pereiopods each reaching distal margin of propodus of preceding leg. Tip of dactylus pale brown, followed on flexor margin by

series of 8 or 9 denticles diminishing in size proximally; corneous spinule projecting from anterior edge of each denticle. Distoventral margin of propodus with 2 movable spines separated by small denticulate lobes; otherwise, propodus unarmed. Carpus approximately 1/2 length of propodus; distal margin with 2 sharp dorsal teeth, 2 indistinct, slightly tuberculate ridges dorsally; 1 or 2 blunt teeth on mesial ridge on second pereopod; slight protuberance at this location on third and fourth pereopods; occasionally few minute denticles on distoventral margin. Merus slightly longer than propodus, laterally compressed with lateral surface dorsally oriented; 2 sharp teeth on distal margin: 1 mesial, 1 lateral, with smooth lobular projection between; similar projections on distal margin ventromesially; row of 4 or 5 spines and tubercles on flexor margin, row of 6 or 7 distinct spines on extensor margin of second and third pereopods, less distinct on fourth pereopods; all projections decreasing in size proximally. Ischium unarmed.

Fifth pereopods with merus expanded, lateral surface slightly scabrous.

Protopod of uropod with posterolateral margin in 3 lobes, minute denticles between lobes; 1 small tooth on posterior margin mesial to notch. Exopod and endopod with granular denticles on lateral margins; similar but larger denticles or spinules on exposed surface of endopod and exopod.

Telson broader than long, divided into 8 plates; anterior plate with slight medial inflation; posterior margin with small medial indentation.

Color.--Specimens examined are preserved in alcohol and are devoid of pigment.

Size.--♂, cl. 8.4 mm,

♀, cl. 7.4-11.0 mm,

ovigerous ♀, cl. 7.8-11.0 mm.

The male holotype increases the size range of males to 11.0 mm.

Sexual dimorphism.--The male specimen has an inconspicuous row of setae on the posterolateral margins of the telson; there are no setae in this location on female specimens. The chelipeds of the male are slightly broader and longer than those of a female of comparable size, and the opposing margins of the fingers are sinusoidal in the male, straight in the female. A larger female (cl. 11.0 mm) has a slight gape between the fingers, with a small blunt projection on the fixed finger; the margins are straight in the distal half.

Habitat.--Data on the bottom type were not recorded for any of the 3 PILLSBURY stations where M. ramahtaylorae was taken.

Types.--The holotype is a male, cl. 11 mm, USNM 138232; the paratype is also a male, cl. 10 mm, USNM 7807.

Type locality.--Near St. Barthelemy, Lesser Antilles, OREGON Sta. 6696, 649-667 m.

Geographic range.--Munidopsis ramahtaylorae has been collected infrequently from widespread locations throughout the Caribbean Sea: in the north, near Cuba; in the east, near St. Barthelemy; in the south, from the coast of Colombia; and in the western Caribbean, off Honduras. The type locality and another location south of Cuba reported by Pequegnat and Pequegnat (1971: 11) are the only records so far published.

Bathymetric range.--Possible range for the material examined is 408-634 m, which falls within the calculated range for previously reported depths of 368-649 m; possible previous range was 368-667 m.

Parasites.--No parasites were found on the specimens examined, and there are no records of parasitism in this species.

Associates.--Munidopsis erinaceus was collected at all 3 PILLSBURY stations where M. ramahtaylorae was taken; M. riveroi was taken at 2 of these stations. The index of affinity was calculated between M. ramahtaylorae and these at 0.24 for the first species, and 0.29 for the second.

Relationships.--Munidopsis ramahtaylorae is similar to M. spinocolata (A. Milne Edwards); both species have the characters used to distinguish M. spinocolata from other species of Munidopsis in the keys presented by Benedict (1902), Chace (1942) and Pequegnat and Pequegnat (1970). See Table 1 for comparison of characters of these 2 species and those of M. subspinocolata (p. 344). M. ramahtaylorae, however, has the rostrum slightly decurved, with the lateral margins convex, and lacking a median longitudinal carina, whereas M. spinocolata has the rostrum straight or slightly upturned, with straight lateral margins, and a distinct longitudinal carina. Also, M. ramahtaylorae has the dorsal surface of the carapace smoother, more pubescent, and with the lateral margins convex, compared to the ridged carapace of M. spinocolata which has straight lateral margins and setae restricted to transverse rows.

Munidopsis ramahtaylorae bears some resemblance to M. bermudezi Chace from which it can easily be distinguished by the absence of epipods on the chelipeds, the absence of spines on the gastric region of

the carapace, the central location of the large eyespine, and the lack of an anterolateral spine on the frontal margin of M. ramahtaylorae.

Munidopsis ramahtaylorae appears to be related to M. hendersoniana Faxon, from the Gulf of Panama. M. hendersoniana however, has the rostrum bluntly carinate and longer with respect to carapace length, the dorsal surface of the carapace lateral to the gastric region concave, and the pereopods with larger, evenly-spaced spines.

Munidopsis riveroi Chace, 1939

Figures 35, 36

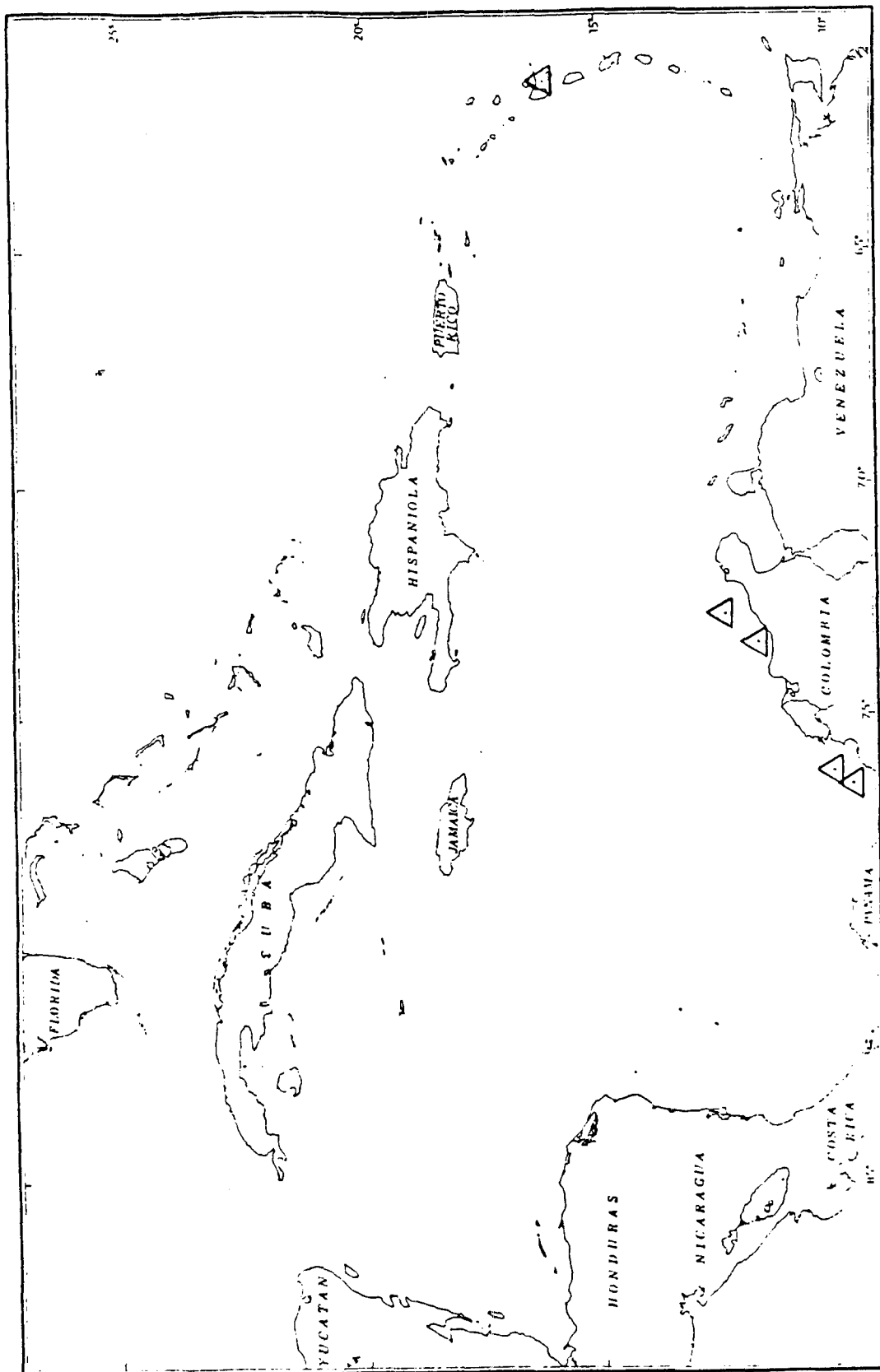
Munidopsis riveroi Chace, 1939: 48; 1942: 75 (key), 93-95, figs. 31, 32.

--Pequegnat and Pequegnat, 1970: 140 (key); 1971: 6 (key), 21-22.

Material examined.--Off Atlantic coast of Colombia: P-374, 434-373 m, 1 ♂, 9.6 mm, (USNM); P-394, 416-634 m, 2 ♂, 9.1, 12.0 mm, 2 ovigerous ♀, 12.8, 13.5 mm, (USNM); P-776, 408-576 m, 5 ♂, 6.8-12.3 mm (1 with branchial parasite), 1 ♀, 10.5 mm, 3 ovigerous ♀, 11.2-14.8 mm, UMMNL 32:5264; P-781, 567-531 m, 1 ♂, 12.5 mm, 2 ♀, 8.1, 12.5 mm (with branchial parasite), 5 ovigerous ♀, 14.2-15.5 mm, (RMNH).--Off Guadeloupe: P-923, 476-686 m, 1 ♂, 12.0 mm (with branchial parasite), (RMNH). Distribution plot 13.

Diagnosis.--Rostrum unarmed, broad hood-like, dorsally excavate, apex drawn out to point; no spines on dorsal surface or margins of carapace, but several raised tuberculate areas on inflated gastric region; frontal margin with post-antennal lobe; second, third and fourth abdominal tergites armed with blunt median tooth on each of 2 transverse carinae; eyes unarmed; no epipods on pereopods.

Description.--Carapace distinctly longer than broad ($cw/cl = 0.80-0.85$); slightly narrower anteriorly; dorsal surface transversely convex, various areas decorated with tubercles and distinct groups of tubercles arranged somewhat symmetrically, nearly all body surfaces pubescent, smooth between decorations; cervical groove visible as broad transverse indentation with oblique anterior and posterior branches extending to lateral margins. Gastric region further inflated, well-defined anteriorly and laterally by groove extending across base of rostrum, turning



Distribution plot 13.--*Munidopsis riveroi* Chace, 1939 collected by the PILLSBURY.

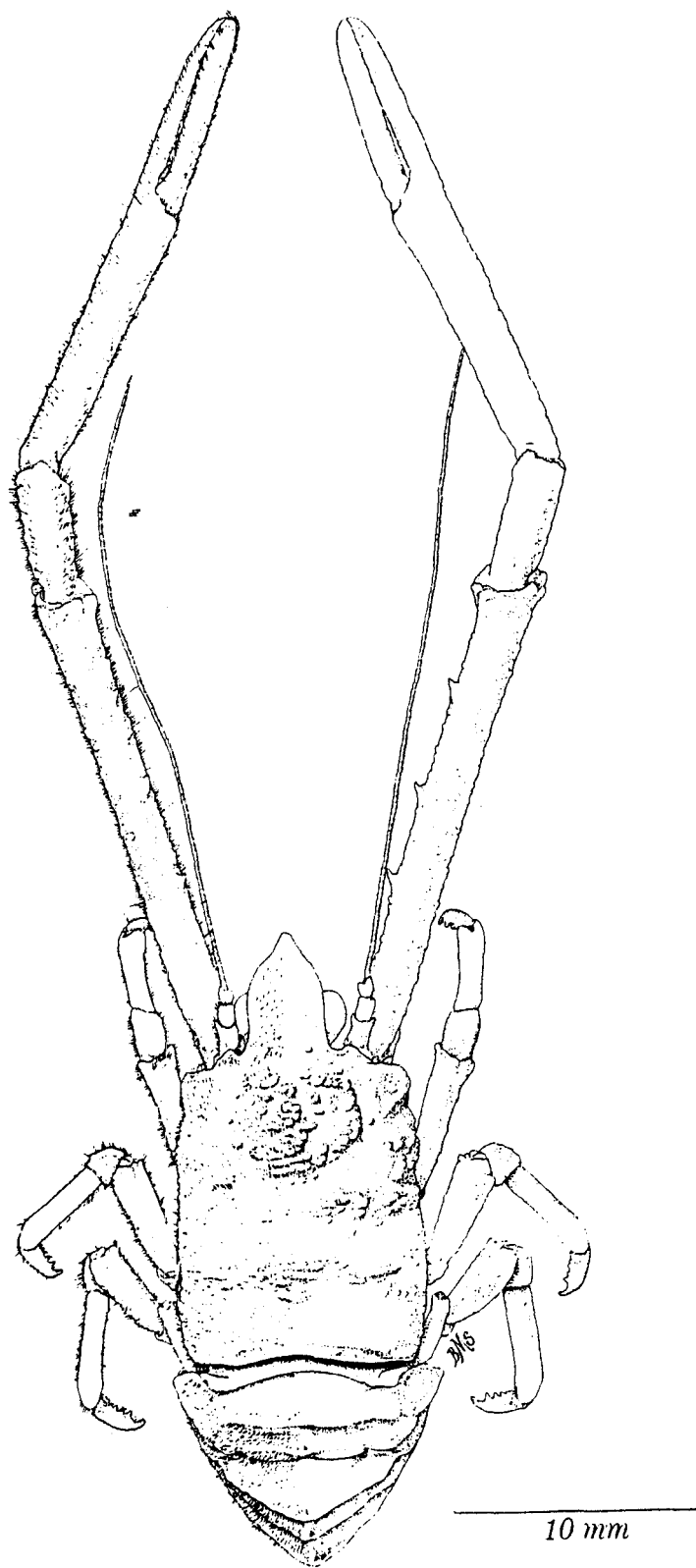


Figure 35. --*Munidopsis riveroi* Chace, 1939, ♂, cl. 12.0 mm, P-394, dorsal view.

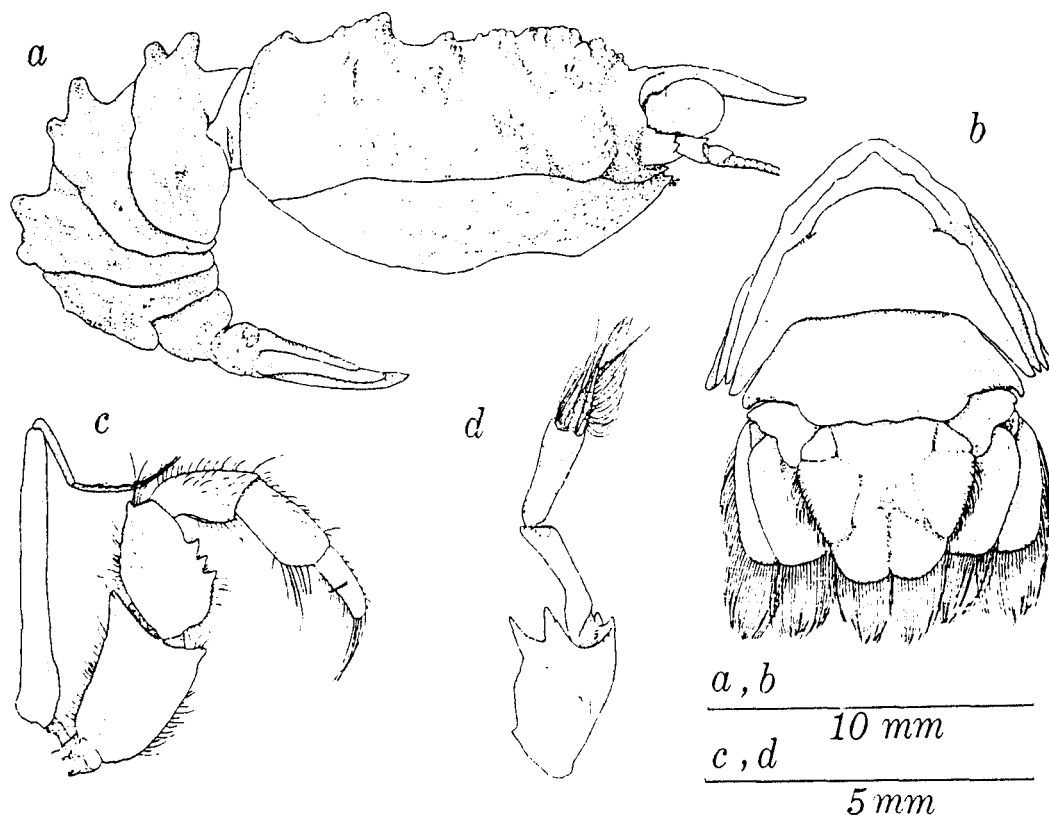


Figure 36. --Munidopsis riveroi Chace, 1939, ♂, cl. 12.0 mm, P-394:
a, lateral view of carapace and abdomen, setae omitted; b, posterior abdominal tergites, telson and uropods, setae shown on posterior margins of telson only; c, right third maxilliped; d, right antennule; latter two ventrolateral view.

posteriorly behind antenna; center of gastric region armed with most prominent cluster of tubercles; smaller cluster anteriorly on midline; front of gastric region with pair of irregular transverse groups of granules, several small groups behind this on either side; prominent sculpturing also posterior to central protuberance; groups of tubercles arranged transversely, extending to lateral margins on raised areas behind cervical groove; forward part of cardiac region in raised tuberculate crest; transverse rows of tubercles on cardiac region posteriorly; hepatic regions granulate or tuberculate, sculpturing most dense near margins. Rostrum broad, hood-like; lateral margins subparallel from base to just beyond eyes, tapering distally to apex, tip often somewhat drawn out, slightly upturned, margins minutely dentate; dorsal surface with broad medial excavation, protuberances or tubercles arranged symmetrically on either side of excavation, basal pair most prominent. Frontal margin with slight rim curving away from base of rostrum to tuberculate post-antennal lobe. Anterolateral angle rounded, densely tuberculate but unarmed. Lateral margin unarmed; indentation at lateral termination of anterior branch of cervical groove; convex between this and slight indentation at terminus of posterior branch of cervical groove. Posterior margin unarmed; leading edge or raised rim minutely granulate, obscure sculpturing posterior to ridge.

First abdominal tergite with smooth rounded flange at posterolateral margin. Second, third and fourth tergites each with 2 transverse carinae armed medially with blunt triangular tooth; anterior ridge sharper, extending to lateral margins of pleura, second tergite with knob approximately $\frac{2}{3}$ distance to margin of pleura; posterior carina rounded; pleura of third, fourth and fifth segments narrowed laterally; fifth

segment with medial knob anteriorly followed by 2 pairs of shallow oval depressions with few or no setae; similar depressions on sixth segment; posterolateral margins of sixth segment with distinct rounded lobes.

Sternum smooth, devoid of setae except for few on rounded intersegmental ridges.

Eyes movable, unarmed; cornea conspicuous, dilated.

Spinule projecting from plate at intersection of bases of eye, antennule and antenna.

Basal segment of antennular peduncle enlarged, but ventrolateral inflation somewhat flattened; anterior surface with sharp dorsal spine and large spine beneath and slightly mesial; ventromesial projection dentate.

Basal segment of antenna with small lateral protuberance and ventral spine. Second segment with dorsal projection proximally at articulation; sharp lateral spine on distal margin. Third segment with small sharp dorsolateral spine on distal margin and minute spinule or protuberance mesially and laterally. Fourth segment with lateral projection terminating in sharp spine. Flagellum reaching to manus of cheliped or beyond fingers.

Ischium of endopod of third maxilliped with sharp dorsal carina terminating in spine; rounded ventral edge terminating in sharp point. Merus concave laterally, flexor margin with 2 or 3 small triangular teeth following curved proximal edge; extensor margin with small distal tooth. Carpus with several minute tubercles on extensor (dorsal) surface.

No epipods on chelipeds or ambulatory legs.

Chelipeds $2 \frac{1}{2}$ to 3 times carapace length, subcylindrical, slender. Manus almost $\frac{1}{2}$ length of cheliped, width approximately $\frac{1}{9}$

length. Dactylus slightly less than $1/2$ length of manus; mesial margins of both fingers very straight, finely toothed along dorsal abutting edges, several tufts of long golden setae on dorsal and ventral surfaces, narrow gape basally; tips spooned, dentate. Manus setose, smooth, with few scattered obscure tubercles. Carpus short, less than $1/4$ length of manus, dorsal and mesial swellings minutely tuberculate at distal articulation; scattered tubercles. Merus approximately same length as manus; tubercles distinct; dorsomesial row of 3 or 4 sharp spines; distal margin with transverse row of small tubercles across dorsal surface, and ventromesial spine; ventrolateral projection often with several spinules near tip. Ischium with blunt dorsal projection, ventral prolongation unarmed.

Second, third and fourth pereopods similar, short. Tip of second pereopod not reaching $1/2$ length of merus of cheliped. Dactylus approximately $1/2$ length of propodus; curved corneous tip followed on flexor margin by 4 or 5 triangular teeth decreasing in size proximally, leading edge sometimes with setae, but no corneous spinules; ventral surface with many short setae, some in tufts. Propodus smooth, subcylindrical, length increasing proportionately from second to fourth pereopod, most surfaces pubescent; blunt tooth on flexor margin near distal articulation. Carpus unarmed, setose, with obscure longitudinal dorsolateral elevation. Merus laterally compressed, expanded flexor margin straight, obscurely denticulate on ridge-like edge, longitudinal depression below ridge; scattered low tubercles on lateral surface more distinct on third and fourth pereopods; merus becoming proportionately shorter and broader from second to fourth pereopods; mesial surface smoother with fewer setae. Ischium short, not distinctive.

Expanded merus of fifth pereopod with distal half of exposed surface setose, flexor margin with flattened denticulate expansion midway along length; another obscure tooth distally on flexor margin.

Protopod of uropod with margin of posterolateral lobe obscurely dentate.

Telson broader than long, consisting of 10 plates, slightly narrower posteriorly; posterior margin with medial indentation.

Color.--All specimens examined has been preserved in alcohol and were devoid of color except for certain thick golden setae on telson and other appendages. No records of color in this species were found in the literature.

Size.--♂, cl. 6.8-12.5 mm,
♀, cl. 8.1-15.5 mm, and
ovigerous ♀, cl. 11.2-15.5 mm.

Sexual dimorphism.--Males have the dense comb of setae on the posterolateral margins of the telson; these setae are lacking in females. Chelipeds of both males and females have only a narrow gape between the bases of the almost straight fingers; males have the chelipeds slightly longer proportionately than do the females. Females, particularly large ovigerous specimens, have the abdomen noticeably broader and fuller.

Habitat.--Of the stations where M. riveroi was collected, the bottom type was recorded only at P-781; the bottom there consisted of mud and pteropod shells.

Types.--The holotype is a male, cl. 12.8 mm, MCZ 10230. The paratype

is an ovigerous female, cl. 13.8 mm.

Type locality.--North coast of Cuba (Nicholas Channel off Punta Sagua la Grande, Santa Clara Province), ATLANTIS Sta. 2989, 659 m (360 fm).

Geographic range.--Munidopsis riveroi has been collected from locations throughout the Caribbean and along the north coast of Cuba, and with some regularity along the north coast of South America. Apart from the locations listed herein for material, the following localities have been reported in the literature: North coast of Cuba (Chace, 1939: 48; 1942: 93); Caribbean Sea: Honduras, Colombia, Venezuela, Dominica, St. Barthélemy, Haiti (Pequegnat and Pequegnat, 1971: 22).

Bathymetric range.--The possible depth range for material collected by the GERDA and PILLSBURY is 373-686 m; calculated range is 434-531 m. Possible range including previous records is 338-914 m; calculated range including previous records is 430-860 m.

Parasites.--The branchial parasites mentioned in the listing of material are bopyrid isopods of the genus Pseudione, probably an undescribed species.

One of the male specimens from P-776 has several colonies of campanulariid hydroids attached to the propodi of the second and third pereopods.

No records of parasites appear in the literature.

Associates.--An index of affinity between M. riveroi and M. erinaceus was calculated at the relatively high significance point of 0.34; the index for M. riveroi with M. ramantaylorae and M. polita was 0.29 and

0.23 respectively.

Relationships.--Munidopsis riveroi can be included in the Elasmonotus group of species including other western Atlantic species, M. brevimanus (A. Milne Edwards), M. longimanus (A. Milne Edwards) and M. alaminos Pequegnat and Pequegnat. The rostrum of M. riveroi is more acuminate than that of the first two of these, and broader than that of the third. M. riveroi has larger eyes and longer, narrower chelipeds than any of these. It is less spiny than M. alaminos, has the abdominal tergites less prominent dorsally than M. longimanus, and the carapace more strongly arched transversely with the raised portions more coarsely tuberculate than M. brevimanus.

Munidopsis robusta (A. Milne Edwards, 1880)

Figures 37, 38

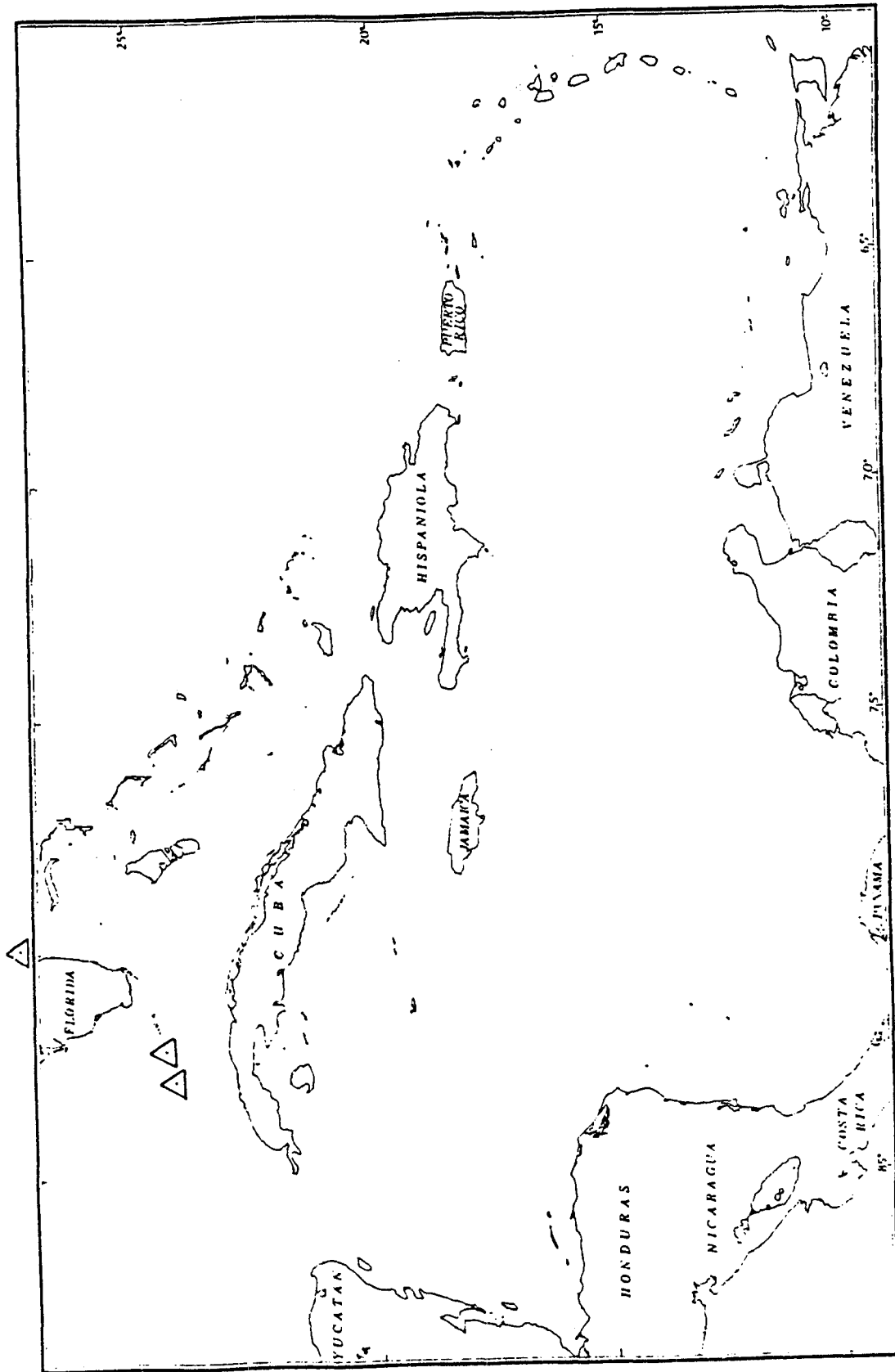
Galathodes robustus A. Milne Edwards, 1880: 54.

Munidopsis robusta: A. Milne Edwards and Bouvier, 1894: 275 (key); 1897: 69-71, pl. VI, figs. 15-20, pl. VII, fig. 1.--Young, 1900: 407 (key), 411.--Benedict, 1902: 277 (key), 325 (list).--Doflein and Balss, 1913: 175 (list), 178 (table).--Chace, 1942: 74 (key).--Springer and Bullis, 1956: 15.--Bullis and Thompson, 1965: 9.--Pequegnat and Pequegnat, 1970: 140 (key), 155, fig. 5-1, table 5-2; 1971: 6 (key).

Material examined.--Straits of Florida: G-654, 324 m, 1 ovigerous ♂, 19.1 mm, (USNM); G-970, 512 m, 2 ♀, 11.9 mm, 16.2 mm (with branchial parasite) UMML 32:5265; G-1099, 1 ovigerous ♀, 16.5 mm, (RMNH).--Gulf of Mexico: 439-454 m, 1 ♀, 18.1 mm UMML 32:2488.--Off Surinam: OREGON Sta. 4301, 366 m, 1 ovigerous ♀, 17.5 mm, (USNM). See distribution plot 14.

Diagnosis.--Rostrum triangular, spine-like, dorsally tuberculate, laterally serrate, but unarmed; rostrum flexed upward or with sharp distal upturn; gastric region of carapace with large central protuberance or blunt spine and 5 smaller protuberances arranged anterior to this; frontal margin with triangular post-antennal lobe, with tubercles anteriorly; sharp triangular tooth at anterolateral angle directed anterolaterally; posterior margin with blunt medial spine; second, third and fourth abdominal tergites with medial spine; eyes unarmed; no epipods on chelipeds or ambulatory legs.

Description.--Carapace distinctly longer than broad ($cw/cl = 0.85-0.95$); broadest posteriorly, strongly convex transversely; dorsal surface



Distribution plot 14.--*Munidopsis robusta* (A. Milne Edwards, 1880) collected by the GERDA.

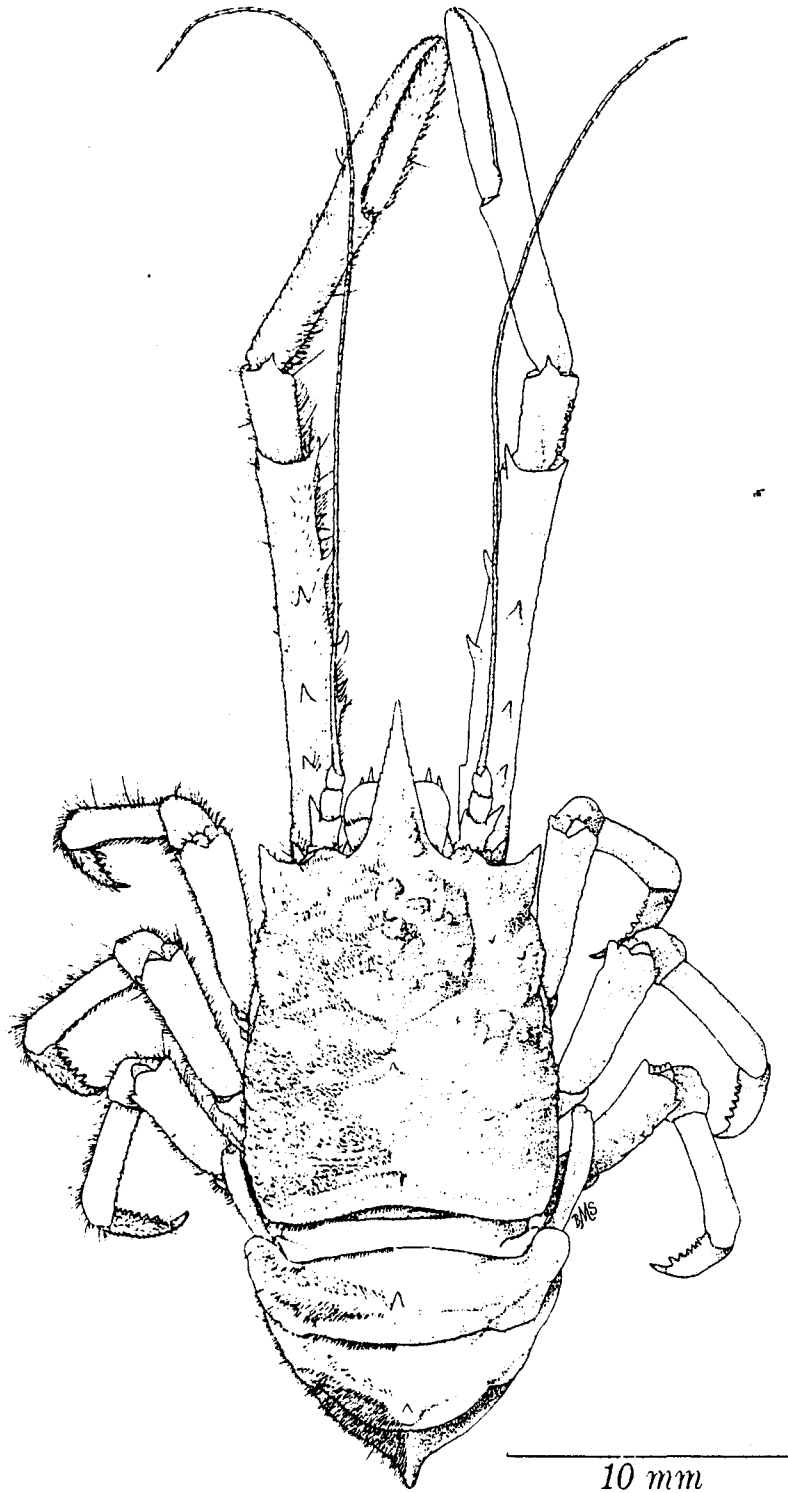


Figure 37. --*Munidopsis robusta* (A. Milne Edwards, 1880), ♀, cl. 11.9 mm, G-970, dorsal view, setae omitted from right side.

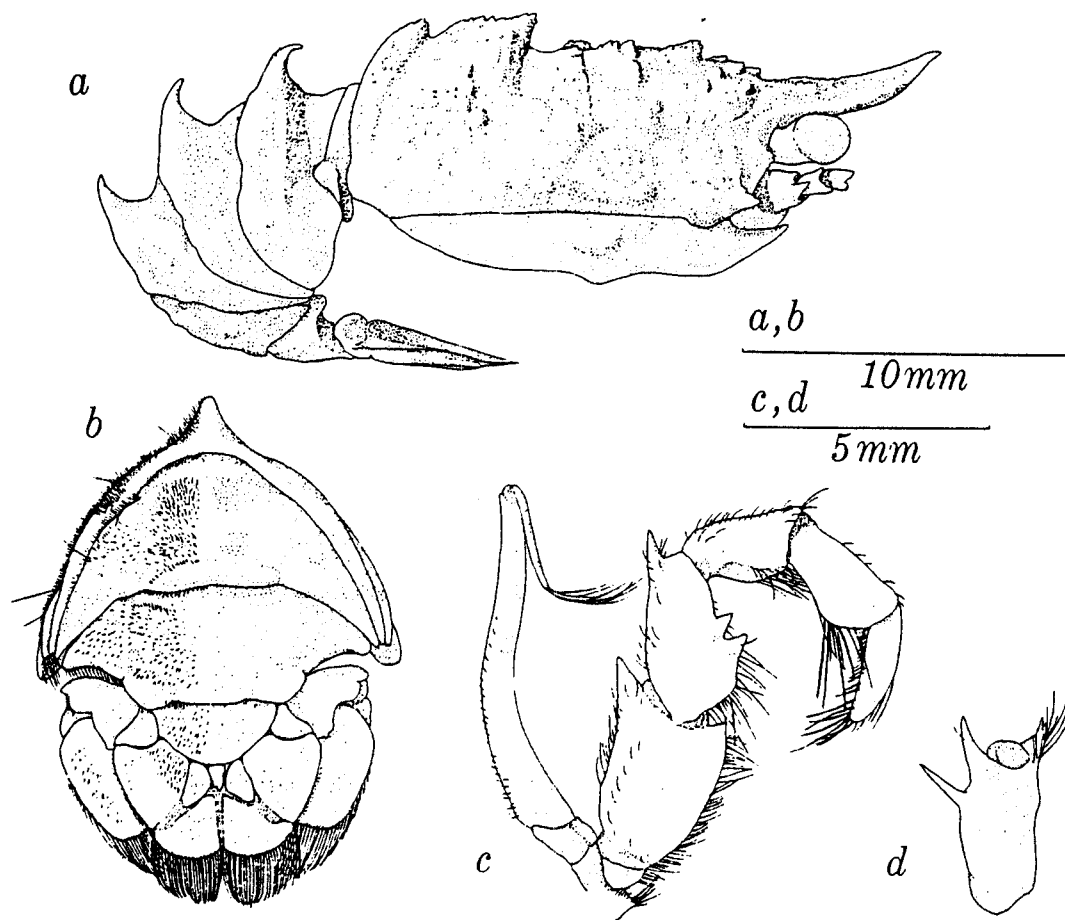


Figure 38. --*Munidopsis robusta* (A. Milne Edwards, 1880). ♀, cl. 11.9 mm, G-970: a, lateral view of carapace and abdomen, setae omitted; b, posterior abdominal tergites, telson and uropods (exopods hidden beneath endopods, setae omitted from right side). ♀, cl. 16.2 mm: c, right third maxilliped, ventrolateral view; d, basal segment of right antennular peduncle, ventrolateral view.

decorated with many knobs and tubercles, densely pubescent in smooth areas between protuberances; regions well-defined; gastric region not greatly inflated, bordered posteriorly by central part of shallow cervical groove; deep indentation on either side at bifurcation of cervical groove; posterior branch oblique, deeper than anterior branch, both delimiting epibranchial region; hepatic region separated from gastric region by shallow smooth depressions; postcervical groove smooth, distinct extending laterally nearly to margins then curving to merge with posterior branch of cervical groove; branchiocardiac grooves less distinct. Center of gastric region with prominent knob with tubercle or tooth directed dorsally and forward; smaller medial tooth or tubercle anterior to this preceded by widely-spaced pair of tuberculate crest-like protuberances, and followed by 2 pairs of protuberances laterally; 5 distinct protuberances arranged around posterior margin of gastric region, and 1 protuberance on either side; groups of 3 or 4 low tubercles anterior to lateral protuberances. Metagastric region with transverse crescentic row of tuberculate swellings posterior to cervical groove. Anterior raised part of cardiac region with medial conical tooth on anterior edge; several tuberculate swellings posteriorly; similar sculpturing in 2 irregular oblique rows extending anterolaterally on metabranchial regions, and on swelling behind and slightly mesial to epibranchial region; coarse tubercles lateral to this and on epibranchial and hepatic regions. Rostrum triangular, dorsally inflated, lateral rounded surfaces of swelling with pairs of tuberculate protuberances merging and becoming indistinct on rounded dorsal carina; rostrum flexed upward from frontal margin or with distal upturn; lateral margins serrate distally beyond eyestalks; ventral surface with rounded carina. Frontal

margin with triangular post-antennal lobe tuberculate or dentate anteriorly. Anterolateral angle with broad triangular tooth, projecting anterolaterally and terminating in spine. Lateral margins tuberculate from carapacial sculpturing; portion of branchiostegite visible in dorsal view below and behind epibranchial region. Posterior margin finely sculptured; raised rim beaded on leading edge with medial projection tooth-like.

First abdominal segment with posterolateral articular flange rounded. Second, third and fourth abdominal tergites with large medial conical spine; anterior transverse swelling on second, third and fourth tergites with distinct ridge extending laterally to pleuronal margins, becoming tuberculate laterally; second and third tergites with transverse swelling on posterior half; posterior part of fourth tergite and fifth and sixth tergites relatively smooth; fifth tergites with 4 obscure ovate depressions centrally; sixth tergite with posterolateral lobes.

Sternum unarmed; intersegmental depressions followed by rounded transverse swellings with rows of short fine setae; shallow longitudinal depression in center between sternites of ambulatory legs.

Eyestalks movable; mesial edge pinched, mesial surface indented, projected onto cornea as dorsomesial lobe; cornea dilated, somewhat elongate and inflated anteromesially; cornea of preserved specimens somewhat corneous; facets small, barely perceptible.

Basal segment of antennular peduncle not swollen, elongate, relatively slender; distal margin armed dorsolaterally with sharp triangular spine; smaller sharp spine posterior and slightly lateral to this; sharp ventromesial spine with setae on distal margin and smaller dorsomesial tooth; spines on basal segment reaching beyond eyes but not

beyond rostrum. Extended second segment, as well as distal segment of peduncle and flagellum, reaching beyond rostrum.

Basal segment of antennal peduncle unarmed except for low lateral tooth with setae. Second segment with dorsomesial knob at articulation near basal margin; distal margin with sharp conical lateral spine and small lobe just mesial to it. Distal margin of third segment with dorsal, slightly lateral spinule, and lateral denticle. Dorsolateral projection of last segment terminating in small spine. Flagellum more than twice carapace length, reaching well beyond tip of chelipeds.

Carpus of endopod of third maxilliped with several small tubercles in longitudinal, slightly lateral, row on extensor margin, terminating in sharp spinule on distal margin. Merus with sharp dorsal spine at distal end of extensor margin; proximal part of flexor margin projected into laterally compressed lobe with distal triangular tooth, often with smaller tooth distally adjacent. Ischium with dorsal tooth distally; flexor margin projected into ventral carina terminating in broader, blunter tooth; mesial carinate margin with corneous teeth.

No epipods on chelipeds or ambulatory legs.

Chelipeds 2 to 2 1/2 times carapace length. Manus less than 1/2 cheliped length, unarmed, slightly compressed dorsoventrally; width of manus 1/7 to 1/8 manus length in females. Dactylus approximately 1/2 length of manus; fingers fairly straight, finely toothed and abutting along entire length of dorsal opposing margins; tips slightly spooned; ventral surface excavate, gaped, with 4 distinctive tufts of heavy golden setae on mesial surface of each edge, and several smaller tufts. Carpus short, with sharp dorsal spine on distal margin; proximal dorsal surface with 2 rows of tubercles, becoming obscure distally.

Merus with sharp spine at each of dorsolateral, dorsomesial and ventromesial angles of distal margin; dorsal surface with 3 large spines in longitudinal row, and smaller spine distal or proximal to these, 2 or 3 spines mesial to these; surface elsewhere tuberculate, setose, with setae conspicuous on mesial surfaces. Ischium with large conical tooth dorsally; ventral projection with smaller tooth near distal margin.

Second, third and fourth pereopods similar, setose, particularly on mesial surfaces and on all surfaces of dactyli. Dactylus of second pereopod reaching to or just beyond distal margin of merus of cheliped. Dactylus shorter than propodus, but more than 1/2 length, curved; brown corneous tip strongly curved, followed on flexor margin by series of 6 or 7 sharp conical teeth, decreasing in size proximally, each with thick seta on anterior edge. Propodus unarmed, subcylindrical. Carpus short, obscurely tuberculate, unarmed. Merus shorter and broader proportionately proceeding from second to fourth pereopods; dorsal edge slightly raised, obscurely tuberculate; dorsolateral surface tuberculate, tubercles more prominent on fourth pereopod; unarmed except for small triangular tooth distolaterally, more prominent on second and third pereopods. Ischium unarmed.

Merus of fifth pereopods expanded, 1 or 2 small teeth on flexor (ventral) margin.

Uropods with posterolateral margin in 2 lobes; margin of anterior lobe irregular at articulation of exopod; posterior margin of posterior lobe with 2 or 3 blunt, obscure denticles.

Telson broader than long, composed of 10 articulated plates; large lateral plate with low rounded tubercle near center; posterior margin slightly indented.

Color.--The specimens examined were preserved in alcohol and were devoid of any pigment except for the brown corneous tips of the pereopodal dactyli, certain thick golden setae on the mouthparts and other appendages, and the translucent yellowish corneae. No records of color in this species were found in the literature.

Size.--Only females are represented in the GERDA collections; 2 ovigerous females, cl. 16.5, 19.1 mm and 2 females without eggs, cl. 11.9, 16.2 mm (the latter with a large branchial parasite). Other material examined was within these ranges.

Sexual dimorphism.--As indicated above, only female specimens of M. robusta were examined. These have the fingers of the cheliped abutting along their entire dorsal margins and only a few fine setae along the posterolateral margins of the telson.

Habitat.--The bottom type was recorded at only one of the GERDA stations where this species was collected: it consisted of pteropods and grey mud.

Type.--The holotype is an ovigerous female, cl. approximately 17 mm; MCZ 6339.

Type locality.--Off Grenada, BLAKE Sta. 258, 281 m (159 fm).

Geographic range.--Munidopsis robusta has been collected throughout the Gulf of Mexico, and in the western Atlantic from northern Florida to Surinam. This species appear to be more abundant and widespread in the Gulf of Mexico and on both sides of Florida than in any other area where it has been taken. It has not been collected in the Caribbean

Sea, except for the single type specimen from Grenada. Apart from the type locality and the localities listed herein, the following locations have been reported in the literature: NE Gulf of Mexico, southern Straits of Florida (Springer and Bullis, 1956: 15); east of northern Florida (Bullis and Thompson, 1965: 9); NW, SW and NE Gulf of Mexico (Pequegnat and Pequegnat, 1970: 155).

Bathymetric range.--Possible and calculated depth ranges for the material examined are the same, 324-622 m. Possible depth range including previous records is 110-824 m; calculated range based on previous records is 110-476 m. Thus GERDA station 1099 in the Straits of Florida is the deepest confirmed record (622 m) for M. robusta.

Parasites.--The branchial parasite on a specimen from G-970, is a bopyrid isopod identified as Pseudione, probably of an undescribed species.

The only record of parasitism in M. robusta is an abdominal parasite, the type specimen of a rhizocephalan, Tortugaster fistulatus Reinhard (1948: 33) found on a specimen of M. robusta from off Tortuga, Florida.

Associates.--Other species of Munidopsis (M. erinaceus and M. polita) were taken with M. robusta at only one GERDA station.

Relationships.--A. Milne Edwards and Bouvier (1897: 71) suggested affinities between Munidopsis robusta and M. serratifrons (A. Milne Edwards); the latter, however, is a much smaller species with a prominent pair of gastric spines, 2 medial cardiac spines, 3 pairs of posterior branchial spines, more abdominal spines, a carinate rostrum and immovable eye-stalks in addition to numerous other distinguishing characters. The

general shape of the carapace and rostrum is somewhat similar, however, and this species may be M. robusta's closest western Atlantic relative. M. sericea Faxon and M. margarita Faxon from the eastern Pacific were also reported as closely related to M. robusta; the first definitely belongs in the group with 2 sharp lateral spines on the rostrum which contains M. erinaceus and M. spinifer, rather than with M. robusta. M. margarita, however, is closer to M. robusta. M. margarita also displays a close similarity in many features with M. serratifrons which serve to distinguish both from M. robusta.

Remarks.--All reports in which the sex of the specimens examined is presented indicate that so far only females of this species have been collected. As the reports of Springer and Bullis (1956: 15) and Bullis and Thompson (1965: 9) do not give details about the fairly large quantity of material they had, it is possible that some males were collected by the OREGON.

Munidopsis rostrata (A. Milne Edwards, 1880)

Figures 39, 40

Galacantha rostrata A. Milne Edwards, 1880: 52.--Smith, 1882: 21, pl. IX, figs. 2, 2a; 1884: 355.--A. Milne Edwards and Bouvier, 1894: 271 (key), 322; 1897: 60-63, pl. IV, figs. 21-24; 1900: 308-311, pl. VI, fig. 9 (color).--Faxon, 1893: 180; 1895: 78-79, pl. B, figs. 1, 1a. --Benedict, 1902: 304-305 (list).--Stebbing, 1908: 20.--Hansen, 1908: 35-36.--Fowler, 1912: 575-576.--Doflein and Balss, 1913: 174 (table). Perez, 1927: 285 (sexual dimorphism).--Barnard, 1950: 494, fig. 92, e-f.--Haig, 1955: 39-40.--Tirmizi, 1966: 206 (key), 206-209, figs. 23, 24.--Kensley, 1968: 284 (list), 292.

Munidopsis rostrata: Smith, 1885: 493; 1886: 649, pl. VI, figs. 1, 1a. --Chace, 1942: 72 (key), 75-76.--Pequegnat and Pequegnat, 1970: 138 (key); 1971: 4 (key).--Miyake and Baba, 1970: 95 (list).

Galacantha Talismani Filhol, 1885, pl. 3.--Perrier, 1885: 295, 341, fig. 242, no. 8.

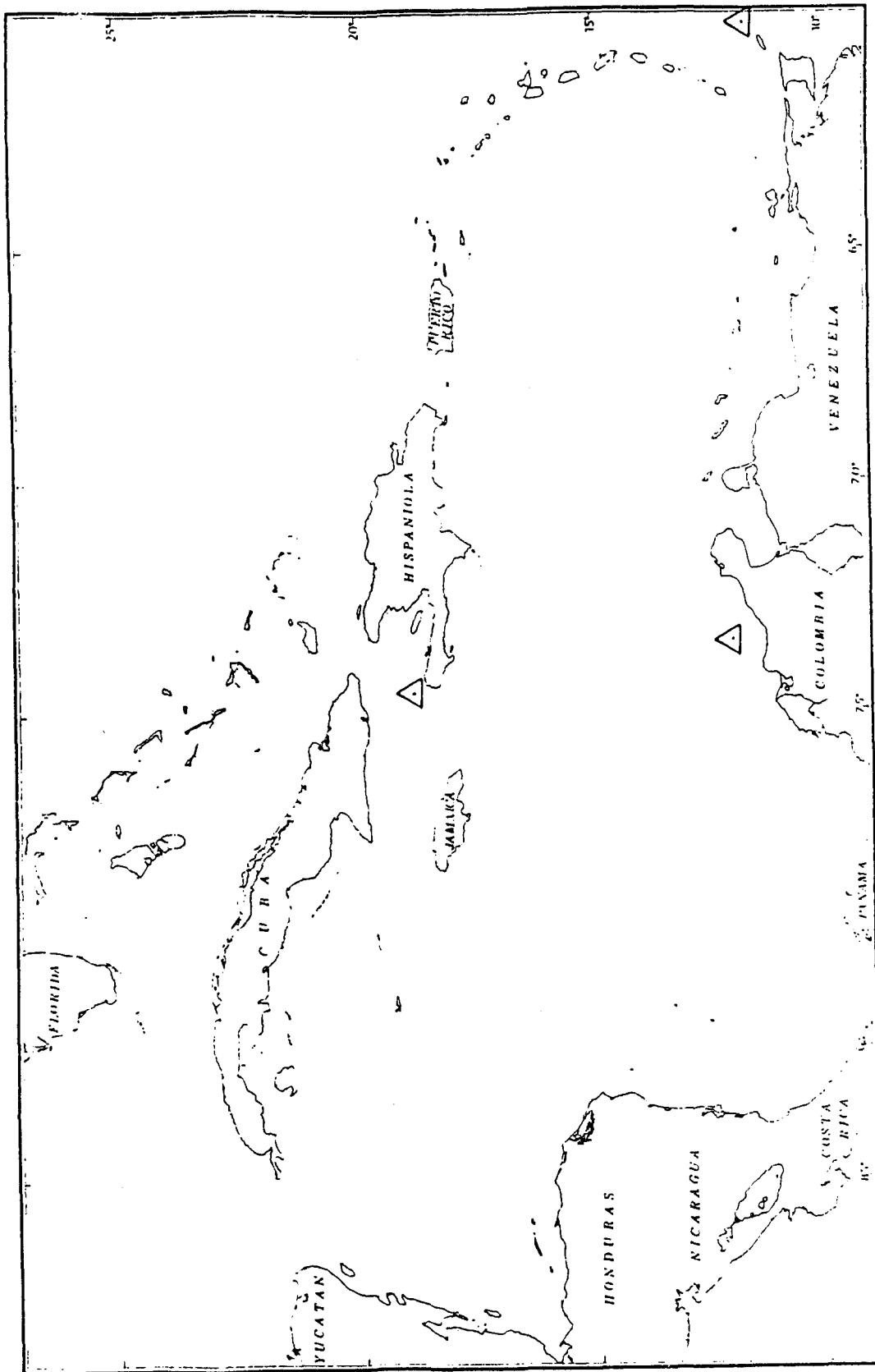
Galacantha talismanii: Henderson, 1888: 167, pl. XX, fig. 1.

Galacantha bellis Henderson, 1885: 418; 1888: 167-168, pl. XIX, fig. 6. --Murray, 1895: 1129.

Galacantha areolata Wood-Mason and Alcock, 1891: 200.--Alcock and Anderson, 1894: 173.--Illustrations of Zoology of the Investigator, Crustaceans, 1901: pl. 55, figs. 5, 5a.

Galacantha investigatoris Alcock and Anderson, 1894: 173.--Illustrations of Zoology of the Investigator, Crustaceans, 1901: pl. 12, fig. 4. --Benedict, 1902: 304 (list).

Galacantha rostrata var. investigatoris Alcock, 1901: 275 (key), 276-277.



Distribution plot 15.--*Munidopsis rostrata* (A. Milne Edwards, 1880) collected by the PILLSBURY.

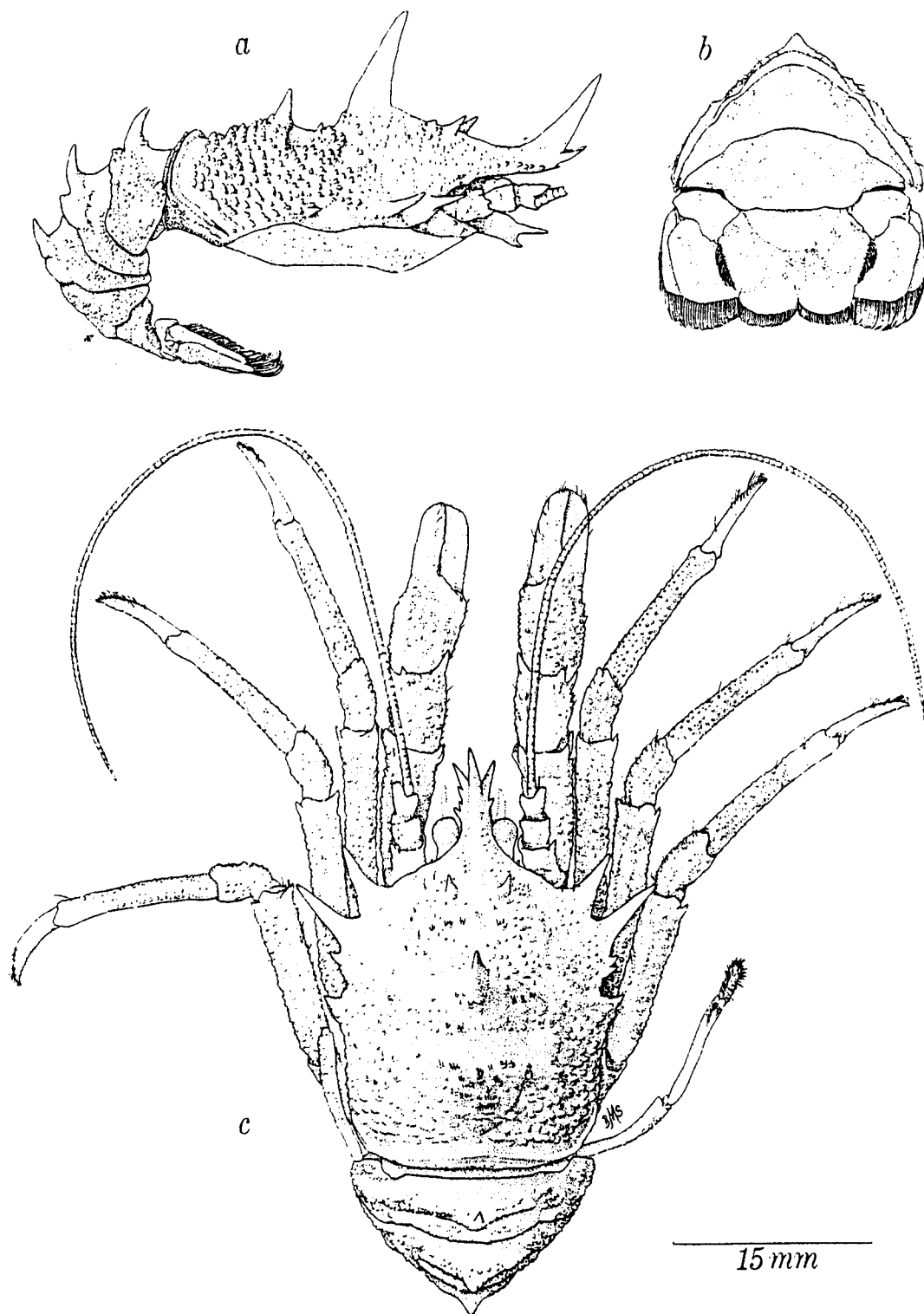


Figure 39. --*Munidopsis rostrata* (A. Milne Edwards, 1880), ♂, cl. 21.7 mm, P-844: a, lateral view of carapace and abdomen; b, posterior abdominal segments, uropods and telson; c, dorsal view. Some setae omitted.

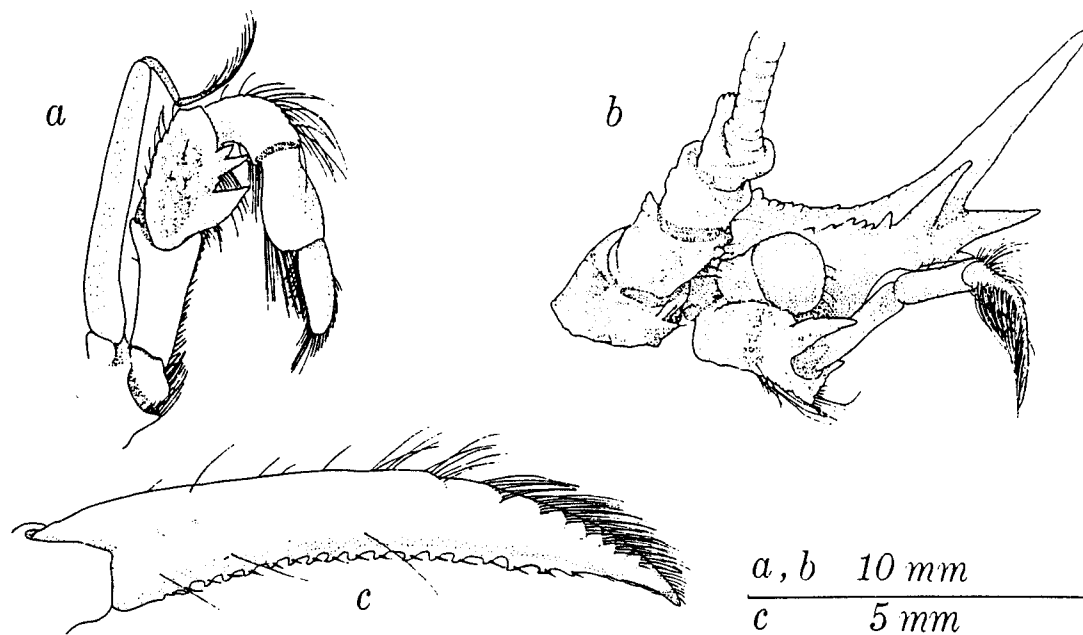


Figure 40. --*Munidopsis rostrata* (A. Milne Edwards, 1880), ♂, cl. 21.7 mm, P-844: a, right third maxilliped, ventrolateral view; b, rostrum, eye, antennule and antenna, ventrolateral view; c, dactylus of right third pereiopod, lateral view.

Galacantha faxoni Benedict, 1902: 304 (new name for Faxon's material).

Material examined.--Off Atlantic coast of Colombia: P-782, 2669-2626 m, 1 ♂, 26.3 mm, (RMNH).--Off Tobago: P-844, 1464-1848 m, 1 ♂, 21.7 mm (with abdominal parasite), 1 ♀, 20.0 mm, UMML 32:5266.--Gonave Bay, Haiti: P-1181, 2489-2548 m, 1 ♀, 11.5 mm, (RMNH). See distribution plot 15.

Diagnosis.--Rostrum narrow, horizontal proximally with strong distal upturn, armed laterally at distal part of horizontal portion; gastric region of carapace with prominent pair of spines anteriorly and huge laterally-compressed spine projecting upward from posterior part; frontal margin unarmed between rostrum and sharp anterolateral spine; posterior margin unarmed; median spine on second, third and fourth segments; eyes unarmed; epipods on chelipeds and first 2 pairs of ambulatory legs.

Description.--Carapace longer than broad ($cw/cl = 0.82-0.89$), moderately convex transversely; cervical groove discernible as smooth crescent in center of tuberculate carapace, anterior and posterior lateral branches obscure; postcervical groove broader, smooth, extending across central 1/3 of carapace, terminating laterally in depressions; anterolateral to each of these, on either side of gastric region, another smooth rounded depression. Anterior gastric region with pair of prominent conical spines; posterior gastric region with huge laterally-compressed median spine projecting dorsally and slightly anteriorly; anterior ridge of cardiac region with median spine equal in size to anterior gastric spines. Rostrum narrow, dorsally carinate, horizontal in basal portion; distal portion projecting upwards as laterally-compressed spine similar to median gastric spine; pair of smaller spines projecting anterolaterally

and slightly upward from distal termination of horizontal portion, followed on base of lateral margins by 1 or more pairs of smaller teeth. Frontal margin unarmed between base of rostrum and large, flattened anterolateral spine; anterolateral spine followed by longer similar spine projecting anterolaterally from lateral margins and occasionally by additional small triangular tooth. Lateral margin with notch indicating termination of posterior branch of cervical groove, followed by triangular tooth or blunt tuberculate protuberance. Raised ridge bordering posterior margin of carapace sharply carinate; carina followed by transverse line of tubercles; area with sculpturing broader at posterolateral angles.

Abdomen with large median spine on anterior ridge across center of second, third and fourth tergites. Two transverse tuberculate carinae across tergites; pleura with coarser tubercles, especially on second segment; anterior ridge interrupted laterally, with tuberculate swelling lateral to depression. Fifth segment smooth, unarmed, with slightly oblique nearly longitudinal channel in same location as depressions on preceding tergites; center obscurely punctate, weak tubercles laterally and on sixth tergite. Sixth tergite with channels shallower, more oblique.

Sternum with intersegmental grooves and setiferous ridges distinct; anterior plate between chelipeds concave, occasionally with pair of rounded tubercles; longitudinal median furrow between pereopods on second through fourth sternites.

Eyes movable, prominent, unarmed; cornea ovoid, slightly inflated.

Short tooth emerging from intersection of bases of eyestalk, antenna and antennule.

Basal segment of antennular peduncle enlarged; lateral swelling

tuberculate anteriorly; distal margin with large, slightly incurving dorsolateral tooth, short dorsomesial tooth, and minutely denticulate ventral projection. All setae associated with tubercles and margins long and fine.

Basal segment of antennal peduncle broad, immovable; distal margin with small triangular ventromesial projection, and larger, blunter lateral projection. Second segment broad, with small tooth proximally at mesial articulation; triangular lateral projection on distal margin with groove and small lobe mesially on dorsal surface; ventromesial tuberculate protuberance near distal margin. Third segment with scattered tubercles; distal margin with dorsolateral and ventromesial minutely denticulate crests. Distal margin of fourth segment with dorsolateral part projected anteriorly. Antennal flagellum 3 to 4 times carapace length.

Ischium of endopod of third maxilliped terminating distally in triangular point on ventromesial angle and small tooth dorsolaterally. Merus with broad basal tooth on flexor margin followed by smaller sharp spine, 2 spines, or bifid spine; lateral surface and extensor margin tuberculate. Carpus with lateral part of extensor margin slightly expanded, weakly tuberculate.

All pereopods with tubercles, usually multidenticate, arranged over most exposed surfaces. Epipods present on chelipeds and first 2 pairs of ambulatory legs.

Chelipeds approximately 1 1/2 times carapace length. Dactylus more than 1/2 length of manus; fingers dorsoventrally compressed; dorsal surfaces smooth; opposing margins toothed and abutting along entire length; tips spooned with large teeth; fingers gaped ventrally. Manus approximately 1/2 length of cheliped; palm broader than fingers; dorsal palmar

surface with coarse tubercles arranged in irregular longitudinal rows, sculpturing weaker on ventral surface. Carpus more than $1/3$ length of chela, with large dorsomesial spine on distal margin; 1, 2 or 3 smaller triangular spines dorsolaterally near distal margin. Merus shorter than chela, armed distally with sharp mesial, ventromesial and lateral spine; distal margin with denticulate crest dorsally, with small triangular tooth near lateral termination. Ischium with conical dorsal tooth and ventral tooth near distal termination of ventral prolongation.

Second, third and fourth pereopods quite similar. Dactylus of second pereopod reaching beyond chelipeds; dactyli of third and fourth pereopods reaching middle of dactylus of preceding leg. Dactylus approximately $1/2$ length of propodus, corneous brown tip followed on flexor margin by series of approximately 18 small triangular teeth, each armed on anterior edge with short curved setae; distal half of extensor margin with 2 parallel rows of setae forming fringe. Propodus slender, subcylindrical, tubercles arranged in longitudinal rows on dorsal and lateral surface; tubercles weaker, sparse on ventromesial surface; ventral surface with lobe lateral to notch near distal margin bearing movable spinule. Carpus slightly more than $1/3$ length of propodus; flexor margin slightly expanded, coarsely tuberculate; distal tubercles prominent; longitudinal row of smaller tubercles dorsolaterally. Merus with terminal triangular spine on either side of lobe on distal margin, dorsomesial spine larger. Ischium with small dorsal tooth on distal margin. Merus of fifth pereopod tuberculate on exposed lateral surface; cristate flexor margin with several ventral projections.

Protopod of uropod with posterior lobe notched, minutely serrate lobe lateral to notch and 2 small teeth mesial to notch. Exposed

surface of protopod and endopod tuberculate.

Telson broader than long, narrower anteriorly and posteriorly; divided into 10 plates, medial plate slightly inflated; tubercles arranged somewhat symmetrically on mesial part of most plates; posterior margin with medial indentation.

Color.--A color slide of a freshly-caught Munidopsis rostrata shows the animal to be completely red-orange, with the spines, distal segments of the appendages and antennae slightly darker, and the corneae paler orange.

Smith (1884: 355) reported the colors of recently-preserved material collected off the east coast of the United States as dark purplish-red, with lighter red antennal flagella and nearly white eyes.

A. Milne Edwards and Bouvier (1900:311) reported the general color of the body as white tinted with orange, with spines of the "shell" and appendages, the sides and numerous band on the abdomen, and the greatest part of the surface of the legs vivid orange, as are the ocular peduncles. The colored figure (A. Milne Edwards and Bouvier, 1900: pl. VI, fig. 9) shows the colors as described above, except that the background color appears to be more yellowish.

Hansen (1908: 36) reported the INGOLF specimens as reddish-yellow, with pale red eyes.

The material examined is preserved in alcohol and is chalky or creamy white except for the brown corneous tips of the ambulatory dactyli and the golden color of thicker setae.

Alcock (1901: 276) reported specimens from the Indian Ocean varying from dull chalky-orange to bright orange-red with whitish patches.

Size.--Specimens taken by the PILLSBURY fall within the following ranges:

♂, cl. 21.7-26.3 mm, and

♀, cl. 11.5-20.0 mm.

Males have been reported with cl. equalling 34.5 mm (Smith, 1882: 355); thus M. rostrata attains a larger size than most other species in the genus.

Sexual dimorphism.--The most striking secondary sexual character is the "comb" of thick golden setae on the posterolateral margins of the telson of the males; marginal setae are completely lacking in this location on the females. The males have the fingers of the cheliped abutting along their entire margins, as do the females.

Habitat.--The bottom at P-1181 consisted of fine yellow mud. Globigerina ooze and blue mud are the principle bottom types reported for stations where M. rostrata has been collected previously.

Type.--The holotype is a female with cl. approximately 18 mm, MCZ 4740.

Type locality.--Off Bequia, Lesser Antilles, BLAKE Sta. 236; 2912 m (1591 fm).

Geographic range.--This species is one of the most widespread in the genus, having been taken on both sides of the Atlantic and Pacific Oceans as well as in the Indian Ocean. This report extends its Caribbean range south to the coast of Colombia, and further south in the western Atlantic to Tobago. Locality records found in the literature are as follows: Western North Atlantic: off eastern coast of United States (Smith, 1882: 21; 1884: 355; 1886: 649); Caribbean Sea: S of Cuba (Chace, 1942: 76),

Lesser Antilles (A. Milne Edwards, 1880: 33); North Atlantic, W of Iceland (Hansen, 1908: 36); eastern Atlantic: near Canary Islands (A. Milne Edwards and Bouvier, 1900: 311), near Cape Point, South Africa (Stebbing, 1908: 20; Barnard, 1950: 494; Kensley, 1968: 292); eastern Pacific: off coast of Chile (Henderson, 1885: 418), Gulf of California and near the Galapagos (Faxon, 1895: 78); western Pacific, near Banda (Henderson, 1888: 167); and the Indian Ocean: Bay of Bengal (Wood-Mason and Alcock, 1891: 200), Arabian Sea (Alcock and Anderson, 1894: 33).

Bathymetric range.--Munidopsis rostrata is a deep-water species, which has not been found shallower than 1600 m. Possible depth range for specimens collected by the PILLSBURY is 1464-2669 m; calculated depth range is 1848-2626 m, which falls within the previously reported range of 1647-2912 m.

Parasites.--The male specimen from P-844 has a small rhizocephalan, probably Sacculina sp., attached beneath the second segment of the abdomen. No other parasites were found on the material examined. No records of parasitism in this species were found in the literature.

Associates.--Munidopsis rostrata was the only Munidopsis taken at 2 of the 3 PILLSBURY stations where it was found.

Relationships.--Munidopsis rostrata is a member of the relatively distinctive Galacantha complex of species with extreme development of carapacial spines. The old genus Galacantha was one of the last to be merged with Munidopsis. Although Smith (1885: 493) included it in Munidopsis, citing M. bairdi as intermediate, several recent authors (Barnard, 1950: 494; Haig, 1955: 39; Tirmizi, 1966: 206; and Kensley, 1968:

292) have continued to split the two, despite the arguments and additional intermediate species (M. cubensis Chace, M. expansa Benedict and M. gilli Benedict) presented by Chace (1942: 69). Chace admits that the typical forms can be recognized readily by the abnormal development of dorsal carapacial spines, but he states that the latter three species, along with G. camelus Ortmann, show the unreliability of the form of the rostrum (horizontal proximally with distinct distal upturn) which A. Milne Edwards and Bouvier considered so important in defining the genus. There is no question, however, that the Galacantha-like species are closely related to one another. There has been some controversy over the validity of some of the species included in the synonymy of M. rostrata, but there is general agreement (Chace, 1942: 76; Stebbing, 1908: 20; and Faxon, 1895: 79) that M. rostrata is a variable abyssal species distributed world-wide.

Munidopsis spinosa (A. Milne Edwards) is the closest relative to M. rostrata in the western Atlantic; the former can be easily distinguished from M. rostrata by the lack of lateral spines on the rostrum and the greater number of median cardiac spines on the carapace.

Munidopsis trachynotus Anderson and M. valdiviae Doflein and Balss, from the Arabian Sea and the east coast of Africa respectively, are very close to M. rostrata, both having the basal portion of the rostrum armed with lateral spines. M. trachynotus, however, has the posterior margin of the carapace as well as the lateral parts of the abdominal carinae armed with a row of small spines and the general sculpturing of the carapace is more spinulate. M. valdiviae has only one prominent anterolateral spine, rather than two. M. diomedae Faxon, from the eastern Pacific, has no lateral spines on the rostrum, smaller gastric spines than

M. rostrata, rugose sculpturing posterolaterally on the carapace, and often lacks a median spine on the fourth abdominal tergite.

Munidopsis serratifrons (A. Milne Edwards, 1880)

Figures 41, 42

Galathodes serratifrons A. Milne Edwards, 1880: 55.Munidopsis serratifrons: Henderson, 1888: 149-150, pl. XVI, fig. 3.--A.

Milne Edwards and Bouvier: 275 (key); 1897: 78-80, pl. VI, fig. 1-5.

--Young, 1900: 407 (key), 410-411.--Benedict, 1902: 277 (key), 326

(list).--Doflein and Balss, 1913: 175, 176 (lists), 178 (table).--

Chace, 1942: 73 (key), 85-86.--Pequegnat and Pequegnat, 1970: 139

(key), 155-156, table 5-3; 1971: 5 (key).

Material examined.--Bahama Islands: G-190, 733-897 m, 1 ♂, 7.8 mm, (RMNH);

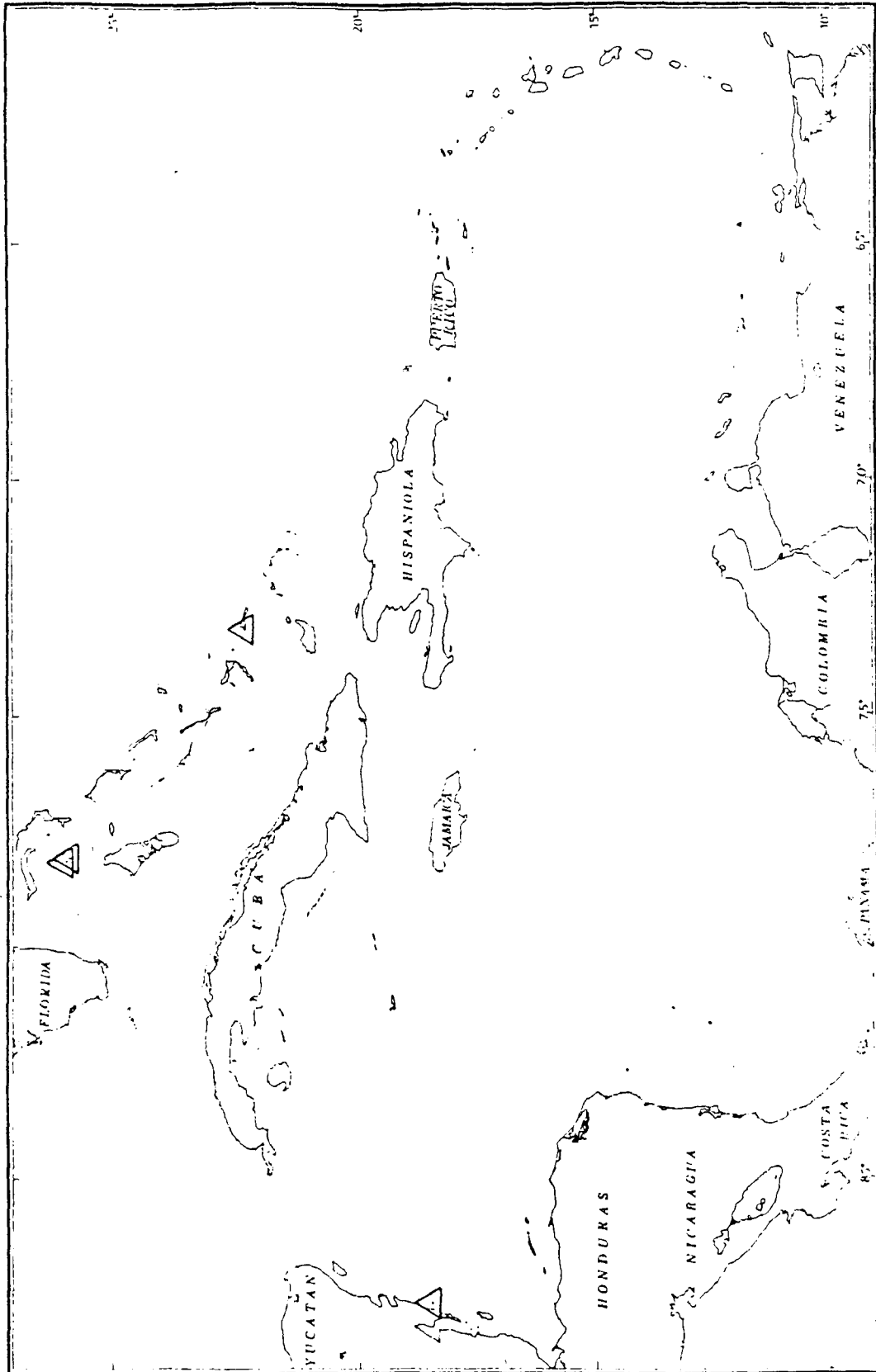
G-191, 824-860 m, 2 ♂, 9.2, 11.0 mm, (USNM); (Mayaguana Passage) P-1438,

770-742 m, 1 ovigerous ♀, 6.0 mm, UMML 32:5268.--Off Yucatan, Mexico:

P-607, 715-787 m, 1 ♂, 8.4 mm, 1 ♀, 7.2 mm, UMML 32:5267. Distrib. plot 16.

Diagnosis.--Rostrum unarmed, lateral margins serrate, nearly horizontal or gently flexed upward; gastric region of carapace with 1 pair of widely-spaced sharp spines; frontal margin unarmed, post-antennal lobe with denticles, but no major spine; posterior margin armed with 1 pair of sharp curved spines; second and third abdominal tergites with lateral spine on either side of medial spine, third with additional medial spine, fourth with single medial spine; eye with dorsomesial denticle on surface of cornea; no epipods or pereopods.

Description.--Carapace, measured from behind eyes, slightly longer than broad ($cw/cl = 0.85-0.95$), broadest posteriorly; dorsal surface evenly granulate or tuberculate, tubercles spinulate anteriorly; cervical groove distinct, transverse centrally behind gastric region, turning forward



Distribution plot 16.--*Munidopsis serratifrons* (A. Milne Edwards, 1880)
collected by the GERDA and PILLSBURY.

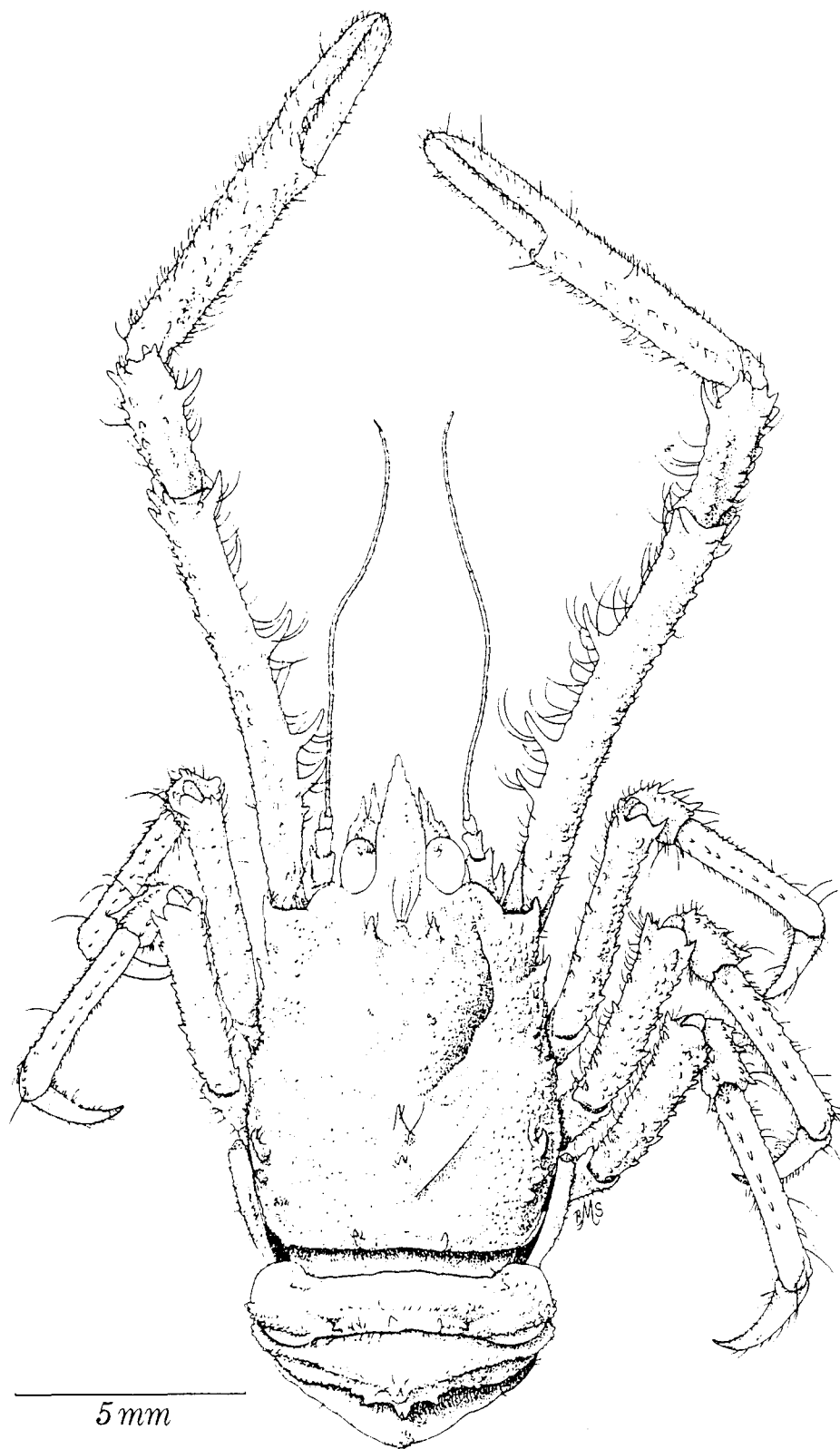


Figure 41. --Munidopsis serratifrons (A. Milne Edwards, 1880), ♀, cl. 7.2 mm, P-607, dorsal view, left fourth pereopod missing.

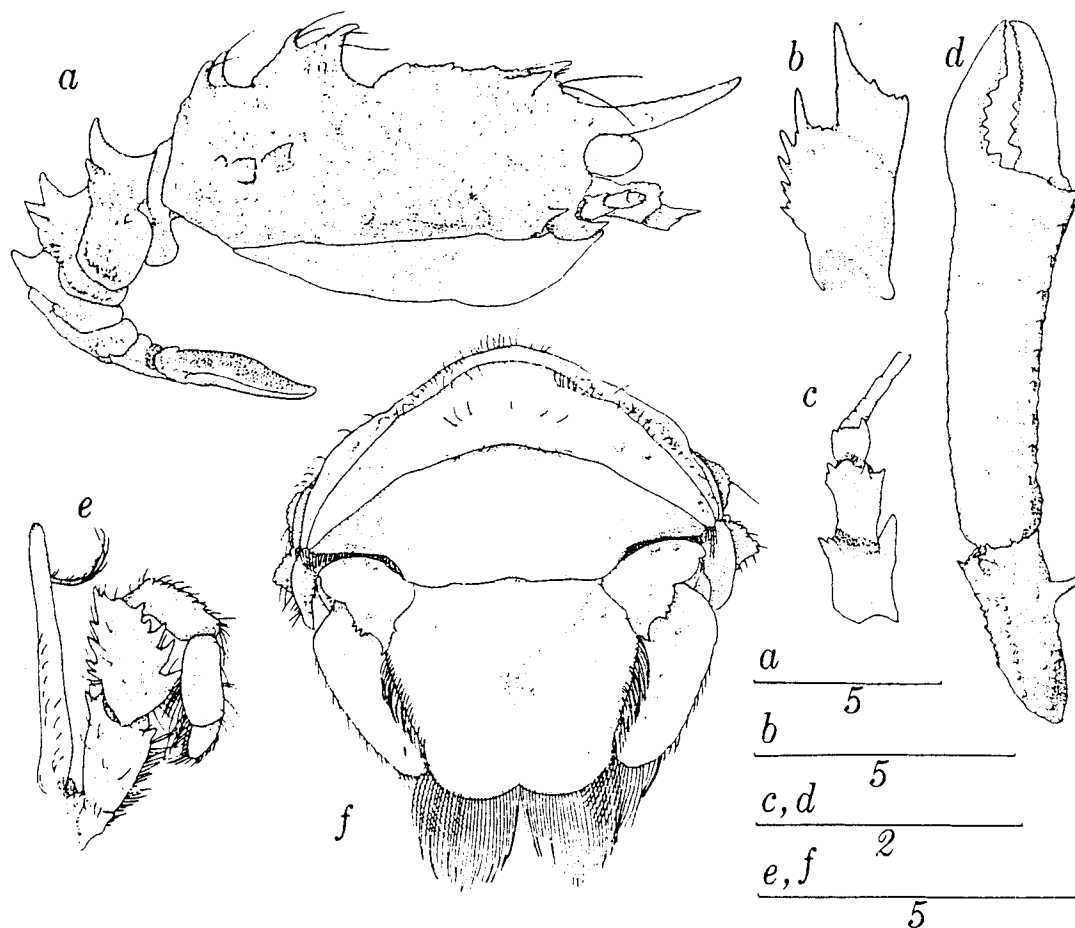


Figure 42. --*Munidopsis serratifrons* (A. Milne Edwards, 1880). ♂, cl. 11.0 mm, G-191: a, lateral view of carapace and abdomen, only major setae on carapace shown; d, carpus and manus of cheliped, dorsal view, setae not shown; e, right third maxilliped, ventrolateral view. ♂, cl. 9.2 mm, G-191: b, right antennular peduncle, lateral view, setae omitted; f, posterior abdominal tergites, telson and uropods (exopods hidden beneath endopods). ♀, cl. 7.2 mm, P-607: c, right antennular peduncle, dorsal view, setae omitted. All scales in mm.

laterally; anterior branch distinct, continuing obliquely to lateral margin; posterior branch less distinct as shallow smooth depression; post-cervical groove adjacent and posterior to central part of cervical groove, extending across central third of carapace, connecting pair of small oval depressions on either side in front of cardiac region. Gastric region greatly inflated, armed anteriorly with large pair of spines, medial tuberosity with several long thick setae slightly anterior to spines; larger medial swelling posterior to spines flanked by small spinulate protuberance on either side, similar protuberances arranged symmetrically anterolateral, lateral and posterior to major spines. Center of inflated cardiac region with large spine curved forward, followed by smaller spine; metabranchial region with longitudinal series of 3 large projections near lateral margins: most anterior spine largest, curved anteromesially, followed by small tooth-like tuberculate protuberance. Rostrum approximately $\frac{1}{3}$ carapace length, broad at base, lateral margins subparallel, smooth between eyes, serrate distally, tapering to apex; rostrum nearly horizontal or flexed upward from base; dorsal surface with evenly distributed granules on either side of strong medial carina; carina denticulate in distal $\frac{2}{3}$; 1 pair of tubercles prominent near base; ventral surface smooth. Frontal margin curving smoothly behind eyes to rounded post-antennal lobe, armed anteriorly with several minute denticles. Anterolateral spine large, well-developed. Lateral margin with similar spine just behind termination of anterior branch of cervical groove; spinules or tubercles enlarged just behind lateral termination of posterior branch of cervical groove. Posterior margin inflated, armed with pair of large curved spines and many small granules.

First abdominal tergite with knob or tubercle on articular flange.

Second tergite with prominent rounded tooth projecting posterolaterally from raised anterior margin near articulation with first segment; anterior part of segment smooth; posterior part with 2 transverse carinae: first indistinct medially, forming rounded denticulate ridge most prominent approximately 1/2 distance from center of tergite to pleural margin; second carina rounded, extending across tergite with 3 large curved spines centrally on posterior margin; 2 small teeth lateral to these; carina interrupted by short deep channel, then extending laterally from rounded swelling, curving slightly forward, and forming ornately spinulate crest; pleuron with granules on excavate dorsal surface. Third segment with large curved medial spine on anterior carina; carina extending laterally to margins as continuous dentate crest; second carina with large curved medial spine flanked on either side by a smaller curved spine and 2 small protuberances; channel interrupting swelling similar to preceding segment, rounded protuberance lateral to this followed by granules, but no projected ridge. Fourth segment with cristate anterior carina armed medially with large curved spine, followed by transverse swelling across tergite with rounded tubercle at lateral termination; larger tubercle lateral to indentation and smaller tubercles lateral and slightly anterior to this, occasionally with medial tubercle. Fifth segment relatively smooth, obscure swelling in position of posterior carina of previous segments and 3 lateral tubercles as above. Central portion of sixth tergite quadrate, posterior margin with posterolateral lobe; obscure tubercle lateral to this and 1 even more distinct lateral and anterior to this on mesial surface of slightly concave pleuron.

Sternum unarmed; intersegmental ridges distinct with setae following broad depression between coxae of pereopods.

Eyes large, immovable; eyestalk short, barely visible at base of slightly elongate cornea, extending out onto dorsomesial surface of cornea terminating in small but distinct spinule and strong setae along forward edge.

Basal segment of antennular peduncle with proximal half inflated laterally, swelling armed with several small tubercles or spinules on leading edge; dorsal margin expanded with series of irregular sharp teeth or spinules in longitudinal row, varying in size, but terminating in large sharp conical spine; distal portion narrower, with larger sharp distal spine dorsally and 2 small teeth below this. Second segment reaching tip of rostrum. Third segment and flagellum extending beyond rostrum.

Basal segment of antennal peduncle with large ventromesial spine, often with denticies on lateral edge. Second segment with large lateral spine on distal margin, spinule on mesial margin and dorsal protuberance proximally near basal articulation. Distal margin of third segment with small mesial, dorsal and lateral teeth. Fourth segment with lateral portion and projected mesial portion terminating in triangular tooth. Flagellum extending just beyond distal margin of merus of cheliped.

Carpus of endopod of third maxilliped with 6 or 7 small teeth along dorsal edge. Flexor margin of merus with 3 conical spines, basal spine largest, small one near distal margin; extensor margin with series of approximately 4 sharp spinules along dorsal edge, distal spinule largest; spinulate tubercles arranged evenly over lateral surface. Ischium with ventral carina terminating in sharp spine distally; dorsolateral edge with similar spine distally; ventrolateral face with several tubercles.

Pereiopods spinulate on all dorsal and lateral surfaces; sculpturing obscure on dactyli. No epipods on chelipeds or ambulatory legs.

Chelipeds 3 to 4 times carapace length, slightly compressed dorso-ventrally; mesial surface with long curved setae, especially prominent on merus. Width of manus $1/5$ to $1/6$ manus length. Dactylus less than $1/2$ length of manus. Fingers toothed along entire length of opposing margins dorsally; proximal half gaped, very narrow in females, pronounced in males; fingers hollowed ventrally, tips curved, spooned; dorsolateral and dorsomesial surfaces with short transverse rows or clusters of denticles, sometimes obscure. Manus with distinct longitudinal row of 6 or 8 small spines on dorsomesial edge, several other prominent spinules arranged irregularly on dorsal surfaces; ventral surface relatively smooth, with minute, often obscure tubercles. Carpus approximately $1/3$ length of manus; large curved spine prominent on dorsomesial edge about $1/3$ length from distal end; 3 longitudinal rows of 6 or more small spines located on dorsomesial, dorsal and dorsolateral ridges, with spine at distal termination. Merus approximately same length as manus; distal margin with slender sharp mesial and ventromesial spine; smaller lateral spine behind articular lobe and similar spine posterior and slightly dorsal to this; mesial surface with large curved spine about $1/2$ length from distal margin, and 2 similar spines more proximally. Short ischium with conical dorsal spine.

Second, third and fourth pereopods similar, slender, spiny. Dactylus of second pereopod reaching to distal margin of merus of cheliped. Dactylus slightly more than $1/2$ length of propodus, curved, tip corneous; flexor margin with series of 12 or more slender corneous spinules mounted on obscure swellings; extensor surface with obscure denticulate sculpturing, more distinct proximally; mesial surface with several tubercles in oblique row near proximal margin. Propodus with several longitudinal

rows of spinules; row of 7 to 10 on lateral face most distinct; dorso-lateral and dorsal row more irregular; dorsolateral row extending to distal margin. Carpus approximately 1/2 length of propodus, armed distally on extensor (dorsal) margin with small, sharp spine, followed by 3 sharp spinules; longitudinal row of approximately 6 spinules lateral to this on dorsolateral edge; lateral surface with 2 or 3 spinules. Merus of second pereiopod slightly longer than propodus, proportionate length of merus decreasing in third and fourth pereiopods; dorsal (extensor) margin raised, with several small spines along edge, proximal spines more prominent, terminating in conical spine on distal margin; ventral edge with many similar spines, and 1 on distal margin; lateral surface with spinules in irregular longitudinal rows; mesial and ventral surfaces relatively smooth. Ischium with small tooth dorsally and several spinules on mesial surface and on distolateral margins.

Merus of fifth pereiopods slightly expanded; distal 2/3 of lateral surface densely spinulate.

Protopod of uropods with 2 separated denticles on posterolateral margin, occasionally 2 denticles in place of lateral one. Endopod with several short calcified setae on exposed surface and on posterior margin.

Telson composed of 7 plates; small swelling slightly anterolateral to center of slightly concave lateral plate, and several minute tubercles on mesial portion; similar tubercle near posterolateral margin of anterolateral plate; posterior plates each with longitudinal row of 5 or 6 obscure tubercles; posterior margin barely indented medially.

Color.--All specimens examined were preserved in alcohol and were devoid of any pigment except for pale brown corneous tips on the dactyli of

pereiopods, and the golden color of the larger setae.

Size.--♂, cl. 7.8-11.0 mm,

♀, cl. 7.2 mm, and

ovigerous ♀, cl. 6.0 mm.

The only size recorded in the literature is for the type specimen which falls within these ranges.

Sexual dimorphism.--Males have the typical comb of thick golden setae on the lateral margins of the telson; this comb is lacking in females. Fingers of the cheliped are abutting along their dorsal length in females, while they are noticeably gaped in the larger males, and to a lesser degree in the smaller males. No obvious difference in the breadth of the abdomen was observed between sexes.

Habitat.--The bottom types at stations where Munidopsis serratifrons was taken were characterized variously as white clay, dead coral and rubble with pteropod shells and fine sediment.

Type.--The holotype is a male with cl. approximately 8 mm, MCZ 4748.

Type locality.--Off Dominica, BLAKE Sta. 185, 609 m (333 fm).

Geographic range.--Munidopsis serratifrons is known in the western North Atlantic from Bermuda to Dominica, from the Bahamas and Cuba, and in the Caribbean from off Yucatan. Apart from the type locality, records in the literature are: off Bermuda (Henderson, 1888: 149); off Havana, Cuba (Benedict, 1902: 326); and north coast of Cuba (Chace, 1942: 86).

Bathymetric range.--Possible range for the GERDA and PILLSBURY material

is 715-897 m; calculated depth range is 770-824 m. If previous records are included, possible and calculated ranges are the same, 604-1908 m, with the CHALLENGER record of 1075 fm off Bermuda greatly increasing the bathymetric range of this species.

Parasites.--The material examined is without any external evidence of branchial or abdominal parasitism; no reports of parasites were found in the literature.

Associates.--Other Munidopsis were taken at only 2 of the 4 GERDA and PILLSBURY stations where M. serratifrons was collected.

Relationships.--The relationship between M. serratifrons and M. robusta (A. Milne Edwards) is discussed in the species account of the latter. Although these two species have in common the general shape of the carapace and the lack of pereopodal epipods, M. robusta has the rostrum without a medial carina, the dorsal sculpturing on the carapace not as distinctly spinose, no posterior branchial spines, only 1 blunt medial spine or tooth on the posterior carapacial margin and on each of the second, third and fourth abdominal tergites.

A. Milne Edwards and Bouvier (1897: 80) mentioned an affinity of M. serratifrons with M. ornata Faxon, pointing out, however, that the abdomen of the latter species is completely unarmed. They failed to mention the even closer similarity to M. margarita Faxon as revealed by the illustrations of this species from the eastern Pacific (Faxon, 1895: pl. XX, fig. 2); this species has more spines on the gastric region and posterior margin of the carapace, and on the abdominal tergites; the armature of the frontal margin of the carapace was not well described and

may have been illustrated incorrectly, as the figure distinctly shows 2 post-antennal spines. Unfortunately the chelipeds were missing from the type specimen of M. margarita.

Munidopsis hastifer Benedict, from Japan, is another close relative of M. serratifrons. It appears from the original description and illustration of the former, however, that M. hastifer has many more spines on all regions of the carapace and has the chelipeds broader and somewhat shorter than does M. serratifrons.

Munidopsis sigsbei (A. Milne Edwards, 1880)

Figures 43, 44

Calathodes Sigsbei A. Milne Edwards, 1880: 56-57.

Munidopsis sigsbei: Henderson, 1888: 150-151, pl. 18, fig. 2.--A. Milne Edwards and Bouvier, 1894: 275 (key); 1897: 83-88, pl. V, figs. 8-26.--Young, 1900: 406 (key), 407-408.--Benedict, 1902: 276 (key), 326 (list).--Schmitt, 1935: 179 (key), 181.--Chace, 1942: 73 (key), 82-83.--Springer and Bullis, 1956: 15.--Pequegnat and Pequegnat, 1970: 139 (key), 156, fig. 5-1, table 5-2; 1971: 5 (key).

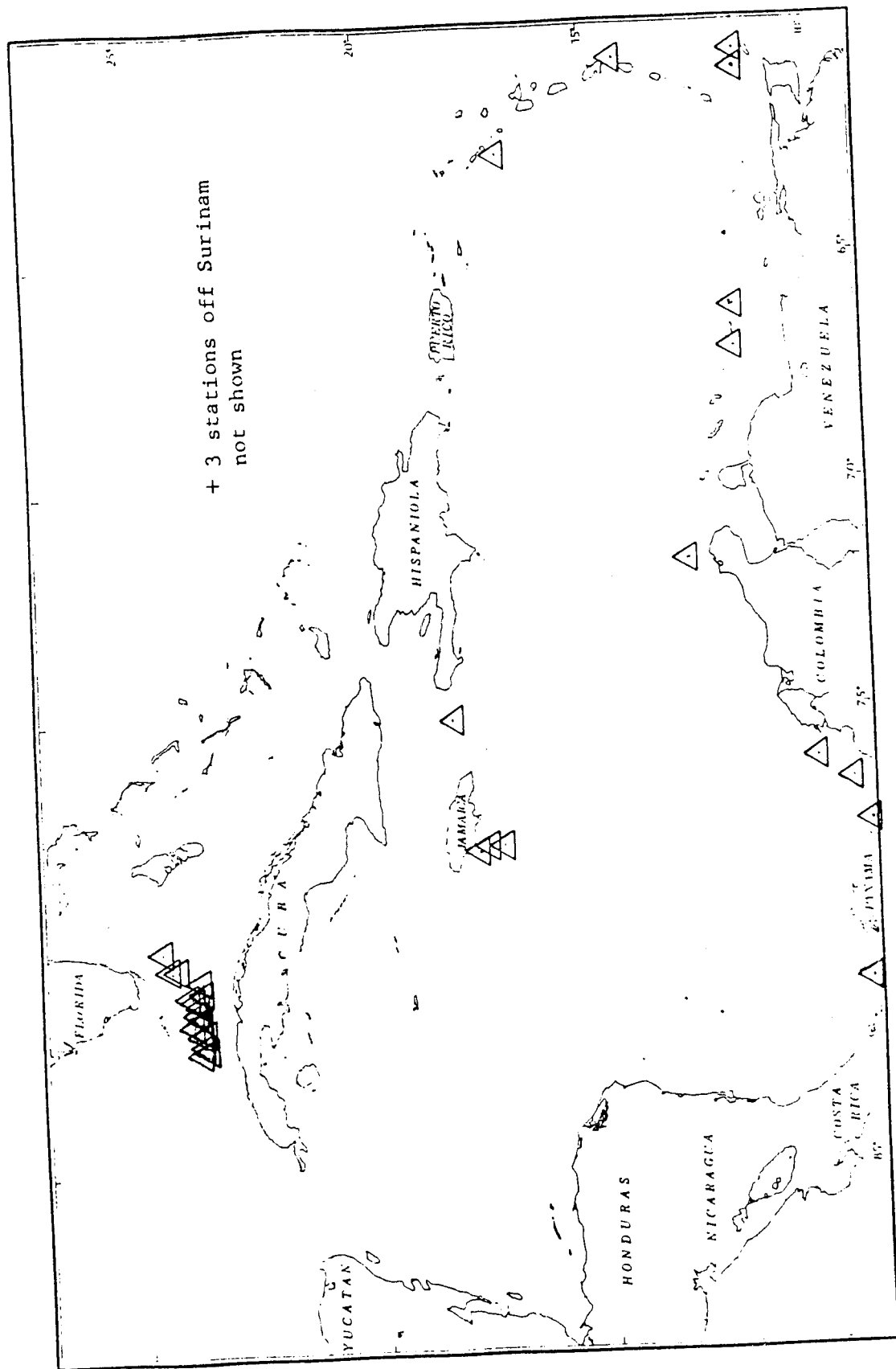
Munidopsis sigsbeyi: Doflein and Balss, 1913: 176 (list), 178 (table).

Material examined.--Straits of Florida: G-121, 1281 m, 2 ♂, 7.0, 13.0 mm, UMML 32:5281; G-129, 1281 m, 1 ♂, 11.1 mm, UMML 32:5282; G-130, 1021 m, 1 ♂, 13.5 mm, 1 ♀, 14.8 mm, UMML 32:5283; G-223, 897-915 m, 1 ♂, 15.4 mm, (USNM); G-226, 802-805 m, 1 ♂, 11.0 mm, UMML 32:5284; G-368, 961-1016 m, 1 ♂, 7.5 mm, 3 ♀, 7.2-11.0 mm, (USNM); G-372, 1107-1162 m, 1 ♂, 13.5 mm, 1 ♀, 14.4 mm, 1 ovigerous ♀, 11.1 mm, (USNM); G-374, 1208-1241 m, 2 ♂, 12.6-16.5 mm, 3 ♀, 8.5-12.5 mm, UMML 32:5285; G-375, 1153-1190 m, 3 ♂, 7.6-15.7 mm, 1 ovigerous ♀, 12.6 mm, (RMNH); G-448, 1135-1184 m, 1 ♂, 10.5 mm, UMML 32:5275; G-449, 1373-1428 m, 1 ♂, 9.6 mm, UMML 32:5276; G-859, 1162-1201 m, 1 ♂, 12.8 mm, (RMNH); G-860, 724-755 m, 1 ♀, 11.0 mm, UMML 32:5277; G-963, 1442-1455 m, 1 ♀, 11.9 mm, UMML 32:5278; G-965, 1395-1400 m, 1 ♂, 16.0 mm, (RMNH); G-980, 920 m, 1 ♂, 9.5 mm, UMML 32:5279; G-1111, 1080-1089 m, 1 ovigerous ♀, 11.0 mm UMML 32:5280; P-636, 1003-1336 m, 2 ♀, 14.5, 15.7 mm, (USNM).--Off Atlantic coast of Colombia: P-364, 924-950 m, 1 ♂, 12.5 mm, 1 ♀, 7.4 mm, UMML 32:5271; P-388, 814-1050 m, 1 ♂, 18.0 mm, 1 ♀, 14.8 mm, UMML 32:5272; P-407, 1158-1225 m,

8 ♂, 12.0-16.3 mm, 3 ♀, 9.0-14.8 mm, 7 ovigerous ♀, 11.4-16.7 mm, UMML 32:5273.--Off Atlantic coast of Panama (Golfo de los Mosquitos): P-448, 952-869 m, 1 ♀, 10.6 mm, (USNM).--Off Venezuela: (S of Orchilla), P-741, 1052-1067 m, 10 ♂, 7.4-18.8 mm, 7 ♀; 10.0-17.0 mm, 1 ovigerous ♀, 16.1 mm, (USNM); (off Los Roques) P-747, 1098-1175 m, 1 ♂, 9.5 mm, with abdominal parasite, (USNM); (N of Golfo de Venezuela) P-770, 1299-1318 m, 1 ♂, 19.0 mm, (USNM).--Off Surinam: P-672, 1221-1336 m, 1 ♂, 10.8 mm, (USNM); P-675, 1235-1272 m, 18 ♂, 10.9-21.8 mm, 9 ♀, 12.2-17.4 mm, 5 ovigerous ♀, 13.7-20.0 mm, (USNM); P-673, 1042-1070 m, 3 ♂, 14.5-22.0 mm, 2 ♀, 11.5, 20.1 mm, 2 ovigerous ♀, 14.0, 17.0 mm, UMML 32:5269; P-682, 1318-1345 m, 2 ♂, 5.6, 14.0 mm, UMML 32:5270.--Off Tobago: P-846, 659-1126 m, 2 ♂, 15.1, 18.7 mm, (RMNH); P-847, 733-1281 m, 5 ♂, 14.7-19.4 mm, 1 ovigerous ♀, 12.7 mm, (RMNH).--Off Monserrat and Nevis: P-954, 686-1043 m, 2 ♂, 12.0, 13.6 mm, 2 ♀, 9.6, 11.5 mm, UMML 32:5274.--Off Martinique: P-892, 116-1354, 1 ♀, 11.8 mm, (USNM).--W of Haiti: P-1187, 1087 m, 1 ♂, 6.6 mm, 1 ♀, 6.8 mm, (RMNH).--S of Jamaica: P-1224, 878-906 m, 2 ♂, 14.0, 17.8 mm, (RMNH); P-1261, 595-824 m, 4 ♂, 13.8-16.0 mm, 1 ♀, 10.0 mm (USNM).--SW of Jamaica: P-1235, 1226-1629 m, 1 ♂, 10.0 mm, (USNM). See distribution plot 17.

Diagnosis.--Rostrum long, simple, spine-like, horizontal; dorsal surface of carapace unarmed; frontal margin unarmed; anterolateral spine short; lateral margin unarmed except for obscure denticles anteriorly; posterior marginal rim armed with 1 to 5 spines near midline; abdominal segments unarmed; eyestalks long, no eyespines; epipods on chelipeds, but not on ambulatory legs.

Description.--Carapace distinctly longer than broad (cw/cl = approximately 0.65-0.70); gastric region inflated, delimited posteriorly by broad



Distribution plot 17.--Munidopsis sirseus (A. Milne Edwards, 1880) collected by the GERDA and PILLSBURY.

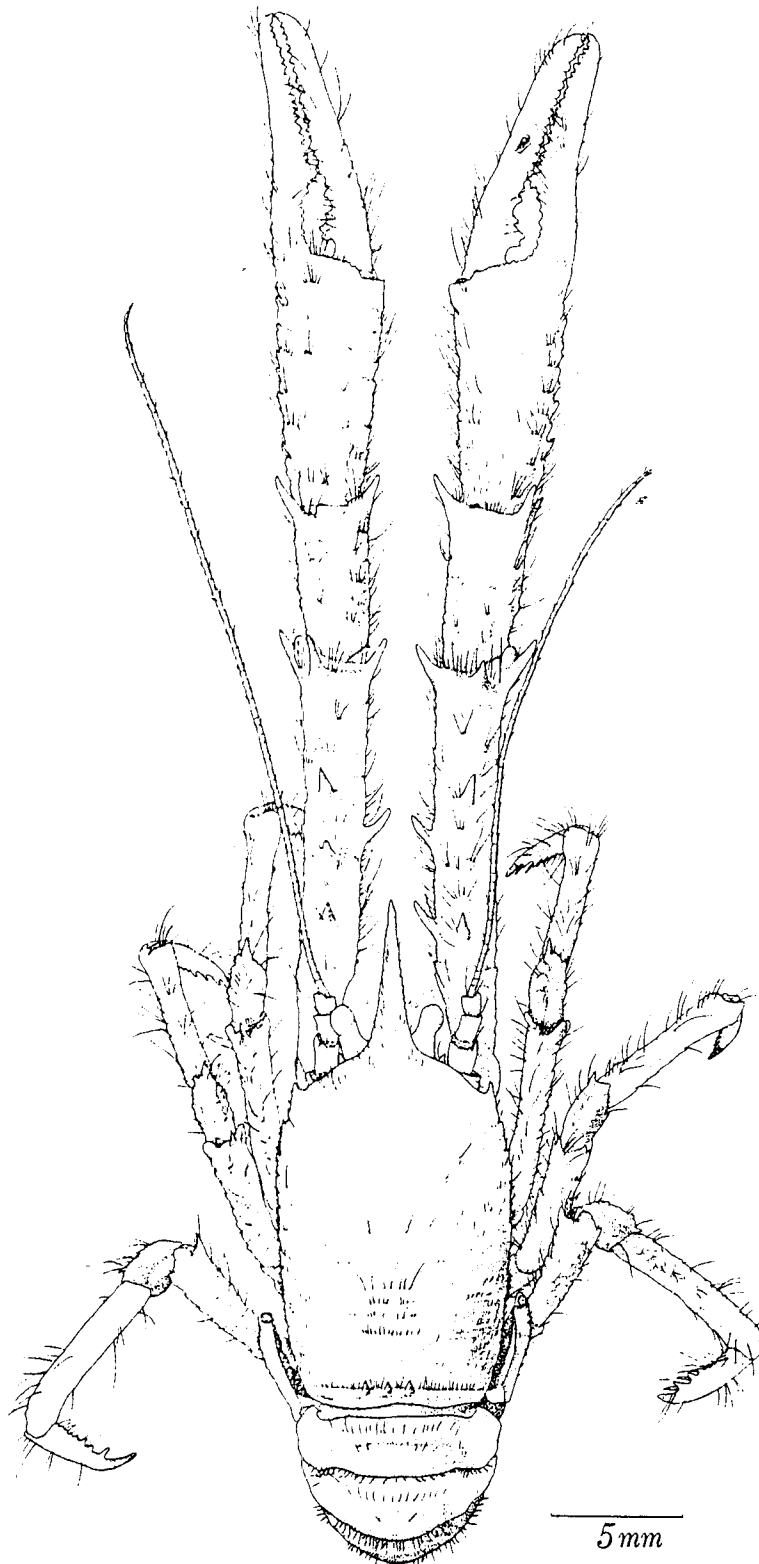


Figure 43. --Munidopsis sigsbei (A. Milne Edwards, 1880), ♂, cl. 12.6 mm, G-374.

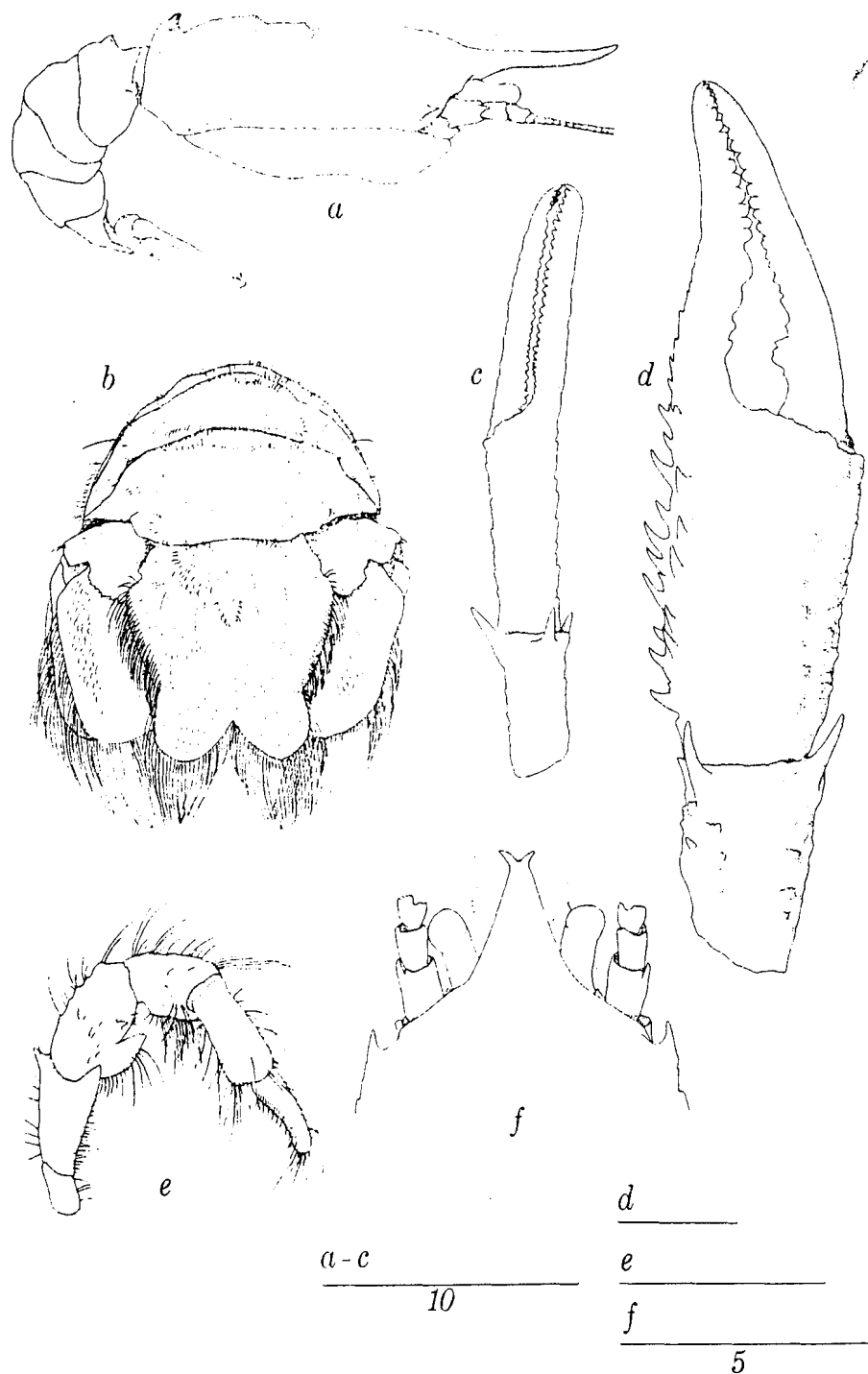


Figure 44. --*Munidopsis sigsbei* (A. Milne Edwards, 1880). Ovigerous ♀, cl. 11.5 mm, P-407: a, lateral view of carapace and abdomen. ♂, cl. 19.0 mm, P-675: b, posterior abdominal segments, uropods and telson. ♀, cl. 12.5 mm, P-675: c, right chela and carpus, dorsal view. ♂, cl. 17.8 mm, P-1224: left chela and carpus, dorsal view. ♂, cl. 16.0 mm, G-965: e, endopod of right third maxilliped, ventrolateral view. ♀, cl. 9.5 mm, P-675: f, anterior carapace with aberrant rostrum. Setae shown on b and e only, scales in mm.

central portion of cervical groove; shallower postcervical groove separating metagastric and cardiac regions, and narrower branchiocardiac grooves. Anterior gastric region smooth, low transverse striae with minutely dentate anterior borders on posterior half; similar sculpturing on posterior surfaces of carapace, more continuous and distinct across inflated cardiac and metabranchial regions, forming small crest on anterior margin of cardiac region, and lower ridge on anterior margin of metagastric region. Rostrum more than 1/3 carapace length, horizontal, with rounded dorsal carina, tapering distally; lateral margins unarmed except for minute anteriorly-projecting teeth, widely-spaced. Frontal margin unarmed between base of rostrum and small anterolateral spine; lateral margins unarmed except for occasional minute tooth or tubercle anteriorly. Posterior raised rim of carapace armed medially with usually 1 to 5 sharp spines, occasionally more.

Abdominal tergites without spines. Second segment with sharp transverse carina extending across tergite anteriorly; slight transverse swelling posterior to this. Third tergite with lower rounded carina anteriorly, posterior swelling ill-defined. Fourth, fifth and sixth abdominal tergites nearly smooth.

Sternum unarmed; intersegmental ridges sharp.

Eyestalks movable, relatively long, slightly compressed and dilated at base, narrowing distally; cornea slightly wider than distal part of peduncle, reaching approximately 1/3 length of rostrum; eyestalk with scattered setae but otherwise unarmed. Sharp broad spine emerging from plate at intersection of bases of eyestalk, antennule and antenna beneath frontal margin of carapace.

Basal segment of antennular peduncle with upper lobe appearing

discoidal in dorsal view; sharp spine on anterior edge of lobe, longer spine below and slightly mesial to this on dorsodistal margin of segment. Ventromesial margin dentate, larger specimens frequently with several well-developed spinules. Antennular peduncle, when extended, reaching beyond tip of rostrum.

Basal segment of antennal peduncle with lateral and ventral tubercles, but no distinct spines. Second segment with sharp conical spine on distal margin laterally. Third segment unarmed, distal margin obscurely dentate. Fourth segment with dorsolateral dentate lobe on distal margin. Antennal flagellum more than twice carapace length.

Endopod of third maxilliped with propodus slightly flattened, mesial surface concave. Merus with proximal ventral margin expanded into broad tooth, several setae on curved lower margin of tooth; small tooth or spine adjacent to this on ventral margin; dorsal margin with several small swellings and sharp distal spine. Ischium with distal ventrolateral angle expanded with broad tooth; dorsal angle terminating in small spine.

Pereiopods tuberculate, many tubercles projected distally with dentate anterior margins and setae between denticles. Larger specimens often with some denticles developed into spines. Epipods on chelipeds, but not on ambulatory legs.

Chelipeds 3 to 4 times carapace length. Dactylus approximately 1/2 length of manus. Fingers often slightly curved outward; toothed on opposing margins; larger males (cl. 12.0 mm or longer) with pronounced proximal gape and tubercles projecting into gape from dactylus; smaller males and most females with toothed opposing margins abutting along entire length. Larger males sometimes with tubercles developed into spines on lateral margin of manus; manus broad and slightly compressed

in larger individuals. Carpus less than $1/3$ length of chela, 3 sharp spines at angles on distal margin: 1 dorsomesial, 1 dorsolateral and 1 ventrolateral. Merus more than twice length of carpus, shorter than chela; 4 spines at angles on distal margin; 3 or 4 spines in line behind distal dorsolateral spine; 2 or 3 behind dorsomesial spine. Ischium with dorsolateral spine at insertion of merus; occasionally spine or tubercles on ventral projection; coxa with sharp ventromesial spine.

Second, third and fourth pereopods similar. Tip of dactylus of second pereopod not reaching distal margin of merus of cheliped; relative lengths of ambulatory legs varying, but dactylus usually reaching at least to distal margin of propodus of preceding legs. Dactylus with curved corneous tip followed on ventral margin by approximately 6 teeth, decreasing in size proximally, distal 3 or 4 usually well-developed; short corneous spinule projecting from anterior edge of each spine, also greatly decreasing in size proximally. Propodus broader distally, less than twice length of dactylus, unarmed except for small scattered tubercles on all surfaces and pair of denticles on ventral distal margin followed by similar denticle approximately $1/3$ distance to base of segment. Carpus approximately $1/2$ propodus length; sharp single dorsal spine on distal margin, followed by low ridge with several tubercles; ridge lateral to this more distinct, often terminating in 1 or more denticles, but no large spine. Merus of second pereopod slightly longer than propodus, third and fourth pereopods with this segment proportionately shorter; large sharp dorsal spine on distal margin, sculptured lobe lateral to this with small sharp tooth (sometimes tubercle on second pereopod) below this; lateral surface heavily sculptured with short denticulate transverse striae; dorsal edge with several small spines or teeth

proximally; teeth more distinct on third and fourth pereopods. Ischium short with small dorsal tooth near insertion of merus.

Fifth pereopods with merus broader in middle of segment, 2 or 3 small tubercles on ventrolateral edge.

Uropod with posterolateral margin or protopod scalloped, lateral edge of posterior lobe denticulate; dorsal surfaces of endopod and exopod with setae but no denticles.

Length of telson approximately same as maximum width, narrower posteriorly, consisting of 8 plates; males with fringe of thick curved golden setae on margin of lateral plate; setae thinner, plumose, fewer in this location on females; posterior margin of telson deeply scalloped.

Color.--In live material, the carapace, chelipeds, eyestalks and mouthparts are dull orange in color. The cornea is distinctly white. The ambulatory legs and edges of the tailfan are lighter, from pale orange to white distally. The dorsal surface of the abdominal tergites may be evenly dull orange, or lighter like the ambulatory legs, with an orange band across each segment.

Specimens preserved in alcohol soon lose all traces of pigment and the corneae appear translucent.

Size.--Specimens taken by the GERDA and PILLSBURY fell within the following size ranges:

- ♂, cl. 5.6-22.0 mm,
- ♀, cl. 6.8-20.1 mm, and
- ovigerous ♀, cl. 11.0-20.0 mm.

Ovigerous females with cl. as small as 10.0 mm were taken by the ALAMINOS (Pequegnat and Pequegnat, 1970).

Sexual dimorphism.--Males of all sizes have the characteristic row of thick golden setae on the lateral margins of the telson, while in the female, setae in this position are like the other marginal setae.

The chelipeds of large males are much broader than those of female of the same size, with the manus slightly compressed and a large gape with several tubercles between the bases of the fingers. Also the chelipeds may be much spinier in the males, and have a distinct dorsal depression on the carpus. Smaller males (cl. 12 mm or shorter) have the chelipeds slender and ungaped, as in the females.

The difference in the rostral curvature between males and females noted by A. Milne Edwards and Bouvier (1897: 88) is not obvious nor consistent in the material examined, although a few females have the rostrum very slightly curved upward.

Habitat.--The bottom at many of the stations in the Straits of Florida where M. sigsbei was taken was characterized by pteropod ooze; several stations also had dead Thalassia blades and coral rubble. The bottom type at the deeper PILLSBURY stations was primarily mud or clay.

Type.--The holotype is a female with cl. approximately 16 mm; present deposition not determined, probably at the Paris Museum.

Type locality.--Martinique, BLAKE Sta. 200, 864 m.

Geographic range.--Munidopsis sigsbei is widely distributed in the Gulf of Mexico, throughout the Caribbean, and from the Straits of Florida at least as far south as Surinam in the western Atlantic. In addition to the type locality and the locations listed for the material examined, M. sigsbei has been reported in the literature from the following loca-

lities: off Sombrero, West Indies (Henderson, 1888: 150); southern Gulf of Mexico, Fredericksted, and Guadeloupe (A. Milne Edwards and Bouvier, 1897: 88); north coast of Cuba, Grenada and south of Jamaica (Chace, 1942: 82); and throughout the Gulf of Mexico (Pequegnat and Pequegnat, 1970:156).

Bathymetric range.--The possible depth range for material in this collection is 595-1629 m; calculated range is 805-1442 m. The range recorded previously was 733-1784 m.

Parasites.--A male specimen taken at P-747 has 1 specimen of Tortugaster fistulatus Reinhard, a peltogastrid rhizocephalan, attached to the ventral surface of the abdomen.

Several other specimens have foraminiferans and hydroids attached to various surfaces of the body and appendages.

Associates.--Specimens of Munidopsis sigsbei in this collection were taken at 38 stations; other species collected with it, and their indices of affinity are as follows: M. simplex at 12 (8 of 17 stations in the Straits of Florida), 0.34; M. armata at 7, 0.25; M. abbreviata at 6, 0.17; and M. longimanus at 4, 0.23.

Relationships.--Although Munidopsis sigsbei superficially resembles other western Atlantic species in the group having a long simple spine-like rostrum and no spines on the frontal margin of the carapace (M. simplex, M. curvirostra, M. reynoldsi and M. abbreviata), in fact it differs markedly from them; it is the only species with the following combination of characters: the gastric region of the carapace unarmed, the posterior margin armed, the abdomen unarmed and epipods on the chelipeds only. (See discussion of relationships in M. simplex).

Munidopsis similis Smith, 1885

Figures 45, 46, 47a, 48

Munidopsis similis Smith, 1885: 496; 1886: 647-649, pl. 5, figs. 1-1e, pl. 6, figs. 2, 2a.--Benedict, 1902: 276 (key), 326 (list).--Doflein and Balss, 1913: 176 (list), 177 (table).--Chace, 1942: 73 (key).--Pequegnat and Pequegnat, 1970: 139 (key); 1971: 7 (key).

Not Hansen, 1908: 38-39, pl. 3, figs. 4a-4b. (= ? M. crassa Smith)

Material examined.--Western North Atlantic: ALBATROSS Sta. 2192, 1940 m, ovigerous ♀, holotype, 17.0 mm, USNM 8255.--Caribbean Sea, off St Vincent: P-871, 2628-2681 m, 1 ♀, 14.3 mm, UMML 32:5286.--S of Hispaniola: P-1266, 1894-3111 m, 1 specimen, badly damaged, approximately 15 mm, sex undeterminable, UMML 32:5287.

Diagnosis.--Rostrum simple, triangular, spine-like, with very slight distal upturn; 1 pair of spines on anterior gastric region of carapace; frontal margin with distinct post-antennal spine, anterolateral spine slightly smaller; 4 lateral spines; posterior margin unarmed; abdominal tergites unarmed; eyes armed with large mesial spine distally and small lateral spine; no epipods on chelipeds or ambulatory legs; chelipeds approximately twice carapace length.

Description.--Carapace longer than broad ($cw/cl = 0.75-0.80$), transversely convex; gastric region with 1 pair of distinct spines anteriorly; posterior to these, swellings with 1 or more setae; posterior half of gastric region with 5 distinct transverse striae; several swellings with setae on hepatic regions. Central ridges behind cervical and postcervical grooves distinct, striate. Entire dorsal surface of carapace behind

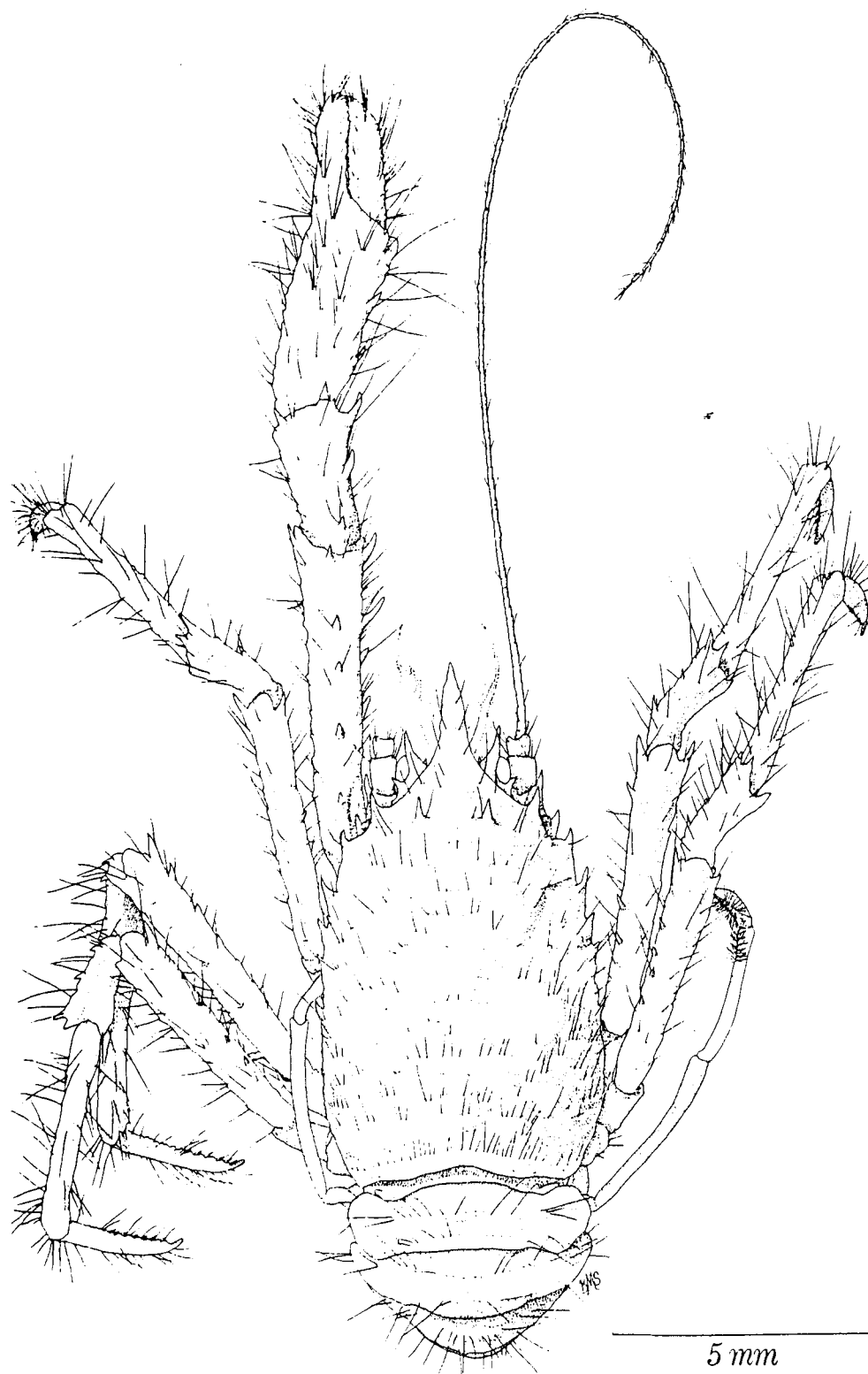


Figure 45. --Munidopsis similis Smith, 1885, ♀, cl. 14.3 mm, P-871, dorsal view.

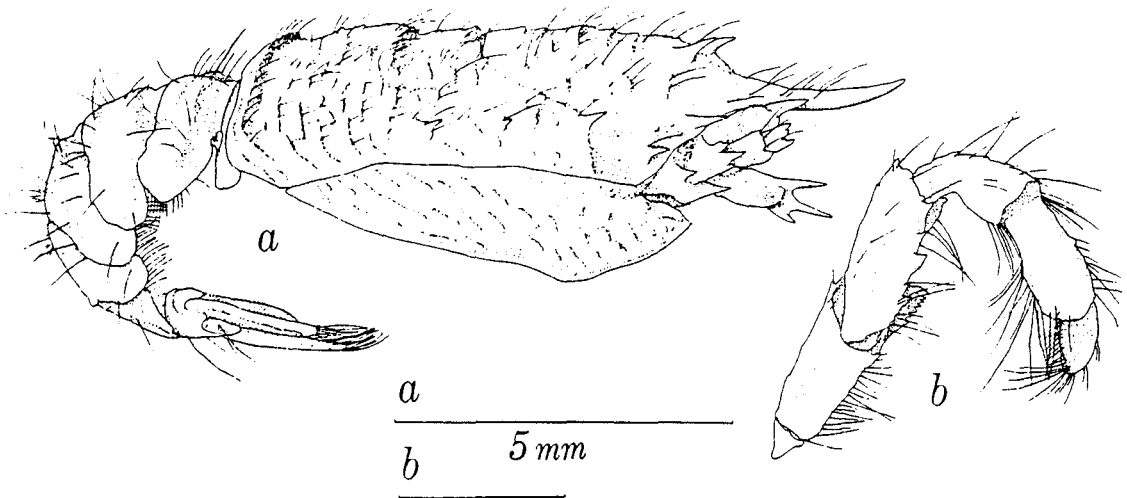


Figure 46. --Munidopsis similis Smith, 1885, ♀, cl. 14.3 mm, P-871: a, carapace and abdomen, lateral view; b, endopod of right third maxilliped, ventrolateral view.

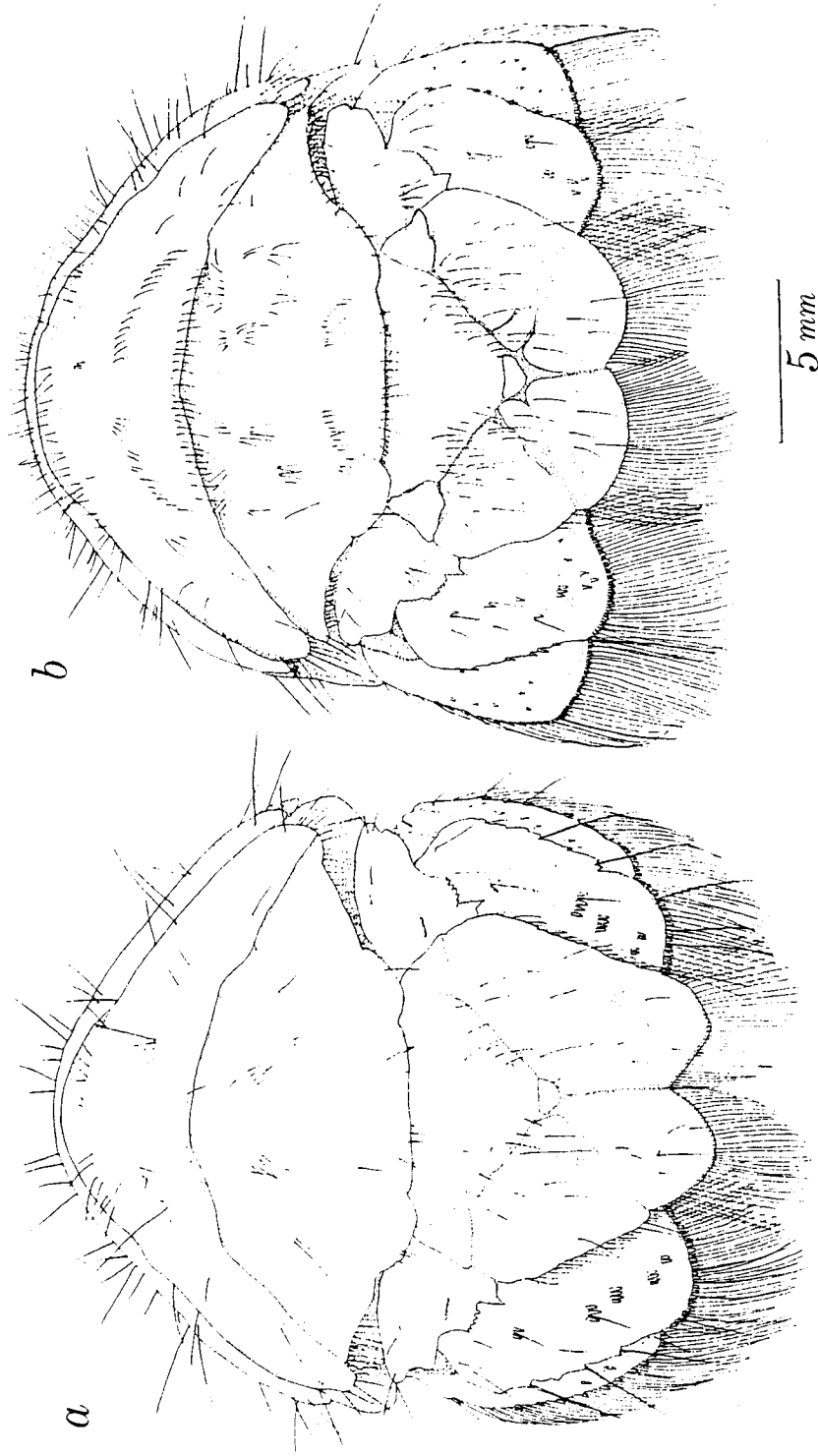


Figure 47. --*Munidopsis similis* Smith, 1885, ♀, cl. 14.3 mm, P-871: a, posterior abdominal tergites, uropods and telson. --*Munidopsis nitida* (A. Milne Edwards, 1880), ♀, cl. 11.6 mm, P-1178: b, posterior abdominal tergites, uropods and telson.

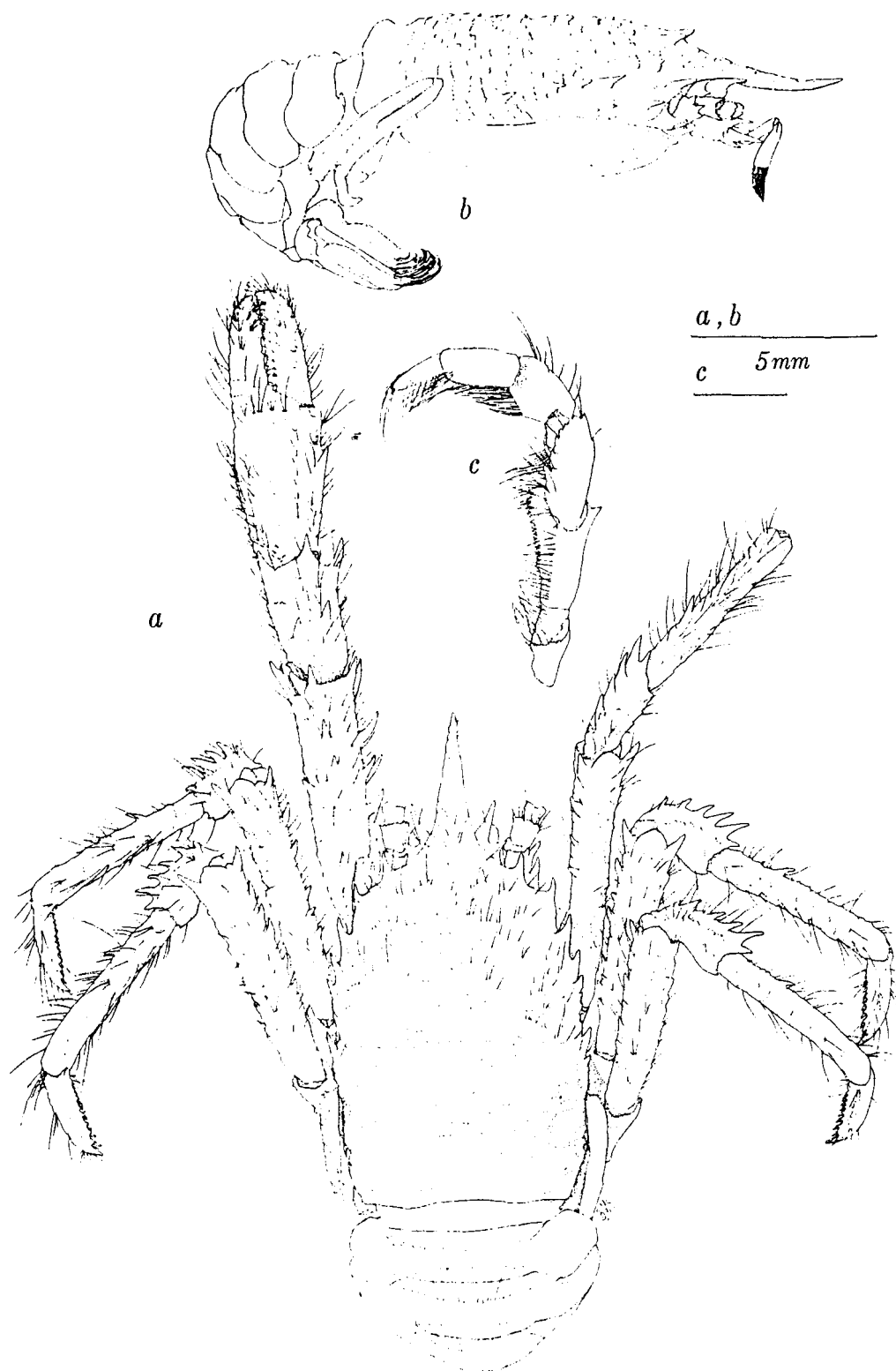


Figure 48. --Munidopsis similis Smith, 1885, ovigerous ♀ holotype, cl. 17.0 mm, ALBATROSS Sta. 2192: a, dorsal view; b, carapace and abdomen, lateral view, setae shown on antennular flagellum and telson only; c, endopod or left third maxilliped, ventral view.

cervical groove sculptured with short swollen transverse striae, particularly prominent on metabranchial regions. Rostrum $1/4$ to $1/3$ carapace length; width of rostrum between eyes slightly more than $1/2$ length, tapering, with slight upturn distally, taper more acute at tip. Frontal margin of carapace with distinct post-antennal spine; anterolateral spine slightly smaller. Lateral margin with 4 distinct spines: most anterior spine largest, followed by 2 slightly smaller spines, and 1 broader spine just behind lateral termination of cervical groove. Posterior margin of carapace unarmed.

Abdomen unarmed; second and third segments with 2 transverse carinae: anterior carina behind depressed front edge of tergite sharper, extending laterally almost to pleuronal margins; posterior carina rounded dorsally, extending only across tergite, bending posteriorly to terminate at posterior margin of segment; fourth tergite with suggestion of transverse swelling and row of setae in place of carina; fifth segment almost smooth. Carinae with sparse rows of moderately long setae.

Sternum unarmed; several short transverse striae with setae between coxae of chelipeds; margins minutely serrate, but without spines.

Eyes colorless, barely movable; eyestalk short, expanded distally over dorsomesial margin of cornea, forming sharp, anteriorly-directed spine; distolateral margin of eyestalk forming small lateral spine directed anterolaterally; base of eyestalk with lateral projection forming denticle; slightly larger ventromesial denticle on eyestalk extending anteriorly as far as distal margin of cornea, smaller denticles on dorsal and ventral sides of lateral denticle.

Basal segment of antennular peduncle broad with sculpturing on forward edge of lateral swelling; 2 sharp dorsolateral spines, 1 above and

1 on distodorsal margin; dorsomesial carina terminating in 1 distal denticle; distoventral margin serrate; tuft of setae at base of antennular flagellum barely reaching distal margin of merus of cheliped, long flagellum extending beyond base of carpus.

Basal segment of antennal peduncle with triangular ventromesial spine, broadest at base, and smaller lateral tooth with terminal spine. Distal margin of movable second segment with sharp lateral spine, small projection with denticle just mesial to it, and minute ventromesial denticle. Distal margins of third and fourth segments with small mesial and lateral denticles, and pairs of setae, longer setae laterally. Antennal flagellum approximately 3 times carapace length.

Merus of endopod of third maxilliped with 3 or 4 small, well-spaced teeth on ventromesial margin; 1 small tooth on distolateral margin. Ischium with small tooth or teeth terminating blunt ventral carina and small tooth on distolateral corner; no tooth at distal end of serrate mesial margin.

No epipods on chelipeds or ambulatory legs.

Chelipeds approximately twice length of carapace and 10 times maximum width of cheliped (at manus); widely-spaced tubercles with straight setae scattered on all surfaces. Length of manus almost 4 times maximum width; dactylus less than 1/2 length of manus. Tips of fingers spooned, dentate; toothed on adjacent abutting margins dorsally, rounded and gaped ventrally. Mesial margin of propodus with 2 sharp curved spines. Carpus less than 1/2 length of manus; distal margin with large curved mesial spine, dorsal spine, smaller dorsolateral spine and triangular projection ventrally terminating in small spine; large curved spine posterior and slightly dorsal to mesial spine; 1 small tooth posterior and

more dorsal to this. Merus approximately same length as manus; distal margin armed with 4 spines: 1 dorsal, 1 dorsomesial, 1 ventrolateral and 1 ventromesial; 4 or 5 spines in dorsal row, decreasing in size proximally; second large curved spine on mesial margin posterior to dorsomesial spine; 2 sharp spines on ventral margin. Ischium with spine dorsally and ventrally and lateral denticle just posterior to articulation with merus.

* Second, third and fourth pereopods similar, long and slender. Dactylus of each of second, third and fourth pereopods reaching manus of cheliped; each segment reaching beyond middle of same segment on preceding leg. Dactylus more than 1/2 length of propodus, tip slightly curved, pale brown; ventral margin with row of approximately 12 denticles, decreasing in size to obscurity proximally, distal 8 to 10 with corneous spinule projecting from anterior edge of each denticle. Propodus smooth with sparsely-distributed long, straight, setae, unarmed except for 2 sharp movable spines on small ventral lobes at distal margin, and a similar small spine or spines located posteriorly 1/4 to 1/2 distance to base of segment. Carpus approximately 1/2 length of propodus; dorsomesial edge with 3 or 4 sharp spines including 1 on distal margin; smaller spine laterally on distal margin followed by longitudinal ridge, with several tubercles, lateral to this irregular row of tubercles; ventromesial surface smooth except for several minute denticles on distal margin. Merus with dorsomesial ridge armed with 7 to 9 spines including larger sharp distal spine, decreasing in size proximally; sharp lateral spine on distal margin of second and third pereopods reduced to blunt tooth on fourth pereopod; dorsolateral and ventrolateral surfaces smoother. Ischium with dorsal swelling or tubercle, but no spines.

Fifth pereopods with merus expanded, lightly sculptured laterally, but unarmed.

Protopod of uropod with posterolateral margin divided in 2 distinct lobes, with smaller lateral projection anteriorly; posterior lobe with 4 or 5 minute denticles lateral to notch and sharp spine posteromesially; small granulose ridge anterior to notch. Exopod with approximately 12 widely-spaced, small, movable spinules; lateral margin with widely-spaced granular denticles, posterior margins of exopod and endopod with closely approximated granules; endopod with 2 larger spinules posterior to uropodial notch, 2 or 3 groups of 3 to 4 spinules posterior to this along center of exposed surface, lateral margin with approximately 3 widely-spaced denticles.

Length of telson almost as great as maximum width, narrowing posteriorly, consisting of 8 distinct plates, and 2 less distinct intermediate plates; posterior margin deeply scalloped; no spinules on posterior margin.

Color.--The specimens examined are preserved in alcohol and are totally devoid of color except for pale brown tips on dactyli and thicker golden setae.

Size.--♀, cl. 14.3-17.0 mm; other specimen damaged, sex indeterminable, cl. approximately same as holotype.

Sexual dimorphism.--Only a complete female of this species was available; lateral margins of the telson of this specimen have no thick setae, and the single remaining cheliped did not have the fingers gaped. The 2 chelae of the damaged specimen also have the opposing margins of the fingers abutting along their entire length.

Habitat.--The bottom at station P-871 in the Venezuelan Basin was characterized as a mixture of bluish sticky clay and a fine silt with an impoverished fauna. The trawl at P-1266 brought up a large chunk of consolidated clay with its flat top coated with manganese; the fauna from that station was negligible.

The bottom at the type locality was characterized as consisting of globigerina ooze.

Type.--The holotype is a female with cl. 17.0 mm, USNM 8255.

Type locality.--Off Nantucket, western North Atlantic; ALBATROSS Sta. 2192, 39°46.5'N, 70°14.8'W; 1940 m.

Geographic range.--The 2 new locations reported here extend the geographical range of Munidopsis similis from the northeastern coast of the United States to include the Caribbean Sea.

Bathymetric range.--1885-2681 m is the possible range of depth for this species according to the records for the stations where it has been collected. The calculated range is 1885-2628 m.

Parasites.--The specimens examined show no external evidence of abdominal or branchial parasitism.

Associates.--Munidopsis similis was the only representative of the genus taken at the 2 PILLSBURY stations where it was collected.

Relationships.--There are several western Atlantic species to which M. similis appear to be related. It is very similar in morphology to M. nitida (A. Milne Edwards), but differs from it in two striking characters: M. similis has the chelipeds much longer (approximately 2 times

the carapace length) than M. nitida (which has the chelipeds approximately equalling the carapace length) and M. similis has no epipods on the pereopods, whereas they are present on the chelipeds of M. nitida. M. crassa Smith and M. geyeri Pequegnat and Pequegnat, also from the western North Atlantic, are somewhat similar to M. similis, but have epipods on the chelipeds, a pair of mesial eyespines only, and are more robust species; in addition M. crassa has 2 pairs of gastric spines. M. similis also bears some resemblance to M. reynoldsi as described by A. Milne Edwards and Bouvier (1897: 80-83, pl. VI, figs. 1-5) but the latter species lacks a post-antennal spine, has a longer rostrum and shorter chelipeds. The presence of gastric spines on the carapace serves to distinguish M. similis from M. spinoculata (A. Milne Edwards), M. subspinoculata Pequegnat and Pequegnat, and M. ramahtaylorae Pequegnat and Pequegnat.

Munidopsis similis looks quite similar to M. verrilli from southern California as illustrated by Benedict (1902); the length and shape of the chelipeds appear to be different, however, as well as the number of carpal spines on the pereopods. M. ciliata Wood-Mason from the Indo-Pacific is similar to M. similis, but has the chelipeds shorter and the posterior abdominal segments more rugose than the latter species. M. ceratophthalma Alcock resembles M. similis, but lacks epipods on the chelipeds and lacks gastric spines.

Remark .--The damaged specimen from P-1266 was identified as M. similis on the basis of its chelipeds which are intact, and fragments of the anterior portion of the body. The chelipeds are nearly identical to those on the undamaged specimen from P-871. The abdomen and sternites are missing entirely however, which has made it impossible to determine the sex of this individual.

The most striking difference between the holotype and the specimens from the Caribbean is the carpal spination of the ambulatory legs: the holotype has 4 or 5 well-developed spines on the dorsal edge of the carpus, whereas in the Caribbean material the spines are quite reduced except for the distal pair. The cheliped on the holotype is broader with respect to its length, and the shape of the manus is slightly different in the holotype. The holotype is larger overall, the sculpturing on the posterior half of the carapace is less distinct, more rounded, and many of the setae are worn away. Both the holotype and a specimen from the Caribbean have been illustrated to show these differences.

Discussion.--I cannot agree that the specimen from the north Atlantic, west of Iceland, assigned to *M. similis* by Hansen (1908) belongs to the same species redescribed here from Smith's holotype. The differences between the two (both ovigerous females) are as follows: the holotype has the rostrum almost straight with only a slight upward curve distally, a distinct spine on the frontal margin of the carapace directly behind the antenna, and one pair of distinct spines on the anterior gastric region of the carapace; as Hansen pointed out, his specimen has the rostrum strongly recurved, no post-antennal spine, and 5 small gastric spines in addition to the 2 major ones. Other differences include the length of the chelipeds with respect to that of the carapace (3:1 in the holotype, 1:1 in Hansen's specimen) and the presence of a small tooth on the eyestalk just outside the cornea of the holotype which does not appear on Hansen's illustration. Also the 2 anterior lateral spines appear much broader than in the holotype and all lateral spines are more laterally directed in the specimen illustrated by Hansen.

While the identity of Hansen's material remains undetermined, his specimen appears to be closer to M. crassa and/or to M. geyeri than to M. similis, but differs from both in lacking a post-antennal spine.

The eggs of the holotype of M. similis measure approximately .2 mm after long preservation in alcohol, in contrast to 3 mm as reported by Hansen.

In his original description of M. similis, Smith (1885: 496) stated that this species was "very closely allied to M. crassa, and will possibly prove to be a variety of it." He described M. similis as having epipods on the first pereopod like M. crassa. Examination of the holotype has shown this to be in error; epipods are completely lacking on all pereopods in M. similis.

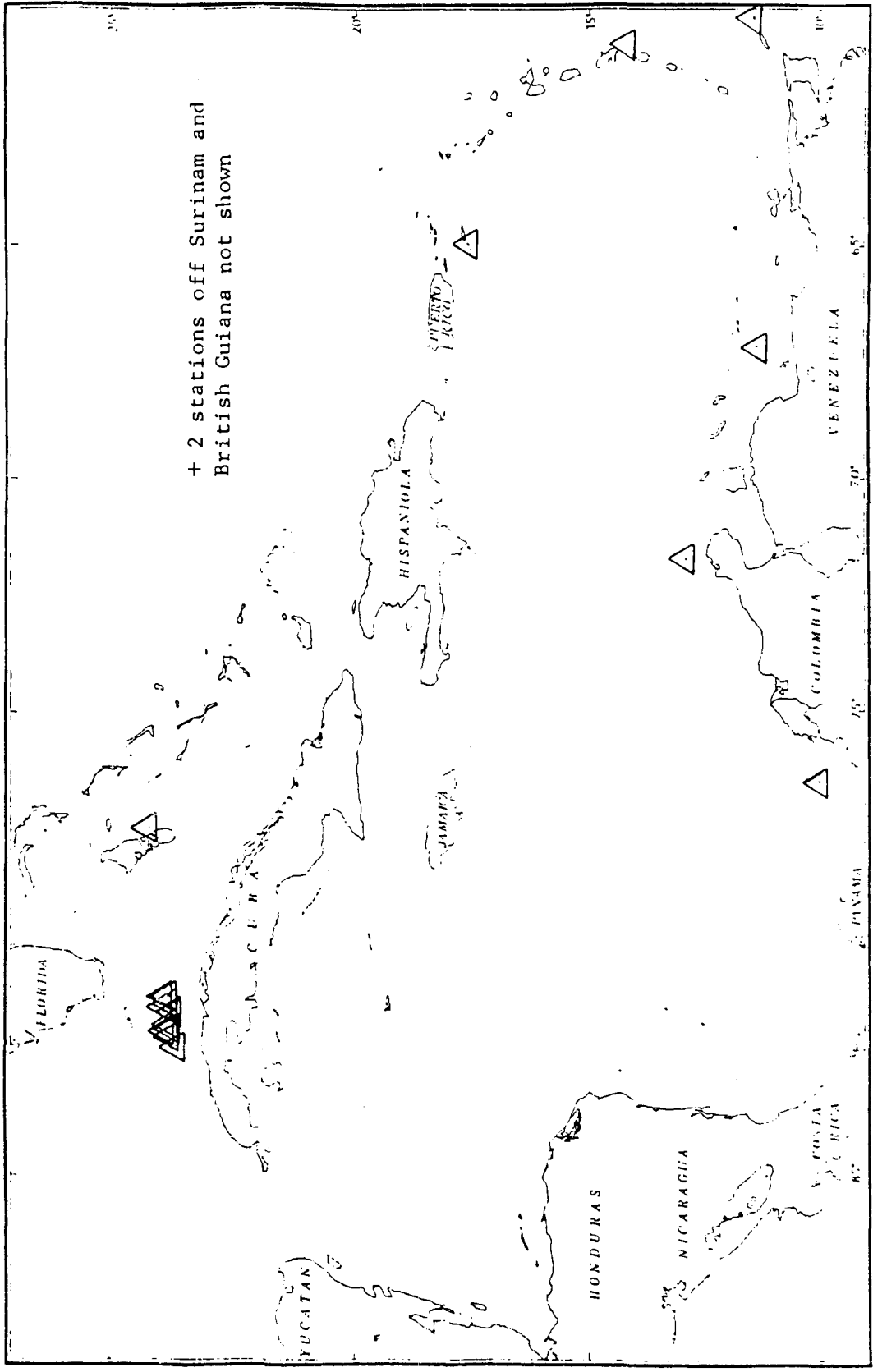
Munidopsis simplex (A. Milne Edwards, 1880)

Figure 49

Galathodes simplex A. Milne Edwards, 1880: 56.

Munidopsis simplex: A. Milne Edwards and Bouvier, 1894: 275 (key); 1897: 89-91, pl. V, figs. 2-7.--Young, 1900: 406 (key), 408.--Benedict, 1902: 277 (key), 326 (list), 178 (table).--Perez, 1927: 236 (sexual dimorphism).--Chace, 1942: 75 (key), 92.--Pequegnat and Pequegnat, 1970: 140 (key), 156-157, figs. 5-1, 5-13, table 5-2; 1971: 6 (key).

Material examined.--Straits of Florida: G-121, 1281 m, 1 ♀, 9.0 mm, (USNM); G-128, 1391-1464 m, 2 ♂, 8.5, 8.7 mm, 2 ♀, 8.7, 9.0 mm, UMML 32:5288; G-129, 1281 m, 1 ovigerous ♀, 11.5 mm, (USNM); G-370, 1281 m, 3 ♂, 8.0-10.3 mm, 1 ovigerous ♀, 8.2 mm, UMML 32:5289; G-374, 1208-1241 m, 2 ♂, 8.5, 9.0 mm, 1 ♀, 9.6 mm, 1 ovigerous ♀, 9.7 mm, UMML 32:5290; G-375, 1153-1190 m, 3 ♂, 6.0-10.0 mm, 1 ovigerous ♀, 8.4 mm, UMML 32:5291; G-449, 1373-1428 m, 1 ♀, 8.2 mm, 1 ovigerous ♀, 8.3 mm, (RMNH); G-859, 1162-1201 m, 2 ♂, 7.2, 8.2 mm, 1 ovigerous ♀, 10.2 mm, (USNM); G-963, 1442-1455 m, 3 ♂, 6.8, 8.2 with abdominal parasite, 8.7 mm, (RMNH); G-964, 1391-1415 m, 1 ♂, 7.3 mm with abdominal parasite, (RMNH); G-965, 1395-1400 m, 1 ♂, 6.2 mm, (USNM).--Bahama Islands: G-923, 1555-1574 m, 1 ♂, 8.1 mm, 1 ovigerous ♀, 11.0 mm (USNM).--Off Atlantic coast of Colombia: P-391, 1222-1748 m, 3 ♂, 7.5-8.6 mm, 8.6 with abdominal parasite, 1 ♀, 8.3 mm with abdominal parasite, UMML 32:5292; P-407, 1158-1225 m, 1 ovigerous ♀, 13.0 mm, (USNM); P-455, 1446 m, 1 ♀, 9.8 mm (RMNH).--Off Surinam: P-675, 1235-1272 m, 8 ♂, 8.8-11.0 mm, 4 ♀, 9.8-11.1 mm, 6 ovigerous ♀, 9.2-12.1 mm, UMML 32:5293.--Off British Guiana: P-689, 1373-1446 m, 1 ♂, 7.4 mm, UMML 32:5294.--Off Venezuela (off Los Roques): P-748, 1784-



Distribution plot 18.--*Monidopsis simplex* (A. Milne Edwards, 1880) collected by the GERDA and PILLSBURY.

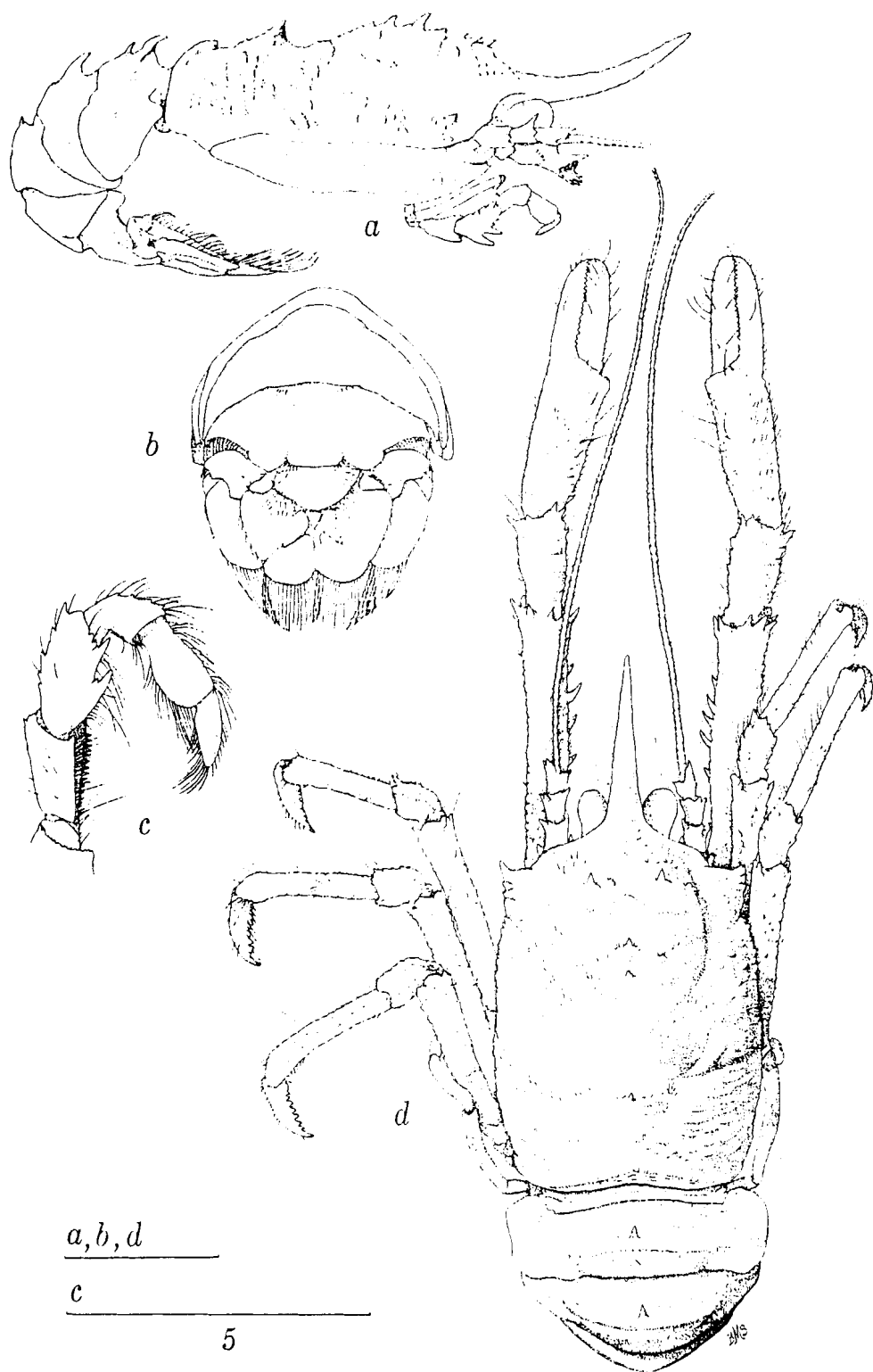


Figure 49. --*Munidopsis simplex* (A. Milne Edwards, 1880). ♀, cl. 11.1 mm, P-675: a, carapace and abdomen, lateral view, setae shown on tail-fan only; b, posterior abdominal tergites, uropods and telson; d, dorsal view. Ovigerous ♀, cl. 12.4 mm, P-675: c, endopod of right third maxilliped. Scales in mm.

1867 m, 1 ♀, 8.0 mm, 2 ovigerous ♀, 9.0-11.1 mm, (USNM); (N of Golfo de Venezuela): P-770, 1299-1318 m, 1 ovigerous ♀, 10.6 mm, (RMNH).--Off Tobago: P-844, 1464-1848 m, 3 ♂, 9.1-10.0 mm, 4 ♀, 8.6-12.5 mm, 1 ovigerous ♀, 11.5 mm, UMML 32:5295.--Off Martinique: P-892, 1116-1354 m, 1 ovigerous ♀, 10.2 mm, (RMNH).--St. Croix Basin, Virgin Islands: P-1304, 3477-3971 m, 1 ♂, 9.9 mm, (USNM). See distribution plot 18.

Diagnosis.--Rostrum long, simple, spine-like, slightly curved upward; anterior gastric region of carapace with pair of sharp spines; several small spines or tubercles along midline, frequently on anterior cardiac ridge; frontal margin unarmed between base of rostrum and anterolateral spine; lateral and posterior margins unarmed; second and third abdominal tergites with sharp median spine; no eyespines; no epipods on pereopods.

Description.--Carapace longer than broad (cw/cl = approximately 0.80); gastric region inflated, cervical groove much shallower than broad rounded postcervical groove separating metagastric and cardiac regions. Dentate projections on front of gastric swelling, anterior gastric region with pair of small spines separated by longitudinal median swelling, armed behind forward pair with 1 to 4 (usually 3) spines or spinules; several transverse ridges, minutely dentate, arranged symmetrically on gastric region, more numerous and continuous on posterior third of carapace. Metagastric region reduced centrally; triangular cardiac region raised anteriorly, forming dentate crest on anterior margin with small median spine. Length of rostrum between $\frac{2}{5}$ and $\frac{3}{5}$ length of carapace, gently flexed upward with rounded dorsal carina; rostrum lightly sculptured with small dentate tubercles dorsally, ventrally and on lateral margins. Frontal margin of carapace with narrow rim, dentate behind

antenna, but unarmed between base of rostrum and anterolateral spines. Lateral margins of carapace sculptured with small teeth or tubercles, but no major spines. Anterior margin of raised posterior rim minutely dentate, but otherwise unarmed.

Second and third tergites each with 2 dentate transverse carinae (anterior carina slightly more extensive), each armed with sharp medial tooth, occasionally slight protuberance in this position on fourth tergite. Fourth tergite with anterior carina only, smooth posteriorly. Fifth and sixth abdominal tergites smooth.

Sternum unarmed; intersegmental ridges distinct.

Eyestalks movable, short, dorsoventrally constricted at base, occasionally few small denticles on lateral margin near base, but no major eyespines; cornea slightly elongate.

Basal segment of antennular peduncle with lateral swelling and scattered small protuberances; 2 sharp spines projecting from dorsolateral surface of segment anteriorly, most dorsal spine usually thicker, longer; lower spine simple, or occasionally bifurcate or with accessory spinule beneath; distal ventromesial margin dentate, projected with 1 or usually 2 sharp spines. Antennular peduncle not long, when extended reaching just beyond tip of rostrum.

Basal segment of antennal peduncle broad, with dentate lateral projection and complex ventromesial projection. Second segment with sharp lateral spine on distal margin with small tooth or lobe mesial to this and ventrolateral projection. Third segment with sharp mesial, dorsal and lateral spines and dentate ventral projection on distal margin. Fourth segment with dorsolateral lobe elongate, dentate distally; shorter mesial lobe with denticle. Antennal flagellum more than twice carapace

length.

Merus of endopod of third maxilliped flattened; ventral margin with broad tooth proximally, and 1 or 2 smaller teeth decreasing in size distally; several small rounded teeth along dorsal edge and sharp tooth distally. Ischium with small tooth at each of dorsolateral and ventral angles.

Pereiopods tuberculate; tubercles slightly projected distally with dentate anterior margins and setae between denticles, particularly on dorsal surfaces. Larger specimens frequently with denticles developed into spines. No epipods on chelipeds or ambulatory legs.

Chelipeds slightly less than 2 to 2 1/2 times length of carapace (males generally with longer chelipeds). Manus almost 1/2 length of cheliped, dactylus approximately 1/2 length of propodus. Combined width of both fingers wider than palm in females, slightly narrower in males; opposing margins dentate, abutting along entire length in both sexes; tips of fingers spooned; ventral surfaces concave; fingers almost devoid of tubercles, dorsal surface of manus tuberculate, but usually without spines. Carpus approximately 1/3 length of chela; distal margin with 3 to 5 spines dorsally, mesial spine often broadly bifurcate; 1 spine ventrally at articulation; dorsal surface tuberculate, frequently 1 or more tubercles developed into spines on dorsomesial surface; shallow longitudinal depression dorsally. Merus slightly more than twice length of carpus; distal margin with 1 spine at each of 4 angles, frequently additional spines on either side of dorsal spine; mesial surface with 1 sharp spine, approximately 1/3 distance to base of segment, similar spine ventrally posterior to this; occasionally other smaller spines posteriorly. Ischium with sharp dorsal tooth at insertion of merus.

Second, third and fourth pereopods similar. Tip of dactylus of second pereopod when extended reaching just beyond distal margin of carpus of cheliped; dactylus of third and fourth pereopods reaching well beyond distal margin of propodus of preceding pereopod. Dactylus with curved corneous tip followed by 8 to 12 sharp teeth on flexor margin, decreasing in size proximally; corneous spinule projecting from distal edge of each tooth. Propodus slightly broader distally, less than twice length of dactylus, tuberculate, but without spines; distal margin with 2 minute lobes with central denticle ventrally. Carpus less than 1/2 length of propodus, distal margin with small sharp spine dorsally, usually distinct on second pereopod, decreasing in size on third and fourth pereopods; extensor margin behind this slightly raised, tuberculate; distinct narrow low ridge with denticles laterally. Distal margin of merus with several small lobes, small teeth or spinules on dorsal and ventral lobes, usually better developed on anterior pereopods; all surfaces tuberculate. Ischium with small dorsal tooth near insertion of merus.

Fifth pereopods with merus broader in middle of segment, exposed lateral surface sculptured but usually without spines.

Uropod with posterolateral margin scalloped, posterior lobe minutely dentate; sculptured swelling on basal portion near articulation with sixth tergite. Dorsal surfaces of endopod and exopod smooth.

Telson broader than long, consisting of 10 plates; scattered setae near junction of plates, particularly on posterolateral margin of medial plate. Males with thick fringe of golden setae on margin of lateral plate; setae short and sparse in this location on female; posterior margin of telson scalloped.

Color.--Color notes were taken on a live male specimen. The carapace, chelipeds eyestalks and mouthparts were dull orange; the dorsal abdomen was paler with an orange transverse ridge across each tergite; ambulatory legs and tailfan were also pale, lightening to white distally; the corneae were distinctly white.

All material examined is preserved in alcohol and has lost all traces of pigment; the corneae appear translucent in these specimens.

Size.--♂, cl. 6.0-11.0 mm,
♀, cl. 7.4-13.0 mm, and
ovigerous ♀, cl. 8.2-13.0 mm.

Sexual dimorphism.--Males of all sizes have the characteristic row of thick golden setae on the lateral margin of the lateral plate of the telson (also reported by Perez, 1927: 284); setae in this position on the female are short and sparse.

Fingers of the chelipeds abut along their entire length in both sexes; even the largest males display no gape. There are subtle differences in the size and shape of the chelipeds, however, which may be used to distinguish the sexes: males have the chelipeds slightly more than 2 times the carapace length; females have them somewhat less than twice the carapace length. Also, the male has the fingers slightly more attenuate and both manus and fingers more slender than do the females. As in most species, the abdomen of the female is broader than that of the male.

Habitat.--At many of the stations in the Straits of Florida where M. simplex occurred, the bottom consisted of pteropod ooze; some stations

also were characterized as having mud, and several with Thalassia blades and coral rubble. The deeper stations at various locations in the Caribbean had diverse bottom types: green and brown mud, rocks, coral rubble, pteropod shells and siliceous sponges (see appendix).

Types.--A. Milne Edwards evidently did not indicate a holotype, and a lectotype has not yet been selected from the type series. Some of the syntypes are housed at the MCZ.

Type locality. The following BLAKE stations are presently considered type localities: off Guadeoupe, no. 162 (734 fm), no. 163 (769-878 fm); off Dominica, no. 180 (982 fm), no. 185 (333 fm); off Martinique, no. 195 (502 fm), no. 214 (892 fm); and off St. Vincent, no. 226 (424 fm), no. 227 (573 fm).

Geographic range.--Munidopsis simplex appears to be widely distributed throughout the Gulf of Mexico, the Caribbean Sea, and in the western Atlantic from the Bahama Islands at least as far south as Surinam. Apart from the type localities, records in the literature are: north coast of Cuba (Chace, 1942: 92); Gulf of Mexico (Pequegnat and Pequegnat, 1970: 156-157).

Bathymetric range.--The possible depth range for material in this collection is 1088-3971 m; calculated range is 116-3477 m. The previously recorded depth range was 609-1858 m, so the deep station in the St. Croix Basin (P-1304) dramatically increases the known depth range.

Parasites.--Two males specimens from the Straits of Florida (G-963, G-964) each had a peltogastrid rhizocephalan attached to the ventral surface of the second abdominal segment; the two parasites appear to be

alike, and were tentatively identified as Sacculina sp., quite similar to S. bucculenta Boschma, 1933. The first of the parasitized specimens has the fourth fifth and sixth pleopods slightly better developed than normal for males. The other specimen has, in addition to Sacculina, a specimen of Galatheascus minutus Boschma, 1933 attached ventrally between the fifth and sixth segments of the abdomen. A male and female taken off the Atlantic coast of Colombia (P-391) each were parasitized by Galatheascus sp., possibly G. striatus Boschma, 1929, attached between the fifth and sixth segments. These constitute the first records of abdominal parasites in this species; there have been no reports of branchial parasites.

Several specimens have various foraminiferans attached to body surfaces.

Associates.--At 10 of 22 stations where M. simplex was taken, M. sigsbei was also collected. The index of affinity calculated between these two species based on these data is 0.34.

Relationships.--As Chace (1942: 92) pointed out, Munidopsis simplex is closely related to M. curvirostra Whiteaves from the northern part of the North Atlantic; on comparing the two species, he expressed little doubt that they are distinct, but said that M. simplex might properly be reduced to subspecific rank. In specimens he examined, the rostrum varied from 41 to 53 per cent of the remainder of the carapace in M. simplex, and from 71 to 76 per cent in M. curvirostra; the rostrum was always more strongly curved in M. curvirostra and the armature of the dorsal surface of the carapace, basa segment of the antennular peduncle and third maxillipeds was usually weaker. In specimens of M. simplex

collected by the GERDA and HILLSBURY, the rostrum/carapace length ratio varies from 0.40 to 0.60; the rostrum appears slightly more curved in females than in males, although there are a few males with greater rostral curvature than certain females. The slight increase in rostrum/carapace length ratio in this material is not considered sufficient to alter the status of this species.

Other species in the western Atlantic closely related to M. simplex are M. reynoldsi (A. Milne Edwards) and M. similis Smith; both of these have a simple, spine-like rostrum, 1 pair of gastric spines and lack epipods on the pereopods. M. simplex is the only species with the above characters which also has the second and third abdominal tergites armed. M. reynoldsi has the posterior margin of the carapace armed, the ambulatory legs longer in respect to the chelipeds, and distinct spines along the merus of all pereopods; M. similis has more lateral spines, a post-antennal spine on the frontal margin of the carapace and distinct eyespines, which are lacking in the other species mentioned.

Milne Edwards and Bouvier (1897) emphasized the similarities between M. simplex and M. sigsbei. These similarities are quite superficial, but since the two species usually occur together, it is useful to cite the major differences between them: M. simplex is a smaller species, more heavily sculptured and spined on the carapace, with shorter, narrower chelipeds (about 2 times carapace length); the abdomen is armed on the second and third segments, and there are no epipods on the pereopods. M. sigsbei is larger, with the gastric region of the carapace unarmed and relatively smooth; the posterior margin is armed with several spines; the chelipeds are longer (about 3 times carapace length) and broader; the abdomen is unarmed, and there are epipods on

the first 3 pairs of pereiopods.

Munidopsis stylirostris Wood-Mason from the Gulf of Aden and the Arabian Sea may also be related to M. simplex; it lacks epipods on the pereiopods, has the rostrum spine-like and upcurved, has no post-antennal spine, and has a pair of gastric spines (followed by several medial spines in M. stylirostris var. africana Doflein and Balss), but it lacks spines on the abdominal tergites.

Munidopsis spinifer (A. Milne Edwards, 1880)

Figures 50, 51

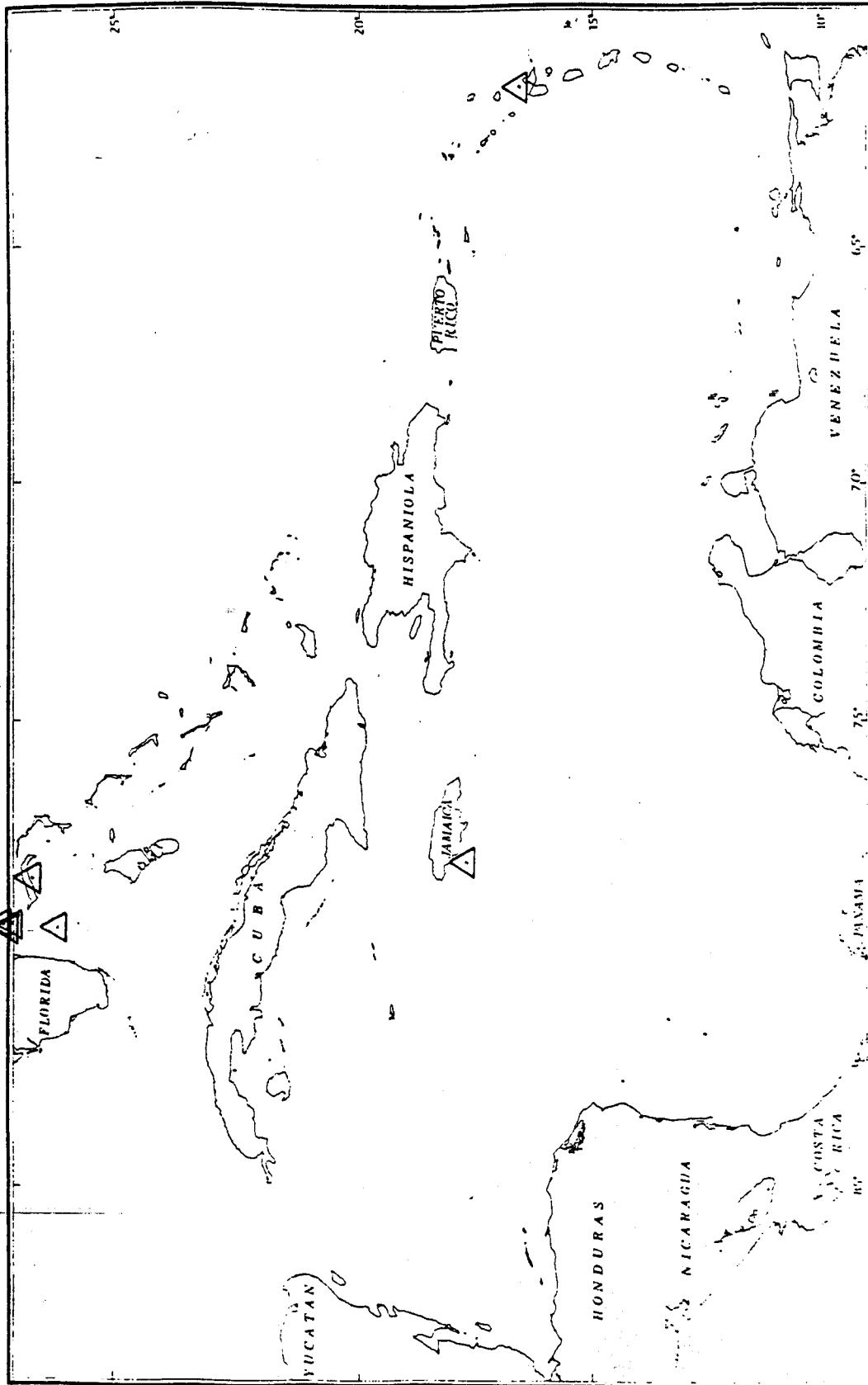
Galathodes spinifer A. Milne Edwards, 1880: 54.

Munidopsis spinifer: A. Milne Edwards and Bouvier, 1894: 275 (key);
 1897: 64-67, pl. VII, figs. 6-8.--Young, 1900: 407 (key), 412.--
 Benedict, 1902: 277 (key), 327 (list).--Doflein and Balss, 1913:
 175 (list), 178 (table).--Perez, 1927: 285 (sexual dimorphism).--
 Chace, 1942: 74 (key), 91-92.--Pequegnat and Pequegnat, 1970: 140
 (key), 157, table 5-3; 1971: 6 (key).

Material examined.--Straits of Florida: G-169, 567-522 m, 1 ♂, 9.1 mm,
 1 ovigerous ♀, 7.7 mm, UMML 32:2682; G-386, 604 m, 1 ♀, 6.8 mm, UMML
 32:5296; G-635, 458-480 m, 1 ovigerous ♀, 7.7 mm, UMML 32:5297; P-209,
 depth not recorded, 1 ♂, 5.5 mm, UMML 32:5298.--Bahama Islands: G-690,
 494-503 m, 1 ♂, 6.1 mm, (USNM).--Off Guadebupe: P-944, 360-421 m, 1 ♂,
 6.5 mm, (RMNH).--S of Jamaica: P-1225, 457-558 m, 3 ♂, 8.5-12.7 mm,
 UMML 32:5299. See distribution plot 19.

Diagnosis.--Rostrum almost horizontal, with 1 pair of lateral spines;
 gastric region of carapace with 3 pairs of spines and 3 to 5 spines on
 posterior margin; second, third and fourth abdominal segments with
 sharp medial spine, additional spine or spines laterally on second and
 third segments; no eyespine; no epipods on chelipeds or ambulatory legs.

Description.--Carapace longer than broad, lateral margins almost paral-
 lel, slightly wider posteriorly. Gastric region inflated, with 3 pairs
 of sharp spines in longitudinal row, anterior spines largest; 2 pairs
 on cardiac region posterior to those; 1 spine on mesobranchial region



Distribution plot 19. -- *Munidopsis spinifer* (A. Milne Edwards, 1880) collected by the GERDA and PILLSBURY.

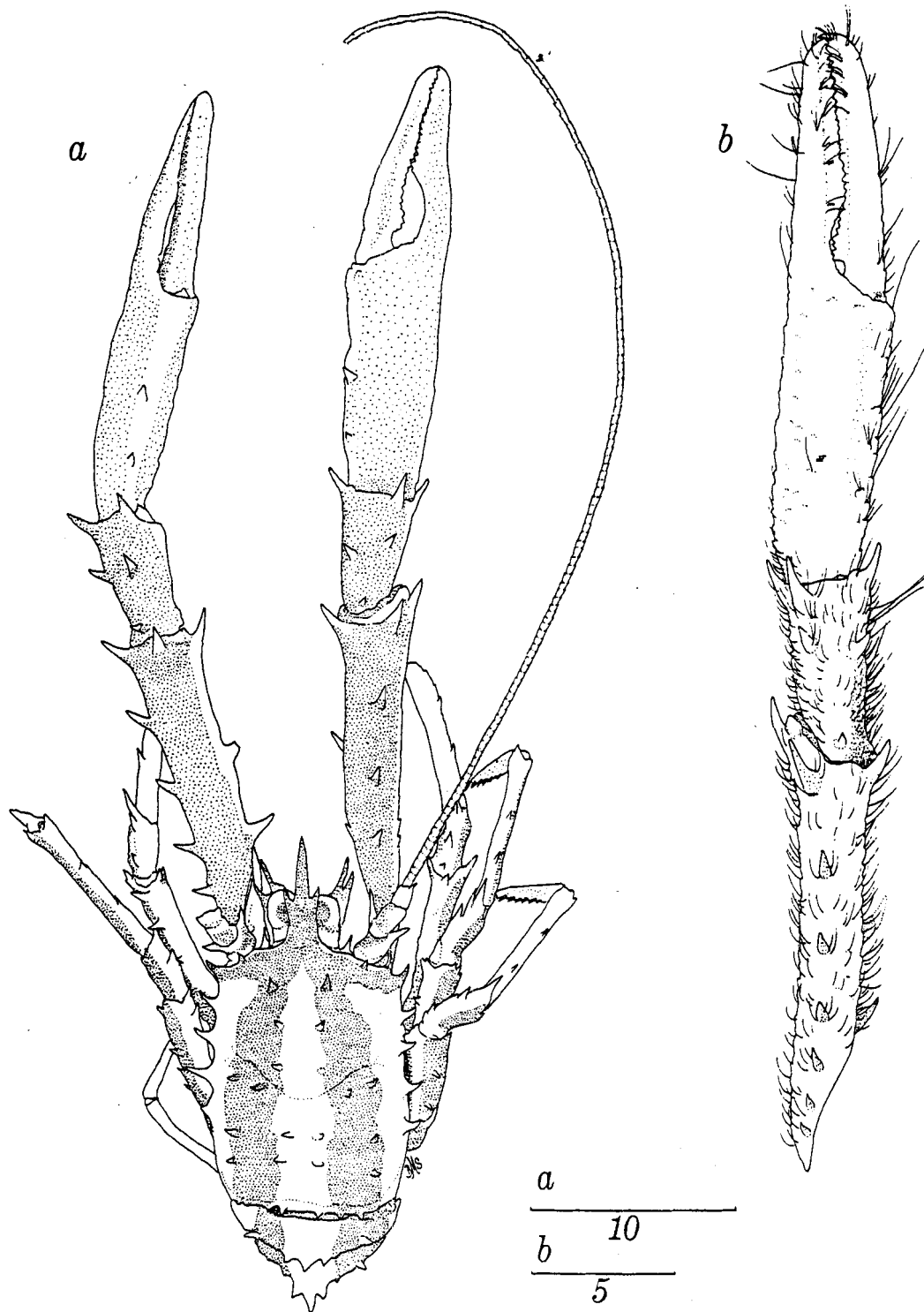
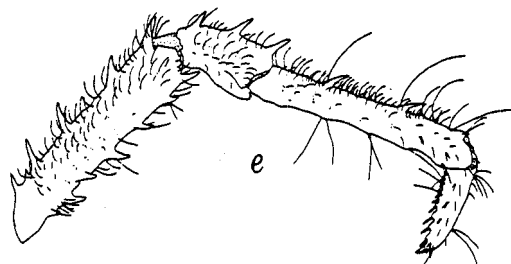
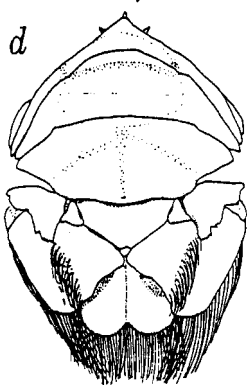
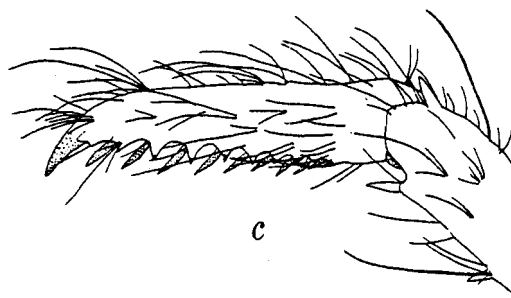
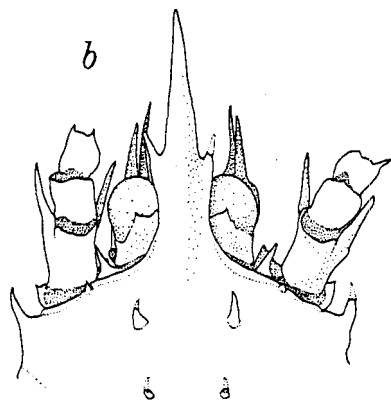
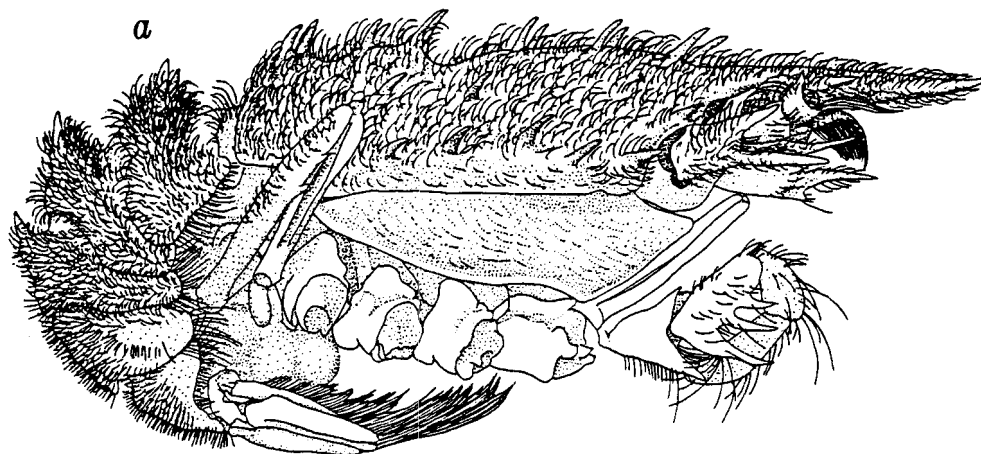


Figure 50. --*Munidopsis spinifer* (A. Milne Edwards, 1880). ♂, cl. 12.7 mm, P-1225: a, dorsal view, no setae shown, shaded areas indicate red-orange color pattern (drawn from color slide taken by D. M. Opresko). ♂, cl. 12.5 mm, P-1225: b, left cheliped, most setae shown. Scales in mm.



a, b	
c	5
d, e	2
	10

Figure 51. --*Munidopsis spinifer* (A. Milne Edwards, 1880). Ovigerous ♀, cl. 7.7 mm, G-169: a, carapace and abdomen, lateral view showing third maxilliped, not all setae shown. Ovigerous ♀, cl. 7.7 mm, G-635: b, anterior carapace and cephalic appendages, setae omitted; c, dactylus of left second pereiopod. ♂, cl. 12.5 mm, P-1225: d, posterior abdominal tergites, uropods and telson, only marginal setae shown; e, right second pereiopod. Scales in mm.

followed by 2 on each metabranchial region; metabranchial region lightly sculptured. Cervical groove distinct behind gastric region across center of carapace; postcervical groove posterior to this deeper across central third of carapace. Surface covered with short, curved setae. Rostrum approximately 1/2 carapace length, narrow, slightly carinate, armed with 1 pair lateral spines approximately 1/2 distance from base of rostrum to tip, tapering distally. Frontal margin with 1 sharp spine posterior and slightly mesial to antenna, sometimes greatly reduced. Anterolateral spine sharp, curved, followed by 4 similar spines on lateral margin, spine posterior to cervical groove slightly heavier. Raised rim at posterior margin armed with 3 to 5 spines on each side of midline.

First abdominal tergite smooth, unarmed. Second and third segments with 5 spines on rounded crest of transverse carina: spine on midline largest, with smaller spine on each side, other spines more lateral, smaller. Fourth segment with 1 spine on midline, occasionally a small spine on either side. Fifth and sixth segments unarmed, smooth. Second through fifth segments covered with short setae, curved on anterior 2 segments, straight on posterior ones.

Sternum unarmed; intersegmental swellings with setae.

Eyes colorless, movable, unarmed; eyestalk short, triangular projection from base of cornea; distal margin of eyestalk with forward-projecting setae, some curved, several long, thick.

Sharp spine projecting from beneath frontal margin of carapace between eyestalk and bases of antennule and antenna.

Basal segment of antennular peduncle swollen, armed with 2 long sharp spine dorsodistally, distal most spine longer. Antennular flagellum extending slightly beyond tip of rostrum.

Basal segment of antennal peduncle broad, ventromesial tooth prominent, lateral triangular projection with terminal denticle. Second segment with 2 long sharp spines on distal margin: ventromesial spine longer than lateral spine. Third segment unarmed. Fourth segment with small dorsolateral spine on distal margin. Antennal flagellum as long as 7 times carapace length.

Ischium of endopod of third maxilliped triangular in cross section; mesial margin serrate, ventral and lateral angles with sharp distal spine. Ventral margin of merus with 3, sometimes 4, sharp spines, decreasing in size distally; proximal spine broad at base; dorsal margin with small sharp distal spine.

No epipods on pereopods.

Chelipeds 2 1/2 to 3 times carapace length. Dactylus approximately 1/2 length of chela; gape at base of fingers (small gape even in some females). Tips of fingers spooned, dentate; fingers toothed along opposing margins; in males, distal 2/3 with margins abutting. Chela narrow, width at widest point less than 1/4 length; manus with several low protuberances on mesial margin, 1 or 2 in center expanded to small tooth. Carpus short, less than 1/2 length of chela, with 4 sharp spines on distal margin: 1 dorsomesial, 1 dorsolateral, 1 lateral and 1 ventrolateral; dorsal face of segment with 3 small spines: 1 spine behind each of dorsal distal spines, and 1 proximal spine. Merus not quite as long as chela, with 4 large spines at distal angles; dorsal surface with 4 large ventromesial spines and 2 or 3 small ventrolateral spines. Ischium with 3 sharp spines along ventral projection and 1 spine on dorsal surface. Surfaces of ambulatory legs and proximal segments of chelipeds with many low, rounded protuberances and short, curved setae.

Second, third and fourth pereopods similar, dorsal and lateral surfaces covered with setae, some longer, most plumose. Dactylus of second pereopod barely reaching carpus of cheliped; curved tip corneous, followed by 8 to 10 triangular teeth on ventral margin, decreasing in size proximally, distal edge of each tooth with movable corneous spinule. Propodus with 2 or 3 sharp curved spines on dorsal surface, 1 small tooth at dorsolateral edge of distal margin, 1 movable spine at distal ventral edge of segment, and 1 approximately 1/3 distance from distal end. Carpus with 3 sharp, curved spines on dorsal crest, distal spine largest; distal margin beneath spine with dorsal and ventral denticles. Merus with 5 to 7 sharp curved spines on dorsal edge, decreasing in size proximally; ventrolateral edge with 5 to 7 smaller spines, arranged in row on second pereopod, more irregular on third and fourth pereopods. Distal margin of ischium with small dorsal and lateral teeth, several protuberances ventrally on second and third pereopods, fourth pereopod only with several protuberances.

Fifth pereopods with merus expanded, lateral surface with short setae, lightly sculptured, with 2 or 3 small teeth on ventral edge.

Posterolateral margin of protopod of uropod scalloped; posterior lobe with 3 denticles on lateral side of notch, 1 or 2 mesially.

Telson divided into 8 plates, central plate very small. Posterior margin in 2 lobes.

Color.--From a color slide of the dorsal aspect taken by Dennis M. Opresko: This species is strikingly colored with broad red-orange stripes on a white background. The rostrum is colored with the pigment extending across the anterior carapace (except for a narrow white frontal rim) and including the anterolateral spines. The colored area continues

posteriorly on either side of the midline as a broad stripe taking in the anterior gastric spine, but passing lateral to the 2 posterior pairs; it includes the area of the meso- and metabranchial spines, but does not include the medial pairs on the cardiac region and posterior margin. The abdominal segments show a continuation of this pattern, with the central 3 spines in the white stripe; the lateral spines are not colored, but are in the center of the red-orange area, and there is a narrow area without color at each lateral margin.

The cornea of the eye appears to have an inner sphere of red-orange pigment, and there is some color dorsally on the eyestalk at the base of the cornea. It is not possible to be certain about coloration of patterns on the cephalic appendages, but the basal antennular spines are colored, as are the second and third segments of the antennal peduncle.

The chelipeds have a broad longitudinal orange band on most of the dorsal surface of the merus with white on either side. The dorsal and mesial surface of the carpus is pale orange, as is the dorsal surface of the chela. The manus appears to have a lighter area on the mesial surfaces, and the dactylus has a darker stripe dorsally. The merus and carpus of the ambulatory legs have a broad orange stripe along the lateral face; the propodus of the second ambulatory leg has a longitudinal stripe on the lateral surface, and it is probably that this segment of the other legs does also. The dactyli and ventral surfaces of the animal were not visible.

Size.--♂, cl. 5.5-12.7 mm,

♀, cl. 6.8-7.7 mm, and

ovigerous ♀, cl. 7.7 mm.

These sizes compare favorably with those given by A. Milne Edwards and Bouvier (1897: 66) which indicate carapace lengths of approximately 12 mm for the male and 7 mm for the female.

Sexual dimorphism.--Some large males have the cheliped gaped, but there is a small gape in all specimens examined (including females) and one large male has the opposing margins abutting for almost the entire length of the fingers. Thus the gape is inconsistent in males.

The fringe of thick golden setae on the lateral margins of the telson occurs only in males. This feature was pointed out by Perez (1927). The differences in the shape of the rostrum and placement of the lateral spines mentioned by A. Milne Edwards and Bouvier (1897: 66) were not observed in the only male and female taken at the same station (G-169).

Habitat.--At the 3 stations for which information about the bottom was recorded, sponges, alcyonarians and coral were characteristic.

Type.--The holotype is a male, cl. approximately 12 mm. Present deposition of the type not determined.

Type locality.--Caribbean Sea (St. Kitts), BLAKE Sta. 146, 450 m.

Geographic range.--Munidopsis spinifer has been collected in the western Atlantic from the Straits of Florida and the Bahamas and in the Caribbean from Cuba to Barbados. Records in the literature are: St. Kitts to Barbados (A. Milne Edwards and Bouvier, 1897: 66-67); north coast of Cuba (Chace, 1942: 91).

Bathymetric range.--The possible depth range for specimens collected by the GERDA and PILLSBURY is 203-604 m; calculated range is 421-522 m,

which falls within the previously recorded depths of 275-880 m.

Parasites.--None of the specimens in this collection shows external evidence of parasitism. The abdominal parasite mentioned by Chace (1942) was identified by Reinhard (1958) as the rhizocephalan Tortugaster fistulatus Reinhard, 1948.

Associates.--No other representative of the genus occurred at more than 1 of the 6 stations where Munidopsis spinifer was collected.

Relationships.--Munidopsis spinifer resembles M. erinaceus (A. Milne Edwards), also from the western Atlantic, in having a pair of lateral teeth on the rostrum and sharp spines arranged symmetrically over the carapace, abdomen and appendages, but differs from it in a number of characters: M. spinifer has 3 pairs of gastric spines instead of 2 pairs; the posterior margin of the carapace is armed; there are medial spines on the abdominal tergites, lateral spines on the propodus of the ambulatory legs, and most spines are directed more anteriorly than laterally.

Munidopsis sericea Faxon and M. agassizi Faxon from the eastern Pacific are close to these species morphologically; both have lateral rostral spines, armed abdominal tergites, and the general configuration of the above, but both lack medial abdominal spines. In addition, M. sericea has only 1 pair of gastric spines and a pair of small supraocular spines; M. agassizi has spines on the dorsal surface of the manus and more lateral spines on the carapace.

Remarks.--Although all specimens examined have short curved setae to some degree over the surface of the carapace, abdomen and pereopods, the male and female from G-169 (northern Straits of Florida) have these

surfaces extremely setose (fig. 51).

As has been pointed out by Chace (1942), the armature of the third maxillipeds can be quite variable. A single specimen of M. spinifer has 3 sharp ventral spines on the merus of one of its third maxillipeds, as is usually the condition, and 4 distinct ventral spines on the opposite maxilliped.

Chace also indicated that M. spinifer had a frontal spine on the carapacial margin which contradicts A. Milne Edwards and Bouvier's description and illustration. While this spine is a consistent feature of individuals in our collection, one specimen (from G-635) has the spine reduced to a spinule.

Munidopsis spinocolata (A. Milne Edwards, 1880)

Figure 54

Orophorhynchus spinocolatus A. Milne Edwards, 1880: 59.Munidopsis spinocolata: A. Milne Edwards and Bouvier, 1894: 275 (key);

1897: 75-78, pl. VI, figs. 8-11.--Young, 1900: 407 (key), 409.--

Benedict, 1902: 276 (key), 327 (list).--Doflein and Balss, 1913:

176 (list), 178 (table).--Chace, 1942: 74 (key), 86.--Pequegnat and

Pequegnat, 1970: 139 (key), 158 (in part), fig. 5-1, table 5-2;

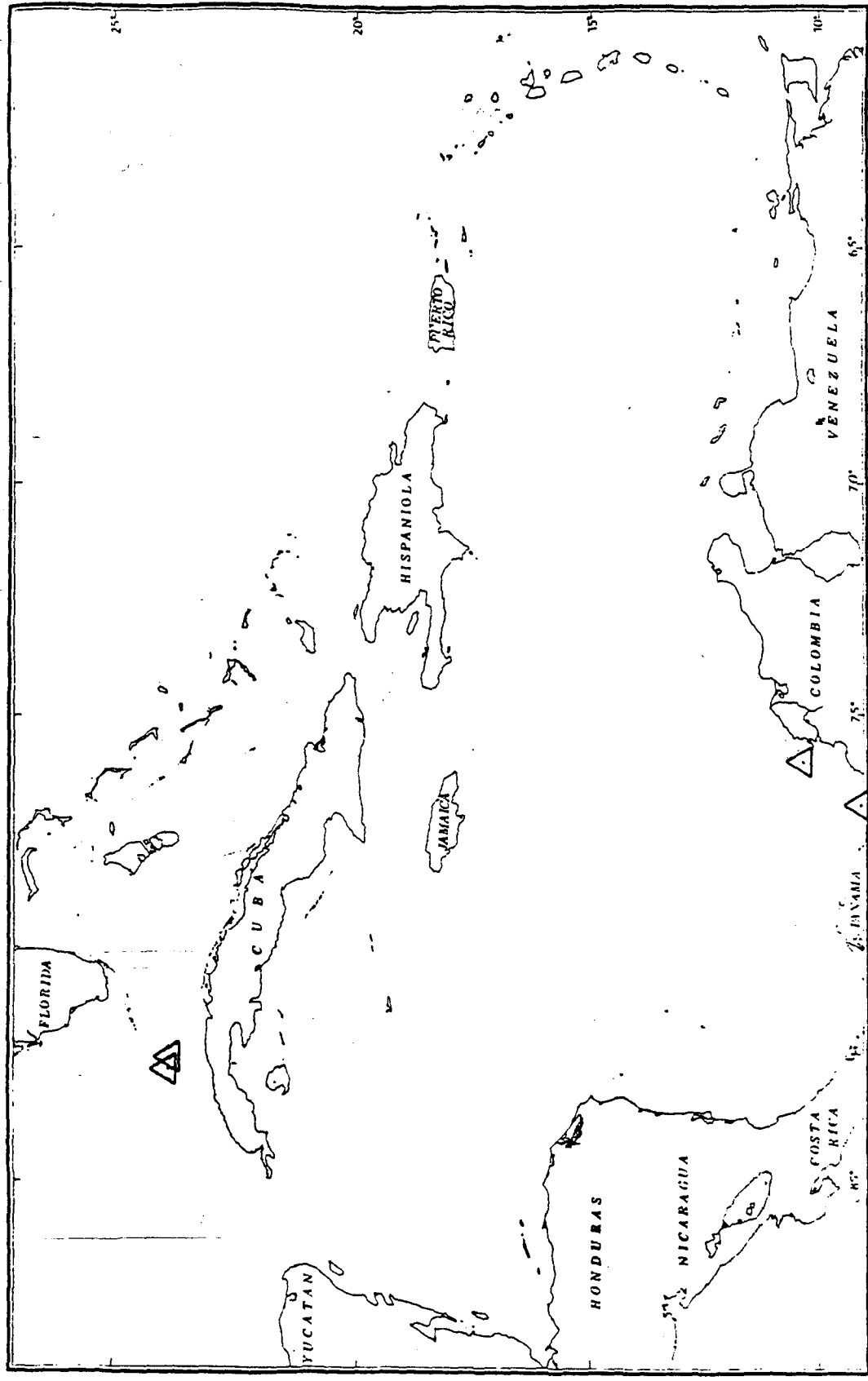
1971: 6 (key), 23-24, fig. 7c.

Material examined.--Straits of Florida: G-446, 1135-1184 m, 1 ♂, 7.9 mm,(USNM); G-448, 988-1071 m, 1 ♂, 8.3 mm, UMML 32:5300.--Off Atlan-tic coast of Colombia: P-381, 724-597 m, 1 ♂, 7.1 mm, UMML 32:5301.--OffDominica: BLAKE Sta. 179, 1508 m (824 fm), 1 ♂, holotype, approximately

9 mm, MCZ 4750. See distribution plot 20.

Diagnosis.--Rostrum long, triangular, spine-like, horizontal; lateral margins straight, tapering directly from base to apex; gastric region unarmed, with obscure irregular transverse sculpturing; frontal margin with prominent post-antennal spine; anterolateral tooth small or lacking; posterior margin of carapace and abdominal segments unarmed; cornea with central spine approximately same length as corneal diameter; no epipods on pereopods; sternum armed with 2 pairs sharp spines between chelipeds; coxa of cheliped with slender mesial spine.

Description.--Carapace longer than broad ($cw/cl = 0.78-0.84$), narrower anteriorly, slightly convex transversely; gastric region moderately inflated; obscure transverse striae in 5 or 6 irregular transverse lines,



Distribution plot 20.--Munidopsis spinoculata (A. Milne Edwards, 1880)
collected by the GERDA and PILLSBURY.

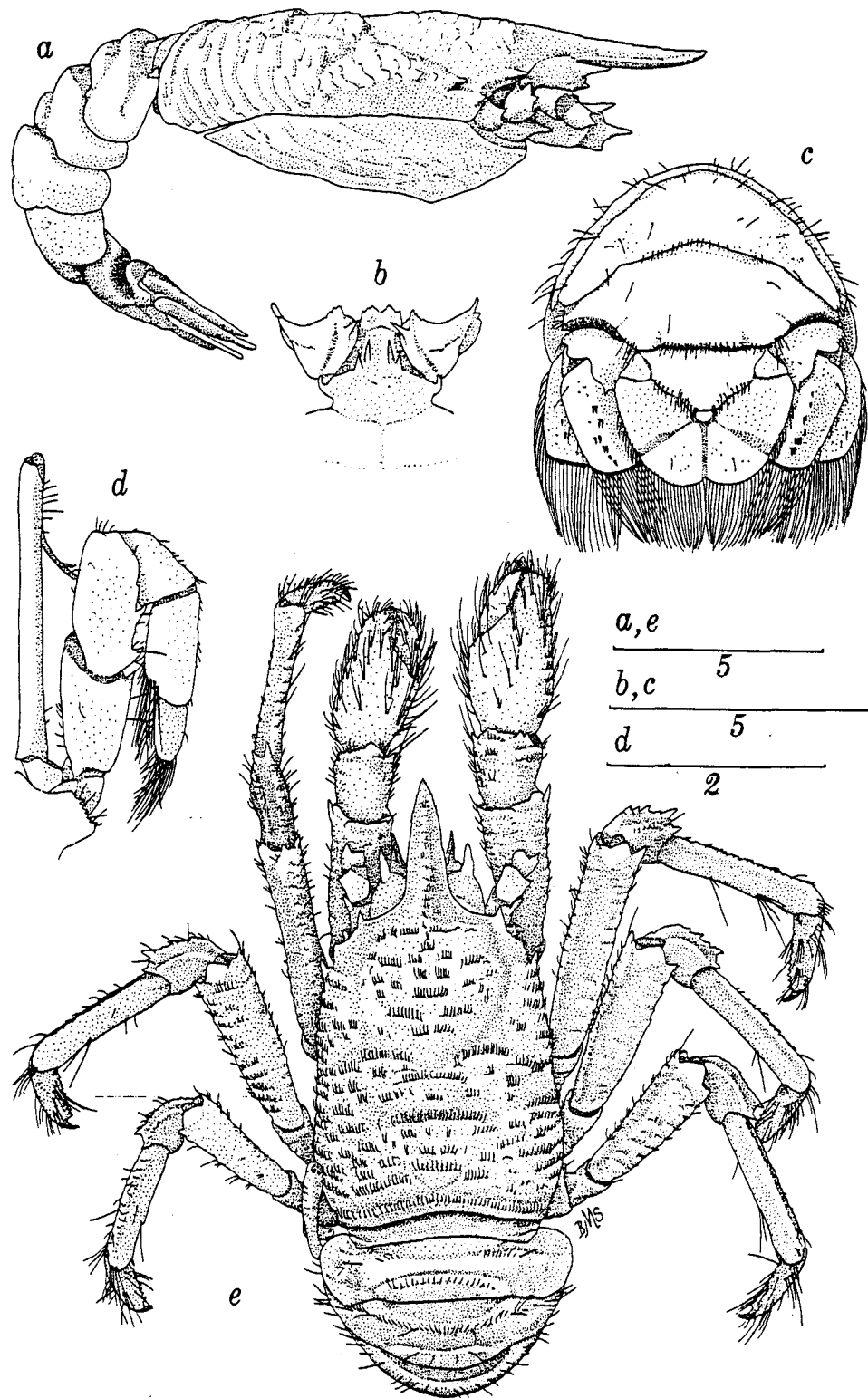


Figure 52. --*Munidopsis spinoculata* (A. Milne Edwards, 1880). ♂, cl. 8.3 mm, G-448: a, carapace and abdomen, lateral view, setae not shown; d, right third maxilliped, ventrolateral view. ♂, cl. 7.1 mm, P-381: b, anterior sternites and coxae of chelipeds; c, posterior abdominal tergites, uropods and telson; e, dorsal view.

interrupted medially, with evenly-spaced setae directed anteriorly; cervical groove shallow but distinct, followed by raised sculpturing across central third of carapace at anterior margin of metagastric region; sculpturing on surface of metagastric and cardiac regions very obscure; anterior margin of cardiac region raised, defined anteriorly by postcervical groove separating cardiac and metagastric region; striae on metabranchial regions more distinct, obscurely beaded, interrupted. Rostrum $1/3$ to $2/5$ carapace length, horizontal; lateral margins straight, tapering directly from base to apex, minutely serrate in distal half; blunt median longitudinal carina with series of obscure denticles. Frontal margin oblique, fused to eyestalks between base of rostrum and prominent post-antennal spine; margin continuing obliquely to small anterolateral tooth, or anterolateral tooth lacking. Lateral margin with large sharp tooth behind termination of anterior branch of cervical groove, and 1 or more denticles posterior to this on lateral edge of epibranchial region. Raised rim on posterior margin of carapace unarmed except for minute beading.

Abdomen unarmed. Second and third segments with 2 transverse carinae: anterior carina sharper, extending laterally to center of pleuron; posterior carina rounded, extending across tergite. Fourth tergite with rounded transverse swelling anteriorly, and very obscure central swelling on posterior part. Fifth and sixth segments smooth. Posterolateral margin of sixth segment slightly lobed.

Sternum armed with 2 pairs of small sharp spines on anterolateral margin between coxae of chelipeds.

Eyes immovable, base fused to frontal margin of carapace, armed

with prominent conical spine projecting anteriorly from center of cornea; length of eyespine almost equal to diameter of cornea; small ventromesial tooth projecting from eyestalk beyond surface of cornea.

Basal segment of antennular peduncle with minutely tuberculate lateral inflation; dorsolateral spine smaller than prominent spine beneath it on distolateral margin; longer spine extending beyond eyespine; distal margin serrate ventrally, with minutely denticulate mesial projection.

Basal segment of antennal peduncle with small lateral spine and longer prominent sharp ventromesial spine. Distal margin of second segment with small conical lateral spine and occasionally smaller ventromesial tooth. Distal margin of third segment minutely denticulate, denticles occasionally developed into small teeth. Distal margin of fourth segment with dorsolateral spine and dorsal and mesial denticles. Flagellum more than twice carapace length, extending well beyond tips of chelipeds.

Merus of endopod of third maxilliped with 2 spinules on flexor (ventral) margin. Rounded ventral carina on ischium terminating in spinule distally.

Pereiopods lightly sculptured on dorsal and exposed lateral surfaces. No epipods on chelipeds or ambulatory legs.

Chelipeds short, broad, length 1 to 1 1/3 times carapace length. Manus dorsoventrally compressed, equal to approximately 1/2 cheliped length; width of manus almost 1/2 length. Dactylus less than 1/2 length of manus; fingers quite compressed, slightly gaped in both males and females, gape more pronounced in males; opposing margins abutting in distal half, toothed; tips spooned, gaped ventrally; fixed finger with distolateral margin expanded to dentate crest; manus with widely-spaced groups of long setae on most surfaces, particularly on lateral and

mesial margins. Carpus less than 1/2 length of manus; distal margin with small dorsomesial tooth and 2 dorsolateral teeth. Merus shorter than manus, extending just beyond tip of rostrum; dorsal margin rounded distally, sharper proximally with denticles becoming coarser proximally; distal margin serrate dorsally, with sharp spine beneath lateral and mesial articular lobes. Ischium with small dorsal tooth distally, and several smaller tubercles posteriorly. Basal segment with sharp slender spine on ventromesial surface directed mesially.

Second, third and fourth pereopods similar. Second pereopod reaching beyond distal margin of cheliped; third and fourth pereopods reaching beyond distal margin of propodus of preceding pereopod. Tip of dactylus curved, corneous, pale brown, followed on flexor margin by series of 10 to 12 triangular teeth, decreasing in size proximally, each armed on distal edge with slender corneous spinule. Propodus approximately twice length of dactylus; extensor surface with 2 minutely denticulate or tuberculate longitudinal ridges, surface flat or slightly excavate between them; slender articulated spinule projecting from each of 2 small ventral lobes on distal margin. Carpus approximately 1/2 length of propodus, extensor margin expanded, with sharp distal spine followed by smaller distinct spine and several denticles or tubercles, decreasing in prominence proximally, occasionally 1 of these developed into spine; distal margin with smaller lateral spine followed by minutely denticulate longitudinal ridge; ventral margin denticulate. Merus with extensor margin expanded dorsally, with widely-spaced denticles, terminating distally in sharp triangular spine; similar distal spine beneath lateral articular lobe on flexor margin. Lateral surface with transverse sculpturing, most distinct on fourth pereopod. Ischium unarmed.

Merus of fifth pereopod compressed, expanded, cristate ventrally with small projection near middle of ventral margin.

Protopod of uropod with obscure sculpturing in center of postero-mesial portion; posterior lobe of posterolateral margin with sharp spine mesial to obscure notch. Endopod with several pairs of articulated spinules in oblique row on exposed surface; exopod and endopod with granular denticles on posterolateral and posterior margins.

Telson broader than long, consisting of 9 plates, smooth; posterior margin indented medially.

Color.--Specimens examined were preserved in alcohol and were completely devoid of color except for the pale brown tips of the dactylus and thick golden setae on certain appendages and body surfaces.

Size.--♂, cl. 7.9-8.3 mm, and

♀, cl. 7.7 mm.

No ovigerous females were collected by the GERDA and PILLSBURY. Cahce (1942: 86) reported an ovigerous female with the carapace and rostrum measuring about 10 mm.

Sexual dimorphism.--Males have a row of setae on the posterolateral margins of the telson which are slightly thicker than other marginal setae, but they do not form the prominent golden "comb" characteristic of many species of Munidopsis; females have very few fine setae in this location.

No difference between sexes was observed in the chelipeds or in the width of the abdomen.

Habitat.--The bottom type was recorded at all 4 GERDA and PILLSBURY stations where M. spinoculata was collected; the bottom was muddy at all

4 stations; pteropod shells were present at 2 stations; sand and rocks were present at 1 of the latter, and coral and Thalassia debris were found at the other.

Type.--♂, cl. approximately 8 mm; MCZ 4750.

Type locality.--Off Dominica, BLAKE Sta. 189, 1508 m (824 fm).

Geographic range.--Munidopsis spinocolata is known from widely scattered locations throughout the western Atlantic: from the Straits of Florida in the north, west from the SW Gulf of Mexico, south from the Atlantic coast of Colombia in the Caribbean, and east from Dominica. Records found in the literature are: north coast of Cuba (Chace, 1942: 86); SW Gulf of Mexico (Pequegnat and Pequegnat, 1970: 158); off British Honduras and near Jamaica (Pequegnat and Pequegnat, 1971: 23).

Bathymetric range.--Possible depth range for the GERDA and PILLSBURY collections is 597-1267 m; calculated range is 724-1135 m. Calculated range including previous records is 724-1508 m.

Associates.--Other species of Munidopsis were taken with Munidopsis spinocolata at 2 of the stations reported here; no species occurred with it more than once.

Parasites.--The female specimen from P-413 has a single abdominal parasite, probably a peltoastrid rhizocephalan. Unfortunately, the material is dried and further identification is impossible.

Relationships.--Several other western Atlantic species are somewhat similar to M. spinocolata. M. subspinocolata Pequegnat and Pequegnat

is very similar to M. spinoculata, but the former species lacks the prominent post-antennal spines, has a distinct anterolateral tooth, and has the carapacial sculpturing far more even and continuous, particularly across the gastric region, than does M. spinoculata, in addition to many other characters (see table 1). Munidopsis ramahtaylorae Pequegnat and Pequegnat is also close to these two, but lacks all sculpturing on the carapace, and has the rostrum slightly decurved, in addition to the other characters listed in the table. Munidopsis nitida (A. Milne Edwards) is closely related to M. spinoculata also, as indicated by A. Milne Edwards and Bouvier (1897: 75-77), but M. nitida has a pair of gastric spines and epipods on the chelipeds which serve to separate it easily from M. spinoculata.

As stated by Alcock (1901: 271), M. ceratophthalma Alcock from the Andaman Sea (Indian Ocean) is closely related to M. spinoculata; in addition to having the pereopods with more spines (the only distinguishing feature indicated by Alcock), M. ceratophthalma has the eyespine on the mesial side of the cornea rather than centrally as in M. spinoculata, and the anterolateral spine is more distinct in M. ceratophthalma.

Remarks.--The left fourth pereopod in the male specimen from P-381 (fig. 52,e) is smaller and less sculptured than the opposite pereopod, and probably has been regenerated. This may also account for the difference in length of the chelipeds of this specimen; all other specimens examined have the chelipeds equal.

Character	<u>M. spinoculata</u>	<u>M. subspinoculata</u>	<u>M. ramahtaylorae</u>
Carapace	Irregular sculpturing with setae, obscurely transverse, with interrupted; no striae	Regular transverse striae	Smooth, no sculpturing or striations, setae not in transverse rows
Dorsal surface, gastric region			
Rostrum: Lateral margins	Straight, tapering directly from base to apex	Subparallel proximally, slightly convex distally	Subparallel proximally, convex distally
Median carina	Present	Present	Absent
Shape dorsally	Horizontal	Horizontal	Convex, downcurved
Post-antennal armature	Spine	Lobe or spine(?)	Spine
Anterolateral armature	Small tooth or none	Distinct spine	None
Abdominal tergites			
Fourth	1 transverse groove with carina anteriorly	2 transverse carinae with grooves	1 transverse groove with carina anteriorly
Fifth	Smooth	Rounded carina	Smooth
Sixth	Smooth	Setae in 2 oblique rows posteriorly	Smooth
Sternal armature	2 pairs sharp spines	1 pair sharp spines	2 pairs sharp spines
Coxae of chelipeds, mesial surface	Armed with 1 sharp spine projecting mesially	Unarmed	Unarmed
Eyespine	Length almost equal to diameter of cornea	Length less than half diameter of cornea	Length about half diameter of cornea
Antenna, lateral spination	Distinct only on 2nd segment, basal and 3rd segments at most denticulate	Small teeth, no spines on basal and 2nd segment, 3rd segment denticulate	Basal, 2nd and 3rd segments with distinct lateral spines

Table 1. --Comparison of characters in three species of Munidopsis.

Munidopsis spinosa (A. Milne Edwards)

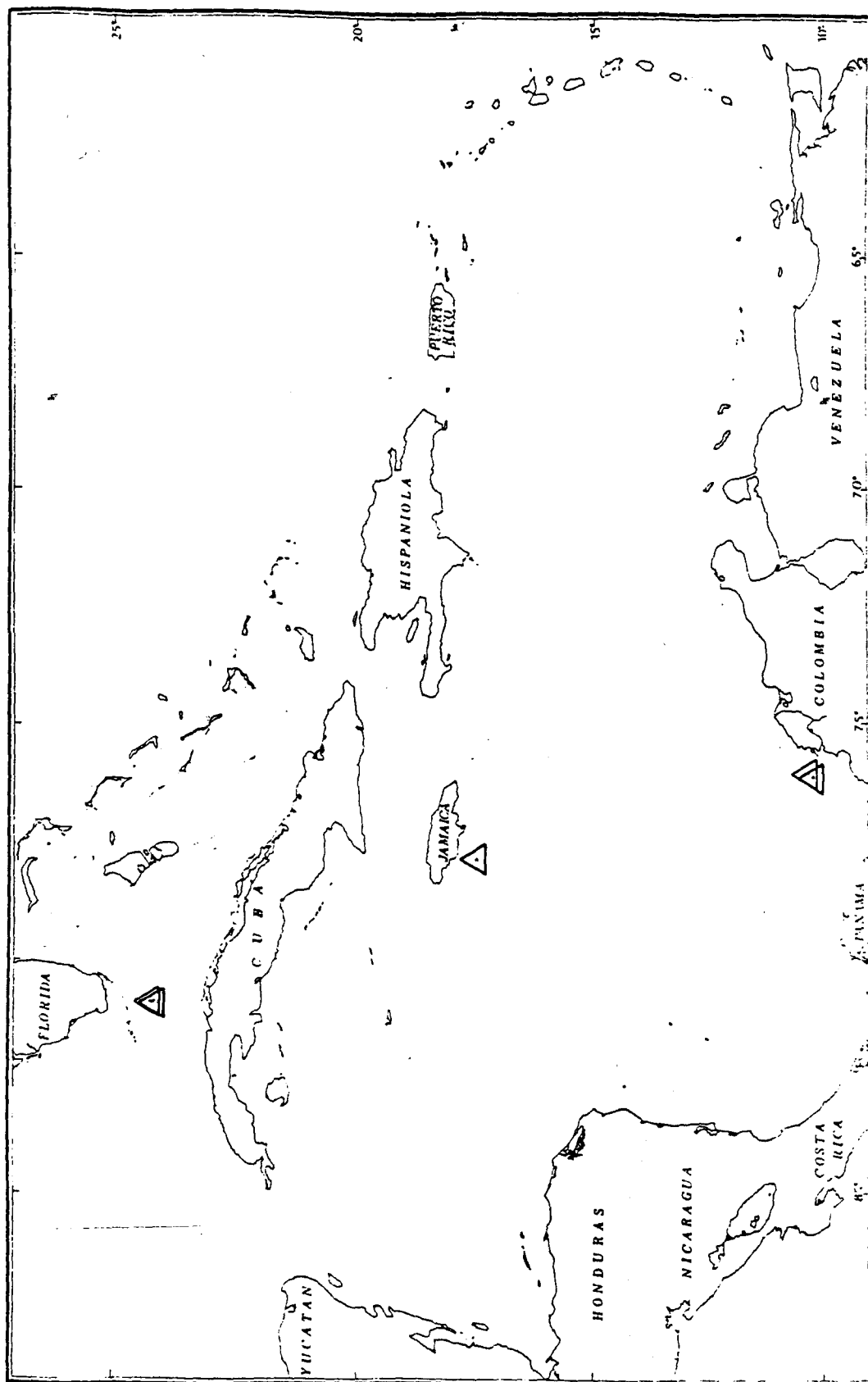
Figures 53, 54

Galacantha spinosa A. Milne Edwards, 1880: 53.--A. Milne Edwards and Bouvier, 1894: 270 (key); 1897: 56-60, pl. IV, figs. 14-20.--Young, 1900: 417.--Benedict, 1902: 305 (list).--Doflein and Balss, 1913: 174 (table). NOT Galacantha spinosa var. trachynotus: Alcock, 1901: 277-278 [= Munidopsis trachynotus (Anderson, 1896)].

Munidopsis spinosa: Chace, 1942: 72 (key), 76-77.--Pequegnat and Pequegnat, 1970: 138 (key); 1971: 4 (key).

Material examined.--Straits of Florida: G-131, 787-733 m, 1 ♂, 27.0 mm, 1 ovigerous ♀, 32.2 mm, UMML 32:2705; G-870, 807-755 m, 1 ♂, 29.7 mm, 1 ovigerous ♀, 28.9 mm, (USNM).--Off Atlantic coast of Colombia: P-381, 724-597 m, 2 ♂, 29.5, 25.0 mm, 3 ♀, 24.7-31.1 mm (all but largest male with branchial parasite), UMML 32:3149; P-388, 814-1050 m, 1 ovigerous ♀, 28.2 mm, (USNM).--S of Jamaica: P-1224, 878-906 m, 1 ♂, 26.4 mm with branchial parasite, 1 ♀, 30.0 mm with branchial and abdominal parasite (RMNH). See distribution plot 21.

Diagnosis.--Rostrum narrow, horizontal proximally with strong distal upturn, unarmed laterally; gastric region of carapace with pair of prominent anterior gastric spines and huge median laterally-compressed spine projecting upwards from posterior part; frontal margin unarmed between rostrum and long anterolateral spine; posterior marginal rim armed with line of short spines; second, third and fourth abdominal tergites armed with prominent median spine and 2 spinose transverse carinae; eyes unarmed, epipods on chelipeds and first 2 pairs of ambulatory legs.



Distribution plot 21.--Munidopsis spinosa (A. Milne Edwards, 1880) collected by the GERDA and PILLSBURY.

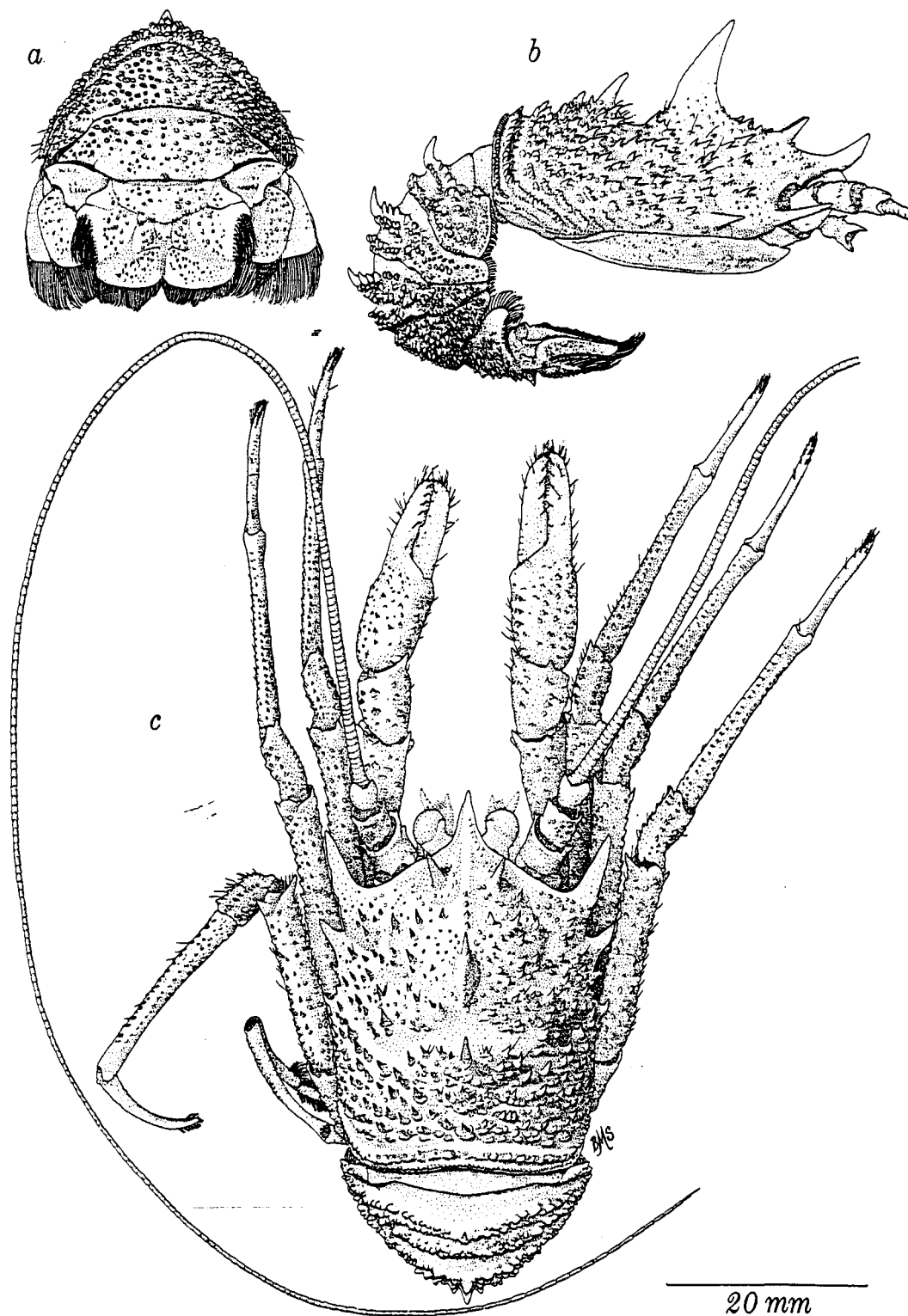


Figure 53. --*Munidopsis spinosa* (A. Milne Edwards, 1880). ♂, cl. 29.5 mm, P-381: a, posterior abdominal segments, uropods and telson; b, lateral view of carapace and abdomen; c, dorsal view. Most, but not all, setae shown.

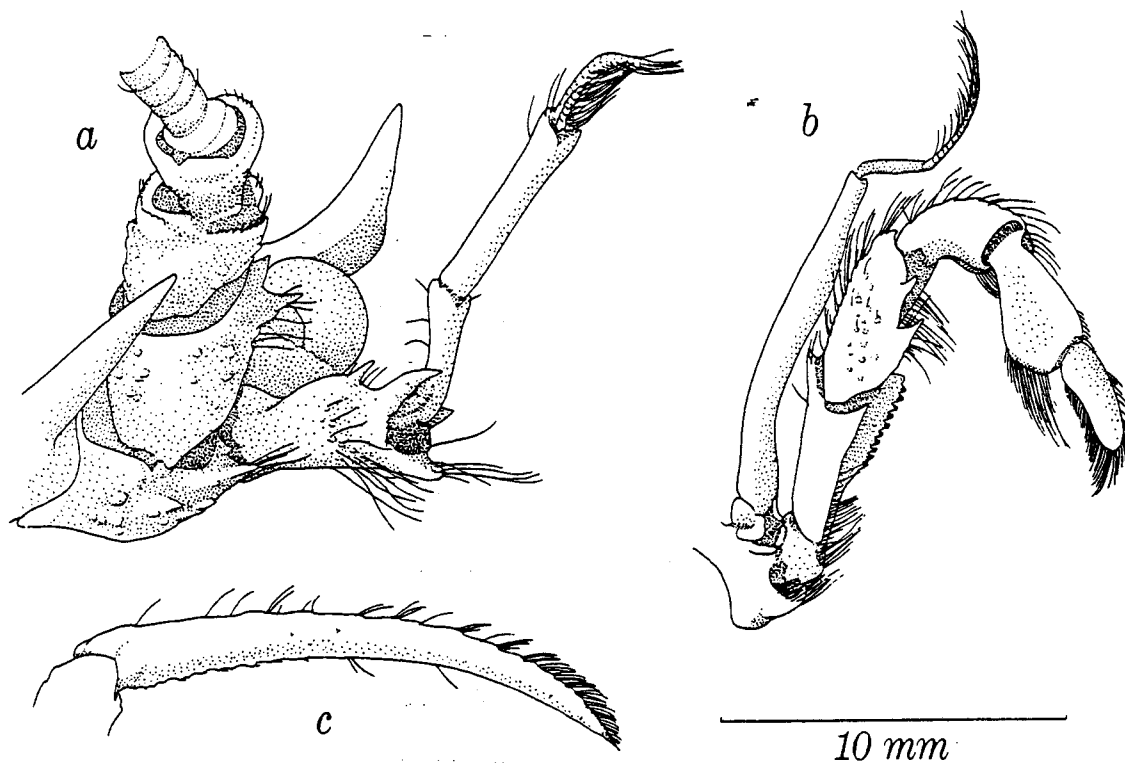


Figure 54. --Munidopsis spinosa (A. Milne Edwards, 1880). ♂, cl. 29 mm, P-381: a, rostrum, eye, antennule and antenna, ventrolateral view; c, dactylus of right third pereopod, lateral view. ♀, cl. 24.7 mm: b, right third maxilliped, ventrolateral view.

Description.--Carapace longer than broad ($cw/cl = 0.85-0.90$), transversely convex; cervical groove extending obliquely forward from center of carapace as fairly straight channel to oval depressions posterolaterally on either side of gastric region; anterior and posterior branches proceeding from this point less distinct; postcervical groove present as smooth depression across central third of carapace; groove extending obliquely from just behind and lateral to depression forward to lateral margins. Anterior gastric region with pair of prominent spines; posterior gastric region with huge laterally-compressed spine projecting upward and slightly forward; anterior to this a longitudinal row of short spines on continuation of rostral carina behind anterior gastric spines, and a transverse series of spines; several of gastric and hepatic tubercles spiniform. Ridge behind cervical groove with several small spines; spines also on epibranchial and mesobranchial regions. Cardiac region with median spine on anterior transverse swelling slightly smaller or about same size as anterior gastric spines; several small spines lateral to this and on surface of cardiac region smaller prominent spine directly behind this, and even smaller spine just ahead of posterior marginal depression; metabranchial region covered with spinulate tubercles. Rostrum narrow, roundly carinate, horizontal in proximal half, with distal half projecting upward, similar to anterior gastric spines; lateral margins with basal rim, but no spines. Frontal margin unarmed between base of rostrum and long, sharp, dorsoventrally-compressed spine at anterolateral angle; this spine followed on lateral margin by much smaller prominent spine, and even smaller spine just ahead of lateral notch; carapace slightly broader behind this, with small but prominent lateral spine posterior to notch. Posterior marginal rim bicarinate: anterior

ridge with line of short spines, posterior line tuberculate.

Abdomen covered with short, blunt spines; second, third and fourth segments with anterior and posterior spinose transverse ridges separated by smooth depression extending across tergite; anterior median spine prominent, much larger than others. Fourth and fifth segments evenly spinose, mesial spines coarser; small medial protuberance on posterior margin of sixth segment.

Sternum with intersegmental ridges distinct; sternite between chelipeds with several pairs of low tubercles; longitudinal median furrow distinct, deeper anteriorly.

Eyes prominent, movable, unarmed; short eyestalks constricted; cornea dilated, nearly spherical, slightly expanded ventromesially.

Small spot of calcification on membrane between bases of antennule, antenna and eyestalk, but no tooth or spine.

Basal segment of antennular peduncle with very slight lateral swelling armed dorsally with small, slender spine; distal margin with long, slightly incurved lateral spine, broad ventral projection with several long setae, and short mesial spine. Second segment of extended peduncle reaching tip of rostrum; long third segment and flagellum reaching to carpus of cheliped.

Basal segment of antennal peduncle broad, immovable; distal margin with triangular ventromesial projection. Second segment broad, with conical ventromesial spine near distal margin, and minute lateral spinule adjacent to dorsolateral lobe on distal margin. Third segment with several small cristate lobes around distal margin. Fourth segment with broad dorsolateral projection on distal margin. Flagellum indecently long, 6 to 10 times carapace length, without setae.

Endopod of third maxilliped with ischium terminating distally in sharp point at dorsolateral and ventral flexor angles. Merus with several obscure tubercles on extensor margin and lateral face; ventral flexor margin with broad flattened basal tooth and smaller tooth distal to that.

Epipods present on chelipeds and first 2 pairs of ambulatory legs.

Chelipeds $1 \frac{1}{3}$ to $1 \frac{1}{2}$ times carapace length. Dactylus more than $\frac{1}{2}$ to $\frac{3}{5}$ length of manus; fingers slightly compressed dorsoventrally, smooth, opposing margins finely toothed, abutting along entire length dorsally, with ventral excavation; tips narrow, with larger sharp interlocking teeth. Manus approximately $\frac{1}{2}$ length of cheliped; palm slightly broader than fingers, inflated, evenly sculptured with low, sparse tubercles on dorsal surfaces, dorsomesial series weakly spiniform, tubercles obscure ventrally. Carpus $\frac{1}{3}$ or less than $\frac{1}{3}$ length of chela; distal margin with prominent dorsolateral spine, occasionally other smaller dorsal spines or triangular teeth on distal margin; dorsal surface with spiniform tubercles arranged in irregular longitudinal dorsomesial, dorsal and dorsolateral rows. Merus shorter than chela; distal margin with ventromesial, dorsomesial, dorsal and lateral spines, dorsomesial spine largest; other surfaces tuberculate; dorsal margin expanded, forming edge proximally. Ischium tuberculate, but with no prominent spines.

Second, third and fourth pereopods very similar. Propodus of second pereopod reaching beyond cheliped; third and fourth pereopods nearly as long. Dactylus more than $\frac{1}{2}$ length of propodus, slightly curved; tip corneous only at very end, barely discernible; typical teeth and corneous spinules lacking on flexor margin distally; obscure serration proximally; distal third of extensor margin with 2 parallel rows of short setae. Propodus long, slender, slightly broader proximally;

extensor margin with several longitudinal rows of obscure tubercles, coarser and somewhat spinulate proximally; flexor surface smooth, rounded; distal margin with 2 small lobes separated by channel; lateral lobe sometimes with spinulé. Carpus broader, approximately 1/3 length of propodus; flexor margin slightly expanded; distal terminal spine followed by series of 5 or 6 teeth or spinulate tubercles; dorsolateral series similar; lateral and mesial surfaces with scattered low tubercles. Merus of second and third pereopods approximately same length as propodus, merus of third pereopod slightly shorter; distal margin with prominent dorsal spine separated by articular lobe from smaller ventrolateral spine; extensor margin slightly expanded, tuberculate; dorsal, lateral and ventral surface tuberculate, tubercles arranged in irregular longitudinal rows; mesial surface smooth. Ischium with several tubercles, but no prominent spines. Merus of fifth pereopods with minute obscure tubercles on exposed lateral surface distally.

Protopod of uropod with posterior lobe notched: margin serrate lateral to notch, coarse tooth mesial to notch; surface with transverse series of tubercles anteriorly and posteriorly. Endopod with small spinulate tubercles on lateral exposed surface.

Telson broader than long, roughly trapezoidal, divided into 8 distinct plates; small intermediate plates obscurely divided from lateral plates, making a total of 10 plates. Spinulate tubercles on all but central plate. Posterior margin with small medial notch between plates.

Color.--A beautiful color slide was taken by Dennis M. Opresko of the female specimen from PILLSBURY Sta. 1224 immediately after capture.

This dorsal view of the animal shows its striking red and white color

pattern: the rostrum, frontal margin and all carapacial spines are bright red against the white dorsal surface of the anterior half of the carapace; the red color extends in an irregular band from the frontal margin posteriorly to the cervical groove, the central part of which is red. The posterior half of the carapace is completely red, except for a white depressed area, the postcervical groove, in front of the cardiac region. The eyestalks, antennules and antennae are reddish, with a whitish area on the dorsal surface of the eyestalks; the corneae are colorless. The chelipeds are white dorsally, with red bands laterally and pinkish fingers. The ambulatory legs appear white on extensor surfaces and red beneath, so that in lateral view the propodus is white above with a longitudinal red stripe below. The lateral articular lobe on the distal margin of the merus is red.

A color slide taken by Jon C. Staiger of a specimen collected by the ISELIN shows the abdomen extended. The red color is more orange than in the above picture. The second through the fifth segments are white with red-orange spines, and the sixth segment and tailfan are completely red-orange.

The material examined is preserved in alcohol and is devoid of color except for the golden color of thicker setae.

This is the first report of the coloration of this species.

Size.--♂, cl. 25.0-29.7 mm,

♀, cl. 24.7-32.3 mm,

ovigerous ♀, cl. 28.2-32.2 mm

The type specimen is somewhat smaller (total length of the carapace is approximately 22 mm). Sizes were not given for the ATLANTIS material (Chace, 1942: 77-79).

Sexual dimorphism.--The only striking sexually dimorphic character observed in this species is the patch of thick, deep-golden (almost brown in preservation) setae on the lateral margins of the telson of males; this tuft, several rows wide, is more prominent in this species than in any of the others examined. Females lack marginal setae in this location.

Habitat.--The bottom at the 3 stations where this information was recorded consisted variously of sponges, green grey mud, and heavy brown clay.

Type.--The holotype is an ovigerous female, with cl. less than 18 mm. Paratypes are at the MCZ, but present deposition of the holotype was not determined.

Geographic range.--Munidopsis spinosa is now known from scattered locations in the western Atlantic: in the north from the Straits of Florida and throughout the Caribbean, from Cuba and Jamaica south to the coast of Colombia and east to Dominica. The only occurrences reported since the type are those near the north and south coasts of Cuba by Chace (1942: 76-77).

Bathymetric range.--Possible depth range for material in this collection is 587-1050 m; calculated range is 724-878 m, which falls within the range previously reported, 609-1006 m (333-550 fm).

Parasites.--The branchial parasites indicated in the list of material examined are bopyrid isopods, probably belonging to the genus Pseudione, and possibly undescribed species. A branchial parasite occurred in one of Chace's specimens from the ATLANTIS collection, but there is no mention in the literature of its identity.

The female specimen from P-1224 carried both a branchial parasite and a large abdominal parasite. The latter is a peltogastrid rhizocephalan, as yet unidentified.

Associates.--At 4 of the 5 stations where M. spinosa was collected, other species of Munidopsis were also found: M. abbreviata, M. erinaceus and M. sigsbei were each captured at 2 of these stations with M. spinosa.

Relationships.--Munidopsis spinosa is another member of the Galacantha species complex, which is discussed in the Relationships section of the account of M. rostrata (A. Milne Edwards). M. spinosa can be distinguished from the latter, its closest western Atlantic relative, by the presence of lateral spines on the rostrum of M. rostrata, and by the otherwise spinier nature of M. spinosa (many more spinulate tubercles on the carapace and more prominent median cardiac spines). In life, the colors of the 2 species are also strikingly different: M. spinosa is white with red spines and splotches, while M. rostrata is solidly red or red-orange.

Chace (1942: 77) points out that M. diomedae (Faxon) and M. trachynotus (Anderson) from the eastern Pacific and Arabian Sea, respectively, are closely related to M. spinosa, but that, contrary to Stebbing (1908), M. trachynotus is not synonymous with and can be distinguished from M. spinosa by the presence of lateral spines on the rostrum. As Chace notes, these 3 species are usually found in water shallower than 2000 m, while M. rostrata is usually deeper and "this may have some bearing on the fact that they show specific morphological characters in different parts of the world, whereas M. rostrata has undergone practically no change in spreading over a similar range." Munidopsis diomedae

has rugose, rather than spinulate, sculpturing on the posterior half of the carapace, and the median spine on the fourth abdominal tergite is reduced or lacking. These characters serve to separate it from M. spinosa. M. valdiviae (Doflein and Balss) from the eastern coast of Africa, has the rostrum armed laterally, the general armature of the carapace tuberculate, and no large spine behind the anterolateral spine.

Munidopsis squamosa (A. Milne Edwards, 1880)

Figures 55, 56

Orophorhynchus squamosus A. Milne Edwards, 1880: 58-59.

Elasmonotus squamosus: A. Milne Edwards and Bouvier, 1894: 282 (key);
1897: 00-101, pl. VIII, figs. 4-6.--Young, 1900: 414 (key).--Bour-
don, 1972: 820 (as host of Parapleuracryptella elasmonoti, n.sp.).

Munidopsis squamosa: Benedict, 1902: 276 (key), 327 (list).--Chace, 1942:
73 (key).--Pequegnat and Pequegnat, 1970: 138 (key); 1971: 4 (key).

Munidopsis squamosa: Doflein and Balss, 1913: 173 (list), 178 (table).

Material examined.--Arrowsmith Bank (Yucatan Channel): G-898, 339-366 m,
1 ♀, 5.1 mm, UMML 32:5303.--S of Dominican Republic: P-1396, 390-395 m,
1 ♂, 4.2 mm, (USNM).

Diagnosis.--Rostrum small, triangular, horizontal; inflated gastric
region of carapace with pairs of tuberosities arranged symmetrically;
frontal margin with 2 pairs of granulate projections lateral to rostrum
between eyes, but no post-antennal spine; anterolateral angle and later-
al margins granulate, but without sharp spines; posterior margin armed
with granulate tuberosities abdomen unarmed; eyes immovable, fused to
carapace, mesial surface with large granulate projection; epipods on
chelipeds and first 2 pairs of ambulatory legs.

Description.--Carapace longer than broad (cw/cl = 0.85-0.90), heavily
sculptured; gastric region greatly inflated, defined posteriorly by
narrow distinct cervical groove, and laterally by smooth depression at
bifurcation of groove and depression between gastric and hepatic regions;
metagastric region practically non-existent centrally, consisting prima-

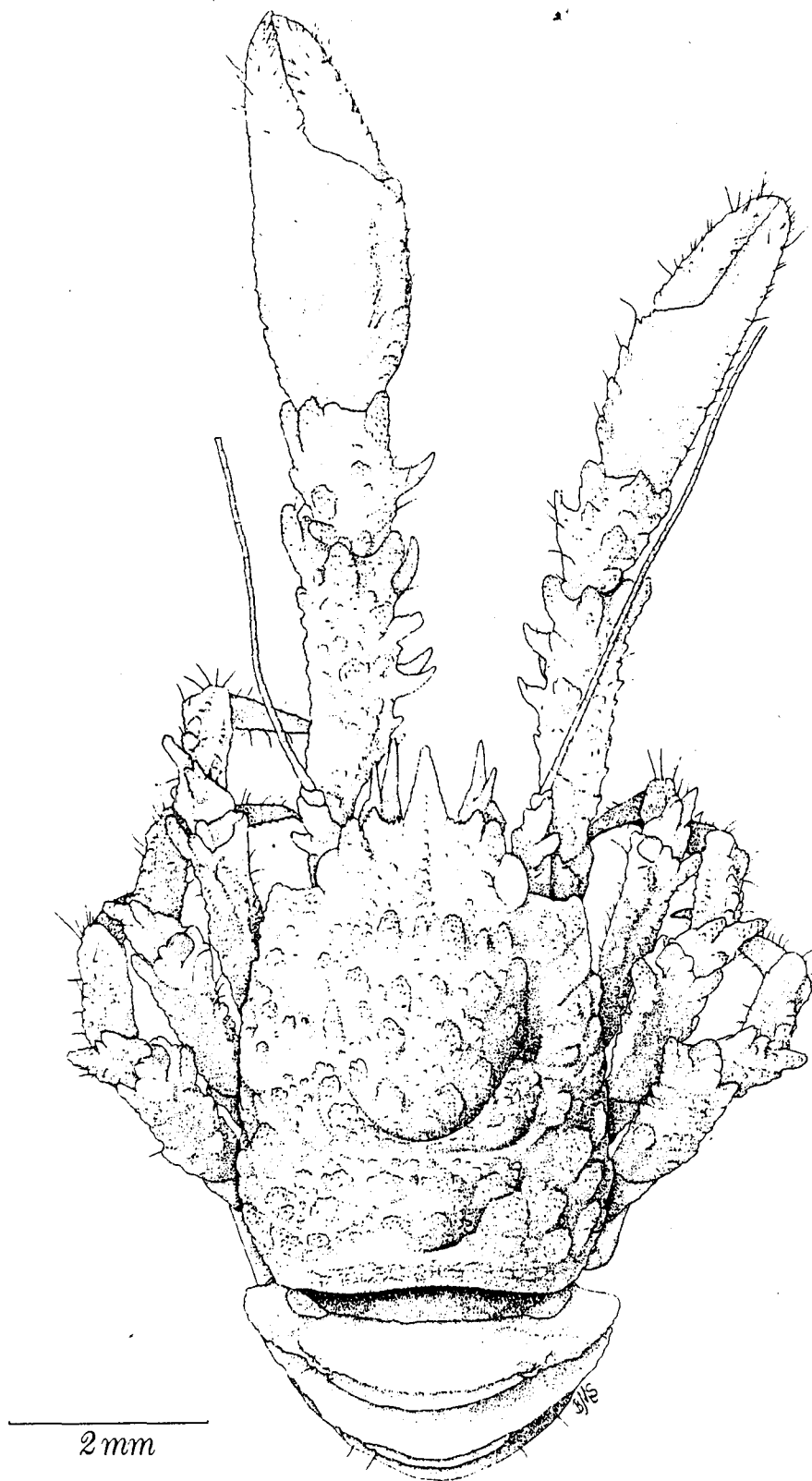


Figure 55. --Munidopsis squamosa (A. Milne Edwards, 1880), ♂, cl. 4.2 mm, P-1396, dorsal view.

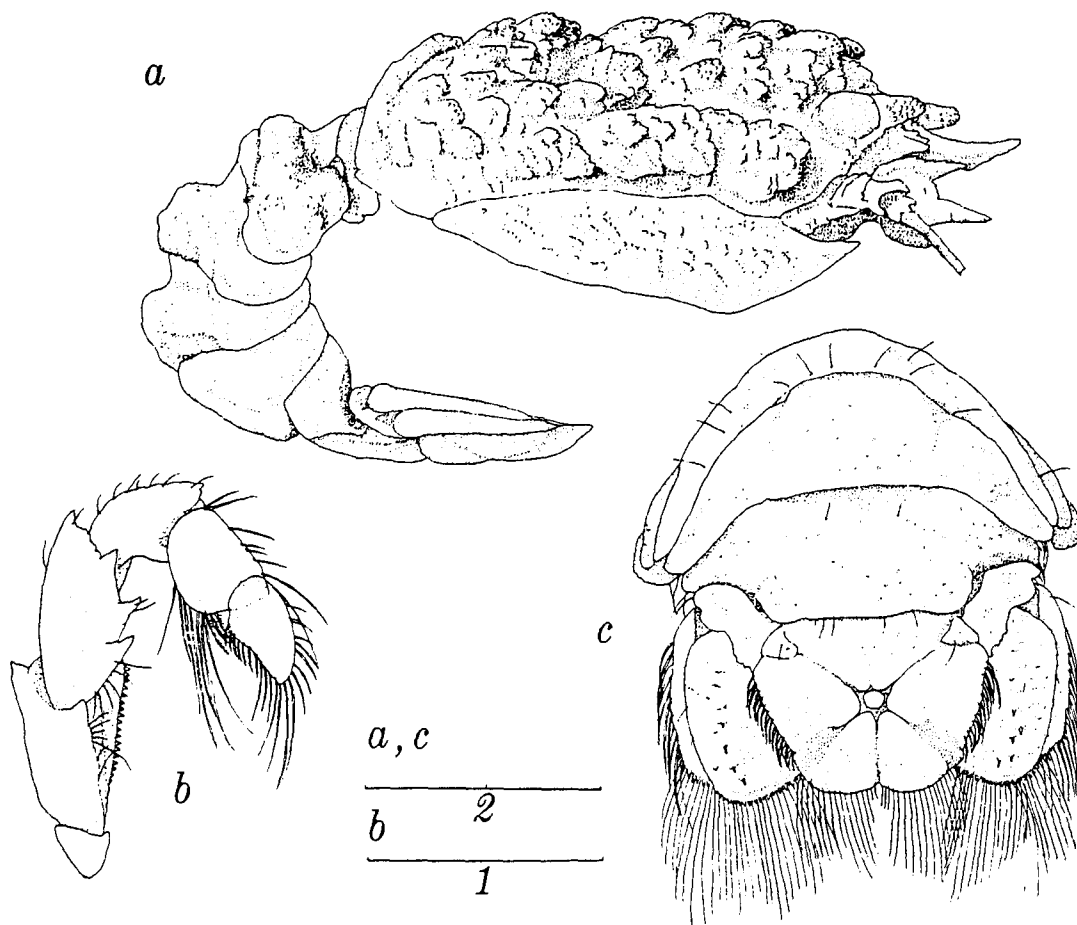


Figure 56. --*Munidopsis squamosa* (A. Milne Edwards, 1880), ♂, cl. 4.2 mm, P-1396: a, carapace and abdomen, lateral view, setae omitted; b, endopod of right third maxilliped; c, posterior abdominal tergites, uropods and telson. Scales in mm.

rily of narrow mesial extensions of mesobranchial regions between cervical and postcervical grooves; latter groove extending across central half of carapace with smooth depression midway between midline and lateral margins, then curving forward and back to lateral margin. Center of gastric region with 4 pairs of squamose granulate tuberosities projecting forward, arranged in longitudinal row, anterior pair largest, spaced slightly wider, second pair smaller than others; approximately 5 similar large tuberosities arranged symmetrically on each side of gastric region and several smaller granulate tubercles; cardiac region with 2 pairs of tuberosities, anterior pair projecting, larger; 2 or 3 large tuberosities lateral to cardiac region and several more on each metabranchial region. Rostrum short, triangular, less than $1/5$ carapace length, nearly horizontal, lateral margins minutely denticulate, rounded dorsal carina smooth distally, extending posteriorly as ridge armed with denticles at point even with tips of eyespines, armature increasing in size posteriorly becoming distinct granulate projections on anterior part of gastric swelling and between first pair of gastric tuberosities; surface on either side of midline between eyes slightly depressed, armed with small granulate tubercles. Frontal margin between eyes fused to bilobed granulate projection medial and slightly ventral to, but continuous with eye projection. Anterolateral angle and lateral margins granulate but not armed with spines. Posterior margin raised, with granulate tubercles on rim. Few short obscure setae scattered over surface of carapace. Forward edge of branchiostegite terminating in sharp triangular spine.

Second, third and fourth abdominal tergites with rounded transverse carina; carina with transverse groove distinct across central half, groove less conspicuous on fourth segment; fifth and sixth tergites

smoother, punctate; pleuron of second segment with granulate sculpturing; third pleuron also sculptured to some extent.

Sternite between bases of chelipeds with anterior margin slightly projected, granulate; similar sculpturing in center of sternite; inter-segmental grooves distinct.

Eyestalks immovably fused to frontal margin of carapace; dorsomesial surface of cornea overgrown with large blunt granulate projection reaching approximately 1/2 length of rostrum; small granulate ventrolateral projection from frontal margin of carapace.

Basal segment of antennular peduncle inflated laterally with dorsal margin raised to form a small spinulate crest projecting forward and slightly laterally to slender spines; spine beneath this broader, longer ventromesial projection triangular. Antipenultimate segment of peduncle when extended reaching tip of rostrum; last segment and flagellum reaching beyond rostrum.

Basal segment of antennal peduncle with sharp conical lateral spine and ventromesial projection. Second segment movable with long blunt lateral projection and small mesial granulation. Third segment with long blunt dorsolateral projection and shorter ventrolateral tooth. Distal segment reduced, with small dorsolateral tooth. Antennal flagellum less than 1 1/2 times carapace length, not reaching beyond tip of cheliped.

Carpus of endopod of third maxilliped with small conical tooth near distal end on extensor margin. Merus with 2 sharp teeth on flexor margin and 2 small sharp spines distally on flexor and extensor margins, lateral surface granulate; dorsal angle at distal margin of ischium sharp, ventral angle projected into short spine; mesial margin dentate.

Epipods on chelipeds and first 2 pairs of ambulatory legs.

Chelipeds 1 1/2 to 2 times length of carapace. Dactylus less than 1/2 length of manus. Fingers straight or slightly angled laterally, toothed opposing margins abutting dorsally along entire length; smooth distally, but dorsal surface granulate proximally. Palm slightly inflated, broader than width of finger but width less than 1/3 to 1/2 length of chela; dorsal surface squamose; 2 to 4 large granulate projections or tuberosities along slightly expanded dorsomesial margin; sculpturing obscure ventrally; setae arranged sparsely along lateral and mesial margins, more setae on fingers. Carpus approximately 1/3 length of chela; distal margin with 4 blunt granulate projections: 1 dorsomesial, 1 dorsolateral, 1 lateral and 1 ventrolateral; dorsal surface with approximately 6 large tuberosities; 1 large sharp curved spine on mesial margin; ventral surface obscurely tuberculate. Merus shorter than chela; 4 blunt curved projections near distal margin: lateral and ventromesial projections long, dorsal and mesial ones shorter; dorsal surface with 4 or 5 large projections in longitudinal row decreasing in size proximally, several smaller tubercles, and many granules; mesial margin with 2 large curved spines and smaller spine proximally or between latter; 2 large curved spines on ventromesial margin; ventral surface with less distinct tubercles: 3 to 5 more prominent tubercles on ventrolateral surface. Ischium with small blunt dorsal spine.

Second, third and fourth pereopods similar. Dactylus straight with sharp curved corneous tip; 8 to 10 corneous spinules projecting anteriorly from tubercles on flexor margin, otherwise dactylus unarmed. Propodus slightly longer than dactylus, segment expanded distally, rotating plane of flexure so dactylus flexes more medially; propodus slenderer in middle: distal ventral margin with 2 small movable spines emerging from

pair of lobes; slightly compressed laterally with smooth longitudinal depression on lateral surface; above this on dorsal margin and below on ventrolateral surface an irregular row of tubercles and projections, more prominent proximally; another row of granules mesial to dorsal row distally, becoming prominent projections merging with dorsal row proximally; mesial surface smooth, with obscure tubercles. Carpus with 2 prominent blunt projections on dorsal margin: 1 distal and 1 proximal with 1 smaller blunt spine between; dorsolateral surface with low irregular row of granulate projections. Merus of second pereiopod longest, that of fourth shortest, all expanded distally with prominent dorsal and lateral projections separated by rounded articular knob; dorsal margin expanded, tuberculate behind distal projection, tubercles forming prominent crest on second pereiopod proximally, forming 2 or 3 tuberosities on third pereiopod, and 1 large projection on fourth pereiopod; lateral surface granulate, fourth pereiopod with additional large tuberosity; ventrolateral margin with irregular row of 5 or 6 tuberosities on second pereiopod, 4 or 5 on third pereiopod, and 3 or 4 on fourth pereiopod: ventral surface smoother, slightly indented; ventromesial margin with row of low granules; dorsomesial surface slightly indented, granulate, granules more prominent on third and fourth pereiopods. Ischium granulate but without spines.

Merus of fifth pereiopods expanded; exposed surface with granules and protuberances.

Uropod with posterolateral margin of protopod in 3 lobes, posterior lobe with denticles and small notch. Lateral margin of exopod and posterior margin of endopod with denticles at bases of marginal setae. Exposed surface of endopod with flattened granulate squamae, 5 or 6 short

movable calcified setae on posterior half.

Telson smooth or obscurely punctate, consisting of 8 distinct plates.

Color.--The specimens examined has been preserved in alcohol for some time and are devoid of any pigment. There are no records of the color of this species in the literature.

Size.--♂, cl. 4.2 mm, and

♀, cl. 5.1 mm.

The male and female collected by the BLAKE are approximately the same size as the male described here. Ovigerous females have not been reported thus far.

Sexual dimorphism.--The only sexually dimorphic character apparent in the material examined is the fringe of thick setae on the lateral margins of the telson of the male; this dense fringe is typically absent in the female.

Both specimens have the fingers of the cheliped abutting along the entire dorsal margins.

Habitat.--The bottom type or characteristics were not reported for either of the 2 stations at which M. squamosa was collected.

Types.--The holotype is a male, with cl. approximately 4 mm, MCZ 4756.

The female paratype is also housed at the MCZ, No. 9784.

Type locality.--Martinique, BLAKE Sta. 210, 350 m.

Geographic range.--Munidopsis squamosa has been collected from only 4 locations scattered around the Caribbean Sea. In addition to the type

locality and the new locations listed here, M. squamosa has been collected off St. Lucia (A. Milne Edwards and Bouvier, 1897:100).

Bathymetric range.--The possible depth range for material in this collection is 339-395 m; calculated range is 366-390 m. The depths recorded previously were approximately 212-350 m, bringing the calculated range to 212-390 m.

Parasites.--The material examined shows no external evidence of branchial or abdominal parasites. The illustration of the male holotype (A. Milne Edwards and Bouvier, 1897: pl. VIII, fig. 4) shows a swelling of the carapace indicating the presence of a bopyrid isopod. This parasite was described as Parapleurocryptella lasmonoti Bourdon, 1972.

Associates.--Munidopsis platirostris was collected in the same sample with M. squamosa south of the Dominican Republic. Although no other galatheids were taken with M. squamosa in the sample from Arrowsmith Bank, it is interesting that M. platirostris was the only Munidopsis collected from Arrowsmith Bank by the GERDA.

Relationships.--Munidopsis squamosa is very closely related to M. barbarae (Boone) from the Gulf of Mexico and the Bahamas. Both have epipods on the first 3 pairs of pereopods, complex, very similar ornamentation on the eyes and similar arrangement of the processes on the carapace. The nature of the sculpturing is different in the two, however: M. squamosa has large granulate tuberosities arranged over the sculptured dorsal surface, whereas in M. barbarae these projections are spinous on a relatively smooth surface; also, M. squamosa lacks the sharp post-antennal spine present on the frontal margin of M. barbarae. M. squamosa

has the gastric and other regions of the carapace more inflated. In M. barbarae, the pereopods lack the tuberosities found in M. squamosa. The specimen of M. barbarae examined is incomplete, the chelipeds and most pereopods are missing so it has been difficult to compare these two adequately. It is possible that M. barbarae is only a subspecies of M. squamosa, but until more material of these apparently rare little species is available, both names will be retained.

M. granulens, also from the western Atlantic (Arrowsmith Bank), is somewhat similar to M. squamosa, but the former has only 1 pair of gastric protuberances on the carapace, an overgrowth on the cornea rather than a mesial projection, evenly granulose carapace and sculptured abdomen, long granulose chelipeds and lacks epipods on the second pair of ambulatory legs.

A. Milne Edwards and Bouvier (1897: 101-102) mentioned an affinity between Elasmonotus squamosus and Orophorhynchus marioni from the eastern Atlantic; the latter also has epipods on the first 3 pairs of pereopods, a general quadrangular carapace with the eyes fused to the frontal margin, and the abdomen smooth. However, the rostrum and frontal margin of the carapace are quite different in M. marioni, the chelipeds are much shorter and spination on the pereopods is different; there are many other characteristics as well which allow easy separation of the 2 species. A. Milne Edwards and Bouvier contended that the two species are very distant which necessitates their placement in different genera, but that they both have incontestable affinities with Munidopsis and in fact represent the most primitive forms of the two genera Elasmonotus and Orophorhynchus which have not yet achieved the definitive degree of differentiation of the two genera. It should be pointed out here that

considerations such as these have led various workers (Benedict, 1902; Chace, 1942) to combine these genera with Munidopsis until a scheme can be devised for separating the species into more consistent generic or subgeneric groupings.

Munidopsis subspinocolata Pequegnat and Pequegnat, 1971

Figure 57

Munidopsis spinocolata: Pequegnat and Pequegnat, 1970: 158 (part).

Munidopsis subspinocolata Pequegnat and Pequegnat, 1971: 6 (key), 13-15, figs. 7a, 7b, 8.

Material examined.--S of Jamaica: P-1225, 457-558 m, 1 ♂, 8.7 mm, UNML 32:5302.

Diagnosis.--Rostrum narrowly triangular, spine-like, horizontal, lateral margins subparallel at base, tapering distally; gastric region of carapace unarmed, with regular transverse striae across dorsal midline; frontal margin with post-antennal lobe, but no distinct spine; anterolateral spine small but distinct; posterior margin of carapace and abdominal segments unarmed; cornea with central spine 1/2 of less than 1/2 diameter of cornea; no epipods on pereopods; sternum armed with 1 pair of slender spines between chelipeds.

Description.--Carapace longer than broad ($cw/cl = 0.80-0.85$), transversely convex; gastric region with 5 well-separated transverse striae, each with setae reaching 1/2 distance to preceding stria; anterior striation interrupted behind rostrum, others with lateral interruptions; striae distinct behind cervical and postcervical grooves; lateral striations shorter, distinct, but discontinuous. Rostrum $2/5$ to $1/2$ carapace length, width at base $1/4$ to $1/6$ length of rostrum, horizontal; blunt longitudinal carina minutely dentate dorsally; lateral margins of rostrum subparallel at base, gradually tapering distally. Frontal margin of carapace between rostrum and antenna fused to eye; margin forming small

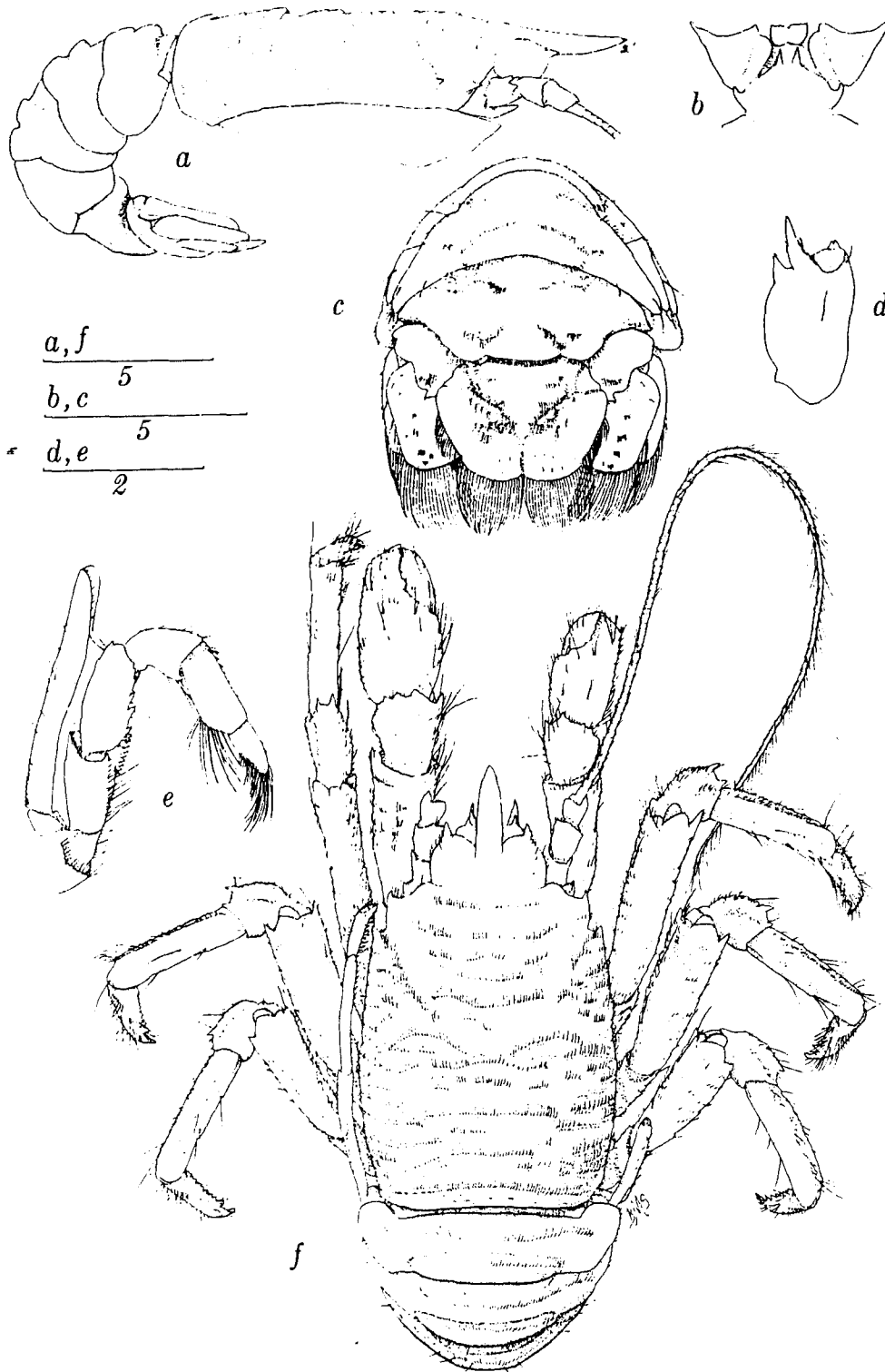


Figure 57. --*Munidopsis subspinoculata* Pequegnat and Pequegnat, 1971, ♂, cl. 8.7 mm, P-1225: a, carapace and abdomen, lateral view, setae omitted; b, anterior sternites and coxae of chelipeds; c, posterior abdominal tergites, uropods and telson; d, basal segment of antennule, ventrolateral view; e, right third maxilliped, ventrolateral view; f, dorsal view. Scales in mm.

post-antennal denticulate lobe (but bearing no large spine or tooth in PILLSBURY specimen); anterolateral angle with sharp tooth. Lateral margin with tooth just posterior to termination of anterior branch of cervical groove. Posterior margin raised, sculptured with obscure short transverse striae, but otherwise unarmed.

Abdomen unarmed; second, third and fourth segments with 2 transverse carinae: anterior carina sharper, extending laterally almost to pleural margins; posterior carina rounded, extending across tergite only. Fifth segment with swelling in same position and with similar shape as posterior carina on preceding segments, but with no anterior ridge; groove delimiting anterior margin of swelling obscure in center. Sixth segment with short setae in row extending from near center of tergite obliquely toward posterolateral margin, followed by shallow depression; similar but obscure rows of setae on anterior part of tergite.

Sternum armed with 1 pair of small sharp spines between coxae of chelipeds.

Eyes colorless; 1 small spine projecting anteriorly from point slightly lateral to center of cornea distally; length of eyespine less than $1/2$ diameter of cornea; 1 minute spine on ventromesial surface of cornea projecting from distal margin of eyestalk. Dorsal surface of cornea with obscure band of calcification extending from base of eyestalk to distal spine, decorated with several short setae.

Basal segment of antennular peduncle broader proximally with lateral swelling; 2 dorsolateral spines: small dorsal spine just above large distal spine; 1 or 2 denticles on distomesial margin.

Basal segment of antenna with ventromesial spine and lateral denticulate tooth (no spine) distally. Distal margin of second segment denti-

culate dorsally, with small lateral tooth. Distal margin of third segment denticulate, but otherwise unarmed. Distal margin of fourth segment with dorsolateral prolongation terminating in 1 denticle; distomesial margin of segment denticulate. Flagellum more than twice total carapace length.

Endopod of merus of third maxilliped with approximately 5 small teeth on ventromesial margin, decreasing in size distally; 1 minute tooth on distolateral margin. Ischium with blunt ventral carina terminating in 1 small tooth distally.

No epipods on chelipeds or ambulatory legs.

Chelipeds lightly sculptured, setae of various lengths scattered over surface of segments, longer on manus, restricted to transverse striae on proximal segments. Manus dorsoventrally compressed; dactylus less than 1/2 length of propodus. Propodus with single row of anteriorly-projecting teeth on distolateral margin; tips of fingers spooned, dentate, opposing margins abutting on dorsal surface, gaped ventrally; right manus with abutting margins straight, left manus with margins sinusoid; dactylus with projection toward fixed finger. Carpus approximately 2/5 length of manus; distal margin with mesial spine, denticulate dorsally; denticle on ventral projection at propodal articulation. Merus not extending beyond rostrum, subtriangular; dorsal margin rounded, with setae on transverse striae; distal margin with large tooth at ventrolateral angle and ventromesial angle; 1 or 2 denticles dorsally, smooth rounded lobe just above ventrolateral tooth. Ischium with distodorsal tooth; ventromesial prolongation with denticle on mesial margin.

Second, third and fourth pereopods similar. Second pereopod reaching beyond distal margin of cheliped; third and fourth pereopods

reaching distal margin of propodus of preceding pereopod. Tip of dactylus light brown, followed on flexor margin by series of 9 to 12 denticles, decreasing in size proximally; 1 slender corneous spinule projecting from distal edge of each denticle. Distal flexor margin of propodus with 2 movable spines separated by 2 small denticulate lobes; dorsal, lateral and mesial surfaces of propodus flattened or very slightly concave; angles between these surfaces distinct as ridges, dorsomesial ridge sharper; both ridges slightly scabrous; ventral surface rounded. Carpus less than 1/2 length of propodus; angle between dorsal and mesial surfaces acute, armed with small irregular tooth, almost obscure, decreasing in size proximally; distal margin of segment denticulate between 2 spines: 1 at end of each dorsal angle, mesial spine larger; ventrolateral lobe with denticulate distal margin. Merus with ridge on expanded flexor margin terminating distally in sharp triangular tooth; similar tooth below this beneath articular lobe; lateral surface dorsally oriented in fourth pereopod, and to lesser degree in third pereopod; these surfaces with striae and associated setae. Ischium unarmed.

Fifth pereopods with exposed lateral surface of merus lightly sculptured.

Protopod of uropod with posterolateral margin in 3 lobes; posterior lobe with 2 short rows of setae on dorsal surface; margin posterior to this notched with denticles lateral to notch, and spine mesial to notch. Exopod and endopod with granular denticles on lateral and posterior margins; similar denticles or small articulated spinules on surface of exopod; spinules on endopod slightly larger.

Telson consisting of 8 plates; anterolateral and lateral plates with several rows of setae near fissure between them. Posterior margin

indented medially.

Color.--The specimen examined is preserved in alcohol and is devoid of any color except for brown corneous tips on the dactylus of the ambulatory legs and certain thicker golden setae on the mouthparts, appendages and body surfaces.

Size.--The male examined has the carapace 8.7 mm long.

Size ranges reported previously are: ♂, cl. 10-11 mm, and
ovigerous ♀, cl. 10 mm.

Sexual dimorphism.--The male specimen examined shows moderate development of the "comb" of golden setae on the lateral margins of the telson. The chelipeds are not broadly gaped.

Habitat.--Bottom type was not recorded in the station data for P-1225.

Types.--The holotype is a male with cl. 11 mm, USNM 138233; the paratype is also a male, cl. 10 mm, USNM 138235. An ovigerous female with cl. 10 mm is the allotype, USNM 138234.

Type locality.--Caribbean Sea off Colombia, ALAMINOS Sta. 70A 10-31, 732 m.

Geographic range.--Munidopsis subspinoculata is known from widely separated locations in the western Atlantic. Apart from the new location south of Jamaica presented here, and the type locality, this species is reported in the literature as occurring in the southwest Gulf of Mexico (Pequegnat and Pequegnat, 1971: 15).

Bathymetric range.--Possible depth range of M. subspinoculata based on

all 4 records is 457-823 m; calculated range is 558-777 m. Possible range previously reported was 732-823 m; calculated range was 732-777 m. Thus the new record is the shallowest reported, and extends the bathymetric range almost 200 m.

Parasites.--The specimen examined shows no external evidence of branchial or abdominal parasites. No mention was made of parasites in reports of the OREGON and ALAMINOS material.

Associates.--Munidopsis alaminos and M. spinifer also were taken with M. subspinoculata at the single station where the latter species was collected.

Relationships.--Munidopsis subspinoculata appears to be most closely related to M. spinoculata (A. Milne Edwards) from the western Atlantic, and to a lesser degree to M. ramahtaylorae Pequegnat and Pequegnat. M. subspinoculata shares, with both of these, all the characters used in the keys to species of Munidopsis by Benedict (1902), Chace (1942) and Pequegnat and Pequegnat (1970). See table 1, p. 344, for comparison of these related species. M. subspinoculata differs from M. spinoculata in having the carapace with continuous striations across the dorsal midline of the gastric region, the lateral margins of the rostrum subparallel proximally and slightly convex distally, the eyespine less than 1/2 the diameter of the cornea, the coxae of the chelipeds unarmed, only 2 spines on the sternum between the chelipeds, and the fifth abdominal tergite sculptured; M. spinoculata, by contrast, has the carapace with no continuous striations across the dorsal midline of the gastric region, the rostrum with straight lateral margins tapering directly from base to apex, the

eyespine almost as long as the diameter of the cornea, the coxa of the cheliped with a sharp spine, 4 spines on the sternum between the chelipeds, and the fourth and fifth abdominal tergites smooth.

Munidopsis transtridens Pequegnat and Pequegnat, 1971

Figures 58, 59

Munidopsis transtridens Pequegnat and Pequegnat, 1971: 7(key), 15-18,
fig. 10.

Material examined.--Straits of Florida: G-859, 1162-1201 m, 1 ovigerous ♀, 11.5 mm, UMML 32:5304.--Off British Guiana: P-689, 1373-1446 m, 11 ♂, 10.2-13.8 mm, 11 ♀, 9.5-14.7 mm, 3 ovigerous ♀, 10.8-13.5 mm, UMML 32: 5305.

Diagnosis.--Tridentate rostrum; horizontal in most small specimens, slightly recurved in larger ones; gastric region of carapace with 1 pair of spinules; frontal margin of carapace with slender post-antennal spine; posterior margin of carapace and abdominal segments unarmed; no eyespines; no epipods on chelipeds or ambulatory legs; chelipeds usually more than 3 times carapace length in females, more than 2 1/2 times carapace length in males; smaller females and males with chelipeds shorter but much more slender (manus width 1/6 manu length); merus of cheliped with 3 or 4 mesial spines proximally.

Description.--Carapace longer than broad ($cw/cl = 0.75-0.80$), transversely convex; dorsal surface finely tuberculate, short setae associated with tubercles; gastric region slightly inflated, armed anteriorly with 1 pair spinules. Cervical groove distinct as shallow smooth depression across central third of carapace; posterior branch similar, anterior branch defining lateral margins of gastric region less distinct; smooth area anterior to postcervical groove not depressed; cardiac region with beaded or minutely denticulate transverse ridge anteriorly; posterior

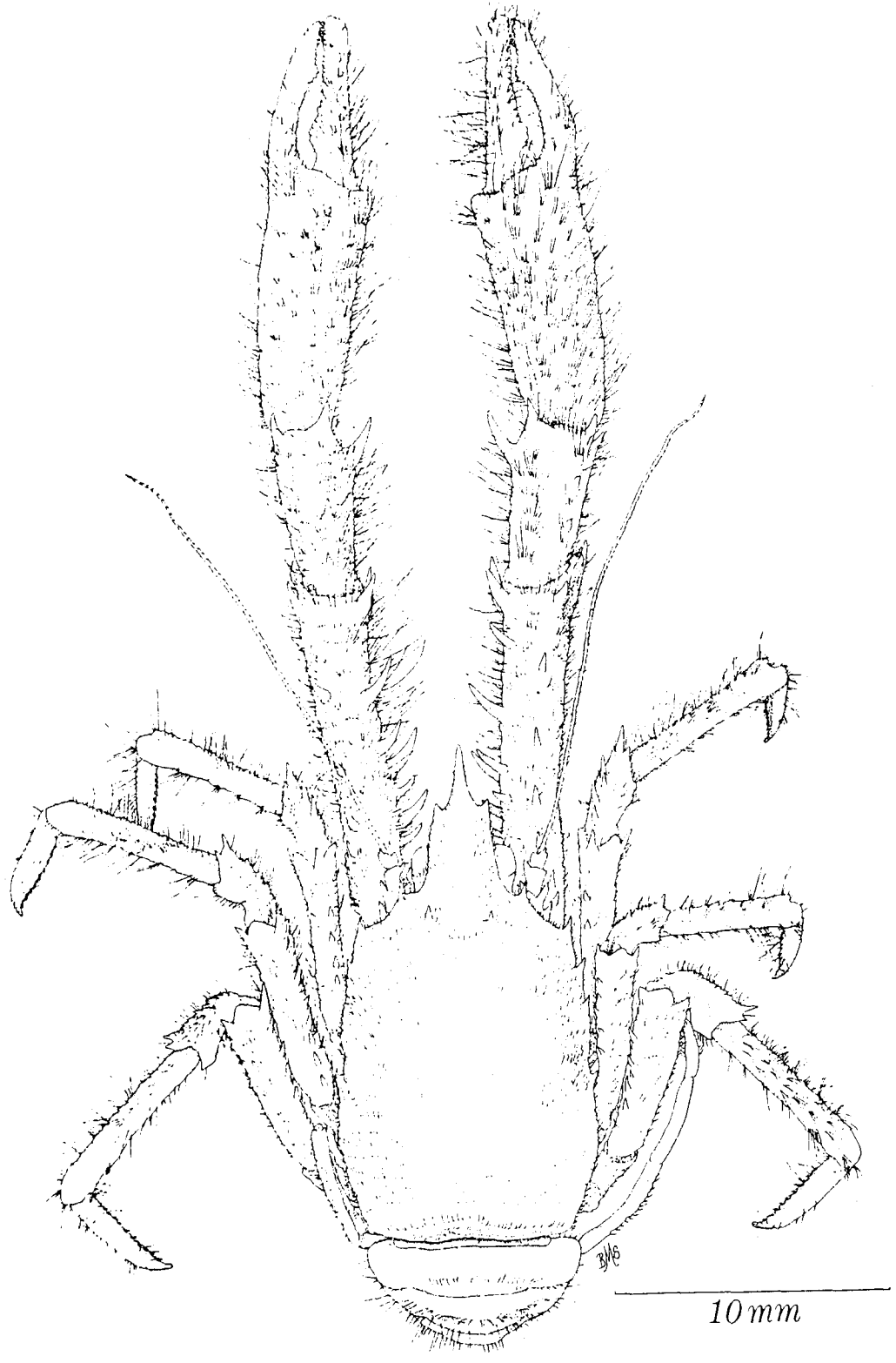


Figure 58. --Munidopsis transtridens Pequegnat and Pequegnat, 1971, ♂, cl. 12.2 mm, P-689, dorsal view.

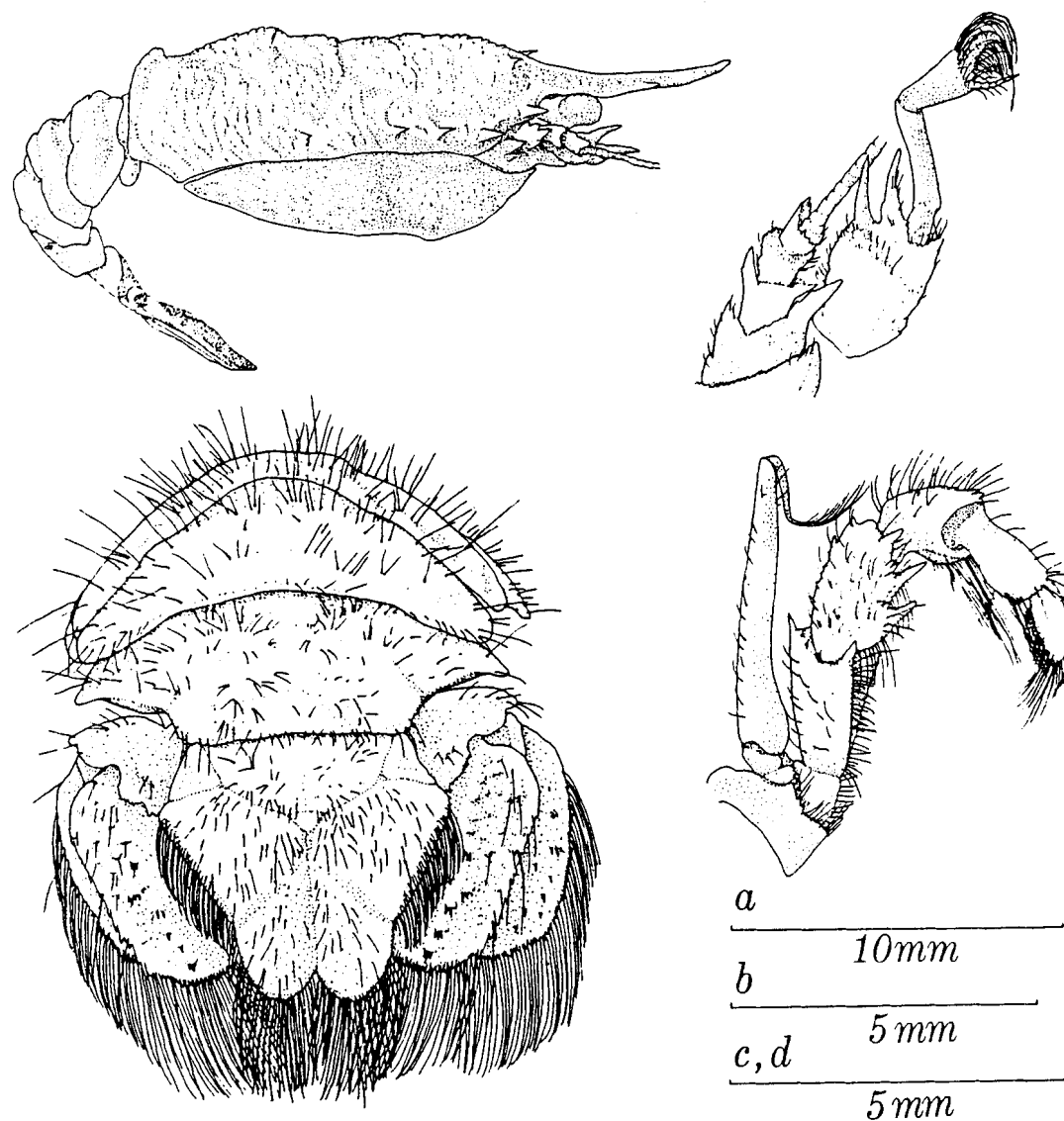


Figure 59. --*Munidopsis transtridens* Pequegnat and Pequegnat, 1971, ♂, cl. 12.2 mm, P-689: a, lateral view of carapace and abdomen (setae omitted); b, posterior abdominal segments, uropods and telson; c, right antennule and basal segments of antenna, ventrolateral view; d, right third maxilliped, ventrolateral view.

boundary of cardiac region defined sharply by narrow groove, deepest medially, extending obliquely toward posterolateral margin from center and obliquely forward to lateral termination of posterior branch of cervical groove; cardiac and metabranchial regions with tubercles arranged in transverse rows, rugose laterally; marginal groove broader mesially, interrupted by several small medial tubercles. Rostrum broad at base, width approximately $1/3$ carapace width, horizontal proximally with moderate distal curve upward; lateral margins nearly straight to slightly convex; length of rostrum almost $3/5$ carapace length, terminating in 3 sharp teeth with medial tooth much longer, lateral margins minutely serrate; distinct longitudinal carina most distinct distally, extending to anterior gastric region. Frontal margin straight and transverse between base of rostrum and sharp post-antennal spine, sloping at 45° angle or slightly concave to anterolateral spine. Anterolateral spine followed on lateral margin by 2 evenly-spaced similar spines and 1 larger curved spine behind lateral termination of posterior branch of cervical groove; lateral margin convex between this and posterior margin. Posterior margin unarmed except for beaded or minutely denticulate raised rim; rim broader mesially, with irregular sculpturing of tubercles and rugae and slight medial indentation.

First abdominal tergite smooth. Second segment with sharp transverse carina across tergite, broadening laterally and extending to middle of pleuron; less prominent carina behind this extending across tergite only. Third and fourth tergites with rounded anterior carina and less prominent transverse swelling posterior to this, posterior swelling quite obscure on fourth segment, location marked by setae; leading faces of transverse carinae decorated with several setae, longer laterally,

particularly on third to fifth tergites. Fifth tergite with several long setae arranged in irregular transverse rows, but no carinae. Sixth tergite relatively smooth with scattered punctae and setae.

Sternum with intersegmental ridges beaded and decorated with short, thick setae; plate concave anteriorly between chelipeds; distinct median longitudinal furrow between second to fourth pereopods; plates behind ridges with irregular transverse rows of obscure tubercles and very short sparse setae.

Eyes movable, unarmed; cornea elongate; eyestalk with setae dorsally near base of cornea, and slight lateral expansion.

Slender sharp spine emerging from intersection of bases of eyestalk, antennule and antenna below frontal margin lateral to eye.

Basal segment of antennular peduncle with lateral inflation, anterior edge of swelling with small tubercles and 2 large dorsolateral spines near distal margin: ventral spine longer, thicker; distal margin denticulate ventromesially and armed with small mesial tooth. Second and third segments short. Extended flagellum reaching just beyond apex of rostrum.

Basal segment of antennal peduncle broad, with blunt triangular lateral tooth and elongate ventromesial projection. Second segment with sharp conical lateral spine. Distal margin of third segment serrate, with small dorsomesial projection or mesial spine. Distal margin of fourth segment with denticulate dorsolateral projection. Antennal flagellum slightly longer than carapace length, reaching just beyond carpus of cheliped.

Ischium of endopod of third maxilliped armed distally with small tooth on ventral flexor and extensor margins. Armature of merus

variable, usually consisting of 2 large sharp teeth on flexor margin, proximal tooth thickest, and small tooth near distal margin; extensor margin with small distal tooth and several small tubercles; lateral surface with several denticulate tubercles and associated setae. Carpus with several irregular tubercles on extensor margin, proximal one most prominent; lateral surface of carpus with obscure row of 3 or 4 short setae.

Pereiopods setose, setae arranged in small groups emerging from evenly-spaced minutely denticulate tubercles. No epipods on pereiopods.

Chelipeds $2 \frac{1}{2}$ to slightly more than 3 times carapace length. Manus almost $\frac{1}{2}$ cheliped length, unarmed; width of manus approximately $\frac{1}{6}$ or less than $\frac{1}{6}$ manus length in females and small males, $\frac{1}{3}$ to $\frac{1}{4}$ manus length in large males. Fingers $\frac{1}{2}$ or slightly less than $\frac{1}{2}$ length of manus; fixed finger of large males arched to form gape proximally; opposing margins toothed; dactylus of males with several teeth expanded into gape; fingers abutting along entire length in females, abutting only distally in males; tips spooned; dorsal surface smooth; mesial and lateral margins of manus with irregular longitudinal rows of denticulate tubercles. Carpus less than $\frac{1}{2}$ length of manus; 3 small spines on distal margin: 1 lateral spine; dorsolateral spine followed by 1 or 2 smaller spines on dorsal surface; dorsomesial spine followed occasionally by 1 or 2 spines; mesial margin with large spine; spination on dorsal surface of carpus variable; ventromesial spine of distal margin on articular knob. Merus with large spines near distal margin at each of 4 angles; smaller spine on distal margin beneath dorsal spine or knob; dorsal and mesial spination variable: dorsal row of 6 to 8 spines; 1 to 3 larger spines in dorsomesial row, and 2 to 4 large spines in

ventromesial row on proximal half, decreasing in size proximally. Ischium with sharp spine dorsally and ventromesially near distal termination; distolateral margin denticulate.

Second, third and fourth pereopods similar. Second pereopod reaching just beyond distal margin of carpus of cheliped. Dactylus slightly longer than $1/2$ length of propodus; only tip curved, corneous, followed on straight flexor margin by series of approximately 10 blunt triangular teeth, decreasing in size proximally, armed on leading edge with long corneous spinule. Propodus with 2 movable spinules on distal ventral margin, and one approximately $1/3$ distance back on flexor surface; dorsal and lateral surface unarmed except for irregular longitudinal rows of denticulate tubercles and associated setae. Carpus with extensor margin expanded, armed distally with sharp spine, often followed on second and third pereopods by row of 2 or 3 prominent spines and several smaller intermediate teeth, prominent spines becoming more obscure on third pereopod, seldom present on fourth pereopod; distal margin with smaller spine lateral to dorsal ones, followed on dorsolateral margin with longitudinal denticulate ridge. Distal margin of merus with slender dorsal and triangular ventrolateral spine; dorsal spine followed on flexor margin by row of 5 to 8 spines on second pereopod, variably decreasing in number on third and fourth pereopods; merus becoming proportionately shorter; lateral and ventral surfaces tuberculate and setose, but not spinous except occasionally on fourth pereopod. Ischium with short dorsal spine on second and third pereopods.

Merus of fifth pereopods expanded in distal half, especially near center of segment; lightly sculptured on exposed surface with several obscure teeth on ventral margin.

Protopod of uropod with posterolateral margin scalloped; posterior lobe serrate on either side of marginal notch and with 2 or 3 tubercles on surface above this. Margins and exposed surfaces of endopod and exopod spinulate; spinules arranged in small groups on surfaces.

Width of telson anteriorly same as length, narrower posteriorly; telson composed of 8 plates; lateral plates slightly concave, tuberculate, posterior margin with deep medial indentation.

Color.--The specimens examined are preserved in alcohol and are completely devoid of color except for golden color of thicker setae, particularly on appendages and on the telson of males. The eyes are unpigmented but translucent. The tips of the dactyli of ambulatory legs are pale brown.

Size.--♂, cl. 10.2-13.8 mm,

♀, cl. 9.5-13.7 mm,

ovigerous ♀, cl. 10.8-13.5 mm.

The female type specimen is smaller than these examined, with cl. 8 mm (Pequegnat and Pequegnat, 1971: 17).

Sexual dimorphism.--The chela is much broader and gaped in the largest male (cl. 13.0 mm), and there is a "comb" of thick golden setae on the lateral margins of the telson. A male with cl. 12.2 mm has the fingers abutting without a proximal gape; however, a smaller male (cl. 10.6 mm) has a distinct gape. Males also have the pereopods slightly more spinose than do the females, particularly on the mesial surface of the merus of the cheliped. The females have the manus much more slender, with the opposing margins of the fingers abutting along their entire length, and have very few fine marginal setae laterally on the telson.

Habitat.--The bottom at G-859 in the southern Straits of Florida consisted of dead coral and pteropod shells; at P-689 it consisted of hard brown mud covered with siliceous sponges and branching madreporarians.

Type.--The holotype is a female, cl. 8 mm, USNM 133236.

Type locality.--Southeast Gulf of Mexico, OREGON Sta. 4566, 1280 m.

Geographic range.--Munidopsis transtridens has been collected from only 2 locations in the southeast Gulf of Mexico (The location reported herein is southern Straits of Florida) and off British Guiana in the western Atlantic. Although it has been collected infrequently, it was abundant (25 specimens) at the PILLSBURY station off British Guiana.

Bathymetric range.--Possible depth range for the material examined is 1162-1446 m; calculated range is 1201-1373 m. The previously reported depth falls within this range.

Parasites.--There are no external evidences of branchial or abdominal parasites in any of the material examined. Several specimens from the PILLSBURY station have small foraminiferans and hydroids attached to various body surfaces.

Associates.--Munidopsis simplex was also collected at both stations where M. transtridens was taken, but no conclusions are drawn from this due to the abundant distribution of the former species.

Relationships.--Munidopsis transtridens is one of the species in the complex of closely related species including M. serricornis and M. tridens. There is some question whether M. transtridens is distinct from

M. tridens, and even whether the latter is distinct from the variable and widespread M. serricornis (this problem will be dealt with in a subsequent report, since the GERDA and PILLSBURY collected no specimens which could be assigned to M. tridens).

The original description of Munidopsis transtridens Pequegnat and Pequegnat, 1971, was based on a small female specimen. A number of differences between this specimen and M. tridens were listed, but the greater quantity of material in the sample from P-689 has shown that these differences are not consistent. The characters used to separate M. transtridens from M. tridens were (1) the convex lateral margins of the rostrum, (2) the less recurved rostrum, (3) the less pigmented eyes, (4) the more slender (less robust) and shorter chelipeds (2 times carapace length compared to 2.6 times carapace length in M. tridens), (5) the longer, more spinous merus of the cheliped (length equal to carapace length and with 3 to 4 internal spines compared to shorter than carapace length in M. tridens with only 1 mesial spine), (6) the serrate ventromesial ridge on the distal portion of the ischium of the cheliped (compared to an acute spine in this location), (7) 2 large spines and 2 or 3 denticles on the inner margin of the merus of the third maxilliped compared to 2 spines and a denticle or 2 fused spines and a denticle, and (8) the greater depth of 1280 m (compared to 380-475 m) of M. transtridens. A male specimen of M. tridens collected by the OREGON from Surinam in 366 m is available for comparison; it exhibits all the characters implied for M. tridens in the above listing except that the cheliped is less than 2 1/2 times the carapace length and bears a row of 2 large spines and a smaller spine proximally on the ventromesial angle of the merus.

Females collected by the GERDA and PILLSBURY do not have all the characters attributed to either species: the rostral margins vary from nearly straight but not parallel to convex as shown in the figure of the type of M. transtridens (Pequegnat and Pequegnat, 1971: fig. 10), and from horizontal to slightly but distinctly recurved. The chelipeds are long and slender, ranging from 2 1/2 to 3 times carapace length with the width of the manus approximately 1/6 length. The merus of the cheliped is slightly longer than the carapace length and there are 3 or 4 large sharp spines in a row on the ventromesial angle proximally. The ischium has a ventromesial serrate ridge distally, but also has a sharp spine in that position. The merus of the third maxilliped has 2 large spines proximally on the ventromesial margin, but the distal armature varies from a much smaller spine to a denticle or a spinule and several denticles.

The males from the PILLSBURY sample display a similar conglomeration of the characters previously assigned to one or the other species. The rostral margins are slightly convex on most specimens, but on some they are nearly straight and almost parallel. All of the larger specimens show remarkable sexual dimorphism, which is described in the appropriate section. The merus of the cheliped is broader and shorter proportional to the length of the whole appendage; it is approximately the same length as the carapace and usually has a row of 3, occasionally 2 or 4, large teeth on the ventromesial margin proximally. Two of the smaller males, with cl. 12.2 and 10.5 mm, have the chelipeds like those of the female specimens--long, slender and without the gaping fingers of the male--but the merus is shorter than the carapace length.

The characters of the female described as M. transtridens fall

within the range exhibited by the specimens from 1 PILLSBURY station. There is a possibility that the morphological differences between M. tridens and M. transtridens are due to depth, but until more material from shallower water is available, the material from deeper water will be assigned to M. transtridens. The most consistent morphological features separating the two species appear to be the longer, more spinous chelipeds of M. transtridens, which are more slender in the females and small males than those of M. tridens.

Pequegnat and Pequegnat (1971: 17) point out a similarity between M. transtridens and M. mina Benedict from the Pacific, but they indicate that the latter differs in having straight lateral margins on the rostrum with the dorsal carina less prominent; the merus of the cheliped is shorter with fewer internal spines, and the anterior margin of the carpus of the cheliped has a ventro-external spine which is lacking in M. transtridens. It is difficult to determine more from the original description and illustration of M. mina, but there is a possibility that this species will prove to be indistinct from M. transtridens, or that both will be relegated to subspecific rank.

Munidopsis crinita Faxon from the eastern Pacific is also a close relative of M. transtridens, and shares the same gastric spination, although the illustration of the former species shows the spines slightly larger; in addition, M. crinita lacks prominent spines on the meri of the abulatory legs, and has the rostrum shorter than that of any of the western Atlantic species with tridentate rostra.

M. transtridens is distinguished from other members of the Galathodes group in the western Atlantic (M. acuminata, M. latifrons and M. serri-cornis) by the presence of the gastric spines on the carapace.

Munidopsis serricornis (Lovén, 1852)

Figures 61-66

Galathea serricornis Lovén, 1852: 22-23.Galathea tridentata Esmark, 1857: 239*.--Sars, M. 1868: 19*.--Sars, G.O., 1872: 256, 283*.Galathodes rosaceus A. Milne Edwards, 1881: 932; 1882: 40; 1883: pl. 15, figs. 1-1d.Galathodes tridentata: Goës, 1863:--Sars, 1883: 43, pl. 1, fig. 3*; 1890: 162, pl. 4 (G. tridentatus).--A. Milne Edwards and Bouvier, 1894: 279 (key), fig. 32, 231, 233, 319, 320, 324, 325 (table), 326. --Norman, 1894: 155, 159.--Caullery, 1896: 390.--A. Milne Edwards and Bouvier, 1899: 83-85; 1900: 331-333, pl. 31, figs. 5-7.--Apellof, 1906*.Munidopsis tridentata: Ortmann, 1892, 256*.--Benedict, 1902: 276 (key), 328 (list).--Doflein and Balss, 1913: 175, 176 (lists), 177 (table). --Chace, 1942: 74 (key), 88-89.--Zariquiey Alvarez, 1968: 268 (key), 269, fig. 95a.--Pequegnat and Pequegnat, 1970: 139 (key), 158-159, figs. 5-1, 5-14, table 5-2; 1971: 5 (key).--Boschma, 1962a: 50-52; 1962b: 76 (as host of Cyphosaccus norvegicus).--Miayke and Baba, 1970: 95 (list).--Samuelsen, 1972: 91-96, figs. 1, 2 (larval stages).Munidopsis ?rosacea: Alcock and Anderson, 1899: 19.Munidopsis (Galathodes) ?tridentata: Alcock, 1901: 250 (key), 264-265.Munidopsis bahamensis Benedict, 1902: 276 (key), 278-279, 317 (list), fig. 22.--Doflein and Balss, 1913: 175 (list), 177 (table).--Chace, 1942: 74 (key), 89.--Pequegnat and Pequegnat, 1970: 139 (key); 1971: 5 (key).

- Munidopsis tenuirostris Benedict, 1902: 276 (key), 289, 328 (list), fig. 32.--Doflein and Balss, 1913: 176 (list), 178 (table).--Chace, 1942: 74 (key).--Pequegnat and Pequegnat, 1970: 139 (key); 1971: 5 (key).
- Munidopsis (Galathodes) tridentata: Doflein and Balss, 1913: 158.--Selbie, 1914: 81-84, pl. 12, figs. 1-5.--Bouvier, 1922: 48.--Laurie, 1926: 139-140.--Perez, 1927: 287 (sexual dimorphism).
- Munidopsis (Galathodes) serricornis: Balss, 1926: 29.
- Munidopsis serricornis: Christiansen, 1972: 46, fig. 57.

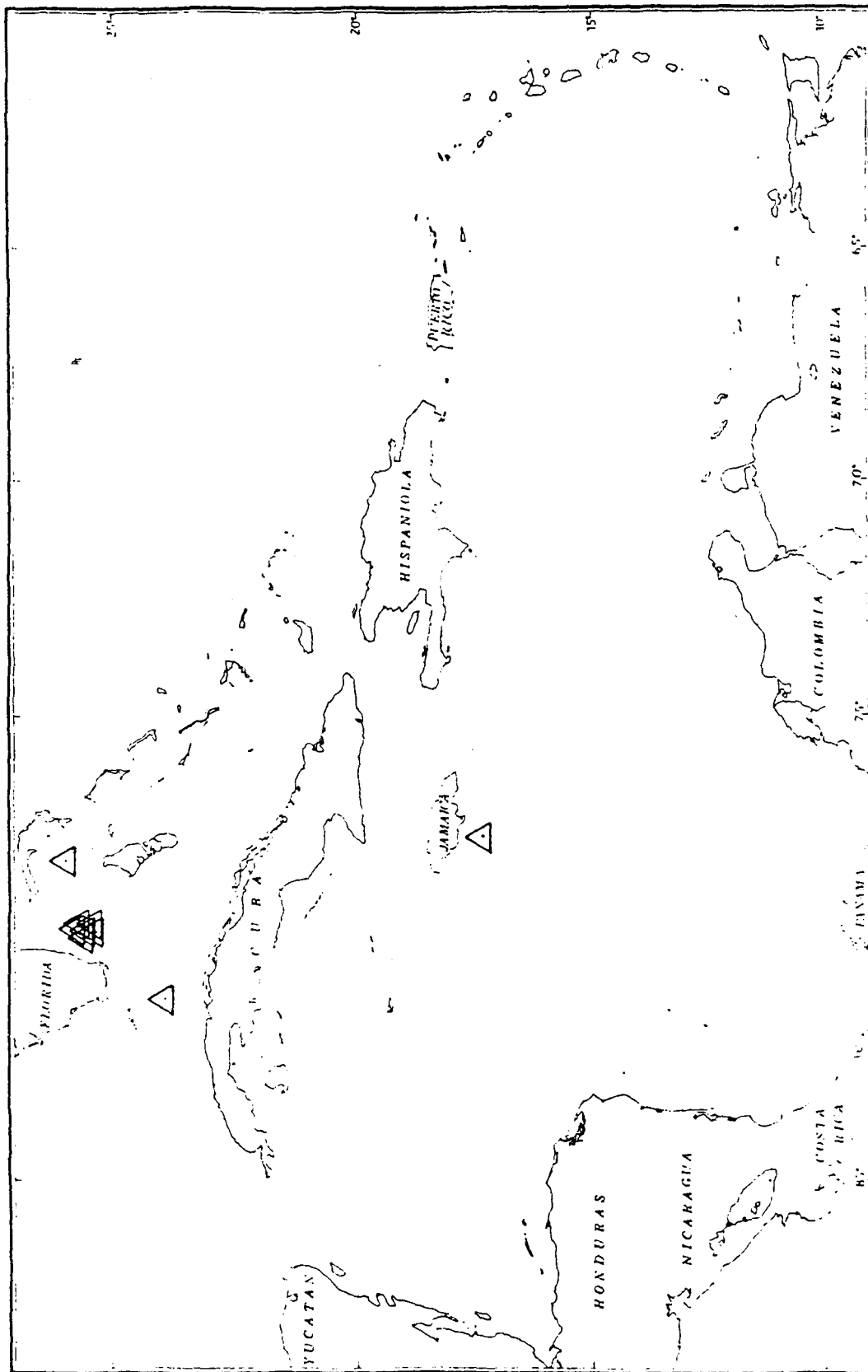
Material examined.--GERDA and PILLSBURY collections. Straits of Florida: G-44, 570-695 m, 1 ♂, 13.3 mm, 1 ♀, 5.0 mm with branchial parasite, 2 ovigerous ♀, 9.4, 9.5 mm; G-103, 824 m, 3 ♂, 5.2-8.5 mm, 4 ♀, 6.2-9.6 mm, 7.5 mm with branchial parasite, 1 ovigerous ♀, 8.5 mm with branchial parasite; G-130, 1021 m, 1 ovigerous ♀, 10.0 mm; G-295, 833-842 m, 3 ♂, 6.2-9.8 mm; G-311, 787-805 m, 4 ♂, 7.5-10.0 mm, 2 ovigerous ♀, 7.2, 7.6 mm; G-354, 805-830 m, 3 ♂, 7.0-9.6 mm, 3 ovigerous ♀, 7.6-9.2 mm, 3 ♀, 4.9-9.0 mm.--Bahamas, NW Providence Channel, G-190, 733-897 m, 1 ♀, 10.0 mm.--Off British Guiana: P-689, 1373-1446 m, 1 ♂, 12.8 mm.--Caribbean Sea, S of Jamaica: P-1262, 805-1089 m, 3 ♂, 4.7-5.6 mm, 5.6 mm with branchial parasite, 2 ♀, 4.0, 6.1 mm, 2 ovigerous ♀, 8.5 mm with branchial parasite, 9.7 mm.

ALBATROSS, ATLANTIS and TALISMAN Collections, material previously reported. North Coast of Cuba: ATLANTIS Sta. 2995, 677-1107 m, 2 ♂, 9.5 mm, other damaged, 2 ♀, 8.3 mm, 8.4 mm with branchial parasite, 1 ovigerous ♀, 10.5 mm; ATL.-3472, 933 m, 1 ♀, 6.6 mm; ATL.-3474, 897 m, 1 ♂, 5.5 mm; MCZ 11762-64 (reported by Chace, 1942: 89).--E of southeastern USA: ATL.-3780, 458-485 m, 1 ♂, 16.5 mm, 1 ♀, 14.0 mm with ab-

dominal parasite; ATL.-3781, 485-531 m, 5 ♂, 5.0-9.5 mm, 1 ovigerous ♀, 9.5 mm; MCZ 11734-35 (reported by Chace, 1942: 89 as M. bahamensis).--ALBATROSS Sta. 2669, 458-530 m, 3 ♂, 12.1-18.1 mm (largest is holotype of M. bahamensis Benedict, 1902), 3 ovigerous ♀, 13.6-16.3 mm, USNM 20555; ALB.-2415, 805 m, 1 ♂, 11.0 mm (holotype of M. tenuirostris Benedict, 1902), 1 ovigerous ♀, 9.3 mm, USNM 20560.--Off Cape Bojador, W Africa: TALISMAN Sta. 70, 698 m, 1 ♂, 8.5 mm, MCZ 6609 (reported by A. Milne Edwards and Bouvier, 1900: 331). See distribution plot 22.

Diagnosis.--Tridentate rostrum, not sharply upturned; gastric region of carapace and abdominal segments without spines; frontal margin with sharp post-antennal spine; no eyespines; no epipods on chelipeds or ambulatory legs; sides of carapace roughly parallel.

Description.--Carapace longer than broad (cw/cl = approximately 0.75-0.80), transversely convex, slightly convex longitudinally. Gastric region slightly inflated, unarmed. Small specimens with an irregular transverse row of granules or indistinct tubercles on each side of anterior gastric region. Cervical groove distinct centrally between meso- and metagastric regions; anterior branch shallow, forming depression around gastric region; posterior branch more distinct, continuous to lateral margins. Postcervical groove distinct as depression across central third of carapace between metagastric and cardiac regions. Posterior to this and on metabranchial regions, surface with widely-spaced interrupted rugae, conspicuous near lateral margins. Smooth area across carapace anterior to raised posterior margin; transverse striation across center of marginal rim. Dorsal surface moderately setose. Rostrum broad at base, lateral margins straight or slightly convex, parallel or slightly converging,



Distribution plot 22.--*Munidopsis serricornis* (Lovén, 1852) collected by the GERDA and PILLSBURY.

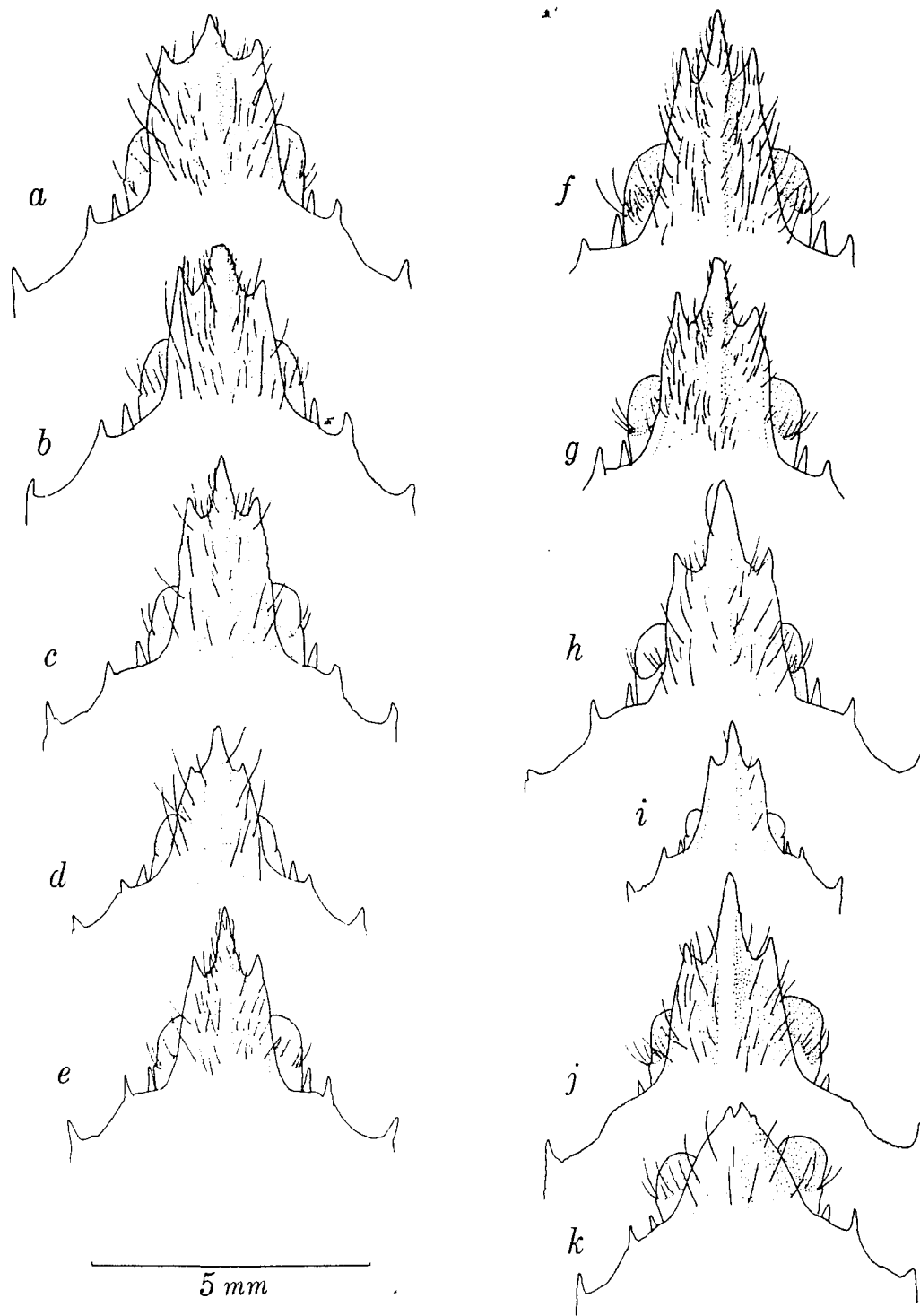


Figure 61. --*Munidopsis serricornis* (Lovén, 1852), variation in form of rostrum. a-e, G-311: a, ♂, cl. 9.6 mm; b, ♂, cl. 9.6 mm; c, ♂, cl. 8.5 mm; d, ♂, cl. 7.5 mm; e, ovigerous ♀, cl. 7.8 mm. f, g, ALBATROSS Sta. 2415 (type material of *M. tenuirostris* Benedict): f, ♂, cl. 11.0 mm; g, ovigerous ♀, cl. 9.3 mm. h, i, G-44: h, ovigerous ♀, cl. 9.6 mm; i, ♀, cl. 5.0 mm. j, k, G-103: j, ♀, cl. 9.6 mm, (deformed, absence of post-antennal spines); k, cl. 8.2 mm (deformed tip of rostrum).

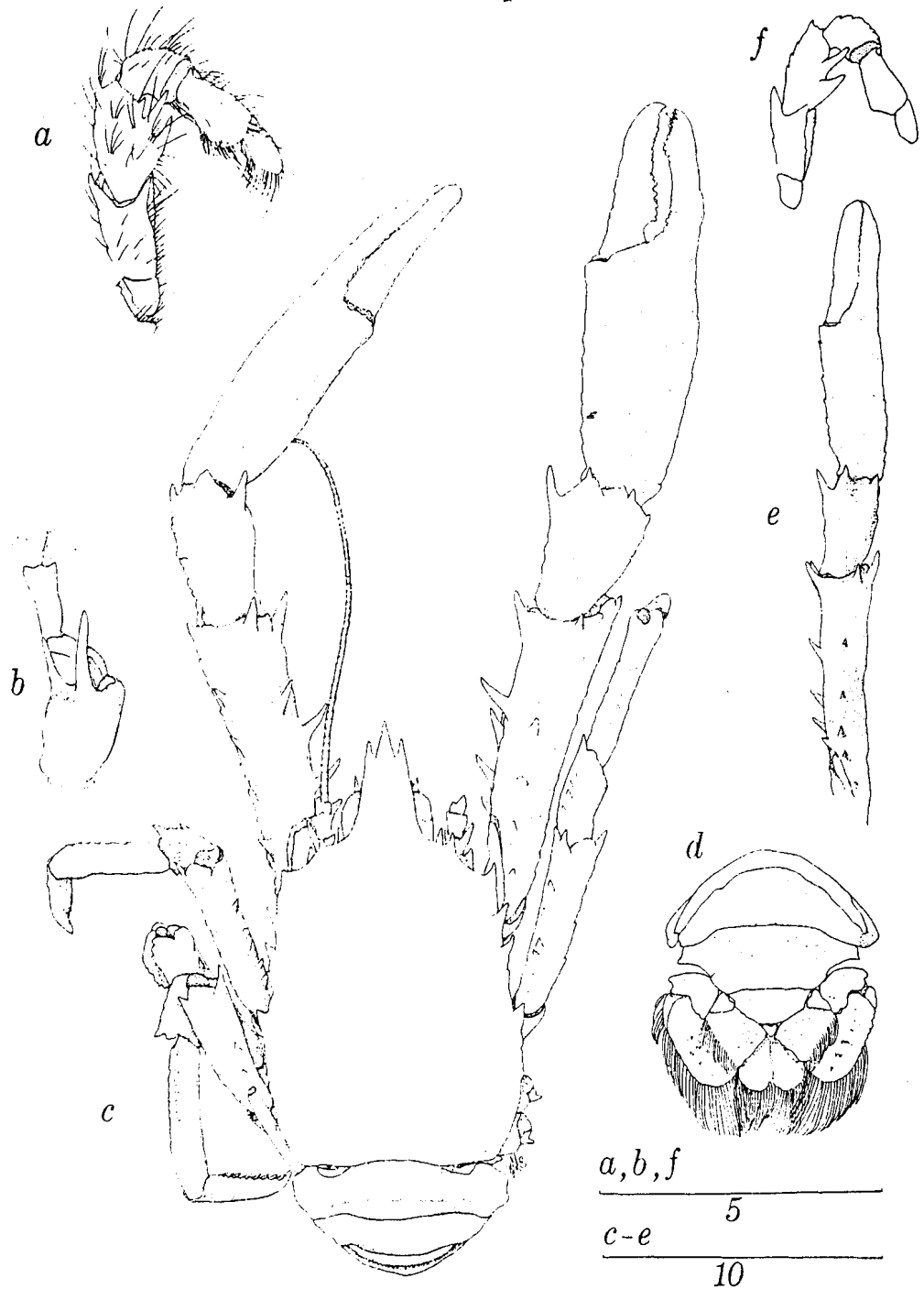


Figure 62. --*Munidopsis serricornis* (Lovén, 1852). ♂, cl. 11.0 mm, ALBATROSS Sta. 2415 (holotype of *M. tenuirostris* Benedict): a, endopod of right third maxilliped, ventrolateral view; b, right antennular peduncle, ventrolateral view; c, dorsal view, setae omitted; d, posterior abdominal tergites, uropods and telson. ♂, cl. 8.5 mm, TALISMAN Sta. 70 (specimen from west coast of Africa identified by A. Milne Edwards): e, right cheliped; f, endopod of right third maxilliped, setae omitted. Scales in mm.

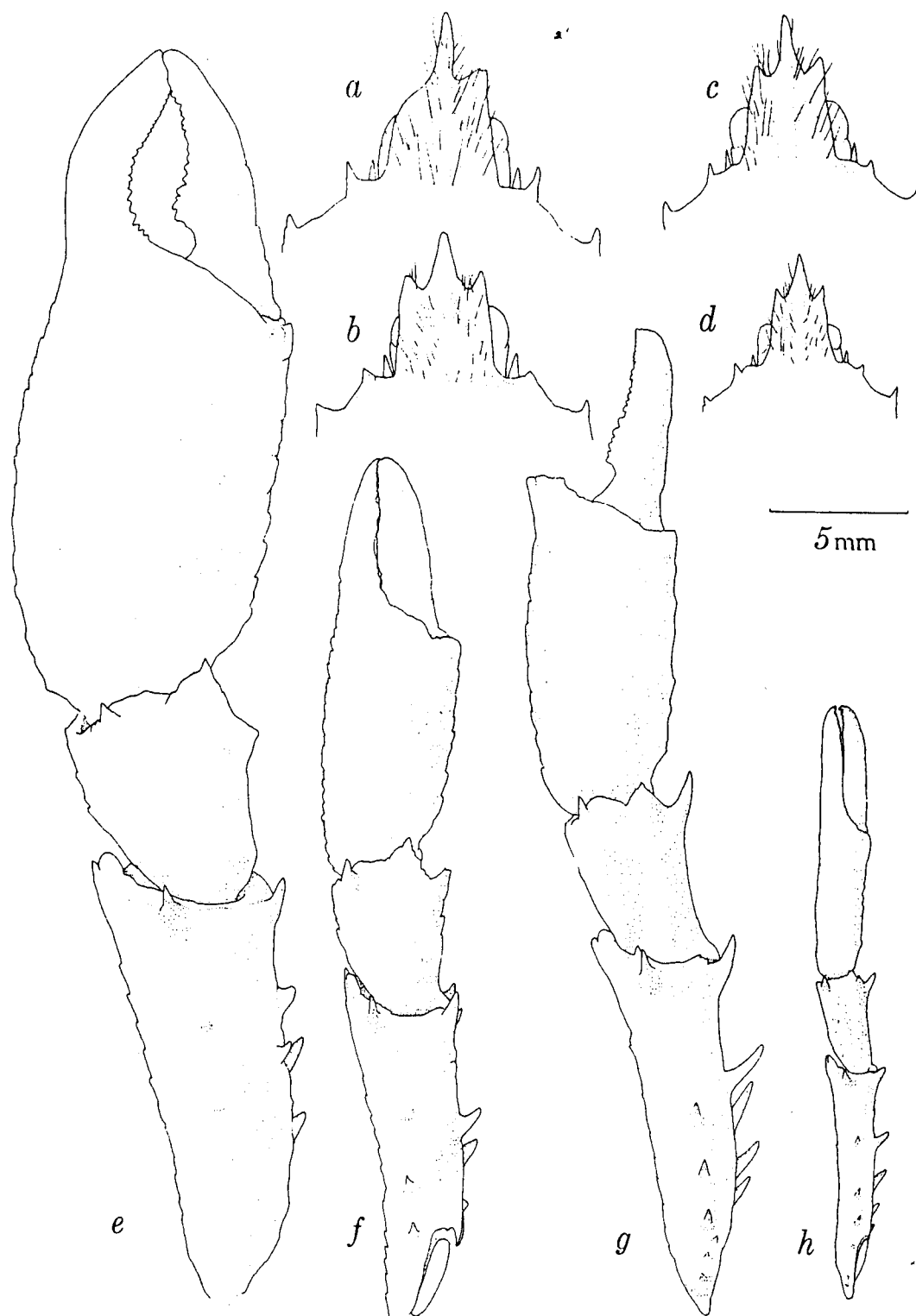


Figure 63. --*Munidopsis serricornis* (Lovén, 1852), rostra and left chelipeds. ♂, cl. 16.5 mm, ATLANTIS Sta. 3780: a, e. ♀, cl. 14.0 mm, ATLANTIS Sta. 3780: b, f. ♂, cl. 13.3 mm, G-44: c, g. Ovigerous ♀, cl. 9.5 mm, G-44: d, h. Setae on chelipeds not shown; e and g are quite setose.

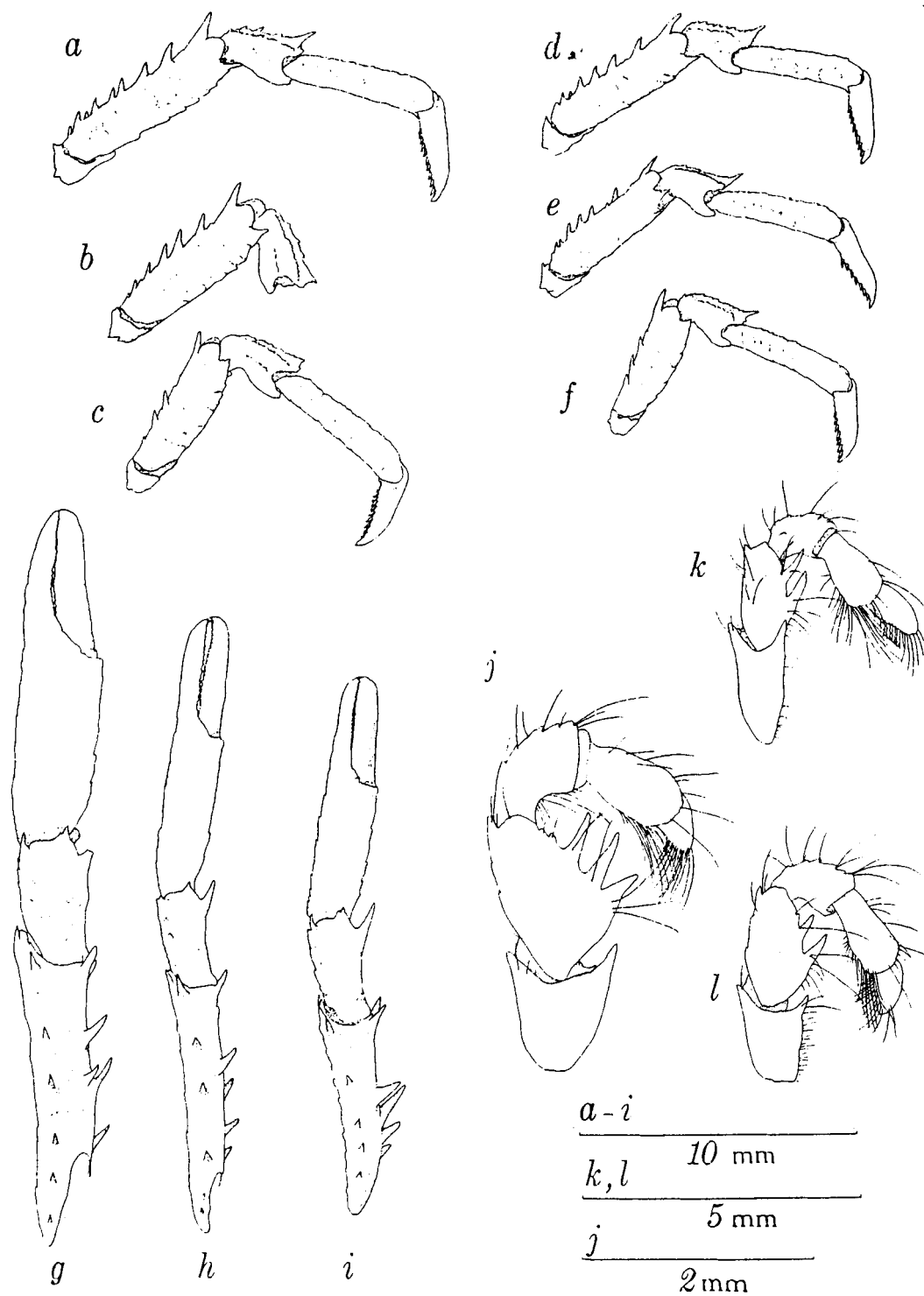


Figure 64. --*Munidopsis serricornis* (Lovén, 1852). ♂, cl. 11.0 mm, ALBATROSS Sta. 2415 (holotype of *M. tenuirostris* Benedict): a-c, second to fourth pereopods, lateral view. ♀, cl. 9.3 mm, ALBATROSS Sta. 2415: d-f, second to fourth pereopods, lateral view. Right chelipeds: g, G-190, ♀, cl. 10.0 mm; h, P-1262, ♀, cl. 8.3 mm; i, G-354, ♂, cl. 9.6 mm. Endopods of right third maxillipeds: j, G-295, ♂, cl. 7.2 mm; k, G-130, ovigerous ♀, cl. 10.0 mm; l, P-1262, ovigerous ♀, cl. 9.7 mm.



Figure 65. --*Munidopsis serricornis* (Lovén 1852), ♂, cl. 12.1 mm, ALBATROSS Sta. 2669 (from type series of *Munidopsis bahamensis* Benedict): a, right antennule, ventrolateral view; b, endopod of right third maxilliped, ventrolateral view; c, dorsal view, setae omitted, fourth pereopod missing.

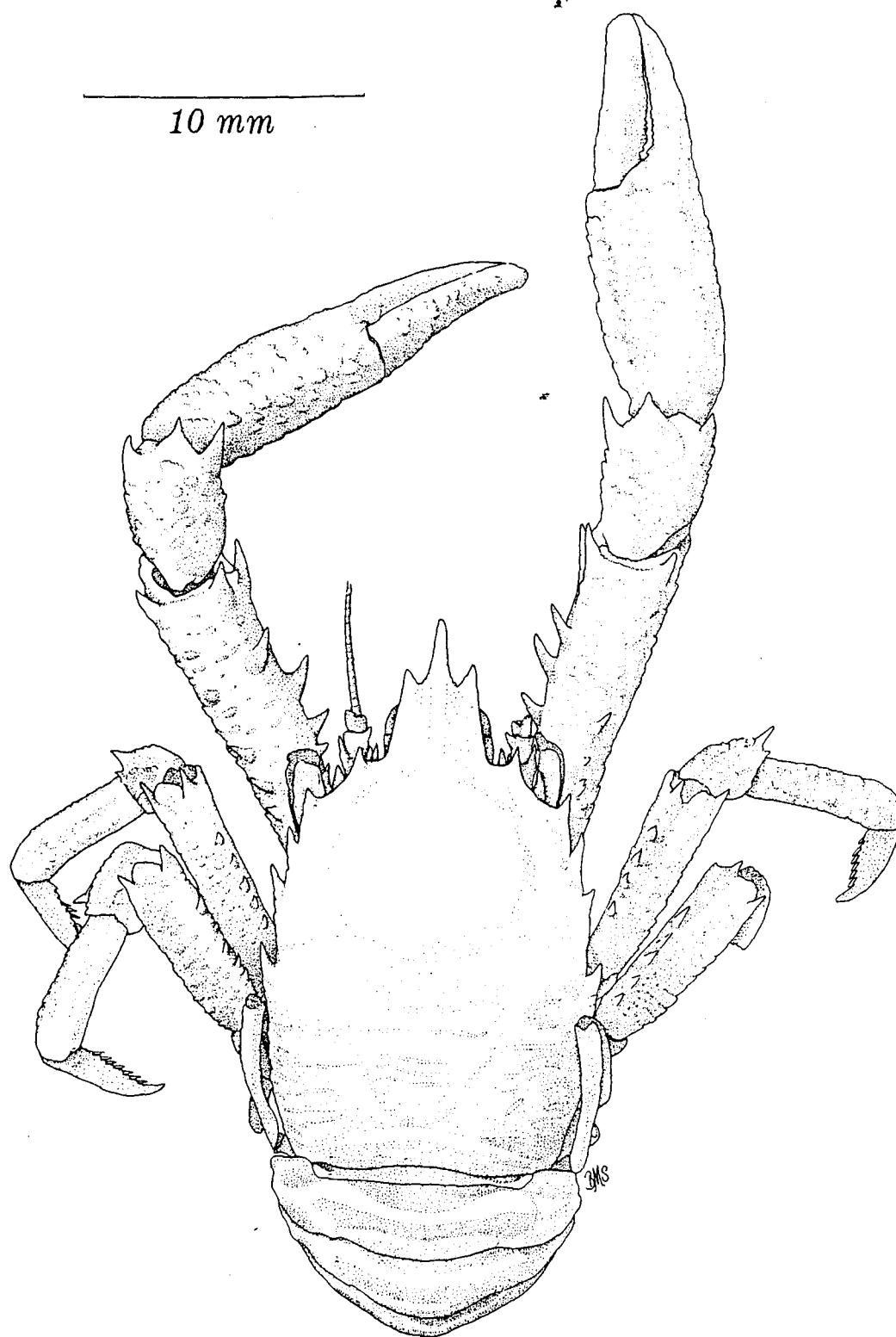


Figure 66. --Munidopsis serricornis (Lovén 1852), ♀, cl. 14.7 mm, ALBATROSS Sta. 2669 (from type series of M. bahamensis Benedict), dorsal view, setae omitted, fourth pereopods missing.

terminating in 3 distinct teeth, central tooth longer; rostrum nearly horizontal, with slight upturn distally; rounded carina extending from gastric region to termination of central tooth; several setae on lateral margins thicker and longer than most. Frontal margin straight or slightly convex between base of rostrum and sharp conical post-antennal spine; margin sloping more between frontal and anterolateral spine. Anterolateral spine followed on lateral margin by 3 sharp spines, posterior spine broader or larger, located posterior to lateral termination of cervical groove.

Abdominal segments unarmed; transverse ridge followed by shallow depression across second and third tergites; fourth tergite with ridge only; remaining segments relatively smooth.

Sternum unarmed; intersegmental ridges and depressions distinct.

Eyes small, frequently almost hidden beneath rostrum, movable, unarmed. Several setae projecting forward from base of cornea.

Sharp conical spine emerging below frontal margin between eyestalk and bases of antenna and antennule.

Basal segment of antennular peduncle with 2 long sharp spines on dorsal surface; distalmost spine thicker and sometimes longer; distal margin serrate ventromesially.

Basal segment of antennal peduncle broad, with 2 terminal spines: 1 broad lateral tooth, 1 expanded ventromesial tooth. Second segment with sharp distolateral spine and very small ventromesial tooth. Parts of distal margin of third segment serrate with mesial denticle. Fourth segment with dorsolateral denticulate projection on distal margin, smaller lobe ventrolaterally; mesial margin slightly expanded, denticulate. Antennal flagellum approximately 1 1/2 times carapace length.

Ischium of endopod of third maxilliped, triangular in cross section; mesial margin toothed; distal margin expanded into triangular tooth at each of 3 angles. Merus with small tooth dorsodistally; ventral margin usually with 2 large spines, proximal spine slightly broader; occasionally small rounded denticle distally on ventral margin.

Low, forward-projecting tubercles, minutely dentate, with setae, scattered evenly over most surfaces of pereopods. No epipods on chelipeds or ambulatory legs.

Length-width ratio quite variable in cheliped; fingers shorter than manus; tips spooned, dentate; opposing margins of fingers ranging from widely gaped in large males to continuously abutting in females and small individuals; proximal expansion of mesial margin on dactylus of individuals with gape. Surface of chela unarmed, smooth except for sculpturing and low tubercles, particularly on slightly raised dorsomesial margin; usually slight longitudinal depression on manus posterior to articulation of dactylus, more conspicuous on broader chelae. Carpus slightly more than 1/3 length of manus; distal margin with large sharp mesial spine; elevation on either side of central depression terminating in small tooth; distal ventral margin serrate with small ventromesial tooth. Merus with large spine on distal margin at dorsal, mesial and ventromesial angles; lateral angle usually with rounded protuberance occasionally developed into tooth; usually 1 or 2 large spines posterior to mesial one, several sharp spines proximal to this on ventromesial angle, and several smaller spines along dorsal angle; spination variable.

Second, third and fourth pereopods similar. Ratio of pereopod and cheliped length variable, but dactylus of second pereopod seldom exceeding distal margin of carpus of cheliped. Dactylus approximately

1/2 length of propodus; unarmed except for longitudinal row of corneous spinules on flexor margin following curved tip. Lateral surface of propodus sculptured, slight ridge dorsally. Carpus approximately same length as dactylus; extensor margin expanded into toothed ridge with large sharp distal spine; longitudinal hollow and ridge lateral to this. Merus with sharp distodorsal spine followed by 4 to 8 spines on second and third pereopods; 2 or 3 spines on fourth pereopod, decreasing in size proximally; large ventral spine near distal margin; lateral surface evenly sculptured, mesial surface almost smooth. Ischium with dorsal protuberance distally, and serrate distolateral margin.

Merus of fifth pereopods sculptured on lateral face and ventral margin.

Protopod of uropod with posterolateral margin scalloped; posterior lobe with serrations, sometimes obscure on both sides of small central notch. Exposed surfaces of endopod and exopod with setae and small group of movable spines, larger on endopod; lateral margins with small movable spines on exopod, small teeth on endopod.

Telson narrowed posteriorly, consisting of 8 distinct plates, posterior margin with medial indentation.

Color.--Specimens preserved in alcohol are chalky white with pale corneous colored corneae. Eggs of a recently preserved specimen are orange. In the original description of the species, type material from Sweden is described as bright pink with white eyes. Bouvier, 1922, reported the animals to be cream white, basing himself on a water color sketch made by M. Borrel, the artist of the Monaco Expeditions, of a freshly captured specimen. No other published records of color in this species were found

in the literature.

Size.--♂, cl. 4.7-13.3 mm,

♀, cl. 4.0-10.0 mm, and

ovigerous ♀, cl. 7.2-10.0 mm.

The material examined extends the range for males to 18.1 mm and for ovigerous females to 16.3 mm.

Sexual dimorphism.--Chelipeds of large males usually have the fixed finger arched or the inner margin excavated, forming a gape; females usually have the fingers straight with no appreciable gape between opposing margins.

Males larger than 6.0 mm carapace length have the characteristic fringe of thick setae on the lateral margins of the telson; females and smaller males lack this fringe.

Habitat.--At locations where this species has been collected, the bottom has consisted variously of rock, coral or shell rubble, sand, mud or Globigerina ooze.

Type.--Deposition of the type material is not known.

Type locality.--"Väderöarne Bahusiae," Sweden, (among the Väder Islands on the Bohuslän coast), about 50 fm.

Geographic range.--Munidopsis serricornis has been reported from both sides of the North Atlantic Ocean, from the Gulf of Mexico, the Caribbean Sea, and from several locations in the northern Indian Ocean.

In the literature it has been recorded from the following localities: eastern Atlantic: Norway (Norman, 1894: 155; Esmark, 1857: 239; Sars:

1868: 19; Boschma, 1962a: 50, 1962b: 76; W of Ireland (Selbie, 1914: 83-84); Bay of Biscay (Caullery, 1896: 390; A. Milne Edwards and Bouvier, 1900: 332); Azores (A. Milne Edwards and Bouvier, 1899: 85; 1900: 332; Bouvier, 1922: 48); NW and W of Spain (Caullery, 1896: 390; A. Milne Edwards and Bouvier, 1900: 331); Canary Islands (Bouvier, 1922: 48); NW and W of Africa (A. Milne Edwards and Bouvier, 1900: 331); Cape Verde Islands (A. Milne Edwards and Bouvier, 1900: 331).--Western Atlantic: N of Cuba (Chace, 1942: 89); E of southeastern USA as M. bahamensis and M. tenuirostris (Benedict, 1902: 278, 289; Chace, 1942: 89).--Gulf of Mexico (Pequegnat and Pequegnat, 1970: 159).--Indian Ocean: E of Africa (Doflein and Balss, 1913: 158); Bay of Bengal (Doflein and Balss, 1913: 158, Alcock, 1901: 265); W of Sumatra (Doflein and Balss, 1913: 158); Arabian Sea (Alcock, 1901: 265); Maldive Atoll (Alcock, 1901: 265); Archipelago of the Seychelles, Saya de Malha (Laurie, 1926: 139).

Bathymetric range.--Possible depth range for material examined is 570-1446 m; calculated range is 695-1373. This species has been reported shallower (275 m, 200-10 m and 96 m) off Norway and in the Azores, and deeper (1480 m) in the Bay of Biscay.

Parasites.--Two records were found in the literature of parasitism in this species by rhizocephalans: Tortugaster fistulatus Reinhard, 1948 reported from Munidopsis bahamensis by Reinhard (1958), the host of which had been reported by Chace (1942); and Cyphosaccus norvegicus Boschma, parasitic on M. tridentata (= M. serricornis) (Boschma, 1962). None of the material in our collection has abdominal parasites. The branchial parasites were all identified as bopyrid isopods of the genus Pseudione, possibly belonging to undescribed species.

Associates.--Munidopsis serricornis was found at 7 stations; M. latifrons was found with it at 4 of these locations, giving these 2 species a relatively high index of affinity, 0.43.

Relationships.--The 5 species of Munidopsis with tridentate rostra found in the western Atlantic appear to be very closely related judging by their similar morphology. M. serricornis can be distinguished from M. acuminata Benedict which has epipods on the chelipeds, shorter ambulatory legs with several distinct carpal spines, and 1 fairly blunt tooth on the merus of the third maxilliped near the distal end of the ventral margin. The gastric region of the carapace and the abdominal segments are unarmed in M. serricornis, while M. tridens (A. Milne Edwards) and M. transtridens Pequegnat and Pequegnat have 1 pair of gastric spines and M. latifrons (A. Milne Edwards) has a pair of median spines and a pleuronal spine on the second abdominal segment.

The emphasis by Benedict (1902) on the acuminate nature of the chelipeds seems unwarranted since the chelipeds are quite variable in this species complex, and certain specimens of M. serricornis, M. transtridens and M. latifrons display this feature.

M. modesta Benedict, M. mina Benedict and M. crinita Faxon from the eastern Pacific, and to a lesser degree, M. trifida Henderson from the western Pacific, are similar to M. serricornis. The latter 3 species each have a pair of gastric spine, however, and M. modesta has the anterior carapacial margin sloping much more than M. serricornis.

Discussion.--With the help of Dr. L. B. Holthuis, who had access to the original Latin description, it has been determined that Lovén, 1852, described this species under the name of Galathea serricornis based on

specimens from Norway with white eyes. Since this is the only "blind" galatheid found in Norwegian waters, where it is fairly common, although Lovén's description of the serrate lateral margins of the rostrum does not really apply to M. serricornis, there is little doubt that he was dealing with the same species which has been called M. tridentata in all recent literature. Balss (1926) was apparently the first of subsequent workers to note this synonymy, but this was ignored by most other authors except recently, by Zariquiel Alvarez (1968) and Christian- sen (1972).

The only characters used in recent keys (Chace, 1942; Pequegnat and Pequegnat, 1970) to separate M. tridentata (= M. serricornis), M. bahamensis and M. tenuirostris are the shapes of the rostra and chelipeds. M. bahamensis was described by Benedict (1902) from a series of large animals (3 ♂, cl. 18.1-12.1 mm and 3 ovigerous ♀, cl. 16.3-13.6 mm) from 645 m off Florida, with robust chelipeds and broad rostra having almost parallel sides. In the same paper he described a male (cl. 11.0 mm) and an ovigerous female (cl. 9.3 mm) from 805 m off Georgia with narrower, more tapering rostra as M. tenuirostris. Benedict reserved M. tridentata for specimens with laterally convex rostra, while Chace distinguished that species from M. bahamensis by the "moderately slender chelipeds and ambulatory legs" of M. tridentata.

Samples in the RSMAS collection from 450-1217 m show a range of variation of these characters which include the extremes expressed by the holotypes of M. bahamensis and M. tenuirostris. In all cases, large individuals have broader rostra and more robust chelipeds than smaller animals in the same sample. The nature of the rostral margins varies, also, as in demonstrated in figures 61 and 63(c-d). Benedict

(1902) separated tenuirostris from tridehitata in his key on the basis of the presence of 2 spines on the inferior margin of the merus of the third maxilliped of M. tenuirostris and 3 spines in that of the latter 2 species; however, in his description of M. tenuirostris he states that there are "two slender spines and a short conical one" in that location. In this group of specimens there is some degree of variation in the armature of this appendage, as Chace (1942) pointed out several times. Since it is impossible to separate these animals into distinct taxa based on these characters, and since examination has revealed no other characters which can be used to define the species morphologically, it is deemed advisable to call all this material M. serricornis.

It should be noted that all the larger specimens (except 1 ♂ from near British Guiana) have come from the Straits of Florida and points north, whereas samples with only small specimens (cl. 10.0 mm and less) have come from the Straits of Florida, Cuba, and south of Jamaica, with the exception of those from ATLANTIS Sta. 3781.

Remarks.--Both the form of the cheliped and the nature of the rostrum show an interesting range of variation. These are depicted in figures 61-66. Samples from GERDA stations 44, 103, 295 and 311 contained specimens which exhibit a wide range of variation and several combinations of the extremes of rostrum and cheliped shape and size. The type material of Benedict's M. tenuirostris (figures 61:f,g; 62: a-d; and 64: a-c) has been illustrated for comparison with his M. bahamensis (figures 65, 66). It should be noted that the rostrum of the female paratype of M. tenuirostris (figure 61,g) is not particularly long or tapered, characters upon which Benedict based the new species.

Figure 62, e and f show the third maxilliped and left cheliped of a specimen collected by the TALISMAN from West Africa and identified by A. Milne Edwards as M. tridentata. Unfortunately the rostrum was broken off presumably near the distal end in the single specimen. The margins are fairly straight however, and slightly converging. There were no outstanding characteristics which distinguish this individual from most of the western Atlantic specimens.

Examination of a quantity of material from Norway identified as M. serricornis revealed no characters significantly different from those of the specimens collected by the GERDA and PILLSBURY.

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APPENDIX

The following list contains data for the stations of the expeditions of the GERDA and FILLSBURY mentioned in the dissertation. The station number, position, depth in meters, bottom, date and the species of Munidopsis taken are listed for every station at which Munidopsis were collected.

The following abbreviations are used to indicate the bottom type or characteristics: alc., alcyonarians; biv., bivalve; bl., black; br., brown; bran., branching; brk., broken; cl., clay; congl., conglomerate; cor., coral; covd., covered; dd., dead; fn., fine; frg., fragments; gn., green; gy., gray; hd., hard; lg., large; madrepo., madreporarian coral; m., mud; pter., pteropod; pum., pumice; r., rock; rky., rocky; sed., sediment; sh., shell; sil., siliceous; slp., slippery; slt., silt; sn., sand; sol., solitary; st., stone; stky., stky., sticky; Thal., Thalassia; thk., thick; veg., vegetable; wh., white; yl., yellow.

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
<u>GERDA</u>					
STRAITS OF FLORIDA:					
44	25°36'N, 79°45'W	570-695		21 JUL 62	<u>serricornis</u>
103	25°17'N, 79°40'W- 25°22'N, 79°41'W	824	hd.co. rubble	10 MAY 63	<u>serricornis</u>
114	24°02'N, 83°02'W	869-759		18 JUN 63	<u>cubensis</u> <u>longimanus</u>
121	23°52'N, 82°05'W	1281		19 JUN 63	<u>sigsbei, simplex</u>
128	23°49'N, 81°37'W- 23°50'N, 81°30'W	1464-1391		20 JUN 63	<u>simplex</u>
129	23°46'N, 81°15'W	1281		20 JUN 63	<u>sigsbei, simplex</u>
130	23°59'N, 81°10'W- 23°59'N, 81°05'W	1021		21 JUN 63	<u>serricornis</u> <u>armata, sigsbei</u>
131	24°11'N, 80°57'W- 24°16'N, 80°48'W	787-733		21 JUN 63	<u>spinosa</u>
132	24°23'N, 80°48'W- 24°29'N, 80°50'W	275-302		21 JUN 63	<u>armata</u>
158	26°27'N, 79°21'W- 26°36'N, 79°24'W	540-531		25 JUN 63	<u>abdominalis</u>
160	26°33'N, 79°42'W- 26°37'N, 79°42'W	586		26 JUN 63	<u>impolita</u>
169	27°01'N, 79°21.5'W- 27°04'N, 70°21'W	567-522	sp.alc.co.	29 JUN 63	<u>spinifer</u>
170	27°06'N, 79°32'W- 27°11'N, 79°30'W	677-659	sp.alc.co.	29 JUN 63	<u>latifrons</u>
BAHAMA ISLANDS:					
190	25°57'N, 78°07'W	733-897	dd.co.	4 JUL 63	<u>serratifrons</u> <u>serricornis</u>
191	26°02'N, 78°10'W- 26°00'N, 78°10'W	824-860	wh.cl.	4 JUL 63	<u>serratifrons</u>
193	26°08'N, 78°12'W- 26°09'N, 78°11.5'W	1190-1080	fn.wh.m.	4 JUL 63	<u>abbreviata</u>

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
<u>GERDA</u>					
STRAITS OF FLORIDA:					
221	24°21'N, 80°35'W- 24°23'N, 80°30'W	604-586	pter. ooze	22 JAN 64	<u>erinaceus</u>
222	24°23'N, 80°28'W- 24°29'N, 80°18'W	824	pter. alc.	22 JAN 64	<u>abbreviata</u>
223	24°18'N, 80°29'W- 24°21'N, 80°23'W	897-915	dd. grass co. pter.	23 JAN 64	<u>sigsbei</u>
225	24°24'N, 80°22'W- 24°28'N, 80°16'W	805		23 JAN 64	<u>abbreviata</u>
226	24°28'N, 80°16'W- 24°51'N, 79°52'W	802-805	pter.	23 JAN 64	<u>abbreviata</u> <u>longimanus</u> <u>sigsbei</u>
295	25°13.5'N, 79°27'W- 25°36'N, 79°23'W	842-833		4-5 APR 64	<u>latifrons</u> <u>serricornis</u>
301	26°28'N, 79°26'W- 26°38'N, 79°21'W	648-622	sea urch.	5 APR 64	<u>abdominalis</u>
311	25°41'N, 79°31'W- 25°47'N, 79°34'W	805-787	co. frg.	24 MAR 64	<u>latifrons</u> <u>serricornis</u>
354	25°39'N, 79°32'W- 25°42'N, 79°30'W	805-830	dd. co. sp.	24 AUG 64	<u>latifrons</u> <u>serricornis</u>
365	24°11'N, 81°37'W- 24°12'N, 81°17'W	672		15 SEP 64	<u>longimanus</u>
368	24°03'N, 81°10'W- 24°08'N, 80°59'W	961-1016		15 SEP 64	<u>longimanus</u> <u>sigsbei</u>
370	23°54'N, 81°19'W- 23°53'N, 81°16'W	1281	pter.	16 SEP 64	<u>simplex</u>
372	23°51'N, 81°02'W- 24°04'N, 80°42'W	1107-1162		16 SEP 64	<u>sigsbei</u>
374	23°50'N, 81°37'W- 23°54'N, 81°27'W	1208-1241		17 SEP 64	<u>sigsbei, simplex</u>
375	23°54'N, 81°27'W- 23°56'N, 81°05'W	1153-1190		17 SEP 64	<u>sigsbei, simplex</u>
386	27°09'N, 79°18'W	604	co. sp. alc.	19 SEP 64	<u>spinifer</u>

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
<u>GERDA</u>					
443	24°05'N, 82°21'W- 24°03'N, 82°18'W	729-829	yl.gy.slt. rks.	29 NOV 64	<u>abbreviata</u>
446	23°57'N, 82°32'W- 23°55'N, 82°28'W	988-1071	pter.debris sandy.m.rk.	30 NOV 64	<u>spinoculata</u>
448	23°54'N, 82°21'W- 23°53'N, 82°17'W	1135-1184	co. <u>Thal.</u> m.pter.sh.	1 DEC 64	<u>sigsbei</u> <u>spinoculata</u>
449	23°55'N, 82°05'W- 23°55'N, 81°58'W	1373-1428	<u>Thal.</u> frg. pter.ooze	1 DEC 64	<u>sigsbei, simplex</u>
460	24°19'N, 82°48'W- 24°19'N, 82°47'W	207-247	m.sh.	25 JAN 65	<u>polita</u>
493	26°32'N, 78°55'W- 26°29'N, 78°52'W	183-549		3 FEB 65	<u>platirostris</u>
635	26°02'N, 79°19'W- 26°08'N, 79°22'W	458-480		30 JUN 65	<u>abdominalis</u> <u>spinifer</u>
654	27°16'N, 79°49'W- 27°20'N, 79°50'W	324		16 JUL 65	<u>robusta</u>
657	27°08'N, 79°49'W- 27°14'N, 79°49'W	216-201		16 JUL 65	<u>polita</u>
BAHAMAS ISLANDS:					
679	25°56'N, 78°09'W- 25°56'N, 78°05'W	595-711	debris, soft m.cinders	20 JUL 65	<u>bradleyi</u>
690	26°35'N, 78°19'W	494-503		21 JUL 65	<u>spinifer</u>
SANTAREN CHANNEL:					
815	24°08'N, 79°48'W	618		22 JUN 67	<u>erinaceus</u> <u>polita</u>
STRAITS OF FLORIDA:					
830	25°40'N, 79°59'W- 25°43'N, 79°59'W	342	dd. <u>Thal.</u> cinders	7 JUL 67	<u>erinaceus</u>
859	23°54'N, 81°57'W- 24°01'N, 81°53'W	1162-1201	dd.co. pter.sh.	29 AUG 67	<u>sigsbei, simplex</u> <u>transtridens</u>
860	24°05'N, 81°46'W- 24°06'N, 81°43'W	755-724		29 AUG 67	<u>abbreviata</u> <u>sigsbei</u>

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
<u>GERDA</u>					
870	24°10'N, 81°07'W- 24°17'N, 80°42'W	807-755	sp.	30 AUG 67	<u>abbreviata</u> <u>erinaceus</u> <u>polita, spinosa</u>
ARROWSMITH BANK (YUCATAN CHANNEL):					
880	21°04'N, 86°25'W	101-329	algae	9 SEP 67	<u>platirostris</u>
894	21°10.5'N, 86°19'W- 21°11.5'N, 86°19'W	174-207		10 SEP 67	<u>platirostris</u>
898	21°04'N, 86°19'W	339-366		10 SEP 67	<u>squamosa</u>
NORTHWEST PROVIDENCE CHANNEL:					
917	25°59'N, 78°12'W	659-706	m.rk.	26 SEP 67	<u>erinaceus</u>
BAHAMA ISLANDS:					
923	24°02'N, 77°34'W- 24°30'N, 77°35'W	1555-1574	sp.	28 SEP 67	<u>simplex</u>
ARROWSMITH BANK (YUCATAN CHANNEL):					
952	21°02'N, 86°26'W	586-92		28 JAN 68	<u>platirostris</u>
STRAITS OF FLORIDA:					
963	23°41'N, 82°16'W- 23°47'N, 83°10'W	1455-1442	pter.	1 FEB 68	<u>sigsbei, simplex</u>
964	23°46'N, 81°51'W	1391-1415	pter.br.m.	1 FEB 68	<u>simplex</u>
965	23°45'N, 81°49'W	1400-1395	pter.br.m.	1 FEB 68	<u>sigsbei, simplex</u>
970	24°24'N, 82°08'W	512		2 FEB 68	<u>erinaceus</u> <u>polita, robusta</u>
972	24°24'N, 80°, 52'W	231-221	rky.	3 FEB 68	<u>platirostris</u>
980	24°28'N, 80°29'W	920	co.	5 MAR 68	<u>sigsbei</u>
SANTAREN CHANNEL:					
1015	23°34'N, 79°17'W- 23°33'N, 79°15'W	525-516	co.alc.	15 JUN 68	<u>abdominalis</u>
STRAITS OF FLORIDA:					
1099	24°12.5'N, 82°50.0'W	622	pter.gy.m.	28 APR 68	<u>robusta</u>
1111	23°51.9'N, 80°42.7'W	1080-1089	pter.m. sol.co.	30 APR 68	<u>sigsbei</u>

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
<u>PILLSBURY</u>					
STRAITS OF FLORIDA:					
209	26°59'N, 79°16'W	not recorded		sp. 12 AUG 64	<u>spinifer</u>
OFF ATLANTIC COAST OF COLOMBIA:					
364	09°28.7'N, 76°34.3'W- 09°20.2'N, 76°34.2'W	924-950		13 JUL 66	<u>armata</u> , <u>sigsbei</u>
374	09°57.0'N, 76°10.6'W	434-373		14 JUL 66	<u>erinaceus</u> <u>riveroi</u>
375	09°59.0'N, 76°02.0'W- 09°59.0'N, 75°59.7'W	134-129	thk.gn. br.m.	14 JUL 66	<u>polita</u>
381	10°17.0'N, 75°59.9'W- 10°15.2'N, 75°59.9'W	724-597	gn.gy.m.	14 JUL 66	<u>abbreviata</u> <u>erinaceus</u> <u>spinoculata</u> <u>spinosa</u>
388	10°16'N, 76°03'W- 10°10.4'N, 76°08.8'W	814-1050	heavy br.cl.	15 JUL 66	<u>longimanus</u> <u>sigsbei</u> , <u>spinosa</u>
391	10°03.0'N, 76°27.0'W- 10°07.0'N, 76°29.0'W	1222-1748	slp.br.m. brk.dd. biv.sh.	16 JUL 66	<u>simplex</u>
394	09°28.6'N, 76°26.3'W- 09°27.4'N, 76°29.0'W	416-634		16 JUL 66	<u>erinaceus</u> <u>ramahtaylorae</u> <u>riveroi</u>
407	09°00.2'N, 77°25.3'W- 09°02.0'N, 77°28.8'W	1158-1225	gn.m.	18 JUL 66	<u>sigsbei</u> , <u>simplex</u>
413	09°01.5'N, 76°53'W- 08°58.4'N, 76°56.3'W	1267-952	cl.debris gy.m.	18 JUL 66	<u>spinoculata</u>
OFF ATLANTIC COAST OF PANAMA (Gulfo de los Mosquitos):					
447	09°07.4'N, 81°11.8'W- 09°04.0'N, 81°13.8'W	657-673		21 JUL 66	<u>alaminos</u> <u>polita</u>
448	09°10.1'N, 80°55.6'W- 09°07.9'N, 80°56.0'W	952-869		21 JUL 66	<u>sigsbei</u>
OFF ATLANTIC COAST OF COLOMBIA:					
455	13°01'N, 71°55'W	1446		27 JUL 66	<u>simplex</u>
S OF YUCATAN CHANNEL:					
577	19°52'N, 85°29'W- 19°45'N, 85°31'W	4407-4420		22 MAY 67	<u>crassa</u>

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
<u>PILLSBURY</u>					
ARROWSMITH BANK:					
584	21°02'N, 86°24'W	353-347	sp.	23 MAY 67	<u>granulens</u>
OFF YUCATAN, MEXICO:					
607	18°30'N, 87°37'W	715-787	rubble pter.sh.17-18 fn.sed.	MAR 68	<u>alaminos</u> <u>impolita</u> <u>serratifrons</u>
NW OF SWAN ISLAND:					
631	18°21'N, 85°53'W- 18°32.5'N, 85°55.5'W	4355-4393	sp.	22 MAR 68	<u>crassa</u>
STRAITS OF FLORIDA:					
634	23°33'N, 82°47'W- 23°30.7'N, 82°32'W	1638-1757	sol.cl.sp. m.lg.rks.	25 MAR 68	<u>gilli</u>
636	23°54'N, 81°27'W	1003-1336	m.rubble	25 MAR 68	<u>armata</u> , <u>sigsbei</u>
OFF SURINAM:					
672	07°37'N, 55°22'W- 07°37'N, 55°27'W	1336-1221		11 JUL 68	<u>sigsbei</u>
673	07°56.5'N, 54°39'W- 08°08'N, 54°36'W	1042-1070	fn.yl.m.	11 JUL 68	<u>sigsbei</u>
675	08°26'N, 54°17'W- 08°41'N, 54°19'W	1235-1272		12 JUL 68	<u>abbreviata</u> <u>sigsbei</u> , <u>simplex</u>
682	07°33.5'N, 56°25'W- 07°38'N, 56°18'W	1318-1345		14 JUL 68	<u>abbreviata</u> <u>sigsbei</u>
OFF BRITISH GUIANA:					
689	08°14.0'N, 57°38'W	1373-1446	hrd.br.m.cvd. by sil.sp.15 bran.madrepo.	JUL 68	<u>armata</u> , <u>simplex</u> <u>serricornis</u> <u>transtridens</u>
OFF VENEZUELA (W of Tortuga Island):					
740	11°13'N, 66°15'W- 11°28'N, 66°10'W	827-924		23 JUL 68	<u>erinaceus</u>
(S of Orchilla):					
741	11°47.3'N, 66°06.8'W- 11°52.4'N, 66°14.0'W	1052-1067		23 JUL 68	<u>abbreviata</u> <u>armata</u> , <u>sigsbei</u> <u>longimanus</u>
(Off Los Roques):					
747	11°46'N, 67°05.7'W- 11°54.7'N, 67°05'W	1175-1098		24 JUL 68	<u>sigsbei</u>
748	11°24.8'N, 67°10.0'W- 11°36'N, 67°06'W	1867-1784		25 JUL 68	<u>simplex</u>

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
<u>PILLSBURY</u>					
(N of Golfo de Triests):					
753	11°18.8'N, 68°22.0'W- 11°31.9'N, 68°25'W	384-607	rubble sh.co..	26 JUL 68	<u>erinaceus</u>
754	11°36.9'N, 68°42.0'W	684-1574		26 JUL 68	<u>erinaceus</u>
(S of Curacao):					
755	11°43.6'N, 69°03'W- 11°46.8'N, 68°53.6'W	796-1006		26 JUL 68	<u>armata</u>
(N of Golfo de Venezuela):					
770	12°55.0'N, 71°46.5'W- 13°04'N, 71°42'W	1318-1299		28 JUL 68	<u>sigsbei</u> , <u>simplex</u>
OFF ATLANTIC COAST OF COLOMBIA:					
776	12°13.3'N, 72°50.0'W- 12°18'N, 72°42.5'W	408-576		29 JUL 68	<u>erinaceus</u> <u>longimanus</u> <u>polita</u> , <u>riveroi</u> <u>ramahtaylorae</u>
781	11°30.1'N, 73°26.5'W- 11°34.5'N, 73°20.0'W	567-531		30 JUL 68	<u>erinaceus</u> <u>polita</u> , <u>riveroi</u>
782	11°57.0'N, 73°32.0'W- 12°08'N, 73°20'W	2269-2626		30 JUL 68	<u>rostrata</u>
784	11°26.5'N, 74°10'W- 11°26.7'N, 73°57.9'W	567-715		31 JUL 68	<u>erinaceus</u> <u>polita</u>
OFF TOBAGO:					
844	11°30'N, 60°14.5'W- 11°44'N, 60°11.2'W	1464-1848		1 JUL 69	<u>rostrata</u> <u>simplex</u>
846	11°37.8'N, 60°37.4'W- 11°38.8'N, 60°37.5'W	659-1126		2 JUL 69	<u>sigsbei</u>
847	11°37.3'N, 60°59.4'W- 11°41'N, 61°01.3'W	733-1281		2 JUL 69	<u>abbreviata</u> <u>longimanus</u> <u>sigsbei</u>
850	11°45.5'N, 61°29.5'W- 11°46.5'N, 61°29.0'W	800-924		3 JUL 69	<u>abbreviata</u>
E OF GRENADINE ISLANDS:					
861	12°42'N, 61°05.5'W- 12°42.5'N, 61°07.3'W	357-586	m.sol.co.	4 JUL 69	<u>erinaceus</u>
OFF ST. VINCENT:					
871	13°14'N, 61°30'W- 13°19.2'N, 61°28.6'W	2628-2681	bl.stky.cl. fn.slt.sh.	5 JUL 69	<u>similis</u>

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
<u>PILLSBURY</u>					
876	13°13.9'N, 61°04.7'W	231-258	pum.st.seds.	6 JUL 69	<u>platirostris</u>
OFF MARTINIQUE:					
892	14°17'N, 60°54.2'W- 14°19.7'N, 60°44.5'W	1116-1354	congl.rks.sn. barnacle sh.	7 JUL 69	<u>sigsbei</u> <u>simplex</u>
OFF ST. LUCIA:					
904	13°45.5'N, 61°05.7'W	589-439		9 JUL 69	<u>erinaceus</u> <u>longimanus</u>
OFF GUADELOUPE:					
919	16°05.3'N, 61°19.3'W- 16°05.6'N, 61°19.0'W	683-733	hrd.cl.	12 JUL 69	<u>erinaceus</u>
920	16°05.8'N, 61°18.7'W- 16°06.5'N, 61°22.1'W	531-733		12 JUL 69	<u>alaminos</u> <u>erinaceus</u>
923	16°05'N, 61°24'W- 16°06.2'N, 61°22.7'W	476-686		14 JUL 69	<u>bradleyi</u> <u>erinaceus</u> <u>polita, riveroi</u>
OFF DOMINICA:					
931	15°31.2'N, 61°12.3'W- 15°32.0'N, 61°13.1'W	146-494		15 JUL 69	<u>platirostris</u>
OFF GUADELOUPE:					
944	16°32.2'N, 61°36.8'W- 16°34.4'N, 61°37.2'W	360-421		17 JUL 69	<u>spinifer</u>
946	16°43.5'N, 61°57.0'W- 16°45.1'N, 61°56.5'W	733-833		17 JUL 69	<u>abbreviata</u>
OFF MONTSERRAT AND NEVIS:					
954	16°55.0'N, 62°43.0'W- 16°58.6'N, 62°46.5'W	686-1043		18 JUL 69	<u>sigsbei</u>
NW OF ANGUILLA:					
988	18°29.3'N, 63°24.6'W- 18°31.0'N, 63°24.1'W	686-724		23 JUL 69	<u>alaminos</u>
989	18°30'N, 63°23.7'W- 18°34'N, 63°21.9'W	664-706		23 JUL 69	<u>erinaceus</u>
S OF ACKLINS ISLAND, BAHAMAS:					
1138	20°51.7'N, 74°22'W- 20°54.8'N, 74°18.6'W	2745-2751	sol.co.	12 JAN 70	<u>bermudezi</u>

STATION DATA

Sta.	Position	Depth (m)	Bottom	Date	Species
<u>PILLSBURY</u>					
N OF DOMINICAN REPUBLIC:					
1160	20°01'N, 68°59'W	201-842	rk.frg.alg.	17 JAN 70	<u>platirostris</u>
GONAVE BAY, HAITI:					
1178	19°14'N, 73°14'W- 19°25'N, 73°09'W	1766-1903	yl.cl.m. veg.debris	30 JUN 70	<u>nitida</u>
1180	18°55'N, 73°53'W- 18°44.4'N, 73°55.0'W	3111-3496	" "	1 JUL 70	<u>geyeri</u> <u>livida</u>
1181	18°51'N, 74°30'W- 18°46.8'N, 74°35.9'W	2489-2548	fn.yl.m.	1 JUL 70	<u>rostrata</u>
W OF HAITI:					
1187	18°17'N, 75°07'W	1034		2 JUL 70	<u>armata, sigsbei</u>
S OF JAMAICA:					
1224	17°32.2'N, 77°49.2'W- 17°32.3'N, 77°47.4'W	878-906		6 JUL 70	<u>armata</u> <u>brevimanus</u> <u>longimanus</u> <u>sigsbei, spinosa</u>
1225	17°42.5'N, 77°58.0'W- 17°47'N, 77°55.8'W	457-558		6 JUL 70	<u>alaminos</u> <u>spinifer</u> <u>subspinoculata</u>
NW OF JAMAICA:					
1235	17°54'N, 78°25.3'W- 17°54'N, 78°15'W	1226-1629		7-8 JUL 70	<u>sigsbei</u>
S OF JAMAICA:					
1255	17°18'N, 78°32'W-	622-823		14 JUL 70	<u>alaminos</u> <u>erinaceus</u>
1256	17°27'N, 78°10'W	521-658		14 JUL 70	<u>bradlevi</u> <u>erinaceus</u>
1261	17°13'N, 77°50'W- 17°18'N, 77°45'W	595-824		15 JUL 70	<u>alaminos</u> <u>sigsbei</u>
1262	17°21.4'N, 77°34.8'W	805-1089		15 JUL 70	<u>abbreviata</u> <u>latifrons</u> <u>serricornis</u>
S OF HISPANIOLA:					
1266	17°53'N, 71°59'W	1885	cl.	17 JUL 70	<u>similis</u>
ST. CROIX BASIN, VIRGIN ISLANDS:					
1304	17°44.5'N, 64°59'W	3477-3971		23 JUL 70	<u>nitida</u> <u>simplex</u>

STATION DATA

432

Sta.	Position	Depth (m)	Bottom	Date	Species
<u>PILLSBURY</u>					
STRAITS OF FLORIDA:					
1309	25°44.5 'N, 79°50.0 'W	311	.	5 DEC 70	<u>erinaceus</u>
OFF HONDURAS:					
1355	14°35 'N, 81°32 'W	450-576		31 JAN 71	<u>erinaceus</u> <u>ramahtaylorae</u>
ATLANTIC OCEAN, N OF VIRGIN ISLANDS:					
1376	20°45.4 'N, 65°00.5 'W- 20°46.8 'N, 64°58.3 'W	5179-5184	soft br. ooze	3 JUL 71	<u>bermudezi</u>
S OF DOMINICAN REPUBLIC:					
1396	18°04.2 'N, 68°44.3 'W- 18°03.8 'N, 68°42.5 'W	390-395		10 JUL 71	<u>platirostris</u> <u>squamosa</u>
ST. CROIX BASIN, VIRGIN ISLANDS:					
1401	17°51.0 'N, 65°04.2 'W- 18°00.6 'N, 64°56.1 'W	4226-4133		12 JUL 71	<u>crassa</u>
S OF CAICOS BANK, BAHAMA ISLANDS:					
1426	20°59.2 'N, 72°27.1 'W	3965-4096		20 JUL 71	<u>crassa</u>
W OF GREAT INAGUA:					
1429	21°19.2 'N, 73°45.5 'W- 21°21.9 'N, 73°44.2 'W	2532-2514		21 JUL 71	<u>crassa</u>
MAYAGUANA PASSAGE, BAHAMA ISLANDS:					
1438	22°27.3 'N, 73°10.1 'W	770-742		23 JUL 71	<u>serratifrons</u>

VITA

Barbara Lucile Shuler was born in Tallahassee, Florida, on January 5, 1945. Her parents are Grover C. and Lucile Branch Shuler. She received her elementary education in Kate Sullivan School and Elizabeth Cobb Junior High School, Leon County Florida, and her secondary education in Leon County High School. In September, 1963, she entered Mary Baldwin College, Staunton, Virginia. During the summer of 1966, she attended a marine biology field program sponsored by Cornell University. She was graduated from Mary Baldwin with the Bachelor of Arts degree in biology in June, 1967.

In September, 1967, she was admitted to the Institute of Marine Sciences, University of Miami for graduate study on a Maytag Fellowship. She was granted the degree of Master of Science in marine biology in June, 1970. Her master's thesis was entitled A review of the genus Cancellus (Crustacea, Diogenidae) with the description of a new species from the Caribbean Sea.

She was awarded an NSF Traineeship in 1970, and held a University of Miami Fellowship during the years 1970-1972. While engaged in her doctoral studies, she taught marine biology at the University of Miami as a teaching assistant, and was instructor in a field marine biology course at Duke University Marine Laboratory, sponsored by Mary Baldwin College.

She married Charles A. "Stormy" Mayo, III in April, 1972.

Barbara Shuler Mayo was granted the degree of Doctor of Philosophy in May, 1974.

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