

The Caridean Shrimps (Crustacea:
Decapoda) of the *Albatross*
Philippine Expedition, 1907–1910,
Part 3: Families Thalassocarididae
and Pandalidae

FENNER A. CHACE, JR.

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The Caridean Shrimps (Crustacea: Decapoda)
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SMITHSONIAN INSTITUTION PRESS

City of Washington

1985

ABSTRACT

Chace, Fenner A., Jr. The Caridean Shrimps (Crustacea: Decapoda) of the *Albatross* Philippine Expedition, 1907–1910, Part 3: Families Thalassocarididae and Pandalidae. *Smithsonian Contributions to Zoology*, number 411, 143 pages, 62 figures, 1985.—The two genera of thalassocaridid shrimps, *Chlorotocoides* and its single species and *Thalassocaris* and its three species, are reviewed briefly. A key is offered for the identification of the pandalid genera known from the Philippines and Indonesia. The monotypic genus *Chlorotocella* is recorded from the Philippines. The widespread species *Chlorotocus crassicornis* was taken by the *Albatross* in both the Philippines and Indonesia. A single specimen of the monotypic genus *Dorodotes* was collected in Makassar Strait, Indonesia. The monotypic genus *Heterocarpoides* is represented in the *Albatross* collections by 13 Philippine specimens. A key to all 20 recognized species and subspecies of *Heterocarpus* is attempted, and the antennal scales of those members represented in the Smithsonian collections are illustrated. *Heterocarpus ensifer parvispina* is recognized as an Indo-Pacific subspecies of an Atlantic species. The genus *Parapandalus* is abandoned as a taxon distinct from *Plesionika*, and a key is presented to the 46 species recognized in the latter genus from the Pacific and Indian oceans, including 12 new species and one new subspecies, all described from Philippine holotypes: *P. acinacifer*, *P. fimbriata*, *P. intermedia*, *P. kensleyi*, *P. lophotus*, *P. parvimartia*, *P. philippinensis*, *P. pumila*, *P. quasigrandis*, *P. reflexa*, *P. simulatrix*, *P. spinensis*, and *P. martia orientalis*.

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

Library of Congress Cataloging in Publication Data

Chace, Fenner Albert.

The caridean shrimps (Crustacea—Decapoda) of the Albatross Philippine Expedition, 1907–1910.

(Smithsonian contributions to zoology ; no. 381, 397)

Bibliography: p.

Includes bibliographies.

Supt. of Docs. no.: SI 1.27:381

Contents: pt. 1. Family Styrodactylidae pt. 2. Families Glyphocrangonidae and Crangonidae pt. 3. Families Thalassocarididae and Pandalidae.

1. Shrimps—Philippines—Classification—Collected works. 2. Crustacea—Classification—Collected works. 3. Crustacea—Philippines—Classification—Collected works. I. Title.

II. Series: Smithsonian contributions to Zoology ; no. 381, etc.

QL1.S54 no. 381 591 s 83-600061 [QL444.M33] [595.3'843]

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The Caridean Shrimps (Crustacea: Decapoda) of the *Albatross* Philippine Expedition, 1907–1910, Part 3: Families Thalassocarididae and Pandalidae

Fenner A. Chace, Jr.

Introduction

General considerations about the *Albatross* Philippine Expedition and its collections have been presented in Part 1 of this series (Chace, 1983). Repeated below are those format particulars that apply to each of the parts.

The genera and species itemized following the keys are those known from the Philippines and Indonesia, whether or not they are represented in the *Albatross* collections; those taken by that Expedition are indicated by an asterisk (*). The genera and species are arranged alphabetically, and the latter are numbered sequentially by order of appearance in the taxonomic portion of the report. The generic entries comprise at least the original reference followed by designation of the type-species and of the gender of the generic name, a diagnosis, and the geographic and bathymetric ranges of the genus. The original reference and range are given in the keys for each extraterritorial species or subspecies cited. There has been no attempt to list all references or even all synonyms under the taxa headings in the text. Usually the species and subspecies entries are limited to: (1) the original reference and type-

locality of both senior and junior synonyms mentioned; (2) a reference to a published illustration, if possible; (3) a diagnosis; and (4) the range of the taxon. Under "Material" of species and subspecies represented in the *Albatross* collections are listed the following particulars when known: (1) general locality; (2) station number; (3) latitude and longitude; (4) depth in meters (in brackets when estimated); (5) character of bottom; (6) bottom temperature in degrees Celsius; (7) date and astronomical time intervals (hours between midnight and midnight) that the gear operated at the indicated depth; (8) gear used; and (9) the number and sex of the specimens, with maximum and minimum postorbital carapace lengths in millimeters, in brackets (the numbers and size ranges of ovigerous females are included in the female totals, as well as separately). Additional station data may be available in Anonymous (1910).

ACKNOWLEDGMENTS.—The following contributions to the preparation of this third part of the *Albatross* Philippine series on the Caridea are recalled with much gratitude and a real sense of indebtedness. Alain Crosnier of the Muséum National d'Histoire Naturelle in Paris reviewed the penultimate draft of the report and offered many helpful suggestions, not all of which, however, have been incorporated in the final draft. At my request, C.E. Dawson of the Gulf Coast Research

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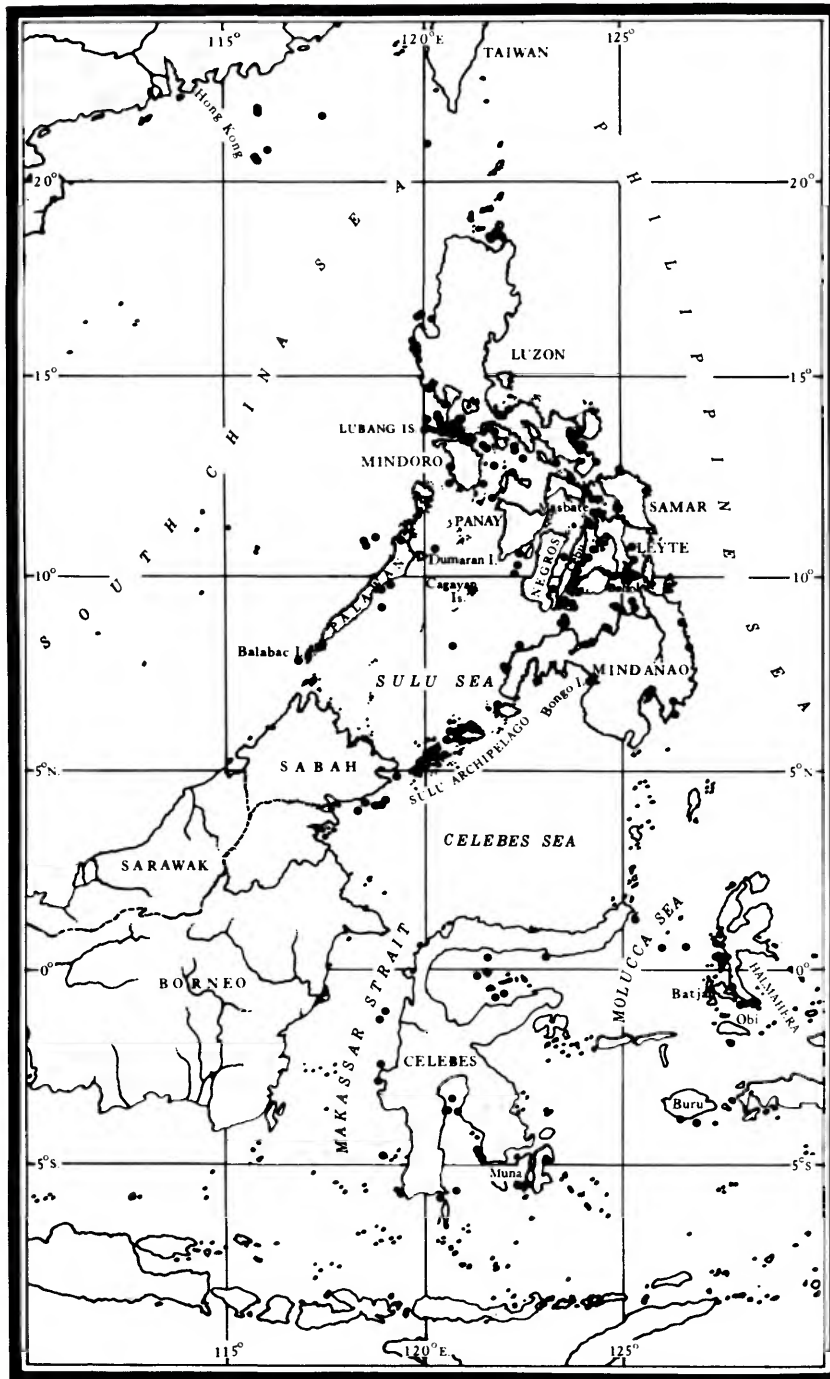


FIGURE 1.—The Philippines and central Indonesia, showing the positions of the 332 *Albatross* offshore stations at which caridean shrimps were collected.

Laboratory, Ocean Springs, Mississippi, investigated the condition of the unique holotype of *Heterocarpus gibbosus* in the British Museum (Natural History). The late Dennis M. Devaney of the Bishop Museum, Honolulu, effected the loan of paratypes of *Plesionika pacifica*. Carlo Frogliani of the Laboratorio di Tecnologia della Pesca, Ancona, Italy, provided topotypic specimens of *Plesionika narval*. C.B. Goodhart of the Cambridge University Museum of Zoology sketched the lectotype of *Thalassocaris affinis* and confirmed the true identity of *Pandalus gracilis*. L.B. Holthuis of the Rijksmuseum van Natuurlijke Historie in Leiden called my attention to an important manuscript list of *Talisman* and *Travailleur* stations compiled by A. Milne-Edwards and he, too, reviewed the penultimate draft of the report. Ken-Ichi Hayashi of the Shimonoseki University of Fisheries, Japan, also read a late draft of the manuscript and contributed a Japanese specimen of *Plesionika lophotes* to the study. R.W. Ingle of the British Museum (Natural History) made possible the loans of type-material of *Nothocaris binoculus*, *Plesionika semilaevis*, and *P. spinipes*. Makoto Omori of the Tokyo University of Fisheries presented paratypes of *Plesionika izumiae* to the Smithsonian collections. Robert A. Wasmer of Columbia Union College, Takoma Park, Maryland, informed me of the occurrence of *Stylopandalus richardi* in the northern Pacific Ocean. My thanks go too, to my Smithsonian colleagues who aided and abetted this research, especially Brian Kensley for examining the type series of *Nothocaris ocellus* in the British Museum (Natural History) and determining that the species is a senior synonym of *Pandalus sindoi*, and for reviewing the penultimate draft of the report; Lilly King Manning for assisting with the preparation of review copies of the illustrations; Raymond B. Manning for permitting an open door between our offices and consequent constant interruptions relating to technical aspects of the report; Marian H. Pettibone for devoting more than one weekend to translating Russian on my behalf; and Marilyn J. Schotte for processing the *Albatross* collections and providing other assist-

ance during hours that were rightfully chargeable to nonretired members of the staff of the Smithsonian Department of Invertebrate Zoology. Finally, Carmen Parrott contributed translations from Russian.

* THALASSOCARIDIDAE Bate, 1888

THALASSOCARIDAE Bate, 1888:1xxvii, 481, 682 [corrected to THALASSOCARIDIDAE by Holthuis, 1955:128; considered a subfamily of family PANDALIDAE by some authors, a synonym of that family by others].

DIAGNOSIS.—Rostrum prominent, dentate both dorsally and ventrally, immovably attached to remainder of carapace; latter without lateral carinae; abdomen with sharp dorsomedian and pleural spines on 1 or more somites; antennular flagella simple, without accessory branches; mandible with palp and with incisor and molar processes deeply separate; 2nd maxilliped with terminal segment subsemicircular; 1st pair of pereopods simple, not chelate; 2nd pair chelate, more robust than 1st pair, carpus entire or with 1 articulation; endopod of 1st pleopod of male enlarged, uniquely convoluted and spinulose, petasma-like.

RANGE.—Southern and eastern Africa and Red Sea to Indonesia, the Philippines, Japan, and eastward to the Marshall and Fiji islands; usually pelagic over depths of 13 to more than 4000 meters.

REMARKS.—The current study fully supports the conclusions of Menon and Williamson (1971:49) that, on the basis of larval characters, the genus *Thalassocaris* cannot be accommodated comfortably in the family Pandalidae and that the genus *Chlorotocoides* is probably confamilial with *Thalassocaris*. The latter opinion is supported, not only by the characters mentioned by Menon and Williamson (similarly constituted photophores, supraocular eaves, and median and pleural abdominal spines), but especially by the peculiar petasma-like endopods of the first pleopods of the male.

I am not convinced, however, that the Thalassocarididae is more closely related to the family

Oplophoridae than it is to the Pandalidae, as Menon and Williamson believed, because of larval characters and of the possibly superficial similarities between the adults of *Thalassocaris* and of *Oplophorus*. The thalassocaridid mouthparts, especially the mandible, first maxilla, and first maxilliped, are nearly identical with those in some pandalid genera and quite different from those in the Oplophoridae. Although the epipods curve rather strongly dorsad in both thalassocaridid genera, they terminate distally in the pair of projections that presumably embrace the mastigobranchs on the adjoining appendages; in all of the oplophorid genera, on the other hand, the dorsal component of the epipod is a fleshy, subconical lobe that is quite different in texture from

the horizontal part and extends perpendicularly beyond the subdistal projections of the latter element. Also, the absence of a chela on the first pereopod is a fairly common pandalid characteristic. Admittedly, the unusual second pereopod of *Thalassocaris*, with its undivided carpus, is not typically pandalid-like, but the divided carpus of this appendage in *Chlorotocoides* tends to bridge that gap. Hopefully, subsequently studies will reveal the true relationships of the Thalassocarididae more exactly, but there seems to be sufficient reason at the present time to treat that family and the Pandalidae together in the same part of this series, even if recognition of a superfamily Pandalioidea comprising those two families is not yet fully justified.

Key to Genera of Thalassocarididae

- Carapace without supraorbital spine; abdomen with dorsomedian spine on posterior margin of 6th somite only; telson bifurcate posteriorly; antennal scale unarmed laterally; pereopods with epipods on 4 anterior pairs; 2nd pereopod with carpus composed of 2 articles **Chlorotocoides*
- Carapace with supraorbital spine; abdomen with dorsomedian spine on posterior margin of 3rd abdominal somite only; telson not bifurcate posteriorly; antennal scale with 3 (2–4) lateral teeth; pereopods with epipods on 3 anterior pairs; 2nd pereopod with undivided carpus. **Thalassocaris*

**Chlorotocoides* Kemp, 1925

Chlorotocoides Kemp, 1925:271, 276 [type-species, by monotypy: *Chlorotocus spinicauda* De Man, 1902:856; gender: masculine].

DIAGNOSIS.—Carapace without supraorbital spine; abdomen with dorsomedian spine on posterior margin of 6th somite only; telson bifurcate at posterior apex; antennal scale with lateral margin unarmed proximal to apex; pereopods with epipods on 4 anterior pairs, 2nd pereopod with divided carpus.

RANGE.—Indian Ocean, Indonesia, and the Philippines; 15 to 141 meters.

Only one species is recognized.

**1. Chlorotocoides spinicauda* (De Man, 1902)

FIGURE 2

Chlorotocus spinicauda De Man, 1902:856, pl. 26: fig. 59–59h [type-locality: Ternate].

Chlorotocoides spinicauda.—Kemp, 1925:277.

DIAGNOSIS.—Rostrum slightly overreaching antennal scale, rostral formula: 2+5/2; telson armed with 4 pairs of dorsolateral spines; eye with ocellus distinct and swollen, partially invading corneal region; antennular peduncle with stylocerite overreaching 2nd segment; pereopods with 3 posterior pairs armed with 4–6 stout spines on flexor margin of merus and 3–7 acces-

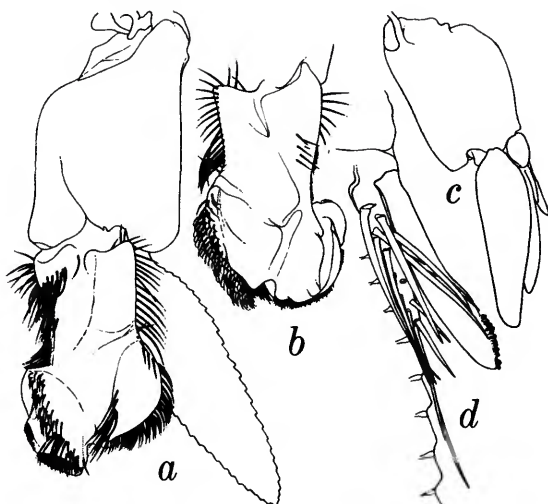


FIGURE 2.—*Chlorotocoides spinicauda*, male from *Albatross* sta 5137, carapace length 6.7 mm: *a*, right 1st pleopod, posterior aspect; *b*, same, endopod, anterior aspect; *c*, right 2nd pleopod, anterior aspect; *d*, same, appendix masculina and appendix interna. (Magnifications: *c*, $\times 10.8$; *a*, *b*, $\times 21.5$; *d*, $\times 53.8$.)

sory spinules on flexor margin of dactyl; maximum carapace length about 9 mm.

MATERIALS.—PHILIPPINES. North Balabac Strait: sta 5355; 8°08'10"N, 117°19'15"E; 80 m; coral, sand; 5 Jan 1908 (0952–1011); 6' McCormick trawl: 1♂ [8.9]. Davao Gulf, Mindanao: sta 5254; 7°05'42"N, 125°39'42"E; 38 m; sand, coral; 18 May 1908 (1426–1431); 6' Johnston oyster dredge: 2♂ [6.5, 6.8]. Off Jolo Island, Sulu Archipelago: sta 5137; 6°04'25"N, 120°58'30"E; 37 m; sand, shells; 14 Feb 1908 (0955–1015); 12' Agassiz beam trawl, 2 mud bags: 2♂ [6.7, 6.7].

RANGE.—Recorded previously from the Maldivic and Andaman islands and Indonesia; 15 to 141 meters.

REMARKS.—The endopod of the first pleopod of the male and of the appendix masculina (Figure 2) are remarkably like those in *Thalassocaris* (Figures 3*u–w*, 4*n–p*). This may be the strongest evidence for combining the two genera in a single, distinct family.

*** *Thalassocaris* Stimpson, 1860**

Thalassocaris Stimpson, 1860:42 [type-species, selected by Kingsley, 1880:426: *Regulus lucidus* Dana, 1952a:27; gender: feminine].

DIAGNOSIS.—Carapace with distinct supraorbital spine; abdomen with dorsomedian spine on posterior margin of 3rd somite; telson not bifurcate posteriorly; antennal scale armed with 2–4 (usually 3) lateral teeth proximal to apex; pereopods with epipods on 3 anterior pairs, 2nd pereopod with carpus entire, undivided.

RANGE.—South Africa and Red Sea to Indonesia, the Philippines, Japan, and the Marshall and Fiji islands; usually pelagic over depths of 13 to more than 4000 meters.

REMARKS.—The definitive taxonomic status of the apparently variable members of this genus must await the study of extensive series from all parts of the range of the genus. For the present, however, it seems best to accept the three species recognized in the Indian Ocean by Menon and Williamson (1971), even though some of the specific distinctions noted by those authors are contradicted by the two dissimilar specimens collected by the *Albatross*.

Key to Species of *Thalassocaris*

- 1. Rostrum with lateral carina tapering rather regularly from base, not forming wide supraorbital cave 4. *T. obscura*
- Rostrum with lateral carina forming rather wide supraorbital cave with subparallel or anteriorly divergent margins 2
- 2. Rostrum no more than 2½ times as long as space between supraorbital spines; telson less than 4 times as long as wide; pereopods with massive chelae on 2nd pair far overreaching rostrum *2. *T. crinita*



FIGURE 3.—*Thalassocaris crinita*, male from Albatross sta 5561, carapace length 4.5 mm: a, anterior carapace and appendages, dorsal aspect; b, anterior carapace and rostrum, right aspect; c, abdominal somites, right aspect; d, telson and uropods, dorsal aspect; e, posterior end of telson, dorsal aspect; f, same, ventral aspect; g, right antennal scale, dorsal aspect; h, right mandible; i, right 1st maxilla; j, right 2nd maxilla; k, right 1st maxilliped; l, right 2nd maxilliped; m, right 3rd maxilliped; n, same, distal end; o, right 1st pereopod; p, same, distal end; q, denuded merus of right 2nd pereopod; r, fingers of same; s, right 3rd pereopod; t, same, dactyl; u, right 1st pleopod, posterior aspect; v, same, endopod, anterior aspect; w, right appendix masculina and appendix interna, anterior aspect. (Magnifications: a-d, g, m, o, s, $\times 10.8$; j-l, $\times 17.2$; q, r, u, v, $\times 21.5$; h, i, $\times 32.3$; e, n, p, t, w, $\times 53.8$; f, $\times 223.6$.)

Rostrum 4 or more times as long as space between supraorbital spines; telson more than 4 times as long as wide; pereopods with chelae of 2nd pair comparatively slender, not attaining level of distal end of antennal scale 3. *T. lucida*

* 2. *Thalassocaris crinita* (Dana, 1852)

FIGURES 3-5

Regulus crinitus Dana, 1852a:27 [type-locality: Sulu Sea]; 1852b:599; 1855, pl. 39: fig. 6a-h.

Thalassocaris crinita.—Menon and Williamson, 1971:33, figs. 1b, 3, 5b, 6c,d, 10a,b, 11j-r, 13.

DIAGNOSIS.—Rostrum $1\frac{3}{4}$ – $2\frac{1}{2}$ times as long as space between supraorbital spines, basally

widened into supraorbital eaves with subparallel or anteriorly divergent margins; pereopods with massive chelae of 2nd pair far overreaching rostrum; maximum carapace length about 7 mm.

MATERIAL.—PHILIPPINES. Teomabal Island, Sulu Archipelago: sta 5561; $5^{\circ}50'45''N$, $121^{\circ}01'15''E$; surface over depth of 18 m; $27.8^{\circ}C$; 18 Sep 1909 (1813–1600); 10' plankton net, ship at anchor: 1♂ [4.5].

INDONESIA. Pulau Kajoa, west of Halmahera:

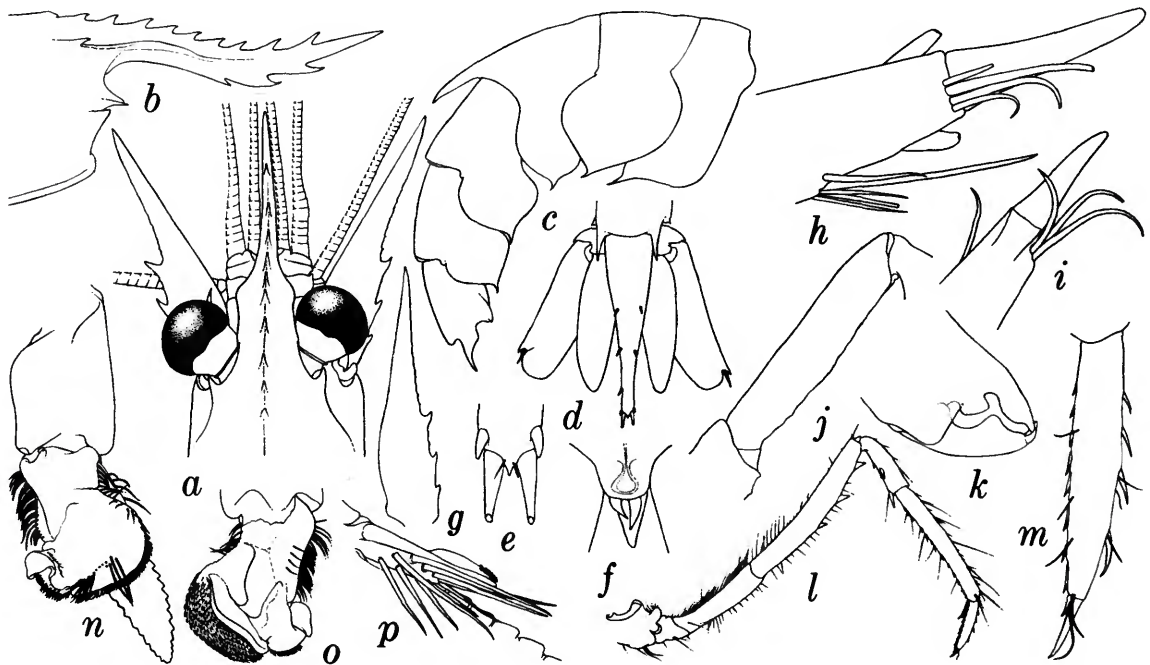


FIGURE 4.—*Thalassocaris crinita?*, male from Albatross sta 5627, carapace length 4.0 mm: a, anterior carapace and appendages, dorsal aspect; b, anterior carapace and rostrum, right aspect; c, abdominal somites, right aspect; d, telson and uropods, dorsal aspect; e, posterior end of telson, dorsal aspect; f, same, ventral aspect; g, right antennal scale, dorsal aspect; h, distal end of right 3rd maxilliped; i, distal end of right 1st pereopod; j, denuded merus of right 2nd pereopod; k, fingers of same; l, right 3rd pereopod; m, same, dactyl; n, right 1st pleopod, posterior aspect; o, same, endopod, anterior aspect; p, right appendix masculina and appendix interna, anterior aspect. (Magnifications: a–d, g, l, $\times 10.8$; j, k, n, o, $\times 21.5$; e, m, p, $\times 53.8$; f, h, i, $\times 223.6$.)

sta 5627; 0°06'00"N, 127°26'00"E; 9 m in total depth of 40 m; 29 Nov 1909 (1802-0542); 10' plankton net, ship at anchor: 1♂ [4.0].

RANGE.—Red Sea through the Indian Ocean to Indonesia, the Philippines, Japan, and the Marshall Islands; usually on continental or insular shelves over depths of less than 100 meters.

REMARKS.—As shown in Figures 3 and 4, the two specimens assigned to this species are quite different from each other. These specimens and seven others from the Marshall Islands (Figure 5) led once again to reconsideration of the possibility that those individuals having the merus of the second pereopod relatively smooth also have the margins of the supraorbital eaves subparallel. If this correlation proved to be constant, perhaps *T. affinis* Borradaile, 1915, which Menon and Williamson confidently synonymized with *T. crinita*, might still be a distinct species. At my request, therefore, C.B. Goodhart of the Cambridge University Museum of Zoology kindly reexamined the lectotype of *T. affinis* and reported, as might have been expected from the action taken by Menon and Williamson, that the supraorbital eaves diverge anteriorly fully as much as Figure 3a, even though the merus was described by those authors (1971:36) as "practically smooth." We can only assume, then, that *T. crinita* is an unusually variable species, not only as regards the basal part of the rostrum and the configuration of the merus of the second pereopods but, to a lesser degree, in the proportions of the dactyl of the third pereopod, the endopod of the first pleopod, and the number and length of the spines on the appendix masculina (Figures 3*t,v*, and 4*m,o,p*).

Perhaps the most useful character for distinguishing *T. crinita* from the other two species is the shorter rostrum relative to the space between the supraorbital spines. Of less exact value are the sensibly larger marginal teeth on the rostrum. Among the distinctions mentioned by Menon and Williamson, the contour of the supraorbital eaves, the length of the posterodorsal spine on the third abdominal somite, and the proportions of the antennal scale are probably of minor importance.

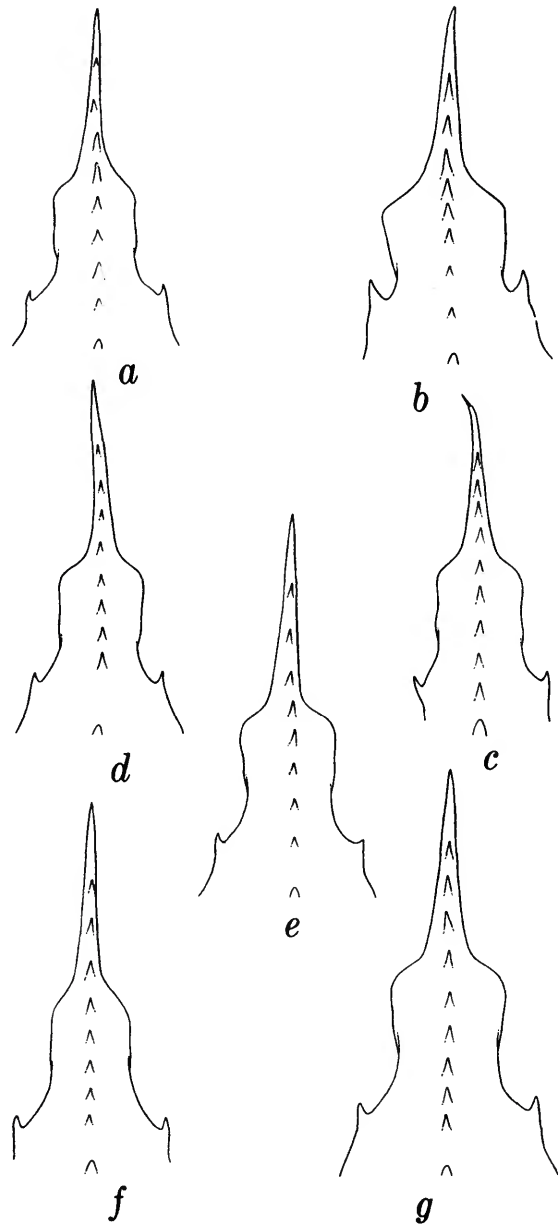


FIGURE 5.—*Thalassocaris crinita?*, rostral conformation in specimens from the Marshall Islands; a, b, from Rongelap lagoon; c-g, from Bikini Atoll: a, ovigerous female, carapace length 4.3 mm; b, ovigerous female, carapace length 5.5 mm; c, ovigerous female, carapace length 4.3 mm; d, female, carapace length 4.5 mm; e, ovigerous female, carapace length 4.9 mm; f, male, carapace length 5.1 mm; g, ovigerous female, carapace length 5.6 mm. (Magnifications: all $\times 10.8$.)

3. *Thalassocaris lucida* (Dana, 1852)

Regulus lucidus Dana, 1852a:27 [type-locality: near Ladrões [Mariana] Islands]; 1852b:598; 1855, pl. 39: fig. 5a-g ("Off Assumption [Asuncion] Island, one of the Ladrões, thirty miles distant; taken December 30, 1841."). [According to Stanton (1975:273), "They [Vincennes and Flying Fish?] passed between Assumption and Maug on December 30. . ."]

Thalassocaris lucida.—Menon and Williamson, 1971:29, figs. 1a, 2, 5a,b, 10c,d, 11s,t, 13.

DIAGNOSIS.—Rostrum 4–6 times as long as space between supraorbital spines, basally broadened into rather wide supraorbital eaves with subparallel margins; telson more than 4 times as long as wide; pereopods with chelae of 2nd pair not massive, not attaining level of distal end of antennal scale; maximum carapace length about 4 mm.

RANGE.—South Africa, eastern Indian Ocean, Japan, Marianas, and the Fiji Islands; pelagic in the open sea beyond continental shelves.

REMARKS.—I have not seen this species, but it is apparently distinguished most readily by the long rostrum armed with relatively small marginal teeth. The presence of a posteromedian tooth on the telson, mentioned as a diagnostic character by Menon and Williamson (1971:31), needs to be defined more exactly if it is to be used effectively to separate *T. lucida* from *T. obscura*.

4. *Thalassocaris obscura* Menon and Williamson, 1971

FIGURE 6

Thalassocaris obscura Menon and Williamson, 1971:36, figs. 1c, 4, 5c, 6e, 7–9, 11a–i, 12, 13 [type-locality: Laccadive Sea; 9°00'N, 75°20'E; 200–0 meters in overall depth of 2100 meters].

DIAGNOSIS.—Rostrum $2\frac{3}{4}$ –4 times as long as space between supraorbital spines, tapering from base, not forming wide supraorbital eaves; telson nearly 4 times as long as wide; pereopods with chelae of 2nd pair of moderate size, not massive, not greatly overreaching rostrum; maximum carapace length about 5 mm.

RANGE.—Red Sea and Indian Ocean to west-

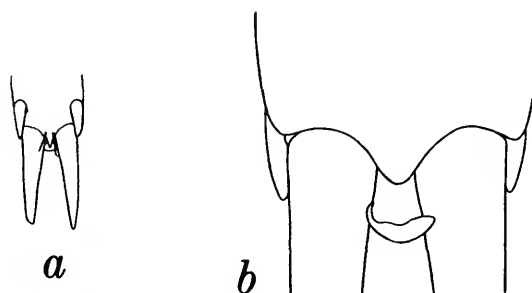


FIGURE 6.—*Thalassocaris obscura*, female from Arabian Sea, USNM 57614, carapace length 4.0 mm: *a*, posterior end of telson, dorsal aspect; *b*, same, ventral aspect. (Magnifications: *a*, $\times 53.8$; *b*, $\times 223.6$.)

ern Indonesia; in the open sea beyond continental shelves.

REMARKS.—Examination of a single female from the Arabian Sea and 39 specimens of both sexes collected by the *Te Vega* southwest of Sri Lanka suggests that, of the three diagnostic characters mentioned by Menon and Williamson (1971:38)—“the shape of the rostrum in dorsal view, the lack of a central telson spine and the poorly developed sexual dimorphism of the dactylus of the third leg,”—only the first is reliable without more explicit definition. The telson does terminate posteriorly in a sharp median tooth (Figure 6a), but the lappet ventral to that tooth, which is triangular in *T. crinita* (Figure 3e), is broadly convex and somewhat recurved in *T. obscura* (Figure 6b); also, the pair of stout spines lying ventral to the lappet in *T. crinita* (Figure 3f) seem to be absent in *T. obscura*.

* PANDALIDAE Haworth, 1825

PANDALIDAE Haworth, 1825:184.

DIAGNOSIS.—Rostrum well-developed, laterally compressed, variable; antennular flagella simple, without accessory branches; mandible with palp and with incisor and molar processes deeply separate; 1st maxilliped with flagellum on exopod; 2nd maxilliped normal, 2 distal segments not arising side by side from penultimate segment; 1st pereopod simple or microscopically chelate; 2nd pereopod chelate, carpus subdivided

into 2 or more articles; 1st male pleopod with endopod normal, not unusually enlarged or elaborately convoluted.

RANGE.—Cosmopolitan; littoral to more than 3000 meters.

REMARKS.—The genus *Chlorocurtis* is included in the following key on the advice of L.B. Holt-huis who has informed me, in correspondence, that both the *Snellius* and *Siboga* expeditions collected it in Indonesia.

Key to Philippine-Indonesian Genera of Pandalidae

1. Carapace with postrostral carina extending nearly to posterior margin, usually with longitudinal carinae on lateral surface also 2
Carapace with at least posterior ¼ of dorsal surface evenly rounded, not carinate, lateral surface without longitudinal carinae 3
2. Pereopods with 2nd pair subequal and similar, carpus composed of no more than 6 articles * *Heterocarpoides*
Pereopods with 2nd pair decidedly unequal and dissimilar, carpus of left member of pair composed of 7–12 articles, of right member 18–25 articles * *Heterocarpus*
3. Pereopods of 2nd pair composed of 2 or 3 articles 4
Pereopods of 2nd pair composed of 6 or more articles 6
4. Carapace bearing supraorbital spine * *Chlorotocella*
Carapace without supraorbital spine 5
5. Mandible with palp; 3rd maxilliped with exopod; pereopods with epipods on 4 anterior pairs, 2nd pair with 2 carpal articles * *Chlorotocus*
Mandible without palp; 3rd maxilliped without exopod; pereopods without epipods, 2nd pair with 3 carpal articles *Chlorocurtis* Kemp, 1925:279
(Gulf of Aden to Indonesia; littoral)
6. Abdomen with distinct longitudinal groove at junction of tergum and pleuron of 4th and 5th somites, 5th somite with strong, flat tooth on tergum adjacent to groove, 6th somite with distolateral tooth appressed to lateral surface of telson unusually strong; telson with margins sinuous, armed with 3–5 strong, movable spines; eye with cornea narrower than stalk * *Dorodotes*
Abdomen without grooves or strong, flat tooth on 4th or 5th somites, 6th somite with distolateral tooth not unusually strong; dorsolateral spines of telson not especially prominent; eye with cornea swollen, distinctly wider than stalk 7
7. Abdomen with 3rd abdominal somite unarmed or with fixed postero-medial tooth; 2nd maxilliped with terminal segment broader than long, applied as strip to distal margin of penultimate segment; appendix masculina on 2nd pleopod of male rather broad and profusely spinose * *Plesionika*
Abdomen with 3rd somite bearing slender, basally articulated postero-medial spine or stout seta (sometimes lost); 2nd maxilliped with terminal segment longer than broad, not applied as strip to distal margin of penultimate segment; appendix masculina on 2nd pleopod of male slender and sparsely spinose * *Stylopandalus*

* *Chlorotocella* Balss, 1914

Chlorotocella Balss, 1914a:33 [type-species, by monotypy: *Chlorotocella gracilis* Balss, 1914a:33; gender: feminine].

DIAGNOSIS.—Rostrum long and slender, mostly unarmed; carapace with supraorbital spine, dorsally rounded on at least posterior $\frac{1}{4}$ of length, lateral surface without longitudinal carinae; abdomen with posterodorsal spine on 6th somite; eye with cornea wider than stalk; 2nd maxilliped with terminal segment nearly as long as wide; 3rd maxilliped without exopod; pereopods without epipods, 2nd pair subequal and similar, carpus composed of 3 articles.

RANGE.—Andaman and Nicobar Islands, Singapore, Indonesia, Philippines, and Japan; littoral to at least 80 meters.

Only one species is known from the Philippine-Indonesian area.

* 5. *Chlorotocella gracilis* Balss, 1914

Chlorotocella gracilis Balss, 1914a:33, figs. 16–22 [type-locality, restricted by Hayashi and Miyake, 1968:12: Sagami Bay, Japan].—Hayashi and Miyake, 1968:12, fig. 1.

DIAGNOSIS.—Rostrum unarmed except for large dorsal tooth near base, smaller tooth arising from carapace posterior to orbital margin, and minute subterminal ventral tooth; abdomen with 4th somite with submarginal groove near posterior border and lateral tergal spine, 5th somite with lateral tergal spine, 6th somite about 3 times as long as 5th, with small posteromedial dorsal tooth; maximum carapace length about 5 mm.

MATERIAL.—PHILIPPINES. Off Jolo Island, Sulu Archipelago: sta 5141; 6°09'N, 120°58'E; 53 m; coral sand; 15 Feb 1908 (0847–0905); 12' Agassiz beam trawl, mud bag: 1♂ [3.9], 1 ovig ♀ [3.6]. Near Siasi, Sulu Archipelago: sta 5147; 5°41'40"N, 120°47'10"E; 38 m; coral sand, shells; 16 Feb 1908 (1127–1147); 12' Agassiz beam trawl, mud bag: 1 ovig ♀ [3.2].

RANGE.—Andaman and Nicobar islands, Indonesia, Singapore, and Japan; littoral to at least 80 meters.

* *Chlorotocus* A. Milne-Edwards, 1882

Chlorotocus A. Milne-Edwards, 1882:14 [type-species, by monotypy: *Chlorotocus gracilipes* A. Milne-Edwards, 1882:14 (= *Pandalus crassicornis* Costa, 1871:89); gender: masculine].

DIAGNOSIS.—Rostrum armed with teeth on both margins; carapace without supraorbital spine or longitudinal lateral carinae, dorsally rounded on at least posterior $\frac{1}{4}$ of length; abdomen without posterodorsal spine on 6th somite; eye with cornea wider than eyestalk; 2nd maxilliped with terminal segment distinctly wider than long; 3rd maxilliped with exopod; pereopods with epipods on 4 anterior pairs, 2nd pair subequal and similar, carpus composed of 2 articles.

RANGE.—Southern and eastern Africa, Andaman Sea, Indonesia, Philippines, Japan, New Zealand, eastern Atlantic and Mediterranean from southern Spain to off the mouth of the Congo River; 3 to 597 meters.

REMARKS.—Crosnier and Forest (1973:185) discussed the uncertain composition of this genus. They were probably correct in tentatively concluding that *Chlorotocus incertus* Bate, 1888, is identical with the type-species, *C. crassicornis*, but that this synonymy may never be confirmed because of the loss of the unique holotype of *C. incertus*. These authors are similarly justified in believing that the Japanese specimen doubtfully assigned to *Chlorotorus* [sic] *incertus* by Balss (1914a:33) probably represents a distinct, otherwise undescribed species because of the unique form of the two posterior abdominal somites. Finally, Crosnier and Forest have determined, by direct comparison, that *C. novaezeelandiae* (Borradaile, 1916) is a recognizably distinct species characterized by its short rostrum, even though the other differences suggested by Borradaile's illustration are fallacious. The status of *C. gracilipes* var. *andamanensis* Alcock and Anderson, 1899, is discussed below.

Thanks to the skillful review by Crosnier and Forest, it seems safe to assume that the genus *Chlorotocus* contains at least three species, one of which (*C. incertus* Balss, not Bate) is still without

a valid name. Only the type-species, however, is known with certainty from the Philippine-Indonesian region.

* 6. *Chlorotocus crassicornis* (Costa, 1871)

FIGURES 7, 8

Pandalus crassicornis Costa, 1871:89, pl. 2: fig. 2 [type-locality: Golfo di Napoli].

Chlorotocus gracilipes A. Milne-Edwards, 1882:14 [type-locality: Alboran Sea off Mediterranean coast of Morocco; 35°21'30"N, 4°22'05"W to 35°24'20"N, 4°32'45"W; 322–432 meters (see "Remarks")].

Chlorotocus gracilipes var. *andamanensis* Alcock and Anderson, 1899:284 [type-locality: Andaman Sea east of North Andaman Island; 13°17'15"N, 93°10'15"E; 338 meters].

Chlorotocus crassicornis.—Sivertsen and Holthuis, 1956:39, figs. 28, 29; pl. 3: fig. 3.—Fujino and Miyake, 1970: 263.—Crosnier and Forest, 1973:184, figs. 58–60.

DIAGNOSIS.—Rostrum distinctly overreaching antennular peduncle; abdomen with ventral margin of pleuron of 2nd somite rather markedly sinuous, 5th somite with pleuron armed poster-

oventrally with simple acute tooth, not recurved, 6th somite with slender submarginal tooth at posteroventral angle; pereopods with 1st pair not reaching level of distal end of antennal scale, carpus considerably longer than propodus, 2nd pair with fingers gaping proximally, dactyl with broad lobe in proximal 1/3 of opposable margin distal to gape, carpus with lateral ridge or carina on proximal and most of distal segments; maximum carapace length about 25 mm.

MATERIAL.—PHILIPPINES. Southwest of Manila Bay, Luzon: sta 5279; 13°57'30"N, 120°22'15"E; 214 m; green mud; 17 Jul 1908 (1326–1335); 12' Agassiz beam trawl, mud bag (net torn, 1 bridle stop carried away); 1♀ [13.3]. Off Jolo Island, Sulu Archipelago: sta 5173; 6°02'55"N, 120°53'E; 340 m; shells, coral; 5 Mar 1908 (1457–1503); 9' Johnston oyster dredge: 1♂ [21.1].

INDONESIA. West of Selat Salajar, southwestern Celebes: sta 5661; 5°49'40"S, 120°24'30"E; 329 m; hard bottom; 10.3°C; 20 Dec 1909 (1624–1627); 12' Agassiz beam trawl (net torn

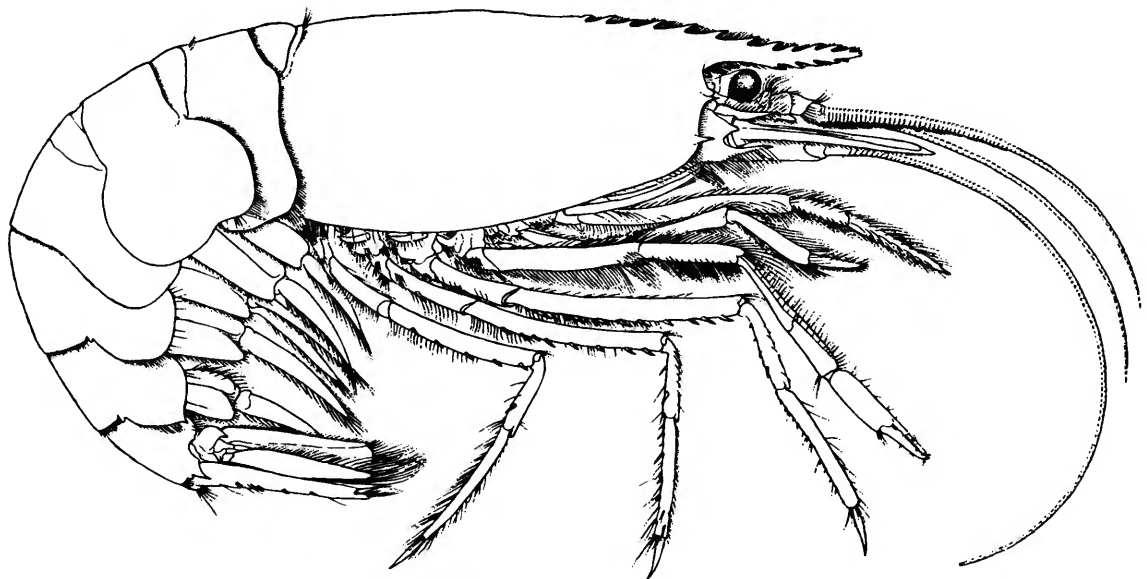


FIGURE 7.—*Chlorotocus crassicornis*, male from Albatross sta 5173, carapace length 21.1 mm. (Magnification: $\times 2.75$.)

below lead line): 1♂ [11.5]. Eastern Molucca Sea near Ternate: sta 5617; 0°49'30"N, 127°25'30"E; 240 m; bottom ?; 27 Nov 1909 (1101-1111); 12' Agassiz beam trawl: 1♂ [10.2].

RANGE.—Previously recorded from eastern and southern Africa, the Andaman Sea, the South and East China seas, Korea Strait, and the eastern Atlantic and Mediterranean from southern Spain to off the mouth of the Congo River; in depths of 3 to 597 meters.

REMARKS.—The *Albatross* material has been compared with 11 males and 8 females (3 ovigerous) of *C. crassicornis* from the Mediterranean Sea off Barcelona, Spain, and near Sicily, without revealing any differences that would seem to justify the recognition of *C. gracilis* var. *andamanensis* as either a specific or a subspecific taxon. In all four of the Indo-Pacific specimens available, the rostrum does not reach the level of the distal end of the antennal scale and it is armed dorsally with 11 or 13 teeth—three to five of which are situated on the carapace posterior to the orbital margin—and ventrally with four to six teeth; in all but three of the Mediterranean specimens, the rostrum reaches as far as, or beyond, the distal end of the antennal scale and it bears 11 to 13 dorsal teeth—three or four of which are situated on the carapace posterior to the orbit—and five to seven ventral teeth. The rostral length is probably variable in both areas, for the *Ombango* specimen from off Cameroon, illustrated by Crosnier and Forest (1973, fig. 58), has the rostrum little longer than does one of the Philippine specimens collected by the *Albatross* (Figure 7). Fujino and Miyake (1970:264) reported that four specimens recorded by them from the East China Sea and Korea Strait bore as many as six pairs of dorsolateral spines on the telson, including the pair at the bases of the long, paired, posterior spines, but the *Albatross* specimens and all but one of the Mediterranean examples show five dorsolateral spines; the dissimilar Mediterranean specimen has only four pairs. The spinulation on the surface of the tegumental scales is variable, but there seems to be no difference in this regard between scales from the male

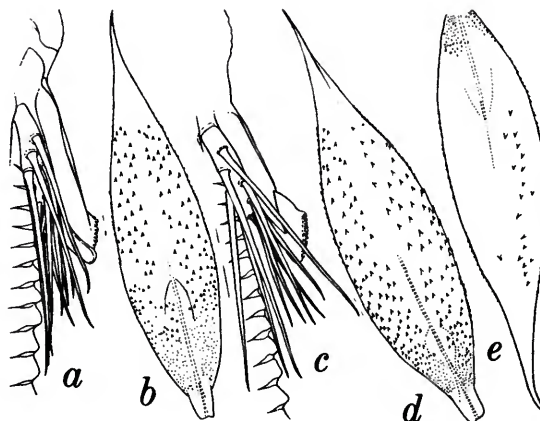


FIGURE 8.—*Chlorotocus crassicornis*, *a, b*, male from *Albatross* sta 5173, carapace length 21.1 mm; *c-e*, male from Mediterranean Sea east of Tunisia, USNM 152129, carapace length 18.7 mm: *a*, appendix masculina and appendix interna, anterior aspect; *b*, tegumental scale; *c*, appendix masculina and appendix interna, anterior aspect; *d, e*, tegumental scales. (Magnification: *a, c*, $\times 21.5$; *b, d, e*, $\times 223.6$.)

from *Albatross* station 5173 (Figure 8*b*) and those from a comparable male from off Sicily (Figure 8*d, e*). The appendix masculina of the former specimen (Figure 8*a*) bears one or two more long spines than does that of the latter (Figure 8*c*), but this is not unexpected in a specimen of slightly larger size. Although this comparison has failed to disclose any means of separating the Indo-West Pacific from the eastern Atlantic and Mediterranean populations assigned to *C. crassicornis*, there is no cause to assume that further study of additional material will not reverse this conclusion, especially if specimens displaying the natural color patterns ever become available.

De Man (1920:110, footnote) noted that the type-locality of *C. gracilipes* A. Milne-Edwards should probably be in the Mediterranean, rather than the Gulf of Gascony as indicated by Bate (1888:674). Reference to a manuscript list of *Talisman* and *Travailleur* stations, compiled by A. Milne-Edwards and received through L.B. Holthuis, supports De Man's contention that the *Travailleur* was in the Mediterranean on 27 July 1881. This conclusion is strengthened further by

the fact that A. Milne-Edwards and Bouvier (1900b:10) recorded *Homola barbata* from "au large de la baie de Alhucemas" on that date. It may be of interest that this determination of the position of the *Travailleur* on that day disagrees with the location given by De Krafft (1882:4). On that page of De Krafft's table, the longitude is noted as "W," rather than "E" as on the preceding page, but the coordinates were calculated for Greenwich by adding the conversion factor of 2°20'15" to the original Paris coordinates, as if east longitude was meant. Actually, the longitude should be "east" for the dredgings made on July 12 through 16, and the coordinates are correct as given for those dates, but the longitude should be "west" for the remainder of the table, and the conversion factor for those coordinates should have been subtracted; De Krafft's longitude coordinates for July 18 through 27 should therefore be reduced by 4°40'30" to produce the correct Greenwich positions.

*** *Dorodotes* Bate, 1888**

Dorodotes Bate, 1888:627, 677 [type-species, selected by Holthuis 1955:119: *Dorodotes reflexus* Bate, 1888:678; gender: masculine].

DIAGNOSIS.—Rostrum armed with teeth on both margins; carapace without supraorbital spine or longitudinal lateral carinae, dorsally rounded on at least posterior ¼ of length; abdomen without dorsomedian spines on any somite; eye with cornea narrower than eyestalk; 2nd maxilliped with terminal segment wider than long; 3rd maxilliped with exopod; pereopods with epipods on 4 anterior pairs, 2nd pair subequal and similar, carpus composed of 8 to 10 articles.

RANGE.—Indian Ocean, Indonesia, and the Philippines; 1920 to 4114 meters.

Only one species is recognized.

***7. *Dorodotes reflexus* Bate, 1888**

FIGURES 9, 10

Dorodotes reflexus Bate, 1888:678, pl. 116: fig. 3 [type-locality: the type series came from two localities: northwest

of Kepulauan Banda, Indonesia; 4°21'S, 129°07'E; 2606 meters; and South China Sea off Lingayen Gulf, Luzon, Philippines; 1920 meters].—Alcock, 1901:109.—De Man, 1920:152.—Calman, 1939:203.

DIAGNOSIS.—Rostral formula 8-10+5-8/4-7, dorsal series extending posteriorly nearly to mid-length of carapace; abdomen with pleuron of 5th somite slightly recurved at posteroventral angle; antennular peduncle with stylocerite slightly overreaching distolateral margin of basal segment; pereopods with carpus of 2nd pair composed of 8-10 articulations; maximum carapace length about 35 mm.

MATERIAL.—INDONESIA. Makassar Strait west of Celebes: sta 5670; 1°19'00"S, 118°43'00"E; 2160 m; gray mud; 3.4°C; 30 Dec 1909 (0818-0838); 12' Agassiz beam trawl: 1♂ [24.5].

RANGE.—Arabian Sea, Bay of Bengal, Indonesia, and the South China Sea off the Philippines; 1920 to 4114 meters.

REMARKS.—In the *Albatross* specimen from Makassar Strait, the telson (Figure 9e) is obviously deformed, with six, rather than the usual four, dorsolateral spines on the right side; the proximal segment of the mandibular palp (Figure 9g) is considerably expanded; the terminal segment of the second maxilliped appears abnormal (Figure 9k), but this possibility cannot be verified because the distal segments are missing from that appendage on the left side; the first pair of pereopods is simple (Figure 10a,b), not microscopically chelate as noted by Alcock (1901:110); the propodus of that appendage bears proximally convergent grooves on the extensor surface and distally convergent ones meeting on the flexor surface; the carpus of the second pereopod consists of eight articles on the right side (Figure 10c), ten on the left (Figure 10f); in both, the movable finger terminates in two blunt teeth that engage the tip of the simple fixed finger.

*** *Heterocarpoides* De Man, 1917**

Heterocarpoides De Man, 1917:284 [type-species, by monotypy: *Dorodotes levicarina* Bate, 1888:680; gender: masculine].

DIAGNOSIS.—Rostrum with teeth on both mar-



FIGURE 9.—*Dorodotes reflexus*, male from Albatross sta 5670, carapace length 24.5 mm: *a*, carapace and anterior appendages, right aspect; *b*, anterior carapace and appendages, dorsal aspect; *c*, orbit, lateral aspect; *d*, abdomen, right aspect; *e*, telson and uropods, dorsal aspect; *f*, same, posterior margin of telson; *g*, right mandible; *h*, right 1st maxilla; *i*, right 2nd maxilla; *j*, right 1st maxilliped; *k*, right 2nd maxilliped; *l*, right 3rd maxilliped; *m*, same, distal end. (Magnifications: *a*, *b*, *d*, *e*, *l*, $\times 2.6$; *h*–*k*, $\times 5.2$; *c*, *g*, *m*, $\times 10.8$; *f*, $\times 21.5$.)

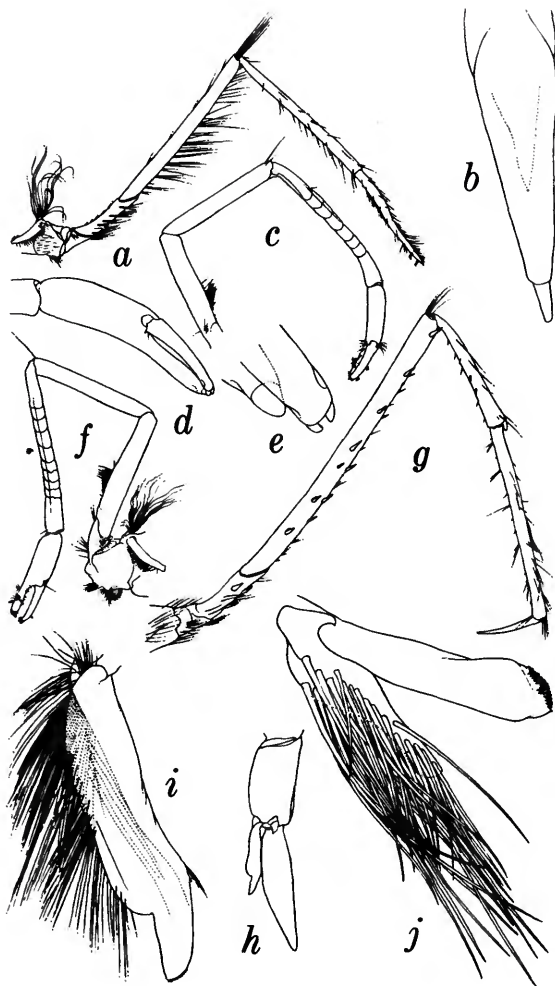


FIGURE 10.—*Dorodotes reflexus*, male from *Albatross* sta 5670, carapace length 24.5 mm: a, right 1st pereopod; b, same, distal end; c, right 2nd pereopod; d, same, chela; e, same, tips of fingers; f, left 2nd pereopod; g, right 4th pereopod; h, right 1st pleopod, posterior aspect; i, same, endopod; j, right appendix masculina and appendix interna. (Magnifications: a, c, f-h, $\times 2.6$; d, $\times 5.2$; i, $\times 10.8$; e, j, $\times 21.5$; b, $\times 53.8$.)

gins; carapace without supraorbital spine, dorsally carinate nearly to posterior margin; abdomen with dorsomedian spines on some somites; eye with cornea wider than eyestalk; 2nd maxilliped with terminal segment wider than long; 3rd maxilliped with exopod; pereopods with epipods

on 4 anterior pairs, 2nd pair subequal and similar, carpus composed of 5 or 6 articles.

RANGE.—Red Sea to Indonesia, South China Sea, and the Philippines; 31 to 393 meters.

Only one species is known for certain.

* 8. *Heterocarpoides levicarina* (Bate, 1888)

FIGURES 11, 12

Dorodotes levicarina Bate, 1888:680, pl. 112: fig. 5 [type-locality: Arafura Sea west of Torres Strait; $9^{\circ}59'S$, $139^{\circ}42'E$; 51 meters].

Heterocarpus (*Heterocarpoides*) *levicarina*.—De Man, 1920: 178, pl. 15: fig. 44.

Heterocarpoides levicarina.—Calman, 1939:207.

[?] *Heterocarpus* (*Heterocarpoides* [sic]) *glabrus* Zarenkov, 1971:193, fig. 4: 16-27 [type-locality: South China Sea; 75 meters].

DIAGNOSIS.—Rostral formula 3-5 + 7-12/4-7, dorsal series of teeth extending posteriorly nearly to midlength of carapace; abdomen with posteromedian tooth on 3rd, 4th, and 5th somites; telson armed with 4 pairs of dorsolateral spines, posterior pair superimposed above bases of lateral pair of posterior spines, posterior length acutely triangular, with pair of long, stout, lateral spines and median pair of contiguous spines concealed beneath triangular margin; eye with papilla on ventromedian surface of eyestalk proximal to cornea; pereopods with dactyl of 3rd pair about $2/5$ as long as propodus; maximum carapace length about 16 mm.

MATERIAL.—PHILIPPINES. Lingayen Gulf, western Luzon: sta 5442; $16^{\circ}30'36"N$, $120^{\circ}11'06"E$; 82 m; coral sand; 10-11 May 1909 (1858-0532); 25' Agassiz beam trawl (apparently drifted 15.5 miles S 12° E from original position): 1♀ [12.7]. Manila Bay off Corregidor Island, Luzon: sta 5097; $14^{\circ}19'15"N$, $120^{\circ}33'52"E$; [55 m]; gray mud, sand, shells; 2 Jan 1908 (118-1137); 9' Tanner beam trawl, mud bag (veered at 5 min. intervals from 137 to 172 and to 190 m; trawl capsized on bottom but made a small catch); 1♂ [5.8]; sta 5100; $14^{\circ}17'15"N$, $120^{\circ}32'40"E$; 64 m; gray sand; 2 Jan 1908 (1422-1442); 9' Tanner beam trawl, mud bag: 1♀ [6.4].

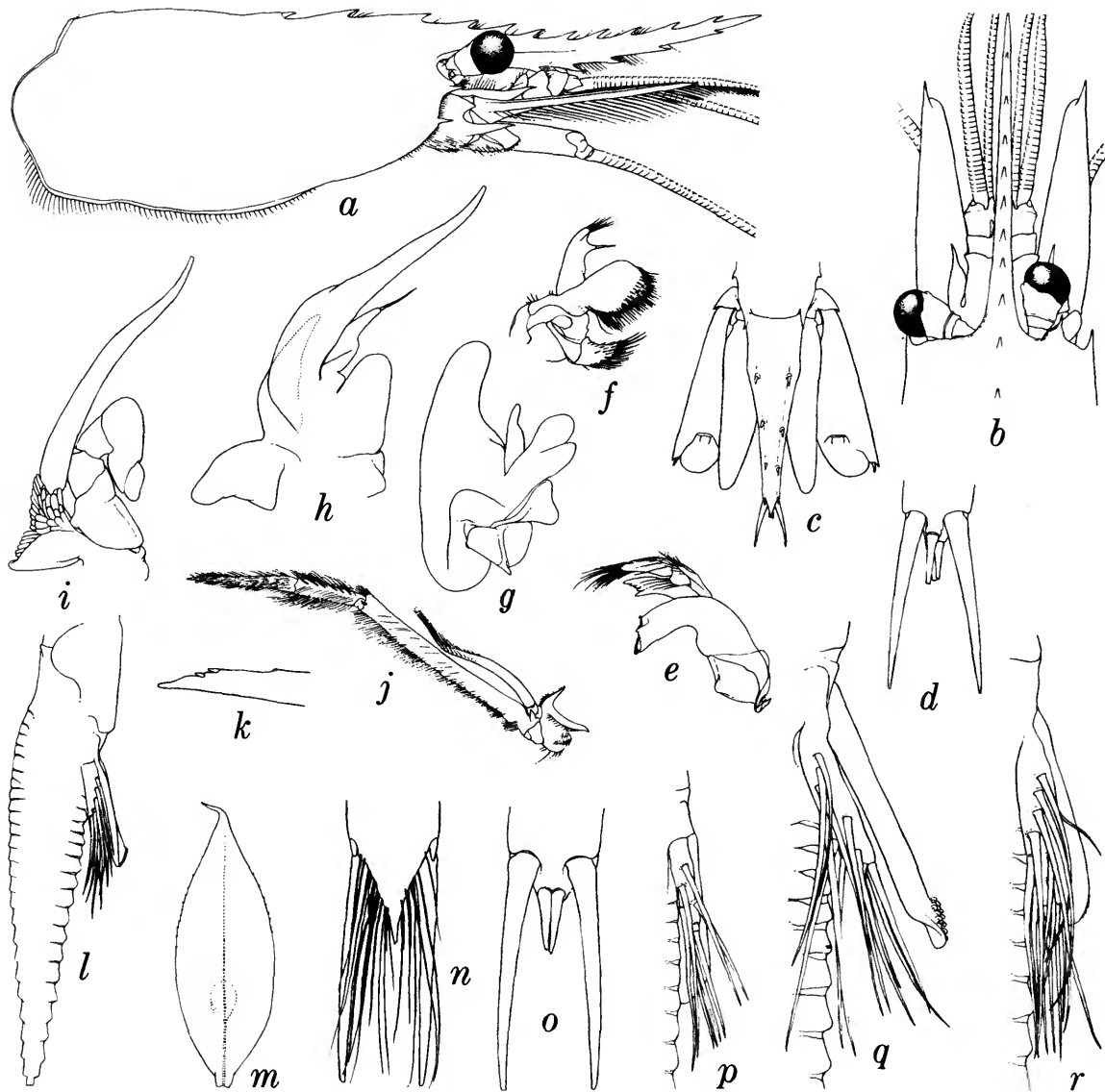


FIGURE 11.—*Heterocarpoides levicarina*, specimens taken in bottom trawls; *a-m*, male from *Albatross* sta 5242, carapace length 10.3 mm; *n, o*, female from *Albatross* sta 5442, carapace length 12.7 mm; *p*, male from *Albatross* sta 5097, carapace length 5.8 mm; *q*, male from *Albatross* sta 5376, carapace length 8.8 mm; *r*, male from *Albatross* sta 5376, carapace length 9.0 mm: *a*, carapace and anterior appendages, right aspect; *b*, anterior carapace and appendages, dorsal aspect; *c*, telson and uropods, dorsal aspect; *d*, posterior end of telson, ventral aspect; *e*, right mandible; *f*, right 1st maxilla; *g*, right 2nd maxilla; *h*, right 1st maxilliped; *i*, right 2nd maxilliped; *j*, right 3rd maxilliped; *k*, same, distal end; *l*, endopod of right 2nd pleopod, anterior aspect; *m*, tegumental scale from near dorsal midline of carapace; *n*, posterior end of telson, dorsal aspect; *o*, same, ventral aspect; *p*, right appendix masculina and appendix interna, anterior aspect; *q*, same; *r*, same. (Magnifications: *a-c, j*, $\times 5.2$; *e-i*, $\times 10.8$; *d, k, l, n, o*, $\times 21.5$; *p-r*, $\times 53.8$; *m*, $\times 223.6$.)

Tayabas Bay, southern Luzon: sta 5376; 13°42'50"N, 121°51'30"E; [165 m]; gray mud, sand; 2 Mar 1909 (1619–1641); 12' Agassiz beam trawl, mud bag (net torn in 2 places near mouth): 2♂ [9.2, 9.2], 5♀ [9.7–15.4], 4 ovig [9.7–13.3]. Batangas Bay, southern Luzon: sta 5266; 13°44'36"N, 120°59'15"E; 183 m; mud; 8 Jun 1908 (0918–0938); 12' Agassiz beam trawl, mud bag: 1♀ [9.5]. Sablayan Anchorage, western Mindoro; [12°50'N, 120°46'E]; surface; 12 Dec 1908 (1900–2030); dip net, electric light: 1♂ [6.9], 1 ovig ♂ [8.0]. Sulu Sea off Siocon Bay, western Mindanao: sta 5129; 7°41'30"N, 122°01'45"E; 5 Feb 1908 (1423–1451); 10' midwater net towed horizontally at 185 m for 20 minutes, then raised vertically to surface in 8 minutes: 1♂ [7.8]. Pujada Bay, southeastern Mindanao: sta 5241; 6°50'45"N, 126°14'38"E; 393 m; soft gray mud; 14 May 1908 (1505–1525); 9' *Albatross-Blake* beam trawl, mud bag (veered from 925 to 988 meters of cable): 1 ovig ♀ [9.9]; sta 5242; 6°51'53"N, 126°14'10"E; 349 m; soft gray mud; 17.8°C; 14 May 1908 (1603–1623); 9' *Albatross-Blake* beam trawl, mud bag: 1♂ [10.3].

RANGE.—Red Sea to Indonesia, South China Sea, and the Philippines; 31 to 393 meters.

REMARKS.—In all 13 of the specimens trawled by the *Albatross*, the lateral carinae on the carapace are weak or absent (Figure 11a), and the rostrum bears 10 to 13 dorsal and four to six ventral teeth. In the specimen taken with a mid-water net near the bottom at station 5129 and the two specimens taken at the surface at Sablayan, Mindoro, the lateral carinae are sharp and prominent (Figure 12a), and the rostrum bears 14 to 16 dorsal and six or seven ventral teeth. All attempts to find more significant characters correlated with those variable ones were unproductive. In the male from station 5129, the appendix masculina is very different from those of the four males with weak or missing lateral carinae on the carapace, but the male from Sablayan agrees with the latter in this respect.

The single female taken by the *Orlik* in the South China Sea at station 36 and described by Zarenkov (1971) under the name *Heterocarpus* (*Heterocarpoides* [sic]) *glabrus* differs from *H. levicarina* in having only five, rather than six, articles in the carpus of the second pereopod and in having the median dorsal carina on the first abdominal somite indistinct. In the *Albatross* specimens, the first abdominal carina is variable; it is obscure or completely absent in fully half of

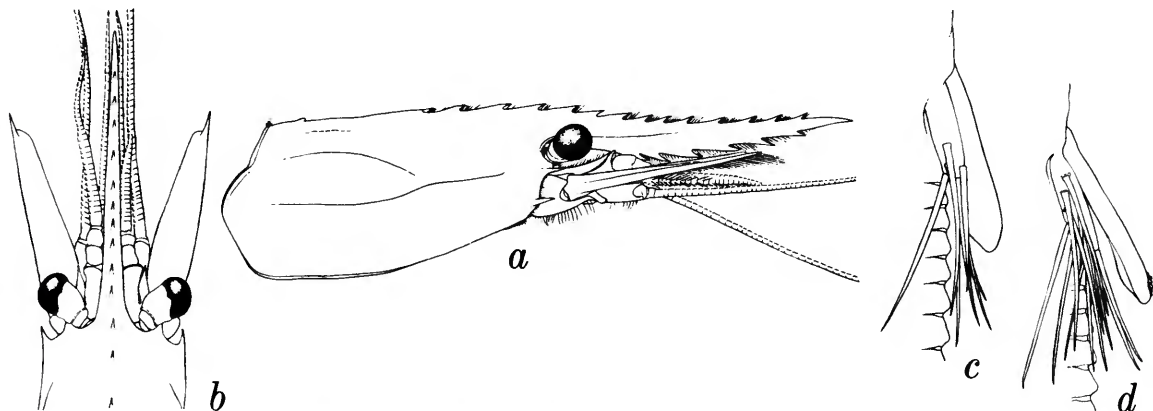


FIGURE 12.—*Heterocarpoides levicarina*, specimens taken in mid-water net and with dip net at surface: a–c, male from *Albatross* sta 5129, carapace length 7.8 mm; d, male collected at Sablayan anchorage, western Mindoro, carapace length 7.8 mm: a, carapace and anterior appendages, right aspect; b, anterior carapace and appendages, dorsal aspect; c, right appendix masculina and appendix interna, anterior aspect; d, same. (Magnifications: a, b, × 5.2; c, d, × 53.8.)

the examples, but it is distinct in the male from station 5129, the two males from station 5376, and the female from station 5442, and it is less prominent in the male from station 5242 and the smallest ovigerous female and the largest female without eggs from station 5376. Although all of the *Albatross* specimens have six carpal articles in both second pereopods (except for the two males from station 5376 in which these pereopods are missing), the possibility that the general variability observed in *H. levicarina* may extend to these pereopods and the fact that the *Orlik* collected only one specimen of *H. glabrus* among 21 specimens of *Heterocarpoides* taken at six localities from 13 to 23 April 1960, suggests that it may be best to treat Zarenkov's specimen as a variant of *H. levicarina* until additional specimens with five articles in the carpus of the second pereopod are found.

*** *Heterocarpus* A. Milne-Edwards, 1881**

Heterocarpus A. Milne-Edwards, 1881:8 [type-species, by original designation: *Heterocarpus ensifer* A. Milne-Edwards, 1881:8; gender: masculine].

DIAGNOSIS.—Rostrum armed with teeth on both margins; carapace without supraorbital spine, dorsally carinate nearly to posterior margin, and with 1 or more longitudinal lateral carinae; eye with cornea wider than eyestalk; 2nd maxilliped with terminal segment wider than long; pereopods with epipods on 4 anterior pairs, 2nd pair distinctly unequal and dissimilar, left member with 7–12 carpal articles, right member with 18–25 articles.

RANGE.—Virtually all tropical and subtropical and some temperate seas; 73 to 2834 meters.

REMARKS.—Inasmuch as material of all but three of the 20 species and subspecies assignable to this genus has been available to me, an attempt has been made to draft a key to all of the known species. This key should be used with caution, however, for I have seen no specimens of *H. laevis*, *H. longirostris*, and *H. uncarinatus*, and the series available of some of the other species—notably *H. alexandri* and *H. signatus*—were far from adequate to encompass the variability suggested by the species represented by more extensive material.

Key to Species of *Heterocarpus*

1. Carapace with at least 2 strong carinae extending over nearly entire length of lateral surface, dorsalmost lateral carina originating anteriorly at or directly posterior to antennal spine 2
 - Carapace with dorsal lateral carina, if present, originating posterior to orbit, not at or in line with antennal spine 5
2. Carapace without intermediate carina on lateral surface dorsal to antennal carina; abdomen without posteromedian spines on any somite, 3rd somite with prominent dorsal tooth near midlength; antennal scale with distolateral spine not overreaching broadly rounded distal margin of blade; pereopods with dactyl of 3rd pair more than ½ as long as propodus *17. *H. woodmasoni*
- Carapace with intermediate carina on posterior part of lateral surface dorsal to antennal carina; abdomen with posteromedian spines on 3rd and 4th somites, no dorsal tooth near midlength of 3rd somite; antennal scale with distolateral spine far overreaching narrowly oblique distal margin of blade; pereopods with dactyl of 3rd pair less than ½ as long as propodus 3
3. Abdomen with strong dorsomedian carinae on 1st and 2nd somites *15. *H. sibogae*

- Abdomen without distinct dorsomedian carinae on 1st and 2nd somites
4
4. Rostrum and carapace armed with 15–23 (average 19.6) dorsal teeth;
 pereopods with merus of 5th pair armed with 15–26 (average 19.0)
 spines *H. ensifer ensifer* A. Milne-Edwards, 1881:8
 (Western Atlantic Ocean from off North
 Carolina to Brazil; eastern Atlantic
 from Spain to Congo; 200–885 meters)
- Rostrum and carapace armed with 14–18 (average 15.8) dorsal teeth;
 pereopods with merus of 5th pair armed with 7–16 (average 12.8)
 spines *10. *H. ensifer parvispina*
5. Carapace with no more than 1 strong longitudinal carina on lateral
 surface6
 Carapace with more than 1 strong longitudinal carina on lateral surface
7
6. Carapace without any longitudinal carina on lateral surface
 *H. laevis* A. Milne-Edwards, 1883
 (Caribbean Sea; 309–543 meters)
- Carapace with 1 longitudinal carina on lateral surface [Figure 13*b,c*]
 *H. alexandri* A. Milne-Edwards, 1883
 (Caribbean Sea; Hawaii ?; 1472–1884 meters)
7. Abdomen without posteromedian spines on any somites8
 Abdomen with posteromedian spine on 3rd somite at least13
8. Carapace with branchiostegal spine overreaching antennal spine9
 Carapace with branchiostegal spine not overreaching antennal
 spine10
9. Rostrum dorsally unarmed on anterior ½ of length; antennal scale with
 blade distally rounded and reaching about to level of tip of distolateral
 spine *12. *H. laevigatus*
 Rostrum armed dorsally throughout length; antennal scale with blade
 distally subtruncate and not reaching level of tip of distolateral spine
 [Figure 13*n*] *H. signatus* Rathbun, 1906:918
 (Hawaii; 463–699 meters)
10. Carapace with carina supporting branchiostegal spine reaching nearly to
 posterior margin; antennal scale with blade not appreciably overreach-
 ing distolateral spine; 3rd maxilliped without exopod [Figure 13*p*]
 *H. vicarius* Faxon, 1893:203
 (Eastern Pacific Ocean from Gulf of California to Golfo de
 Panama; 73–549 meters)
- Carapace with carina supporting branchiostegal spine disappearing on
 posterior ¼ or more of length; antennal scale with blade distinctly
 overreaching distolateral spine; 3rd maxilliped with well-developed
 exopod11
11. Rostrum with lateral carina remaining sharp over entire length
 *16. *H. tricarinatus*
 Rostrum with lateral carina becoming broadly rounded ridge anterior

- to eyes 12
12. Pereopods with dactyl of 3rd pair $\frac{1}{3}$ or more as long as propodus
 *11. *H. gibbosus*
 Pereopods with dactyl of 3rd pair less than $\frac{1}{4}$ as long as propodus
 *13. *H. lepidus*
13. Abdomen dentate posteromedially on 4th and 5th somites 14
 Abdomen not dentate posteromedially on 4th and 5th somites 18
14. Abdomen with dorsal carina of 3rd somite incised and forming subrec-
 tangular tooth near midlength of somite 15
 Abdomen without dorsal tooth near midlength of 3rd somite 17
15. Third maxilliped without exopod [Figure 13l]
 *H. reedi* Bahamonde, 1955:105
 (Off Central Chile (25° to
 39° S); 200–500 meters)
 Third maxilliped with short but distinct exopod 16
16. Rostrum usually shorter than carapace, with distinct lateral carina over
 entire length; antennal scale less than 4 times as long as wide, less than
 $\frac{2}{3}$ as long as carapace [Figure 13a] *H. affinis* Faxon, 1893:204
 (Off Pacific coast of Mexico;
 1207–1244 meters)
 Rostrum usually more than $1\frac{1}{2}$ times as long as carapace, without distinct
 lateral carina; antennal scale fully 4 times as long as wide, about $\frac{3}{4}$ as
 long as carapace [Figure 13h] *H. hostilis* Faxon, 1893:204
 (Golfo de Panama; 1271–1866 meters)
17. Third maxilliped with short but distinct exopod *9. *H. dorsalis*
 Third maxilliped without exopod [Figure 13k]
 *H. oryx* A. Milne-Edwards, 1881:10
 (Western Atlantic Ocean from
 Gulf of Mexico to northern Brazil;
 649–1774 meters)
18. Carapace with carina supporting branchiostegal spine weak and confined
 to anterior $\frac{1}{4}$ of length
 *H. unicarinatus* Borradaile, 1915:208
 (Providence Island, Seychelles;
 1165–1216 meters)
 Carapace with carina supporting branchiostegal spine strong and extend-
 ing nearly to posterior margin 19
19. Rostrum about as long as carapace, unarmed dorsally on anterior $\frac{1}{2}$ of
 length; pereopods with dactyl of 3rd pair more than $\frac{1}{3}$ as long as
 propodus [Figure 13g]
 *H. grimaldii* A. Milne-Edwards and Bouvier, 1900:58
 (Eastern Atlantic Ocean from the Azores and
 off Portugal to Angola; 914–2834 meters)
 Rostrum, more than $1\frac{1}{2}$ times as long as carapace, armed dorsally
 throughout length; pereopods with dactyl of 3rd pair about $\frac{1}{4}$ as long
 as propodus 14. *H. longirostris*

* 9. *Heterocarpus dorsalis* Bate, 1888

FIGURE 13d

Heterocarpus dorsalis Bate, 1888:630, pl. 111 [type-locality: off Kepulauan Banda, Indonesia; 4°34'00"S, 129°57'30"E; 366 meters].—De Man, 1920:171, pl. 15: fig. 43.—Calman, 1939:206.

Heterocarpus alphonsi Bate, 1888:632, pl. 112: fig. 1 [type-locality: the type series came from two localities: off Kepulauan Talaud, Indonesia; 4°33'N, 127°06'E; 914 meters; and Sagami Bay, Japan; 35°11'N, 139°28'E; 631 meters].

Heterocarpus affinis Borradaile, 1915:208 [type-locality: off Saya de Malha Bank, Seychelles-Mauritius Ridge, Indian Ocean; 549–914 meters]; 1917:399, pl. 58: fig. 3. [Not *H. affinis* Faxon, 1893.]

DIAGNOSIS.—Rostrum varying from more than twice as long as carapace in juveniles to about same length as carapace in largest adults, usually armed dorsally with 9–13 teeth extending to anterior end of rostrum and including 2 or 3 on carapace posterior to level of orbital margin, and ventrally with 9–14, usually 12 or 13, teeth; carapace with nearly complete intermediate and lateral carinae and very short posterior sublateral and anterior antennal carina or buttress, branchiostegal spine sometimes overreaching antennal spine; abdomen without dorsal carina on 2 anterior somites, 3rd, 4th, and 5th somites carinate and armed with posteromedian tooth, 6th with dorsal depression; antennal scale varying from less than $\frac{3}{5}$ to more than $\frac{7}{10}$ of carapace length, decreasing slightly in proportionate length with age, blade far overreaching distolateral spine; pereopods with 23–29 articles in carpus of longer 2nd pair, 10–14 in shorter; pereopods with dactyl of 3rd pair $\frac{1}{3}$ to $\frac{1}{2}$ as long as propodus, carpus of each of 3 posterior pairs unarmed, merus armed with 6–17 spines on 3rd pair, 6–11 on 4th, and 2–11 on 5th, ischium with 2–4 spines on 3rd, 1–3 on 4th, and usually none (rarely 1) on 5th; maximum carapace length about 40 mm.

MATERIAL.—SOUTH CHINA SEA. Southeast of Hong Kong: sta 5299; 20°05'N, 116°05'E; 958 m; gray mud, sand; 5.8°C; 8 Aug 1908 (0853–

0915); 12' Agassiz beam trawl, mud bag: 1♀ [22.0].

PHILIPPINES. Off Dasol Bay, western Luzon: sta 5438; 15°54'42"N, 119°44'42"E; 543 m; green mud; 7.9°C; 8 May 1909 (1620–1641); 12' Agassiz beam trawl, mud bag: 1♀ [28.9] (see "Remarks"). Off western Lubang Islands: sta 5274; 13°57'30"N, 120°03'25"E; 960 m; gray mud, sand; 5.2°C; 16 Jul 1908 (0959–1029); 12' Agassiz beam trawl: 1♀ [18.7]. Verde Island Passage, north of Mindoro: sta 5115; 13°37'11"N, 120°43'40"E; 622 m; 20 Jan 1908 (1341–1401); 12' Tanner beam trawl, mud bag: 1♂ [33.3], 1 ovig ♀ [32.8]. Lagonoy Gulf, east of southern Luzon: sta 5463; 13°40'57"N, 123°57'45"E; [549 m]; [sand]; 16 Jun 1909 (1028–1044); 12' Agassiz beam trawl, mud bag: 2♂ [31.0, 38.1], 1♀ [14.8]; sta 5468; 13°35'39"N, 123°40'28"E [1041 m]; green mud; 18 Jun 1909 (0958–1031); 12' Agassiz beam trawl, mud bag: 1♀ [19.0]; sta 5447; 13°28'N, 123°46'18"E; 567 m; green mud; 7.4°C; 4 Jun 1909 (0614–0635); 12' Agassiz beam trawl: 2♂ [28.2, 33.2], 1 ovig ♀ [36.6].

Northern Palawan Passage: sta 5348; 10°57'45"N, 118°38'15"E; 686 m; coral, sand; 13.6°C; 27 Dec 1908 (1009–1029); 12' Tanner beam trawl, mud bag: 1♀ [10.0]. Sulu Sea off Puerto Princesa, Palawan: sta 5429; 9°41'30"N, 118°50'22"E; 1401 m; green mud; 5 Apr 1909 (0814–0832); 12' Agassiz beam trawl, mud bag: 1♀ [17.0]. Cagayan Islands, Sulu Sea: sta 5423; 9°38'30"N, 121°11'E; 929 m; gray mud, coral sand; 9.9°C; 31 Mar 1909 (0955–1022); 12' Agassiz beam trawl, mud bag: 1♀ [23.5].

INDONESIA. Celebes Sea off Sabah (North Borneo): sta 5585; 4°07'00"N, 118°49'54"E; 871 m; gray mud; 5.1°C; 28 Sep 1909 (0931–0951); 9' Tanner beam trawl, mud bag: 1♀ [carapace missing]; sta 5586; 4°06'50"N, 118°47'20"E; 635 m; gray mud; 6.7°C; 28 Sep 1909 (1144–1217); 9' Tanner beam trawl, mud bag: 1♂ [20.1], 5♀ [21.4–24.4]; sta 5589; 4°12'10"N, 118°38'08"E; 476 m; fine gray sand, gray mud; 7.6°C; 29 Sep 1909 (0744–0804); 9' Tanner beam trawl, mud bag: 1♂ [32.2], 4♀ [29.1–35.0],

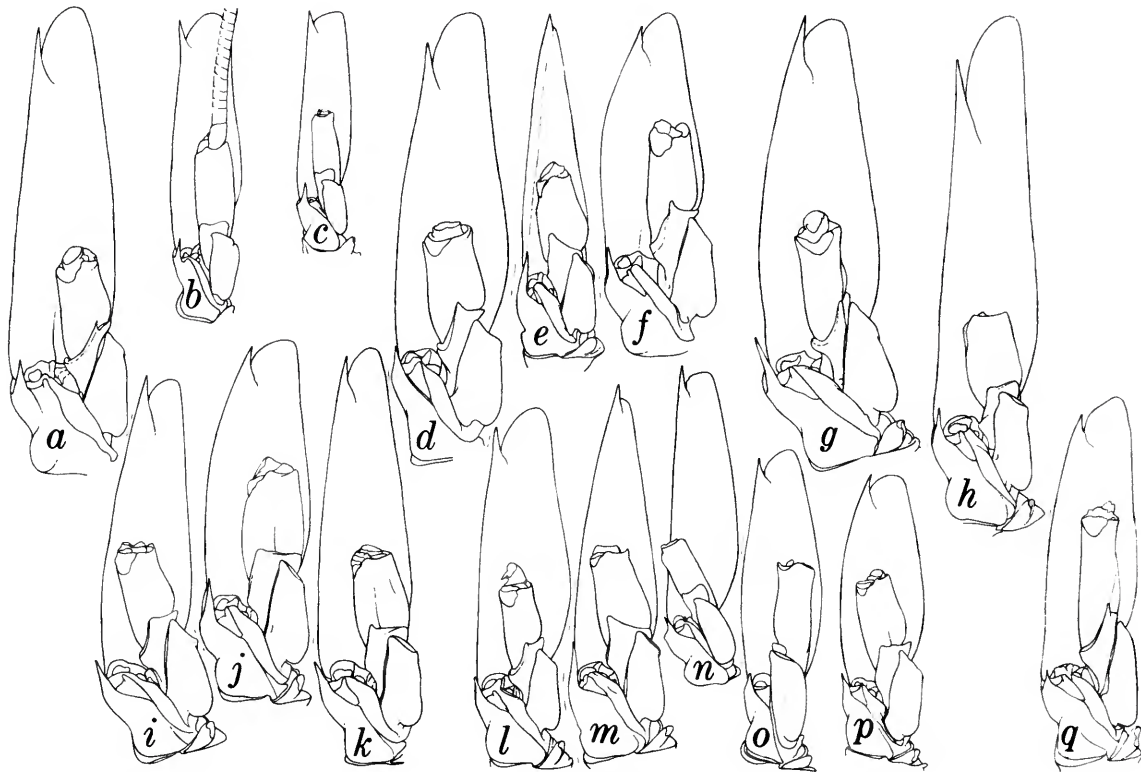


FIGURE 13.—Right antennal scales, ventral aspect, of species of *Heterocarpus* represented in the Smithsonian collections: *a*, *H. affinis*, male syntype from off Islas Tres Marias, Mexico (*Albatross* sta 3425), carapace length 36.2 mm; *b*, *H. alexandri*, young male from southern Exuma Sound, Bahamas (*Albatross* sta 2629), carapace length 11.0 mm; *c*, *H. alexandri*?, young female from Kauai Island, Hawaii (*Albatross* sta 4181), carapace length 9.7 mm; *d*, *H. dorsalis*, male from Verde Island Passage, Philippines (*Albatross* sta 5115), carapace length 33.2 mm; *e*, *H. ensifer parvispina*, male from off southwestern Celebes, Indonesia (*Albatross* sta 5661), carapace length 26.7 mm; *f*, *H. gibbosus*, male from Burias Pass, southeastern Luzon, Philippines (*Albatross* sta 5388), carapace length 31.0 mm; *g*, *H. grimaldii*, female from off southern Gabon, Africa (*Geronimo* cruise 2, sta 231), carapace length 34.8 mm; *h*, *H. hostilis*, male syntype from Isla del Coco, Costa Rica (*Albatross* sta 3371), carapace length 31.2 mm; *i*, *H. laevigatus*, male from off eastern Molokai Island, Hawaii (*Albatross* sta 3901), carapace length 30.9 mm; *j*, *H. lepidus*, male from Batangas Bay, southern Luzon, Philippines (*Albatross* sta 5269), carapace length 30.8 mm; *k*, *H. oryx*, male from Gulf of Mexico east of Mississippi River Delta (*Oregon* sta 1426), carapace length 31.0 mm; *l*, *H. reedi*, female from off Valparaiso, Chile (E.P. Reed), carapace length 28.0 mm; *m*, *H. sibogae*, male from Balayan Bay, southern Luzon, Philippines (*Albatross* sta 5113), carapace length 31.2 mm; *n*, *H. signatus*, juvenile syntype from Kawaihae Bay, western Hawaii Island, Hawaii (*Albatross* sta 4041), carapace length 12.3 mm; *o*, *H. tricarinatus*, male from northern Palawan Passage, Philippines (*Albatross* sta 5349), carapace length 29.0 mm; *p*, *H. vicarius*, male syntype from Golfo de Panama (*Albatross* sta 3385), carapace length 28.0 mm; *q*, *H. woodmasoni*, male from southeast of Hong Kong (*Albatross* sta 5301), carapace length 31.0 mm. (Magnifications: *a*, *d*–*m*, *o*–*q*, $\times 2.6$; *b*, *c*, *n*, $\times 5.2$.)

1 ovig [35.0]; sta 5590; 4°10'50"N, 118°39'35"E; 567 m; green mud, sand; 6.8°C; 29 Sep 1909 (0902-0923); 9' Tanner beam trawl, mud bag: 2♀ [24.8, 36.7]. Makassar Strait off southwestern Celebes: sta 5664; 4°43'22"S, 118°53'18"E; 732 m; hard bottom; 6.3°C; 28 Dec 1909 (0943-1004); 12' Agassiz beam trawl: 1 ovig ♀ [28.8] (see "Remarks").

Teluk Bone, Celebes: sta 5650; 4°53'45"S, 121°29'00"E; 988 m; green mud; 4.5°C; 17 Dec 1909 (0922-0932); 12' Agassiz beam trawl: 1 ovig ♀ [25.2]; sta 5655; 3°34'10"S, 120°50'30"E; 1112 m; gray mud, fine sand; 4.0°C; 18 Dec 1909 (1100-1120); 12' Agassiz beam trawl: 3 ovig ♀; [25.8-26.9]; sta 5656, 3°17'40"S, 120°36'45"E; 885 m; gray mud; 5.1°C; 19 Dec 1909 (0837-0842); 12' Agassiz beam trawl: 1 ovig ♀ [29.3]; sta 5657; 3°19'40"S, 120°36'30"E; 900 m; gray mud; 5.2°C; 19 Dec 1909 (1108-1128); 12' Agassiz beam trawl: 1♂ [12.0]. Selat Butung, Celebes: sta 5647; 5°34'00"S, 122°18'15"E; 950 m; green mud; 16 Dec 1909 (1444-1504); 12' Agassiz beam trawl: 1♂ [15.1], 1♀ [18.2]; sta 5648; 5°35'00"S, 122°20'00"E; 1023 m; green mud; 4.0°C; 16 Dec 1909 (1629-1652); 12' Agassiz beam trawl: 4♂ [13.3-23.2]. Teluk Tomini, Celebes: sta 5605; 0°21'33"N, 121°34'10"E; 1183 m; 16 Nov 1909 (1025-1046); 12' Agassiz beam trawl: 1 juv [6.2]. West of Halmahera: sta 5619; 0°35'00"N, 127°14'40"E; 795 m; fine gray sand, mud; 27 Nov 1909 (1612-1641); 12' Agassiz beam trawl: 1♂ [17.0], 1 juv [8.5]; sta 5620; 0°21'30"N, 127°16'45"E; 655 m; gray mud; 28 Nov 1909 (0624-0645); 12' Agassiz beam trawl: 2♂ [28.6, 30.8], 1 ovig ♀ [32.7]. Southern end of Selat Patinti, southern Halmahera: sta 5630; 0°56'30"S, 128°05'00"E; 1041 m; coral sand, mud; 2 Dec 1909 (0956-1000); 12' Agassiz beam trawl: 1♂ [21.3].

RANGE.—Eastern Africa to Indonesia, Philippines, Japan, New Caledonia, and western Samoa; 185-1400 meters.

REMARKS.—There seems little reason to doubt that *H. alphonsi* is synonymous with *H. dorsalis* since the comparison of the type specimens of

both species by Calman (1939:206) disclosed "no grounds for separating these species," although Monod (1973:123) treated *H. alphonsi* as a subspecies of *H. dorsalis*. Unfortunately, Calman did not mention the number of carpal articles in the longer second pereopod of *H. alphonsi*, depicted by Bate (1888, pl. 112: fig. 1') as amounting to 40 and mentioned by Borradaile (1917:399) as perhaps the most important distinction between Bate's species from the Indian Ocean and the one that Borradaile called *H. affinis*. I am unaware of any other species of *Heterocarpus* with as many as 40 articles in the carpus of the second pereopod, so it seems safe to assume that Bate's illustration represents just another of the numerous unfortunate errors in the report on the *Chal-lenger* macrurans.

The series of specimens collected by the *Albatross* are variable in many respects, but only two of them are sufficiently aberrant to cast doubt on their specific identity. The first Philippine specimen listed above—the female with a carapace length of 28.9 mm from station 5438—has only six teeth in the dorsal rostral series, two on the carapace, two strong ones above the antennular peduncle, and two indistinct denticles on the anterior fourth of the rostrum. In all other characters, this specimen falls well within the limits of variation of *H. dorsalis*, so probably the unusual rostral armature can be attributed to accident, genetic or otherwise. The other atypical specimen is the ovigerous female with a carapace length of 28.8 mm from station 5664 in Makassar Strait. In this specimen, the rostrum is only three-fourths as long as the carapace, armed dorsally with two teeth on the carapace, one large one in line with the posterior margin of the orbit, and a small one at the base of the rostrum, proper, with the remainder of the dorsal margin completely unarmed; the ventral margin bears only seven teeth. Perhaps this abnormal rostrum can be blamed on injury, like that of the specimen from off Luzon, but in the Makassar Strait specimen it seems to be associated with similarly aberrant posterior pairs of pereopods, in which the dactyl is unusually short—slightly less than a

third as long as the propodus—and the meral spines are unusually prominent. It is barely possible that this rather imperfect specimen represents a second Indo-Pacific member of the genus in which there are posteromesial teeth on the third, fourth, and fifth abdominal somites.

* 10. *Heterocarpus ensifer parvispina* De Man, 1917

FIGURES 13e, 14–16

Heterocarpus ensifer var. *parvispina* De Man, 1917:282

[type-locality: the type series came from 3 rather widely distant localities: between the Bali and Flores seas; 7°35.4'S, 117°28.6'E; 521 meters; off Jolo Island, Sulu Archipelago; 6°08'N, 121°19'E; 275 meters; and Kepulauan Ewab; 5°40'S, 132°26'E; 310 meters]; 1920:167, pl. 14: fig. 41.—Crosnier and Forest, 1973:192.

[?] *Heterocarpus ensifer*.—Rathbun, 1906:917, pl. 21: fig. 7.—Hayashi and Miyake, 1969:74, fig. 6.—Wilder, 1979:5, 6, figs. 1, 3.—Moffitt, 1983:435.

DIAGNOSIS.—Rostrum varying from nearly twice as long as carapace in juveniles to slightly shorter than carapace in adults, with low lateral carina on posterior $\frac{1}{3}$ of length, armed dorsally with 14–18, usually 15 or 16, teeth extending to anterior end of rostrum and including 4–6, usually 5, on carapace posterior to level of orbital margin, and ventrally with 8–11; carapace with nearly maximum antennal and lateral carinae and posterior intermediate carina; branchiostegal spine rarely reaching level of tip of antennal spine; abdomen without sharp dorsal carina on 2 anterior somites, 3rd and 4th somites carinate and armed with posteromesial tooth, 5th and 6th dorsally rounded and unarmed; antennal scale varying from $\frac{3}{5}$ to $\frac{4}{5}$ of carapace length, blade converging toward lateral margin, falling far short of tip of distolateral spine; pereopods with 16–20 (usually 18) articles in carpus of longer member of 2nd pair, shorter one with 6–8 (usu-

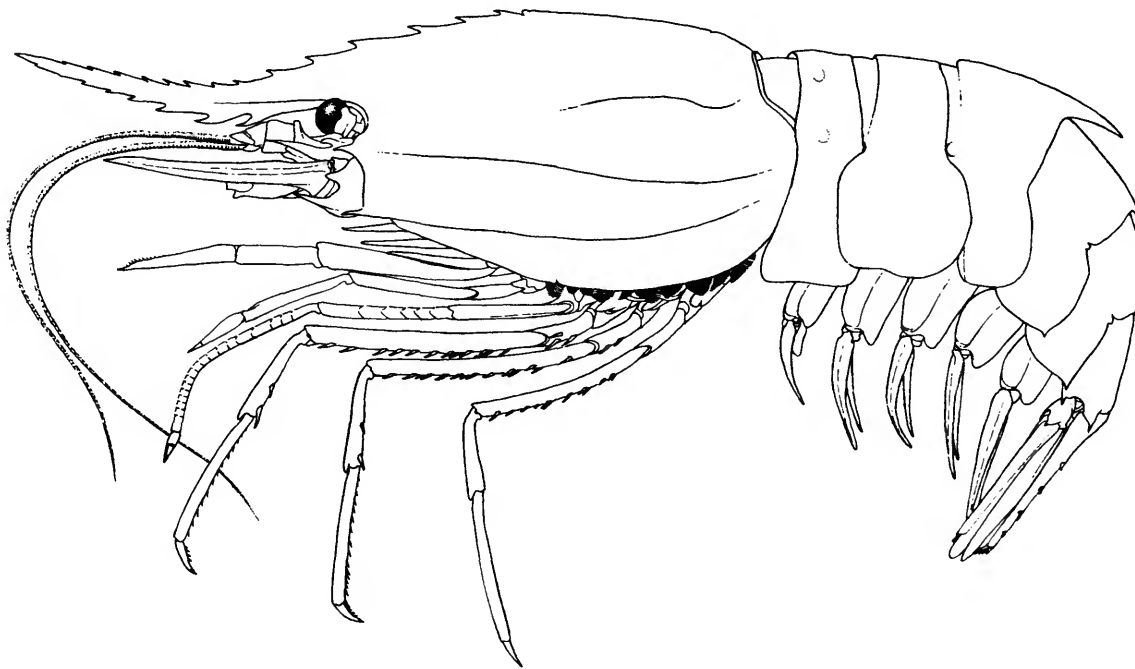


FIGURE 14.—*Heterocarpus ensifer parvispina*, male from Albatross sta 5661, carapace length 26.7 mm. (Magnification: $\times 2.0$.)

ally 7) articles, dactyl of 3rd pair $\frac{1}{4}$ to $\frac{2}{5}$ as long as propodus, carpus of 3rd pair armed with 1–5 (usually 2 or 3) spines, of 4th pair with 1–7 (usually 2 or 3), and of 5th pair, 0–5 (usually 2–4), merus of 3rd pair armed with 12–23 (usually 13–18) spines, of 4th pair with 12–19 (usually 13–17) spines, and of 5th pair, 7–16 (usually 12–14), ischium of 3rd pair armed with 2–4 (usually 3) spines, of 4th pair with 1–4 (usually 2), and of 5th pair, 0–3, but nearly always unarmed; maximum carapace length about 35 mm.

MATERIAL.—**PHILIPPINES.** Babuyan Channel, north of Luzon: sta 5329; 18°33'N, 121°37'–30"E; 388 m; blue mud; 10.8°C; 19 Nov 1908 (1125–1135); 12' Tanner beam trawl, mud bag: 2 juv [7.5, 9.7]. Off Jolo Island, Sulu Archipelago: sta 5173; 6°02'55"N, 120°53'E; 340 m; shells, coral; 5 Mar 1908 (1457–1503); 9' Johnston oyster dredge: 1♂ [19.8]. Off Tawitawi Island, Sulu Archipelago: sta 5577; 5°20'36"N, 119°58'51"E; 439 m; coarse sand; 12.4°C; 23 Sep 1909 (1501–1519); 9' Tanner beam trawl, mud bag: 1 ovig ♀ [23.6].

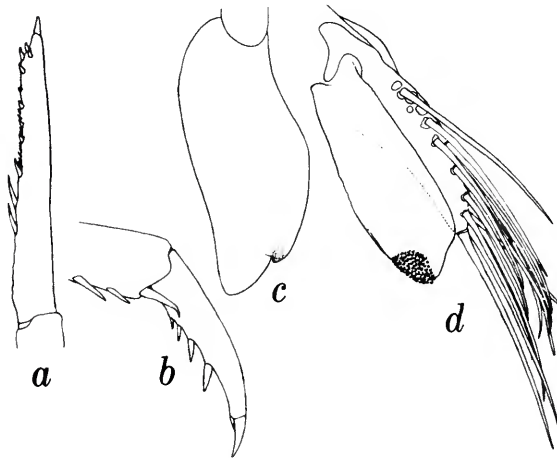


FIGURE 15.—*Heterocarpus ensifer parvispina*, male from *Albatross* sta 5661, carapace length 26.7 mm: a, terminal segment (denuded) of right 3rd maxilliped, lateral aspect; b, dactyl of right 3rd pereopod; c, endopod of left 1st pleopod; d, left appendix interna and appendix masculina. (Magnifications: a, $\times 5.2$; b, c, $\times 10.8$; d, $\times 21.5$.)

INDONESIA. West of Aelat Salajar, southwestern Celebes: sta 5661; 5°49'40"S, 120°24'–30"E; 329 m; hard bottom; 10.3°C; 20 Dec 1909 (1624–1627); 12' Agassiz beam trawl (net torn below lead line): 7♂ [14.1–26.7], 4♀ [13.4–24.9], 1 ovig [24.9]. South of Pulau Muna, Celebes: sta 5646; 5°31'30"S, 122°22'40"E; 834 m; green mud; 16 Dec 1909 (1210–1230); 12' Agassiz beam trawl: 1 juv [11.2]. Southern end of Selat Patinti, southern Halmahera: sta 5629; 0°50'00"S, 128°12'00"E; 375 m; coral sand; 2 Dec 1909 (0643–0645); 12' Agassiz beam trawl (badly damaged): 2♀ [25.9, 27.4].

RANGE.—Possibly Madagascar and Réunion to Indonesia, Philippines, and probably New Britain and Sagami Bay, Japan, New Caledonia, Tonga, and Tahiti; 183 to 834 meters. This or a closely related subspecies is abundant in Hawaii in depths of 57 to 858 meters and in the Pacific islands farther west—Marianas, Guam, and Palau—in 250 to more than 700 meters. The nominate subspecies inhabits the western Atlantic from off North Carolina to the Gulf of Mexico and Caribbean Sea and the eastern Atlantic from Spain and Madeira to Angola, in 200 to 885 meters.

REMARKS.—Comparison of the Philippine-Indonesian specimens collected by the *Albatross* with material from Hawaii and the western Atlantic seems to substantiate the suggestion made by Crosnier and Forest (1973:192) that Atlantic and Indo-Pacific populations of *H. ensifer* may be subspecifically distinguishable. No consistent differences between these populations could be found as regards the relative lengths of the rostrum and of the antennal scale, the number of articles in the carpus of the second pereopods, and the relative length of the dactyl of the three posterior pairs of pereopods, but the differences in the dentition of the dorsal margin of the carapace and of the walking legs—both characters mentioned by Crosnier and Forest—have stood the test of further analysis (Figure 16). Although the Hawaiian population seems to be intermediate in some respects—especially in regard to the number of spines on the third and

fourth pairs of pereopods—and therefore vitiates any attempt to recognize two distinct species, the failure to recognize any taxonomic distinction between Atlantic and Pacific populations would suppress significant evidence for such recognition. Mayr (1969:189) indicated that a coefficient of difference—calculated from the means and standard deviations of two populations—of about 1.28 is suggestive of the presence of subspecies, but a CD of at least 1.5 is demanded by some taxonomists. A CD calculated from the analysis of the dorsal dentition of the carapace

and rostrum of the Atlantic and Pacific populations is 1.49 and that from the difference in spination on the merus of the fifth pereopod of the same two populations is 1.62.

A trend similar to that suggested by the meral characters is indicated by the spination on the carpus and the ischium of the three posterior pairs of pereopods. The carpus of the third pereopod is armed with two to five spines, with a mean of 4.10 and a standard deviation of 0.54, in the western Atlantic; one to five spines, with a mean of 3.05 and an SD of 0.71, in Hawaii;

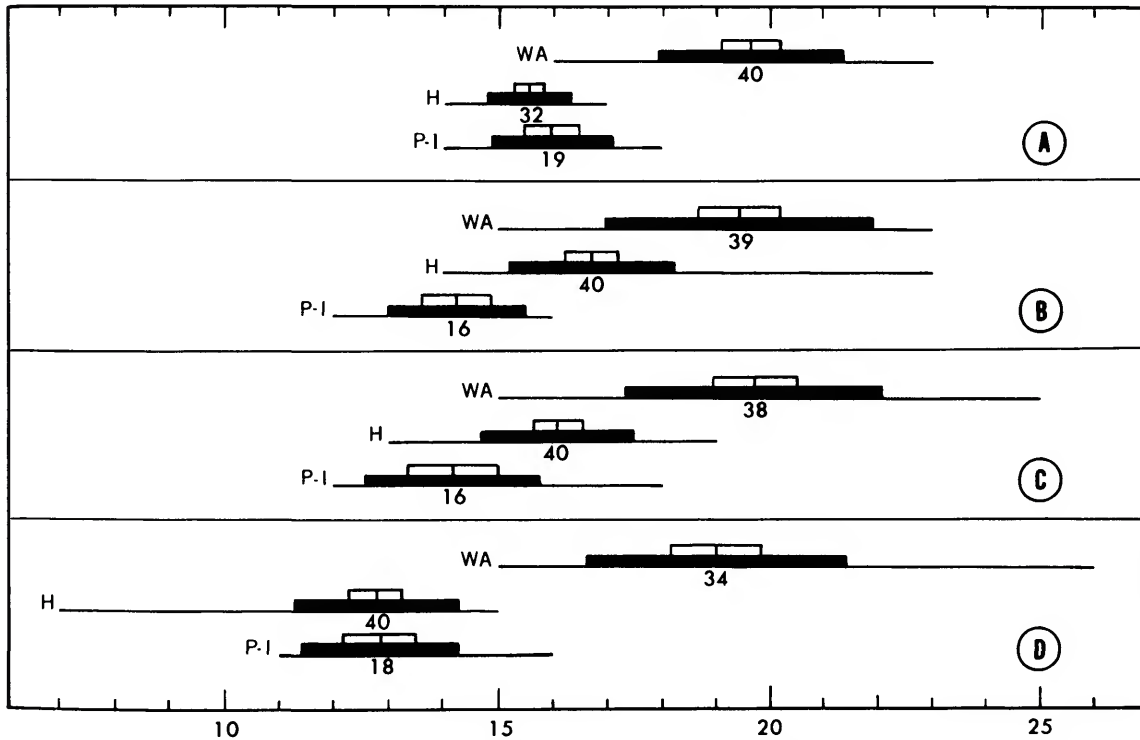


FIGURE 16.—Variation of populations of *Heterocarpus ensifer* from the western Atlantic (WA), Hawaii (H), and the Philippine-Indonesian region (P-I) in the number of teeth in the dorsal midline of the carapace and rostrum (A) and the number of spines on the meri of the 3rd pereopod (B), the 4th pereopod (C), and the 5th pereopod (D). For each sample, the horizontal line denotes the total variability in the number of teeth or spines; the solid horizontal bar represents 1 unit of standard deviation on each side of the mean; the blank rectangles, twice the standard error on each side of the mean; and the numbers below the mean, the number of specimens sampled.

and one to four spines, with a mean of 2.31 and an SD of 0.79, in the Philippines and Indonesia. The carpus of the fourth pereopod bears one to five spines, with a mean of 4.18 and an SD of 0.78, in the western Atlantic; two to four spines, with a mean of 3.12 and an SD of 0.40, in Hawaii; and one to seven spines, with a mean of 2.69 and an SD of 1.58 in the Philippines and Indonesia. The carpus of the fifth pereopod bears four to six spines, with a mean of 4.74 and an SD of 0.62, in the western Atlantic; none to five spines, with a mean of 3.38 and an SD of 1.00, in Hawaii; and none to five spines, with a mean of 2.39 and an SD of 1.09 in the Philippines and Indonesia. The ischium of the third pereopod bears two to five spines, with a mean of 3.76 and an SD of 0.66, in the western Atlantic; two or three spines, with a mean of 2.95 and an SD of 0.22, in Hawaii; and two to four spines, with a mean of 3.00 and an SD of 0.37, in the Philippines and Indonesia. The ischium of the fourth pereopod bears two to four spines, with a mean of 3.10 and an SD of 0.38, in the western Atlantic; one to three spines, with a mean of 2.00 and an SD of 0.23, in Hawaii; and two to five spines, with a mean of 2.38 and an SD of 0.89, in the Philippines and Indonesia. The ischium of the fifth pereopod bears none to three spines, with a mean of 1.00 and an SD of 0.75, in the western Atlantic; none to three spines, with a mean of 0.08 and an SD of 0.47, in Hawaii; and none or one spine, with a mean of 0.06 and an SD of 0.24, in the Philippines and Indonesia. As was true of the meral spines, the distinctions are most noticeable on the fifth pereopod. None of the western Atlantic specimens examined had fewer than four spines on the carpus of that leg, whereas the means were little more than four on the third and fourth pairs, and only two of 58 specimens from Hawaii and the Philippines and Indonesia have even a single ischial spine on the fifth pereopod, whereas 28 of 37 examples from the western Atlantic have one or more ischial spines.

In all but four of the specimens from the Philippines and Indonesia, the posterodorsal tooth on the fourth abdominal somite is distinctly

less than half as long as the tooth on the third somite. In the three juvenile specimens, the teeth are subequal, and, in a female with a carapace length of 24.2 mm from station 5661, the tooth on the fourth somite is 0.6 times as long as that on the third. In only two of 17 specimens from the western Atlantic, however, was the tooth on the fourth somite even slightly shorter than the one on the third. Curiously enough, the teeth on these somites were more nearly similar in size in the Hawaiian population than in those from the western Atlantic, and one Hawaiian male, with a carapace length of 31.2 mm, has the tooth on the fourth somite perceptibly longer than the one on the third. Eventually, it may be desirable to distinguish the Hawaiian population subspecifically and thereby disburden it of the inappropriate name assigned to it by the current study.

Only a single lot of 12 small specimens from Dakar Harbor, Senegal, is available to me as representatives of the eastern Atlantic population of *H. ensifer*. In the number of spines on the three posterior pairs of pereopods, these specimens compare reasonably well with those from the western Atlantic. The average number of spines seems to be slightly less than that found in western Atlantic specimens, but the difference is certainly too slight to justify any consideration of a subspecific difference. Surely, it is less noticeable than the difference in relative rostral lengths recorded by Crosnier and Forest (1973:190) between populations from off Congo and those from Guinea. In all of the material examined during this study, no such discrepancy in rostral length was noted.

Although, by definition, *H. ensifer* is the type-species of *Heterocarpus*, it is one of the least typical members of the genus. Only it and the closely related *H. sibogae* have the blade of the antennal scale tapering strongly toward the distolateral spine, rather than broadly rounded or subtruncate distally (Figure 13*e,m*). Also, those two species share only with *H. woodmasoni* an antennal carina extending from the antennal spine nearly to the posterior margin of the carapace; in all of the other species, the antennal

carina amounts to no more than a short buttress supporting the antennal spine.

***11. *Heterocarpus gibbosus* Bate, 1888**

FIGURES 13f, 17

Heterocarpus gibbosus Bate, 1888:634, pl. 112: fig. 2 [type-locality: Sibuyan Sea between Tablas and Sibuyan islands, Philippines; 12°21'N, 122°15'E; 1280 meters].—De Man, 1920:163, pl. 14: fig. 39.

Diagnosis.—Rostrum varying from more than 1½ times as long as carapace in juveniles to about ⅔ as long in largest adults, without distinct lateral carina, armed dorsally with 4–12, usually 8 or 9, teeth extending to anterior end of rostrum and including 4, less commonly 5, on carapace posterior to level of orbital margin and often 1 situated directly above that margin, and ventrally with 7–20, most commonly 12–16, teeth becoming increasingly obscure toward rostral tip; car-

apace with blunt but nearly complete intermediate carina, anteriorly distinct and posteriorly indistinct lateral carina, and very short and obscure anterior antennal carina or buttress; abdomen unarmed and rounded dorsally, except for blunt median ridge on 3rd somite and obscurely flattened mesial area on anterior part of 4th; antennal scale varying from less than ½ as long as carapace in larger specimens to more than ⅔ as long in smaller ones, blade overreaching distolateral spine; pereopods with longer 2nd pair having 17–36 (usually 21–25 and most commonly 23 or 24) articles in carpus, shorter with 7–14 (usually 7–9 and most commonly 8); dactyl of 3rd pair from less than 1.3 to more than ⅔ as long as propodus; carpi of 3 posterior pairs armed with 0–8 (usually 1–4 and most commonly 2) spines on 3rd pair, 0–8 (usually 0–4 and most commonly 1) on 4th, and 0–6 (usually 0–2 and most commonly 1) on 5th; meri armed with 8–30 (usually 11–21 and most commonly 15–19)

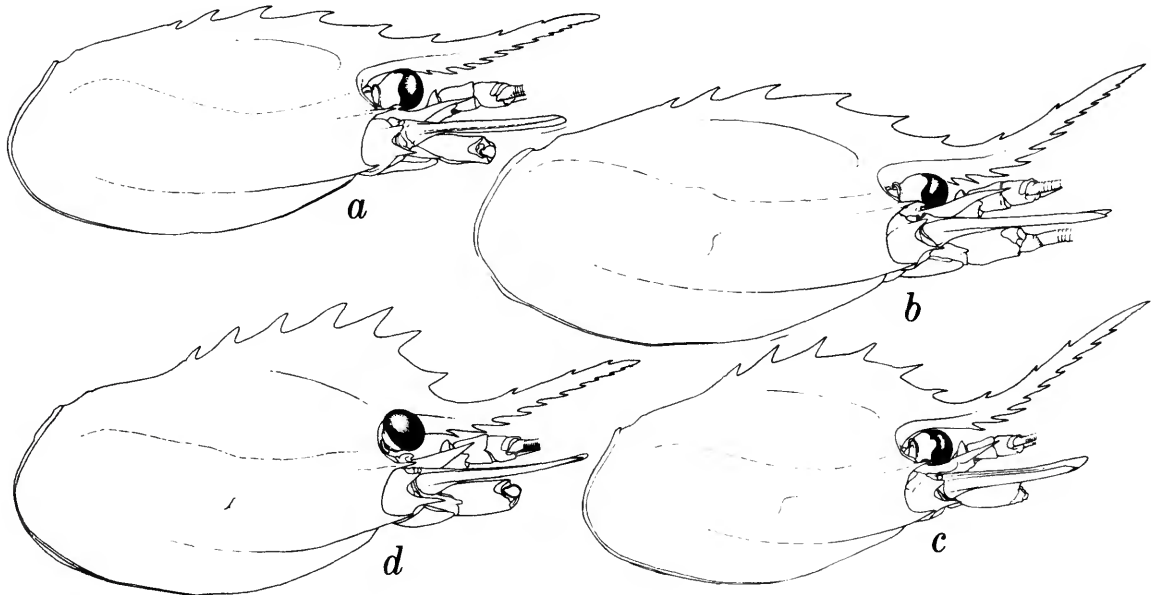


FIGURE 17.—*Heterocarpus gibbosus*, variation in lateral profile of carapace and rostrum: a, male from *Albatross* sta 5622, carapace length 29.0 mm; b, female from *Albatross* sta 5622, carapace length 33.5 mm; c, ovigerous female from *Albatross* sta 5622, carapace length 27.2 mm; d, male from *Albatross* sta 5590, carapace length 28.8 mm. (Magnifications: all $\times 1.3$.)

spines on 3rd pair, 7–24 (usually 8–14) on 4th, and 3–26 (usually 5–14 and most commonly 6–10) on 5th; ischia with 0–4 (usually 2) spines on 3rd and 4th pairs and 0–2 (usually 0) on 5th; maximum carapace length about 40 mm.

MATERIAL.—PHILIPPINES. South China Sea off western Luzon: sta 5331; 15°36'45"N, 119°47'45"E; 326 m; sand, shells, mud; 12.6°C; 22 Nov 1908 (0841–0901); 12' Tanner beam trawl, mud bag: 1♂ [26.0]. Western Verde Island Passage: sta 5281; 13°52'45"N, 120°25'E; 368 m; dark gray sand; 10.2°C; 18 Jul 1908 (1040–1100); 12' Agassiz beam trawl, mud bag: 2♀ [17.7, 26.8]; sta 5282; 13°53'N, 120°26'45"E; 454 m; dark gray sand; 8.5°C; 18 Jul 1908 (1144–1204); 12' Agassiz beam trawl, mud bag: 4♀ [22.7–32.0]. Southwest of Lubang Islands: sta 5265; 13°41'15"N, 120°00'50"E; 247 m; sand, mud; 6 Jun 1908 (1109–1129); 12' Agassiz beam trawl, mud bag: 2♂ [8.2, 24.0], 1♀ [24.5].

Balayan Bay, southern Luzon; sta 5111; 13°45'15"N, 120°46'30"E; 432 m; green mud; 16 Jan 1908 (1508–1538); 12' Tanner beam trawl, mud bag: 1♂ [22.5], 3♀ [11.3–33.0]; sta 5113; 13°51'30"N, 120°50'30"E; 291 m; dark green mud; 17 Jan 1908 (1602–1612); 12' Tanner beam trawl, mud bag: 2♀ [26.2, 26.6], 1 ovig [26.2]; sta 5116; 13°41'N, 120°47'05"E; 366 m; 10.1°C; 20 Jan 1908 (1513–1533); 12' Tanner beam trawl, mud bag: 1♂ [23.7]; sta 5118; 13°48'45"N, 120°41'51"E; 291 m; dark green mud; 21 Jan 1908 (1100–1130); 12' Tanner beam trawl, mud bag: 2♂ [22.1, 25.3], 7♀ [19.1–31.4]; sta 5363; 13°47'20"N, 120°43'30"E; [329 m]; 20 Feb 1909 (0927–1042); 25' Agassiz beam trawl: 1♂ [24.9], 3♀ [21.7–34.8]; sta 5364 or 5365; 13°48'30"N, 120°43'45"E or 13°44'24"N, 120°45'30"E; [293 or 391 m]; 20 Feb 1909 (1440–1523) or 22 Feb 1909 (0904–0940); 25' Agassiz beam trawl; 6♂ [18.8–28.2], 5♀ [18.0–33.3]; sta 5365; 13°44'24"N, 120°45'30"E; [391 m]; 22 Feb 1909 (0904–0940), 25' Agassiz beam trawl: 1♂ [23.9], 1♀ [25.0].

Batangas Bay, southern Luzon: sta 5268; 13°42'N, 120°57'15"E; 311 m; sand, pebbles; 8 Jun 1908 (1114–1134); 12' Agassiz beam

trawl, mud bag: 2♀ [24.8, 33.2], 1 ovig [33.2]; sta 5269; 13°39'50"N, 120°59'30"E; 402 m, fine sand, pebbles; 8 Jun 1908 (1334–1354); 12' Agassiz beam trawl, mud bag: 2♂ [20.2, 20.8], 1♀ [15.0]; sta 5289; 13°41'50"N, 120°58'30"E; 315 m; broken shells, sand; 22 Jul 1908 (0925–1945); 12' Agassiz beam trawl, mud bag: 2♂ [20.6, 22.5], 2♀ [29.2, 32.7], 1 ovig [32.7]; sta 5290; 13°40'09"N, 120°59'30"E; [391 m]; lava, gravel; 22 Jul 1908 (1054–1114); 12' Agassiz beam trawl, mud bag: 2♂ [27.0, 28.7], 3♀ [25.0–26.0], 2 ovig [25.0, 25.2]; sta 5298; 13°43'25"N, 120°57'40"E; [256 m]; [sand]; 24 Jul 1908 (1509–1519); 12' Agassiz beam trawl, mud bag: 2♀ [21.5, 28.7], 1 ovig [28.7]. Verde Island Passage: sta 5291; 13°29'40"N, 121°00'45"E; 316 m; fine black sand; 10.8°C; 23 Jul 1908 (1345–1405); 12' Agassiz beam trawl, mud bag: 2♂ [20.0, 29.2], 1♀ [26.8]; sta 5293; 13°28'15"N, 121°04'30"E; 329 m; fine black sand; 14.1°C; 23 Jul 1908 (1559–1629); 12' Agassiz beam trawl, mud bag: 1♂ [25.2]; sta 5294; 13°32'15"N, 121°02'E; 446 m; sand, pebbles; 9.1°C; 24 Jul 1908 (0913–0930); 12' Agassiz beam trawl, mud bag: 1♀ [16.0]; sta 5296; 13°40'09"N, 120°57'45"E; [384 m]; [mud, sand]; 24 Jul 1908 (1247–1307); 12' Agassiz beam trawl, mud bag: 1♂ [28.0].

Tayabas Bay, southern Luzon: sta 5221; 13°38'15"N, 121°48'15"E; 353 m; green mud; 11.3°C; 24 Apr 1908 (1525–1545); 12' Agassiz beam trawl, mud bag: 3♂ [24.3–28.2], 6♀ [23.0–31.4], 1 ovig [29.3]; sta 5222; 13°38'30"N, 121°42'45"E; 357 m; green mud; 11.6°C; 24 Apr 1908 (1649–1709); 12' Agassiz beam trawl, mud bag: 1♂ [29.8], 4♀ [24.0–34.0], 2 ovig [24.2, 34.0]; sta 5374; 13°46'45"N, 121°35'08"E; [348 m]; gray mud; 2 Mar 1909 (1157–1230); 12' Tanner beam trawl, mud bag: 2♂ [23.0, 27.0], 3♀ [30.8–34.0]. Northwest of Mindoro: sta 5122; 13°31'30"N, 120° [probably 121°] 30'33"E; 402 m; green mud; 2 Feb 1908 (1059–1119); 12' Tanner beam trawl, mud bag: 1 y♂ [7.9], 7♀ [23.7–30.2], 1 ovig [26.0]; sta 5123; 13°12'45"N, 121°38'45"E; 518 m; green mud; 2 Feb 1908 (1344–1404); 12' Tanner beam

trawl, mud bag: 3♂ [13.0–24.6], 11♀ [12.8–32.2], 1 ovig [29.2].

Tablas Strait, east of Mindoro; sta 5260; 12°25'35"N, 121°31'35"E; 428 m; green mud, sand; 10.8°C; 3 Jun 1908 (1532–1552); 12' Agassiz beam trawl, mud bag: 17♂ [19.0–29.3], 27♀ [10.0–32.8]. Burias Pass, south of southeastern Luzon: sta 5216; 12°52'N, 123°23'30"E; 393 m; green mud; 11.1°C; 22 Apr 1908 (0836–0856); 12' Agassiz beam trawl, mud bag: 8♂ [19.7–29.0], 6♀ [19.7–27.8]; sta 5387; 12°54'40"N, 123°20'30"E; 382 m; soft green mud; 11.3°C; 11 Mar 1909 (1342–1402); 12' Agassiz beam trawl, mud bag: 10♂ [17.0–30.0], 3♀ [13.0–23.0], 1 ovig [23.0]; sta 5388; 12°51'30"N, 123°26'15"E; 413 m; soft green mud; 10.8°C; 11 Mar 1909 (1527–1553); 12' Agassiz beam trawl, mud bag: 13♂ [16.0–31.0], 14♀ [14.0–34.0], 1 ovig [28.4]. Albay Gulf, east of southern Luzon: sta 5454; 13°12'N, 123°50'30"E; [280 m]; 7 Jun 1909 (1046–1107); 12' Agassiz beam trawl: 1♂ [24.0], 1♀ [34.0]; sta 5459; 13°10'21"N, 123°59'54"E; [368 m]; 8 Jun 1909 (1541–1601); 12' Agassiz beam trawl, mud bag: 1♂ [23.0], 4♀ [21.3–31.6], 1 ovig [25.3]. North of Samar: sta 5446; 12°43'51"N, 124°59'18"E; 549 m; green mud; 3 Jun 1909 (1358–1426); 12' Agassiz beam trawl: 1♀ [24.0].

Masbate Pass, east of Masbate: sta 5214; 12°25'18"N, 123°37'15"E; 399 m; green mud; 10.8°C; 21 Apr 1908 (0919–0939); 12' Agassiz beam trawl, mud bag: 1♀ [16.7]. West of Leyte: sta 5402; 11°11'45"N, 124°15'45"E; 344 m; green mud; 13.2°C; 16 Mar 1909 (1416–1438); 12' Agassiz beam trawl, mud bag: 1♂ [27.0]; sta 5404; 10°50'N, 124°26'18"E, 348 m; mud; 13.0°C; 17 Mar 1909 (0858–0924); 12' Agassiz beam trawl; 7♂ [18.3–30.0], 14♀ [22.7–30.0], 2 ovig [24.8, 27.3]; sta 5404; 10°49'20"N, 124°24'23"E; 479 m; hard bottom; 17 Mar 1909 (1009–1029); 12' Agassiz beam trawl: 3♂ [21.2–27.2], 3♀ [27.0–31.2], 1 ovig [30.3]; sta 5406; 10°49'03"N, 124°22'30"E; 545 m; mud; 17 Mar 1909 (1141–1208); 12' Agassiz beam trawl: 4♂ [18.2–24.3], 1♀ [23.6]; sta 5407;

10°51'38"N, 124°20'54"E; 640 m; green mud; 17 Mar 1909 (1328–1348); 12' Agassiz beam trawl: 1♂ [23.0], 2♀ [18.8, 23.0]; sta 5409; 10°38'N, 124°13'08"E; 346 m; green mud; 18 Mar 1909 (0951–1020); 12' Agassiz beam trawl, mud bag: 4♂ [17.2–24.2], 15♀ [20.2–31.2], 4 ovig [24.0–30.3].

Camotes Sea east of Cebu: sta 5410; 10°28'45"N, 124°05'30"E; 704 m; green mud; 18 Mar 1909 (1156–1210); 12' Agassiz beam trawl, mud bag: 2♂ [14.7, 29.0], 1 juv [6.6]. Bohol Strait, east of Cebu: sta 5419; 9°58'30"N, 123°46'E; 320 m; green mud; 12.5°C; 25 Mar 1909 (1355–1415); 12' Agassiz beam trawl: 1♂ [28.7]; sta 5198; 9°40'50"N, 123°39'45"E; 402 m; green mud; 12.2°C; 9 Apr 1908 (1125–1145); 12' Agassiz beam trawl, 3 mud bags: 2♂ [25.5, 27.1], 3♀ [26.2–31.0]. Between Negros and Siquijor: sta 5536; 9°15'45"N, 123°22'00"E; 510 m; green mud; 11.9°C; 19 Aug 1909 (1336–1356); 12' Tanner beam trawl: 3♀ [27.0–31.7]; sta 5537; 9°11'00"N, 123°23'00"E; 465 m; green mud; 11.9°C; 19 Aug 1909 (1539–1559); 12' Tanner beam trawl: 1♂ [20.8], 4♀ [11.1–30.6].

Macajalar Bay, northern Mindanao: sta 5501; 8°37'37"N, 124°35'E; 391 m; fine sand, gray mud; 12.4°C; 4 Aug 1909 (1428–1448); 12' Tanner beam trawl: 2♂ [28.0, 30.0], 2 ovig ♀ [25.0, 31.2]; sta 5502; 8°37'37"N, 124°35'E; 391 m; fine sand, gray mud; 4 Aug 1909 (1528–1548); 12' Tanner beam trawl: 2♂ [25.0, 27.8], 1♀ [31.6]; sta 5502 or 5503; 8°37'37"N, 124°35'E or 8°36'26"N, 124°36'08"E; 391 or 413 m; fine sand, gray mud or green mud; ? or 11.8°C; 4 Aug 1909 (1528–1548 or 1638–1658); 12' Tanner beam trawl; 1♂ [26.5], 2♀ [23.3, 31.4]; sta 5504 or 5505; 8°35'30"N, 124°36'E or 8°37'15"N, 124°36'E; 366 [or 402] m; green mud or ?; 12.4°C or ?; 5 Aug 1909 (0615–0657 or 0725–0749); 12' Tanner beam trawl: 6♂ [10.7–29.0], 8♀ [11.2–36.3], 1 ovig [31.5]; sta 5506; 8°40'N, 124°31'45"E; 479 m; green mud; 11.8°C; 5 Aug 1909 (0912–0926); 12' Tanner beam trawl: 2♂ [25.3, 26.2], 1♀ [30.0].

Iligan Bay, northern Mindanao: sta 5508; 8°17'24"N, 124°11'42"E; 494 m; green mud, fine sand; 11.8°C; 5 Aug 1909 (1517-1541); 12' Tanner beam trawl: 8♂ [19.8-27.8], 7♀ [19.2-28.6]; sta 5510; 8°16'N, 124°03'50"E; 774 m; gray mud, fine sand; 11.7°C; 7 Aug 1909 (1031-1038); 12' Tanner beam trawl: 1 juv [9.2]; sta 5511; 8°15'20"N, 123°57'E; 750 m; gray mud, sand; 11.7°C; 7 Aug 1909 (1218-1238); 12' Tanner beam trawl: 3y♂ [10.0-13.0], 3y♀ [9.6-11.5]. Western entrance to Mindanao Sea near Silino Island: sta 5522; 8°49'N, 123°26'30"E; 421 m; globigerina; 11.3°C; 10 Aug 1909 (0957-1015); 12' Tanner beam trawl (net fouled over beam): 1♀ [34.0]. Davao Gulf, Mindanao: sta 5247; 7°02'N, 125°38'45"E; 247 m; mud; 18 May 1908 (0908-0928); 12' Agassiz beam trawl, mud bag: 1♂ [23.0], 1♀ [22.1].

Off Jolo Island, Sulu Archipelago: sta 5135; 6°11'50"N, 121°08'20"E; 294 m; fine coral sand; 14.1°C; 7 Feb 1908 (1450-1510); 12' Tanner beam trawl, mud bag: 1 ovig ♀ [22.0]; sta 5173; 6°02'55"N, 120°53'E; 340 m; shells, coral; 5 Mar 1908 (1457-1503); 9' Johnston oyster dredge; 1♂ [22.2]. West of Jolo Island, Sulu Archipelago: sta 5551; 5°54'48"N, 120°44'24"E; 353 m; fine sand; 11.8°C; 17 Sep 1909 (1407-1427); 9' Tanner beam trawl: 3♂ [20.0-26.5], 8♀ [9.7-30.3]. Near Usada Island, Sulu Archipelago: sta 5172; 6°03'15"N, 120°35'30"E; 582 m; fine sand, shells; 5 Mar 1908 (1031-1051); 12' Agassiz beam trawl, mud bag: 3♂ [15.8-26.1], 4♀ [15.0-36.7], 1 ovig [25.9]. Southwest of Jolo Island, Sulu Archipelago: sta 5565; 5°51'42"N, 120°30'30"E; 444 m; sand, pteropod shells; 11.3°C; 21 Sep 1909 (1300-1321); 9' Tanner beam trawl, mud bag; 1♀ [17.0]. Off Tawitawi, Sulu Archipelago: sta 5162; 5°10'N, 119°47'30"E; 421 m; coarse sand, broken shells; 11.6°C; 22 Feb 1908 (1031-1046); 12' Agassiz beam trawl, mud bag: 2♀ [23.7, 27.8], 1 ovig [23.7]; sta 5576; 5°25'56"N, 120°03'39"E; 507 m; sand; 11.8°C; 23 Sep 1909 (1122-1130); 9' Tanner beam trawl, mud bag: 1♂ [25.0].

INDONESIA. Celebes Sea off Sabah (North Bor-

neo): sta 5589; 4°12'10"N, 118°38'08"E; 476 m; fine gray sand, gray mud; 7.6°C; 29 Sep 1909 (0744-0804); 9' Tanner beam trawl, mud bag: 2y♂ [10.9, 12.0], 5♀ [9.5-18.0]; sta 5590; 4°10'50"N, 118°39'35"E; 567 m; green mud, sand; 6.8°C; 29 Sep 1909 (0902-0923); 9' Tanner beam trawl, mud bag: 1♂ [28.8] 1♀ [16.2]; sta 5592; 4°12'44"N, 118°27'44"E; 558 m; green mud; 6.3°C; 29 Sep 1909 (1600-1610); 9' Tanner beam trawl: 1♂ [20.9]; sta 5593; 4°02'40"N, 118°11'20"E; 70 m; fine sand; 29 Sep 1909 (1934-1949); 9' Tanner beam trawl (frame badly bent): 1♂ [17.0] [a depth of only 70 meters at this station is most unusual for the species].

West of Halmahera: sta 5621; 0°15'00"N, 127°24'35"E; 545 m; gray and black sand; 28 Nov 1909 (0950-1010); 12' Agassiz beam trawl, mud bag: 1♂ [23.3]; sta 5622; 0°19'20"N, 127°28'30"E; 503 m; gray mud; 29 Nov 1909 (0803); 12' Agassiz beam trawl, mud bag: 9♂ [13.1-33.0], 8♀ [27.2-35.3], 4 ovig [27.2-32.2]; sta 5623; 0°16'30"N, 127°30'00"E; 497 m; fine sand, mud; 29 Nov 1909 (0922-0944); 12' Agassiz beam trawl: 1♂ [17.0]; sta 5624; 0°12'15"N, 127°29'30"E; 527 m; fine sand, mud; 29 Nov 1909 (1058-1118); 12' Agassiz beam trawl: 6♂ [12.6-32.2], 3♀ [31.0-35.0], 1 ovig [31.0]; sta 5625; 0°07'00"N, 127°28'00"E; 421 m; gray mud, fine sand; 29 Nov 1909 (1416-1437); 12' Agassiz beam trawl: 2♂ [25.8, 29.8], 3♀ [26.0-34.2]. South of Pulau Muna, Celebes: sta 5645; 5°29'06"S, 122°36'06"E; 377 m; 16 Dec 1909 (0954-0955); 12' Agassiz beam trawl: 2♂ [24.3, 30.5], 1♀ [22.7].

RANGE.—Eastern Africa to Indonesia, the Philippines, New Hebrides, Fijis, and even as far east as Tonga; 247-1280 meters. Unlike *H. sibogae*, with which *H. gibbosus* was often taken by the Albatross, the latter species was not found north of the latitude of Manila Bay.

REMARKS.—For a discussion of the name applied to this species, see "Remarks" under *H. tricarinatus*.

As noted by De Man (1920:163, pl. 14: fig. 39-39d), the dorsal outline of the carapace and

rostrum is so variable that the extremes might well be considered as distinct species, but this possibility is dispelled when adequate series of specimens are examined. The *Albatross* material (Figure 17) displays the same variability as that described and illustrated by De Man, and there is no suggestion of a distributional pattern; it may be noticed that the specimens represented by Figure 17*a*, *b*, and *c* were all taken at a single station.

Of 354 specimens in which the rostrum is intact, one tooth of the dorsal series is situated directly above the posterior margin of the orbit in 160 specimens (45 per cent), and the anterior half of the rostrum is dorsally unarmed in only 13 (less than 4 per cent). Although injury may be responsible for a few of these atypical individuals, in which the rostrum is without dorsal teeth anterior to midlength, I am inclined to believe that the reduction in the number of dorsal rostral teeth is due to genetic variability.

The smallest of the ovigerous females from station 5409 (west of Leyte) has the left antennal scale grotesquely deformed and armed with a large abnormal tooth on the lateral margin. I am unable to decide whether this is the consequence of an injury or not.

The longer of the second pair of pereopods is nearly always on the left side, the shorter, more robust one on the right. Only seven of the 411 specimens (less than two per cent) are "left-handed," with the longer cheliped on the right side.

Although De Man (1920, pl. 14: fig. 39g) illustrates the dactyl of the third pereopod as simple, it is either obscurely or distinctly biungulate in all of the *Albatross* specimens.

The variability in the number of spines on the carpi, meri, and ischia of the three posterior pairs of pereopods certainly minimizes their importance as diagnostic characters. Some of the more unusual examples of this armature may be explained by regeneration (a number of specimens have clearly regenerating pereopods), but I suspect that most of the variability is of genetic origin.

There is no indication of protandry in the *Albatross* series of this species, as there is in some pandalid genera. The smallest male in which the appendix masculina is barely discernible as a bud visible through the cuticle of the endopod of the second pleopod, has a carapace length of 10.0 mm, but males can be recognized at a carapace length of only 7.9 mm by the partially differentiated endopod of the first pleopod. Males are somewhat smaller than females, the largest of the *Albatross* series having a carapace length of 33.0 mm, whereas the carapace is 39.2 mm long in the largest female. Ovigerous specimens have carapace lengths of from 22.0 to 34.0 mm. Only 32 of the 238 females (187 with a carapace length of 22 mm or more) are ovigerous. There is no apparent seasonal significance to the occurrence of ovigerous females. They were found in all months in which more than six presumably mature females were taken: January, February, March, April, June, July, August, and November. The largest number of ovigerous specimens taken in any one month was 10 (21 per cent of the mature females collected) in March, but the highest percentages were 36 per cent (5 of 14 mature females) in November and 31 per cent (4 of 13) in July.

*12. *Heterocarpus laevigatus* Bate, 1888

FIGURE 13i

Heterocarpus laevigatus Bate, 1888:636, pl. 112: fig. 3 [type-locality: Banda Sea off Kepulauan Banda, Indonesia; 4°34'00"S, 129°57'30"E; 366 meters].—Alcock, 1899, pl. 42: fig. 1.—Rathbun, 1906:918.—Crosnier and Forest, 1973: 195, fig. 61c.—Wilder, 1979:5, figs. 2, 3.—Moffitt, 1983:435.

Diagnosis.—Rostrum varying from less than 1¼ to more than 1½ times as long as carapace in juveniles to shorter than carapace in largest adults, without distinct lateral carina, armed dorsally with 6–10, usually 6 or 7, teeth on carapace and basal part of rostrum, including 5, less commonly 4 or 6, on carapace posterior to level of orbital margin and, infrequently, 1 situated di-

rectly above posterior margin of orbit, and ventrally with 6–13 teeth, most commonly 10 or 11; carapace with blunt but nearly complete intermediate carina, anteriorly sharp and posteriorly indistinct lateral carina, short and obscure anterior antennal carina or buttress, and posterior submarginal carina; abdomen unarmed dorsally, rounded on 1st and 2nd somites, with blunt median ridge on 3rd, 4th, and 5th somites and slightly sulcate median area on 6th somite; antennal scale varying from little more than $\frac{1}{2}$ as long as carapace in largest specimens to as much as $\frac{3}{5}$ as long in smaller ones, blade and distolateral spine reaching approximately same level; pereopods with longer member of 2nd pair having 20 or 21 (rarely 19 or 22) articles in carpus, shorter one with 6 or 7 (rarely 8), dactyl of 3rd pair from about $\frac{1}{7}$ to nearly $\frac{1}{4}$ as long as propodus, carpi of 3 posterior pairs armed with 1 (rarely 0 or 2) spines on 3rd pair, 0 or 1 on 4th pair, and 0 on 5th pair, meri armed with 14–16 (rarely as few as 11 or as many as 21) spines on 3rd pair, 6–19 (usually 12–14) on 4th, and 5–8 (nearly always 7) on 5th, ischia with 2 (rarely 1 or 3) spines on 3rd and 4th pairs and 0 on 5th; maximum carapace length probably nearly 50 mm.

MATERIAL.—INDONESIA. Celebes Sea off Sabah (North Borneo): sta 5586; 4°06'50"N, 118°47'20"E; 635 m; gray mud; 6.7°C; 28 Sep 1909 (1144–1217); 9' Tanner beam trawl, mud bag: 1y♂ [17.8].

RANGE.—The quantitative distribution of *H. laevigatus* seems to be unusual. Kensley (1977:38) increased the number of specimens known from South Africa from one to six. The species has been reported from Madagascar and Réunion. Apparently nine specimens were taken in the Arabian Sea by the *Investigator* (Alcock, 1901:105). A total of three specimens have been trawled in Indonesia by the *Challenger*, *Siboga*, and *Albatross*, and it has been recorded from the New Hebrides, western Samoa, and Tonga, but the species has not yet been found in the Philippines. Three or four specimens currently believed to belong to this species have been recorded from Madeira and the Cape Verde Is-

lands in the eastern Atlantic by Figueira (1957:41; 1958:24) and Crosnier and Forest (1973:196). In all, a total of probably less than 25 specimens are known from these four regions. The *Albatross*, however, collected no less than 72 specimens in Hawaii in 1891 and 1902. Wilder (1979) indicated that the species is common off Guam in depths below 600 meters, and Moffitt (1983) reported it to be the most common species in the northern Marianas at a depth of 732 meters. The general bathymetric range is from 366 to 966 meters.

REMARKS.—Analysis of the Hawaiian series of specimens, referred to above, is the basis for the diagnosis presented herewith. There has been no opportunity to compare these specimens with similar material from other parts of the world, so the taxonomic status of other populations—especially the one in the eastern Atlantic alluded to, but not validated, as a varietal form by Coutière (1911:157)—is still undecided.

The species is probably one of the larger members of the genus. Only three ovigerous females—one from the Cape Verde Islands by Coutière and illustrated by Crosnier and Forest, and two of the Hawaiian series—are known to me and they are as large as any specimens on record, all having carapace lengths greater than 46 mm. Males can be identified by the bilobed endopod of the first pleopod at a carapace length of about 15 mm, but the appendix masculina on the second pleopod does not appear, even as a bud, until the shrimp attains a carapace length of more than 20 mm, and it is sometimes lacking in specimens with carapace lengths of nearly 25 mm; it usually fails to reach full development at a carapace length of less than 30 mm.

In rather typical fashion, the relative length of the rostrum decreases with growth, but there is a considerable spread in juvenile and immature specimens, stemming in part from the variable curvature of the rostrum.

None of the Hawaiian specimens are “left-handed” as far as the second pereopods are concerned; in all of the specimens, the left member of the pair is the longer one, and the right one is

shorter and more robust.

***13. *Heterocarpus lepidus* De Man, 1917**

FIGURE 13j

Heterocarpus lepidus De Man, 1917:282 [type-locality: the nearly complete female syntype came from the westernmost part of the Banda Sea, west of Pulau Kakabia, from a depth of 500 meters; the less complete male syntype was found in the Kepulauan Kai in the easternmost Banda Sea; 5°53.8'S, 132°48.8'E; 560 meters]; 1920:164, pl. 14: fig. 40.

Diagnosis.—Rostrum about as long as carapace in adults, without lateral carina, armed dorsally with 8–11 teeth extending nearly to anterior end of rostrum and including 3 or 4 on carapace posterior to level of orbital margin and 1 situated above posterior margin of orbit, and ventrally with 6–10 teeth; carapace with blunt but nearly complete intermediate carina, anteriorly strong lateral carina fading out on posterior ½ of carapace, and short and blunt anterior antennal carina or buttress; abdomen unarmed and rounded dorsally but with broad median ridge on 3rd somite; antennal scale varying from about ½ to nearly ⅔ as long as carapace, blade reaching about as far as or slightly beyond distolateral spine; pereopods with longer member of 2nd pair having 20–23 articles in carpus, shorter one with 7–10, dactyl of 3rd pair from ⅙ to ⅕ as long as propodus, carpi of 3 posterior pairs armed with 2 or 3 spines on 3rd pair, 0–2 on 4th pair, and 0 on 5th, meri armed with 12–16 spines on 3rd pair, 11–16 on 4th, and 6–13 on 5th, ischia with 2 spines on 3rd pair, 1 or 2 on 4th, and 0 on 5th; maximum carapace length about 32 mm.

MATERIALS.—PHILIPPINES. Batangas Bay, southern Luzon: sta 5269; 13°39'50"N, 120°59'30"E; 402 m; fine sand, pebbles; 8 Jun 1908 (1334–1354); 12' Agassiz beam trawl, mud bag: 1♂ [30.8]. Cagayan Islands, Sulu Sea: sta 5424; 9°37'05"N, 121°12'37"E; 622 m; coral sand; 10.2°C; 31 Mar 1909 (1324–1344); 12'

Agassiz beam trawl, mud bag: 1♂ [21.2], 2♀ [23.1, 26.2].

INDONESIA. Ceram Sea south of Pulau Obi: sta 5635; 1°53'30"S, 127°39'00"E; 732 m; coral, rock, soapstone; 3 Dec 1909 (0956–1001); 12' Agassiz beam trawl: 1 ovig ♀ [23.2].

RANGE.—Known previously only from the two syntypes from the Banda Sea. The recorded bathymetric range is extended by the *Albatross* collections to 402–732 meters.

REMARKS.—In view of the generally consistent presence of the longer second pereopod on the left side in the species covered previously, it was somewhat surprising to find the longer member of the pair on the right side in three of the five specimens of *H. lepidus* taken by the *Albatross*.

14. *Heterocarpus longirostris* MacGilchrist, 1905

Heterocarpus longirostris MacGilchrist, 1905:237 [type-locality: Andaman Sea; 13°29'30"N, 95°29'E; 1756 meters; mud; bottom temperature 4.8°C (*Investigator* sta 310)].—Alcock and MacGilchrist, 1905, pl. 71: fig. 2.—Moffitt, 1983:435.

DIAGNOSIS.—Rostrum about 1¼ times as long as carapace in adults, armed dorsally with 13 teeth extending nearly to anterior end of rostrum and including 4 on carapace posterior to level of orbital margin, and ventrally with 12–14; carapace with strong and nearly complete intermediate and lateral carinae and obscure anterior antennal carina or buttress; abdomen acutely produced posteromesially on 3rd somite, with blunt dorsomesial ridge on 3rd to 6th somites; antennal scale about ⅔ as long as carapace, blade overreaching distolateral spine; pereopods with longer member of 2nd pair having 22 articles in carpus, shorter one with 8, 3rd pair with dactyl about ¼ as long as propodus; maximum carapace length at least 42 mm.

RANGE.—Maldive Islands, Andaman Sea, west of Sumatra, and Mariana Islands; 1097–1756 meters.

*15. *Heterocarpus sibogae* De Man, 1917

FIGURES 13m, 18–20

Heterocarpus ensifer.—Bate, 1888:638, pl. 112: fig. 4 [not *H. ensifer* A. Milne-Edwards, 1881].

Heterocarpus sibogae De Man, 1917:283 [type-locality: 8 stations in Indonesia between 115°E; and 133°E and between the equator and 8°S; 289 to 560 meters]; 1920:169, pl. 14: fig. 42.—Calman, 1939:206.

DIAGNOSIS.—Rostrum varying from twice as long as carapace in juveniles to occasionally less than $\frac{3}{4}$ as long as carapace in adults, with rather distinct lateral carina, armed dorsally with 9–26, usually 16–18, teeth extending to anterior end of rostrum and including 3–7, usually 5 or 6, on carapace above or posterior to orbital margin, and ventrally with 6–13, usually 10 or 11, teeth; carapace with nearly complete antennal and lat-

eral carinae and posterior intermediate carina; branchiostegal spine not overreaching antennal spine; abdomen with 2 anterior somites having sharp dorsal carina, 3rd and 4th carinate and armed with posteromesial tooth, 5th and 6th dorsally rounded and unarmed; antennal scale decreasing in relative length from more than $\frac{4}{5}$ of carapace length in juveniles to little more than $\frac{1}{2}$ as long as carapace in adults, blade converging toward lateral margin, falling far short of tip of distolateral spine; pereopods with longer member of 2nd pair having 17–30, most commonly 20, articles in carpus, shorter one with 6–11, usually 7 or 8, dactyl of 3rd pair from about $\frac{1}{3}$ to nearly $\frac{1}{2}$ as long as propodus, carpus of 3rd pair armed with 0–6, usually 2–4, spines, of 4th pair with 1–5, usually 2–4, and of 5th pair 1–6, usually 2–4, merus of 3rd pair armed with 11–

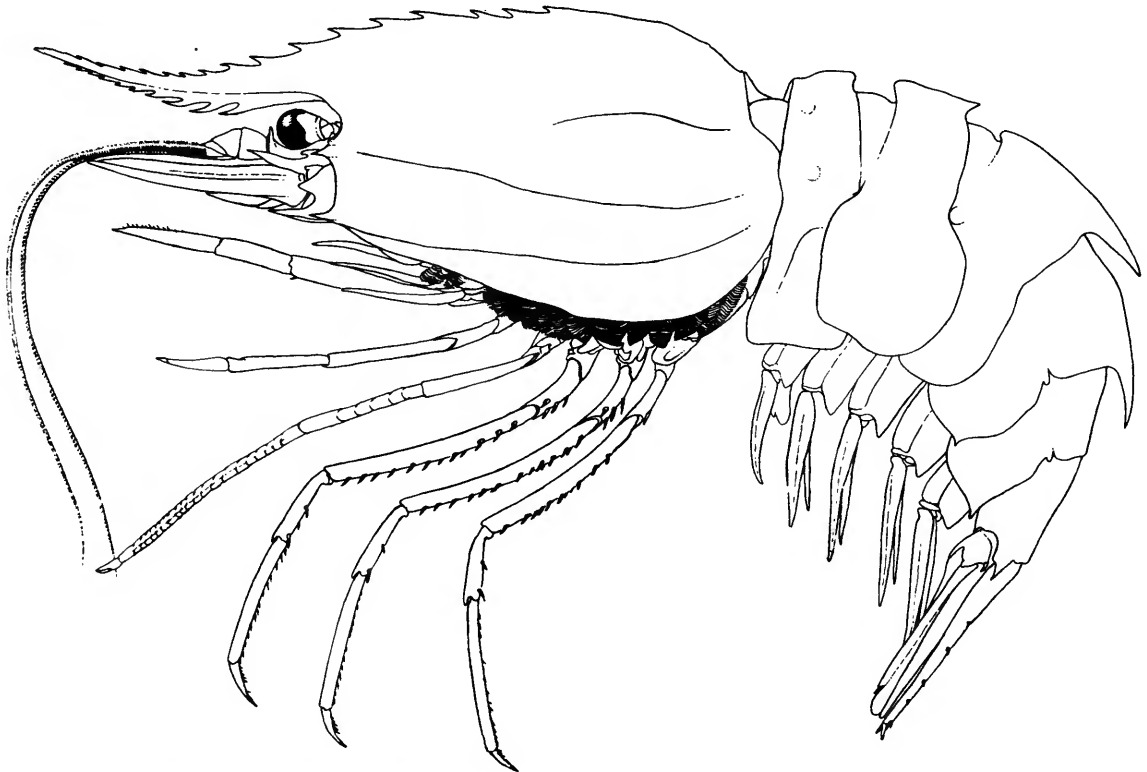


FIGURE 18.—*Heterocarpus sibogae*, male from Albatross sta 5289, carapace length 29.0 mm. (Magnification: $\times 2.0$.)

36, usually 14–20, spines, of 4th pair with 13–29, usually 15–19, and of 5th pair, 7–26, usually 10–20, ischium of 3rd pair armed with 1–10, usually 3 or 4, spines, of 4th pair with 1–7, usually 2–4, and of 5th pair 0–4, usually 0 or 1; maximum carapace length about 37 mm.

MATERIAL.—SOUTH CHINA SEA. Southeast of Hong Kong: sta 5317; 21°36'N, 117°27'E; 421 m; sand, small shells; 10.3°C; 5 Nov 1908 (1431–1451); 12' Tanner beam trawl, mud bag; 6♂ [10.8–31.7], 3♀ [19.2–29.8]; sta 5301; 20°37'N, 115°43'E; 380 m; gray mud, sand; 10.3°C; 8 Aug 1908 (1729–1749); 12' Agassiz beam trawl, mud bag: 1♂ [20.2], 1 ovig ♀ [28.1]; sta 5300; 20°31'N, 115°49'E; 485 m; gray mud, sand; 8 Aug 1908 (1429–1449); 12' Agassiz beam trawl, mud bag: 3♂ [26.0–27.2], 2♀ [18.0, 19.2].

PHILIPPINES. Babuyan Channel, north of Luzon: sta 5325; 18°34'15"N, 121°51'15"E; 410 m; green mud; 11.8°C; 12 Nov 1908 (1113–1132); 12' Tanner beam trawl, mud bag: 1♂

[18.6], 3♂ [17.7–29.7]; sta 5326; 18°32'30"N, 122°01'E; 421 m; mud; 13.0°C; 12 Nov 1908 (1328–1348); 12' Tanner beam trawl, mud bag: 5♂ [14.0–27.3], 3♀ [14.9–24.4]; sta 5327; 18°31'30"N, 122°03'E; 362 m; soft mud, fine sand; 12 Nov 1908 (1439–1459); 12' Tanner beam trawl, mud bag: 1♂ [26.0]; sta 5329; 18°33'N, 121°37'30"E; 388 m; blue mud; 10.8°C; 19 Nov 1908 (1125–1135); 12' Tanner beam trawl, mud bag: 3♂ [17.8–34.0], 4♀ [26.5–32.0]. South China Sea off western Luzon: sta 5441; 16°38'N, 119°57'18"E; 340 m; 11.2°C; 10 May 1909 (1547–1607); 25' Agassiz beam trawl: 2♀ [19.2, 29.8], 1 ovig [29.8], 1? [18.5]; sta 5440; 16°33'52"N, 119°52'54"E; 315 m; fine gray sand, globigerina; 11.8°C; 10 May 1909 (1401–1421); 12' Agassiz beam trawl, mud bag: 1♀ [18.8]; sta 5331; 15°36'45"N, 119°47'45"E; 326 m; sand, shells, mud; 12.6°C; 22 Nov 1908 (0841–0901); 12' Tanner beam trawl, mud bag: 2♂ [12.8, 30.7], 2♀ [12.8, 28.8].

Southwest of Lubang Islands: sta 5265; 13°41'15"N, 120°00'50"E; 247 m; sand, mud; 6 Jun 1908 (1109–1129); 12' Agassiz beam trawl, mud bag: 2♂ [12.8, 20.0], 2♀ [15.0, 16.7]. Western Verde Island Passage: sta 5281; 13°52'45"N, 120°25'E; 368 m; dark gray sand; 10.2°C; 18 Jul 1908 (1040–1100); 12' Agassiz beam trawl, mud bag: 4♂ [23.8–33.7]; sta 5282; 13°53'N, 120°26'45"E; 454 m; dark gray sand; 8.5°C; 18 Jul 1908 (1144–1204); 12' Agassiz beam trawl, mud bag: 3♀ [17.7–35.5], 2 ovig [28.0, 35.5].

Balayon Bay, southern Luzon: sta 5111; 13°45'15"N, 120°46'30"E; 432 m; green mud; 16 Jan 1908 (1508–1538); 12' Tanner beam trawl, mud bag: 1♂ [17.2], 5♀ [13.0–27.2]; sta 5112; 13°48'22"N, 120°47'25"E; 324 m; dark green mud; 11.3°C; 17 Jan 1908 (1433–1503); 12' Tanner beam trawl, mud bag: 4♂ [26.0–30.8], 3♀ [28.2–32.2], 2 ovig [32.0, 32.2]; sta 5113; 13°51'30"N, 120°50'30"E; 291 m; dark green mud; 17 Jan 1908 (1602–1612); 12' Tanner beam trawl, mud bag: 1♂ [31.0], 1 ovig ♀ [34.0]; sta 5116; 13°41'N, 120°47'05"E; 366 m; 10.1°C; 20 Jan 1908 (1513–1533); 12' Tanner beam trawl, mud bag: 1♂ [23.8], 3♀ [30.2–

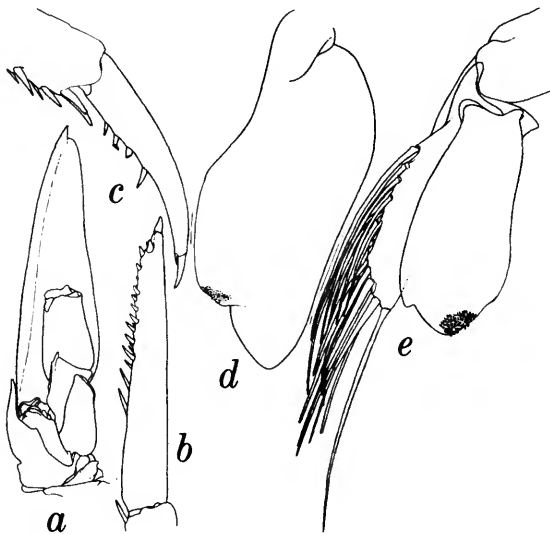


FIGURE 19.—*Heterocarpus sibogae*, male from *Albatross* sta 5289, carapace length 29.0 mm: a, right antennal scale, ventral aspect; b, terminal segment (denuded) of right 3rd maxilliped, lateral aspect; c, dactyl of right 3rd pereopod; d, endopod of right 1st pleopod; e, right appendix interna and appendix masculina. (Magnifications: a, $\times 2.6$; b, $\times 5.2$; c, d, $\times 10.8$; e, $\times 21.5$.)

35.2], 1 ovig [30.2], sta 5118; 13°48'45"N, 120°41'51"E; 291 m; dark green mud; 21 Jan 1908 (1100–1130); 12' Tanner beam trawl, mud bag: 8♂ [25.0–31.6], 6 ovig [26.5–28.5]; sta 5363; 13°47'20"N, 120°43'30"E; [329 m]; 20 Feb 1909 (0927–1042); 25' Agassiz beam trawl: 4♂ [29.3–32.0], 1♀ [30.2]; sta 5364 or 5365; 13°48'30"N, 120°43'45"E or 13°44'24"N, 120°45'30"E; [293 or 391 m]; 20 Feb 1909 (1440–1523) or 22 Feb 1909 (0904–0940); 25' Agassiz beam trawl: 5♂ [11.0–32.2], 5♀ [10.5–29.3], 1 ovig [29.3].

Batangas Bay, southern Luzon: sta 5268; 13°42'N, 120°57'15"E; 311 m; sand, pebbles; 8 Jun 1908 (1114–1134); 12' Agassiz beam trawl, mud bag: 15♂ [12.8–31.8], 5♀ [23.0–29.0], 4 ovig [24.3–29.0]; sta 5269; 13°39'50"N, 120°59'30"E; 402 m; fine sand, pebbles; 8 Jun 1908 (1334–1354); 12' Agassiz beam trawl, mud bag: 1♀ [12.8]; sta 5289; 13°41'50"N, 120°58'30"E; 315 m; broken shells, sand; 22 Jul 1908 (0925–0945); 12' Agassiz beam trawl, mud bag: 4♂ [11.2–31.2], 1 ovig ♀ [25.8]; sta 5297; 13°41'20"N, 120°58'E; [362 m]; [mud, sand]; 24 Jul 1908 (1355–1415); 12' Agassiz beam trawl, mud bag: 2♂ [26.3, 31.1], 4♀ [14.6–26.3], 3 ovig [25.8–26.3]; sta 5298; 13°43'25"N, 120°57'40"E; [256 m]; [sand]; 24 Jul 1908 (1509–1519); 12' Agassiz beam trawl, mud bag: 2♀ [21.0, 27.5], 1 ovig [27.5]. Verde Island Passage: sta 5292; 13°28'45"N, 121°01'12"E; 296 m; fine black sand; 11.3°C; 23 Jul 1908 (1437–1457); 12' Agassiz beam trawl, mud bag: 3♂ [28.8–32.0], 5♀ [23.3–31.3].

Tayabas Bay, southern Luzon: sta 5221; 13°38'15"N, 121°48'15"E; 353 m; green mud; 11.3°C; 24 Apr 1908 (1525–1545); 12' Agassiz beam trawl, mud bag: 2♀ [27.2, 31.0], 1 ovig [31.0]; sta 5222; 13°38'30"N, 121°42'45"E; 357 m; green mud; 11.6°C; 24 Apr 1908 (1649–1709); 12' Agassiz beam trawl, mud bag: 4♂ [27.3–31.7], 1♀ [30.8]; sta 5374; 13°46'45"N, 121°35'08"E; [348 m]; gray mud; 2 Mar 1909 (1157–1230); 12' Tanner beam trawl, mud bag: 2♂ [22.7, 25.0], 5♀ [23.0–31.3], 2 ovig [29.3, 31.3]. Tablas Strait, east of Mindoro: sta 5260;

12°25'35"N, 121°31'35"E; 428 m; green mud, sand; 10.8°C; 3 Jun 1908 (1532–1552); 12' Agassiz beam trawl, mud bag: 3♂ [13.6–18.2], 4♀ [14.0–15.0]. Lagonoy Gulf, east of southern Luzon: sta 5447; 13°28'N, 123°46'18"E; 567 m; green mud; 7.4°C; 4 Jun 1909 (0614–0635); 12' Agassiz beam trawl: 2♂ [21.8, 23.2]. Albay Gulf, east of southern Luzon; sta 5459; 13°10'21"N, 123°59'54"E; [368 m]; 8 Jun 1909 (1541–1601); 12' Agassiz beam trawl, mud bag: 1♀ [25.0] (variety).

East of southern Luzon; sta 5476; 12°-56'24"N, 124°25'24"E; 494 m; fine sand; 9.1°C; 24 Jun 1909 (1102–1128); 12' Agassiz beam trawl: 5♂ [24.0–31.5], 3♀ [25.8–27.0] (1 variety), 1? [25.9]. North of Samar: sta 5444; 12°43'51"N, 124°58'50"E; 564 m; green mud; 7.4°C; 3 Jun 1909 (1032–1049); 12' Agassiz beam trawl: 4♂ [24.0–30.3] 4♀ [25.2–33.8]; sta 5445; 12°44'42"N, 124°59'50"E; 700 m; green mud, sand; 6.8°C; 3 Jun 1909 (1201–1238); 12' Agassiz beam trawl: 1♂ [26.3], 3♀ [25.4–29.7], 2 ovig [25.4, 29.7]; sta 5446; 12°43'51"N, 124°59'18"E; 549 m; green mud; 3 Jun 1909 (1358–1426); 12' Agassiz beam trawl: 1♂ [26.7]. Bohol Strait, east of Cebu: sta 5198; 9°40'50"N, 123°39'45"E; 402 m; green mud; 12.2°C; 9 Apr 1908 (1125–1145); 12' Agassiz beam trawl, 3 mud bags; 2♂ [24.0, 25.4], 1 ovig ♀ [27.0].

Between Negros and Siquijor: sta 5536; 9°15'45"N, 123°22'00"E; 510 m; green mud; 11.9°C; 19 August, 1909 (1336–1356); 12' Tanner beam trawl: 2♂ [19.0, 30.0], 4♀ [20.0–32.3], 3 ovig [27.7–32.3]; sta 5537; 9°11'00"N, 123°23'00"E; 465 m; green mud; 11.9°C; 19 Aug 1909 (1539–1559); 12' Tanner beam trawl: 1♂ [23.7]. Macajaler Bay, northern Mindanao: sta 5501; 8°37'37"N, 124°35'E; 391 m; fine sand, gray mud; 12.4°C; 4 Aug 1909 (1428–1448); 12' Tanner beam trawl: 1 ovig ♀ [27.5]; sta 5502 or 5503; 8°37'37"N, 124°35'E or 8°36'26"N, 124°36'08"E; 391 or 413 m; fine sand, gray mud or green mud; (11.8°C); 4 Aug 1909 (1528–1548 or 1638–1658); 12' Tanner beam trawl: 1♂ [28.7], 1 ovig ♀ [25.2].

Western Mindanao Sea: sta 5518; 8°48'N,

123°31'E; 366 m; gray mud, globigerina; 12.2°C; 9 Aug 1909 (1255-1316); 12' Tanner beam trawl: 3♂ [15.8-30.0]; sta 5541; 8°49'-38"N, 123°34'30"E; 401 m; fine sand, broken shells; 11.8°C; 20 Aug 1909 (0551-0612); 12' Tanner beam trawl: 1♂ [28.2], 7♀ [22.3-32.0], 5 ovig [27.2-32.0]; sta 5542; 8°48'30"N, 123°35'30"E; 366 m; fine sand, broken shells; 12.4°C; 20 Aug 1909 (0656-0716); 12' Tanner beam trawl: 1♂ [20.3], 1♀ [22.8]. Western entrance to Mindanao Sea near Silino Island: sta 5523; 8°48'44"N, 123°27'35"E; depth ?; 10 Aug 1909 (1049-1109); 12' Tanner beam trawl, mud bag: 2♂ [25.2, 34.0], 6 ovig ♀ [28.8-36.3]. Davao Gulf, Mindanao: sta 5247; 7°02'N, 125°38'45"E; 247 m; mud; 18 May 1908 (0908-0928); 12' Agassiz beam trawl, mud bag: 8♂ [9.2-26.1], 7♀ [15.7-25.2], 2 ovig [25.0, 25.2].

West of Jolo Island, Sulu Archipelago: sta 5549; 6°01'15"N, 120°44'20"E; 481 m; sand, globigerina, Foraminifera; 11.3°C; 17 Sep 1909 (0936-0957); 9' Tanner beam trawl, mud bag: 2♂ [28.5, 32.3] 2 ovig ♀ [29.2, 35.0]; sta 5550; 6°02'00"N, 120°44'40"E; 472 m; fine sand, shells; 11.3°C; 17 Sep 1909 (1046-1114); 9' Tanner beam trawl: 2♂ [26.0, 28.5], 2 ovig ♀ [28.8, 33.0]; sta 5551; 5°54'48"N, 120°44'-24"E; 353 m; fine sand; 11.8°C; 17 Sep 1909 (1407-1427); 9' Tanner beam trawl: 5♂ [16.2-35.0], 1 ovig ♀ [29.5]. Near Usada Island, Sulu Archipelago: sta 5172; 6°03'15"N, 120°35'-30"E; 582 m; fine sand, shells; 5 Mar 1908 (1031-1051); 12' Agassiz beam trawl, mud bag: 2♀ [9.9, 11.3]. Southwest of Jolo Island, Sulu Archipelago: sta 5566; 5°52'12"N, 120°31'00"E; 446 m; fine sand shells; 11.4°C; 21 Sep 1909 (1407-1434); 9' Tanner beam trawl: 1 ovig ♀ [29.0].

INDONESIA. Celebes Sea off Sabah (North Borneo): sta 5590; 4°10'50"N, 118°39'35"E; 567 m; green mud, sand; 6.8°C; 29 Sep 1909 (0902-0923); 9' Tanner beam trawl, mud bag: 1♂ [17.0]. West of Halmahera: sta 5621; 0°15'-00"N, 127°24'35"E; 545 m; gray and black sand; 28 Nov 1909 (0950-1010); 12' Agassiz beam trawl, mud bag: 1 ovig ♀ [29.2] (variety);

sta 5622; 0°19'20"N, 127°28'30"E; 503 m; gray mud; 29 Nov 1909 (0803-0824); 12' Agassiz beam trawl, mud bag: 5♂ [8.2-28.5] 5♀ [8.7-31.8], 3 ovig [31.3-31.8]; sta 5623; 0°16'30"N, 127°30'00"E; 497 m; fine sand mud; 29 Nov 1909 (0922-0942); 12' Agassiz beam trawl: 1♂ [26.2], 5♀ [22.9-33.8], 4 ovig [25.2-33.8]; sta 5624; 0°12'15"N, 127°29'-30"E; 527 m; fine sand, mud; 29 Nov 1909 (1058-1118); 12' Agassiz beam trawl: 5♂ [10.0-31.0], 5♀ [10.0-16.7]; sta 5625; 0°07'00"N, 127°28'00"E; 421 m; gray mud, fine sand; 29 Nov 1909 (1416-1437); 12' Agassiz beam trawl: 1♀ [20.0] sta 5626; 0°07'30"N, 127°29'00"E; 485 m; gray mud, fine sand; 29 Nov 1909 (1534-1552); 12' Agassiz beam trawl: 1 ovig ♀ [26.2] (variety). South of Pulau Muna, Celebes: sta 5645; 5°29'06"S, 122°36'06"E; 377 m; 16 Dec 1909 (0954-0955); 12' Agassiz beam trawl: 2♀ [13.8, 27.8], 1 ovig [27.8] (variety).

RANGE.—Andaman Sea, eastward through Indonesia and the Philippines to southern Japan, and southward to Victoria, Australia, and New Caledonia, as well as the New Hebrides, Fijis and western Samoa (see "Remarks" regarding the occurrence of a varietal form at Belau, Caroline Islands); 247-700 meters.

REMARKS.—As noted by Calman (1939), this species is similar to *H. ensifer*. Its identity is further challenged by the form with less pronounced carinae on the two anterior abdominal somites, described and illustrated as *H. ensifer* by Bate (1888). Five of the 290 *Albatross* specimens assigned to this species belong to this varietal form, as noted in the material listed, but all four specimens in a lot of one male and three ovigerous females from the Belau Islands (Palau) recently received from W. Bruce Saunders, seem to belong to this variety. This form (Figure 20) seems to prolong into maturity the less developed abdominal carinae often observed in juvenile specimens, but it seems to differ in no other way from the typical features of *H. sibogae* (Figure 18). In an attempt to answer the question about the validity of the species justifiably raised by Calman, the *Albatross* specimens were compared

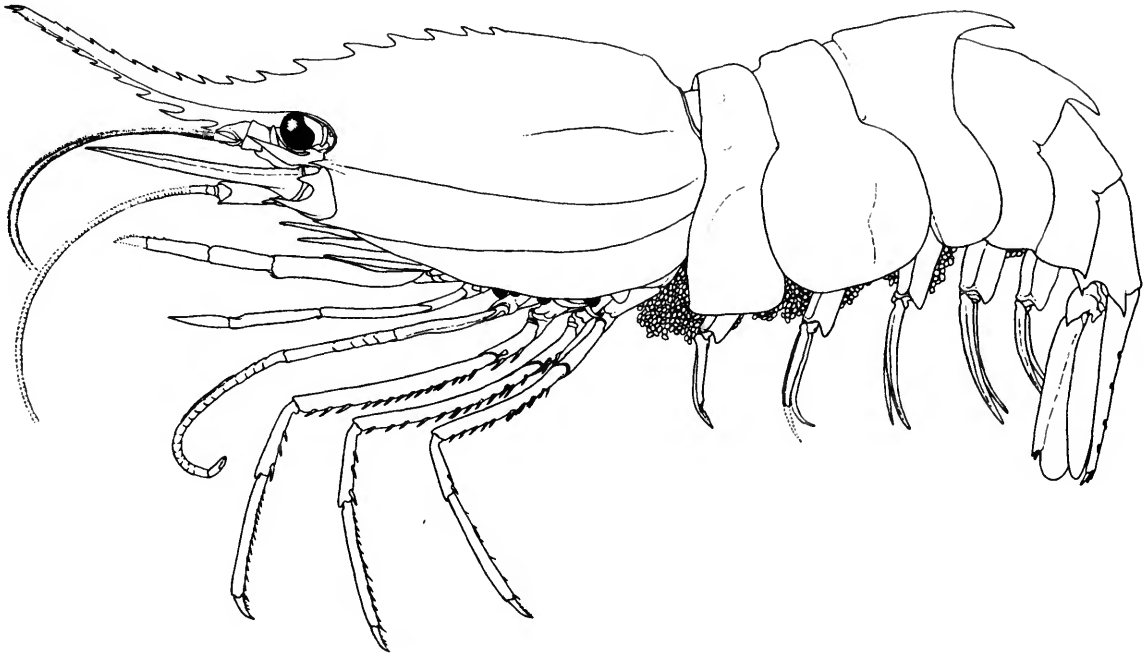


FIGURE 20.—*Heterocarpus sibogae*, variety, ovigerous female from *Albatross* sta 5621, carapace length 29.2 mm. (Magnification: $\times 1.7$.)

with those assigned to *H. ensifer parvispina* from the same collections, as well as with material of the same taxon randomly selected from the Hawaiian series obtained by the *Albatross* and with similarly selected western Atlantic examples of *H. e. ensifer*. Special emphasis was given to the two supplemental characters mentioned by De Man (1920:167): the relative height of the carapace and the extent of the carapace that is dorsally dentate. Although neither of these characters proved to be as constant as observed in De Man's more limited series, both of them showed sufficient quantitative differentiation to reinforce the distinctive feature represented by the presence or virtual absence of a dorsal carina on the two anterior abdominal somites.

In 288 specimens of *H. sibogae* measured, the carapace varies from 1.19 to 1.48 times as long as high, with a mean of 1.32 and a standard deviation of 4.78. The Philippine-Indonesian and Hawaiian material of *H. ensifer parvispina*

and western Atlantic specimens of *H. e. ensifer* seem to display similar carapace proportions, and the three populations were therefore treated as one for comparative purposes. In 115 specimens measured from these three areas, the carapace length/height ratio varies from 1.29 to 1.57, with a mean of 1.41 and a standard deviation of 5.41.

In 290 specimens of *H. sibogae*, from 40 to 62 per cent of the dorsal margin of the carapace is dentate, with a mean of 51 per cent and a standard deviation of 4.14. In 114 specimens of both subspecies of *H. ensifer*, on the other hand, 33 to 49 per cent of the carapace is dentate, with a mean of 42 per cent and a standard deviation of 2.87. In *H. sibogae*, 206, or more than 70 per cent, of the 290 specimens analyzed have dorsal teeth on more than half of the dorsal margin of the carapace, whereas none of the 114 specimens of *H. ensifer* have teeth on the posterior half.

Perhaps of some indeterminate concern is an indication that the variability in the extent of the

dentition on the carapace of *H. sibogae* is not uniform throughout the range of the species. In 35 specimens taken at stations 5300, 5301, and 5317 in the South China Sea southeast of Hong Kong, at station 5331 west of Luzon, and at station 5247 in Davao Gulf, Mindanao, only 42 to 52 per cent of the dorsal margin of the carapace is dentate, and more than half of this margin is unarmed in no less than 31 of the 35 specimens. In other words, if the material from the South China Sea and the Gulf of Davao was disregarded, the differences between the two species would be more sharply defined. On the other hand, if only specimens from those areas were considered, the differences, although still present, would be less marked.

As anticipated, the analysis of the extended series obtained by the *Albatross* has increased the known variability of *H. sibogae*, but there is still ample justification for treating it as a species distinct from *H. ensifer*.

In contrast with the virtual absence of "left-handed" individuals in *H. gibbosus* is the situation with *H. sibogae*. Of the 284 specimens of *H. sibogae* on which at least one of the second pereopods is intact, no less than 86 (30 per cent) have the longer and more slender member of the pair on the right side, rather than on the left. This anomaly was found in all of the populations sampled but—like the dentition on the carapace—it seems to be especially prevalent at some stations; 10 of the 16 specimens taken at the three stations southeast of Hong Kong are "left-handed," as are 11 of 20 from station 5268 in Batangas Bay, southern Luzon.

*** 16. *Heterocarpus tricarinatus* Alcock and Anderson, 1894**

FIGURE 130

Heterocarpus tricarinatus Alcock and Anderson, 1894:154 [type-locality: Arabian Sea off Byramgore Reef, Laccadive Islands; 12°05'35"N, 71°35'50"E; 1582–1609 meters].—Alcock and McArdle, 1901, pl. 51: fig. 1.—De Man, 1920: 161, pls. 13: figs. 38a–d; 14: fig. 38.—Calman, 1939:204 [part ?].

DIAGNOSIS.—Rostrum varying from about $\frac{2}{3}$ as long to nearly as long as carapace in adults, with sharp lateral carina over nearly entire length, armed dorsally with 12–15 teeth extending to anterior end of rostrum and including 5 or 6 teeth on carapace posterior to level of orbital margin and often 1 situated directly above orbital margin, and ventrally with 7–10 teeth; carapace with blunt but nearly complete intermediate carina, sharp lateral carina disappearing on posterior $\frac{1}{2}$ of carapace, and short antennal carina or buttress; abdomen unarmed, rounded dorsally on 2 anterior somites, with blunt median ridge on 3rd and faint ridges on 4th and 5th; antennal scale about $\frac{1}{2}$ as long as carapace, blade considerably overreaching distolateral spine; pereopods with longer member of 2nd pair having 20–25 articles in carpus, shorter one with 6–8, dactyl of 3rd pair from about $\frac{1}{3}$ to more than $\frac{2}{3}$ as long as propodus; carpi of 3 posterior pairs armed with 2 or 3 spines on 3rd pair and 1 or 2 on 4th and 5th pairs, meri armed with 11–17 spines on 3rd pair, 12–15 on 4th, and 5–8 on 5th, ischia with 2 spines on 3rd and 4th pairs and none on 5th; maximum carapace length more than 35 mm.

MATERIAL.—PHILIPPINES. Northern Palawan Passage: sta 5349; 10°54'N, 118°26'20"E; 1335 m; coral, sand; 4.8°C; 27 Dec 1908 (1340–1400); 12' Tanner beam trawl, mud bag: 2♂ [12.0, 29.0].

INDONESIA. Molucca Sea: sta 5601; 1°13'–10"N, 125°17'05"E; 1399 m; sand, globigerina, pteropods; 13 Nov 1909 (1418–1439); 12' Agassiz beam trawl, mud bag: 1♀ [10.0]. Teluk Tomini, Celebes: sta 5606; 0°16'28"N, 121°33'30"E; 1525 m; 17 Nov 1909 (1007–1027); 12' Agassiz beam trawl: 1♂ [20.5], 2♀ [28.3, 35.7]; sta 5607; 0°04'00"S, 121°36'–00"E; 1392 m; fine sand; 18 Nov 1909 (0920–0940); 12' Agassiz beam trawl: 1♂ [23.7], 1♀ [24.8].

RANGE.—South Africa to Indonesia and the southern Philippines; 1046–2000 meters.

REMARKS.—With good reason, Calman (1939:205) questioned the distinctions used by

most authors to separate this species from *H. gibbosus* because all of the characters used are subject to considerable variation. I encountered the same problem in identifying the *Albatross* material, but the probability that two species are represented was indicated by the fact that, of the 362 specimens in question, 354 were found in depths shallower than 775 meters, while the remaining eight were taken from more than 1335 meters. I finally noticed that all eight of the deepwater specimens have a prominent, sharp, lateral carina on the rostrum, whereas the rostrum of the shallower form bears only a low, rounded, lateral ridge. If this character proves to be reliable, there would seem to be little doubt that *H. gibbosus* is confined to depths above 800 meters, and that *H. tricarinatus* is usually found between 1000 and 2000 meters. If true, the John Murray Expedition material that prompted Calman's query probably represented both species: 11 specimens of *H. gibbosus* from stations 115 and 145E, and 18 specimens of *H. tricarinatus* from stations 54, 62, 162, and 185.

Unfortunately, there is still an apparently insoluble problem regarding the true identity of *H. gibbosus*. That species was proposed by Bate (1888:634) for a species based on a single, probably immature, specimen with a carapace length of 16 mm from a depth of 700 fathoms (1280 meters) in the Philippine Sibuyan Sea. The possibility that this specimen represents the deepwater species subsequently called *H. tricarinatus* by Alcock and Anderson, rather than the shallower water form to which the name *H. gibbosus* has generally been applied, is suggested by what appears to be a lateral rostral carina in Bate's illustration (pl. 112: fig. 2). On the other hand, the same figure indicates that the lateral carina of the carapace is considerably more extensive than it usually is in the deepwater species. A simple examination of the unique holotype of *H. gibbosus* should suffice to settle this problem, but Calman (1939:205) reported that the specimen "is not now in a condition to supply any information." On the chance that enough of the rostrum might remain to show the presence or

absence of a lateral carina, I asked C.E. Dawson of the Gulf Coast Research Laboratory, Ocean Springs, Mississippi, to look at Bate's type-specimen during a visit to the British Museum (Natural History). He graciously compiled but subsequently reported: "The specimen lacks all trace of rostrum, eyes, antennae, etc., is largely decalcified and, I strongly suspect, useless for taxonomic purposes." In view of this regrettable development, there would seem to be no reasonable alternative to the retention of the concepts that have been attributed to the names *H. gibbosus* and *H. tricarinatus* in the past.

* 17. *Heterocarpus woodmasoni* Alcock, 1901

FIGURE 13q

Heterocarpus Wood-masoni Alcock, 1901:108 [type-locality: Andaman Sea; 485 meters].—De Man, 1920:156, pl. 13: fig. 36.

Heterocarpus wood-masoni.—Alcock and McArdle, 1901, pl. 51: fig. 2.

Heterocarpus Wood-Masoni.—Calman, 1939:204.

DIAGNOSIS.—Rostrum varying from more than twice as long as carapace in juveniles to slightly longer than carapace in adults, without lateral carina, armed dorsally with 7–12, usually 10 or 11, teeth extending nearly to anterior end of rostrum and including 1 or, usually, 2 on carapace above or posterior to level of orbital margin, and ventrally with 4–9, usually 7 or 8, teeth; carapace with nearly complete antennal and lateral carinae, branchiostegal spine not overreaching antennal spine; abdomen with 2 anterior somites dorsally rounded, 3rd, 4th, and 5th carinate mesially, 6th with paired longitudinal carinae, 3rd somite with median tooth near midlength, but no somites with posteromesial teeth; antennal scale decreasing in relative length from about $\frac{2}{3}$ or more of carapace length in juveniles to little more than $\frac{1}{2}$ as long as carapace in adults, blade distally convex and reaching well beyond distolateral spine; pereopods with longer member of 2nd pair having 20–26, usually 22–26, articles in carpus, shorter one with 9–12, most commonly 10, articles, dactyl of 3rd pair

from $\frac{1}{2}$ to more than $\frac{2}{3}$ as long as propodus, carpus of 3rd pair armed with 0–7, usually 4 or 5, spines, of 4th pair with 1–7, usually 2–5, and of 5th pair, 0–7, merus of 3rd pair armed with 8–18, usually 10–14, spines, of 4th pair with 6–18, usually 12–15, and of 5th pair, 3–12, usually 9–11, ischium of 3rd pair armed with 1–4, usually 2, spines, of 4th pair with 2 or 3, usually 2, and of 5th pair, invariably unarmed; maximum carapace length about 35 mm.

MATERIAL.—SOUTH CHINA SEA. Southeast of Hong Kong: sta 5301; $20^{\circ}37'N$, $115^{\circ}43'E$; 380 m; gray mud, sand; $10.3^{\circ}C$; 8 Aug 1908 (1729–1749); 12' Agassiz beam trawl, mud bag: 9♂ [12.3–31.0], 3♀ [21.0–27.0], 2 ovig [25.1, 27.0].

PHILIPPINES. Balayan Bay, southern Luzon: sta 5118; $13^{\circ}48'45"N$, $120^{\circ}41'51"E$; 291 m; dark green mud; 21 Jan 1908 (1100–1130); 12' Tanner beam trawl, mud bag: 10♂ [12.6–32.8], 2♀ [11.0, 27.0]. Albay Gulf, east of southern Luzon: sta 5459; $13^{\circ}10'21"N$, $123^{\circ}59'54"E$; [368 m]; 8 Jun 1909 (1541–1601); 12' Agassiz beam trawl, mud bag: 5♂ [22.3–28.0], 2 ovig ♀ [25.0, 27.7]. East of southern Luzon: sta 5476; $12^{\circ}56'24"N$, $124^{\circ}25'24"E$; 494 m; fine sand; $9.1^{\circ}C$; 24 Jun 1909 (1102–1128); 12' Agassiz beam trawl: 1y♂ [10.2]. West of Jolo Island, Sulu Archipelago: sta 5551; $5^{\circ}54'48"N$, $120^{\circ}44'24"E$; 353 m; fine sand; $11.8^{\circ}C$; 17 Sep 1909 (1407–1427); 9' Tanner beam trawl: 5♂ [19.2–29.3], 1♀ [22.0].

INDONESIA. West of Halmahera: sta 5620; $0^{\circ}21'30"N$, $127^{\circ}16'45"E$; 655 m; gray mud; 28 Nov 1909 (0624–0645); 12' Agassiz beam trawl: 1 juv [8.0]. South of Pulau Muna, Celebes; sta 5645; $5^{\circ}29'06"S$, $122^{\circ}36'06"E$; 377 m; 16 Dec 1909 (0954–0955); 12' Agassiz beam trawl: 2♀ [14.2, 32.8], 1 ovig [32.8].

RANGE.—Eastern Africa (?) and Andaman Sea through Indonesia and the Philippines to the South China Sea; 291–655 meters.

REMARKS.—Calman (1939:204) noted that specimens from the Zanzibar region off eastern Africa have the gastric area “much more elevated than in de Man's figures” and only two pairs of dorsal spinules on the telson in addition to the

posterior pair. In none of the *Albatross* specimens is the carapace convex to this implied extent, and in most of them there are four pairs of lateral spines on the telson anterior to the posterior pair. In one specimen, there are no lateral spines anterior to the posterior pair, in one there is one pair, in two there are two pair, in three there are three spines on at least one side, in four specimens there are five pairs, and in one there are six on one side and eight on the other. If the eastern African specimens consistently have only two pairs of lateral spines in advance of the posterior pair, they may represent a subspecies with a more vaulted carapace.

* *Plesionika* Bate, 1888

Plesionika Bate, 1888:626, 640 [type-species, selected by Alcock, 1901:93: *Plesionika uniproducta* Bate, 1888:641 (= *Acanthephyra ensis* A. Milne-Edwards, 1881:14); gender: feminine].

Nothocaris Bate, 1888:626, 650 [type-species, selected by Fowler, 1912:551: *Nothocaris rostricrescentis* Bate, 1888:653; gender: feminine].

Parapandalus Borradaile, 1899:411 [type-species, selected by Alcock, 1901:94: *Pandalus (Parapandalus) serratifrons* Borradaile, 1899:411; gender: masculine].

DIAGNOSIS.—Rostrum immovably attached to remainder of carapace, armed with at least some fixed teeth on both margins; carapace without supraorbital spine or lateral carinae, dorsally carinate anteriorly, rounded posteriorly; abdomen with 3rd somite unarmed or bearing fixed posteromesial tooth; eye with cornea wider than eyestalk; 2nd maxilliped with terminal segment wider than long; 3rd maxilliped with exopod; pereopods with 2nd pair having carpus divided into more than 3 articles.

RANGE.—Virtually all tropical and subtropical and some temperate seas; 14 to 1463 meters, infrequently pelagic.

REMARKS.—The genus *Parapandalus*, proposed as a subgenus by Borradaile (1899:411) on a false premise (“Rostrum . . . armed above and below with movable spines”) and subsequently retained for those pandalids that differ from *Plesionika* in lacking strap-like epipods on the

pereopods, hardly seems tenable any longer and it is here abandoned as virtually meaningless phylogenetically.

If there were reasonably constant correlation between the absence of pereopodal epipods and serrate rostral margins, like those in the *Parapandalus narval* (Fabricius, 1787) group of species, there would be ample justification for continued recognition of the genus, but even one of the three species originally included in the genus, *P. longirostris* (= *P. edwardsii*), bridges that gap, both in the disposition of the teeth on the rostral crest and the reduced epipods on the four anterior pairs of pereopods.

Although most of the species of *Plesionika* (sensu stricto) have well-developed epipods on the four anterior pairs of pereopods, there are several exceptions in addition to the vestigial pereopodal epipods in *P. edwardsii*. In *P. intermedia*, there are epipods on only the three anterior pairs of pereopods, and, in *P. exigua* and *P. minor*, epipods are confined to the two anterior pairs. Even in species assignable to *Parapandalus*, some—like *P. narval*, *P. pacifica*, and *P. serratifrons*—have an epipod on the third maxilliped, while others—like *P. grandis* and *P. quasigrandis*—do not.

Similarly, in addition to *P. edwardsii*, *P. indica* has rostral teeth almost as numerous and close-set as those in typical *Parapandalus*, yet it has well-developed epipods on all four anterior pairs of pereopods. *Plesionika simulatrix*, on the other hand, agrees with typical members of the *P. martia* group in lacking dorsal teeth over most of the length of the rostrum and in having a truncately triangular ocellus, yet it lacks epipods on all appendages posterior to the third maxillipeds.

At some future time, there may be a valid reason to separate a group of species allied to *P. serratifrons*, the type-species of *Parapandalus*, from those related to *P. ensis*, the type-species of *Plesionika*, but I doubt that such a dichotomy will be related to the presence or absence of epipods, and it seems to me that little is gained by retaining that concept for the present. On the other hand, even though I doubt that a "natural" cleav-

age is defined by the presence or absence of epipods, I do not hesitate to use that character as a primary means of subdividing the genus in the artificial key offered below.

It should be noted that one of the species previously assigned to *Parapandalus* is considered to be generically distinct from *Plesionika*; it is dealt with below as *Stylopandalus richardi*, with which *Pandalus* (*Plesionika*) *gracilis* Borradaile, 1915, is synonymized.

Burukovsky (1981:42) proposed the subdivision of the genus *Plesionika* (sensu stricto) into two subgenera on the basis of the form of the second pair of pereopods. He suggested that the nominal subgenus be reserved for the 25 species in which the second pereopods are subequal and similar and that the generic name *Nothocaris* Bate, 1888, be revived for the 13 species in which the second pereopods are clearly unequal and dissimilar. This proposal seems to me to have more merit than the division of *Parapandalus* from *Plesionika* because it is based on a more nearly constant character that has been used previously to advantage in a parallel case, to separate *Heterocarpoides* from *Heterocarpus*; the fact that Bate (1888: 626) indicated that the second pereopods are unequal in both *Plesionika* and *Nothocaris* has no real bearing on the matter. The only reason that I am not adopting Burukovsky's proposal immediately and extending it to include the species formerly assigned to *Parapandalus*—in which both forms of second pereopods also occur—is a practical one: the pereopods in *Plesionika* are often lost at the time of capture or subsequently, making generic, or subgeneric, identification difficult in the absence of characters other than the form of the second pereopods. Perhaps further study will eventually reveal one or more additional, correlated characters that will give practical importance to Burukovsky's proposal.

Of the approximately 65 described species that might conform with the concept of the genus *Plesionika* herein suggested, a few may eventually fall into synonymy, but at least one, *Pandalus brevis* Rathbun, 1906:916, must be excluded

from the genus. That species was based on two imperfect Hawaiian specimens. The male holotype from *Albatross* station 4180 is, as noted by Rathbun, "nearest to the European *P. brevirostris* Rathke" (= *Pandalina brevirostris*). As in that species, there is no exopod on the remnant of the third maxilliped on the left side of the holotype. Unfortunately, Rathbun wrote, "Outer maxilliped with exopod.", presumably because there is a well-developed exopod on both third maxillipeds of the paratype female from *Albatross* station 4139. On the basis of this misstatement, De Man (1920:105, 114) justifiably transferred the species to the genus *Plesionika*. Actually, *Pandalus brevis* does not seem to fit any of the current generic concepts in the Pandalidae. The holotype has well-developed arthrobranchs at the bases of the four anterior pairs of pereopods, which are lacking in *Pandalina*, and the posterior lobe of the scaphognathite of the second maxilla is broadly rounded, rather than acutely produced, as in *Pandalus*, or truncate, as in *Austropandalus*. All 12 of the dorsal rostral teeth of the holotype seem to have basal sutures, although the latter become increasingly obscure anteriorly, so perhaps the species could remain in the genus *Pandalus*, in which all of the dorsal rostral teeth are movable.

The female paratype of *P. brevis* is in considerably worse condition than the holotype; the posterior 3/4 of the carapace is macerated and all of the pereopods are missing. Superficially, however, the paratype resembles the holotype. The rostrum is nearly identical with that of the latter;

it, too, bears 12 dorsal teeth, but the anterior-most lacks a basal suture. The remnants of the appendages, however, especially the mouthparts, are very different from those of the holotype. The four anterior pairs of pereopodal stumps not only bear epipods (much smaller and less distinct than those in the holotype) but well-developed exopods on all four bases. The mouthparts resemble those described for *Lipkius holt-huisi* Yaldwyn, 1960:16. Although the adult female holotype of that species has only rudimentary exopods on the three anterior pairs of pereopods, a presumed postlarva assigned to the same species has well-developed exopods on the four anterior pairs of pereopods. I am reasonably satisfied, therefore, that the female paratype of *Pandalus brevis* probably represents an undescribed species of the rhynchocinetid genus *Lipkius*.

Thanks to the kind cooperation of the late Dennis M. Devaney of the Bernice P. Bishop Museum, I have been able to examine three paratypes of *Plesionika pacifica* and two additional Hawaiian specimens of the same species. Not surprisingly, the specimens lack epipods on all of the pereopods and otherwise closely resemble *P. serratifrons*. The proportionately longer sixth abdominal somite and, especially, the greater difference in length between the two distal segments of the third maxilliped, however, combined with the apparently smaller size of the Hawaiian form, seems to justify the continued recognition of Edmondson's species as a distinct taxon for the time being.

Key to Pacific and Indian Ocean Species of *Plesionika*

1. Without strap-like epipods on coxae of any pereopods 2
 Strap-like epipods (sometimes obscure) on at least 2 anterior pairs of
 pereopods 14
2. Rostrum barely reaching or slightly overreaching level of distal end of
 antennal scale 3
 Rostrum far overreaching antennal scale 5
3. Rostrum with subapical dorsal tooth; 2nd pair of pereopods unequal,

- right member with 22 carpal articles, left with 7
- *P. gracilis* (Zarenkov, 1971:187)
(Western South China Sea; 38 meters)
- Rostrum completely unarmed dorsally in anterior 1/2; 2nd pair of pereopods subequal, with 12–15 carpal articles 4
4. Two posterior pairs of pereopods with 3 distal segments very long, thread-like *P. filipes* (Calman, 1939:202)
[probably a synonym of *P. persica*]
(Red Sea and South Arabian coast; 0–2500 meters (mesopelagic))
- Two posterior pairs of pereopods very long but possibly not thread-like *P. persica* (Kemp, 1925:273)
(Gulf of Oman; 477–1362 meters)
5. Third maxilliped with 2 distal segments subequal
- *P. costelloi* (Yaldwyn, 1971:91)
(Bay of Plenty, New Zealand; 119–220 meters)
- Third maxilliped with penultimate segment longer than terminal one 6
6. Rostrum with dorsal margin armed with closely set teeth, serrate 7
- Rostrum with dorsal teeth widely spaced or absent anterior to basal crest 13
7. Rostrum with ventral teeth spaced noticeably wider apart than dorsal ones 8
- Rostrum with ventral teeth spaced subequally to dorsal ones 9
8. Rostrum with nearly 70 dorsal teeth, more than 40 ventral
- *P. multispinosus* (Zarenkov, 1971:185)
Off Easter Island; 80–150 meters)
- Rostrum with less than 50 dorsal teeth, 22–31 ventral
- *P. spinipes* Bate, 1888:646
(North of New Guinea; 274 meters)
9. Three posterior pairs of pereopods with carpi and propodi thread-like, swollen at distal ends *P. tenuipes* (Borradaile, 1899:412)
[not *Pandalus tenuipes* Smith, 1881]
(New Britain and New Guinea)
- Three posterior pairs of pereopods not thread-like, carpi and propodi not swollen distally 10
10. Fourth abdominal somite without marginal denticle on pleuron; 6th somite 2–3 times as long as high; telson usually shorter or little longer than 6th somite; ocellus subcircular or transversely oval; 3rd maxilliped with strap-like epipod 11
- Fourth abdominal somite with marginal denticle on pleuron; 6th somite no more than twice as long as high; telson distinctly longer than 6th somite; ocellus longitudinally oval; 3rd maxilliped without epipod . 12
11. Sixth abdominal somite nearly or more than 2½ times as long as high; telson about 4/5 as long as 6th somite; 3rd maxilliped with penultimate

- segment less than $1\frac{2}{5}$ times as long as terminal segment; smallest ovigerous female with carapace length of 8.4 mm
 *P. pacifica* Edmondson, 1952:67
 (Hawaii; 180–195 meters)
- Sixth abdominal somite seldom more than $2\frac{1}{4}$ times as long as high; telson nearly as long as or slightly longer than 6th somite; 3rd maxilliped with penultimate segment more than $1\frac{1}{2}$ times as long as terminal segment; smallest ovigerous female with carapace length of 10.0 mm *42. *P. serratifrons*
12. Rostrum with 10–31 ventral teeth; 3rd maxilliped with penultimate segment more than $1\frac{1}{2}$ times as long as terminal segment *26. *P. grandis*
 Rostrum with 32–44 ventral teeth; 3rd maxilliped with penultimate segment less than $1\frac{1}{2}$ times as long as terminal segment *38. *P. quasigrandis*, new species
13. Rostrum with dorsal teeth distributed over entire length; abdomen with 6th somite less than twice as long as high; ocellus longitudinally oval; stylocerite sharp, barely overreaching dorsal margin of 1st antennular segment; antennal scale less than $4\frac{1}{2}$ times as long as wide; 3rd pereopod overreaching antennal scale by more than combined lengths of 3 distal segments; exopod of 3rd pleopod less than $\frac{2}{3}$ as long as carapace *P. adensameri* (Balss, 1914c:134; 1915:18)
 (Red Sea to Maldives; 457–1308 meters)
- Rostrum unarmed anterior to basal crest; abdomen with 6th somite more than twice as long as high; ocellus truncately triangular; stylocerite blunt, distinctly overreaching dorsal margin of 1st antennular segment; antennal scale more than $4\frac{1}{2}$ times as long as wide; 3rd pereopod overreaching antennal scale by lengths of dactyl, propodus, and part of carpus; exopod of 3rd pleopod more than $\frac{2}{3}$ as long as carapace *43. *P. simulatrix*, new species
14. Three posterior pairs of pereopods without strap-like epipods 15
 Third pair of pereopods with strap-like epipods 16
15. Rostrum unarmed dorsally over much of length, except for 2 subapical teeth; teeth on basal crest bluntly barbed terminally
 *P. exigua* (Rathbun, 1906:916)
 (Hawaii; 73–426 meters)
- Rostrum with dorsal teeth distributed over entire length; teeth on basal crest tapering to sharp point *P. minor* Calman, 1939:199
 (Gulf of Oman; 210 meters)
16. Fourth pair of pereopods without strap-like epipods
 *28. *P. intermedia*, new species
 Four anterior pairs of pereopods with strap-like epipods (reduced and obscure in *P. edwardsii*) 17
17. Teeth on rostral crest bluntly barbed terminally 18
 Teeth on rostral crest tapering to sharp point 19
18. Rostrum armed dorsally with 9 or 10 dorsal teeth, including 2 or 3 on

- carapace posterior to level of orbital margin; stylocerite reaching at least as far as distal margin of 1st antennular segment
- *P. mexicana* Chace, 1937:112
(Southern California to Ecuador; 28–258 meters)
- Rostrum armed dorsally with 6 teeth, including 1 on carapace posterior to level of orbital margin; stylocerite falling far short of distal margin of 1st antennular segment *37. *P. pumila*, new species
19. Abdomen with acute posteromesial tooth on 3rd somite 20
Abdomen with tergum of 3rd somite evenly rounded and unarmed posteriorly 22
20. Rostrum dentate dorsally over entire length; ocellus subcircular; 3rd pereopod with combined lengths of 3 distal segments more than 1½ times carapace length; maximum carapace length about 13 mm *44. *P. spinensis*, new species
- Rostrum dorsally unarmed anterior to dorsal crest, except for subapical tooth; 3rd pereopod with combined lengths of 3 distal segments about equal to carapace length; maximum carapace length about 20 mm 21
21. Third abdominal somite with posteromesial tooth not recurved dorsally; 3rd pereopod with dactyl usually less than ¼ as long as propodus *P. ensis* (A. Milne-Edwards, 1881:14)
(Eastern and western Atlantic; 230–732 meters; Indian Ocean (?))
- Third abdominal somite usually with posteromesial tooth recurved dorsally; 3rd pereopod with dactyl usually more than ¼ as long as propodus * 39. *P. reflexa*, new species
22. More than 25 teeth closely set on dorsal margin of rostrum and carapace 23
Fewer than 20 teeth less closely set on dorsal margin of rostrum and carapace 24
23. One to 3 teeth of dorsal rostral series arising from carapace posterior to level of orbital margin; 4th abdominal somite without marginal denticle on pleuron; 6th abdominal somite 1¾ or more times as long as high; telson little longer than 6th somite; 3rd maxilliped with penultimate segment subequal to terminal segment; 4 anterior pairs of pereopods with vestigial epipods; 2nd pereopods with 21–25 carpal articles; 3rd pereopod with carpus about as long as propodus * 24. *P. edwardsii*
- Four to 6 teeth of dorsal rostral series arising from carapace posterior to level of orbital margin; 4th abdominal somite with marginal denticle on pleuron; 6th abdominal somite about 1½ times as long as high; telson more than 1½ times as long as 6th somite; 3rd maxilliped with penultimate segment at least 1⅕ times as long as terminal segment; 4 anterior pairs of pereopods with prominent epipods; 2nd pereopods with 31–34 carpal articles; 3rd pereopod with carpus more than twice

- as long as propodus * 27. *P. indica*
24. Telson bearing 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines 25
 Telson bearing 5 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines 42
25. Rostrum ventrally unarmed or with obscure ventral serrations 26
 Rostrum with series of distinct ventral teeth 28
26. Rostrum completely unarmed ventrally
 *P. hypanodon* Doflein, 1902:615
 (Sagami Bay, Japan)
 Rostrum with obscure serrations on ventral margin 27
27. Three or 4 posteriormost teeth of dorsal rostral series forming cluster of movable spines on carapace posterior to orbital margin
 * 18. *P. acinacifer*, new species
 None of dorsal rostral teeth movable 23. *P. brevirostris*
28. Fourth and 5th abdominal somites with marginal tooth on pleuron . . 29
 Fourth abdominal somite without marginal tooth on pleuron 35
29. Third abdominal somite sharply carinate in dorsal midline
 * 46. *P. unidens*
 Third abdominal somite sometimes compressed but without sharp dorsal carina 30
30. Posterior teeth of dorsal rostral series forming distinct crest dorsal and posterior to orbit 31
 No prominent crest at base of rostrum 32
31. Rostrum dentate dorsally throughout length; stylocerite not overreaching 2nd segment of antennular peduncle; shorter 2nd pereopod with more than 40 carpal articles; 3rd pereopod with dactyl more than $\frac{1}{4}$ as long as propodus * 31. *P. lophotes*, new species
 Rostrum unarmed dorsally anterior to basal crest, except for 2 subapical teeth; stylocerite overreaching 2nd segment of antennular peduncle; shorter 2nd pereopod with 17–21 carpal articles; 3rd pereopod with dactyl less than $\frac{1}{5}$ as long as propodus * 40. *P. rostricrescentis*
32. Telson less than $1\frac{1}{4}$ times as long in midline as 6th abdominal somite; 3rd pereopod with dactyl more than $\frac{1}{2}$ as long as propodus
 * 29. *P. izumiae*
 Telson more than $1\frac{1}{4}$ times as long in midline as 6th abdominal somite; 3rd pereopod with dactyl less than $\frac{1}{2}$ as long as propodus 33
33. Third pereopod with dactyl about $\frac{1}{5}$ as long as propodus
 20. *P. assimilis*
 Third pereopod with dactyl more than $\frac{1}{5}$ as long as propodus 34
34. Shorter 2nd pereopod with more than 25 carpal articles; 3rd pereopod with dactyl more than $\frac{1}{3}$ as long as propodus 22. *P. binoculus*
 Shorter 2nd pereopod with fewer than 25 carpal articles; 3rd pereopod with dactyl less than $\frac{1}{3}$ as long as propodus
 * 36. *P. philippinensis*, new species
35. Rostrum usually armed ventrally with fewer than 20 rather widely spaced

- teeth; 5th abdominal somite with posteroventral denticle on pleuron
 36
- Rostrum usually armed ventrally with more than 20 closely set teeth,
 serrate; 5th abdominal somite with pleuron blunt posteroventrally,
 without denticle 40
36. Rostrum not reaching level of distal end of antennal scale
 * 30. *P. kensleyi*, new species
- Rostrum overreaching antennal scale 37
37. Rostrum unarmed dorsally anterior to basal crest; eye without ocellus;
 3rd maxilliped with 2 distal segment usually subequal; 3rd pereopod
 with merus not nearly reaching distal end of antennal scale; carapace
 as much as 30 mm long * 19. *P. alcocki*
- Rostrum dorsally dentate throughout length; eye with ocellus; 3rd
 maxilliped with penultimate segment $1\frac{1}{5}$ to $1\frac{4}{5}$ times as long as
 terminal segment; 3rd pereopod with merus reaching as far as, or
 beyond, distal end of antennal scale; carapace no more than 20 mm
 long 38
38. Sixth abdominal somite little more than $1\frac{1}{2}$ times as long as maximum
 height; telson about $1\frac{1}{2}$ times as long as 6th somite; 2nd pereopod
 with 37–42 carpal articles * 34. *P. ortmanni*
- Sixth abdominal somite more than $1\frac{2}{3}$ times as long as maximum height;
 telson less than $1\frac{1}{3}$ times as long as 6th somite; 2nd pereopod with
 17–26 carpal articles 39
39. Third pereopod with dactyl usually more than $\frac{1}{4}$ as long as propodus,
 accessory distal spine usually more than $\frac{1}{2}$ as long as terminal spine
 and usually in close contact with latter
 * 25. *P. fimbriata*, new species
- Third pereopod with dactyl less than $\frac{1}{6}$ as long as propodus, accessory
 distal spine less than $\frac{1}{2}$ as long as and well separated from terminal
 spine * 33. *P. ocellus*
40. Anteriormost tooth of dorsal rostral series usually arising anterior to
 distal end of antennular peduncle; 6th abdominal somite usually con-
 siderably more than twice as long as maximum height; 3rd pereopod
 with dactyl averaging $\frac{1}{2}$ as long as propodus; maximum carapace
 length about 15 mm * 35. *P. parvimartia*, new species
- None of dorsal rostral teeth arising anterior to distal end of antennular
 peduncle; 6th abdominal somite usually about twice as long as maxi-
 mum height; 3rd pereopod with dactyl averaging less than $\frac{1}{3}$ length
 of propodus; maximum carapace length 25 mm or more 41
41. Eye large but usually not kidney-shaped, posterior margin of orbit nearly
 vertical; 3rd pereopod with dactyl averaging about $\frac{1}{4}$ length of pro-
 podus; exopod of 3rd pleopod usually more than $\frac{3}{4}$ carapace length
 in small specimens to more than $\frac{7}{10}$ in large ones
 * 32. *P. martia orientalis*, new subspecies
- Eye larger, kidney-shaped, posterior margin of orbit inclined postero-

- dorsad; 3rd pereopod with dactyl averaging $\frac{1}{3}$ length of propodus; exopod of 3rd pleopod usually less than $\frac{3}{4}$ carapace length in small specimens to less than $\frac{7}{10}$ in large ones * 41. *P. semilaevis*
42. Rostrum with 10–18 ventral teeth; 6th abdominal somite more than twice as long as maximum height; telson slightly longer than 6th abdominal somite; eye with inconspicuous ocellus; stylocerite not reaching as far as dorsal arc of distal margin of 1st antennular segment 43
- Rostrum with 4–9 ventral teeth; 6th abdominal somite less than $1\frac{1}{2}$ times as long as maximum height; telson more than $1\frac{2}{5}$ times as long as 6th abdominal somite; eye without ocellus; stylocerite overreaching dorsal arc of distal margin of 1st antennular segment 44
43. Sixth abdominal somite nearly $2\frac{1}{2}$ times as long as maximum height; antennal scale with distolateral tooth overreaching blade; 2nd pereopod with 8 or 9 carpal articles *P. beebei* Chace, 1937:114
(Pacific coast of Mexico; 73–914 meters)
- Sixth abdominal somite little more than twice as long as maximum height; antennal scale with distolateral tooth not reaching level of distal margin of blade; 2nd pereopod with 14–17 carpal articles
. *P. trispinus* Squires and Barragan, 1976:113
(Pacific coast of Colombia; 209–302 meters)
44. Seven to 10 teeth of dorsal rostral series situated on carapace posterior to level of orbital margin; maximum diameter of eye no more than 0.15 of carapace length; 3rd maxilliped with penultimate segment no more than $\frac{2}{3}$ as long as terminal segment; 3rd pereopod with combined lengths of 3 distal segments amounting to about $\frac{2}{3}$ carapace length * 45. *P. spinidorsalis*
- Three to 5 teeth of dorsal rostral series situated on carapace posterior to level of orbital margin; maximum diameter of eye about 0.20 of carapace length; 3rd maxilliped with penultimate segment at least $\frac{3}{4}$ as long as terminal segment; 3rd pereopod with combined lengths of 3 distal segments exceeding carapace length * 21 *P. bifurca*

***18. *Plesionika acinacifer*, new species**

FIGURES 21–23

DIAGNOSIS.—Rostrum typically falling short of or slightly overreaching level of distal end of antennal scale, armed dorsally with 5 (rarely 6) teeth on basal crest, including 3 (rarely 4) movable spines on carapace at or posterior to level of orbital margin, dorsal teeth absent from more

than anterior $\frac{1}{2}$ of rostrum and none of teeth with barbed tips, armed ventrally with 7–13 closely appressed serrations becoming obscure anteriorly; orbital margin slightly convex and trending posterodorsad in ventral $\frac{1}{2}$, sinuously anterodorsad in dorsal $\frac{1}{2}$; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th somite with pleuron rounded, without marginal denticle, 5th somite with postero-

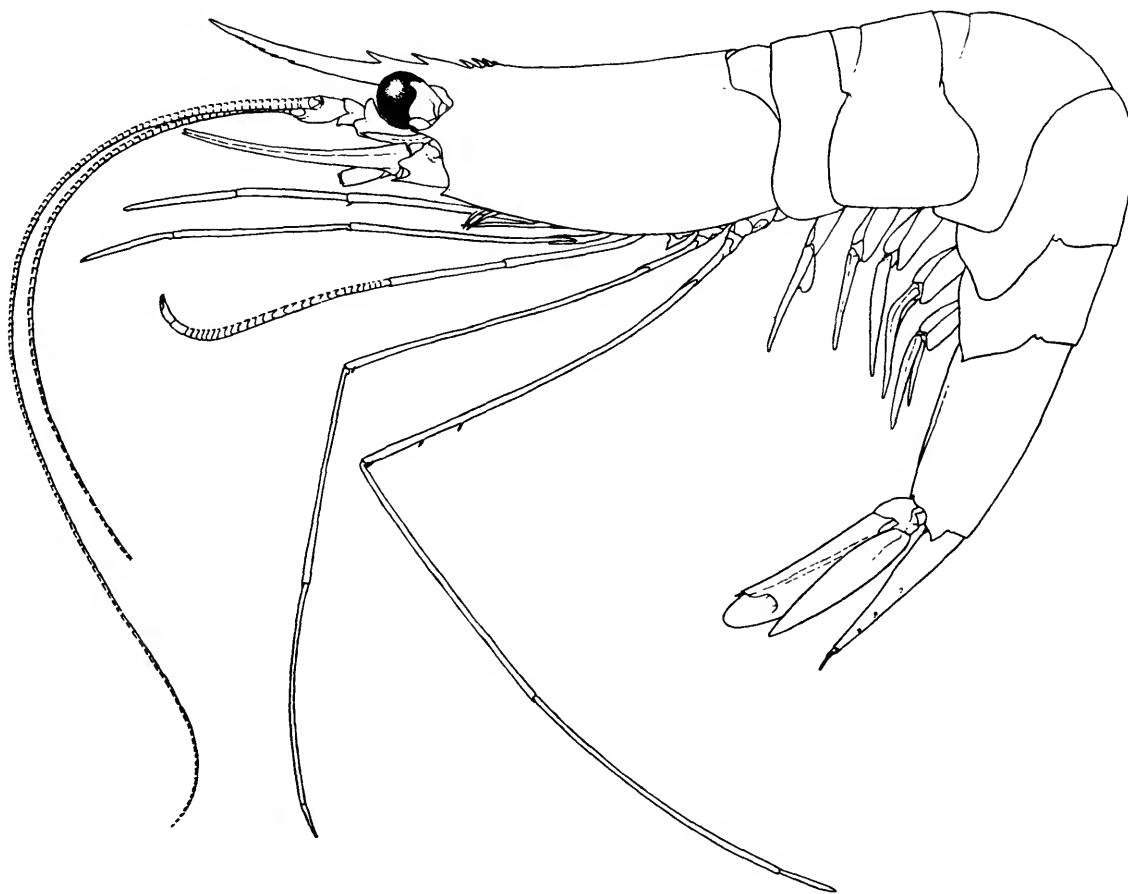


FIGURE 21.—*Plesionika acinacifer*, new species, male holotype from *Albatross* sta 5533, carapace length 9.8 mm (4th pereopod possibly regenerating). (Magnification: $\times 4.1$.)

ventral tooth on pleuron, 6th somite about twice as long as maximum height; telson $\frac{8}{10}$ – $\frac{9}{10}$ as long as 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye subpyriform, maximum diameter slightly more than $\frac{1}{3}$ of carapace length, without true ocellus; stylocerite acute, barely overreaching dorsal arc of distal margin of 1st antennular segment; antennal scale slightly more or less than 4 times as long as wide, distolateral tooth not quite reaching level of distal margin of blade; 3rd maxilliped with epipod, penultimate segment subequal to terminal segment; pereopods with epipods on 4 anterior

pairs, 2nd pair subequal, with 27–30 carpal articles; 3rd pleopod with exopod slightly more or less than $\frac{2}{5}$ of carapace length; maximum carapace length 12 mm.

DESCRIPTION.—Rostrum (Figure 22a) curving slightly dorsad anteriorly, usually not reaching level of distal end of antennal scale, $\frac{1}{2}$ – $\frac{9}{10}$ as long as carapace; dorsal margin armed with 5 or 6 teeth in basal portion, including 3 or 4 on carapace at or posterior to level of orbital margin, leaving most of rostrum dorsally unarmed, 3 or 4 posteriormost teeth movable, spine-like, set close together, and separated from 2 large, fixed teeth above orbit, none with barbed tips;

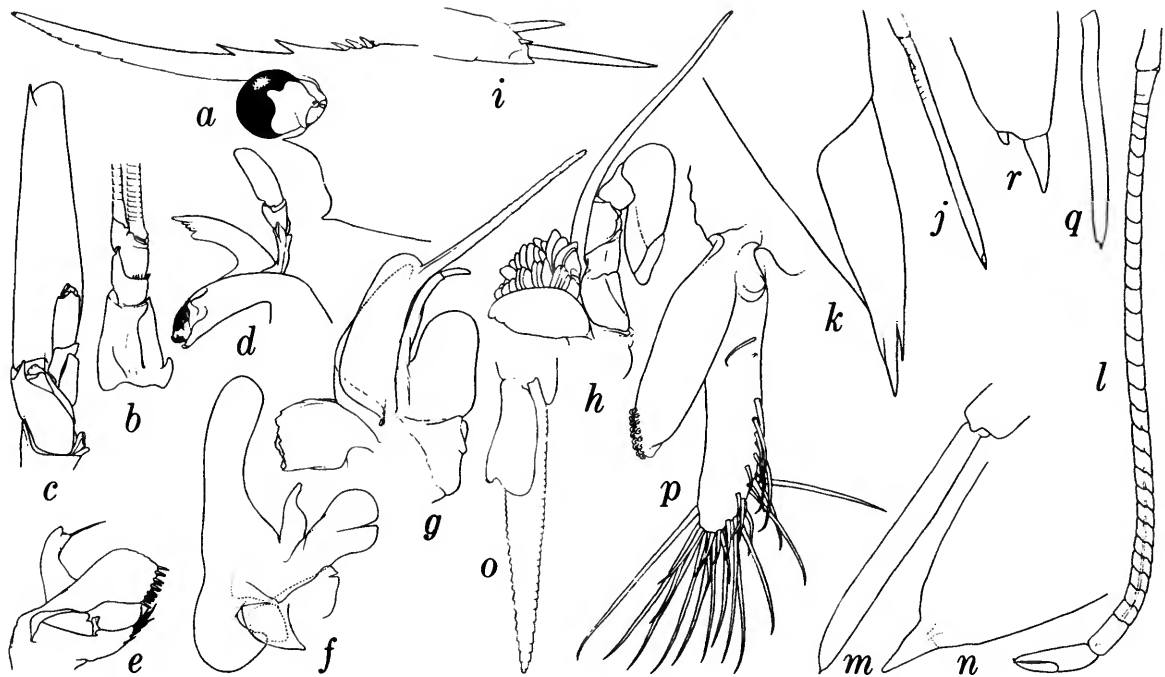


FIGURE 22.—*Plesionika acinacifer*, new species, *a-p*, male holotype from *Albatross* sta 5533, carapace length 9.8 mm; *q, r*, female paratype from *Albatross* sta 5123, carapace length 10.0 mm: *a*, anterior carapace and eye, left aspect; *b*, right antennule, mesiodorsal aspect; *c*, right antenna, ventral aspect; *d*, right mandible; *e*, right 1st maxilla; *f*, right 2nd maxilla; *g*, right 1st maxilliped; *h*, right 2nd maxilliped; *i*, distal end of right 3rd maxilliped; *j*, chela of right 1st pereopod; *k*, same, fingers; *l*, carpus and chela of left 2nd pereopod; *m*, dactyl of left 5th pereopod; *n*, same, distal end; *o*, endopod and exopod of right 1st pleopod, posterior aspect; *p*, left appendix interna and appendix masculina, mesial aspect; *q*, dactyl of right 4th pereopod; *r*, same, distal end. (Magnifications: *a-c*, $\times 5.2$; *d-h, j, l, o*, $\times 10.8$; *m, q*, $\times 21.5$; *i, p*, $\times 53.8$; *k, n, r*, $\times 223.6$.)

ventral margin armed with 7–13 rather indistinct serrations becoming even more obscure anteriorly. Orbit (Figure 22*a*) concave except for slightly convex portions dorsally and ventrally. Antennal spine much stronger than pterygostomian spine. Median postrostral ridge faintly concave, not sharp, extending posteriorly to about midlength of carapace.

Abdomen with 3rd somite rounded posteriorly, unarmed, without median carina, rather regularly convex dorsally in lateral aspect. Pleura of 4 anterior somites rounded, that of 5th sharply acute, with sinuously convex ventral margin.

Sixth somite 2 to 2½ times as long as 5th and about twice, or less, as long as maximum height. Telson $\frac{8}{10}$ to $\frac{9}{10}$ as long as 6th somite, with 4 pairs of dorsolateral spinules, posteriormost pair situated dorsolateral to base of long, lateral spine of 2 posterior pairs.

Eye (Figure 22*a*) subpyriform, maximum diameter slightly more than $\frac{1}{5}$ carapace length, distal margin of eyestalk intruding into cornea but not forming true ocellus.

Antennular peduncle (Figure 22*b*) without tooth or denticle on ventromesial margin of basal segment. Stylocerite acute, slightly overreaching

dorsal arc of distal margin of basal segment.

Antennal scale (Figure 22c) with lateral margin straight or faintly convex, fully $\frac{3}{4}$ as long as carapace, roughly 4 times as long as wide, distolateral tooth falling slightly short of level of oblique distal margin of blade.

Mouthparts as illustrated (Figure 22d-i). Third maxilliped with epipod, overreaching antennal scale by nearly $\frac{1}{2}$ of distal segment, armed terminally with long apical and 2 or 3 shorter subapical spines (Figure 22i), penultimate segment subequal to terminal segment.

Pereopods with prominent epipods on 4 anterior pairs. First pereopod (Figure 22j) overreaching antennal scale by slightly more than length of chela; fingers (Figure 22k) small but distinct, movable finger overreaching fixed one. Second pereopods subequal, overreaching antennal scale by length of chela and about distal article of carpus, carpus (Figure 22l) composed of 27-30 articles. Third pereopods missing or incomplete in all available specimens. Fourth pereopod (possibly regenerating) overreaching antennal scale by lengths of dactyl and propodus and more than $\frac{1}{2}$ of carpus; dactyl (Figure 22q,r) sinuous, terminating in 2 very unequal and widely separated spines; 3 distal segments, combined, fully $1\frac{3}{4}$ times as long as carapace. Fifth pereopod overreaching antennal scale by lengths of dactyl and propodus and about $\frac{2}{3}$ of carpus; dactyl (Figure 22m,n) subspatulate, apparently terminating in single stout spine; 3 distal segments, combined, $2\frac{1}{2}$ times as long as carapace.

Endopod of 1st pleopod of male (Figure 22o) with mesial margin sinuous, notch in distal margin pronounced. Appendix masculina on 2nd pleopod (Figure 22p) armed with more than 30 spines of various lengths on anteromesial and distal margins. Exopod of 3rd pleopod about $\frac{2}{3}$ as long as carapace. Mesial branch of uropod overreaching telson, proper; lateral branch longer and bearing movable spine mesial to distolateral tooth.

SIZE.—Carapace length of male halotype, 9.8 mm; of nonovigerous female paratypes, 7.6-12.0 mm.

MATERIAL.—PHILIPPINES. Northeast of Mindoro: sta 5123; $13^{\circ}12'45''N$, $121^{\circ}38'45''E$; 518 m; green mud; 2 Feb 1908 (1344-1404); 12' Tanner beam trawl, mud bag: 1♀ [10.0]. North of Samar: sta 5445; $12^{\circ}44'42''N$, $124^{\circ}59'50''E$; 700 m; green mud, sand; $6.8^{\circ}C$; 3 Jun 1909 (1201-1238); 12' Agassiz beam trawl: 1♀ [11.1] (identification tentative). Southern end of Bohol Strait, southeast of Cebu: sta 5533; $9^{\circ}27'15''N$, $123^{\circ}31'48''E$; 790 m; green mud, sand; $11.8^{\circ}C$; 19 Aug 1909 (0608-0631); 12' Tanner beam trawl: 1♂ holotype [9.8] (USNM 205209). Iligan Bay, northern Mindanao: sta 5511; $8^{\circ}15'20''N$, $123^{\circ}57'E$; 750 m; gray mud, sand; $11.7^{\circ}C$; 7 Aug 1909 (1218-1238); 12' Tanner beam trawl: 3♀ [7.6-12.0].

INDONESIA. Celebes Sea off Sabah (North Borneo): sta 5587; $4^{\circ}10'35''N$, $118^{\circ}37'12''E$; 759 m; green mud, sand, coral; $5.7^{\circ}C$; 28 Sep 1909 (1511-1532); 9' Tanner beam trawl, mud bag: 1♀ (variety) [11.9].

TYPE-LOCALITY.—Between southern Cebu and Siquijor, Philippines; $9^{\circ}27'15''N$, $123^{\circ}31'48''E$; 790 meters.

RANGE.—Known only from the Philippine and, possibly, the Celebes Sea localities recorded above, in 518-790 meters.

REMARKS.—The aberrant female from the western Celebes Sea off Sabah (North Borneo) (Figure 23) differs from the five specimens in the type series from the Philippines in having the rostrum much longer and the cornea projecting onto the eyestalk but still not forming a true ocellus. The three posterior pairs of pereopods are lacking but, in all other respects, the specimen agrees with those from the Philippines, and it therefore seems best to consider it a varietal form of *P. acinacifer* until such a conclusion is disproved by the examination of additional material.

In the female from north of Samar tentatively identified with this species, the rostrum is lacking beyond the cluster of three movable spines on the carapace, but the specimen seems to be typical in all other respects.

In the shortness of the rostrum, this species

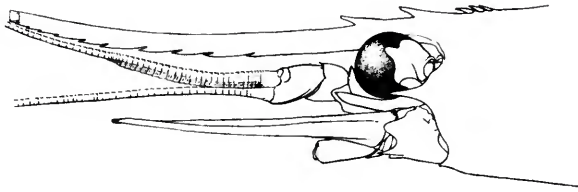


FIGURE 23.—*Plesionika acinacifer?*, anterior carapace and appendages, left aspect, of female from *Albatross* sta 5587, carapace length 11.9 mm. (Magnification: $\times 5.3$.)

resembles *P. acanthonotus* (Smith, 1882:61) from the Atlantic as well as *P. kensleyi*, described below. It is readily distinguishable from both of those species, however, by the very different rostral dentition and more numerous articles in the carpus of the second pereopods. From *P. kensleyi*, it also differs noticeably in the absence of a distinct ocellus on the eyestalk, the longer penultimate segment of the third maxilliped, and the more usual configuration of the endopod of the first male pleopod.

Another species with a short rostrum is *P. brevirostris*, known from a single specimen from Moro Gulf, east of Basilan Strait, Philippines, but that form will probably prove to be an aberrant specimen of *P. semilaevis*, with which it was collected, as suggested by Bate (1888:650).

ETYMOLOGY.—The Latin combination *acinaces* (a scimitar) plus *fero* (to bear or carry) was chosen in the belief that the rostrum of this species may resemble a battle-scarred example of the sword by that name used by the ancient Persians, Medes, and Scythians.

***19. *Plesionika alcocki* (Anderson, 1896)**

Pandalus alcocki Anderson, 1896:92 [type-locality: Laccadive Sea off Malabar Coast of India; $9^{\circ}34'57''N$ $75^{\circ}36'30''E$; 743 meters].

Pandalus (Plesionika) alcocki.—Alcock and McArdle, 1901, pl. 52: figs. 2, 4.

DIAGNOSIS.—Rostrum overreaching antennal scale, armed dorsally only with 4–6 teeth on basal crest, including 2–4 movable spines on carapace posterior to level of orbital margin, none with

barbed tips, armed ventrally with 8–23 teeth becoming obscure anteriorly; orbital margin rather regularly concave except for shallow concavities dorsally and ventrally; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th somite with pleuron rounded, without marginal denticle, 5th somite with pleuron rather sharply acute posteroventrally, 6th somite $1\frac{3}{4}$ times to twice as long as maximum height; telson slightly longer or shorter than 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye broadly subpyriform, maximum diameter about $\frac{1}{5}$ carapace length, without ocellus; stylocerite rather narrowly acute, overreaching dorsal arc of distal margin of 1st antennular segment; antennal scale about $3\frac{3}{4}$ times as long as wide, distolateral tooth not quite reaching level of distal margin of blade; third maxilliped with epipod, penultimate segment from slightly shorter than to $1\frac{1}{2}$ times as long as terminal segment; pereopods with epipods on 4 anterior pairs, 2nd pair subequal, with 26 to more than 32 carpal articles, 3rd pair overreaching antennal scale by lengths of dactyl, propodus, and fully $\frac{1}{2}$ of carpus, dactyl about $\frac{1}{4}$ as long as propodus, accessory distal spine vestigial or absent, 3 distal segments, combined, about $1\frac{1}{2}$ times as long as carapace, none of pereopods extremely slender or thread-like; 3rd pleopod with exopod slightly more than $\frac{1}{2}$ as long as carapace; maximum carapace length 30 mm.

MATERIAL.—PHILIPPINES. Tayabas Bay, southern Luzon: sta 5373; $13^{\circ}40'N$, $121^{\circ}31'10''E$; 618 m; soft mud; $11.0^{\circ}C$; 2 Mar 1909 (1015–1035); 12' Tanner beam trawl, mud bag: 1♂ [17.2], 1♀ [18.2]. Northeast of Mindoro: sta 5123; $13^{\circ}12'45''N$, $121^{\circ}38'45''E$; 518 m; green mud; 2 Feb 1908 (1344–1404); 12' Tanner beam trawl, mud bag: 2♂ [18.0, 21.0], 1 ovig ♀ [19.8]. North of Samar: sta 5445; $12^{\circ}44'42''N$, $124^{\circ}59'50''E$; 700 m; green mud, sand; $6.8^{\circ}C$; 3 Jun 1909 (1201–1238); 12' Agassiz beam trawl: 2♂ [14.5, 22.3], 5♀ [24.3–28.0], 4 ovig [24.3–28.0]. Panay Gulf, south of Panay: sta 5184; $10^{\circ}18'30''N$, $122^{\circ}23'30''E$; 1033 m;

green mud; 9.9°C; 30 Mar 1908 (1353–1413); 12' Agassiz beam trawl, 3 mud bags: 1 ovig ♀ [18.7]. Sogod Bay, southern Leyte: sta 5202; 10°12'N, 125°04'10"E; 918 m; gray mud; 10 Apr 1908 (1107–1127), 12' Agassiz beam trawl, 3 mud bags: 1y♂ [9.3], 2♀ [13.0, 21.0], 1 ovig [21.0]; sta 5487; 10°02'45"N, 125°05'33"E; 1339 m; green mud; 11.3°C; 31 Jul 1909 (1403–1426); 12' Agassiz beam trawl: 1 ovig ♀ [22.6]; sta 5488; 10°N, 125°06'45"E; 1412 m; green mud; 11.3°C; 31 Jul 1909 (1652–1738); 12' Agassiz beam trawl: 2♂ [14.9, 18.8], 1 ovig ♀ [21.9].

Between Bohol and Siquijor Island; sta 5527; 9°22'30"N, 123°42'40"E; 719 m; globigerina ooze; 11.8°C; 11 Aug 1909 (1338–1358); 12' Tanner beam trawl: 2 ovig ♀ [17.0, 19.3]. Eastern Mindanao Sea: sta 5491; 9°24'N, 125°12'E; 1346 m; green mud, coral; 11.3°C; 1 Aug 1909 (1012–1043); 12' Agassiz beam trawl: 3♂ [16.7–20.0], 3♀ [17.9–20.9], 1 ovig [20.9]; sta 5494; 9°06'30"N, 125°18'40"E; 1240 m; green mud, sand; 11.8°C; 2 Aug 1909 (0917–0952); 12' Agassiz beam trawl: 2♀ [16.3]. Macajalar Bay, northern Mindanao: sta 5499; 8°41'30"N, 124°35'40"E; 1013 m; green mud, fine sand; 11.3°C; 4 Aug 1909 (1050–0955); 12' Agassiz beam trawl: 1♂ [18.7].

INDONESIA. Celebes Sea off Sabah (North Borneo): sta 5586; 4°06'50"N, 118°47'20"E; 635 m; gray mud; 6.7°C; 28 Sep 1909 (1144–1217); 9' Tanner beam trawl, mud bag: 3♂ [18.0–21.5], 3♀ [17.0–27.7], 2 ovig [25.5, 27.7].

RANGE.—Recorded previously from the Indian Ocean, from eastern Africa to western Australia, the Andaman Sea, and New Caledonia; 500–1125 meters. The *Albatross* collections extend the known geographic range to the Philippines and the bathymetric range to 1412 meters.

20. *Plesionika assimilis* De Man, 1917

Plesionika assimilis De Man, 1917:280 [type-locality: southern part of Selat Moro west of Flores, Lesser Sunda Islands, Indonesia: 54–90 meters; 1920:131, pl. 11: fig. 29c–g; pl. 12: fig. 29a,b.

DIAGNOSIS.—Rostrum overreaching antennal

scale, armed dorsally with 5–7 teeth on basal crest, including 4 or 5 on carapace posterior to level of orbital margin, and 3 or 4 subapical teeth, 4 or 5 posteriormost teeth with distinct basal sutures but none with barbed tips, armed ventrally with 10–12 teeth; orbital margin with obtuse angle in ventral ½, rather regularly concave dorsally; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th and 5th somites with pleura posteroventrally dentate, 6th somite about 1½ times as long as maximum height; telson about 1½ times as long as 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye broadly subpyriform, maximum diameter about ¼ carapace length, ocellus longitudinally oval, constricted at juncture with cornea; stylocerite overreaching dorsal arc of distal margin of 1st antennular segment; antennal scale about 4½ times as long as wide, distolateral tooth barely reaching level of distal angle of strongly oblique margin of blade; 3rd maxilliped with penultimate segment about 7/10 as long as terminal one; pereopods with epipods on 4 anterior pairs, 2nd pair unequal, 3rd pair with dactyl about ½ as long as propodus, none of pereopods extremely slender or thread-like; maximum carapace length about 10 mm.

RANGE.—Apparently known only from the type-locality west of Flores in 54–90 meters.

REMARKS.—It is apparent that *P. assimilis* is closely related to, if not identical with, the true *P. binoculus*, a species that De Man (1920) misidentified (see *P. lophotes* below). The only obvious difference between De Man's description of *P. assimilis* and the type series of *P. binoculus* lies in the length of the dactyls of the three posterior pairs of pereopods; the dactyl in *P. assimilis* is apparently about half as long as it is in *P. binoculus*.

*21. *Plesionika bifurca* Alcock and Anderson, 1894

FIGURE 24

Plesionika bifurca Alcock and Anderson, 1894:155 [type-locality: east of Bassas de Pedro, Laccadive Islands;

13°47'49"N, 73°07'E; 1165 meters].—De Man, 1920: 136, pl. 12: fig. 31.

Pandalus (Plesionika) bifurca.—Alcock and McArdle, 1901, pl. 51: fig. 6.

DIAGNOSIS.—Rostrum falling slightly short of or slightly overreaching level of distal end of antennal scale, depending on curvature, armed dorsally throughout length with 5–10 teeth, including 3–5 on carapace posterior to level of orbital margin, all teeth immovable but posteriormost sometimes with faint and partial basal suture, none with barbed tips, armed ventrally with 4–9 teeth; orbital margin strongly convex immediately above antennal spine, rather regularly concave elsewhere; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th somite usually with small posteroverentral tooth on pleura, 5th somite with stronger one, 6th somite from less than $1\frac{1}{3}$ to $1\frac{1}{2}$ times as long as maximum height; telson $1\frac{2}{3}$ to $1\frac{3}{4}$

times as long as 6th somite, with 5 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye broadly subpyriform, maximum diameter barely $\frac{1}{5}$ carapace length, without ocellus; stylocerite sharply acute, overreaching dorsal arc of distal margin of 1st antennular segment; antennal scale about 4 times as long as wide, distolateral tooth overreaching distal margin of blade; 3rd maxilliped with epipod, penultimate segment $\frac{3}{4}$ as long as to nearly subequal to terminal segment; pereopods with well-developed epipods on 4 anterior pairs, 2nd pair unequal, right with 10–15 carpal articles, left with 15–24, 3rd pair overreaching antennal scale by lengths of dactyl, propodus, and about $\frac{1}{2}$ of carpus, dactyl from barely $\frac{2}{3}$ to $\frac{1}{2}$ as long as propodus, accessory distal spine slender, in close contact with and reaching nearly to tip of main terminal spine, 3 distal segments, combined, about $1\frac{1}{5}$ times as long as carapace, none

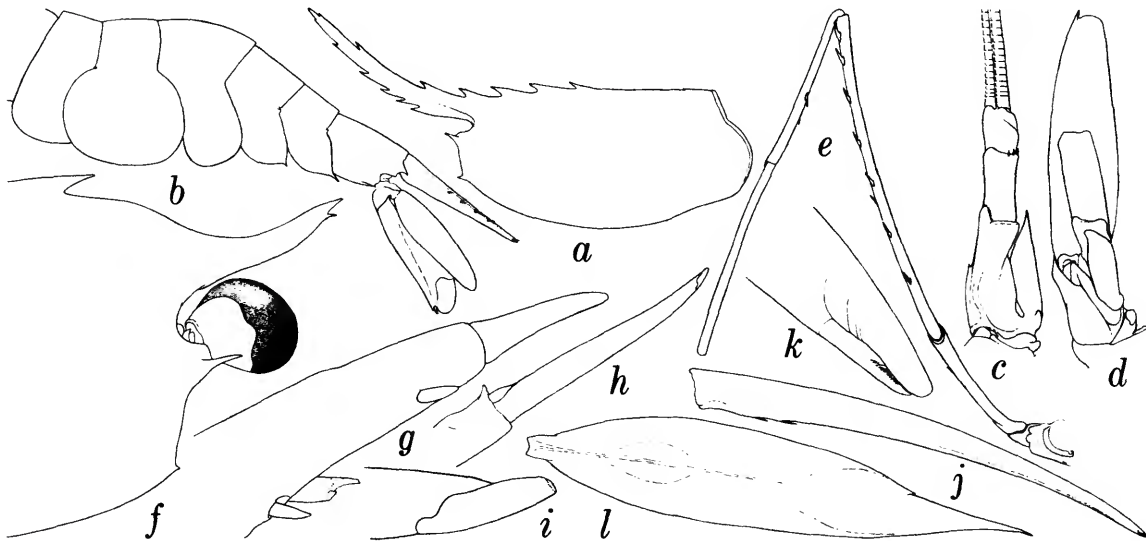


FIGURE 24.—*Plesionika bifurca*, a–e, female from *Albatross* sta 5201 (southern Leyte, Philippines), carapace length 13.2 mm; f–l, ovigerous female with deformed rostrum from *Albatross* sta 5589 (Celebes Sea), carapace length 15.0 mm: a, carapace and rostrum, left aspect; b, abdomen, left aspect; c, right antennule, mesiodorsal aspect; d, right antenna, ventral aspect; e, left 4th pereopod; f, anterior carapace and eye, right aspect; g, distal end of left 3rd maxilliped; h, chela of right 1st pereopod; i, same, fingers; j, dactyl of right 3rd pereopod; k, same, distal end; l, tegumental scale from posterodorsal area of carapace. (Magnifications: a, b, $\times 2.6$; e, $\times 4.3$; c, d, f, $\times 5.2$; h, $\times 10.8$; j, $\times 21.5$; g, i, $\times 53.8$; k, l, $\times 223.6$.)

of pereopods extremely slender or thread-like; 3rd pleopod with exopod about $\frac{1}{2}$ as long as carapace; maximum carapace length about 15 mm.

MATERIAL.—PHILIPPINES. Verde Island Passage, north of Mindoro: sta 5115; 13°37'11"N, 120°43'40"E; 622 m; 20 Jan 1908 (1341–1401); 12' Tanner beam trawl, mud bag: 1♂ [10.2]. Tayabas Bay, southern Luzon: sta 5221; 13°38'–15"N, 121°48'15"E; 353 m; green mud; 11.3°C; 24 Apr 1908 (1525–1545); 12' Agassiz beam trawl, mud bag: 1♀ [7.6]; sta 5373; 13°40'N, 121°31'10"E; 618 m; soft mud; 11.0°C; 2 Mar 1909 (1015–1035); 12' Tanner beam trawl, mud bag: 1♂ [9.3]. Northeast of Mindoro: sta 5123; 13°12'45"N, 121°38'45"E; 518 m; green mud; 2 Feb 1908 (1344–1404); 12' Tanner beam trawl, mud bag: 1♂ [6.0]. Tablas Strait, east of Mindoro: sta 5260; 12°25'35"N, 121°31'35"E; 428 m; green mud, sand; 10.8°C; 3 Jun 1908 (1532–1552); 12' Agassiz beam trawl, mud bag: 1♂ [10.3], 2♀ [7+, 8.8]. Northwest of Panay: sta 5259; 11°57'30"N, 121°42'15"E; 571 m; gray mud, globigerina; 9.6°C; 3 Jun 1908 (1031–1051); 12' Agassiz beam trawl, mud bag: 2♂ [8.8, 9.6], 1 ovig ♀ [9.3].

Samar Sea, east of Masbate: sta 5397; 11°57'27"N, 124°10'42"E; 245 m; green mud; 15 Mar 1909 (1036–1052); 12' Agassiz beam trawl, mud bag: 1♂ [6.9]. North of Samar: sta 5445; 12°44'42"N, 124°59'50"E; 700 m; green mud, sand; 6.8°C; 3 Jun 1909 (1201–1238); 12' Agassiz beam trawl: 3♀ [13.2–13.8]. Sogod Bay, southern Leyte: sta 5201; 10°10'N, 125°04'–15"E; 1013 m; gray sand, mud; 11.6°C; 10 Apr 1908 (0913–0933); 12' Agassiz beam trawl, 3 mud bags (veered 205 m cable during haul): 1♂ [8.7], 1♀ [13.2], 4♀ [6.3–10.0]; sta 5202; 10°12'N, 125°04'10"E; 918 m; gray mud; 10 Apr 1908 (1107–1127); 12' Agassiz beam trawl, 3 mud bags; 5♂ [5.7–8.8], 2♀ [6.8, 10.5], 1 ovig [10.5]; sta 5488; 10°N, 125°06'45"E; 1412 m; green mud; 11.3°C; 31 Jul 1909 (1652–1738); 12' Agassiz beam trawl: 1♂ [8.2], 9♀ [8.8–12.5], 5 ovig [9.6–11.6]. Camotes Sea east of Cebu: sta 5410; 10°28'45"N, 124°05'30"E; 704 m; green

mud; 18 Mar 1909 (1156–1210); 12' Agassiz beam trawl, mud bag: 1♂ [8.4], 3♀ [8.0–11.0], 2 ovig [9.3, 11.0].

Southern end of Bohol Strait southeast of Cebu: sta 5533; 9°27'15"N, 123°31'48"E; 790 m; green mud, sand; 11.8°C; 19 Aug 1909 (0608–0631); 12' Tanner beam trawl: 1♂ [8.5]. North of Siquijor Island: sta 5528; 9°24'45"N, 123°39'15"E; 803 m; globigerina ooze; 11.8°C; 11 Aug 1909 (1542–1611); 12' Tanner beam trawl: 1 ovig ♀ [12.5]. Eastern Mindanao Sea: 9°24'N, 125°12'E; 1346 m; green mud, coral; 11.3°C; 1 Aug 1909 (1012–1043); 12' Agassiz beam trawl: 2♂ [10.3, 10.8], 5♀ [11.3–14.3], 2 ovig [11.3, 14.3]; sta 5492; 9°12'45"N, 125°20'E; 1344 m; gray mud; 11.3°C; 1 Aug 1909 (1331–1359); 12' Agassiz beam trawl: 1♂ [11.7], 2 ovig ♀ [11.0, 13.6]; sta 5494; 9°06'30"N, 125°18'40"E; 1240 m; green mud, sand; 11.8°C; 2 Aug 1909 (0917–0952); 12' Agassiz beam trawl: 1♂ [10.3], 4♀ [10–14.0].

Iligan Bay, northern Mindanao: sta 5511; 8°15'20"N, 123°57'E; 750 m; gray mud, sand; 11.7°C; 7 Aug 1909 (1218–1238); 12' Tanner beam trawl: 1 ovig ♀ [12.7]; sta 5515; 8°34'48"N, 124°01'24"E; about 1280 m (no sounding); 8 Aug 1909 (1042–1110); 12' Tanner beam trawl: 1♀ [10.5]. Davao Gulf, Mindanao: sta 5247; 7°02'N, 125°38'45"E; 247 m; mud; 18 May 1908 (1908–0928); 12' Agassiz beam trawl, mud bag: 1♀ [7.8]. Off Jolo Island, Sulu Archipelago: sta 5173; 6°02'55"N, 120°53'E; 340 m; shells, coral; 5 Mar 1908 (1457–1503); 9' Johnston oyster dredge: 1 ovig ♀ [8.3].

INDONESIA. Celebes Sea off Sabah (North Borneo): sta 5589; 4°12'10"N, 118°38'08"E; 476 m; fine gray sand, gray mud; 7.6°C; 29 Sep 1909 (0744–0804); 9' Tanner beam trawl, mud bag: 2♂ [11.5, 13.2], 4♀ [9.0–15.0], 2 ovig [11.2, 15.0], larger nonovigerous female with ellobiosid parasites on carapace. West of Halmahera: sta 5618; 0°37'00"N, 127°15'00"E; 763 m; gray mud; 27 Nov 1909 (1444–1504); 12' Agassiz beam trawl: 7 ovig ♀ [10.2–12.0]; sta 5619; 0°35'00"N, 127°14'40"E; 795 m; fine gray sand, mud; 27 Nov 1909 (1612–1641); 12' Agas-

siz beam trawl: 1♂ [10.9], 6♀ [8.1–13.3], 5 ovig [11.0–13.3]; sta 5622; 0°19'20"N, 127°28'30"E; 503 m; gray mud; 29 Nov 1909 (0803–0824); 12' Agassiz beam trawl, mud bag: 1 ovig ♀ [9.1]; sta 5624; 0°12'15"N, 127°29'30"E; 527 m; fine sand, mud; 29 Nov 1909 (1058–1118); 12' Agassiz beam trawl: 1♀ [15.0]; sta 5625; 0°07'00"N, 127°28'00"E; 421 m; gray mud, fine sand; 29 Nov 1909 (1416–1437); 12' Agassiz beam trawl: 1♂ [8.5]. Teluk Bone, Celebes: sta 5651; 4°43'50"S, 121°23'24"E; 1280 m; green mud; 3.7°C; 17 Dec 1909 (1432–1452); 12' Agassiz beam trawl: 1♀ [11.5]; sta 5657; 3°19'40"S, 120°36'30"E; 900 m; gray mud; 5.2°C; 19 Dec 1909 (1108–1128); 12' Agassiz beam trawl: 1♀ [8.9].

RANGE.—Eastern Africa to Indonesia, South China Sea, and southern Japan; 330–1165 meters. The collections reported here extend the known bathymetric range to 245–1412 meters.

REMARKS.—De Man (1920:136) noted that the material collected by the *Siboga* in Indonesia differed from the illustration of *P. bifurca* in Alcock and McArdle (1901) in having the rostrum "more acuminate, more strongly curved upwards and projecting nearly always a little beyond the antennal scales." In 76 of the *Albatross* specimens in which the curvature of the rostrum is determinable, it is considerably greater than in the *Investigator* illustration in 63 specimens. Also, in spite of this pronounced curvature, the rostrum overreaches the antennal scale in 25 of 61 specimens in which it is intact. I suspect that the figure in Alcock and McArdle may not depict the most common configuration of the *Investigator* specimens, for Alcock and Anderson (1894:155) refer to "the up-curved rostrum" in their original description of the species, and an ovigerous female collected by the *Investigator* in the Andaman Islands and received in exchange from the Indian Museum in 1911 has the rostrum moderately curved and distinctly overreaching the antennal scale.

Only 19 of the 86 specimens collected by the *Albatross* have both members of the second pair of pereopods intact, but an additional 32 speci-

mens have one of the pair present; although the second pereopods are sometimes not too different in length, the one on the right is normally more robust (especially as regards the chela), so handedness can be determined satisfactorily when either member of the pair is present. Of the 51 specimens fulfilling this requirement, only one, an ovigerous female with a carapace length of 11.7 mm from station 5618 west of Halma-hera, is lefthanded, with the more robust cheliped on the left side. Both members of the pair are intact in this specimen and, aside from the difference in stoutness, they are unusually similar, each having 19 carpal articles. This example may represent the closest approximation of the species with unequal second pereopods—for which Burukovsky (1981) revived the subgeneric name *Nothocaris*—to those with subequal and similar pereopods of the second pair.

22. *Plesionika binoculus* (Bate, 1888)

FIGURE 25

Nothocaris binoculus Bate, 1888:656, pl. 114: fig. 2 [type-locality: Arafura Sea; 8°56'S, 136°05'E; 90 meters].
Plesionika binoculus.—Omori, 1971:248 [part], fig. 5a–e.

DIAGNOSIS.—Rostrum overreaching antennal scale, armed dorsally with 11–14 irregularly spaced teeth, including 4 on carapace posterior to level of orbital margin, 5 posteriormost teeth basally articulated and movable but none with barbed tips, armed ventrally with 13–15 teeth; orbital margin somewhat convex in ventral part, rather irregularly concave dorsally to base of rostrum; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th and 5th somites with small posteroventral tooth on pleuron, 6th somite nearly 1½ times as long as maximum height; telson more than 1½ times as long as 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye broadly subpyriform, maximum diameter fully ¼ carapace length, ocellus longitudinally oval, constricted at juncture with cornea; stylocerite acute, overreaching

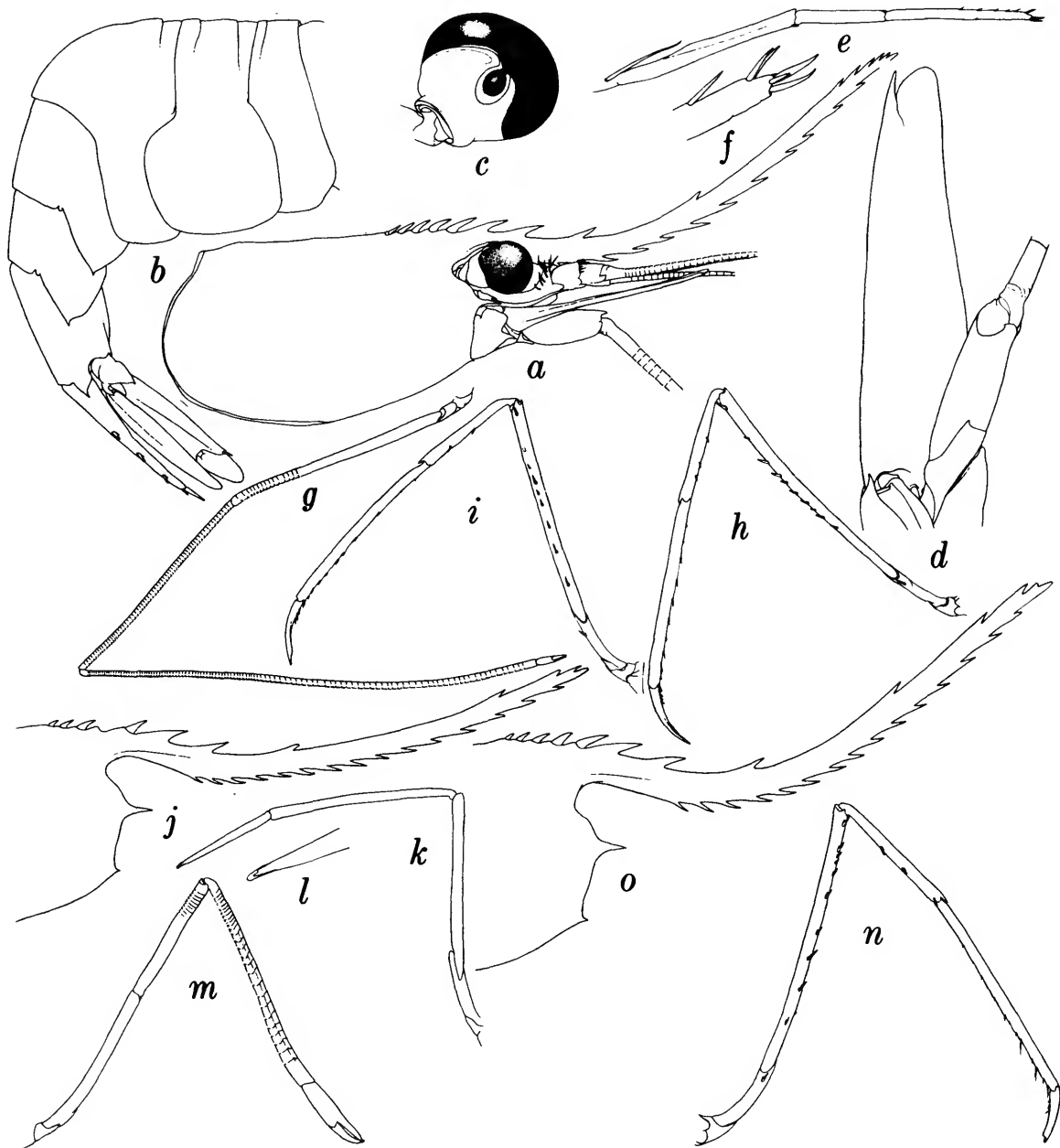


FIGURE 25.—*Plesionika binoculus*, a–i, ovigerous female syntype, carapace length 7.3 mm; j–n, ovigerous female syntype, carapace length 8.3 mm; o, ovigerous female syntype, carapace length 9.6 mm: a, carapace and anterior appendages, right aspect; b, abdomen, right aspect; c, right eye, dorsal aspect; d, right antenna, ventral aspect; e, right 3rd maxilliped; f, same, distal end; g, left 2nd pereopod; h, left 4th pereopod; i, left 5th pereopod; j, anterior carapace and rostrum, right aspect; k, left 1st pereopod; l, same, distal end of chela; m, right 2nd pereopod; n, right 3rd pereopod; o, anterior carapace and rostrum, right aspect. (Magnifications: a, b, e, g–k, m–o, $\times 5.2$; c, d, $\times 10.8$; f, l, $\times 21.5$.)

dorsal arc of distal margin of 1st antennular segment; antennal scale about 4 times as long as wide, distolateral tooth not reaching level of oblique distal margin of blade; 3rd maxilliped with epipod, penultimate segment $\frac{2}{3}$ as long as terminal segment; pereopods with epipods on 4 anterior pairs, 2nd pair unequal, right with 27 or more carpal articles, left with about 110, 3rd pair overreaching antennal scale by slightly more than lengths of dactyl and propodus, dactyl about $\frac{1}{3}$ as long as propodus, 3 distal segments, combined, about $1\frac{1}{2}$ times as long as carapace, none of pereopods extremely slender or thread-like; maximum carapace length about 12 mm.

RANGE.—Probably known only from the type-locality between New Guinea and Australia.

REMARKS.—Thanks to the kind cooperation of R.W. Ingle of the British Museum (Natural History), I have been able to examine three syntypes of this species. The type series apparently consists of one male and four (not three) ovigerous females. Bate's illustrations, presumably from the largest ovigerous female, depict the rostral crest as bearing four movable spines, whereas Bate (1888:656) noted that there were five (subsequently "four or five"), as in the other three ovigerous syntypes (Figure 25*a,j,o*). Bate also indicated that the left second pereopod is "shorter and more robust than that on the right." The other ovigerous syntypes (Figure 25*g,m*) suggest that the largest is an aberrant, lefthanded individual such as have been noted in other species of the genus. The opportunity to examine part of the type series of *P. binoculus* has confirmed my suspicion that all of the material assigned to that species since 1888 probably belongs to a distinct species (see *P. lophotes* below).

23. *Plesionika brevirostris* Bate, 1888

Plesionika brevirostris Bate, 1888:650, pl. 113: fig. 5 [type-locality: Moro Gulf east of Basilan Strait, Mindanao, Philippines; 6°47'N, 122°28'E; 457 meters].

DIAGNOSIS.—Rostrum reaching level of distal end of antennal scale, armed dorsally with 6 teeth on dorsal crest, including 2 on carapace posterior to or in line with orbital margin, and obscure

serrations near tip of rostrum, none of teeth movable or with barbed tips, armed ventrally with about 10 obscure serrations near apex; orbital margin convex in ventral part, subvertical posteriorly; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th somite with pleuron depicted as rounded, unarmed, 5th terminating in sharp posteroventral angle, 6th somite about $2\frac{1}{3}$ times as long as maximum height; telson about $1\frac{1}{4}$ times as long as 6th somite; eye apparently quite broad, about $\frac{1}{4}$ carapace length, ocellus not expanded beyond juncture with cornea; stylocerite overreaching dorsal arc of distal margin of 1st antennular segment; antennal scale with distolateral tooth barely overreaching distal margin of blade; 3rd maxilliped with penultimate segment nearly $\frac{9}{10}$ as long as terminal one; 2nd pair of pereopods subequal, 3rd pair overreaching antennal scale by lengths of dactyl, propodus, and about $\frac{1}{3}$ of carpus, none of pereopods extremely slender or thread-like; carapace length 26 mm.

RANGE.—Known with certainty only from the type-locality off Mindanao, Philippines. There is doubt about the Maldivic specimen recorded by Calman (1939:197) (see "Remarks").

REMARKS.—In my opinion, the single ovigerous female on which this species was established is an aberrant specimen of *P. semilaevis* (or *P. martia orientalis*) with a damaged and regenerated rostrum. Even Bate (1888:650) was inclined toward a similar conclusion, in noting that the type specimen "was trawled with considerable numbers of *Plesionika semilaevis*, with which it appears to closely correspond in general aspect and in all parts, excepting in the shortness of the rostrum and the absence of teeth from the lower margin. It is not improbable that it is only an extreme variation in form of the latter species due to some accidental cause, and illustrating the early stage of a specific variation." My only reason for not fully abiding by this conviction is my respect for Calman's expertise and species sense. He (1939:198) examined the holotype of *P. brevirostris* and supplemented Bate's description of it without expressing any doubt about the validity of the species. However, the Maldivic specimen

that he identified with the same species must be questioned because of its more distinct ocellus, a character that is usually reliable at the species level in *Plesionika*.

*24. *Plesionika edwardsii* (Brandt, 1851)

FIGURE 26

Pandalus narval.—H. Milne-Edwards, 1841, pl. 54: fig. 2 [not *Astacus Narval* Fabricius, 1787].

Pandalus [subgenus *Pontophilus*] *Edwardsii*? Brandt, 1851:122 [type-locality: not established. Brandt evidently proposed the name *Pandalus Edwardsii* for the species beautifully illustrated under the name *Pandalus narval* by H. Milne-Edwards (1841), for which no locality was indicated. The species previously cited by the latter author (1837:385) as *Pandalus narval* came from "la Méditerranée," but the description of the rostrum in that reference seems to apply more closely to the species described by Fabricius than to the drawing in H. Milne-Edwards (1841)].

Pandalus (*Parapandalus*) *longirostris* Borradaile, 1899:413, pl. 37: fig. 10 [type-locality: New Britain].

Plesionika edwardsii.—Crosnier and Forest, 1973:202, figs. 63b, 64b.

DIAGNOSIS.—Rostrum far overreaching antennal scale, armed dorsally throughout length with 28–34 teeth, including 1–3 on carapace posterior to level of orbital margin, none movable or with barbed tips, armed ventrally with 33–50 teeth; orbital margin rather regularly and deeply concave; abdomen without posteromesial tooth or median dorsal carina on 3rd somite; 4th somite with pleuron rounded, without marginal denticle; 5th somite with posteroventral tooth on pleuron, 6th somite $1\frac{3}{4}$ to nearly twice as long as maximum height; telson subequal to 6th somite in length, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye subpyriform, maximum diameter about $\frac{1}{3}$ carapace length, ocellus longitudinally oval, slightly constricted at juncture with cornea; stylocerite acute, barely overreaching dorsal arc of distal margin of 1st antennular segment; antennal scale $4\frac{1}{2}$ to $5\frac{1}{2}$ times as long as wide, distolateral tooth falling slightly short of or slightly overreaching distal margin of blade; 3rd maxilliped with minute epipod, penultimate seg-

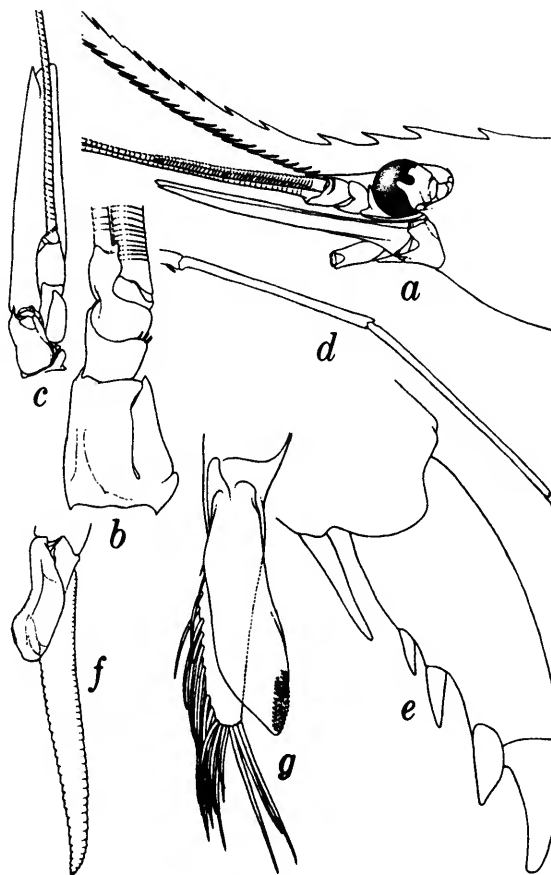


FIGURE 26.—*Plesionika edwardsii*, a–e, female from *Albatross* sta 5580 (Celebes Sea), carapace length 16.5 mm; f, g, male from *Albatross* sta 5255 (Davao Gulf, Mindanao, Philippines), carapace length 16.9 mm: a, anterior carapace and appendages, left aspect; b, right antennule, mesiodorsal aspect; c, right antenna, ventral aspect; d, distal segments of right 4th pereopod; e, same, dactyl; f, endopod and exopod of right 1st pleopod, posterior aspect; g, right appendix masculina and appendix interna, mesial aspect. (Magnifications: a, c, d, $\times 2.6$; b, f, $\times 5.2$; g, $\times 21.5$; e, $\times 53.8$.)

ment subequal to terminal segment; pereopods with reduced, inconspicuous epipods on 4 anterior pairs, 2nd pair subequal, with 21–25 carpal articles, 3rd pair overreaching antennal scale by little more than lengths of dactyl and propodus, dactyl barely $\frac{1}{10}$ as long as propodus, accessory distal spine about $\frac{1}{2}$ as long as and well separated

from main terminal spine, 3 distal segments, combined, about $1\frac{1}{2}$ times as long as carapace, none of pereopods extremely slender or thread-like; 3rd pleopod with exopod nearly or fully $\frac{2}{3}$ as long as carapace; maximum carapace length about 20 mm.

MATERIAL.—PHILIPPINES. Davao Gulf, Mindanao: sta 5255; $7^{\circ}03'N$, $125^{\circ}39'E$; 183 m; soft mud; 18 May 1908 (1813–1833); 12' Agassiz beam trawl, mud bag (made after dark): 1♂ [16.9], 1♀ [15.0].

INDONESIA. Off Darvel Bay, Sabah (North Borneo): sta 5580; $4^{\circ}52'45"N$, $119^{\circ}06'45"E$; 296 m; brown sand, coral; $13.2^{\circ}C$; 25 Sep 1909 (0940–0957); 9' Tanner beam trawl, mud bag: 1♀ [16.7].

RANGE.—If my identification of the *Albatross* specimens is correct, this is the only species of the genus with apparently identical populations in the western and eastern Atlantic (including the Gulf of Mexico and the Mediterranean) and in the Indo-Pacific region. The small specimens recorded as *Plesionika longirostris* from off South Africa by Stebbing (1914:37) and Barnard (1950:681, fig. 126n) should be re-examined, especially in view of Barnard's note that the telson is "distinctly shorter than the 6th segment." The depth range is 50–689 meters.

REMARKS.—There seems to be little reason to doubt that the three *Albatross* specimens belong to the species described under the name of *P. longirostris* from New Britain by Borradaile. Borradaile's probably erroneous reference to movable rostral spines has been alluded to by other authors, and his count of three or four teeth of the rostral series being located on the carapace is denied by his illustration that shows only one tooth posterior to the orbital margin.

Comparison of the *Albatross* specimens with material from the western Atlantic has failed to disclose a single character for distinguishing the two populations. Unless, therefore, the study of additional specimens from the Indo-Pacific form reveals quantitative differences of perhaps sub-specific importance, one must credit Monod (1966:139) with unusual sagacity in citing the

distribution of *Plesionika edwardsii* as "Atlantique tropical, Indopacifique."

*25. *Plesionika fimbriata*, new species

FIGURE 27

"? *Pandalus ocellus* (Bate)."—Rathbun, 1906:915, pl. 21: fig. 1 [not *Nothocaris ocellus* Bate, 1888].

DIAGNOSIS.—Rostrum far overreaching antennal scale, armed dorsally throughout length with 11–14 teeth, including 3 or 4 on carapace posterior to level of orbital margin, 2–4 posteriormost teeth with distinct basal sutures but none with barbed tips, armed ventrally with 5–8 teeth; orbital margin convex in ventral part, rather regularly concave in dorsal $\frac{1}{2}$; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th somite with pleuron rounded, without marginal denticle, 5th somite with poteroventral tooth on pleuron, 6th somite $1\frac{2}{3}$ to more than $1\frac{1}{5}$ times as long as maximum height; telson $1\frac{1}{6}$ to nearly $1\frac{1}{3}$ times as long as 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye broadly subpyriform, maximum diameter about $\frac{1}{4}$ carapace length, ocellus large, subcircular, in broad contact with cornea; stylocerite acute, overreaching dorsal arc of distal margin of 1st antennular segment; antennal scale $4\frac{1}{4}$ – $5\frac{1}{5}$ times as long as wide, distolateral tooth overreaching distal margin of blade; 3rd maxilliped with epipod, penultimate segment $1\frac{1}{4}$ – $1\frac{1}{2}$ times as long as terminal segment; pereopods with epipods on 4 anterior pairs, 2nd pair subequal, with 18–30 carpal articles, 3rd pair overreaching antennal scale by lengths of dactyl, propodus, carpus, and nearly $\frac{1}{4}$ of merus, dactyl $\frac{1}{4}$ to $\frac{1}{3}$ as long as propodus, accessory distal spine more than $\frac{1}{2}$ as long as and usually in close contact with main terminal spine, 3 distal segments, combined, $2\frac{1}{10}$ – $2\frac{1}{3}$ times as long as carapace, none of pereopods extremely slender or thread-like; 3rd pleopod with exopod slightly more than $\frac{1}{2}$ as long as carapace; maximum carapace length about 19 mm.

DESCRIPTION.—Rostrum (Figure 27a) directed somewhat dorsad, overreaching antennal scale, $1\frac{1}{2}$ –2 times as long as carapace (average 1.7); dorsal margin armed with 11–14 teeth over virtually entire length, including 3 or 4 on carapace posterior to level of orbital margin, 2 or 3 (rarely 4) posteriormost teeth with distinct basal suture, none with barbed tips; ventral margin armed with 5–8 teeth. Orbit (Figure 27b) convex in ventral portion posterior to antennal spine, rather regularly concave in dorsal half. Antennal spine stronger than pterygostomial spine. Median postrostral ridge straight, compressed but not sharp, extending posteriorly to about mid-length of carapace.

Abdomen with 3rd somite rounded posteriorly, unarmed, without median carina, regularly arched dorsally in lateral aspect. Pleura of 4 anterior somites rounded, that of 5th sharply acute, with convex, posteriorly sinuous ventral margin (Figure 27c). Sixth somite $1\frac{1}{4}$ times to slightly more than twice as long as 5th somite (average 1.9) and $1\frac{2}{3}$ to at least $1\frac{1}{2}$ times as long as maximum height (average 1.76). Telson $1\frac{1}{6}$ to nearly $1\frac{1}{3}$ times as long as 6th somite (average 1.2) with 4 pairs of dorsolateral spinules, posteriormost pair situated dorsolateral to base of long, lateral spine of 2 posterior pairs.

Eye (Figure 27b) broadly subpyriform, maximum diameter about $\frac{1}{4}$ carapace length; ocellus large, subcircular, in broad contact with cornea.

Antennular peduncle (Figure 27d) with small tooth on ventromesial margin of basal segment. Stylocerite acute, overreaching dorsal arc of distal margin of basal segment.

Antennal scale (Figure 27e) with lateral margin sinuous, $\frac{8}{10}$ – $\frac{9}{10}$ as long as carapace, $4\frac{1}{4}$ to $5\frac{1}{5}$ times as long as wide (average 4.7), distolateral tooth overreaching transverse distal margin of blade.

Mouthparts as illustrated (Figure 27f–k). Third maxilliped with epipod, overreaching antennal scale by length of distal segment and about $\frac{1}{4}$ of penultimate, armed terminally with 6 apical and subapical spines (Figure 27k), penultimate segment $1\frac{1}{4}$ – $1\frac{1}{2}$ times as long as terminal segment (average 1.35).

Pereopods with large epipods on 4 anterior pairs. First pereopod (Figure 27u) overreaching antennal scale by length of chela and about $\frac{2}{3}$ of carpus; fingers (Figure 27v) small but distinct, acuminate tip of movable finger overreaching fixed one. Second pereopods subequal, overreaching antennal scale by length of chela and about $\frac{1}{3}$ of carpus, carpus (Figure 27l) composed of 18–30 (commonly 19–21) articles. Third pereopod overreaching antennal scale by lengths of dactyl, propodus, carpus, and nearly $\frac{1}{4}$ of merus; dactyl (Figure 27m,n) $\frac{1}{4}$ – $\frac{1}{3}$ as long as propodus, $\frac{1}{5}$ to fully $\frac{1}{4}$ as long as carapace, accessory distal spine more than $\frac{1}{2}$ as long as main terminal spine, setose opposable margin usually in close contact with latter; carpus usually $1\frac{1}{2}$ – $1\frac{3}{4}$ (occasionally $1\frac{1}{6}$ –3) times as long as propodus; 3 distal segments, combined, little more than twice to about $2\frac{1}{3}$ times as long as carapace. Fourth pereopod overreaching antennal scale by lengths of dactyl, propodus, and carpus; dactyl (Figure 27o,p) similar to that of 3rd pereopod; 3 distal segments, combined, usually about twice as long as carapace or slightly more. Fifth pereopod overreaching antennal scale by lengths of dactyl and propodus and fully $\frac{2}{3}$ of carpus; dactyl (Figure 27q,r) similar to those of 3rd and 4th pereopods; 3 distal segments, combined, from slightly more than twice to fully $2\frac{1}{2}$ times as long as carapace.

Endopod of 1st pleopod of male (Figure 27s) with mesial margin faintly concave, notch in distal margin distinct but not deep. Appendix masculina on 2nd pleopod (Figure 27t) armed with more than 30 long spines on anteromesial and distal margins. Exopod of 3rd pleopod usually slightly more than $\frac{1}{2}$ as long as carapace (average 0.54). Mesial branch of uropod reaching posterior margin of telson proper; lateral branch longer and bearing movable spine mesial to distolateral tooth.

SIZE.—Carapace length of male holotype, 12.3 mm; of male paratypes, 10.8–15.1; of nonovigerous female paratypes, 11.1–13.2 mm; of ovigerous female paratypes, 14.6–16.0 mm.

MATERIAL.—PHILIPPINES. Samar Sea east of Masbate: sta 5391; $12^{\circ}13'15''N$, $124^{\circ}05'03''E$; [216 m]; 13 Mar 1909 (0907–0927); 12' Agassiz

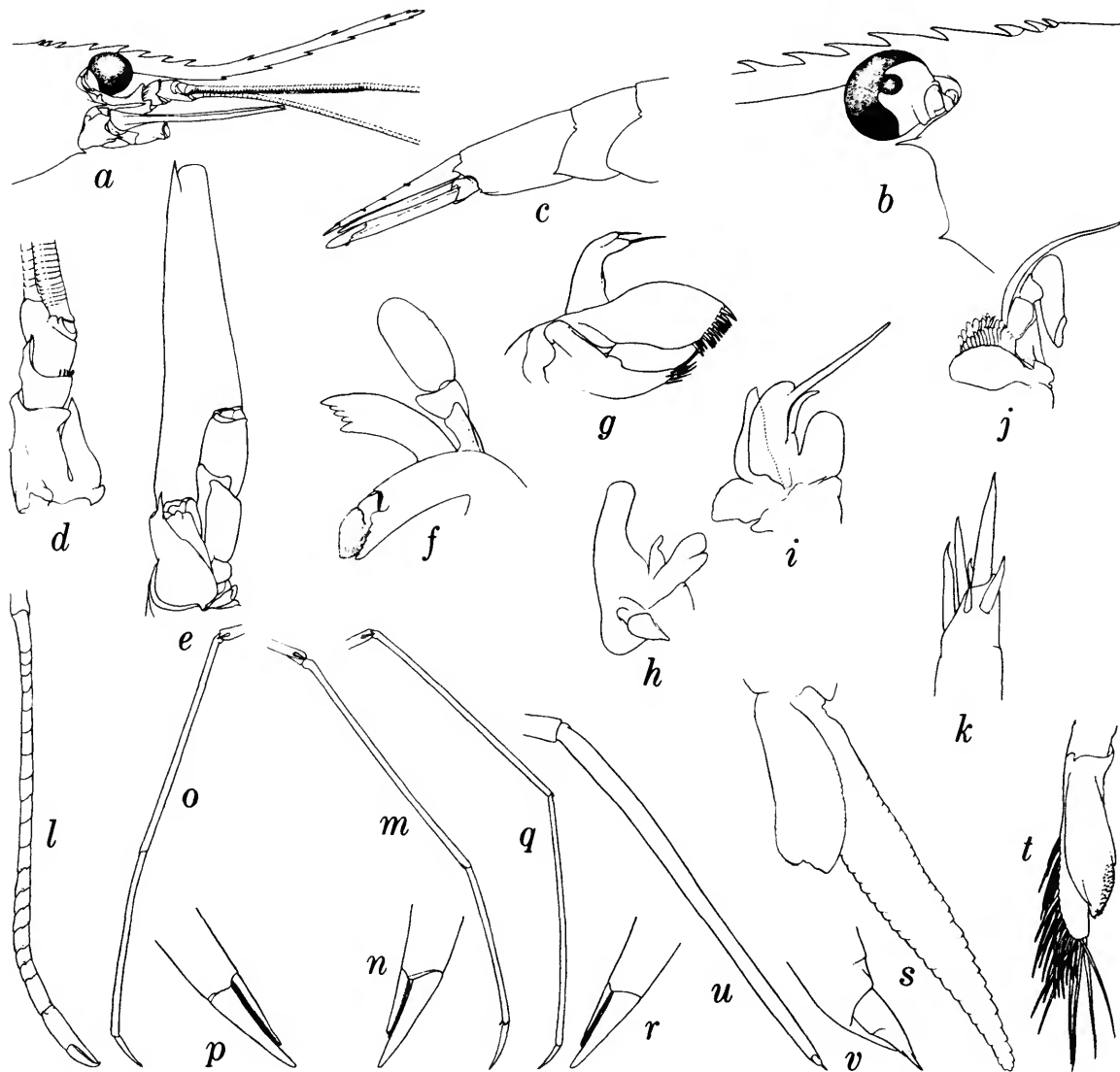


FIGURE 27.—*Plesionika fimbriata*, new species, a–t, male holotype from *Albatross* sta 5391, carapace length 12.3 mm; u, v, male paratype from *Albatross* sta 5391, carapace length 13.7 mm: a, anterior carapace and appendages, right aspect; b, orbital region, left aspect; c, posterior part of abdomen, right aspect; d, right antennule, mesiodorsal aspect; e, right antenna, ventral aspect; f, right mandible; g, right 1st maxilla; h, right 2nd maxilla; i, right 1st maxilliped; j, right 2nd maxilliped; k, distal end of right 3rd maxilliped; l, carpus and chela of right 2nd pereopod; m, distal segments of right 3rd pereopod; n, same, distal end of dactyl; o, distal segments of left 4th pereopod; p, same, distal end of dactyl; q, distal segments of right 5th pereopod; r, same, distal end of dactyl; s, endopod and exopod of right 1st pleopod, posterior aspect; t, right appendix masculina and appendix interna, mesial aspect; u, chela of right 1st pereopod; v, same, fingers. (Magnifications: a, c, m, o, q, $\times 2.6$; b, d, e, h–j, l, $\times 5.2$; f, g, s, u, $\times 10.8$; t, $\times 21.5$; k, n, p, r, v, $\times 53.8$.)

beam trawl, mud bag: 10♂ [10.8–15.1], 3♀ [11.1–16.0], 1 ovig [16.0]; 1♂ is holotype (USNM 205210); sta 5392; 12°12'35"N, 124°02'48"E; 247 m; green mud, sand; 13 Mar 1909 (1010–1015); 12' Agassiz beam trawl, mud bag (net slightly torn): 3♂ [11.8–12.1], 1 ovig ♀ [14.6].

TYPE-LOCALITY.—Samar Sea east of Masbate, Philippines; 12°13'15"N, 124°05'03"E; [216 meters].

RANGE.—In addition to the two stations in the Samar Sea, in the Philippines, *P. fimbriata* is known with certainty only from Hawaii, where it was taken at no less than 10 stations by the *Albatross* in 1902. The species is known from depths of less than 95 to more than 250 meters.

REMARKS.—Rathbun (1906:915) correctly determined that at least two species of *Plesionika* resemble *P. ocellus* (Bate). Being misled by the unusually small number of posterior movable spines in the dorsal rostral series of the specimen illustrated by Bate, she understandably assigned the commoner Hawaiian form to Bate's species, with reservations. The current study has revealed the variability in the characters that Rathbun used to separate the species. The most reliable difference between the two seems to be the length and form of the dactyls of the three posterior pairs of pereopods. In the species assigned to *P. ocellus* by Rathbun, the dactyl of the third pereopod is usually more than a fourth as long as the propodus and from a fifth to more than a fourth as long as the carapace, and the accessory distal spine is typically more than half as long as the principal terminal spine, usually in close contact with the latter, and fringed on the opposable margin (Figure 27n). In the species that Rathbun called *Pandalus sindoi*, the dactyl of the third pereopod is from a tenth to a sixth as long as the propodus and from a fourteenth to a seventh as long as the carapace, and the accessory distal spine is shorter, well separated from the principal spine, and without a fringe (Figure 40g).

At my request, Brian Kensley examined the syntypes of *Nothocaris ocellus* in the British Museum (Natural History) and found that the characteristic dactyl of the third pereopod corre-

sponds with the one in Rathbun's *P. sindoi*, thereby leaving the other species undescribed.

ETYMOLOGY.—The Latin *fimbriata* (fringed) was suggested by the distinctive accessory distal spine on the dactyls of the walking legs.

* 26. *Plesionika grandis* Doflein, 1902

FIGURES 28, 29

Plesionika spinipes var. *grandis* Doflein, 1902:618, pl. 3: figs. 3–5 [type-locality: Sagami Bay, Japan].

Parapandalus spinipes.—De Man, 1920:142, pl. 12: fig. 33a,c–e; pl. 13: fig. 33, 33b [not *Plesionika spinipes* Bate, 1888].

DIAGNOSIS.—Rostrum far overreaching antennal scale, armed dorsally throughout length with 37–53 teeth, including 4–8 on carapace posterior to level of orbital margin, 1–3 posteriormost teeth with variably distinct basal sutures, none with barbed tips, armed ventrally with 20–31 teeth; orbital margin slightly convex in ventral part, regularly concave elsewhere; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th and 5th somites with posteroventral tooth on pleuron, 6th somite 1½–1⅝ times as long as maximum height; telson usually 1¼–1½ times as long as 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye subpyriform, maximum diameter more or less than ⅓ carapace length, ocellus broadly, (usually) longitudinally oval, slightly constricted at juncture with cornea; stylocerite acute, barely overreaching dorsal arc of distal margin of 1st antennular segment; antennal scale 4–5½ times as long as wide, distolateral tooth usually overreaching blade; 3rd maxilliped without epipod, penultimate segment 1½–1⅝ times as long as terminal segment; pereopods without epipods, 2nd pair subequal, with 18–30 carpal articles, 3rd pair overreaching antennal scale by slightly more than lengths of dactyl, propodus, and carpus, dactyl usually about ⅓–¼ as long as propodus, acute accessory distal spine about ½ as long as and rather narrowly but distinctly separated from

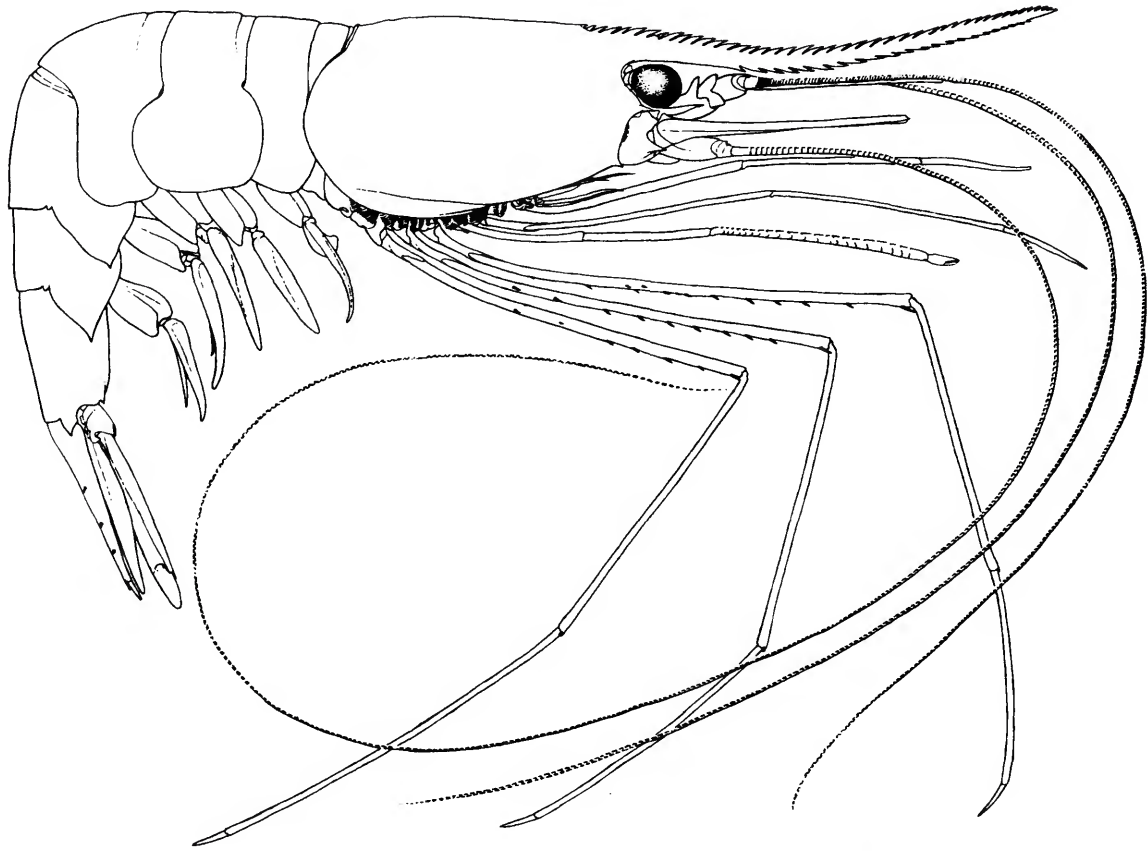


FIGURE 28.—*Plesionika grandis*, male from *Albatross* sta 5135 (Sulu Archipelago, Philippines), carapace length 16.2 mm. (Magnification: $\times 2.4$.)

main terminal spine, 3 distal segments, combined, $1\frac{1}{2}$ – $2\frac{1}{2}$ times as long as carapace, none of pereopods extremely slender or thread-like; 3rd pleopod with exopod slightly less than $\frac{1}{2}$ as long as carapace; maximum carapace length more than 30 mm.

COLOR.—Accompanying the lot of 45 specimens from station 5420 in Bohol Strait is the following note: "The form with long regularly serrated horn has red stripes on sides & back, 2 on sides, about 8 finer lines on back. Eggs pale pink. Serrations of horn red, otherwise all pale pink, except lower antennae." No other caridean species was taken at this station, so there is little

doubt that the color note refers to *P. grandis*.

MATERIAL.—PHILIPPINES. Batangas Bay, southern Luzon: sta 5266; $13^{\circ}44'36''N$, $120^{\circ}59'15''E$; 183 m; mud; 8 Jun 1908 (0918–0938); 12' Agassiz beam trawl, mud bag: 3♂ [12.5–19.0], 4♀ [13.3–20.0], 3 ovig [19.1–20.0]. Bohol Strait, east of Cebu: sta 5420; $9^{\circ}49'35''N$, $123^{\circ}45'E$; 232 m; 25 Mar 1909 (1548–1605); 12' Agassiz beam trawl, mud bag: 23♂ [9.8–17.1], 22♀ [16.0–20.1], 20 ovig [16.3–20.1]. Davao Gulf, Mindanao: sta 5247; $7^{\circ}02'N$, $125^{\circ}38'45''E$; 247 m; mud; 18 May 1908 (0908–0928); 12' Agassiz beam trawl, mud bag: 1♂ [20.0]; sta 5255; $7^{\circ}03'N$, $125^{\circ}39'E$; 183 m; soft

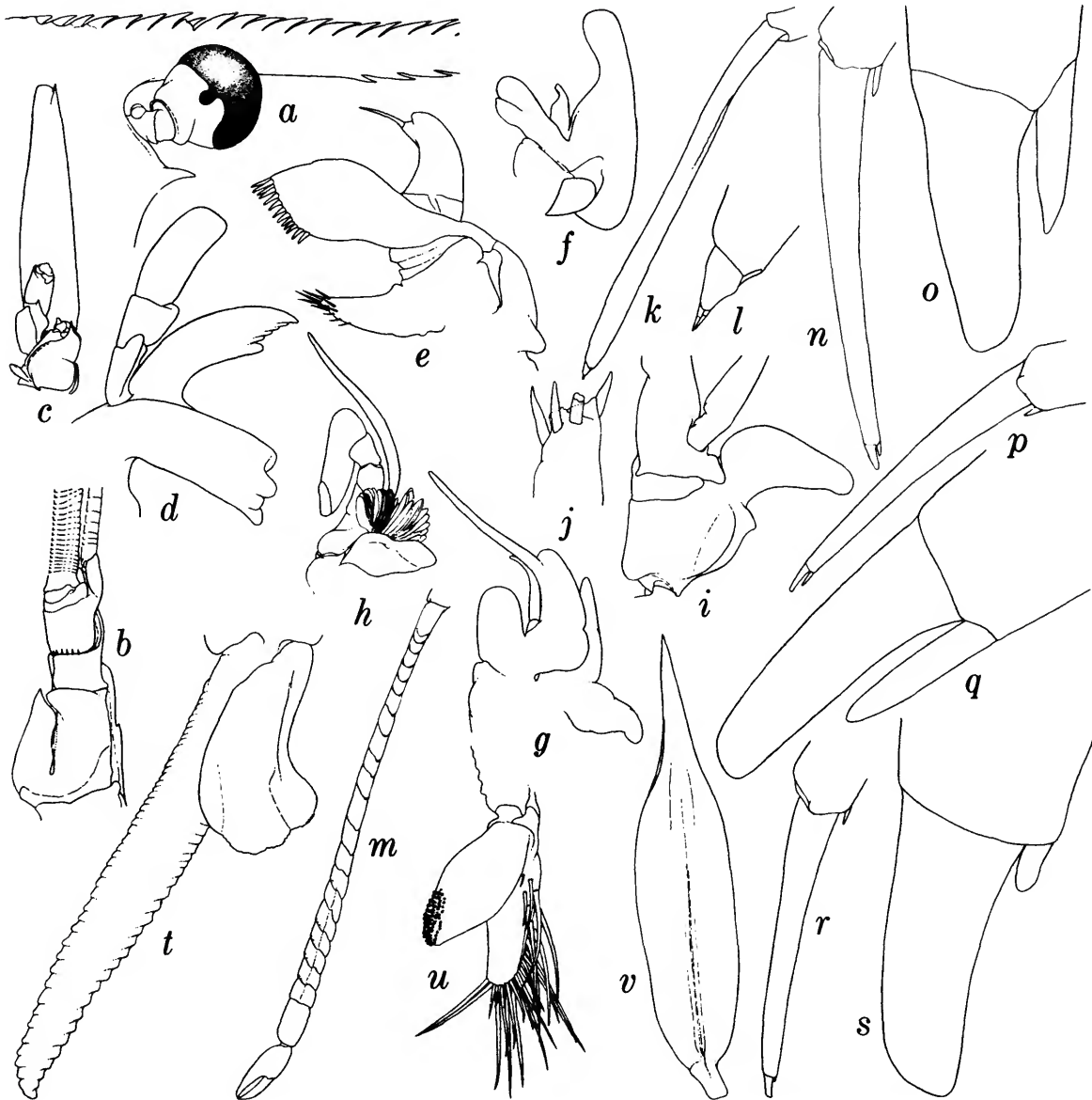


FIGURE 29.—*Plesionika grandis*, male from *Albatross* sta 5135 (Sulu Archipelago, Philippines), carapace length 16.2 mm: a, right eye and orbit; b, left antennule, mesiodorsal aspect; c, left antenna, ventral aspect; d, left mandible; e, left 1st maxilla; f, left 2nd maxilla; g, left 1st maxilliped; h, left 2nd maxilliped; i, left 3rd maxilliped, proximal portion; j, same, distal end; k, chela of left 1st pereopod; l, same, fingers; m, carpus and chela of left 2nd pereopod; n, dactyl of left 3rd pereopod; o, same, distal end; p, dactyl of left 4th pereopod; q, same, distal end; r, dactyl of left 5th pereopod; s, same, distal end; t, endopod and exopod of left 1st pleopod, posterior aspect; u, left appendix masculina and appendix interna, mesial aspect; v, tegumental scale from dorsolateral part of 6th abdominal somite. (Magnifications: c, $\times 2.6$; a, b, f-h, m, $\times 5.2$; d, e, i, k, t, $\times 10.8$; n, p, r, u, $\times 21.5$; j, l, $\times 53.8$; o, q, s, v, $\times 223.6$.)

mud; 18 May 1908 (1813–1833); 12' Agassiz beam trawl, mud bag (made after dark): 1 ovig ♀ [15.0].

Off Jolo Island, Sulu Archipelago: sta 5135; 6°11'50"N, 121°08'20"E; 294 m; fine coral sand; 14.1°C; 7 Feb 1908 (1450–1510); 12' Tanner beam trawl, mud bag: 21♂ [14.2–19.2], 25♀ [12.1–22.0], 21 ovig [16.2–22.0]; sta 5545; 6°04'45"N, 121°20'20"E; 209 m; fine coral sand; 15 Sep 1909 (0943–0959); 9' Tanner beam trawl: 16♂ [12.2–19.0], 12♀ [9.3–30.8], 8 ovig [16.6–30.8], 1 juv [6.0]; sta 5546; 6°06'48"N, 121°20'32"E; 252 m; fine coral sand; 13.5°C; 15 Sep 1909 (1052–1111); 9' Tanner beam trawl: 5♂ [16.2–18.9], 7♀ [17.8–21.0], 6 ovig [17.8–21.0]; sta 5547; 6°09'20"N, 121°13'40"E; 284 m; fine sand; 13.5°C; 15 Sep 1909 (1351–1411); 9' Tanner beam trawl: 1♀ [21.0].

INDONESIA. Off Darvel Bay, Sabah (North Borneo): sta 5580; 4°52'45"N, 119°06'45"E; 296 m; brown sand, coral; 13.2°C; 25 Sep 1909 (0940–0957); 9' Tanner beam trawl, mud bag: 3♀ [12.3–19.0], 2 ovig [18.6, 19.0].

RANGE.—Known previously with some certainty only from the type-locality in southern Japan and in the extreme eastern part of the Banda Sea, Indonesia, the latter in a depth of 204 meters. The *Albatross* records expand the known bathymetric range to 183–296 meters.

REMARKS.—The current study has revealed what seems to be extensive speciation in the *Plesionika narval* group, to which *P. grandis* belongs. Thanks to Sardinian specimens of *P. narval*, kindly provided by Carlo Froggia of the Laboratorio di Tecnologia della Pesca, Ancona, Italy, I am inclined to believe that that species is a Mediterranean endemic, differing from both West African and western Atlantic populations in having a well-developed epipod on the third maxilliped, the stylocerite longer and sharper, more numerous dorsal rostral teeth, the ocellus of slightly different shape, and the dactyls of the posterior pairs of pereopods more robust. There is also some evidence of at least subspecific differences between eastern and western Atlantic populations.

Although Crosnier (1976:235) has tentatively recorded *P. narval* from Réunion in the Indian Ocean, all of the related specimens that I have examined from the *Albatross* Philippine collections can be distinguished quite satisfactorily from Mediterranean and Atlantic material, especially by the longer and more slender dactyls of the three posterior pairs of pereopods.

There is little doubt that the shrimps identified herein as *P. grandis* are identical with those called *P. spinipes* by De Man (1920). The suspicion that they are distinct from *P. spinipes* Bate from the Admiralty Islands was confirmed by comparing them with three male syntypes of that species kindly made available by R.W. Ingle of the British Museum (Natural History). As shown in Figure 30, Bate's species is distinguished by fewer and less outstanding ventral rostral teeth, by a longer distolateral spine on the antennal scale, and by a noticeably deeper notch in the distal

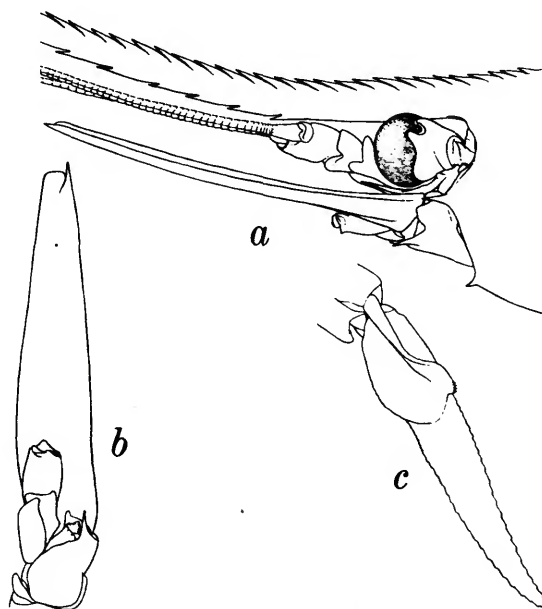


FIGURE 30.—*Plesionika spinipes*, male syntype from *Challenger* sta 219 (Admiralty Islands), carapace length 11.0 mm: a, anterior carapace and appendages, left aspect; b, left antenna, ventral aspect; c, endopod and exopod of left 1st pleopod, posterior aspect. (Magnifications: a, b, $\times 5.2$; c, $\times 10.8$.)

margin of the endopod of the first male pleopod. Of the two forms of the *P. narval* group collected by the *Albatross* that agree with *P. spinipes* in lacking an epipod on the third maxilliped, this one seems to conform with the analysis of syntypes of *P. spinipes* var. *grandis* from Sagami Bay furnished by De Man (1920:146), especially in the number of ventral rostral teeth. I therefore have little hesitation in identifying this form with the one described by Doflein.

* 27. *Plesionika indica* De Man, 1917

FIGURES 31, 32

Plesionika longipes var. *indica* De Man, 1917:279 [type-locality: Kepulauan Kai, Indonesia; 5°40'S, 132°26'E; 310 meters]; 1920:121, pl. 10: fig. 25a-g; pl. 11: fig. 25.
Plesionika indica.—Calman, 1939:198.

DIAGNOSIS.—Rostrum far overreaching antennal scale, armed dorsally throughout length with 27–33 teeth, including 4–6 on carapace posterior to level of orbital margin, 2–4 poste-

riormost teeth with distinct basal suture but none with barbed tips, armed ventrally with 22–27 teeth; orbital margin convex ventrally, strongly concave elsewhere; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th and 5th somites with posteroventral tooth on pleuron, 6th somite about 1½ times as long as maximum height; telson about 1⅓ times as long as 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye subpyriform, maximum diameter fully ⅙ carapace length, ocellus prominent, somewhat constricted at juncture with cornea; stylocerite acute, considerably overreaching dorsal arc of distal margin of 1st antennular segment; antennal scale 4–5½ times as long as wide, distolateral tooth falling distinctly short of level of distal margin of blade; 3rd maxilliped with epipod, penultimate segment 1⅓–1½ times as long as terminal segment; pereopods with prominent epipods on 4 anterior pairs, 2nd pair subequal, with 31–34 carpal articles, 3rd pair overreaching antennal scale by lengths of dactyl,

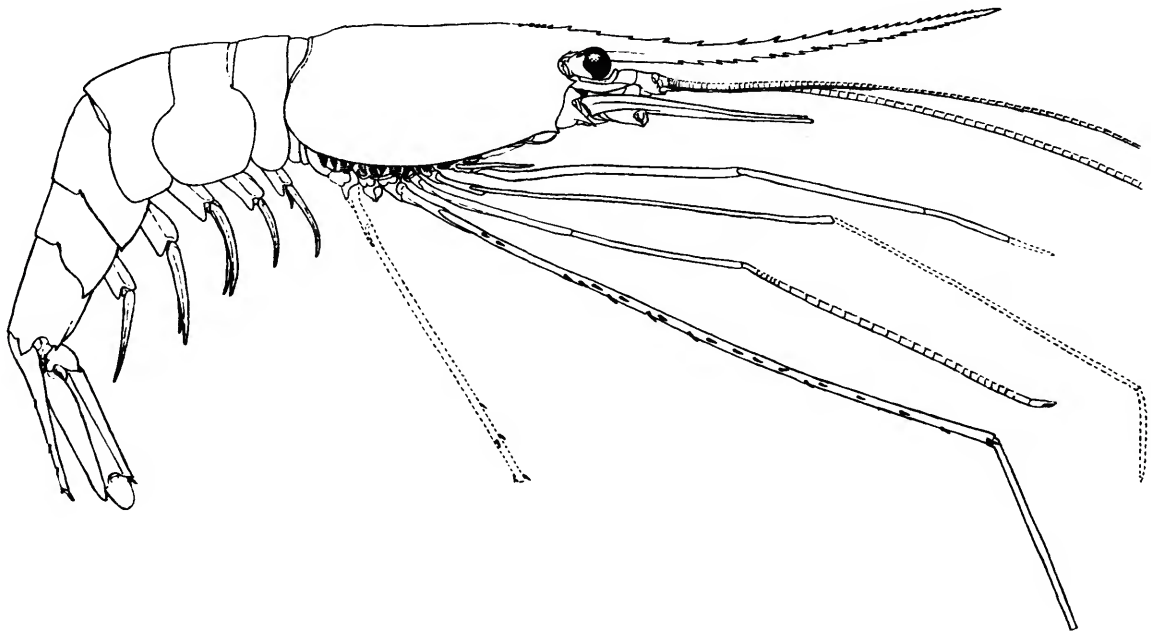


FIGURE 31.—*Plesionika indica*, female from *Albatross* sta 5516, carapace length 17.2 mm. (Magnification: × 2.1.)

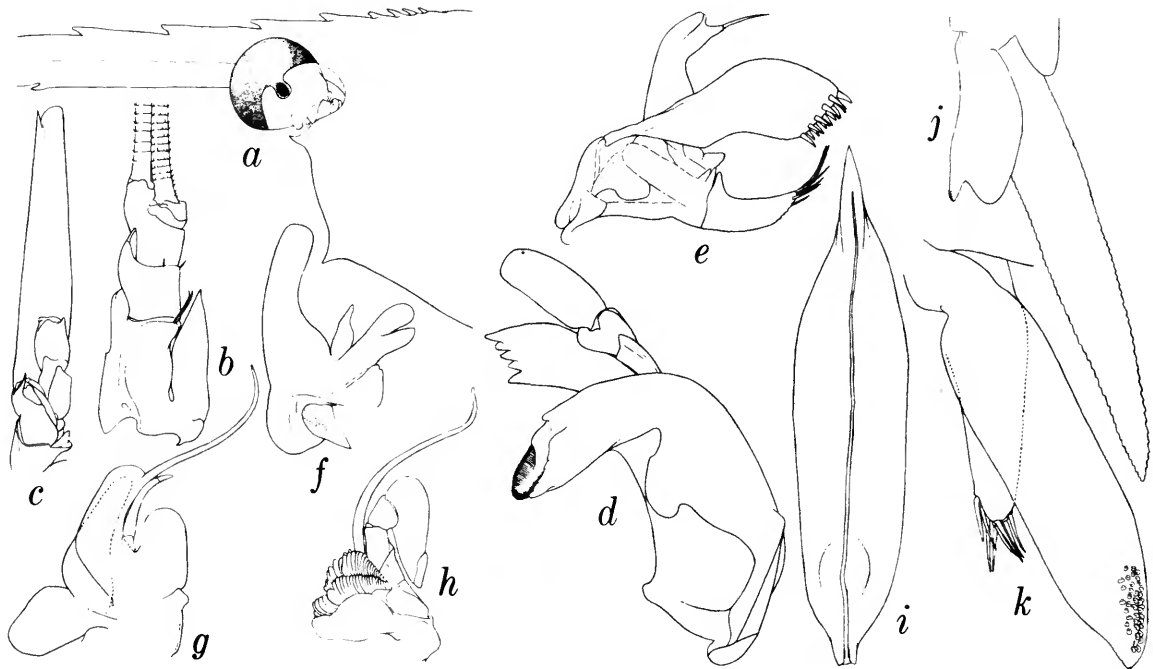


FIGURE 32.—*Plesionika indica*, a–h, female from *Albatross* sta 5516, carapace length 17.2 mm; i–k male from *Albatross* sta 5519, carapace length 16.8 mm: a, anterior carapace and eye, left aspect; b, right antennule, dorsomesial aspect; c, right antenna, ventral aspect; d, right mandible; e, right 1st maxilla; f, right 2nd maxilla; g, right 1st maxilliped; h, right 2nd maxilliped; i, tegumental scale from dorsal area of carapace; j, endopod and exopod of right 1st pleopod; k, right appendix masculina and appendix interna, mesial aspect. (Magnifications: c, $\times 2.6$; a, b, f–h, $\times 5.2$; d, e, j, $\times 10.8$; k, $\times 53.8$; i, $\times 223.6$.)

propodus, carpus, and $\frac{1}{9}$ – $\frac{1}{2}$ of merus, dactyl slightly less than $\frac{1}{3}$ as long as propodus, none of pereopods extremely slender or thread-like, 3rd pleopod with exopod about $\frac{2}{5}$ as long as carapace; maximum carapace length about 40 mm.

MATERIAL.—PHILIPPINES. Western Mindanao Sea: sta 5516; $8^{\circ}46'N$, $123^{\circ}32'30"E$; 320 m; globigerina; $12.4^{\circ}C$; 9 Aug 1909 (1021–1041); 12' Tanner beam trawl: 1♂ [17.2]. Western entrance to Mindanao Sea near Silino Island: sta 5519; $8^{\circ}47'N$, $123^{\circ}31'15"E$; 333 m; globigerina, sand; $12.4^{\circ}C$; 9 Aug 1909 (1356–1439); 12' Tanner beam trawl: 1y♂ [16.8].

RANGE.—The species has been recorded previously from off Zanzibar, the South China Sea, and eastern Indonesia in 238–310 meters. The *Albatross* specimens extend the known geo-

graphic range to the Philippines, and the bathymetric range to 333 meters.

REMARKS.—There is little doubt that *P. indica* is the Indo-Pacific counterpart of *P. longipes* from the western Atlantic, but I agree with Calman (1939) that it should be treated as a distinct species, because of lack of agreement in a number of characters, most obviously the smaller number of rostral teeth. Examination of five specimens of *P. longipes* with complete rostra disclosed a range of 45 to 49 ventral rostral teeth, without evident correlation with the size of the specimens. This is fewer than the approximately 70 ventral teeth usually cited for *P. longipes* (apparently derived from A. Milne-Edwards' (1883) crude rendition of the rostrum), but considerably more than the 22–27 ventral teeth in *P. indica*.

The two *Albatross* specimens—the smallest of the species on record—differ from De Man's detailed description (1920) in having the stylocerite shorter, reaching little beyond midlength of the second antennular segment, rather than "to the far end of the 2nd joint or just beyond it," the antennal scale $\frac{9}{10}$ as long as the carapace, rather than "little longer than two-thirds the length of the carapace," and more than $5\frac{1}{2}$, rather than 4, times as long as wide, the terminal segment of the third maxilliped nearly $\frac{1}{3}$, rather than "about $\frac{1}{6}$," shorter than the penultimate segment, the first pereopod overreaching the antennal scale by slightly more than the combined lengths of the carpus and chela, rather than $\frac{2}{3}$ of the carpus, the second pereopod overreaching the antennal scale by the length of the chela and nearly $\frac{4}{5}$ of the carpus, rather than "by the chela and half the carpus or a little more," and the third pereopod overreaching the antennal scale by the lengths of the three terminal segments, plus nearly half of the merus, rather than "by the three last joints and a small part (about $\frac{1}{9}$) of the merus," and the merus $2\frac{1}{3}$, rather than $1\frac{1}{3}$ to $1\frac{2}{3}$, times as long as the carapace.

The form of the appendix masculina of the male specimen (Figure 32*k*) suggests that the *Albatross* specimens may be juveniles and that the differences noted above may be correlated with age. As a possible test of that hypothesis, specimens of *P. longipes* from the Gulf of Mexico—comparable in size with the Philippine specimens and with De Man's type series of *P. indica*—were examined; it was found that the immature form differed from the adult in the same characters and to about the same degree as do the *Albatross* specimens from those of the *Siboga*. It seems reasonably safe to assume, therefore, that the former represent the juvenile form of *P. indica*.

* 28. *Plesionika intermedia*, new species

FIGURE 33

DIAGNOSIS.—Rostrum far overreaching antennal scale, armed dorsally on basal crest with 6

or 7 teeth, including 3 on carapace posterior to level of orbital margin, 1 or more posteriormost teeth with faint, incomplete basal sutures but none movable or with barbed tips, armed ventrally with 34–43 teeth; orbital margin convex in ventral part, nearly vertical posteriorly; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th somite with pleuron rounded, without marginal denticle, 5th somite with rather obscure posteroventral tooth on pleuron, 6th somite more than twice as long as maximum height; telson from slightly shorter to slightly longer than 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye considerably broader than long, maximum diameter fully $\frac{1}{5}$ carapace length, ocellus represented by tapering, subtruncate lobe, broadening rather than constricted at base; stylocerite blunt, considerably overreaching dorsal arc of distal margin of 1st antennular segment; antennal scale about 5 times as long as wide, distolateral tooth usually overreaching distal margin of blade; 3rd maxilliped with epipod, penultimate segment nearly $1\frac{1}{4}$ times as long as terminal segment; pereopods with epipods on 3 anterior pairs, 2nd pair subequal, with 19 or 20 carpal articles; 3rd pleopod with exopod nearly or fully $\frac{2}{3}$ as long as carapace; maximum carapace length more than 15 mm.

DESCRIPTION.—Rostrum (Figure 33*a*) directed somewhat dorsad, distinctly overreaching antennal scale, about twice as long as carapace; dorsal margin armed with 6 or 7 teeth on basal portion, unarmed anterior to level of distal end of antennular peduncle, posterior 3 teeth situated on carapace posterior to level of orbital margin, 1 or more with faint and partial basal suture, but none actually movable or with barbed tip; ventral margin armed with 34–43 teeth. Orbit (Figure 33*b*) convex in ventral portion, margin then becoming subvertical and finally veering posteriorly at dorsal end before disappearing. Antennal spine slightly smaller than pterygostomial spine. Median postrostral ridge slightly convex, sharp, extending over about $\frac{2}{5}$ of carapace.

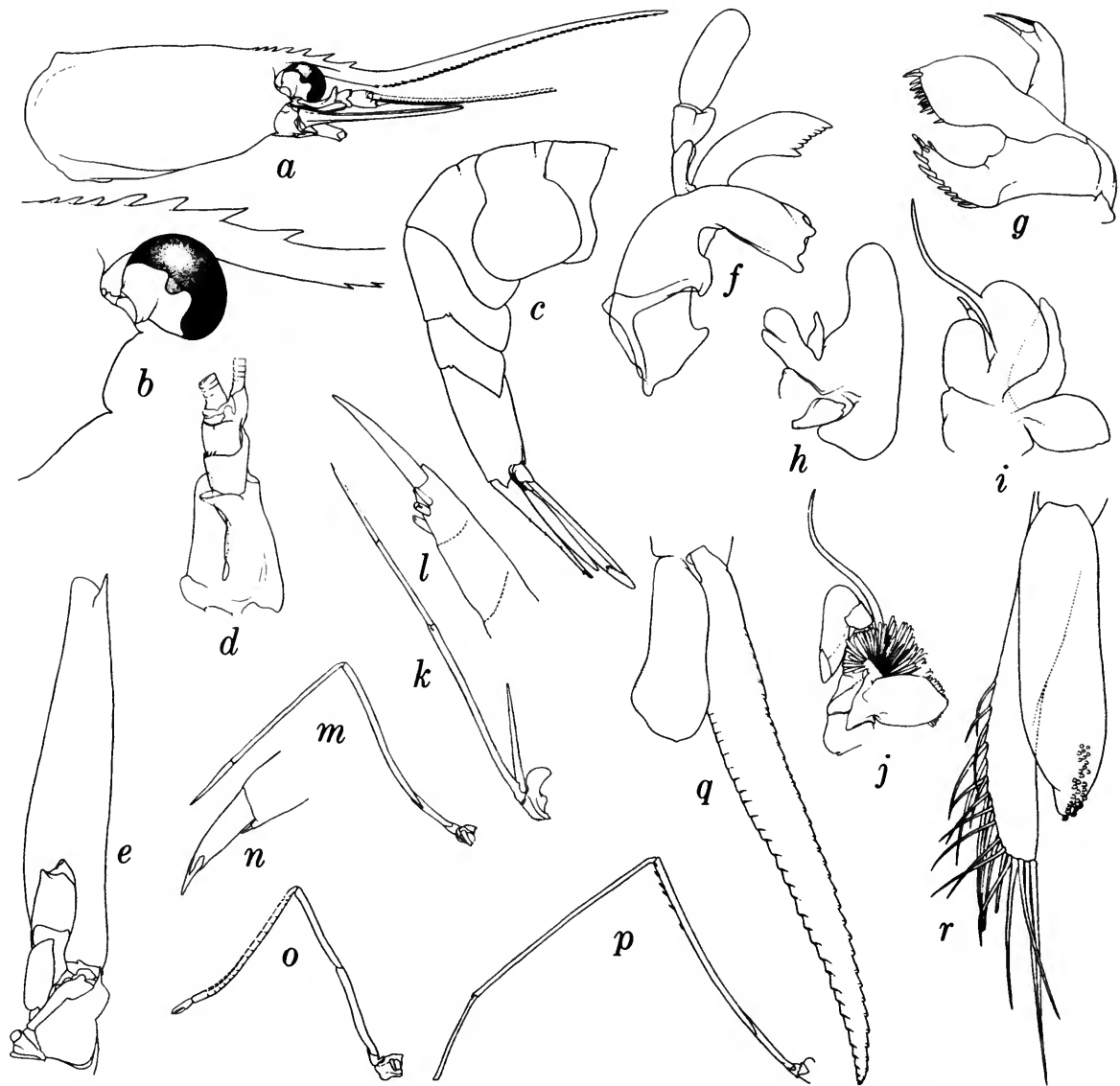


FIGURE 33.—*Plesionika intermedia*, new species, *a-p*, ovigerous female holotype from *Albatross* sta 5191, carapace length 15.2 mm; *q*, male paratype from *Albatross* sta 5191, carapace length 14.4 mm; *r*, young male paratype from *Albatross* sta 5191, carapace length 10.2 mm: *a*, carapace and anterior appendages, right aspect; *b*, right eye and orbit; *c*, abdomen, right aspect; *d*, left antenna, ventral aspect (ventromesial tooth not visible in this view); *e*, left antenna, mesiodorsal aspect; *f*, left mandible; *g*, left 1st maxilla; *h*, left 2nd maxilla; *i*, left 1st maxilliped; *j*, left 2nd maxilliped; *k*, left 3rd maxilliped; *l*, same, distal end; *m*, left 1st pereopod; *n*, same, distal end of chela; *o*, left 2nd pereopod; *p*, left 5th pereopod; *q*, endopod and exopod of right 1st pleopod, posterior aspect; *r*, right appendix masculina and appendix interna, mesial aspect. (Magnifications: *a, c*, $\times 2.2$; *k, m, o, p*, $\times 2.6$; *b, d, e, h-j*, $\times 5.2$; *f, g, q*, $\times 10.8$; *l, n, r*, $\times 53.8$.)

Abdomen (Figure 33c) with 3rd somite rounded posteriorly, unarmed, without median carina, rather noticeably depressed in dorsal midline in lateral aspect. Pleura of 4 anterior somites rounded, that of 5th acute and provided with minute tooth posteroventrally. Sixth somite 2 or more times as long as 5th and from $1\frac{3}{4}$ times to more than twice as long as maximum height. Telson slightly shorter or longer than 6th somite, armed with 4 pairs of dorsolateral spinules, posteriormost pair situated dorsolateral to base of long lateral spine of 2 posterior pairs.

Eye (Figure 33b) distinctly broader than long, maximum diameter $\frac{1}{5}$ of carapace length; ocellus represented by lingulate projection from orbital margin.

Antennular peduncle (Figure 33d) with minute tooth on ventromesial margin of basal segment. Stylocerite rounded with obscure denticle distally, overreaching dorsal arc of distal margin of basal segment.

Antennal scale (Figure 33e) with lateral margin sinuous, little more than $\frac{3}{4}$ as long as carapace, barely 5 times as long as wide, distolateral tooth overreaching distal margin of blade in 2 largest specimens.

Mouthparts as illustrated (Figure 33f-l). Third maxilliped with epipod, overreaching antennal scale by about $\frac{2}{3}$ length of distal segment, armed terminally with strong distal spine and few subapical spines (Figure 33l), penultimate segment about $1\frac{1}{4}$ times as long as terminal segment.

Pereopods with distinct epipods on 3 anterior pairs, devoid of them on 4th and 5th pairs. First pereopod (Figure 33m) overreaching antennal scale by slightly more than length of chela; dactyl with lateral accessory spine, fixed finger with terminal spine (Figure 33n). Second pereopods (Figure 33o) subequal, reaching distal $\frac{1}{10}$ of antennal scale, carpus composed of 19 or 20 articles. Third and 4th pereopods missing from all 3 specimens. Fifth pereopod (represented only by incomplete left member of pair in ovigerous female holotype (Figure 33p)) overreaching antennal scale by slightly more than combined lengths of dactyl and propodus.

Endopod of 1st pleopod of male (Figure 33q) with mesial margin concave in distal $\frac{1}{2}$, notch in distal margin shallow, minute subacute projection in extreme distal margin. Appendix masculina on 2nd pleopod missing in larger male paratype, slender, overreaching appendix interna, and bearing more than 20 long spines on anterior and distal margins in apparently immature male paratype (Figure 33r). Exopod of 3rd pleopod slightly less than $\frac{2}{3}$ as long as carapace. Mesial branch of uropod (Figure 33c) barely overreaching telson; lateral branch distinctly overreaching telson and bearing movable spine mesial to distolateral tooth.

SIZE.—Carapace lengths of male paratypes, 10.2–14.4 mm; of ovigerous female holotype, 15.2 mm. The smaller male paratype may be immature, as indicated by the shape of the endopod of the first pleopod.

MATERIAL.—PHILIPPINES. Tañon Strait, east of Negros: sta 5191; $10^{\circ}29'45''N$, $123^{\circ}31'15''E$; 472 m; green mud; $17.1^{\circ}C$; 2 Apr 1908 (1526–1546); 12' Agassiz beam trawl, 3 mud bags: 2♂ [10.2, 14.4], 1 ovig ♀ holotype [15.2] (USNM 205238); sta 5188; $9^{\circ}44'N$, $123^{\circ}14'20''E$; 547 m; green mud; $17.0^{\circ}C$; 1 Apr 1908 (1044–1104); 12' Agassiz beam trawl, 3 mud bags: 1♂ [10.8].

TYPE-LOCALITY.—Tañon Straight, east of Negros, Philippines; $10^{\circ}29'45''N$, $123^{\circ}31'15''E$; 472 meters.

RANGE.—Known only from the two stations in Tañon Strait cited above.

REMARKS.—This is one of the five Philippine species of *Plesionika* that seem to belong to the *P. martia* group. It may be distinguished from *P. martia orientalis*, *P. parvimartia*, and *P. semilaevis* by the absence of an epipod on the fourth pereopod and from *P. simulatrix* by the presence of epipods on the three anterior pairs of pereopods. It seems to differ from all four of the other species in the smaller major diameter of the eye and the shorter antennal scale relative to the carapace length (about 0.75 vs. 0.85–1.18) and from *P. martia orientalis* and *P. simulatrix*, and less distinctly from *P. parvimartia*, in the shorter

exopod on the third pleopod relative to the carapace length. Finally, it may usually be separated from *P. parvimartia* by the absence of dorsal rostral teeth anterior to the level of the distal end of the antennular peduncle.

ETYMOLOGY.—The Latin *intermedia* (that is in between) refers to the intermediate position of the species in the *P. martia* group, between those with a full complement of epipods on four pairs of pereopods (*P. martia orientalis*, *P. parvimartia*, and *P. semilaevis*) and the one without epipods on any of the pereopods (*P. simulatrix*).

* 29. *Plesionika izumiae?* Omori, 1971

FIGURE 34

Plesionika izumiae Omori, 1971:242, figs. 1–4, 6–12, pl. 1 [type-locality: off Abe River, Suruga Bay, Honshu, Japan; 34°54'06"N, 138°24'42"E; 45 meters].—Hayashi and Koike, 1976:47, figs. 1a–e, 2.

DIAGNOSIS.—Rostrum far overreaching antennal scale, armed dorsally throughout length with 12–15 teeth, including 3 or 4 on carapace posterior to level of orbital margin, 6 or 7 posteriormost teeth movable, with distinct basal sutures but none with barbed tips, armed ventrally with 11–16 teeth; orbital margin convex in ventral part, rather regularly concave in dorsal ½; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th and 5th somites with posteroventral tooth on pleuron, 6th somite 1½–1¾ times as long as maximum height; telson 1¼ to more than 1½ as long as 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye large, maximum diameter about ¼ carapace length, with rather narrowly linguuate ocellus positioned diagonally to main axis of eyestalk; styl-ocerite sharp, falling slightly short of or reaching slightly beyond level of dorsal arc of distal margin of 1st antennular segment; antennal scale from slightly less than 4 to 4½ times as long as wide, distolateral tooth usually falling distinctly short of level of distal margin of blade; 3rd maxilliped with epipod, penultimate segment about ¾ as

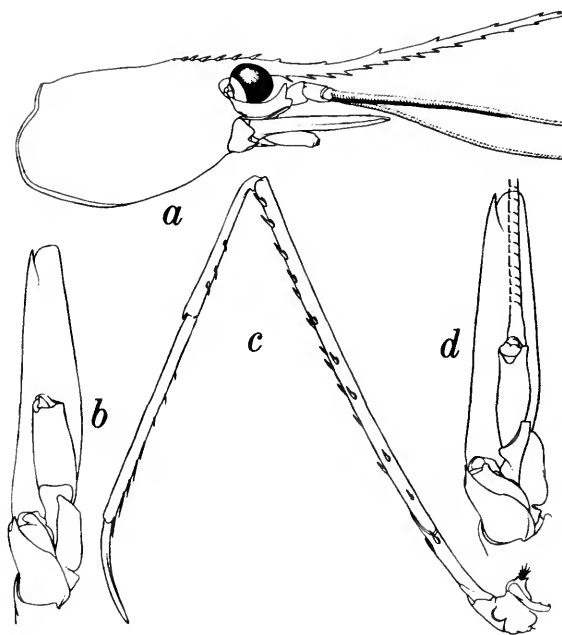


FIGURE 34.—*Plesionika izumiae?*, a–c, male from Albatross sta 5545, carapace length 10.1 mm; d, ovigerous female from Albatross sta 5545, carapace length 10.8 mm: a, carapace and anterior appendages, right aspect; b, right antenna, ventral aspect; c, left 3rd pereopod; d, right antenna, ventral aspect. (Magnifications: a, × 2.6, b–d, × 5.2.)

long as terminal segment or slightly longer; pereopods with prominent epipods on 4 anterior pairs, 2nd pair very unequal, left with 50–75 carpal articles, right with 18–24, 3rd pair overreaching antennal scale by lengths of dactyl, propodus, and about ½ of carpus, dactyl about ½ as long as propodus, accessory distal spines apparently paired, nearly as long as and little separated from main terminal spine, 3 distal segments, combined, nearly 1½ times as long as carapace, none of pereopods extremely slender or thread-like; 3rd pleopod with exopod ⅔–½ as long as carapace; maximum carapace length about 11 mm.

MATERIAL.—PHILIPPINES. Off Jolo Island, Sulu Archipelago: sta 5545; 6°04'45"N, 121°20'20"E; 209 m; fine coral sand; 15 Sep 1909

(0943–0959); 9' Tanner beam trawl: 2♂ [8.2, 10.1], 4 ovig ♀ [8.2–10.8].

RANGE.—*Plesionika izumiae* is a relatively common shrimp in the coastal waters of Japan—except off northern Honshu and Hokkaido—in depths of 40 to 80 meters (Hayashi and Koike, 1976). It has not been recorded elsewhere, and the single lot of six specimens herein reported tentatively from the Sulu Archipelago in 209 meters must remain of questionable identity for the time being.

REMARKS.—The *Albatross* lot differs from Omori's description of *P. izumiae* and from three males and three females of the original series of that species collected in Suruga Bay 6 November 1968, and kindly deposited in the Smithsonian collections by Dr. Omori, in being of somewhat larger size, in having the rostrum nearly twice as long as the carapace, rather than little more than $1\frac{1}{2}$ times as long, and in having the dactyls of the three posterior pairs of pereopods slightly shorter in proportion to the other segments.

Comparison of the six *Albatross* specimens with a few of a large series of *P. heterocarpus* (Costa, 1871) from off Sicily revealed that the proportionate rostrum length is comparable, both forms having the rostrum longer than in typical *P. izumiae*, but the Philippine specimens have fewer teeth on both margins of the rostrum proper (12 to 15 versus 17 to 18 and 11 to 16 versus 17 to 19) and more (six or seven) of the dorsal teeth are movable than in *P. heterocarpus* (five). The third abdominal somite is strongly and regularly convex in lateral aspect in *P. izumiae*?, whereas this margin is slightly concave in the posterior part of the somite in *P. heterocarpus*, suggesting the much more pronounced configuration of this somite in *P. unidens*. The sixth somite is slightly less elongate in *P. izumiae* (?) ($1\frac{2}{3}$ to $1\frac{1}{4}$ times as long as maximum height) than in *P. heterocarpus* (more than $1\frac{1}{4}$ to $1\frac{9}{10}$ times as long). The eyes seem to be slightly smaller in *P. izumiae*? than in *P. heterocarpus* (maximum diameter about $\frac{1}{4}$ versus about $\frac{3}{10}$ as long as carapace). As noted by Omori (1971:248), both second pereopods have fewer carpal articles in *P. izumiae* than in *P.*

heterocarpus. The dactyl of the third pereopod is proportionately longer in *P. izumiae*? (half as long as propodus) than in *P. heterocarpus* ($\frac{2}{5}$ as long as propodus), and the carpus of that appendage seems to be a little shorter in relation to the propodus in *P. izumiae*? than in *P. heterocarpus* ($\frac{7}{10}$ versus fully $\frac{3}{4}$), but the ratios of the combined lengths of the three distal segments of the three posterior pairs of pereopods to the carapace length are not too dissimilar in the two species. The exopod of the third pleopod is usually less than half as long as the carapace in *P. izumiae*?, whereas it is more than half as long in *P. heterocarpus*.

Comparison of the Philippine lot with specimens of *P. antigai* Zariquiey, 1955, from the Adriatic Sea and from off Sicily discloses that the rostrum of that Mediterranean species is slightly shorter than in the Philippine specimens but still considerably longer than in typical *P. izumiae*. Also, *P. antigai* seems to correspond more closely with the Philippine form in the rostral dentition (12 or 13 dorsal and 14 to 19 ventral teeth) than does *P. heterocarpus*, but, as in the latter species, no more than five of the dorsal teeth are movable. The third abdominal somite in *P. antigai* is like that in *P. izumiae*? in that it forms a regularly convex cap over the anterior end of the fourth somite, rather than being depressed posteriorly, as in *P. heterocarpus*. The sixth abdominal somite is even longer in *P. antigai* than it is in the *P. heterocarpus*, measuring at least twice as long as its maximum height, and the telson is proportionately shorter in *P. antigai* than it is in either of the other two species, being only slightly longer than the sixth somite to little more than $1\frac{1}{4}$ as long. The eyes in *P. antigai* seem slightly larger than those in *P. izumiae*?; they are nearly as large as those in *P. heterocarpus*. The number of carpal articles in the second pereopods is about the same as in *P. izumiae*?, that is, less numerous than in *P. heterocarpus*. The dactyl of the third pereopod is proportionately shorter in *P. antigai* (less than $\frac{1}{5}$ as long as the propodus) than in either *P. heterocarpus* or *P. izumiae*?, but the carpus seems to be longer in proportion to the

propodus in *P. antigai* ($\frac{4}{5}$ or more) than in either of the other species; the ratio of the combined lengths of the three distal segments of the three posterior pairs of pereopods to the carapace length is slightly lower in *P. antigai* than in the other species. The exopod of the third pleopod is more or less than half as long as the carapace in *P. antigai*.

The *Albatross* specimens are not in the best condition, apparently having dried out at some time. The question about the identity of this lot from the Sulu Archipelago with the Japanese species cannot be decided satisfactorily until additional material becomes available for comparison, but there is little doubt that *P. izumiae* is closely related to the Mediterranean *P. heterocarpus* and *P. antigai*, perhaps more closely to the latter than the former.

* 30. *Plesionika kensleyi*, new species

FIGURES 35, 36

Plesionika acanthonotus.—Kensley, 1969:170, fig. 13 [not *Pandalus acanthonotus* Smith, 1882].

DIAGNOSIS.—Rostrum not overreaching antennal scale, armed dorsally throughout length with 9–13 teeth, including 2–4 on carapace posterior to level of orbital margin, 2 or 3 posteriormost teeth with basal sutures but none with barbed tips, armed ventrally with 3–5 teeth in anterior $\frac{1}{2}$ of rostrum; orbital margin convex in ventral part, concave in dorsal $\frac{1}{2}$; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th somite with pleuron narrowly rounded, without marginal denticle, 5th somite with strong posteroventral tooth on pleuron, 6th somite more or less than twice as long as maximum height; telson $\frac{1}{5}$ to nearly as long as 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye subpyriform, maximum diameter about $\frac{1}{4}$ carapace length, ocellus prominent, only slightly constricted at juncture with cornea; stylocerite acute, not overreaching dorsal arc of distal margin of 1st antennular segment; anten-

nal scale 4 to nearly 5 times as long as wide, distolateral tooth usually overreaching distal margin of blade; 3rd maxilliped with epipod, penultimate segment $1\frac{2}{5}$ – $1\frac{1}{2}$ times as long as terminal segment; pereopods with well-developed epipods on 4 anterior pairs, 2nd pair subequal, with 18–23 carpal articles, 3rd pair overreaching antennal scale by lengths of dactyl, propodus, carpus, and about $\frac{1}{6}$ of merus, dactyl $\frac{1}{5}$ to fully $\frac{2}{5}$ as long as propodus, accessory distal tooth very small, tipped with slender spine, and well separated from main terminal spine, 3 distal segments, combined, $1\frac{9}{10}$ – $2\frac{1}{5}$ times as long as carapace, none of pereopods extremely slender or thread-like; 3rd pleopod with exopod slightly more or less than $\frac{1}{2}$ as long as carapace; maximum carapace length about 12 mm.

DESCRIPTION.—Rostrum (Figure 35) nearly horizontal or curving slightly dorsad anteriorly, not nearly reaching level of distal end of antennal scale, from less than $\frac{3}{5}$ to nearly $\frac{4}{5}$ as long as carapace; dorsal margin armed with 9–13 teeth over virtually entire length, including 2–4 on carapace posterior to level of orbital margin, 2 or 3 (rarely 1) posteriormost teeth with distinct basal suture, none with barbed tips; ventral margin armed with 4 (rarely 3 or 5) teeth in distal $\frac{1}{2}$ of length. Orbit (Figure 36a) rather abruptly convex in ventral portion posterior to antennal spine, rather evenly and shallowly concave in dorsal $\frac{1}{2}$. Antennal spine stronger than pterygostomial spine. Median postrostral ridge rounded, not strongly compressed, extending posteriorly to about midlength of carapace.

Abdomen with 3rd somite rounded posteriorly, unarmed, without median carina, not strongly arched in dorsal midline in lateral aspect. Pleura of 3 anterior somites broadly rounded, of 4th narrowly rounded, of 5th sharply acute. Sixth somite $1\frac{1}{5}$ – $2\frac{1}{2}$ times as long as 5th somite and slightly more or slightly less than twice as long as maximum height. Telson $\frac{1}{5}$ to nearly as long as 6th somite, with 4 pairs of dorsolateral spinules, posteriormost pair situated dorsolateral to base of long, lateral spine of 2 posterior pairs.

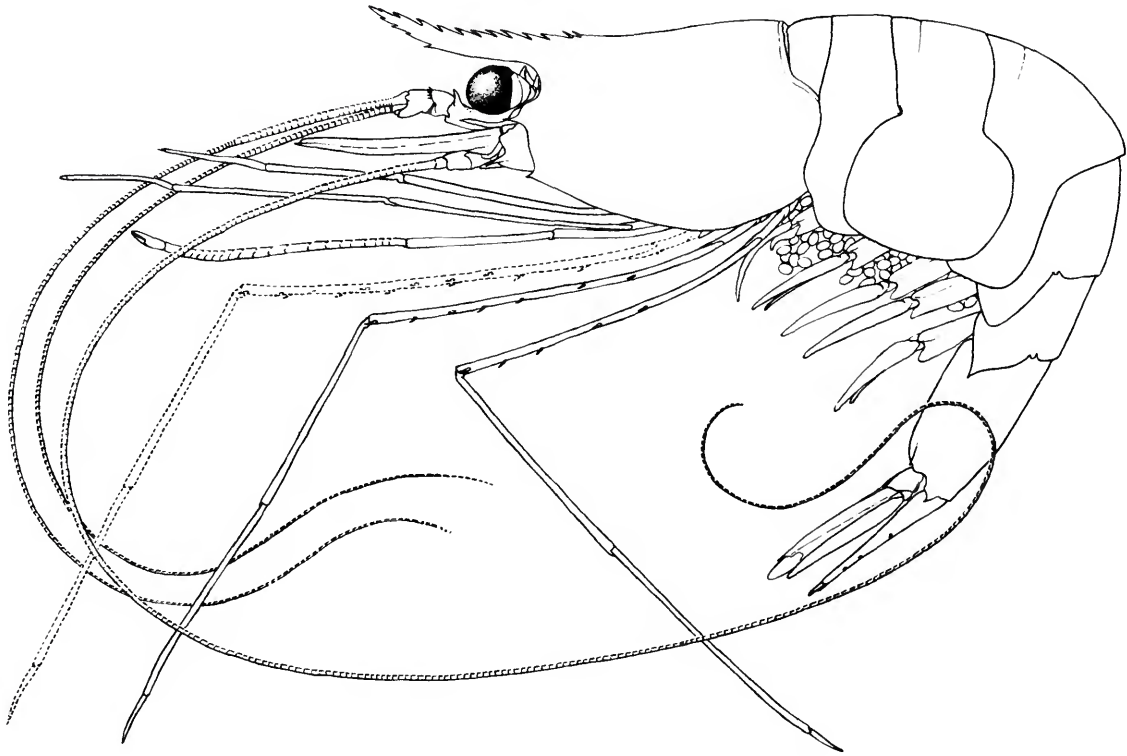


FIGURE 35.—*Plesionika kensleyi*, new species, ovigerous female holotype from *Albatross* sta 5517 (Mindanao Sea, Philippines), carapace length 8.9 mm. (Magnification: $\times 4.0$.)

Tegumental scales (Figure 36o) with margins obscurely and minutely denticulate and with pair of curved flanges forming "parentheses-like" pattern embracing midline distally.

Eye (Figure 36a) subpyriform, maximum diameter about $\frac{1}{4}$ of carapace length in large specimens, slightly more, proportionately, in smaller ones; ocellus large and prominent, little longer in long axis of eyestalk than wide, slightly constricted at juncture with cornea.

Antennular peduncle (Figure 36b) with distinct tooth on ventromesial margin of basal segment. Stylocerite rather sharply acute, not reaching level of dorsal arc of distal margin of basal segment.

Antennal scale (Figure 36c) with lateral margin nearly straight, $\frac{7}{10}$ to more than $\frac{9}{10}$ as long as carapace, barely 4 to nearly 5 times as long as

wide, distolateral tooth nearly always overreaching blade.

Mouthparts as illustrated (Figures 36d–i). Third maxilliped with epipod, overreaching antennal scale by somewhat more than length of distal segment, armed terminally with long, slender apical and few subapical spines (Figures 36i), penultimate segment fully $1\frac{1}{4}$ to nearly $1\frac{2}{3}$ times as long as terminal segment.

Pereopods with well-developed epipods on 4 anterior pairs. First pereopod (Figure 36j) overreaching antennal scale by length of chela and about $\frac{1}{2}$ of carpus; fingers as illustrated (Figure 36k). Second pereopods subequal, overreaching antennal scale by length of chela and more than $\frac{1}{2}$ of carpus, carpus (Figure 36l) composed of 18–22 (usually 19 or 20) articles. Third pereopod overreaching antennal scale by more than



FIGURE 36.—*Plesionika kensleyi*, new species, a–n, ovigerous female holotype from *Albatross* sta 5517 (Mindanao Sea, Philippines), carapace length 8.9 mm; o, male paratype from *Albatross* sta 5516, carapace length 7.2 mm; p–r, male paratype from *Albatross* sta 5517, carapace length 8.2 mm: a, anterior carapace and eye, left aspect; b, right antennule, mesiodorsal aspect; c, right antenna, ventral aspect; d, right mandible; e, right 1st maxilla; f, right 2nd maxilla; g, right 1st maxilliped; h, right 2nd maxilliped; i, distal end of left 3rd maxilliped; j, chela of right 1st pereopod; k, same, distal end; l, carpus and chela of right 2nd pereopod; m, dactyl of right 4th pereopod; n, same, distal end; o, tegumental scale from carapace; p, exopod and endopod of left 1st pleopod, posterior aspect; q, same, endopod; r, left appendix masculina and appendix interna, mesial aspect. (Magnifications: b, c, l, p, $\times 5.2$; a, f–h, j, $\times 10.8$; d, e, m, q, $\times 21.5$; i, k, r, $\times 53.8$; n, o, $\times 223.6$.)

combined lengths of dactyl, propodus, and carpus; dactyl $\frac{1}{3}$ to fully $\frac{2}{3}$ as long as propodus, laterally carinate distally and terminating in stout spine opposed by spine-tipped extension of flexor margin; carpus $1\frac{1}{10}$ to $1\frac{1}{4}$ times as long as propodus; 3 distal segments, combined, about twice as long as carapace or longer. Fourth pereopod overreaching antennal scale by lengths of dactyl and propodus and about $\frac{3}{4}$ of carpus; dactyl (Figure 36*m*) slightly shorter but similar to dactyl of 3rd pereopod; 3 distal segments, combined, usually more than twice as long as carapace. Fifth pereopod overreaching antennal scale by lengths of dactyl and propodus and about $\frac{1}{2}$ of carpus; dactyl slightly shorter than that of 4th pereopod; 3 distal segments, combined, from nearly twice to $2\frac{1}{2}$ times as long as carapace.

Endopod of 1st pleopod of male (Figure 36*p*, *q*) tapering distally from near midlength and terminating in 2 subequal lobes, mesial one bearing cluster of adhesive hooks. Appendix masculina on 2nd pleopod of male (Figure 36*r*) armed with about 30 long spines on anteromesial and distal margins. Exopod of 3rd pleopod about $\frac{1}{2}$ as long as carapace. Mesial branch of uropod overreaching posterior end of telson proper; lateral branch longer and bearing movable spine mesial to distolateral tooth.

SIZE.—Carapace lengths of male paratypes, 6.7–8.7 mm; of nonovigerous female paratypes, 6.9–10.2 mm; of ovigerous female holotype, 8.9 mm; of ovigerous female paratypes, 7.2–11.2 mm; of juvenile, 4.9 mm.

MATERIAL.—PHILIPPINES. Northeast of Lubang Islands: sta 5272; 14°N , $120^{\circ}22'30''\text{E}$; 216 m; mud, shells, coral sand; 14.1°C ; 14 Jul 1908 (1005–1031); 12' Agassiz beam trawl: 2♂ [7.4, 7.4]. Balayan Bay, southern Luzon: sta 5117; $13^{\circ}52'22''\text{N}$, $120^{\circ}46'22''\text{E}$; 216 m; 21 Jan 1908 (0927–0947); 12' Tanner beam trawl, mud bag: 1♀ [10.2]; sta 5118; $13^{\circ}48'45''\text{N}$, $120^{\circ}41'51''\text{E}$; 291 m; dark green mud; 21 Jan 1908 (1100–1130); 12' Tanner beam trawl, mud bag: 1 ovig ♀ [8.4]. Batangas Bay, southern Luzon: sta 5266; $13^{\circ}44'36''\text{N}$, $120^{\circ}59'15''\text{E}$; 183 m; mud; 8 Jun 1908 (0918–0938); 12' Agassiz beam trawl, mud

bag: 6♂ [6.7–8.3], 2♀ [6.9, 9.8]. Eastern end of Verde Island Passage, north of Mindoro: sta 5121; $13^{\circ}27'20''\text{N}$, $121^{\circ}17'45''\text{E}$; 198 m; dark green mud; 2 Feb 1908 (0830–0850); 12' Tanner beam trawl, mud bag: 1 juv. (?) [4.9]. Panay Gulf, south of Panay: sta 5183; $10^{\circ}32'48''\text{N}$, $122^{\circ}26'\text{E}$; 176 m; soft green mud; 17.4°C ; 30 Mar 1908 (1051–1111); 12' Agassiz beam trawl, 3 mud bags (veered from 351 to 457 m [cable] during haul): 1♂ [9.9].

Bohol Strait, east of Cebu: sta 5417; $10^{\circ}10'\text{N}$, $123^{\circ}53'15''\text{E}$; 302 m; gray mud, sand; 12.4°C ; 25 Mar 1909 (0840–0900); 12' Agassiz beam trawl: 1 ovig ♀ [10.1]. Western Mindanao Sea: sta 5516; $8^{\circ}46'\text{N}$, $123^{\circ}32'30''\text{E}$; 320 m; globigerina; 12.4°C ; 9 Aug 1909 (1021–1041); 12' Tanner beam trawl: 2♂ [7.2, 8.7], 4♀ [8.0–11.1], 3 ovig [8.2–11.1]; sta 5517; $8^{\circ}45'30''\text{N}$, $123^{\circ}33'45''\text{E}$; 309 m; globigerina; 12.4°C ; 9 Aug 1909 (1121–1139); 12' Tanner beam trawl: 3♂ [7.8–8.2], 4 ovig ♀ [7.8–11.2], 1 ovig ♀ is holotype (USNM 205211). Western entrance to Mindanao Sea near Silino Island: sta 5519; $8^{\circ}47'\text{N}$, $123^{\circ}31'15''\text{E}$; 333 m; globigerina, sand; 12.4°C ; 9 Aug 1909 (1356–1439); 12' Tanner beam trawl: 1♂ [7.3], 2 ovig ♀ [9.7, 9.8].

TYPE-LOCALITY.—Mindanao Sea off Murcielagos Bay, Mindanao, Philippines; $8^{\circ}45'30''\text{N}$, $123^{\circ}33'45''\text{E}$; 309 meters.

RANGE.—Philippines and off Durban, South Africa, in 118 to 333 meters.

REMARKS.—Attempts to compare the specimens described above with examples of *P. acanthonotus* (Smith, 1882) from the western Atlantic, which Kensley (1969:172) believed to be the same species or one "very closely related," have been thwarted by the fact that all of the western Atlantic material in the Smithsonian collections identified as *P. acanthonotus* belongs to *P. holt-huisi* Crosnier and Forest, 1968, or to another species of the *P. acanthonotus* complex, with a considerably longer rostrum, from off northern Brazil. It seems apparent to me, however, that *P. kensleyi* is not as closely related to this group as might be suggested by superficial resemblances. In *P. kensleyi*, the ventral margin of the rostrum

is dentate only in the anterior half, rather than over a more extensive span; the ocellus on the eye is far more prominent and more sharply circumscribed than in material from the Atlantic; and, finally, the form of the endopod of the first pleopod of the male seems to differ from that of most other species of the genus, including the *P. acanthonotus* complex.

ETYMOLOGY.—It is a pleasure to name this species for Brian F. Kensley, not so much because he may have been the first to record the shrimp but, more importantly, in recognition of his notable contributions to several aspects of carcinology and of those that will surely follow as he succeeds me on the Smithsonian invertebrate staff.

*** 31. *Plesionika lophotes*, new species**

FIGURE 37

Plesionika binoculus.—De Man, 1920:134, pl. 12: fig. 30.—Hayashi and Koike, 1976:47, fig. 1a'–e'. [Not *Nothocaris binoculus* Bate].

Plesionika binoculus.—Boone, 1935:113, pl. 30.

DIAGNOSIS.—Rostrum overreaching antennal scale, armed dorsally with 12–15 teeth, including 5 or 6 on carapace posterior to level of orbital margin, all teeth on carapace with distinct basal sutures and movable but none with barbed tips, armed ventrally with 14–18 teeth; orbital margin convex in ventral part, rather deeply concave posteriorly, becoming nearly straight dorsally; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th and 5th somites with small marginal tooth on pleura, 6th somite $1\frac{1}{3}$ to fully $1\frac{1}{2}$ times as long as maximum height; telson $1\frac{2}{5}$ – $1\frac{7}{10}$ times as long as 6th somite, typically with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye broadly subpyriform, maximum diameter about $\frac{1}{5}$ carapace length, ocellus longitudinally oval, narrowly constricted at juncture with cornea; stylocerite sharply acute, distinctly overreaching dorsal arc of distal margin of 1st antennular segment; antennal scale about 4 times as long as wide, distolateral tooth not nearly

reaching level of distal margin of blade; 3rd maxilliped with epipod, penultimate segment about $\frac{2}{3}$ as long as terminal segment; pereopods with epipods on 4 anterior pairs, 2nd pair unequal, right with 40–59 carpal articles, left with 156–171, 3rd pair overreaching antennal scale by length of dactyl and fully $\frac{3}{4}$ of propodus, dactyl nearly $\frac{1}{3}$ to nearly $\frac{1}{2}$ as long as propodus, accessory distal spine nearly as long as and in close contact with main terminal spine, 3 distal segments, combined, about $1\frac{1}{3}$ times as long as carapace, none of pereopods extremely slender or thread-like; 3rd pleopod with exopod about $\frac{1}{2}$ as long as carapace; maximum carapace length more than 20 mm.

DESCRIPTION.—Rostrum (Figure 37a) directed rather strongly dorsad in anterior $\frac{2}{3}$ of length, distinctly overreaching antennal scale, $1\frac{1}{3}$ – $1\frac{3}{4}$ times as long as carapace; dorsal margin armed with 12–15 teeth over nearly entire length, including 5 or 6 on carapace posterior to level of orbital margin, all teeth on carapace with distinct basal suture and movable, none with barbed tips; ventral margin armed with 14–18 teeth. Orbit convex in ventral portion posterior to antennal spine, rather deeply concave posteriorly, becoming nearly straight in dorsal portion. Antennal spine much stronger than pterygostomial spine. Rostral crest elevated considerably above dorsal surface of carapace but ridge posterior to teeth rounded, inconspicuous, and not very long.

Abdomen (Figure 37b) with 3rd somite rounded posteriorly, unarmed, without median carina, regularly and rather strongly arched dorsally in lateral aspect. Pleura of 3 anterior somites rounded, those of 4th and 5th with sharp marginal spine and convex ventral margin. Sixth somite $1\frac{2}{5}$ – $1\frac{2}{3}$ (rarely $1\frac{3}{4}$) times as long as 5th somite and $1\frac{1}{3}$ to more than $1\frac{1}{2}$ times as long as maximum height. Telson $1\frac{2}{5}$ – $1\frac{7}{10}$ as long as 6th somite with, typically, 4 pairs of dorsolateral spinules, posteriormost pair situated dorsolateral to base of long, lateral spine of 2 posterior pairs.

Tegumental scales of carapace (Figure 37y) bearing tooth on each lateral margin at base of

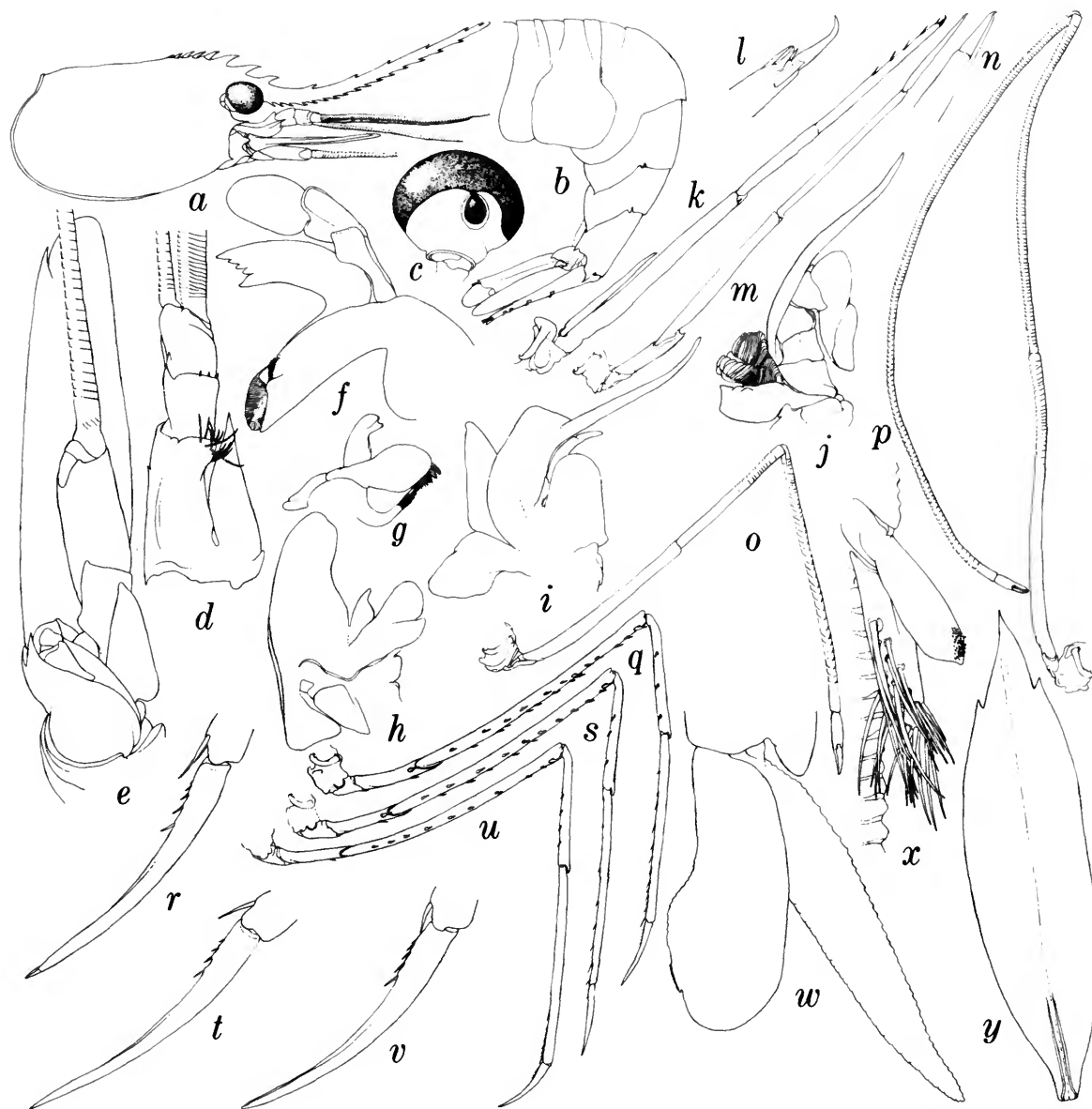


FIGURE 37.—*Plesionika lophotes*, new species, male holotype from Albatross sta 5397 (Samar Sea, Philippines), carapace length 16.8 mm: *a*, carapace and anterior appendages, right aspect; *b*, abdomen, left aspect; *c*, right eye, dorsal aspect; *d*, right antennule, mesiodorsal aspect; *e*, right antenna, ventral aspect; *f*, right mandible; *g*, right 1st maxilla; *h*, right 2nd maxilla; *i*, right 1st maxilliped; *j*, right 2nd maxilliped; *k*, right 3rd maxilliped; *l*, same, distal end; *m*, right 1st pereopod; *n*, same, distal end of chela; *o*, right 2nd pereopod; *p*, left 2nd pereopod; *q*, right 3rd pereopod; *r*, same, dactyl; *s*, right 4th pereopod; *t*, same, dactyl; *u*, right 5th pereopod; *v*, same, dactyl; *w*, endopod and exopod of right 1st pleopod, posterior aspect; *x*, right appendix masculina and appendix interna; *y*, tegumental scale from dorsal area of carapace. (Magnifications: *a*, *b*, $\times 1.6$; *k*, *m*, *o*-*q*, *s*, *u*, $\times 2.6$; *c*-*e*, *g*-*j*, $\times 5.2$; *f*, *r*, *t*, *v*, *w*, $\times 10.8$; *l*, *n*, *x*, $\times 21.5$; *y*, $\times 223.6$.)

sharply triangular terminal portion.

Eye (Figure 37c) broadly subpyriform, maximum diameter about $\frac{1}{5}$ carapace length; ocellus prominent, longitudinally oval (tear-drop shaped), narrowly connected with cornea, not noticeably skewed from midline of eyestalk.

Antennular peduncle (Figure 37d) with minute tooth on ventromesial margin of basal segment. Stylocerite sharply acute, considerably overreaching dorsal arc of distal margin of basal segment.

Antennal scale (Figure 37e) with lateral margin faintly convex, about 4 times as long as wide, distolateral tooth not nearly attaining level of distal margin of blade.

Mouthparts as illustrated (Figure 37f-l). Third maxilliped with strong epipod, overreaching antennal scale by about $\frac{2}{3}$ length of terminal segment, armed terminally with strong apical and about 4 subapical spines (Figure 37l), penultimate segment about $\frac{2}{3}$ as long as terminal segment.

Pereopods with large epipods on 4 anterior pairs. First pereopod (Figure 37m) overreaching antennal scale by about $\frac{2}{3}$ length of chela; fingers (Figure 37n) small but distinct, acuminate tip of movable finger slightly overreaching fixed one. Second pereopods markedly unequal, right one (Figure 37o) usually much shorter, overreaching antennal scale by length of chela and about $\frac{1}{2}$ of carpus, latter composed of 40-59 articles, left one (Figure 37p) overreaching antennal scale by lengths of chela and carpus and more than $\frac{1}{2}$ of merus, usually with 156-171 carpal articles. Third pereopod (Figure 37q) overreaching antennal scale by length of dactyl and fully $\frac{3}{4}$ of propodus, dactyl (Figure 37r) variable in proportionate length, usually about $\frac{1}{3}$ as long as propodus and $\frac{1}{4}$ as long as carapace, accessory distal spine nearly as long as and rather closely appressed to main terminal spine; carpus about $\frac{2}{3}$ as long as propodus; 3 distal segments, combined, about $1\frac{1}{3}$ times as long as carapace. Fourth pereopod (Figure 37g) overreaching antennal scale by length of dactyl and nearly $\frac{1}{2}$ of propodus; dactyl (Figure 37t) about $\frac{2}{3}$ as long as propodus; 3 distal segments, combined, about $1\frac{1}{3}$ times as

long as carapace. Fifth pereopod (Figure 37u) overreaching antennal scale by length of dactyl and nearly $\frac{1}{3}$ of propodus; dactyl (Figure 37v) fully $\frac{1}{3}$ as long as propodus; 3 distal segments, combined, about $1\frac{1}{4}$ times as long as carapace.

Endopod of 1st pleopod of male (Figure 37w) with mesial margin rather strongly sinuous, distal margin convexly produced, without obvious notch or sinus. Appendix masculina on 2nd pleopod (Figure 37x) armed with about 25 long spines on anteromesial and distal margins. Exopod of 3rd pleopod about $\frac{1}{2}$ as long as carapace. Lateral branch of uropod (Figure 37b) reaching to near posterior end of telson proper, mesial branch slightly shorter, lateral branch with movable spine mesial to distolateral angle.

SIZE.—Carapace length of male holotype, 16.8 mm; of male paratypes, 9.5-17.8 mm; of non-ovigerous female paratypes, 13.6-19.8 mm; of ovigerous female paratypes, 15.7-18.2 mm.

MATERIAL.—PHILIPPINES. Southwest of Manila Bay, Luzon: sta 5273; $13^{\circ}58'45''N$, $120^{\circ}21'35''E$; 209 m; mud, shells, coral sand; 14 Jul 1908 (1047-1117); 12' Agassiz beam trawl: 2♂ [9.5, 11.8], 1♀ [13.6]. Batangas Bay, southern Luzon: sta 5266; $13^{\circ}44'36''N$, $120^{\circ}59'15''E$; 183 m; mud; 8 Jun 1908 (0918-0938); 12' Agassiz beam trawl, mud bag: 1 ovig ♀ [18.2]. Verde Island Passage, north of Mindoro: sta 5367; $13^{\circ}34'37''N$, $121^{\circ}07'30''E$; [329 m]; 22 Feb 1909 (1710-1736); 25' Agassiz beam trawl (rear beam broken and iron frame twisted): 1♀ [19.8].

Samar Sea, east of Masbate: sta 5393; $12^{\circ}03'30''N$, $124^{\circ}03'36''E$; 249 m; hard sand; 13 Mar 1909 (1404-1412); 12' Agassiz beam trawl, mud bag: 2♀ [17.2, 17.8], 2 ovig ♀ [15.7, 16.5]; sta 5394; $12^{\circ}00'30''N$, $124^{\circ}05'36''E$; 280 m; green mud; 13 Mar 1909 (1513-1522); 12' Agassiz beam trawl, mud bag: 1 fragmentary specimen [9.8]; sta 5396; $11^{\circ}57'N$, $124^{\circ}12'24''E$; 251 m; green mud; 15 Mar 1909 (0945-1005); 12' Agassiz beam trawl, mud bag: 1♂ [17.5]; sta 5397; $11^{\circ}57'27''N$, $124^{\circ}10'42''E$; 245 m; green mud; 15 Mar 1909 (1036-1052); 12' Agassiz beam trawl, mud bag: 3♂ [13.0-16.8], largest is holotype (USNM 205212). Off Jolo Island, Sulu Archipelago: sta 5545; $6^{\circ}04'45''N$,

121°20'20"E; 209 m; fine coral sand; 15 Sep 1909 (0943-0959); 9' Tanner beam trawl: 1♀ [15.3].

TYPE-LOCALITY.—Samar Sea between south-eastern Masbate and Almagro Island, Philippines; 11°57'27"N, 124°10'42"E; 245 meters.

RANGE.—Shikoku, Japan (see "Remarks") and the Philippines to southern Indonesia; 183 to 329 meters.

REMARKS.—The ovigerous female from station 5266 (Batangas Bay) is "lefthanded," the longer second pereopod being on the right side rather than the left.

The opportunity to examine syntypic material of *Nothocaris binoculus*, through the kind cooperation of R.W. Ingle of the British Museum (Natural History), has verified the possibility that most of the specimens subsequently assigned to that species have been misidentified. As comparison of Figure 37 with Figure 25 will reveal, the material recorded from Indonesia by De Man (1920) and Boone (1935) differs from the species described by Bate in having the rostral crest much more prominent, the distolateral tooth on the antennal scale less advanced, and both second pereopods longer and with many more carpal articles.

There seems to be little doubt that all Japanese collections identified as *P. binoculus* prior to 1976 actually represent *P. izumiae*, as indicated by Hayashi and Koike (1976). Their illustration of the carapace of a specimen from Tosa Bay, Shikoku, leaves some doubt about the true identity of that specimen, however. It probably represents the form described by De Man—herein referred to *P. lophotes*—but I have seen no specimens of that species in which the anteriormost movable tooth of the dorsal rostral series is situated so far anteriorly. An ovigerous female from the Tosa Bay series, kindly deposited in the Smithsonian collections by Dr. Hayashi, is less different from the Philippine specimens than the specimen figured by Hayashi and Koike and it seems to confirm the presence of *P. lophotes* at least as far north as Shikoku.

ETYMOLOGY.—The combination of the Greek *lophos* (crest) plus the suffix *otes* was suggested by

the rostral crest, which is the most apparent distinguishing feature of the species.

*** 32. *Plesionika martia orientalis*, new subspecies**

FIGURES 38, 39, 53, 54

Plesionika semilaevis Bate, 1888:644 [part].

DIAGNOSIS.—Rostrum far overreaching antennal scale, armed dorsally, on basal crest only, with 5-9 teeth, including 2-5 on carapace posterior to level of orbital margin, none with distinct basal sutures or barbed tips, armed ventrally with 34-56 teeth; orbital margin convex in ventral part, nearly vertical posteriorly; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, none of abdominal pleura with distinct marginal tooth or denticle, 6th somite about twice as long as maximum height; telson from subequal to 1¼ times as long as 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye very broadly subpyriform, maximum diameter usually little more than ¼ carapace length, ocellus represented by tapering, subtruncate lobe, broadening rather than constricted at juncture with cornea; stylocerite bluntly acute, slightly overreaching dorsal arc of distal margin of 1st antennular segment; antennal scale 5 or 6 times as long as wide, distolateral tooth reaching at most to level of distal margin of blade; 3rd maxilliped with epipod, penultimate segment from 1½ to more than 2 times as long as terminal segment; pereopods with epipods on 4 anterior pairs, 2nd pair subequal, with 18-36 carpal articles, 3rd pair overreaching antennal scale by lengths of dactyl, propodus, and most of carpus, dactyl from ½ to nearly ⅔ as long as propodus, accessory distal spine short, little more than ¼ as long as and well separated from main terminal spine, 3 distal segments, combined, 1½ times to more than twice as long as carapace, none of pereopods extremely slender or thread-like; 3rd pleopod with exopod nearly ¾ to nearly ⅞ as long as carapace; maximum carapace length about 29 mm.

DESCRIPTION.—Rostrum (Figure 38) directed

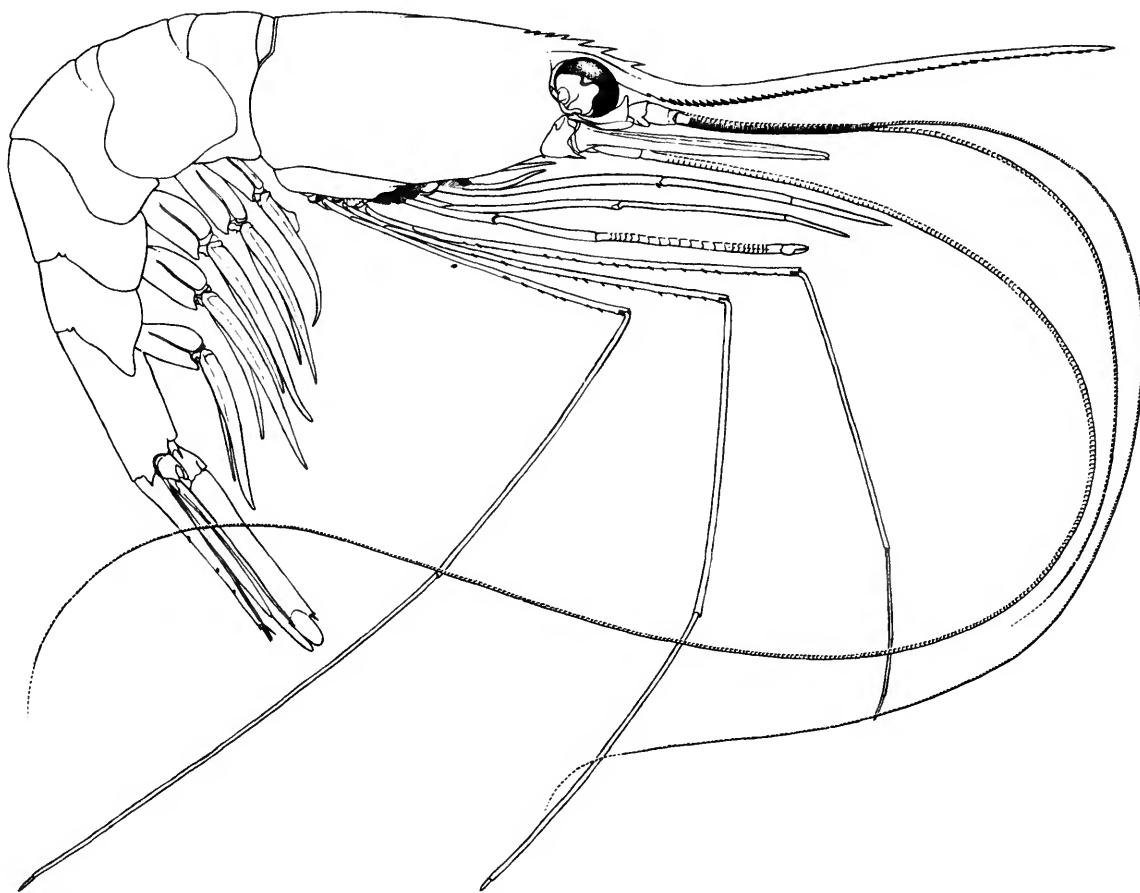


FIGURE 38.—*Plesionika martia orientalis*, new subspecies, male holotype from Albatross sta 5567 (Sulu Archipelago, Philippines), carapace length 21.0. (Magnification: $\times 1.9$.)

slightly dorsad, distinctly overreaching antennal scale, somewhat more than twice as long as carapace in adults and about $2\frac{1}{2}$ times as long in immature specimens; dorsal margin armed with 5–9 (usually 7) teeth on basal portion, usually unarmed anterior to level of distal end of antennular peduncle, posterior 2–5 (usually 3) teeth situated on carapace posterior to level of orbital margin, none with distinct sutures or barbed tips; ventral margin armed with 34–56 (average 44) teeth. Orbit (Figure 39a) convex in ventral portion posterior to antennal spine, nearly vertical or somewhat convex again posteriorly. Antennal spine slightly longer but more slender than pterygostomial spine. Median postrostral ridge cari-

nate, faintly convex, extending posteriorly to about midlength of carapace.

Abdomen with 3rd somite rounded posteriorly, unarmed, without median carina, feebly arched dorsally in lateral aspect. Pleura of 4 anterior somites rounded, that of 5th forming constricted lobe posteroventrally, terminating in 45° – 73° angle. Sixth somite from slightly more than $1\frac{3}{4}$ to slightly more than $2\frac{1}{2}$ times as long as 5th and from slightly more than $1\frac{3}{4}$ to $2\frac{1}{2}$ times as long as maximum height. Telson from subequal to 6th somite to $1\frac{3}{4}$ times as long, with 4 pairs of dorsolateral spinules, posteriormost pair situated dorsolateral to base of long, lateral spine of 2 posterior pairs.



FIGURE 39.—*Plesionika martia orientalis*, new subspecies, *a*–*s*, male holotype from *Albatross* sta 5567 (Sulu Archipelago, Philippines), carapace length 21.0 mm; *t*, *u*, ovigerous female paratype from *Albatross* sta 5135 (Sulu Archipelago, Philippines), carapace length 21.3 mm: *a*, left eye and orbit; *b*, left antennule, mesiodorsal aspect; *c*, left antenna, ventral aspect; *d*, left mandible; *e*, right mandible; *f*, left 1st maxilla; *g*, left 2nd maxilla; *h*, left 1st maxilliped; *i*, left 2nd maxilliped; *j*, distal end of left 3rd maxilliped; *k*, “chela” of left 1st pereopod; *l*, same, distal end; *m*, carpus and chela of left 2nd pereopod; *n*, dactyl of left 3rd pereopod; *o*, same, distal end; *p*, dactyl of 4th pereopod; *q*, same, distal end; *r*, endopod and exopod of right 1st pleopod, posterior aspect; *s*, right appendix masculina and appendix interna, mesial aspect; *t*, tegumental scale from posterior dorsal region of carapace; *u*, same, lateral aspect. (Magnifications: *c*, $\times 2.6$; *a*, *b*, *d*–*i*, *m*, *r*, $\times 5.2$; *k*, $\times 10.8$; *n*, *p*, *s*, $\times 21.5$; *j*, *l*, $\times 53.8$; *o*, *q*, *t*, *u*, $\times 223.6$.)

Tegumental scales of carapace (Figures 39*t,u*) with margins entire and with 2 pairs of curved flanges forming parentheses-like pattern embracing midline proximally and distally, latter pair more distinct.

Eye (Figure 39*a*) very broadly subpyriform, varying from about $\frac{1}{2}$ to nearly $\frac{9}{10}$ as long as wide, maximum diameter usually less than $\frac{1}{3}$ carapace length; ocellus represented by tapering, subtruncate or rounded lobe broadening rather than constricted at juncture with cornea.

Antennular peduncle (Figure 39*b*) with minute tooth on ventromesial margin of basal segment. Stylocerite bluntly acute, barely overreaching dorsal arc of distal margin of basal segment.

Antennal scale (Figure 39*c*) with lateral margin faintly sinuous, about $\frac{9}{10}$ as long as carapace, usually more than $5\frac{1}{2}$ times as long as wide, distolateral tooth usually falling distinctly short of level of distal margin of blade.

Mouthparts as illustrated (Figure 39*d-j*). Third maxilliped with epipod, overreaching antennal scale by about $\frac{2}{3}$ length of distal segments, latter terminating in long, stout distal spine with 4 less conspicuous subapical spines (Figure 39*j*), penultimate segment from $1\frac{1}{7}$ to more than $1\frac{2}{5}$ times as long as terminal segment (average 1.27).

Pereopods with well-formed epipods on 4 anterior pairs. First pereopod (Figure 39*k*) overreaching antennal scale by about $\frac{1}{2}$ length of chela; microscopic denticle at end of flexor margin of propodus (Figure 39*l*) forming very obscure chela. Second pereopods subequal, reaching nearly to distal margin of antennal scale, carpus (Figure 39*m*) composed of 18–36 (commonly 19–23) articles. Third pereopod overreaching antennal scale by lengths of dactyl, propodus, and most of carpus; dactyl (Figure 39*n*) from $\frac{1}{7}$ to nearly $\frac{2}{5}$ as long as propodus (average 0.24), about $\frac{1}{15}$ as long as carapace, accessory distal spine little more than $\frac{1}{4}$ as long as and well separated from main terminal spine (Figure 39*o*); carpus about 1–3 times as long as propodus (average 1.8); 3 distal segments, combined, 1–2.5 times to more than twice as long as carapace (average 1.8). Fourth pereopod overreaching antennal scale by lengths of dactyl, propodus, and

nearly $\frac{2}{3}$ of carpus; dactyl (Figure 39*p,q*) shorter than dactyl of 3rd pereopod; 3 distal segments, combined, 2 to $3\frac{2}{5}$ times as long as carapace (average 2.6). Fifth pereopod overreaching antennal scale by length of dactyl, propodus, and nearly $\frac{1}{2}$ of carpus; 3 distal segments combined, $2\frac{3}{4}$ – $4\frac{1}{3}$ times as long as carapace (average 3.5).

Endopod of 1st pleopod of male (Figure 39*r*) with mesial margin nearly straight as far as subdistal bulge, distal margin oblique, without obvious notch. Appendix masculina on 2nd pleopod (Figure 39*s*) armed with more than 30 long spines on anteromesial and distal margins. Exopod of 3rd pleopod nearly $\frac{3}{4}$ to nearly $\frac{9}{10}$ as long as carapace (average 0.79). Mesial branch of uropod not reaching posterior margin of telson proper; lateral branch overreaching telson and bearing movable spine mesial to distolateral tooth.

COLOR.—The lot of 17 specimens from station 5135 (off Jolo Island, Sulu Archipelago)—the first good series of this species taken after the *Albatross* arrived in the Philippines—bears the following color note: “Shrimps almost colorless—of pinkish tinge. Eggs blue.”

SIZE.—Carapace length of male holotype, 21.0 mm; of male paratypes, 8.0–28.0; of nonovigerous female paratypes, 8.2–27.0 mm; of ovigerous female paratypes, 15.0–29.1 mm; of juveniles, 6.8–8.7 mm. In males with carapace lengths of less than 11.0 mm, the appendix masculina on the 2nd pleopod is noticeably shorter than the appendix interna.

MATERIAL.—PHILIPPINES. Babuyan Channel, north of Luzon: sta 5325; $18^{\circ}34'15''N$, $121^{\circ}51'15''E$; 410 m; green mud; $11.8^{\circ}C$; 12 Nov 1908 (1113–1132); 12' Tanner beam trawl, mud bag: 6♀ [16.6–19.6], 5 ovig [17.3–19.6], 1? [17.0]; sta 5326; $18^{\circ}32'30''N$, $122^{\circ}01'E$; 421 m; mud; $13.0^{\circ}C$; 12 Nov 1908 (1328–1348); 12' Tanner beam trawl, mud bag: 12♂ [11.0–19.0], 13♀ [9.3–17.0], 5 ovig [16.0–17.0], 2 juv [7.0, 7.5]; sta 5327; $18^{\circ}31'30''N$, $122^{\circ}03'E$; 362 m; soft mud, fine sand; 12 Nov 1908 (1439–1459); 12' Tanner beam trawl, mud bag: 1♂ [16.2]; sta 5329; $18^{\circ}33'N$, $121^{\circ}37'30''E$; 388 m; blue

mud; 10.8°C; 19 Nov 1908 (1125–1135); 12' Tanner beam trawl, mud bag: 4♂ [13.1–18.0], 9♀ [16.0–18.3], 6 ovig [16.7–18.3]. Southwest of Lubang Islands: sta 5265; 13°41'15"N, 120°00'50"E; 247 m; sand, mud; 6 Jun 1908 (1109–1129); 12' Agassiz beam trawl, mud bag: 9♂ [8.6–19.2], 7♀ [8.2–21.1], 4 ovig [15.0–21.1], 5 juv [6.8–7.6].

Western Verde Island Passage, north of Mindoro: sta 5281; 13°52'45"N, 120°25'E; 368 m; dark gray sand; 10.2°C; 18 Jul 1908 (1040–1100); 12' Agassiz beam trawl, mud bag: 1♂ [19.6]; sta 5282; 13°53'N, 120°26'45"E; 454 m; dark gray sand; 8.5°C; 18 Jul 1908 (1144–1204); 12' Agassiz beam trawl, mud bag: 3♂ [15.1–20.8] 7♀ [14.1–20.2], 4 ovig [18.7–20.2]; sta 5283; 13°48'30"N, 120°28'40"E; 512 m; dark gray sand; 8.2°C; 18 Jul 1908 (1336–1400); 12' Agassiz beam trawl, mud bag: 2♂ [22.0, 28.0], 1♀ [27.0].

Verde Island Passage, north of Mindoro: sta 5115; 13°37'11"N, 120°43'40"E; 622 m; 20 Jan 1908 (1341–4101); 12' Tanner beam trawl, mud bag: 2 ovig ♀ [18.0–22.0]; sta 5291; 13°29'40"N, 121°00'45"E; 316 m; fine black sand; 10.8°C; 23 Jul 1908 (1345–1405); 12' Agassiz beam trawl, mud bag: 13♂ [8.0–19.8], 4 ♀ [10.8–20.0], 3 ovig [19.2–20.0]; sta 5292; 13°28'45"N, 121°01'12"E; 296 m; fine black sand; 11.3°C; 23 Jul 1908 (1437–1457); 12' Agassiz beam trawl, mud bag: 2 ovig ♀ [18.0, 19.0]; sta 5293; 13°28'15"N, 121°04'30"E; 329 m; fine black sand; 14.1°C; 23 Jul 1908 (1559–1629); 12' Agassiz beam trawl, mud bag: 19♂ [10.9–21.0], 20♀ [9.0–20.3], 10 ovig [16.6–20.3], 3 juv [7.8–8.7]; sta 5294; 13°32'15"N, 121°02'E; 446 m; sand, pebbles; 9.1°C; 24 Jul 1908 (0913–0930); 12' Agassiz beam trawl, mud bag: 10♂ [12.1–21.5], 13♀ [17.0–21.5], 12 ovig [17.0–21.5]; sta 5295; 13°33'15"N, 121°E; 422 m; gray sand; 10.7°C; 24 Jul 1908 (1026–1046); 12' Agassiz beam trawl, mud bag: 12♂ [15.5–20.4], 6♀ [9.2–20.8], 2 ovig [18.2–20.8]; sta 5296; 13°40'09"N, 120°57'45"E; [384 m]; [mud, sand]; 24 Jul 1908 (1247–1307); 12' Agassiz beam trawl, mud bag: 4♂ [17.6–22.2], 10 ovig ♀ [17.9–23.0]; sta 5367; 13°34'37"N,

121°07'30"E; [320 m]; 22 Feb 1909 (1710–1736); 25' Agassiz beam trawl (rear beam broken and iron frame twisted): 3♂ [10.5–18.7], 4♀ [17.0–20.6], 2 ovig [17.0, 20.6], 1 juv [9.0].

Balayan Bay, southern Luzon: sta 5111; 13°45'15"N, 120°46'30"E; 432 m; green mud; 16 Jan 1908 (1508–1538); 12' Tanner beam trawl, mud bag: 3 ovig ♀ [18.0–22.0]. Batangas Bay, southern Luzon: sta 5267; 13°42'20"N, 120°58'25"E; 311 m; pebbles, sand, shells; 8 Jun 1908 (1025–1045); 12' Agassiz beam trawl, mud bag: 1♂ [17.0], 2 ovig ♀ [18.0, 21.0]; sta 5268; 13°42'N, 120°57'15"E; 311 m; sand, pebbles; 8 Jun 1908 (1114–1134); 12' Agassiz beam trawl, mud bag: 19♂ [9.8–20.3], 46♀ [9.1–23.3], 28 ovig [17.2–23.3]; sta 5269; 13°39'50"N, 120°59'30"E; 402 m; fine sand, pebbles; 8 Jun 1908 (1334–1354); 12' Agassiz beam trawl, mud bag: 16♂ [11.5–21.0], 37♀ [9.0–22.8], 23 ovig [17.5–22.8]; sta 5289; 13°41'50"N, 120°58'30"E; 315 m; broken shells, sand; 22 Jul 1908 (0925–1945); 12' Agassiz beam trawl, mud bag: 10♂ [10.8–20.0], 11♀ [11.1–22.3], 9 ovig [17.0–22.3]; sta 5290; 13°40'09"N, 120°59'30"E; [391 m]; lava gravel; 22 Jul 1908 (1054–1114); 12' Agassiz beam trawl, mud bag: 6♂ [13.1–19.8], 5♀ [17.0–21.3], 4 ovig [17.0–21.3]; sta 5297; 13°41'20"N, 120°58'E; [362 m]; [mud, sand]; 24 Jul 1908 (1355–1415); 12' Agassiz beam trawl, mud bag: 5♂ [16.1–21.0], 9♀ [14.5–22.1], 6 ovig [18.1–22.1]; sta 5298; 13°43'25"N, 120°57'40"E; [256 m]; [sand]; 24 Jul 1908 (1509–1519); 12' Agassiz beam trawl, mud bag: 5♂ [14.3–19.3], 9♀ [16.2–20.4], 7 ovig [16.7–20.4].

Northern Palawan Passage: sta 5348; 10°57'45"N, 118°38'15"E; 686 m; coral, sand; 13.6°C; 27 Dec 1908 (1009–1029); 12' Tanner beam trawl, mud bag: 3♂ [22.3–25.8]. Near Usada Island, Sulu Archipelago: sta 5172; 6°03'15"N, 120°35'30"E; 582 m; fine sand, shells; 5 Mar 1908 (1031–1051); 12' Agassiz beam trawl, mud bag: 40♂ [10.8–22.0], 33♀ [10.5–20.2], 24 ovig [17.7–20.2]. Off Jolo Island, Sulu Archipelago: sta 5135; 6°11'50"N, 121°08'20"E; 294 m; fine coral sand; 14.1°C; 7 Feb 1908 (1450–1510); 12' Tanner beam trawl,

mud bag: 1♂ [19.5], 16♀ [14.2–24.7], 15 ovig [17.7–24.7]; sta 5173; 6°02'55"N, 120°53'E; 340 m; shells, coral; 5 Mar 1908 (1457–1503); 9' Johnston oyster dredge: 3♂ [11.3–12.2], 6♀ [9.2–17.2], 1 ovig [17.2]. West of Jolo Island, Sulu Archipelago: sta 5549; 6°01'15"N, 120°44'20"E; 481 m; sand, globigerina, Foraminifera; 11.3°C; 17 Sep 1909 (0936–0957); 9' Tanner beam trawl, mud bag: 4♂ [17.1–19.7], 18♀ [17.4–22.8], 15 ovig [17.4–22.8]; sta 5550; 6°02'00"N, 120°44'40"E; 472 m; fine sand, shells; 11.3°C; 17 Sep 1909 (1046–1114); 9' Tanner beam trawl: 2♂ [16.2, 20.2], 10♀ [17.2–21.8], 8 ovig [18.0–21.8]; sta 5551; 5°54'48"N, 120°44'24"E; 353 m; fine sand; 11.8°C; 17 Sep 1909 (1407–1427); 9' Tanner beam trawl: 1♀ (identification tentative).

Between Jolo and Tawitawi islands, Sulu Archipelago: sta 5563; 5°48'12"N, 120°30'48"E; 410 m; fine coral sand; 11.3°C; 21 Sep 1909 (1047–1105); 9' Tanner beam trawl, mud bag: 1♂ [14.2]; sta 5564; 5°50'00"N, 120°31'00"E; 432 m; fine coral, sand; 11.3°C; 21 Sep 1909 (1145–1213); 9' Tanner beam trawl: 3♂ [17.7–22.2], 3 ovig ♀ [18.5–21.8]; sta 5567; 5°48'00"N, 120°33'45"E; 490 m; fine sand; 11.1°C; 21 Sep 1909 (1536–1557); 9' Tanner beam trawl, mud bag: 5♂ [13.7–21.0], 7♀ [15.4–21.0], 4 ovig [16.2–21.0], largest ♂ is holotype (USNM 205220). North of Tawitawi Island, Sulu Archipelago: sta 5569; 5°33'15"N, 120°15'30"E; 555 m; coral sand; 11.3°C; 22 Sep 1909 (0849–0859); 9' Tanner beam trawl, mud bag: 9♂ [13.7–20.1], 2♀ [15.9, 17.7], 1 ovig [17.7]; sta 5574; 5°30'45"N, 120°07'57"E; 622 m; 23 Sep 1909 (0720–1744); 9' Tanner beam trawl, mud bag: 14♂ [8.3–22.0], 3♀ [16.9–20.5], 2 ovig [18.5, 20.5]; sta 5575; 5°28'30"N, 120°02'27"E; 576 m; coral, sand; 11.3°C; 23 Sep 1909 (0943–1003); 9' Tanner beam trawl, mud bag: 32♂ [16.0–21.2], 11♀ [8.2–21.4], 4 ovig [17.2–21.4]. Off Tawitawi Island, Sulu Archipelago: sta 5162; 5°10'N, 119°47'30"E; 421 m; coarse sand, broken shells; 11.6°C; 22 Feb 1908 (1031–1046); 12' Agassiz beam trawl, mud bag: 1 ♂ [16.7].

INDONESIA. Off Darvel Bay, Sabah (North Bor-

neo): sta 5579; 4°54'15"N, 119°09'52"E; 320 m; fine sand, coral; 12.9°C; 25 Sep 1909 (0825–0845); 9' Tanner beam trawl, mud bag: 4♂ [11.8–18.2], 7♀ [17.9–19.8], 2 ovig [18.0, 19.6]. Celebes Sea off Sabah (North Borneo): sta 5586; 4°06'50"N, 118°47'20"E; 635 m; gray mud; 6.7°C; 28 Sep 1909 (1144–1217); 9' Tanner beam trawl, mud bag: 2♂ [23.0, 25.2], 2♀ [25.8, 25.8]; sta 5589; 4°12'10"N, 118°38'08"E; 476 m; fine gray sand, gray mud; 7.6°C; 29 Sep 1909 (0744–1804); 9' Tanner beam trawl, mud bag: 3♂ [22.2–24.8], 6♀ [17.1–25.8], 1 ovig [25.2]; sta 5592; 4°12'44"N, 118°27'44"E; 558 m; green mud; 6.3°C; 29 Sep 1909 (1600–1610); 9' Tanner beam trawl: 3♂ [15.8–20.6], 5♀ [15.2–22.7], 3 ovig [17.2–22.7]. West of Halmahera: sta 5620; 0°21'30"N, 127°16'45"E; 655 m; gray mud; 28 Nov 1909 (0624–0645); 12' Agassiz beam trawl: 1♂ [21.8], 1♀ [20.8].

TYPE-LOCALITY.—Sulu Archipelago between Jolo and Tawitawi islands; 5°48'00"N, 120°33'45"E; 490 meters.

RANGE.—Known with certainty only from the Philippine and Indonesian localities cited above in 247 to 686 meters. *Plesionika martia orientalis* seems to have a more restricted distribution in the Philippines than does the closely related *P. semilaevis*. It was taken by the *Albatross* only in the Babuyan Channel, north of Luzon; in the vicinity of the Lubang Islands and Verde Island Passage north of Mindoro; once in Palawan Passage in the southeastern part of the South China Sea; and in the Sulu Archipelago. Curiously, all of these Philippine stations are west of, or only slightly beyond, the 122nd meridian of east longitude. Although *P. semilaevis* also occurred in all of the areas cited above, except Palawan Passage, *P. martia orientalis* seems to have been absent from the entire region east of the 122nd meridian between southern Luzon and Mindanao, where the other species was not uncommon. The apparently restricted range of *P. martia orientalis* is not reflected, however, in the number of specimens collected. Where it occurred, it was more common than its counterpart, averaging more than 15 specimens per haul as opposed to about 8 specimens per haul for *P.*

semilaevis. In the collection as a whole, therefore, there are 644 specimens of *P. martia orientalis* and only 518 of *P. semilaevis*, even though the former species was taken at only 42 stations, compared with 64 for the latter.

REMARKS.—Comparison of the Philippine and Indonesian material with that of the presumably typical *P. martia* (A. Milne-Edwards, 1883) from the eastern Atlantic and Mediterranean has disclosed minor differences that seem to me to justify subspecific recognition of the two populations. Although specimens from both the eastern and western Atlantic have eyes that are comparable in size and shape with those here assigned to the Indo-Pacific subspecies—0.20 to 0.29 (average 0.24) of the carapace length (those of western Atlantic specimens may be slightly smaller than those from the eastern Atlantic and Mediterranean)—some of the other proportions in Atlantic specimens are similar to those associated with material here assigned to *P. semilaevis*. The three distal segments of the third pereopod have combined lengths of from $1\frac{1}{7}$ to $1\frac{2}{3}$ times the length of the carapace (average 1.5). The three distal segments of the fourth pereopod vary from $1\frac{2}{5}$ to $2\frac{2}{5}$ times the carapace length (average 1.6). Only four Atlantic or Mediterranean specimens were available in which the fifth pereopods were intact; in those, the three distal segments vary from $2\frac{1}{6}$ to $2\frac{1}{2}$ times the carapace length (average 2.3). It will be noted that these averages are even lower than those of *P. semilaevis* and that the longest fifth pereopod measured in the four Atlantic specimens is proportionately shorter than the shortest one found in the Indo-Pacific. Also, the telson seems to be consistently longer than the sixth abdominal somite in Atlantic specimens—as in *P. semilaevis*—rather than nearly subequal to that somite—as in *P. martia orientalis*. Finally, the exopod of the third pleopod is proportionately shorter in Atlantic specimens—from less than $\frac{2}{3}$ to more than $\frac{4}{5}$ as long as the carapace (average 0.74)—but it fails to reflect the differences in pereopod lengths that it does in *P. martia orientalis* and *P. semilaevis*. Chiefly for that reason, it seemed best to treat

the two forms of the smaller-eyed species as subspecies rather than as distinct species.

As noted in the "Remarks" under *P. semilaevis*, at least one specimen of *P. martia orientalis* was included among the syntypes of that species.

ETYMOLOGY.—The Latin *orientalis* (of the east) is assigned to this subspecies in the belief that it is representative of Asiatic and adjacent seas.

*33. *Plesionika ocellus* (Bate, 1888)

FIGURE 40

Nothocaris ocellus Bate, 1888:657, pl. 114: fig. 3 [type-locality: eastern Sulu Sea northwest of Basilan Strait; 7°03'N, 121°48'E; 150 meters].

Pandalus sindoi Rathbun, 1906:915, pl. 21: fig. 4 [type-locality: Ukula (= Puolo) Point, Kauai, Hawaii, S. 71°, E. 9.7'; 430–419 meters].

Plesionika Sindoi.—De Man, 1920:126, pl. 11: fig. 27–27d, pl. 12: fig. 27e.

DIAGNOSIS.—Rostrum far overreaching antennal scale, armed dorsally with 11–18 teeth extending nearly to tip, including 4–6 on carapace posterior to or directly above orbital margin, 2–5 posteriormost teeth with basal sutures but none with barbed tips, armed ventrally with 5–10 teeth; orbital margin convex ventrally, nearly vertical posteriorly before turning toward ventral margin of rostrum; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th somite with pleuron rounded, without marginal denticle, 5th somite with posteroventral tooth on pleuron, 6th somite about $1\frac{3}{4}$ times to slightly more than twice as long as maximum height; telson from slightly shorter to somewhat longer than 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye broadly subpyriform, maximum diameter $\frac{1}{4}$ to $\frac{1}{5}$ carapace length, ocellus lingulate, little constricted at juncture with cornea; stylocerite acute, reaching about to level of dorsal arc of distal margin of 1st antennular segment; antennal scale 4 to about $5\frac{1}{2}$ times as long as wide, distolateral tooth overreaching distal margin of blade; 3rd maxil-

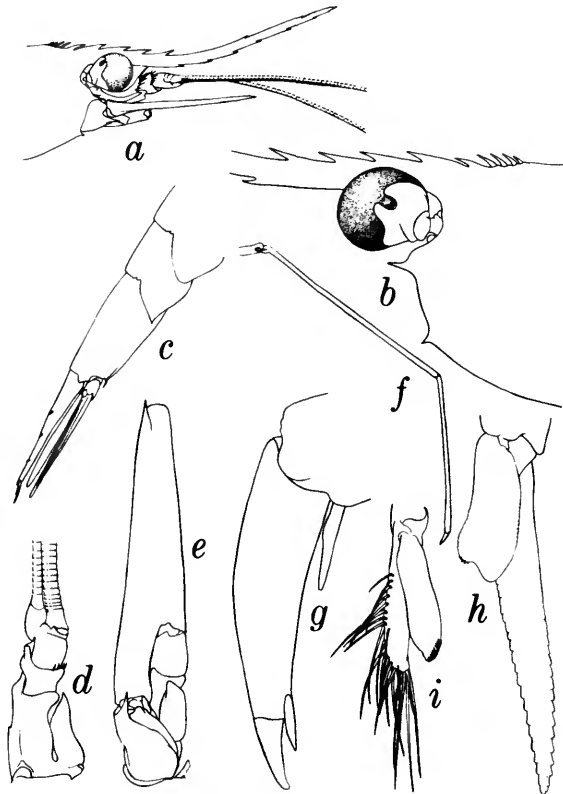


FIGURE 40.—*Plesionika ocellus*, male from *Albatross* sta 5629 (Halmahera, Indonesia), carapace length 9.4 mm: *a*, anterior carapace and appendages, right aspect; *b*, anterior carapace and eye, left aspect; *c*, posterior part of abdomen, right aspect; *d*, right antennule, mesiodorsal aspect; *e*, right antenna, ventral aspect; *f*, distal segments of right 3rd pereopod; *g*, dactyl of left 3rd pereopod; *h*, right 1st pleopod, posterior aspect; *i*, right appendix masculina and appendix interna, mesial aspect. (Magnifications: *a*, *c*, *f*, $\times 2.6$; *b*, *d*, *e*, $\times 5.2$; *h*, $\times 10.8$; *i*, $\times 21.5$; *g*, $\times 53.8$.)

liped with epipod, penultimate segment from less than $1\frac{1}{4}$ to more than $1\frac{3}{4}$ as long as terminal segment; pereopods with epipods on 4 anterior pairs, 2nd pair subequal, with 17–25 carpal articles, 3rd pair overreaching antennal scale by lengths of dactyl, propodus, carpus, and extreme distal end of merus, dactyl usually $\frac{1}{10}$ – $\frac{1}{6}$ as long as propodus, accessory distal spine about $\frac{1}{2}$ as long as and divergent from main terminal spine, 3 distal segments, combined, $1\frac{2}{3}$ – $2\frac{1}{2}$ times as

long as carapace, none of pereopods extremely slender or thread-like; 3rd pleopod with exopod about $\frac{1}{2}$ – $\frac{2}{3}$ as long as carapace; maximum carapace length about 15 mm.

MATERIAL.—SOUTH CHINA SEA. Southeast of Hong Kong: sta 5317; $21^{\circ}36'N$, $117^{\circ}27'E$; 421 m; sand, small shells; $10.3^{\circ}C$; 5 Nov 1908 (1431–1451); 12' Tanner beam trawl, mud bag: 1♂ [14.3], 3♀ [8.8–14.1].

PHILIPPINES. Southwest of Manila Bay, Luzon: sta 5110; $13^{\circ}59'20"N$, $120^{\circ}75'$ [sic—corrected to “25'” from *Albatross* chart] $45^{\circ}E$; 247 m; dark gray mud; $15.0^{\circ}C$; 15 Jan 1908 (1532–1552); 12' Tanner beam trawl, mud bag (30 m cable veered during haul): 1♂ [11.2]. Verde Island Passage, north of Mindoro: sta 5367; $13^{\circ}34'37"N$, $121^{\circ}07'30"E$; [329 m]; 22 Feb 1909 (1710–1736); 25' Agassiz beam trawl (rear beam broken and iron frame twisted): 6♂ [8.7–11.1], 13♀ [7.1–14.1], 4 ovig [12.2–13.0]. Iligan Bay, northern Mindanao: sta 5508; $8^{\circ}17'24"N$, $124^{\circ}11'42"E$; 494 m; green mud, fine sand; $11.8^{\circ}C$; 5 Aug 1909 (1517–1552); 12' Tanner beam trawl: 1♂ [9.8].

Western Mindanao Sea: sta 5516; $8^{\circ}46'N$, $123^{\circ}32'30"E$; 320 m; globigerina; $12.4^{\circ}C$; 9 Aug 1909 (1021–1041); 12' Tanner beam trawl: 14♂ [7.2–12.2], 12♀ [6.5–12.0], 5 ovig [9.3–12.0]; sta 5516–5517: 1♀ [8.7]; sta 5517; $8^{\circ}45'30"N$, $123^{\circ}33'45"E$; 309 m; globigerina; $12.4^{\circ}C$, 9 Aug 1909 (1121–1139); 12' Tanner beam trawl: 21♂ [7.3–11.2], 16♀ [8.8–13.0], 10 ovig [8.8–13.0]; sta 5518; $8^{\circ}48'N$, $123^{\circ}31'E$; 366 m; gray mud, globigerina; $12.2^{\circ}C$; 9 Aug 1909 (1255–1316); 12' Tanner beam trawl: 7♂ [5.7–12.0], 11♀ [6.7–13.0], 5 ovig [9.9–13.0]; sta 5543; $8^{\circ}47'15"N$, $8^{\circ}47'15"N$, $123^{\circ}35'00"E$; 296 m; sand; $12.5^{\circ}C$; 20 Aug 1909 (0904–0921); 12' Tanner beam trawl: 4♂ [6.5–9.2], 4♀ [7.5–11.7], 3 ovig [10.7–11.7]. Western entrance to Mindanao Sea near Silino Island: sta 5519; $8^{\circ}47'N$, $123^{\circ}31'15"E$; 333 m; globigerina, sand; $12.4^{\circ}C$; 9 Aug 1909 (1356–1439); 12' Tanner beam trawl: 39♂ [7.5–12.3], 42♀ [8.1–13.6], 28 ovig [9.0–13.6], 2 juv [6.2, 7.0]; sta 5523; $8^{\circ}48'44"N$, $123^{\circ}27'35"E$; depth ?; 10

Aug 1909 (1049–1109); 12' Tanner beam trawl, mud bag: 1 ovig ♀ [12.2].

Off Jolo Island, Sulu Archipelago: sta 5135; 6°11'50"N, 121°08'20"E; 294 m; fine coral sand; 14.1°C; 7 Feb 1908 (1450–1510); 12' Tanner beam trawl, mud bag: 1 ovig ♀ [13.2]; sta 5173; 6°02'55"N, 120°53'E; 340 mm; shells, coral; 5 Mar 1908 (1457–1503); 9' Johnston oyster dredge: 1 ovig ♀ [12.2]; sta 5547; 6°09'20"N, 121°13'40"E; 284 m; fine sand; 13.5°C; 15 Sep 1909 (1351–1411); 9' Tanner beam trawl: 1♂ [9.0]. Near Usada Island, Sulu Archipelago: sta 5172; 6°03'15"N, 120°35'30"E; 582 m; fine sand, shells; 5 Mar 1908 (1031–1051); 12' Agassiz beam trawl, mud bag: 1♂ [8.3], 3♀ [8.3–9.9].

INDONESIA. West of Selat Salajar, southwestern Celebes: sta 5661; 5°49'40"S, 120°24'30"E; 329 m; hard bottom; 10.3°C; 20 Dec 1909 (1624–1627); 12' Agassiz beam trawl (net torn below lead line): 2♂ [8.0, 14.5]. South of Pulau Muna, Celebes: sta 5645; 5°29'06"S, 122°36'06"E; 377 m; 16 Dec 1909 (0954–0955); 12' Agassiz beam trawl: 2♀ [11.0, 13.0], 1 ovig [13.0]. Southern end of Selat Patinti, southern Halmahera: sta 5629; 0°50'00"S, 128°12'00"E; 375 m; coral sand; 2 Dec 1909 (0643–0645); 12' Agassiz beam trawl (badly damaged): 1♂ [9.4].

RANGE.—South China Sea, Philippines, Indonesia, and Hawaii in 150 to 500 or 600 meters. *Albatross* collections from the two areas indicate that *P. ocellus* is much more common in the Philippines than it is in Hawaii.

REMARKS.—Two of the characters mentioned in Bate's description of *Nothocaris ocellus* are at variance with the material here assigned to that species. On page 658, Bate noted: "The ocellus on the posterior surface [of the ophthalmopod] is small, and its upper margin is in contact with the ophthalmus by a process from the latter dipping towards it." My associate, Brian Kensley, kindly examined the *Challenger* syntypes in the British Museum (Natural History) and reported that the ocellus is just as large and prominent as it is in the *Albatross* specimens. On page 660, Bate described the second pereopods of the *Challenger*

female as having "the carpos on the left side nearly twice as long as that on the right," rather than subequal to it as in the *Albatross* examples. I suspected that the right second pereopod might have been regenerating, but Kensley found that these appendages were missing from both syntypes. Among the loose appendages in the jar, he found only two second pereopods, one left and one right. Both are well developed and subequal in length, the carpus of the right-hand member being composed of 22 articles, the other one of 29. In the absence of other evidence, I am inclined to believe that both of Bate's equivocal statements may be disregarded.

For a discussion of the differences between *P. ocellus* and *P. fimbriata*, see the "Remarks" under the latter species.

*34. *Plesionika ortmanni* Doflein, 1902

FIGURE 41

Plesionika ortmanni Doflein, 1902:616, pl. 3: fig. 2, 2a [type-locality: Sagami Bay, Japan].—Bals, 1914a:30, fig. 14.—Fujino and Miyake, 1970:261, fig. 8.
Plesionika Ortmanni.—De Man, 1920:124, pl. 11: fig. 26.

DIAGNOSIS.—Rostrum overreaching antennal scale, armed dorsally throughout length with 17 or 18 teeth, including 3 or 4 on carapace posterior to level of orbital margin, 2 or 3 posterior-most teeth with partial or complete basal sutures but none with barbed tips, armed ventrally with 6–11 teeth; orbital margin slightly convex in ventral part, rather regularly concave elsewhere; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th somite with pleuron subquadrate, without marginal denticle, 5th somite with posteroventral tooth on pleuron, 6th somite fully 1½ times as long as maximum height; telson about 1½ times as long as 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye subpyriform, maximum diameter barely ½ carapace length, ocellus lingulate, elongate longitudinally, very little constricted at juncture with cornea; stylocerite drawn out to sharp

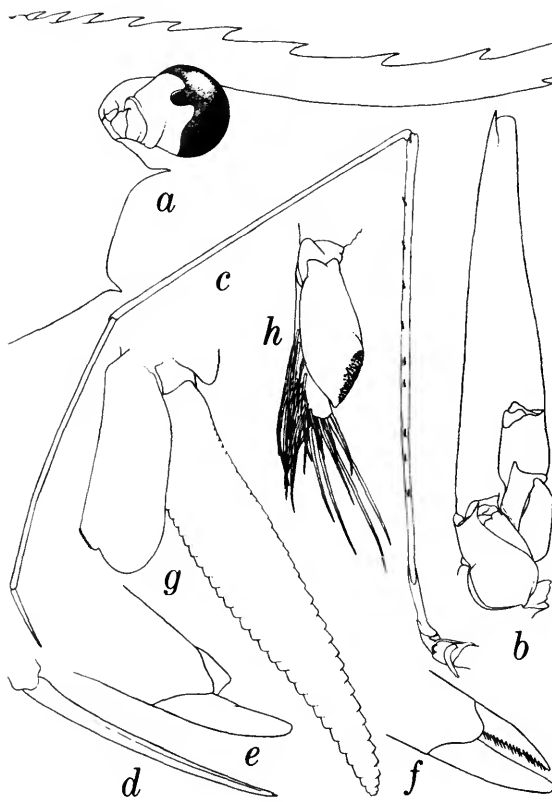


FIGURE 41.—*Plesionika ortmanni*, male from *Albatross* sta 5241, carapace length 16.0 mm: *a*, anterior carapace and eye; *b*, right antenna, ventral aspect; *c*, left 4th pereopod; *d*, same, dactyl; *e*, same, distal end; *f*, distal end of left 5th pereopod; *g*, endopod and exopod of right 1st pleopod, posterior aspect; *h*, right appendix masculina and appendix interna, mesial aspect. (Magnifications: *c*, $\times 2.6$; *b*, $\times 4.3$; *a*, $\times 5.2$; *g*, $\times 10.8$; *d*, *h*, $\times 21.5$; *e*, *f*, $\times 223.6$.)

point, overreaching dorsal arc of distal margin of 1st antennular segment; antennal scale barely 5 times as long as wide, distolateral tooth overreaching narrow distal margin of blade; 3rd maxilliped with epipod, penultimate segment $1\frac{1}{2}$ to nearly $1\frac{9}{10}$ as long as terminal segment; pereopods with prominent epipods on 4 anterior pairs, 2nd pair subequal, with 28–42 carpal articles, 3rd pair overreaching antennal scale by lengths of dactyl, propodus, carpus, and about $\frac{1}{5}$ of merus, none of pereopods extremely slender or thread-like; 3rd pleopod with exopod slightly less

than $\frac{1}{2}$ as long as carapace; maximum carapace length more than 16 mm.

MATERIAL.—PHILIPPINES. Pujada Bay, southeastern Mindanao: sta 5241; $6^{\circ}50'45''\text{N}$, $126^{\circ}14'38''\text{E}$; 393 m; soft gray mud; 14 May 1908 (1505–1525); 9' *Albatross-Blake* beam trawl, mud bag (veered from 925 to 988 meters cable): 2♂ [12.0, 16.0].

RANGE.—Japan to Indonesia in 80 to nearly 400 meters. The *Albatross* collected this species, like *P. serratifrons*, only in the vicinity of Pujada Bay, Mindanao.

REMARKS.—There has been no opportunity to compare the two *Albatross* specimens with Japanese examples of *P. ortmanni*. Until such a comparison is made, the identification of these specimens, as well as of the *Siboga* pair from the Bali Sea, must be regarded with some caution.

*35. *Plesionika parvimartia*, new species

FIGURES 42, 43

Plesionika martia var. *semilaevis*.—De Man, 1920:116 [part].

DIAGNOSIS.—Rostrum far overreaching antennal scale, armed dorsally, on posterior section only, with 6–9 teeth, including 2 or 3 on carapace posterior to level of orbital margin, none with distinct basal sutures or barbed tips, armed ventrally with 25–50 teeth; orbital margin rather strongly convex in both ventral and posterodorsal parts; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, none of abdominal pleura with distinct marginal tooth or denticle, 6th somite from twice to nearly $2\frac{1}{2}$ times as long as maximum height; telson from $\frac{4}{5}$ as long as to subequal to 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye somewhat kidney-shaped, maximum diameter from more than $\frac{1}{4}$ to $\frac{1}{3}$ carapace length, ocellus represented by lingulate lobe, slightly broadening rather than constricted at juncture with cornea; stylocerite rather bluntly acute, slightly overreaching dorsal arc of distal margin of 1st antennular segment;

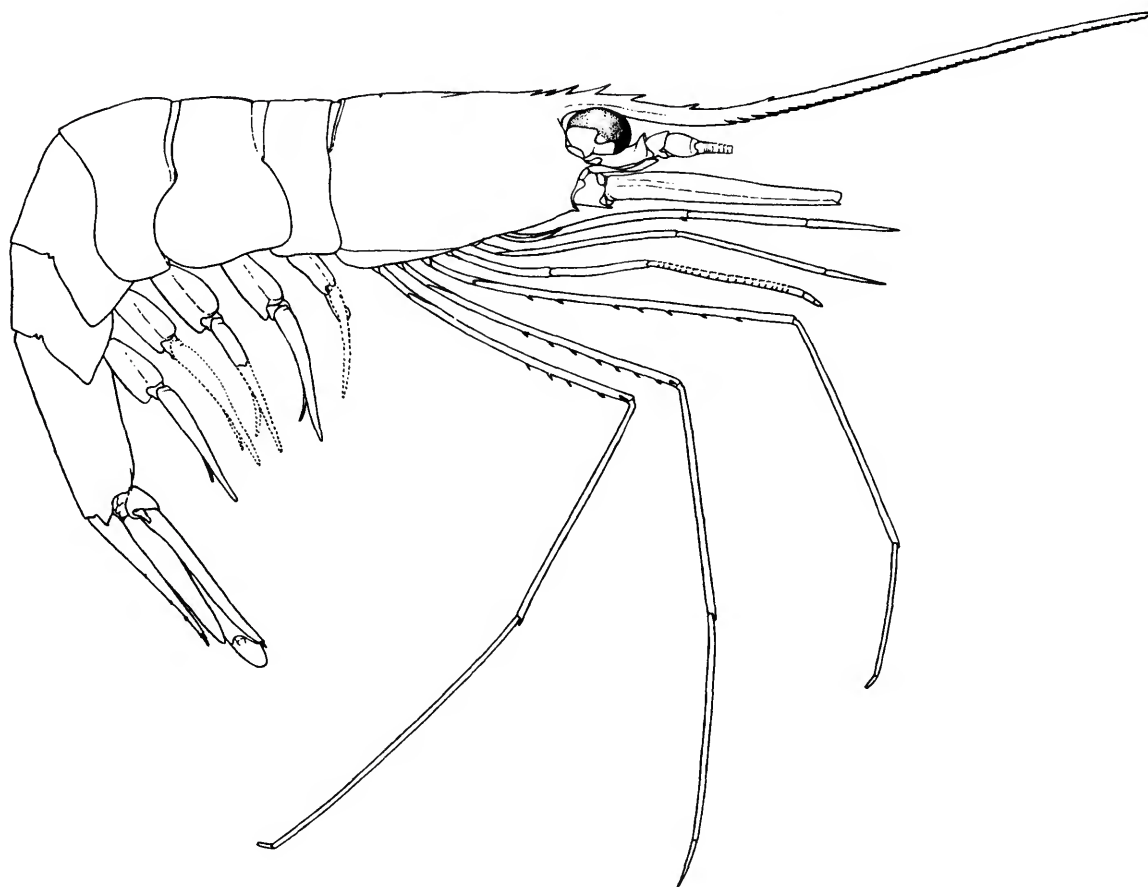


FIGURE 42.—*Plesionika parvimartia*, new species, male holotype from Albatross sta 5397 (Samar Sea, Philippines), carapace length 11.3 mm. (Magnification: $\times 2.9$.)

antennal scale from slightly less than 5 to more than 6 times as long as wide, distolateral tooth not reaching level of distal margin of blade; 3rd maxilliped with epipod, penultimate segment from $1\frac{1}{8}$ to more than $1\frac{1}{3}$ times as long as terminal segment; pereopods with epipods on 4 anterior pairs, 2nd pair subequal, with 18–25 carpal articles, 3rd pair overreaching antennal scale by lengths of dactyl, propodus, and about $\frac{1}{5}$ of carpus, dactyl from less than $\frac{1}{2}$ to $\frac{3}{5}$ as long as propodus, accessory distal spine very small, separated from main terminal spine, 3 distal segments, combined, from about $1\frac{1}{4}$ to $2\frac{2}{5}$ times as long as carapace, none of pereopods extremely slender or thread-like; 3rd pleopod

with exopod from $\frac{2}{3}$ to nearly $\frac{9}{10}$ as long as carapace; maximum carapace length about 15 mm.

DESCRIPTION.—Rostrum (Figure 42) directed slightly dorsad, distinctly overreaching antennal scale, more than twice as long as carapace in adults and 3 or more times as long in immature individuals; dorsal margin armed with 6–9 (commonly 7, rarely 6) teeth on basal portion, usually present anteriorly beyond distal end of antenular peduncle, posterior 2 or 3 teeth situated on carapace posterior to level of orbital margin, none with distinct basal suture or barbed tip; ventral margin armed with 25–50 (average 40) teeth. Orbit (Figure 43a) convex in ventral por-

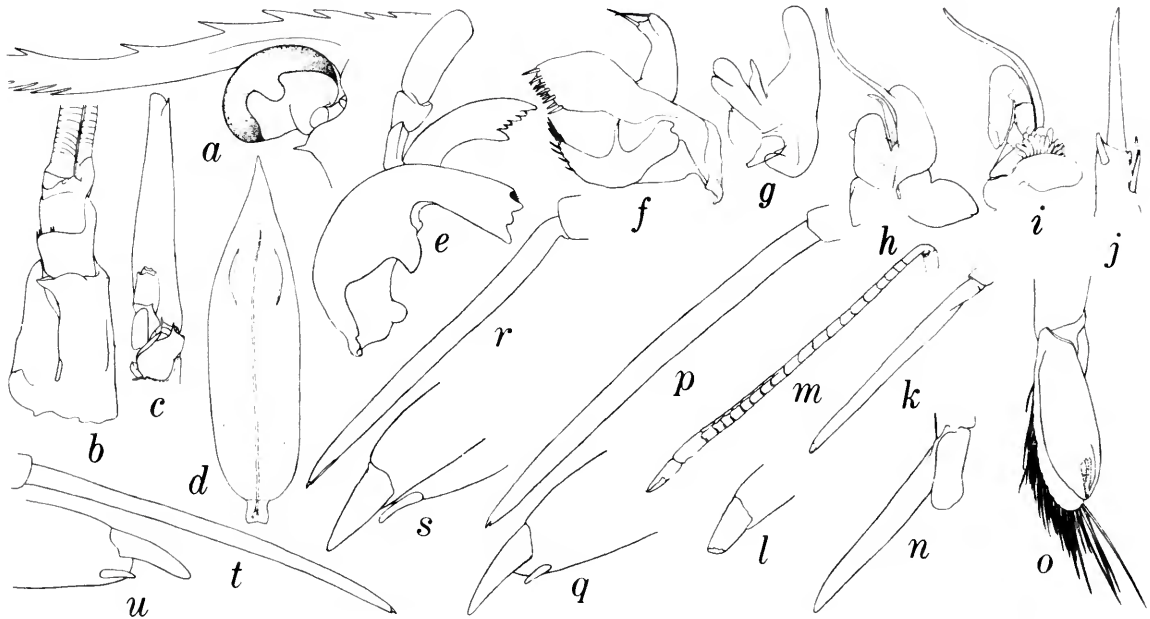


FIGURE 43.—*Plesionika parvimartia*, new species, all specimens from Albatross sta 5397 (Samar Sea, Philippines); a, ovigerous female paratype, carapace length 11.9 mm; b–d, male paratype, carapace length 13.0 mm; e–o, male holotype, carapace length 11.3 mm; p–s, ovigerous female paratype, carapace length 11.8 mm; t, u, male paratype, carapace length 11.3 mm: a, left eye and orbit; b, left antennule, mesiodorsal aspect; c, left antenna, ventral aspect; d, tegumental scale from posterodorsal area of carapace; e, left mandible; f, left 1st maxilla; g, left 2nd maxilla; h, left 1st maxilliped; i, left 2nd maxilliped; j, distal end of left 3rd maxilliped; k, “chela” of left 1st pereopod; l, same, distal end; m, carpus and chela of left 2nd pereopod; n, endopod and exopod of left 1st pleopod, posterior aspect; o, right appendix masculina and appendix interna, mesial aspect; p, dactyl of left 3rd pereopod; q, same, distal end; r, dactyl of left 5th pereopod; s, same, distal end; t, dactyl of right 4th pereopod; u, same, distal end. (Magnifications: c, $\times 2.6$; a, b, g–i, m, n, $\times 5.2$; e, f, k, $\times 10.8$; o, p, r, t, $\times 21.5$; j, l, $\times 53.8$; d, q, s, u, $\times 223.6$.)

tion posterior to antennal spine and convex also posterodorsally. Antennal spine slightly longer but more slender than pterygostomian spine. Median postrostral ridge carinate, slightly convex, extending posteriorly to about midlength of carapace.

Abdomen with 3rd somite rounded posteriorly, unarmed, without median carina, feebly arched dorsally in lateral aspect. Pleura of 3 anterior somites rounded, that of 4th subquadrate, that of 5th forming 50° – 60° spineless angle. Sixth somite from slightly more than twice to $2\frac{3}{4}$ times as long as 5th and from twice to nearly $2\frac{1}{2}$ times as long as maximum height. Telson usually about $\frac{9}{10}$ as long as 6th somite,

rarely subequal to latter, armed with 4 pairs of dorsolateral spinules, posteriormost pair situated dorsolateral to base of long, lateral spine of 2 posterior pairs.

Tegumental scales of carapace (Figure 43d) with margins entire and with 2 pairs of curved flanges forming parentheses-like pattern embracing midline proximally and distally, latter pair more distinct.

Eye (Figure 43a) rather kidney-shaped, varying from about $\frac{3}{5}$ to more than $\frac{4}{5}$ as long as wide, maximum diameter up to $\frac{1}{3}$ carapace length; ocellus represented by tapering, atypically rounded lobe not constricted at juncture with cornea.

Antennular peduncle (Figure 43*b*) with minute tooth on ventromesial margin of basal segment. Stylocerite bluntly acute, overreaching dorsal arc of distal margin of basal segment.

Antennal scale (Figure 43*c*) with lateral margin sinuous, nearly as long as or somewhat longer than carapace, usually more than $5\frac{1}{2}$ times as long as wide, distolateral tooth falling distinctly short of level of distal margin of blade.

Mouthparts as illustrated (Figures 43*e-j*). Third maxilliped with epipod, overreaching antennal scale by about $\frac{2}{3}$ of terminal segment, latter terminating in long distal spine and at least 3 shorter subapical spines (Figure 43*j*), penultimate segment from $\frac{1}{8}$ to more than $\frac{1}{3}$ times as long as terminal segment (average 1.26).

Pereopods with well-formed epipods on 4 anterior pairs. First pereopod (Figure 43*k*) overreaching antennal scale by about $\frac{1}{6}$ of chela; fixed finger very small (Figure 43*l*). Second pereopods subequal, reaching nearly to distal margin of antennal scale, carpus (Figure 43*m*) composed of 18–25 (commonly 19–22) articles. Third pereopod overreaching antennal scale by lengths of dactyl, propodus, and most of carpus; dactyl (Figure 43*p*) usually about $\frac{1}{2}$ as long as propodus (average 0.48), about $\frac{1}{4}$ as long as carapace, accessory distal spine (Figure 43*q*) short and slender and well separated from main terminal spine; carpus $1\frac{1}{2}$ –2 times as long as propodus (average 1.8); 3 distal segments; combined, about $1\frac{3}{4}$ – $2\frac{2}{5}$ times as long as carapace (average 1.9). Fourth pereopod overreaching antennal scale by lengths of dactyl, propodus, and nearly $\frac{1}{2}$ of carpus; dactyl (Figure 43*t,u*) slightly shorter than dactyl of 3rd pereopod; 3 distal segments, combined, $1\frac{1}{2}$ to about $2\frac{1}{2}$ times as long as carapace (average 2.2). Fifth pereopod overreaching antennal scale by lengths of dactyl, propodus, and fully 1.3 of carpus; dactyl (Figure 43*r,s*) shorter than dactyl of 4th pereopod; 3 distal segments, combined, $2\frac{3}{4}$ – $3\frac{1}{4}$ times as long as carapace (average 2.9).

Endopod of 1st pleopod of male (Figure 43*n*) with mesial margin nearly straight as far as subdistal bulge, distal margin sinuously oblique, with

feeble notch. Appendix masculina on 2nd pleopod (Figure 43*o*) armed with at least 30 long spines on anterior and distal margins. Exopod of 3rd pleopod from $\frac{2}{3}$ to nearly $\frac{9}{10}$ as long as carapace (average 0.71). Mesial branch of uropod slightly overreaching distal margin of telson, proper; lateral branch considerably longer and bearing spine mesial to distolateral angle.

COLOR.—The lot of 41 specimens from station 5241 in Pujada Bay, Mindanao, is accompanied by the following note: "Body hyaline. Eggs flavocous blue. Antennae vermilion."

SIZE.—Carapace length of male holotype, 11.3 mm; of male paratypes, 6.3–14.2 mm; of non-ovigerous female paratypes, 6.1–13.0 mm; of ovigerous female paratypes, 10.0–14.7 mm.

MATERIAL.—PHILIPPINES. Southwest of Manila Bay, Luzon: sta 5110; $13^{\circ}59'20''N$, $120^{\circ}75'$ [sic—corrected to "25'" from *Albatross* chart] $45''E$; 247 m; dark gray mud; $15.0^{\circ}C$; 15 Jan 1908 (1532–1552); 12' Tanner beam trawl, mud bag (30 m cable veered during haul): 12♂ [10.0–13.3], 5♀ [10.0–11.0], 4 ovig [10.0–11.0]. Batangas Bay, southern Luzon: sta 5266; $13^{\circ}44'36''N$, $120^{\circ}59'15''E$; 183 m; mud; 8 Jun 1908 (0918–0938); 12' Agassiz beam trawl, mud bag: 2♂ [7.8, 7.8], 3♀ [6.7–7.5]. Eastern end of Verde Island Passage, north of Mindoro: sta 5121; $13^{\circ}27'20''N$, $121^{\circ}17'45''E$; 198 m; dark green mud; 2 Feb 1908 (0830–0850); 12' Tanner beam trawl, mud bag: 4♀ [6.1–6.7], 2? [6.0, 6.7]. Albay Gulf, east of southern Luzon: sta 5454; $13^{\circ}12'N$, $123^{\circ}50'30''E$; [280 m]; 7 Jun 1909 (1046–1107); 12' Agassiz beam trawl: 11♂ [8.9–11.3], 16♀ [9.0–12.3], 14 ovig [9.8–12.3]; sta 5458; $13^{\circ}10'54''N$, $123^{\circ}59'38''E$; [366 m]; 8 Jun 1909 (1404–1427); 12' Agassiz beam trawl: 1♂ [13.0].

Samar Sea, east of Masbate: sta 5393; $12^{\circ}03'30''N$, $124^{\circ}03'36''E$; 249 m; hard sand; 13 Mar 1909 (1404–1412); 12' Agassiz beam trawl, mud bag: 1♂ [6.3], 1♀ [6.8]; sta 5396; $11^{\circ}57'N$, $124^{\circ}12'24''E$; 251 m; green mud; 15 Mar 1909 (0945–1005); 12' Agassiz beam trawl, mud bag: 3♀ [10.0–11.3], 2 ovig [11.2, 11.3]; sta 5397; $11^{\circ}57'27''N$, $124^{\circ}10'42''E$; 245 m; green mud;

15 Mar 1909 (1036–1052); 12' Agassiz beam trawl, mud bag: 7♂ [10.7–13.6], 16♀ [8.3–13.0], 11 ovig [11.0–13.0], 1? [9.0], 1♂ is holotype (USNM 205213). Panay Gulf, south of Panay: sta 5183; 10°32'48"N, 122°26'E; 176 m; soft green mud; 17.4°C; 30 Mar 1908 (1051–1111); 12' Agassiz beam trawl, 3 mud bags (veered from 351 to 457 m [cable] during haul): 1♀ [7.8].

Bohol Strait, east of Cebu: sta 5411; 10°10'–30"N, 123°51'15"E; 265 m; green mud; 12.9°C; 23 Mar 1909 (0848–0912): 12' Agassiz beam trawl, mud bag: 1♂ [14.0], 3 ovig ♀ [14.0–14.7]; sta 5412; 10°09'15"N, 123°52'E; 296 m; green mud; 12.6°C; 23 Mar 1909 (0958–1020); 12' Agassiz beam trawl: 2♂ [13.0, 13.9], 1 ovig ♀ [14.0]. Pujada Bay, southeastern Mindanao: sta 5241; 6°50'45"N, 126°14'38"E; 393 m; soft gray mud; 14 May 1908 (1505–1525); 9' *Albatross-Blake* beam trawl, mud bag: 14♂ [11.3–12.2], 27♀ [8.5–13.8], 26 ovig [12.0–13.8]; sta 5242; 6°51'53"N, 126°14'10"E; 349 m; soft gray mud; 17.8°C; 14 May 1908 (1603–1623); 9' *Albatross-Blake* beam trawl, mud bag: 4♂ [8.3–9.1], 13♀ [8.5–14.4], 5 ovig [12.8–14.4]; sta 5244; 6°52'05"N, 126°14'15"E; 313 m; gray mud; 15 May 1908 (1405–1425); 12' Agassiz beam trawl, mud bag: 1♂ [8.2], 9♀ [7.2–14.0], 1 ovig [14.0]. Davao Gulf, Mindanao: sta 5247; 7°02'N, 125°38'45"E; 247 m; mud; 18 May 1908 (0908–0928); 12' Agassiz beam trawl, mud bag: 1♂ [14.2], 1 ovig ♀ [13.2].

TYPE-LOCALITY.—Samar Sea south of Tagapula Island; 11°57'27"N, 124°10'42"E; 245 meters.

RANGE.—To the Philippine localities listed above (176–366 meters) may probably be added two of the lots identified by De Man (1920) as *P. martia* var. *semilaevis* from the Lesser Sunda Islands, Indonesia (247–274 meters).

REMARKS.—This species, like *P. simulatrix*, is characterized by its relatively small size; neither species attains a carapace length of much more than 15 mm, a size at which the other two Philippine-Indonesian species related to *P. martia*—*P. martia orientalis* and *P. semilaevis*—have barely reached maturity. *Plesionika parvimartia* is usu-

ally distinguishable from the other three species by the presence of at least one of the dorsal rostral teeth arising anterior to the level of the distal end of the antennular peduncle (in only 2 of 62 *Albatross* specimens of the species examined for this character was the anteriormost dorsal rostral tooth situated at or posterior to this level) and by proportionately longer dactyls on the three posterior pairs of pereopods. It differs further from *P. simulatrix* in having the eye considerably broader than long and in having distinct epipods on the four anterior pairs of pereopods. The sixth abdominal somite is proportionately slightly longer and less deep, and the telson is slightly shorter in *P. parvimartia* than it is in either *P. martia orientalis* or *P. semilaevis*.

There is considerable likelihood that some or all of the 383 small specimens recorded as atypical *P. martia* var. *semilaevis* by De Man (1920) from *Siboga* stations 306 and 312 in the Lesser Sunda Islands may belong to *P. parvimartia*. De Man not only noted that "the numerous egg-laden specimens from the Stations 306 and 312 are still quite young, being not yet half as long as the full-grown specimen from Stat. 173" (p. 117) but he added (p. 118): "In the young specimens from the Stations 306 and 312 . . . the anterior tooth [on the dorsal side of the rostrum] stands usually a little before the distal extremity of the antennular peduncle to near the tip of the antennal scales, which fact does never occur in the older specimens . . ." and "in the young specimens from the Stations 306 and 312 the telson is usually even a little shorter than the endopodite [of the caudal fan]."

ETYMOLOGY.—The Latin *parvus* (little) plus the specific name *martia* was suggested by the small adult size of this presumed relative of *P. martia*.

*36. *Plesionika philippinensis*, new species

FIGURE 44

DIAGNOSIS.—Rostrum overreaching antennal scale, armed dorsally throughout length with 11–13 teeth, including 4 on carapace posterior to

level of orbital margin, 5 or 6 posteriormost teeth with distinct basal suture but none with barbed tip, armed ventrally with 10–16 teeth; orbital margin convex in ventral part, concave dorsally; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th and 5th somites with posteroventral tooth on pleuron, 6th somite from less than $1\frac{1}{2}$ to $1\frac{2}{3}$ times as long as maximum height; telson from $1\frac{1}{4}$ to more than $1\frac{1}{2}$ times as long as 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye broadly subpyriform, maximum diameter about $\frac{1}{4}$ carapace length, ocellus skewed laterally and somewhat constricted at juncture with cornea but usually in rather broad contact with latter; stylocerite acute, slightly overreaching dorsal arc of distal margin of 1st antennular segment; antennal scale about $4\frac{1}{2}$ times as long as wide, distolateral tooth not reaching level of distal margin of blade; 3rd maxilliped with epipod, penultimate segment from nearly $\frac{2}{3}$ to slightly more than $\frac{3}{4}$ as long as terminal segment; pereopods with epipods on 4 anterior pairs, 2nd pair unequal, right with 18–23 carpal articles, left with 83–119, 3rd pair overreaching antennal scale by length of dactyl and fully $\frac{3}{4}$ of propodus, dactyl somewhat more or less than $\frac{1}{4}$ as long as propodus, accessory distal spine more than $\frac{1}{2}$ as long as and not much separated from main terminal spine, 3 distal segments, combined, about $1\frac{1}{3}$ times as long as carapace, none of pereopods extremely slender or thread-like; 3rd maxilliped with exopod about $\frac{1}{2}$ as long as carapace; maximum carapace length probably about 10 mm.

DESCRIPTION.—Rostrum (Figure 44a) directed slightly to rather noticeably dorsad, distinctly overreaching antennal scale, $1\frac{1}{2}$ to more than twice as long as carapace, dorsal margin armed with 11–13 (usually 12) teeth, including 4 on carapace posterior to or level with orbital margin, 5 (rarely 6) posteriormost teeth with distinct basal suture, none with barbed tips, ventral margin armed with 10–16 (usually 12 or 13) teeth. Orbit rather strongly convex in ventral portion posterior to antennal spine, regularly

concave in dorsal $\frac{1}{2}$. Antennal spine much stronger than pterygostomian spine. Median postrostral ridge faintly convex, carinate, not extending posteriorly as far as midlength of carapace.

Abdomen (Figure 44b) with 3rd somite rounded posteriorly, unarmed, without median carina, regularly and rather strongly arched dorsally in lateral aspect. Pleura of 3 anterior somites rounded, those of 4th and 5th armed with sharp marginal tooth, with nearly straight ventral margin. Sixth somite from about $1\frac{1}{2}$ to $1\frac{9}{10}$ times as long as 5th and from less than $1\frac{1}{2}$ to $1\frac{2}{3}$ times as long as maximum height. Telson from $1\frac{1}{4}$ to more than $1\frac{1}{2}$ times as long as 6th somite, with 4 pairs of dorsolateral spinules, posteriormost pair situated dorsolateral to base of long, lateral spine of 2 posterior pairs.

Tegumental scales of carapace (Figure 44y) bearing tooth on each lateral margin at base of sharply triangular terminal portion.

Eye (Figure 44c,z) broadly subpyriform, maximum diameter about $\frac{1}{4}$ carapace length; ocellus skewed somewhat laterad, usually in rather broad contact with but distinctly constricted at juncture with cornea.

Antennular peduncle (Figure 44d) with small tooth on ventromesial margin of basal segment. Stylocerite acute, overreaching dorsal arc of distal margin of basal segment.

Antennal scale (Figure 44e) with lateral margin nearly straight, fully $\frac{4}{5}$ as long as carapace, $4\frac{1}{2}$ times as long as wide, distolateral tooth approaching but never overreaching level of distal margin of blade.

Mouthparts as illustrated (Figure 44f–l). Third maxilliped (Figure 44k) with epipod, overreaching antennal scale by about $\frac{1}{2}$ of terminal segment, armed terminally with about 5 apical and subapical spines (Figure 44l), penultimate segment about $\frac{2}{3}$ as long as distal one.

Pereopods with well-developed epipods on 4 anterior pairs. First pereopod (Figure 44m,n) overreaching antennal scale by about $\frac{1}{2}$ length of chela, distinctly chelate. Second pereopods unequal, right (Figure 44o) usually shorter and

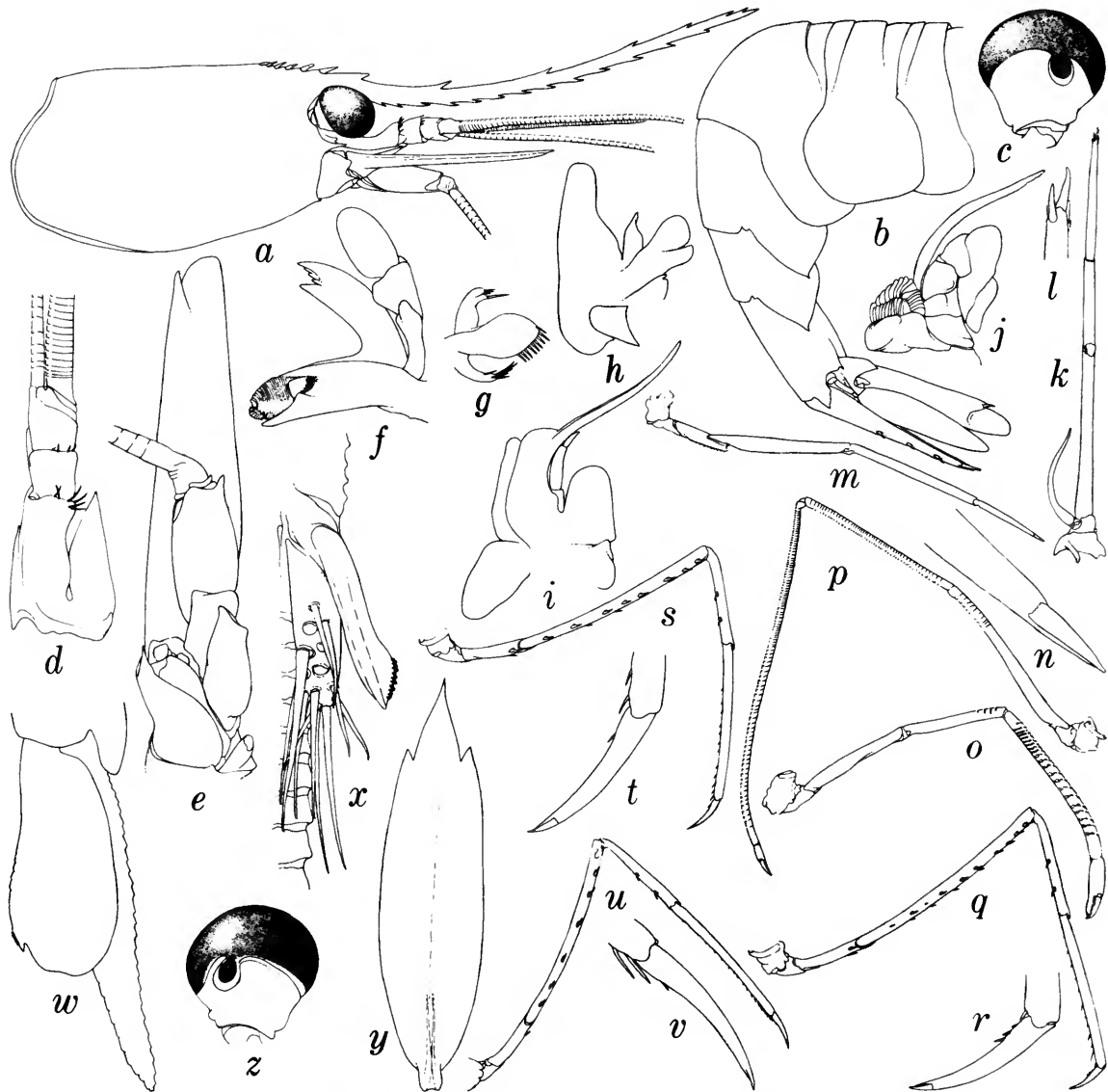


FIGURE 44.—*Plesionika philippinensis*, new species; a–y, male holotype from *Albatross* sta 5483, carapace length 7.1 mm; z, male paratype from same station, carapace length 7.5 mm: a, carapace and anterior appendages, right aspect; b, abdomen, right aspect; c, right eye, dorsal aspect; d, right antennule, mesiodorsal aspect; e, right antenna, ventral aspect; f, right mandible; g, right 1st maxilla; h, right 2nd maxilla; i, right 1st maxilliped; j, right 2nd maxilliped; k, right 3rd maxilliped; l, same, distal end; m, right 1st pereopod; n, same, distal end; o, right 2nd pereopod; p, left 2nd pereopod; q, right 3rd pereopod; r, same, dactyl; s, right 4th pereopod; t, same, dactyl; u, right 5th pereopod; v, same, dactyl; w, endopod and exopod of right 1st pleopod, posterior aspect; x, right appendix masculina and appendix interna; y, tegumental scale from dorsal area of carapace; z, left eye, dorsal aspect. (Magnifications: a, b, k, m, o–q, s, u, $\times 5.2$; c–e, g–j, z, $\times 10.8$; f, l, r, t, v, w, $\times 21.5$; n, x, $\times 53.8$; y, $\times 223.6$.)

more robust, with 18–25 (commonly 21) carpal articles and overreaching antennal scale by length of chela and about $\frac{1}{2}$ of carpus, left (Figure 44*p*) usually with 83–119 carpal articles and overreaching antennal scale by length of chela and about $\frac{9}{10}$ of carpus. Third pereopod (Figure 44*q*) overreaching antennal scale by length of dactyl and fully $\frac{3}{4}$ of propodus; dactyl (Figure 44*r*) about $\frac{1}{4}$ as long as propodus and about $\frac{1}{7}$ as long as carapace, accessory distal spine more than $\frac{1}{2}$ as long as and approximating main terminal spine; carpus usually at least $\frac{2}{3}$ as long as propodus; 3 distal segments, combined, about $1\frac{1}{5}$ times as long as carapace. Fourth pereopod (Figure 44*s*) overreaching antennal scale by length of dactyl and nearly $\frac{1}{2}$ of propodus; dactyl (Figure 44*t*) similar to that of 3rd pereopod; 3 distal segments, combined, also about $1\frac{1}{5}$ times as long as carapace. Fifth pereopod (Figure 44*u*) overreaching antennal scale by length of dactyl and about $\frac{1}{4}$ of propodus; dactyl (Figure 44*v*) less than $\frac{1}{3}$ as long as propodus; carpus less than $\frac{3}{4}$ as long as propodus; 3 distal segments, combined, about $1\frac{1}{7}$ times as long as carapace.

Endopod of 1st pleopod of male (Figure 44*w*) with mesial margin slightly sinuous, notch in distal margin narrow. Appendix masculina on 2nd pleopod reaching about as far as appendix interna (Figure 44*x*) and bearing about 15 long spines. Exopod of 3rd pleopod about $\frac{1}{2}$ as long as carapace. Mesial branch of uropod reaching to about level of posterior margin of telson, proper; lateral branch slightly longer and bearing movable spine mesial to distolateral tooth.

SIZE.—Carapace length of male holotype, 7.1 mm; of male paratypes, 5.5–7.5; of nonovigerous female paratype, 6.5 mm; of ovigerous female paratypes, 5.3–9.0 mm.

MATERIAL.—PHILIPPINES. Surigao Strait, east of Leyte: sta 5482; $10^{\circ}27'30''\text{N}$, $125^{\circ}18'E$; 123 m; broken shells, sand, and green mud; 30 Jul 1909 (0911–0935); 12' Agassiz beam trawl: 1♂ [6.8], 2 ovig ♀ [8.9, ?]; sta 5483; $10^{\circ}27'30''\text{N}$, $125^{\circ}19'15''\text{E}$; 135 m; sand, broken shells; 30 Jul 1909 (1000–1021); 12' Agassiz beam trawl: 1♂

[5.5–7.5], 2♀ [5.3–9.0], 21 ovig [5.3–9.0], 1♂ is holotype (USNM 205214).

TYPE-LOCALITY.—Northern Surigao Strait between Cabugan Grande and Hibuson islands, Philippines; $10^{\circ}27'30''\text{N}$, $125^{\circ}19'15''\text{E}$; 135 meters.

RANGE.—Known only from Surigao Strait, Philippines, in 123 to 135 meters.

REMARKS.—Three of the 40 specimens from station 5483—one male and two females (one ovigerous)—are “lefthanded,” with the longer second pereopod on the right side rather than the left.

Plesionika philippinensis is very similar to *P. binoculus* and may eventually prove to be identical with that species from the Arafura Sea. It seems best for the present, however, to recognize the possible taxonomic significance of the somewhat different appearance of the ocellus on the eyestalk, fewer articles in the carpus of the shorter second pereopod, and slightly shorter dactyls of the three posterior pairs of pereopods. The Philippine species also resembles *P. izumiae* from Japan and, possibly, the Sulu Archipelago but it may be readily distinguished from that species by the shorter dactyls of the posterior pereopods.

ETYMOLOGY.—The proposed specific name may serve to differentiate the form from Surigao Strait geographically from the comparable species from Japan and from the Arafura Sea between New Guinea and Australia.

*37. *Plesionika pumila*, new species

FIGURES 45, 46

DIAGNOSIS.—Rostrum far overreaching antennal scale, armed dorsally with 4 teeth in basal part, including 1 on carapace posterior to level of orbital margin, and 2 small, subapical teeth anteriorly, 1 or 2 posteriormost teeth with faint basal suture, all 4 basal ones with bluntly barbed tips, armed ventrally with about 12 teeth; orbital margin steep and faintly convex in ventral part, concave in dorsal part; abdomen without poster-

omesial tooth but compressed dorsally into slightly elevated median ridge or blunt carina on 3rd somite, 4th and 5th somites with posteroventral tooth on pleuron, 6th somite nearly twice as long as maximum height; telson fully as long as 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye compressed subpyriform, maximum diameter fully $\frac{1}{4}$ carapace length, ocellus large, lingulate, in broad contact with cornea; stylocerite acute, falling far short of dorsal arc of distal margin of 1st antennular segment; antennal scale $4\frac{1}{2}$ –5 times as long as wide, distolateral tooth reaching to or beyond level of distal margin of blade; 3rd maxilliped with epipod, penultimate segment about $\frac{2}{3}$ as long as terminal segment; pereopods with epipods on 4 anterior pairs, 2nd

pair probably unequal; exopod of 3rd pleopod barely $\frac{1}{2}$ as long as carapace; maximum carapace length probably less than 8 mm.

DESCRIPTION.—Rostrum (Figure 45) curving somewhat dorsad, far overreaching antennal scale, about twice as long as carapace; dorsal margin armed with 5 obscurely barbed teeth in basal part, including 1 on carapace posterior to level of posterior margin of orbit, and 2 small teeth near apex of rostrum, leaving most of length dorsally unarmed, 1 or 2 posteriormost teeth with faint basal suture; ventral margin armed over most of length with about 12 small but distinct and discretely spaced teeth. Orbit (Figure 46a) steep and very faintly convex in ventral portion above antennal spine, somewhat irregularly concave dorsally. Antennal spine con-

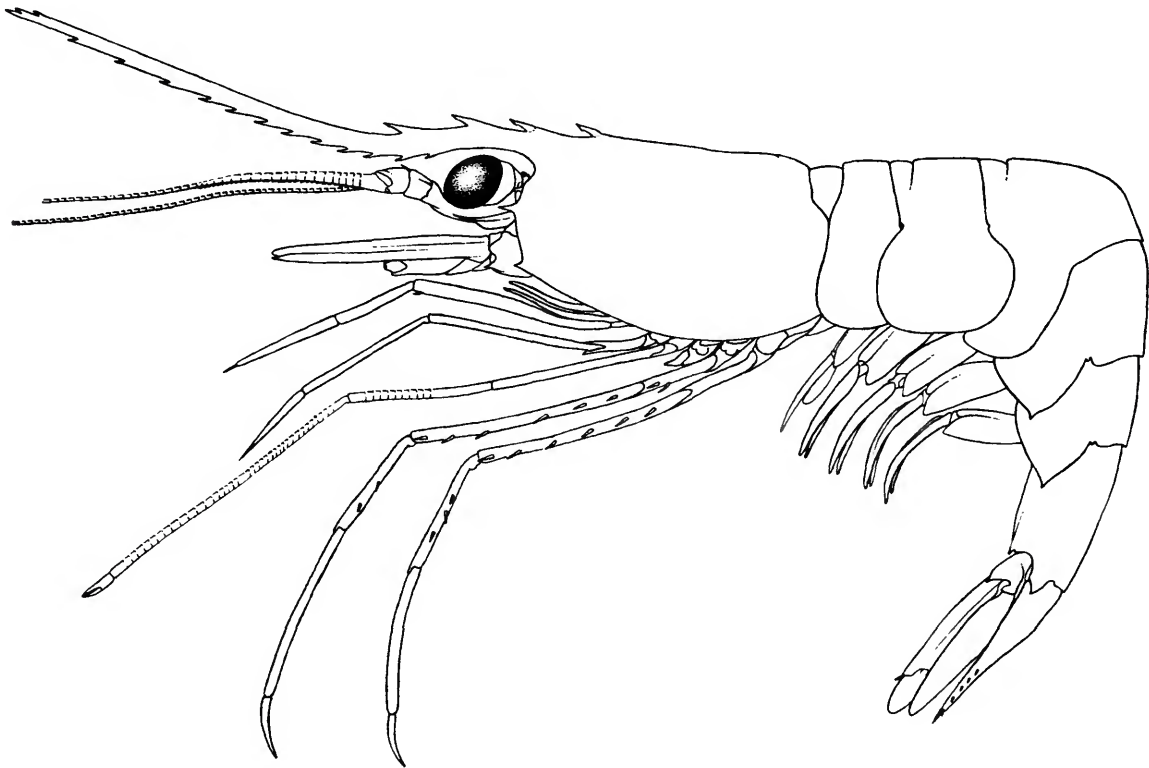


FIGURE 45.—*Plesionika pumila*, new species, male holotype from Albatross sta 5134, carapace length 4.2 mm. (Magnification: $\times 9.1$.)

siderably stronger than pterygostomian spine. Median postrostral ridge faintly concave, compressed but not sharp, very short, not extending posteriorly as far as midlength of carapace.

Abdomen with 3rd somite rounded posteriorly, unarmed, posterior part compressed into median subcarinate ridge slightly elevated in lateral aspect. Pleura of 3 anterior somites broadly rounded, those of 4th and 5th terminating posteroventrally in small, sharp tooth, ventral margins slightly sinuous. Sixth somite of adult less than twice as long as 5th and nearly twice as long as maximum height. Telson fully as long as 6th somite, armed typically with 4 pairs of dorsolat-

eral spinules, posteriormost pair situated dorso-lateral to base of long lateral spine of 2 posterior pairs.

Eye (Figure 46a) somewhat compressed in one plane, pyriform in other, maximum diameter fully $\frac{1}{4}$ carapace length; ocellus large, lingulate, main axis in line with axis of eyestalk, in broad contact with remainder of cornea.

Antennular peduncle (Figure 46b) with small but distinct tooth on ventromesial margin of basal segment. Stylocerite acute, falling considerably short of dorsal arc of distal margin of basal segment.

Antennal scale (Figure 46c) with lateral margin

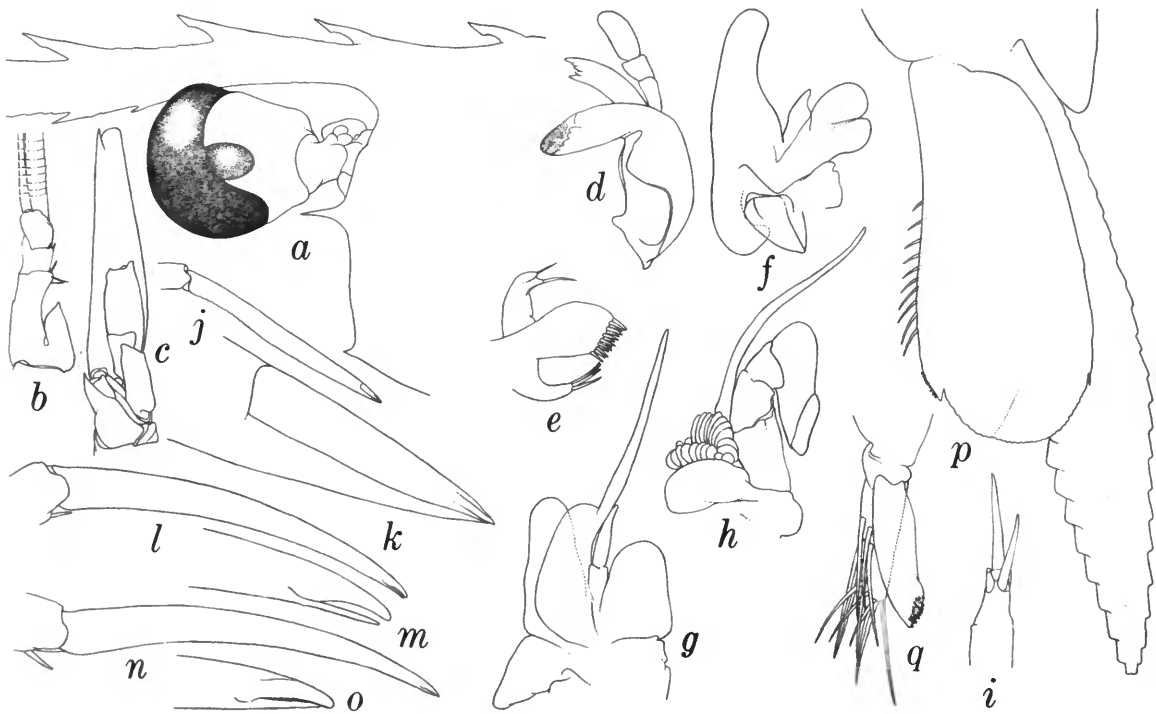


FIGURE 46.—*Plesionika pumila*, new species, male holotype from *Albatross* sta 5134, carapace length 4.2 mm: a, anterior carapace and eye; b, right antennule, mesiodorsal aspect; c, right antenna, ventral aspect; d, right mandible; e, right 1st maxilla; f, right 2nd maxilla; g, right 1st maxilliped; h, right 2nd maxilliped; i, distal end of right 3rd maxilliped; j, chela of right 1st pereopod; k, same, fingers; l, dactyl of right 4th pereopod; m, same, distal end; n, dactyl of right 5th pereopod; o, same, distal end; p, endopod and exopod of right 1st pleopod; q, right appendix masculina and appendix interna, mesial aspect. (Magnifications: b, c, $\times 10.8$; a, d–h, j, $\times 21.5$; i, l, n, p, q, $\times 53.8$; k, m, o, $\times 223.6$.)

faintly concave, nearly straight, more than $\frac{4}{5}$ as long as carapace, $4\frac{1}{2}$ –5 times as long as wide, distolateral tooth reaching about as far as or beyond level of distal margin of blade.

Mouthparts as illustrated (Figure 46*d–i*). Third maxilliped with epipod, overreaching antennal scale by nearly $\frac{1}{2}$ of distal segment, latter armed with long terminal and subapical spines (Figure 46*i*), penultimate segment about $\frac{2}{3}$ as long as terminal segment.

Pereopods with well-developed epipods on 4 anterior pairs. First pereopod (Figure 46*j*) overreaching antennal scale by fully $\frac{4}{5}$ length of chela; fingers as illustrated (Figure 46*k*). Second pereopods represented only by left member of pair (on holotype) overreaching antennal scale by length of chela and about $\frac{3}{4}$ of carpus, carpus composed of about 40 articles. Third pereopod missing or incomplete in both specimens. Fourth pereopod overreaching antennal scale by length of dactyl and more than $\frac{4}{5}$ of propodus; dactyl (Figure 46*l,m*) curved, terminating in 2 long, nearly contiguous spines, accessory one much more slender than main terminal spine; 3 distal segments, combined, slightly less than $1\frac{1}{3}$ times as long as carapace in adult. Fifth pereopod overreaching antennal scale by length of dactyl and about $\frac{2}{3}$ of propodus; dactyl (Figure 46*n,o*) like that of 4th; 3 distal segments, combined, about $1\frac{1}{4}$ times as long as carapace in adult.

Endopod of 1st pleopod of male (Figure 46*p*) with mesial margin slightly sinuous, notch in distal margin narrow, not prominent. Appendix masculina on 2nd pleopod (Figure 46*q*) not reaching distal end of appendix interna, armed with about 12 long spines on anteromesial and distal margins. Exopod of 3rd pleopod of male holotype barely $\frac{1}{2}$ as long as carapace. Mesial branch of uropod reaching about to level of distal margin of telson, proper; lateral branch longer and bearing movable spine mesial to distolateral tooth.

SIZE.—Carapace length of male holotype, 4.2 mm; of juvenile male paratype, 2.7 mm. The form of the endopod of the 1st pleopod of the smaller of the two available specimens leaves no

doubt that it is a male, even though there is no sign of an appendix masculina on the second pleopod.

MATERIAL.—PHILIPPINES. Western Basilan Strait, southwest of Zamboanga Peninsula, Mindanao: sta 5134; $6^{\circ}44'45''$ N, $121^{\circ}48'$ E; 46 m; fine sand; 7 Feb 1908 (0722–0742); 9' Tanner beam trawl, mud bag: 2♂ [2.7, 4.2], larger is holotype (USNM 205215).

TYPE-LOCALITY.—Western part of Basilan Strait, northwest of Basilan Island, Sulu Archipelago; $6^{\circ}44'45''$ N, $121^{\circ}48'$ E; 46 meters.

RANGE.—Known only from the type-locality at the western end of Basilan Strait, Philippines, in 46 meters.

REMARKS.—The telson of the male holotype is probably abnormal, being considerably inflated in its anterior half and armed with five dorsolateral spinules on the left side, four on the right. In the immature male paratype, the telson is narrower, regularly tapering, and armed with four dorsolateral spinules on each side.

The length and number of carpal articles in the left second pereopod of the holotype suggests that the members are unequal.

The species seems to be most closely related to the equally small Hawaiian *P. exigua* and the Pacific American *P. mexicana*, both of which have the spines on the rostral crest bluntly barbed and the third abdominal somite compressed posterodorsally. *Plesionika pumila* differs from *P. exigua* in having strap-like epipods on four anterior pairs of pereopods, only one dorsal rostral spine on the carapace posterior to the orbit, and the dactyls of the three posterior pairs of pereopods longer and devoid of the prominent accessory spines on the flexor margin with which that segment is provided in *P. exigua*. From *P. mexicana*, apparently it is also distinguished by the fewer dorsal rostral spines, as well as by the shorter telson and, especially, by the distinctly shorter stylocerite, which falls far short of the distal end of the first antennular segment, rather than slightly overreaching that segment.

ETYMOLOGY.—The Latin *pumila* (dwarfish) refers to the presumably small size of the species.

***38. *Plesionika quasigrandis*, new species**

FIGURES 47, 48

DIAGNOSIS.—Rostrum far overreaching antennal scale, armed dorsally throughout length with 41–53 teeth, including 4–7 on carapace above or posterior to orbital margin, 1 or 2 posteriormost teeth with indistinct basal sutures but none with barbed tips, armed ventrally with 32–44 teeth; orbital margin faintly convex in ventral $\frac{1}{2}$, concave posteriorly, and slightly convex or sinuous dorsally; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th and 5th somites with pleura tapering posteroventrally to strong tooth, 6th somite about $1\frac{2}{3}$ – $1\frac{3}{4}$ times as long as maximum height; telson $1\frac{1}{4}$ – $1\frac{2}{5}$ times as long as 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye subpyriform, maximum diameter less than $\frac{1}{4}$ carapace length, ocellus rather narrowly oval, long axis longitudinal, constricted at juncture with cornea; stylocerite abruptly acute, barely overreaching dorsal arc of distal margin of 1st antennular segment; antennal scale 4–5 times as long as wide, distolateral tooth typically overreaching blade; 3rd maxilliped without epipod, penultimate segment usually $1\frac{1}{4}$ – $1\frac{2}{5}$ times as long as terminal segment; pereopods without epipods, 2nd pereopods subequal, with 19–32 carpal articles, 3rd pair overreaching antennal scale by lengths of dactyl, propodus, carpus, and extreme distal end of merus, dactyl $\frac{1}{7}$ – $\frac{1}{3}$ as long as propodus, accessory distal spine minute and well separated from main terminal spine, 3 distal segments, combined, $1\frac{3}{4}$ – $1\frac{1}{2}$ times as long as carapace, none of pereopods extremely slender or thread-like; 3rd pleopod with exopod about $\frac{1}{2}$ as long as carapace; maximum carapace length more than 26 mm.

DESCRIPTION.—Rostrum (Figure 47) directed slightly dorsad, distinctly overreaching antennal scale, $1\frac{1}{3}$ – $1\frac{3}{4}$ times as long as carapace; dorsal margin armed with 41–53 (average 47) teeth over virtually entire length, including 5 or 6 (rarely 4 or 7) on carapace posterior to level of

orbital margin, 1 or 2 posteriormost sometimes with indistinct basal suture, none with barbed tips; ventral margin armed with 32–44 (usually 34–38) teeth. Orbit (Figure 48a) sloping posterodorsally in ventral portion from base of antennal spine, concave posteriorly, and convex or sinuous dorsally. Antennal spine stronger than pterygostomial spine. Median postrostral ridge nearly straight, carinate, extending posteriorly to about midlength of carapace.

Abdomen with 3rd somite rounded posteriorly, unarmed, without median dorsal carina, with somewhat sinuous dorsal profile in lateral aspect. Pleura of 3 anterior somites rounded, those of 4th and 5th acute, ventral margins strongly sinuous. Sixth somite $1\frac{1}{2}$ times to twice as long as 5th and usually about $1\frac{2}{3}$ – $1\frac{3}{4}$ times as long as maximum height. Telson $1\frac{1}{4}$ – $1\frac{2}{5}$ times as long as 6th somite, armed with 4 pairs of dorsolateral spinules, posteriormost situated dorsolateral to base of long lateral spine of 2 posterior pairs.

Tegumental scales (Figure 48v) with margins entire and with 2 barely visible pairs of curved flanges forming parentheses-like pattern embracing midline proximally and distally.

Eye (Figure 48a) subpyriform, maximum diameter averaging barely $\frac{1}{5}$ of carapace length, ocellus elongate oval, with long axis lying along that of eye and eyestalk.

Antennular peduncle (Figure 48b) with minute tooth on ventromesial margin of basal segment. Stylocerite abruptly acute but not spinose, barely overreaching dorsal arc of distal margin of basal segment.

Antennal scale (Figure 48c) with lateral margin very faintly sinuous, from slightly more than $\frac{3}{4}$ to nearly as long as carapace, 4–5 times as long as wide, distolateral tooth usually overreaching distal margin of blade.

Mouthparts as illustrated (Figure 48d–j). Third maxilliped without epipod, overreaching antennal scale by somewhat more than distal segment, latter not especially spinose apically (Figure 48i), penultimate segment $1\frac{1}{4}$ – $1\frac{2}{5}$ times as long as terminal segment.

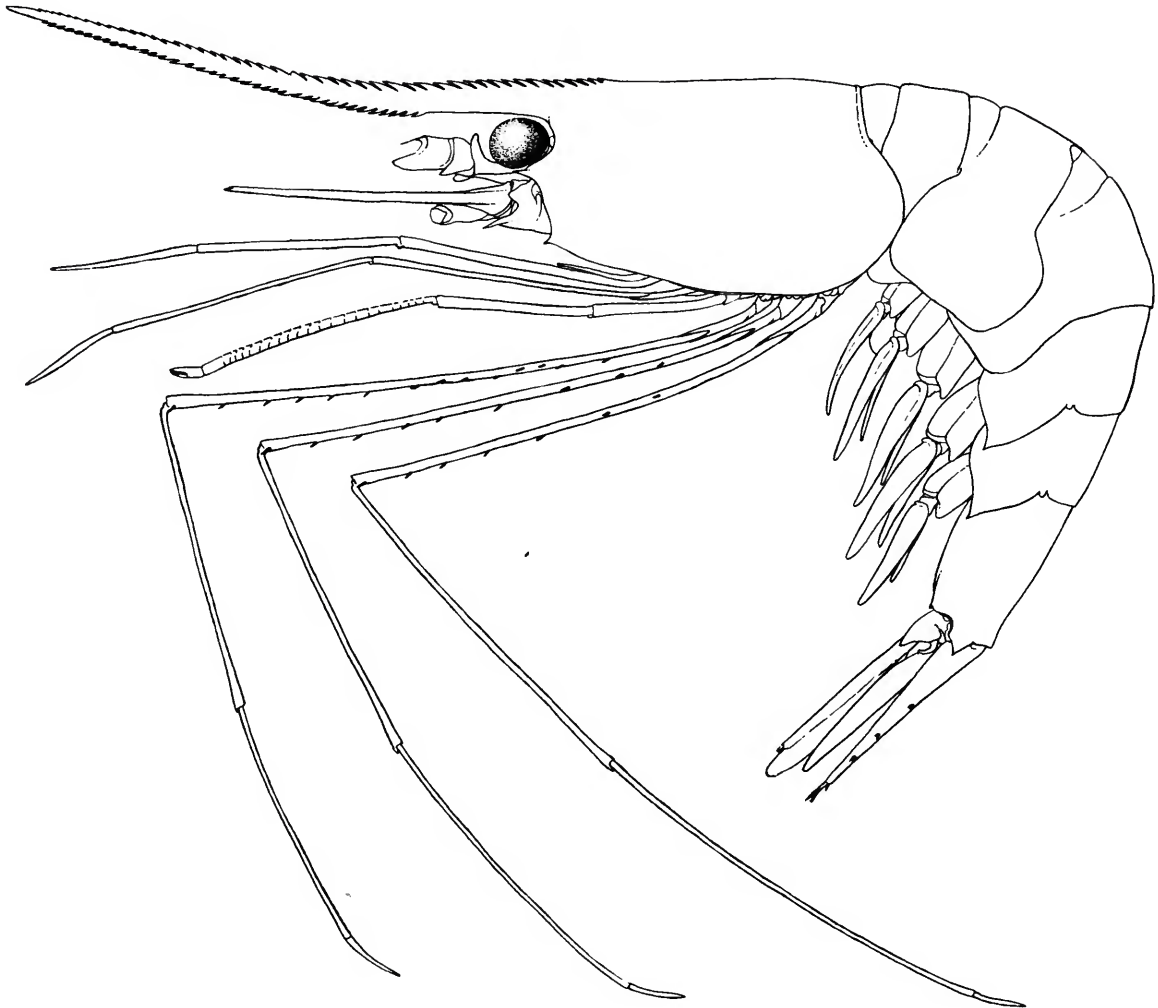


FIGURE 47.—*Plesionika quasigrandis*, new species, male holotype from Albatross sta 5247 (Davao Gulf, Mindanao, Philippines), carapace length 20.1 mm. (Magnification: $\times 2.2$.)

Pereopods with epipods. First pereopod overreaching antennal scale by length of chela (Figure 48k) and somewhat less than $\frac{1}{2}$ length of carpus; fingers (Figure 48l) distinct but tiny, movable finger considerably longer than fixed one. Second pereopods subequal, overreaching antennal scale by at least twice length of chela, carpus (Figure 48m) composed of 19–32 (commonly 21–24) articles. Third pereopod overreaching antennal scale by lengths of dactyl, propodus,

carpus, and about $\frac{1}{7}$ of merus; dactyl (Figure 48n,o) about $\frac{1}{7}$ – $\frac{1}{3}$ as long as propodus, about $\frac{1}{5}$ as long as carapace, accessory distal spine minute, well separated from base of main terminal spine; carpus $1\frac{1}{2}$ times as long as propodus; 3 distal segments, combined, $1\frac{3}{4}$ – $2\frac{1}{2}$ times as long as carapace. Fourth pereopod overreaching antennal scale by lengths of dactyl, propodus, and most of carpus; dactyl (Figure 48p,q) shorter than dactyl of 3rd pereopod, accessory distal



FIGURE 48.—*Plesionika quasigrandis*, new species, male holotype from *Albatross* sta 5247 (Davao Gulf, Mindanao, Philippines), carapace length 20.1 mm: *a*, left eye and orbit; *b*, right antennule, mesiodorsal aspect; *c*, right antenna, ventral aspect; *d*, left mandible; *e*, left 1st maxilla; *f*, left 2nd maxilla; *g*, left 1st maxilliped; *h*, left 2nd maxilliped; *i*, distal end of left 3rd maxilliped; *j*, basal part of left 3rd maxilliped; *k*, chela of right 1st pereopod; *l*, same, fingers; *m*, carpus and chela of right 2nd pereopod; *n*, dactyl of right 3rd pereopod; *o*, same, distal end; *p*, dactyl of left 4th pereopod; *q*, same, distal end; *r*, dactyl of right 5th pereopod; *s*, same, distal end; *t*, endopod and exopod of right 1st pleopod, posterior aspect; *u*, right appendix masculina and appendix interna, mesial aspect; *v*, tegumental scale from dorsal region of 6th abdominal somite. (Magnifications: *c*, *m*, $\times 2.6$; *a*, *b*, *d*–*h*, *t*, $\times 5.2$; *j*, *k*, *n*, *p*, *r*, $\times 10.8$; *u* $\times 21.5$; *i*, *l*, $\times 53.8$; *o*, *q*, *s*, *v*, $\times 223.6$.)

spine much stronger, reaching at least to mid-length of main terminal spine; 3 distal segments, combined, more than twice as long as carapace. Fifth pereopod overreaching antennal scale by lengths of dactyl, propodus, and nearly $\frac{1}{7}$ of carpus; dactyl (Figure 48*r,s*) fully as long as dactyl of 4th pereopod; 3 distal segments, combined, usually $2\frac{1}{2}$ –3 times as long as carapace.

Endopod of 1st pleopod of male (Figure 48*t*) with mesial margin strongly concave, no deep notch in distal margin. Appendix masculina on 2nd pleopod (Figure 48*u*) armed with about 20 long spines on anteromesial and distal margins. Exopod of 3rd pleopod about $\frac{1}{2}$ as long as carapace. Mesial branch of uropod barely reaching posterior end of telson proper; lateral branch longer and bearing movable spine mesial to distolateral tooth.

SIZE—Carapace length of male holotype, 20.1 mm; of male paratypes, 15.8–23.0; of nonovigerous female paratypes, 10.2–24.7 mm; of ovigerous female paratypes, 19.8–26.1 mm.

MATERIAL—PHILIPPINES. Southwest of Manila Bay, Luzon: sta 5110; 13°59'20"N, 120°75'–[sic—corrected to "25'" from *Albatross* chart] 45"E; 247 m; dark gray mud; 15.0°C; 15 Jan 1908 (1532–1552); 12' Tanner beam trawl, mud bag; 5♂ [18.3–21.2], 6♀ [18.2–24.7], 4 ovig [20.9–24.3]. Balayan Bay, southern Luzon: sta 5118; 13°48'45"N, 120°41'5"E; 291 m; dark green mud; 21 Jan 1908 (1100–1130); 12' Tanner beam trawl, mud bag: 1 ovig ♀ [21.0]. Albay Gulf, east of southern Luzon: sta 5453; 13°12'N, 123°49'18"E [267 m]; 7 Jun 1909 (0944–1004); 12' Agassiz beam trawl: 4♂ [15.8–22.0], 4♀ [18.3–22.8], 3 ovig [21.8–22.8]; sta 5454; 13°12'N, 123°50'30"E; [280 m]; 7 Jun 1909 (1046–1107); 12' Agassiz beam trawl: 1 ovig ♀ [21.0].

Samar Sea, east of Masbate: sta 5393; 12°03'30"N, 124°03'36"E; 249 m; hard sand; 13 Mar 1909 (1404–1412); 12' Agassiz beam trawl, mud bag: 1♀ [10.2]; sta 5395; 11°56'40"N, 124°14'E; 256 m; green mud; 15 Mar 1909 (0855–0914); 12' Agassiz beam trawl, mud bag: 2♂ [17.7, 20.0], 4♀ [15.2–24.9], 2 ovig [22.2,

24.9]; sta 5396; 11°57'N, 124°12'24"E; 251 m; green mud; 15 Mar 1909 (0945–1005); 12' Agassiz beam trawl, mud bag: 4♂ [16.3–19.9], 1 ovig ♀ [21.7]; sta 5397; 11°57'27"N, 124°10'42"E; 245 m; green mud; 15 Mar 1909 (1036–1052); 12' Agassiz beam trawl, mud bag: 1♂ [16.9]. West of Leyte: sta 5194; 11°15'30"N, 124°11'E; 271 m; green mud; 13.6°C; 3 Apr 1908 (1415–1435); 12' Agassiz beam trawl, 3 mud bags: 9♂ [19.0–22.7], 5♀ [18.2–22.2], 3 ovig [20.7–22.2].

Bohol Strait, east of Cebu: sta 5197; 9°52'30"N, 123°40'45"E; 318 m; green mud; 12.4°C; 9 Apr 1908 (0855–0915); 12' Agassiz beam trawl, 3 mud bags: 1♀ [20.7]; sta 5411; 10°10'30"N, 123°51'15"E; 265 m; green mud; 12.9°C; 23 Mar 1909 (0848–0912); 12' Agassiz beam trawl, mud bag: 1♂ [22.2], 3 ovig ♀ [23.0–26.1]; sta 5412; 10°09'15"N, 123°52'E; 296 m; green mud; 12.6°C; 23 Mar 1909 (0958–1020); 12' Agassiz beam trawl: 1♂ [17.8], 2 ovig ♀ [21.0, 21.6]; sta 5416; 10°11'30"N, 123°53'30"E; 274 m; green mud; 12.4°C; 25 Mar 1909 (0743–1803); 12' Agassiz beam trawl: 3 ovig ♀ [22.7–25.4]; sta 5417; 10°10'N, 123°53'15"E; 302 m; gray mud, sand; 12.4°C; 25 Mar 1909 (0840–0900); 12' Agassiz beam trawl: 1♀ [14.8]; sta 5418; 10°08'50"N, 123°52'30"E; 291 m; gray mud, sand; 12.4°C; 25 Mar 1909 (0948–1008); 12' Agassiz beam trawl: 1♂ [23.0], 4♀ [22.9], 3 ovig [22.9–23.9]; sta 5419; 9°58'30"N, 123°46'E; 320 m; green mud; 12.5°C; 25 Mar 1909 (1355–1415); 12' Agassiz beam trawl: 1 ovig ♀ [19.9]. Davao Gulf, Mindanao: sta 5247; 7°02'N, 125°38'45"E; 247 m; mud; 18 May 1908 (0908–0928); 12' Agassiz beam trawl, mud bag: 3♂ [18.9–22.3], 11 ovig ♀ [19.8–24.3], 1♂ if holotype (USNM 205216).

TYPE-LOCALITY.—Davao Gulf about 2 miles (3.2 km) off Davao, Mindanao, Philippines; 7°02'N, 125°38'45"E; 247 meters.

RANGE.—Known only from the Philippine localities listed above (245–320 meters).

REMARKS.—This species is nearly identical with *P. grandis* but it seems to differ from that shrimp in two variable but correlated and appar-

ently significant morphological characters. *Plesionika grandis* has 20 to 31 (usually 24 to 28) ventral teeth on the rostrum and the penultimate segment of the third maxilliped varies from slightly more than $1\frac{1}{2}$ to slightly more than $1\frac{3}{4}$ times as long as the terminal segment. *Plesionika quasigrandis*, on the other hand, has 32 to 44 (usually 34 to 38) ventral rostral teeth, and the penultimate segment of the third maxilliped is usually proportionately shorter, only $1\frac{1}{4}$ to $1\frac{1}{2}$ times as long as the terminal segment.

Like the quantitative relationship between the closely related *P. martia orientalis* and *P. semilaevis*, *P. quasigrandis* is represented in the *Albatross* collections by 80 specimens from 17 stations, whereas there are 144 specimens of *P. grandis* from only nine stations; *P. quasigrandis* (like *P. semilaevis*) seems to be more generally prevalent in the areas surveyed by the *Albatross*, but *P. grandis* (like *P. martia orientalis*) appears to be more abundant where it does occur.

ETYMOLOGY.—The relationship between these two Philippine species of the *P. narval* group is reflected in the name chosen for the previously undescribed one, the Latin *quasi* (simulating) plus the specific name *grandis*.

*** 39. *Plesionika reflexa*, new species**

FIGURE 49

Diagnosis.—Rostrum far overreaching antennal scale, usually armed dorsally with 6–8 teeth, including 2 or 3 on carapace posterior to level of orbital margin and 1 subapical tooth, otherwise without dorsal teeth anterior to level of distal end of antennular peduncle, posteriormost tooth usually with indistinct basal suture but none with barbed tips, armed ventrally with 26–48 teeth; orbital margin convex in ventral part, nearly vertically convex again in dorsal $\frac{1}{2}$; abdomen with strong, frequently recurved posteromesial tooth but without median dorsal carina on 3rd somite, 4th somite with pleuron rounded, 5th somite with strong posteroventral tooth on pleuron, 6th somite $2\frac{1}{2}$ –3 times as long as maximum height; telson from $\frac{3}{4}$ to more than $\frac{4}{5}$ as long as 6th somite, with 4 pairs, of dorsolateral spinules,

including pair adjacent to lateral pair of posterior spines; eye very broadly subpyriform, maximum diameter nearly $\frac{1}{3}$ carapace length, ocellus lingulate, not constricted at juncture with cornea; stylocerite acute, reaching about to level of dorsal arc of distal margin of 1st antennular segment; antennal scale more than 5 times as long as wide, distolateral tooth usually overreaching distal margin of blade; 3rd maxilliped with epipod, penultimate segment about $\frac{9}{10}$ as long as terminal segment; pereopods with well-developed epipods on 4 anterior pairs, 2nd pair subequal, with 15–26 carpal articles, 3rd pair overreaching antennal scale by length of dactyl and about $\frac{1}{10}$ of propodus, dactyl from about $\frac{1}{4}$ to more than $\frac{2}{5}$ as long as propodus, accessory distal spine less than $\frac{1}{4}$ as long as main terminal spine and little separated from base of latter, 3 distal segments, combined, about as long as carapace, none of pereopods extremely slender or thread-like; 3rd pleopod with exopod slightly more than $\frac{1}{2}$ as long as carapace; maximum carapace length at least 20 mm.

DESCRIPTION.—Rostrum (Figure 49a) directed dorsad to variable degree, distinctly overreaching antennal scale, about twice as long as carapace in largest specimens, somewhat longer in smaller ones; dorsal margin armed with 5–7 (usually 6) teeth on basal portion, unarmed anterior to distal end of antennular peduncle except for single subapical tooth, posterior 3 (rarely 2) teeth situated on carapace posterior to level of orbital margin, posteriormost tooth usually with indistinct basal suture, other basal teeth with or without incomplete basal suture, none with barbed tips; ventral margin armed with 34–48 teeth, overlapping in posterior part of series, becoming somewhat more widely spaced anteriorly. Orbit (Figure 49b) convex in ventral portion posterior to antennal spine, dorsal portion also somewhat convex but in vertical plane. Antennal and pterygostomial spines similar. Median postrostral ridge straight, blunt, extending posteriorly about halfway from posteriormost dorsal tooth to posterior margin of carapace.

Abdomen (Figure 49c) with 3rd somite armed with strong, frequently recurved posterodorsal

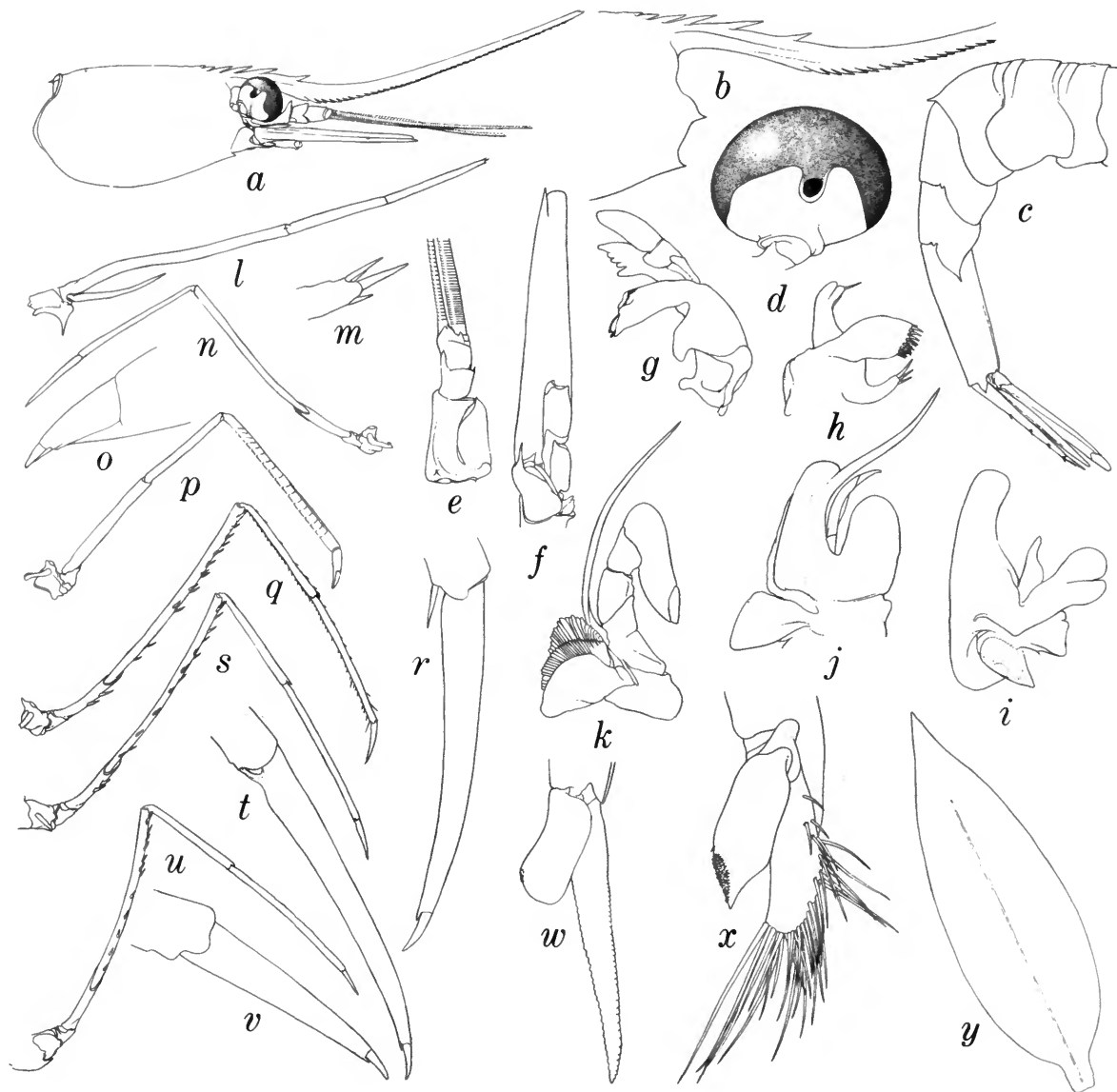


FIGURE 49.—*Plesionika reflexa*, new species, male holotype from Albatross sta 5476 (southeastern Luzon, Philippines), carapace length 16.7 mm: *a*, carapace and anterior appendages, right aspect; *c*, abdomen, right aspect; *b*, anterior carapace, right aspect; *d*, right eye, dorsal aspect; *e*, right antennule, dorsal aspect; *f*, right antenna, ventral aspect; *g*, right mandible; *h*, right 1st maxilla; *i*, right 2nd maxilla; *j*, right 1st maxilliped; *k*, right 2nd maxilliped; *l*, left 3rd maxilliped; *m*, same, distal end; *n*, left 1st pereopod; *o*, same, fingers; *p*, right 2nd pereopod; *q*, right 3rd pereopod; *r*, same, dactyl; *s*, right 4th pereopod; *t*, same, dactyl; *u*, right 5th pereopod; *v*, same, dactyl; *w*, endopod and exopod of right 1st pleopod, posterior aspect; *x*, left appendix masculina and appendix interna, mesial aspect; *y*, tegumental scale from 6th abdominal somite. (Magnifications: *a*, *c*, $\times 1.5$; *b*, *e*, *f*, *l*, *n*, *p*, *q*, *s*, *u*, $\times 2.6$; *d*, *g*–*k*, *w*, $\times 5.2$; *m*, *r*, *t*, *v*, $\times 21.5$; *o*, $\times 53.8$; *y*, $\times 223.6$.)

tooth, without median dorsal carina, regularly but not strongly arched in lateral aspect. Pleura of 4 anterior somites rounded, that of 5th drawn out posteroventrally to long, sharp spine, ventral margin strongly sinuous. Sixth somite $2\frac{1}{4}$ – $2\frac{3}{4}$ times as long as 5th somite and from $2\frac{1}{2}$ to fully 3 times as long as maximum height. Telson from $\frac{3}{4}$ to more than $\frac{4}{5}$ as long as 6th somite, with 4 pairs of dorsolateral spinules, posteriormost pair situated dorsolateral to base of long lateral spine of 2 posterior pairs.

Tegumental scales (Figure 49y) simple, with entire lateral margins and without surface flanges.

Eye (Figure 49d) distinctly ($1\frac{1}{4}$ to nearly $1\frac{1}{2}$ times) wider than long; ocellus lingulate, not constricted at juncture with cornea.

Antennular peduncle (Figure 49e) with ventromesial margin of basal segment unarmed. Stylocerite acute, reaching level of dorsal arc of distal margin of basal segment.

Antennal scale (Figure 49f) with lateral margin faintly sinuous, about as long as carapace, more than 5 times as long as wide, distolateral tooth usually overreaching distal margin of blade.

Mouthparts as illustrated (Figures 49g–m). Third maxilliped with epipod, overreaching antennal scale by about $\frac{1}{10}$ of terminal segment, armed terminally with 4 apical and subapical spines (Figure 49m), penultimate segment about $\frac{1}{10}$ as long as terminal segment.

Pereopods with well-developed epipods on 4 anterior pairs. First pereopod (Figure 49n) falling short of distal end of antennal scale by about $\frac{3}{5}$ length of chela; fingers (Figure 49o) small but well formed. Second pereopods subequal, falling short of level of distal end of antennal scale by length of chela and about $\frac{3}{4}$ of distal articulation of carpus, carpus (Figure 49p) composed of 15–26 (usually 17–20) articles. Third pereopod (Figure 49q) overreaching antennal scale by length of dactyl and about $\frac{1}{10}$ of propodus; dactyl (Figure 49r) from less than $\frac{1}{5}$ to more than $\frac{2}{5}$ as long as propodus, about 1.7 as long as carapace, accessory distal spine less than $\frac{1}{4}$ as long as main terminal spine, not far removed from base of

latter; carpus from less than $\frac{4}{5}$ as long to nearly as long as propodus; 3 distal segments, combined, about as long as carapace. Fourth pereopod (Figure 49s) overreaching antennal scale by about $\frac{1}{2}$ length of dactyl; dactyl (Figure 49t) similar to that of 3rd pereopod; 3 distal segments, combined, also about as long as carapace. Fifth pereopod (Figure 49u) falling short of distal end of antennal scale by length of dactyl and nearly $\frac{1}{5}$ of propodus; dactyl (Figure 49v) similar to but shorter than those of 3rd and 4th pereopods, only about $\frac{1}{5}$ as long as propodus; 3 distal segments, combined, similarly about as long as carapace.

Endopod of 1st pleopod of male (Figure 49w) with mesial margin rather regularly concave, without distinct notch in distal margin. Appendix masculina on 2nd pleopod (Figure 49x) overreaching appendix interna, armed with more than 40 long spines on anteromesial and distal margins. Exopod of 3rd pleopod slightly more than $\frac{1}{2}$ as long as carapace. Both branches of uropod overreaching telson proper; lateral branch bearing strong movable spine mesial to much weaker distolateral tooth.

SIZE.—Carapace length of male holotype, 16.7 mm; of male paratypes, 9.7–19.5 mm; of nonovigerous female paratypes, 9.0–15.0 mm; of ovigerous female paratypes, 14.0–18.0 mm. In the smallest male, the appendix masculina is distinct but shorter than the appendix interna.

MATERIAL.—SOUTH CHINA SEA. Southeast of Hong Kong: sta 5317; $21^{\circ}36'N$, $117^{\circ}27'E$; 421 m; sand, small shells; $10.3^{\circ}C$; 5 Nov 1908 (1431–1451); 12' Tanner beam trawl, mud bag: 1♂ [13.2], 7♀ [13.2–18.0], 1 ovig [18.0].

PHILIPPINES. South China Sea off western Luzon: sta 5440; $16^{\circ}33'52"N$, $119^{\circ}52'54"E$; 315 m; fine gray sand, globigerina; $11.8^{\circ}C$; 10 May 1909 (1401–1421); 12' Agassiz beam trawl, mud bag: 2♂ [10.3, 11.2]. East of southern Luzon: sta 5476; $12^{\circ}56'24"N$, $124^{\circ}25'24"E$; 494 m; fine sand; $9.1^{\circ}C$; 24 Jun 1909 (1102–1128); 12' Agassiz beam trawl: 25♂ [9.8–19.5], 1♀ [16.5], 1♂ is holotype (USNM 205217). Western entrance to Mindanao Sea near Silino Island: sta

5523; 8°48'44"N, 123°27'35"E; depth ?; 10 Aug 1909 (1049–1109); 12' Tanner beam trawl, mud bag: 1 ovig ♀ [18.0]. Off Sanco Point, eastern Mindanao: sta 5237; 8°09'06"N, 126°31'45"E; 455 m; green mud; 8.0°C; 12 May 1908 (1042–1059); 12' Agassiz beam trawl, 3 mud bags: 1♂ [19.5].

INDONESIA. West of Selat Salajar, southwestern Celebes: sta 5661; 5°49'40"S, 120°24'30"E; 329 m; hard bottom; 10.3°C; 20 Dec 1909 (1624–1627); 12' Agassiz beam trawl (net torn below lead line): 2♂ [9.7, 15.0], 3♀ [9.0–16.0], 2 ovig [14.0, 16.0].

TYPE-LOCALITY.—East of southern Luzon, northeast of San Bernardino Strait, Philippines; 12°56'24"N, 124°25'24"E; 494 meters.

RANGE.—See "Remarks." Known definitely only from the South China Sea and the Philippine and Indonesian localities cited above; 315 to 494

meters.

REMARKS.—Comparison of the specimens described above with material identified as *P. ensis* (A. Milne-Edwards, 1881) from various parts of the world has disclosed differences, especially as regards the proportionate lengths of the dactyls of the three posterior pairs of pereopods, that may or may not prove to be of specific significance. In 14 specimens available from the western Atlantic (the type-locality of *P. ensis* is near Barbados), the dactyl of the 3rd pereopod (Figure 50*d*) varies from 0.17 to 0.25 as long as the propodus (from 0.20 to 0.23 in all but two of the specimens examined). In 37 specimens examined from off Gabon, west Africa, this ratio is from 0.26 to 0.40 (most commonly 0.31 to 0.36); this is remarkably similar to the ratio of 0.30 to 0.46 (most frequently 0.31 to 0.32) in 30 of the South China Sea and Philippine specimens in which at

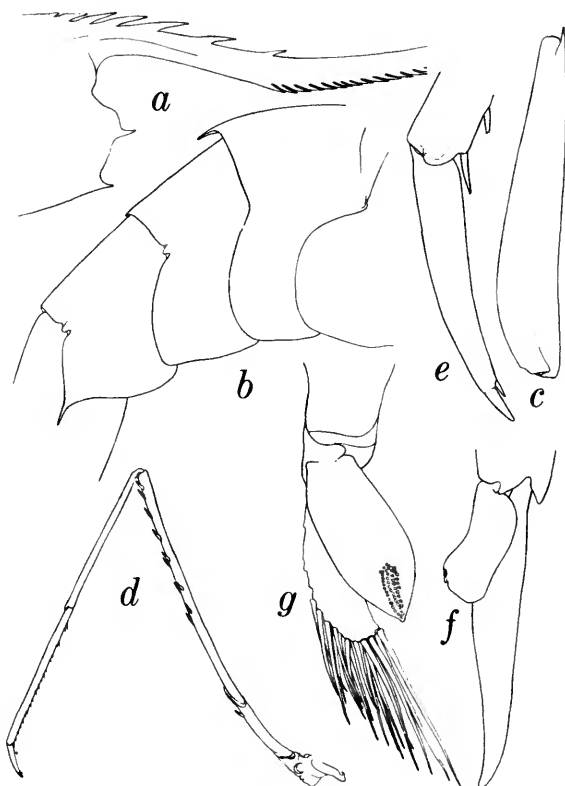


FIGURE 50.—*Plesionika ensis*, male from *Pelican* sta 11 (off Miami, Florida, USA), carapace length 18.3 mm: *a*, anterior carapace, right aspect; *b*, 3rd, 4th, and 5th abdominal somites, right aspect; *c*, right antennal scale, dorsal aspect; *d*, left 3rd pereopod; *e*, same, dactyl; *f*, endopod and exopod of right 1st pleopod, posterior aspect; *g*, right appendix masculina and appendix interna, mesial aspect. (Magnifications: *a–d*, $\times 2.6$; *f*, $\times 5.2$; *e*, *g*, $\times 21.5$.)

least one of the third pereopods is intact. In 35 specimens from Hawaii, there seem to be two forms: 21 of the specimens have very short dactyls on the third pereopod, ranging from 0.12 to 0.16 of the propodus, whereas the other 14 display a range of 0.21 to 0.30 (most commonly 0.24 to 0.30), which is intermediate between the ratio represented by the western Atlantic population and that found in the collections from the eastern Atlantic and the Philippines. The dactyl is proportionately shorter (0.24 to 0.28) in the Indonesian material.

It seems desirable at this time to recognize the Philippine form as a distinct species in order to alert other students to the population characteristics encountered. In addition to the rather striking difference in the relative lengths of the dactyl of the third pereopod, there seem to be a couple of other dissimilarities between the Philippine and western Atlantic populations that may be of taxonomic importance. In *P. reflexa*, the posteromesial tooth on the third abdominal somite shows a tendency to recurve (Figure 49c), whereas no such inclination has been noticed in the typical form of *P. ensis* (Figure 50b). Also, the distolateral tooth on the antennal scale does not project as far distally in *P. reflexa* (Figure 49f) as it does in *P. ensis* (Figure 50c). The eastern Atlantic series examined, which so closely approximates the length of the dactyl of the third pereopod seen in *P. reflexa*, also seems to have a less prominent tooth on the antennal scale, but in none of these specimens is the tooth on the third abdominal somite bent at an angle as it frequently is in the Philippine form.

No collections of *P. ensis* have been available to me from the Indian Ocean, so no comparison between that population and *P. reflexa* has been possible. The identity of the specimens recorded by Alcock and Anderson (1899:284), Alcock (1901:96), George (1969:44), and Suseelan and Mohamed (1969:88) must therefore be held in abeyance for the time being.

ETYMOLOGY.—The Latin *reflexa* (bent or turned back) was suggested by the usually recurved posteromesial tooth on the third abdominal somite.

* 40. *Plesionika rostricrescentis* (Bate, 1888)

Nothocaris rostricrescentis Bate, 1888:653, pl. 114: fig. 1
[type-locality: Kepulauan Ewab, south of western New Guinea; 5°49'15"S, 132°14'15"E; 256 meters].

DIAGNOSIS.—Rostrum overreaching antennal scale, armed dorsally with 7–9 teeth on rostral crest, including 5 or 6 on carapace posterior to level of orbital margin, and 2 subapical teeth, 5 or 6 posteriormost teeth with basal suture, movable, but none with barbed tips, armed ventrally with 9–15 teeth; orbital margin obtusely angular in ventral part, concave posteriorly, and sinuous dorsally; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th and 5th somites with posteroventral tooth on pleuron, 6th somite about 1½ times as long as maximum height; telson nearly 1½ times as long as 6th somite; eye somewhat compressed, rather broadly subpyriform, maximum diameter usually more than ¼ carapace length, ocellus large, subcircular, skewed on eyestalk, and narrowly constricted at juncture with cornea; stylocerite narrowly tapering to sharp point considerably overreaching 2nd antennular segment; antennal scale 3¾–4⅓ times as long as wide, distolateral tooth falling short of or barely overreaching level of distal margin of blade; 3rd maxilliped with epipod, penultimate segment about ⅔ as long as terminal segment; pereopods with epipods on 4 anterior pairs, 2nd pair unequal, left member long and slender with about 88 carpal articles, right shorter and stouter with 17–21 carpal articles, 3rd pair overreaching antennal scale by length of dactyl and about ⅓ of propodus, dactyl ⅙–⅓ as long as propodus, accessory distal spine nearly as long as and in close contact with main terminal spine, 3 distal segments, combined, 1⅓–1½ times as long as carapace, none of pereopods extremely slender or thread-like; 3rd pleopod with exopod about ⅔ as long as carapace; maximum carapace length 18 mm.

MATERIAL.—PHILIPPINES. Off northwestern tip of Leyte: sta 5398: 11°35'12"N, 124°13'48"E; 209 m; green mud; 15 Mar 1909 (1521–1528); 12' Agassiz beam trawl, mud bag; 1♂

[10.2], 1♀ [10.9]. Off Tawitawi, Sulu Archipelago: sta 5168; 4°56'30"N, 119°45'40"E; 146 m; coarse sand; 25 Feb 1908 (0723–0726); 12' Agassiz beam trawl, mud bag (net fouled bottom): 2♀ [9.1, 10.8], 1 ovig [9.1].

INDONESIA. Southern end of Selat Patinti, southern Halmahera: sta 5629; 0°50'00"S, 128°12'00"E; 375 m; coral sand; 2 Dec 1909 (0643–0645); 12' Agassiz beam trawl (badly damaged): 1♀ [10.5].

RANGE.—Known previously from the type-locality south of western New Guinea, from the south coast of Honshu, Japan, and from Tonga (latter record from unseen 1981 report by M. King, in correspondence from L.B. Holthuis).

REMARKS.—The holotype of this species from Kepulauan Ewab, south of New Guinea, is considerably larger than the *Albatross* specimens, having a carapace length of 18 mm. Yokoya (1933:19) did not indicate the size of the ovigerous female recorded by him from off Suruga Bay, Japan. In the only male in the *Albatross* collections, from off northwestern Leyte, with a carapace length of little more than 10 mm, the appendix masculina on the second pleopod is considerably shorter than the appendix interna, which may or may not indicate immaturity. Also, the *Albatross* specimens have only 9 or 10 ventral rostral teeth, whereas Bate reported 15 in the female from the *Challenger* collections.

*** 41. *Plesionika semilaevis* Bate, 1888**

FIGURES 51–54

Plesionika semilaevis Bate, 1888:644, pl. 113: fig. 3 [type-locality (restricted by lectotype selection below): Moro Gulf east of Basilan Strait, Philippines; 6°47'N, 122°28'E; 457 meters].

Plesionika martia var. *semilaevis*.—De Man, 1920:116 [part], pl. 10: fig. 24.

DIAGNOSIS.—Rostrum far overreaching antennal scale, armed dorsally, on basal crest only, with 5–9 teeth, including 2 or 3 on carapace posterior to level of orbital margin, none with distinct basal suture or barbed tip, armed ventrally with 19–52 teeth; orbital margin composed of 2 convex lobes, 1 in ventral part, other trend-

ing slightly posterodorsad in dorsal part; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, none of abdominal pleura with distinct marginal tooth or denticle, 6th somite about twice as long as maximum height; telson about as long as 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye kidney-shaped, maximum diameter usually nearly 1/3 carapace length, ocellus represented by tapering, subtruncate lobe, broadening rather than constricted at juncture with cornea; stylocerite bluntly acute, slightly overreaching dorsal arc of distal margin of 1st antennular segment; antennal scale usually less than 5/2 times as long as wide, distolateral tooth reaching at most to level of distal margin of blade; 3rd maxilliped with epipod, penultimate segment from subequal to 1 1/2 as long as terminal segment; pereopods with epipods on 4 anterior pairs, 2nd pair subequal, with 19–36 carpal articles, 3rd pair overreaching antennal scale by lengths of dactyl, propodus, and about 3/5 of carpus, dactyl from 1/4 to nearly 1/2 as long as propodus, accessory distal spine about 1/3 as long as and close to main terminal spine, 3 distal segments, combined, 1–2 1/2 times as long as carapace, none of pereopods extremely slender or thread-like; 3rd pleopod with exopod from more than 1/2 to 4/5 as long as carapace; maximum carapace length about 25 mm.

MATERIAL.—SOUTH CHINA SEA. Southeast of Hong Kong: sta 5317; 21°36'N, 117°27'E; 421 m; sand, small shells; 10.3°C; 5 Nov 1908 (1431–1451); 12' Tanner beam trawl, mud bag: 2♂ [13.4, 15.5], 5♀ [13.3–17.8], 1 ovig [17.8]; sta 5301; 20°37'N, 115°43'E; 380 m; gray mud, sand; 10.3°C; 8 Aug 1908 (1729–1749); 12' Agassiz beam trawl, mud bag: 7♂ [13.5–17.9], 2♀ [16.0, 17.0], 1 ovig [17.0]; sta 5300; 20°31'N, 115°49'E; 485 m; gray mud, sand; 8 Aug 1908 (1429–1449); 12' Agassiz beam trawl, mud bag: 1 juv [6.0].

PHILIPPINES. Babuyan Channel, north of Luzon: sta 5325; 18°34'15"N, 121°51'15"E; 410 m; green mud; 11.8°C; 12 Nov 1908 (1113–1132); 12' Tanner beam trawl, mud bag: 2♀

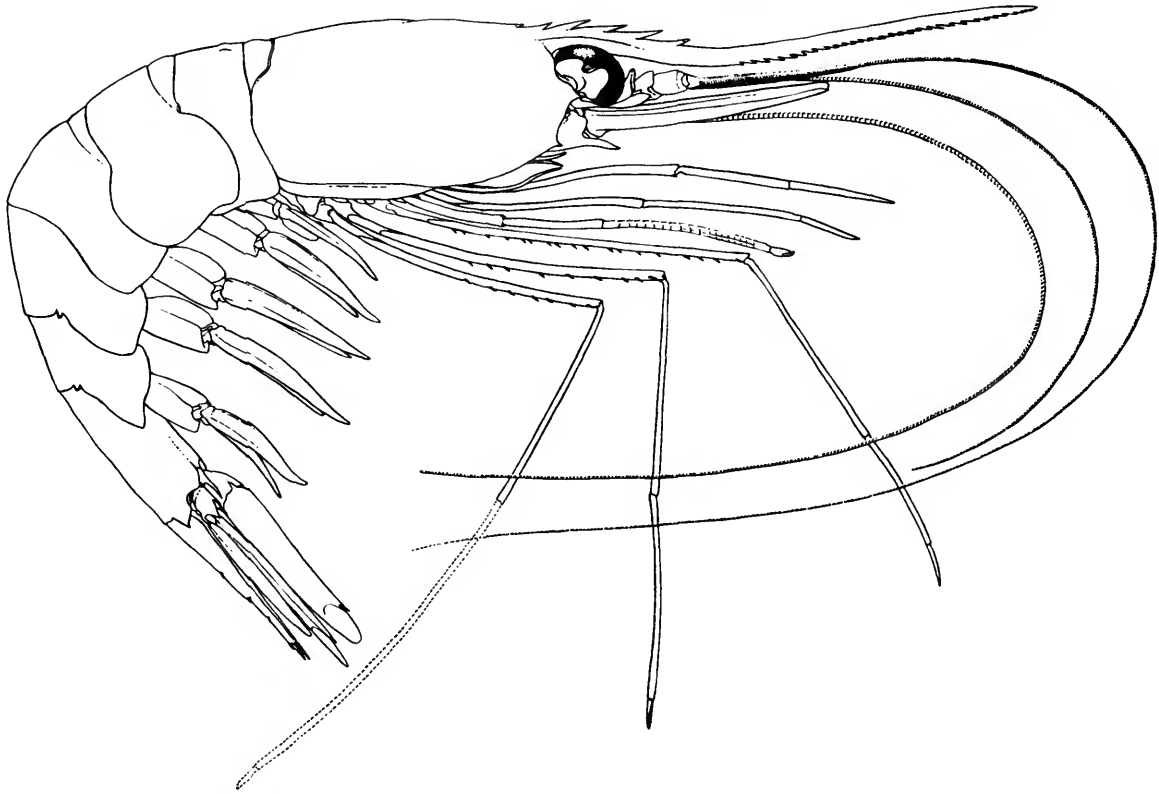


FIGURE 51.—*Plesionika semilaevis*, male from *Albatross* sta 5662 (off Celebes, Indonesia), carapace length 20.9 mm. (Magnification: $\times 2.0$.)

[19.3, 21.7]. Off Dasol Bay, western Luzon: sta 5438; $15^{\circ}54'42''\text{N}$, $119^{\circ}44'42''\text{E}$; 543 m; green mud; 7.9°C ; 8 May 1909 (1620–1641); 12' Agassiz beam trawl, mud bag: 2♂ [12.0, 19.2]. South China Sea off western Luzon: sta 5331; $15^{\circ}36'45''\text{N}$, $119^{\circ}47'45''\text{E}$; 326 m; sand, shells, mud; 12.6°C ; 22 Nov 1908 (0841–0901); 12' Tanner beam trawl, mud bag: 1♀ [21.2]. Southwest of Manila Bay, Luzon: sta 5110; $13^{\circ}59'20''\text{N}$, $120^{\circ}75'$ [sic—corrected to “25'” from *Albatross* chart] $45''\text{E}$; 247 m; dark gray mud; 15.0°C ; 15 Jan 1908 (1532–1552); 12' Tanner beam trawl, mud bag (30 m cable veered during haul): 2♀ [15.5, 17.8]. Western Verde Island Passage, north of Mindoro: sta 5280; $13^{\circ}55'20''\text{N}$, $120^{\circ}25'55''\text{E}$; 353 m; gray sand; 9.8°C ; 17 Jul 1908 (1505–1523); 12' Agassiz

beam trawl, mud bag: 4 ovig ♀ [17.6–20.2]; sta 5281; $13^{\circ}52'45''\text{N}$, $120^{\circ}25'\text{E}$; 368 m; dark gray sand; 10.2°C ; 18 Jul 1908 (1040–1100); 12' Agassiz beam trawl, mud bag: 3♂ [15.0–17.0], 2 ovig ♀ [20.0, 21.1].

Balayan Bay, southern Luzon: sta 5112; $13^{\circ}48'22''\text{N}$, $120^{\circ}47'25''\text{E}$; 324 m; dark green mud; 11.3°C ; 17 Jan 1908 (1433–1503); 12' Tanner beam trawl, mud bag: 5♂ [13.3–17.0], 1 ovig ♀ [17.7]; sta 5113; $13^{\circ}51'30''\text{N}$, $120^{\circ}50'30''\text{E}$; 291 m; dark green mud; 17 Jan 1908 (1602–1612); 12' Tanner beam trawl, mud bag: 5♂ [11.6–16.7], 1 ovig ♀ [21.2], 1? [15.0]; sta 5116; $13^{\circ}41'\text{N}$, $120^{\circ}47'05''\text{E}$; 366 m; 10.1°C ; 20 Jan 1908 (1513–1533); 12' Tanner beam trawl, mud bag: 2♂ [12.5, 13.8], 10 ♀ [10.5–19.3], 3 ovig [18.8–19.3]; sta 5118; $13^{\circ}48'$

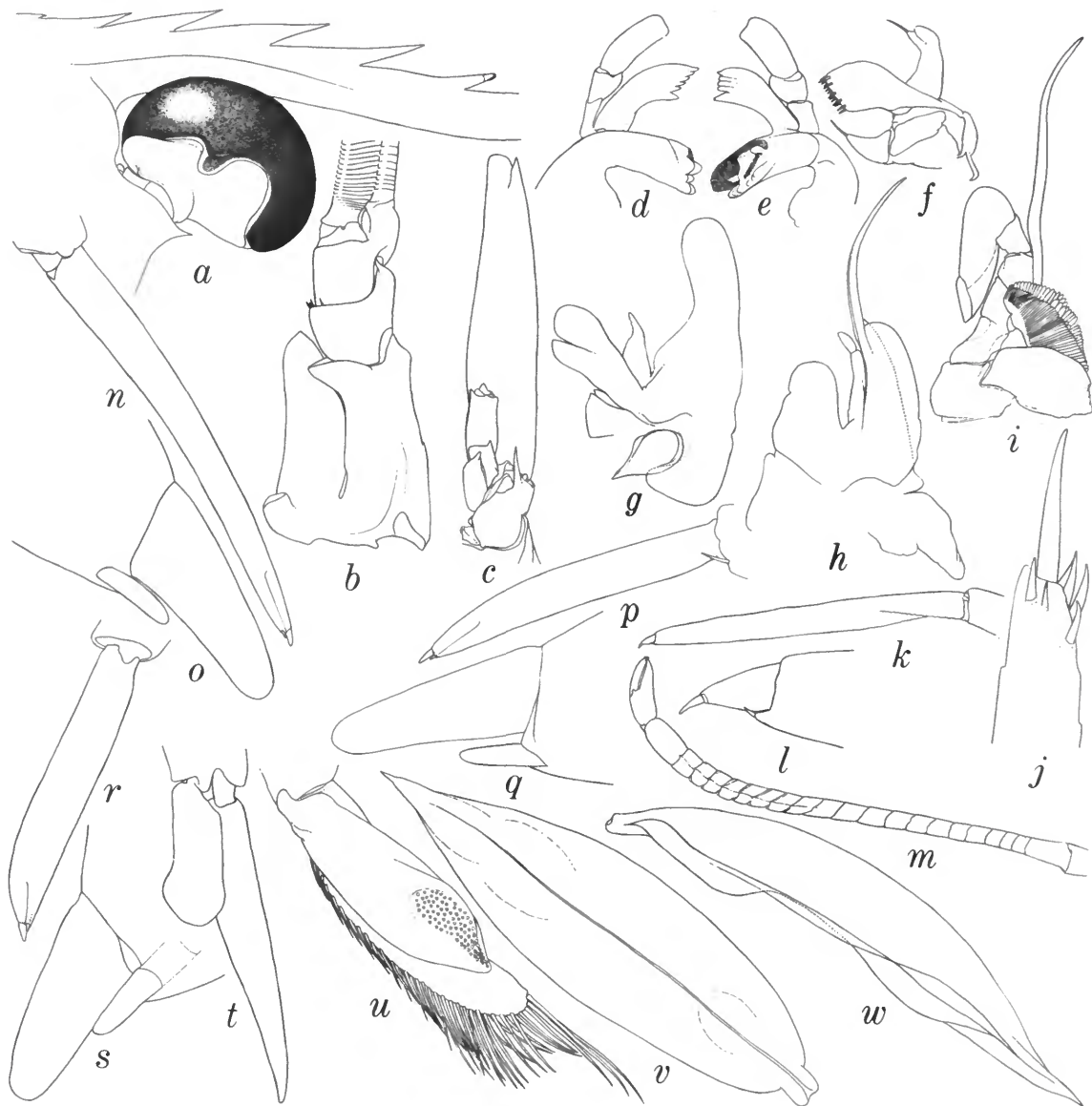


FIGURE 52.—*Plesionika semilaevis*, male from Albatross sta 5662 (off Celebes, Indonesia), carapace length 20.9 mm: *a*, right eye and orbit; *b*, left antennule, mesiodorsal aspect; *c*, left antenna, ventral aspect; *d*, left mandible; *e*, right mandible; *f*, left 1st maxilla; *g*, left 2nd maxilla; *h*, left 1st maxilliped; *i*, left 2nd maxilliped; *j*, distal end of 3rd maxilliped; *k*, "chela" of left 1st pereopod; *l*, same, distal end; *m*, carpus and chela of left 2nd pereopod; *n*, dactyl of right 3rd pereopod; *o*, same, distal end; *p*, dactyl of left 4th pereopod; *q*, same, distal end; *r*, dactyl of left 5th pereopod; *s*, same, distal end; *t*, endopod and exopod of right 1st pleopod; *u*, right appendix masculina and appendix interna, mesial aspect; *v*, tegumental scale from posterodorsal area of carapace; *w*, same, lateral aspect. (Magnifications: *c*, $\times 2.6$; *a*, *b*, *d*–*i*, *m*, *t*, $\times 5.2$; *k*, $\times 10.8$; *n*, *p*, *r*, *u*, $\times 21.5$; *j*, *l*, $\times 53.8$; *o*, *q*, *s*, *v*, *w*, $\times 223.6$.)

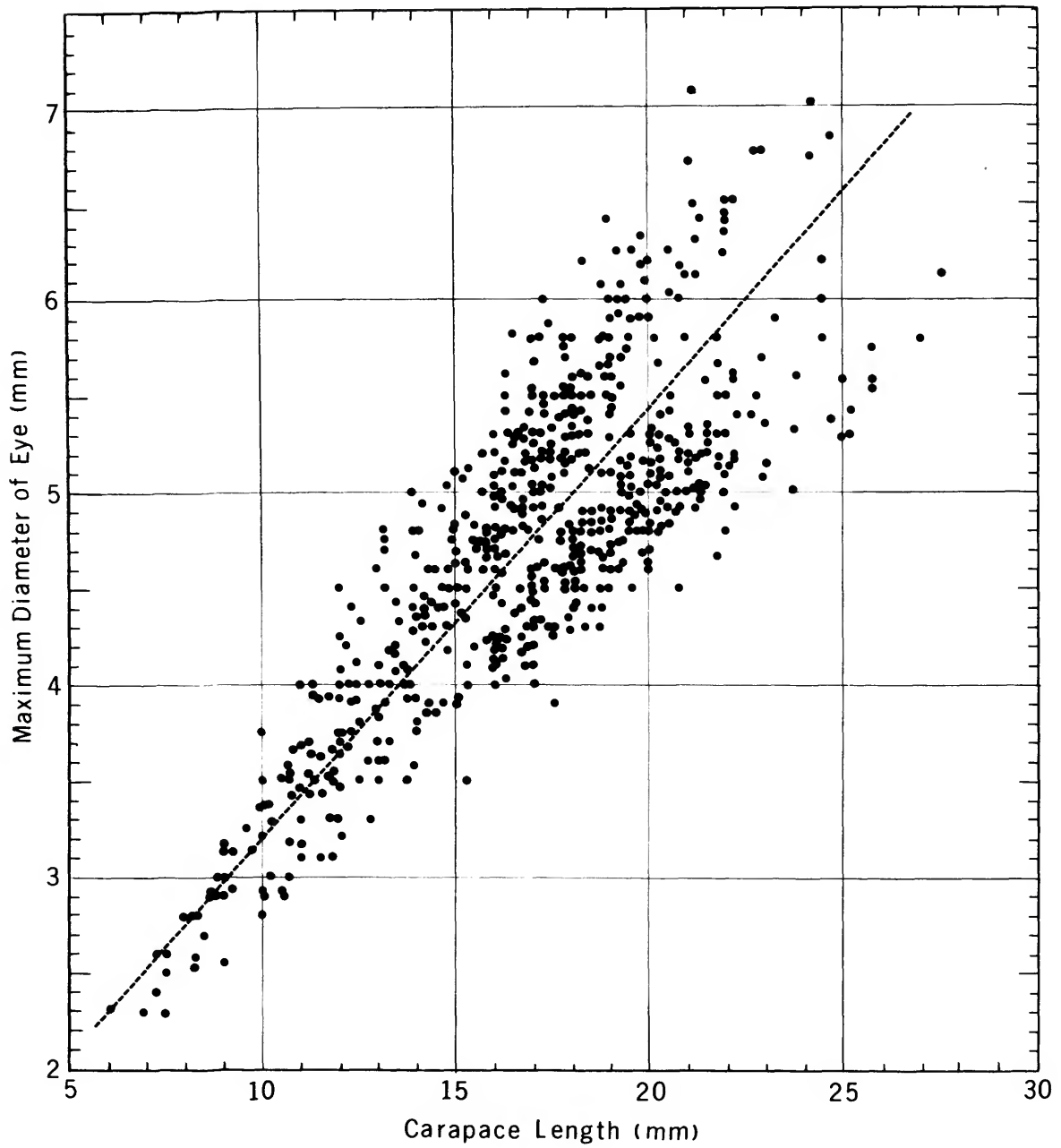


FIGURE 53.—Relationship between eye size and carapace length in *Albatross* specimens referable to either *Plesionika martia orientalis* or *P. semilaevis*. In general, dots lying to the left and above the dashed line represent *P. semilaevis*, those to the right and below, *P. martia orientalis*.

45°N, 120°41'51"E; 291 m; dark green mud; 21 Jan 1908 (1100–1130); 12' Tanner beam trawl, mud bag: 12♂ [12.0–18.8], 5♀ [12.3–18.0], 1 ovig [18.0]; sta 5363; 13°47'20"N, 120°43'30"E; [329 m]; 20 Feb 1909 (0927–1042); 25' Agassiz beam trawl: 1♀ [16.9] sta 5364 or 5365; 13°48'45"N, 120°43'45"E or 13°44'24"N, 120°45'30"E; [293 or 391 m]; 20 Feb 1909 (1440–1523) or 22 Feb 1909 (0904–0940); 25' Agassiz beam trawl: 1♂ [10.6], 2 ovig ♀ [20.0, 20.3], 1? [10.9]; sta 5365; 13°44'24"N, 120°45'30"E; [391 m]; 22 Feb 1909 (0904–0940); 25' Agassiz beam trawl: 3♂ [17.4–18.2], 3♀ [12.8–20.0], 1 ovig [20.0].

Verde Island Passage, north of Mindoro: sta 5292; 13°28'45"N, 121°01'12"E; 296 m; fine black sand; 11.3°C; 23 Jul 1908 (1437–1457); 12' Agassiz beam trawl, mud bag: 1♂ [18.4]; sta 5367; 13°34'37"N, 121°07'30"E; [329 m]; 22 Feb 1909 (1710–1736); 25' Agassiz beam trawl (rear beam broken and iron frame twisted): 6♂ [10.0–18.3], 4♀ [14.7–18.8], 3 ovig ♀ [17.4–18.8]. Tayabas Bay, southern Luzon: sta 5221; 13°38'15"N, 121°48'15"E; 353 m; green mud; 11.3°C; 24 Apr 1908 (1525–1545); 12' Agassiz beam trawl, mud bag: 5♂ [15.7–17.7], 6♀ [18.5–21.3], 5 ovig [18.5–21.3], 1 juv [6.8]; sta 5222; 13°38'30"N, 121°42'45"E; 357 m; green mud; 11.6°C; 24 Apr 1908 (1649–1709); 12' Agassiz beam trawl, mud bag: 3♀ [17.7–19.5], 2 ovig [17.7, 18.5]; sta 5368; 13°35'30"N, 121°48'E; 331 m; gray mud; 23 Feb 1909 (1445–1522); 12' Agassiz beam trawl, mud bag: 1♂ [18.7]; sta 5372; 13°49'12"N, 121°36'09"E; [274 m]; green mud; 24 Feb 1909 (1542–1603); 12' Agassiz beam trawl, mud bag: 9♂ [14.0–18.2], 1♀ [11.3]; sta 5374; 13°46'45"N, 121°35'08"E; [348 m]; gray mud; 2 Mar 1909 (1157–1230); 12' Tanner beam trawl, mud bag: 3♂ [15.3–18.7], 2 ovig [16.6, 17.4].

Northeast of Mindoro: sta 5122; 13°21'–30"N, 120° [probably 121°]30'33"E; 402 m; green mud; 2 Feb 1908 (1059–1119); 12' Tanner beam trawl, mud bag: 2♂ [17.5, 18.5] 8♀ [17.0–19.8], 6 ovig [17.0–19.8]; sta 5123; 13°12'45"N, 121°38'45"E; 518 m; green mud;

2 Feb 1908 (1344–1404); 12' Tanner beam trawl, mud bag: 2♀ [14.3, 19.4]. Tablas Strait, east of Mindoro: sta 5124; 12°52'N, 121°48'30"E; 514 m; soft green mud; 2 Feb 1908 (1738–1755); 12' Tanner beam trawl, mud bag: 1 ovig ♀ [22.0]; sta 5260; 12°25'35"N, 121°31'35"E; 428 m; green mud, sand; 10.8°C; 3 Jun 1908 (1532–1552); 12' Agassiz beam trawl, mud bag: 12♂ [9.4–17.8], 14♀ [10.8–22.2], 11 ovig [15.8–21.0], 1 juv [7.2]. Northwest of Panay: sta 5259; 11°57'30"N, 121°42'15"E; 571 m; gray mud, globigerina; 9.6°C; 3 Jun 1908 (1031–1051); 12' Agassiz beam trawl, mud bag: 1♂ [19.0], 2 ovig ♀ [18.3, 18.8]. East of southern Luzon: sta 5476; 12°56'24"N, 124°25'24"E; 494 m; fine sand; 9.1°C; 24 Jun 1909 (1102–1128); 12' Agassiz beam trawl: 15♂ [14.0–18.9], 10♀ [13.8–21.0], 6 ovig [17.9–21.0].

North of Samar: sta 5444; 12°43'51"N, 124°58'50"E; 564 m; green mud; 7.4°C; 3 Jun 1909 (1032–1049); 12' Agassiz beam trawl: 3♂ [12.4, 16.8, ?], 1 ovig ♀ [19.8]; sta 5445; 12°44'42"N, 124°59'50"E; 700 m; green mud, sand; 6.8°C; 3 Jun 1909 (1201–1238); 12' Agassiz beam trawl: 1♂ [14.2], 1 ovig ♀ [20.7]. Burias Pass, south of southeastern Luzon: sta 5216; 12°52'N, 123°23'30"E; 393 m; green mud; 11.1°C; 22 Apr 1908 (0836–0856); 12' Agassiz beam trawl, mud bag: 3♀ [12.2–16.9], 2 ovig [16.1, 16.9]; sta 5387; 12°54'40"N, 123°20'–30'E; 382 m; soft green mud; 11.3°C; 11 Mar 1909 (1342–1402); 12' Agassiz beam trawl, mud bag: 6♂ [15.2–17.4], 28♀ [12.6–19.0], 13 ovig [14.8–19.0], 1? [14.8]. Albay Gulf, east of southern Luzon: sta 5458; 13°10'54"N, 123°59'38"E; [366 m]; 8 Jun 1909 (1404–1427); 12' Agassiz beam trawl: 1 ovig ♀ [17.9]; sta 5459; 13°10'21"N, 123°59'54"E; [368 m]; 8 Jun 1909 (1541–1601); 12' Agassiz beam trawl, mud bag: 1♂ [17.2]. Masbate Pass, east of Masbate: sta 5214; 12°25'18"N, 123°37'15"E; 399 m; green mud; 10.8°C; 21 Apr 1908 (0919–0939); 12' Agassiz beam trawl, mud bag: 1♀ [12.8].

West of Leyte: sta 5402; 11°11'45"N, 124°–

15°45'E; 344 m; green mud; 13.2°C; 16 Mar 1909 (1416–1438); 12' Agassiz beam trawl, mud bag: 1♂ [17.7]; sta 5404; 10°50'N, 124°26'18"E; 348 m; mud; 13.0°C; 17 Mar 1909 (0858–0924); 12' Agassiz beam trawl: 1♂ [14.4]; sta 5409; 10°38'N, 124°13'08"E; 346 m; green mud; 18 Mar 1909 (0951–1020); 12' Agassiz beam trawl, mud bag: 3♂ [13.9–16.9], 2♀ [14.1, 18.9], 1 ovig [18.9]. Panay Gulf, south of Panay: sta 5183; 10°32'48"N, 122°26'E; 176 m; soft green mud; 17.4°C; 30 Mar 1908 (1051–1111); 12' Agassiz beam trawl, 3 mud bags: 1 ovig ♀ [14.7]; sta 5421; 10°33'30"N, 122°26'E; 251 m; green mud; 14.7°C; 30 Mar 1909 (1738–1810); 12' Agassiz beam trawl, mud bag: 1♂ [16.1], 4♀ [12.0–17.1]. Bohol Strait, east of Cebu: sta 5198; 9°40'50"N, 123°39'45"E; 402 m; green mud; 12.2°C; 9 Apr 1908 (1125–1145); 12' Agassiz beam trawl, 3 mud bags: 2♂ [9.7, 15.8], 8♀ [16.7–20.5], 7 ovig [16.7–20.5]. Between Negros and Siquijor: sta 5535; 9°20'30"N, 123°23'45"E; 567 m; gray globigerina ooze; 11.8°C; 19 Aug 1909 (1107–1116); 12' Tanner beam trawl: 1 ovig ♀ [18.9], 1? [17.3]; sta 5536; 9°15'45"N, 123°22'00"E; 510 m; green mud; 11.9°C; 19 Aug 1909 (1336–1356); 12' Tanner beam trawl: 5♂ [14.3–18.0], 2 ovig ♀ [16.2, 18.0]; sta 5537; 9°11'00"N, 123°23'00"E; 465 m; green mud; 11.9°C; 19 Aug 1909 (1539–1559); 12' Tanner beam trawl: 5♂ [10.3–17.0], 4♀ [11.2–19.3], 2 ovig [16.2, 16.6].

Western entrance to Mindanao Sea near Silino Island: sta 5523; 8°48'44"N, 123°27'35"E; depth ?; 10 Aug 1909 (1049–1109); 12' Tanner beam trawl, mud bag: 1♀ [11.0], 1 juv [5.2]. Western Mindanao Sea: sta 5541; 8°49'38"N, 123°34'30"E; 401 m; fine sand, broken shells; 11.8°C; 20 Aug 1909 (0551–0612); 12' Tanner beam trawl: 2♂ [10.1, 11.7], 1♀ [8.2]. Iligan Bay, northern Mindanao: sta 5508; 8°17'24"N, 124°11'42"E; 494 m; green mud, fine sand; 11.8°C; 5 Aug 1909 (1517–1541); 12' Tanner beam trawl: 2♂ [13.9, 15.5], 8♀ [13.3–18.0], 7 ovig [15.3–18.0]. Macajalar Bay, northern Mindanao: sta 5501; 8°37'37"N, 124°35'E; 391 m; fine sand, gray mud; 12.4°C; 4 Aug 1909 (1428–

1448); 12' Tanner beam trawl: 11♂ [14.2–18.7], 4♀ [10.7–17.2], 3 ovig [16.8–17.2]; sta 5502; 8°37'37"N, 124°35'E; 391 m; fine sand, gray mud; 12.4°C; 4 Aug 1909 (1528–1548); 12' Tanner beam trawl: 2♂ [16.7, 17.1], 2 ovig ♀ [19.2, 21.2]; sta 5504 or 5505; 8°35'30"N, 124°38'E or 8°37'15"N, 124°36'E; 366 [or 402] m; green mud or ?; 5 Aug 1909 (0615–0657 or 0725–0749); 12' Tanner beam trawl: 11♂ [8.7–18.3], 23♀ [8.7–19.5], 13 ovig [15.3–19.5]; sta 5506; 8°40'N, 124°45'E; 479 m; green mud; 11.8°C; 5 Aug 1909 (0912–1926); 12' Tanner beam trawl: 7♂ [11.4–16.2], 5♀ [9.0–17.7], 2 ovig [17.1–17.8].

Off Sanco Point, eastern Mindanao: sta 5237; 8°09'06"N, 126°31'45"E; 455 m; green mud; 8.0°C; 12 May 1908 (1042–1059); 12' Agassiz beam trawl, 3 mud bags: 2♂ [16.0, 18.3], 1 ovig [18.8]. Pujada Bay, southeastern Mindanao: sta 5243; 6°50'55"N, 126°14'35"E; 399 m; gray mud; 17.6°C; 15 May 1908 (1312–1332); 12' Agassiz beam trawl, mud bag: 1 ovig ♀ [13.7]. West of Jolo Island, Sulu Archipelago: sta 5551; 5°54'48"N, 120°44'24"E; 353 m; fine sand; 11.8°C; 17 Sep 1909 (1407–1427); 9' Tanner beam trawl: 22♂ [10.1–13.2], 12♀ [9.8–15.0], 1 ovig [15.0]. Off Tawitawi, Sulu Archipelago: sta 5576; 5°25'56"N, 120°03'39"E; 507 m; sand; 11.8°C; 23 Sep 1909 (1122–1130); 9' Tanner beam trawl, mud bag: 1♂ [16.3].

INDONESIA. Celebes Sea off Sabah (North Borneo): sta 5590; 4°10'50"N, 118°39'35"E; 567 m; green mud, sand; 6.8°C; 29 Sep 1909 (0902–0923); 9' Tanner beam trawl, mud bag: 1♂ [15.8], 3 ovig ♀ [16.8–21.0]; sta 5592; 4°12'44"N, 118°27'44"E; 558 m; green mud; 6.3°C; 29 Sep 1909 (1600–1610); 9' Tanner beam trawl: 3♂ [15.8–20.6], 5♀ [15.2–22.7], 3 ovig [17.2–22.7]. West of Halmahera: sta 5621; 0°15'00"N, 127°24'35"E; 545 m; gray and black sand; 28 Nov 1909 (0950–1010); 12' Agassiz beam trawl, mud bag: 23♂ [10.0–19.8], 14♀ [10.7–21.2], 8 ovig [17.0–21.2]; sta 5622; 0°19'20"N, 127°28'30"E; 503 m; gray mud; 29 Nov 1909 (0803–0824); 12' Agassiz beam trawl, mud bag: 2♂ [9.2–15.3], 10♀ [16.0–21.9],

6 ovig [17.5–21.9]; sta 5623; 0°16'30"N, 127°30'00"E; 497 m; fine sand, mud; 29 Nov 1909 (0922–0944); 12' Agassiz beam trawl: 23♂ [12.3–20.0], 30♀ [12.2–23.0], 17 ovig [17.3–22.3], 1 juv [6.4]; sta 5624; 0°12'15"N, 127°29'30"E; 527 m; fine sand, mud; 29 Nov 1909 (1058–1118); 12' Agassiz beam trawl: 5♂ [16.9–19.8], 2♀ [15.3, 19.4], 1 ovig [19.4]; sta 5625; 0°07'00"N, 127°28'00"E; 421 m; gray mud, fine sand; 29 Nov 1909 (1416–1437); 12' Agassiz beam trawl: 4♂ [13.2–22.0], 5♀ [15.2–24.2]; sta 5626; 0°07'30"N, 127°29'00"E; 485 m; gray mud, fine sand; 29 Nov 1909 (1534–1552); 12' Agassiz beam trawl: 2♂ [15.0, 16.0], 5♀ [17.3–24.7], 2 ovig [17.3, 18.4].

South of Pulau Muna, Celebes: sta 5645; 5°29'06"S, 122°36'06"E; 377 m; 16 Dec 1909 (0954–0955); 12' Agassiz beam trawl: 3♀ [16.0–17.0], 2 ovig [16.2, 17.0]. Southwest of Makasar, Celebes: sta 5662; 5°43'00"S, 119°18'00"E; 386 m; (no bottom sample); 9.3°C; 21 Dec 1909 (0612–0632); 12' Agassiz beam trawl: 2♂ [16.7, 20.9], 1 ovig ♀ [17.5].

RANGE.—Known with certainty only from the Philippine and Indonesian localities cited above; 176 to 700 meters.

REMARKS.—Analysis of the more than 1200 *Albatross* specimens assignable to the generally accepted concept of *Plesionika martia* (A. Milne-Edwards, 1883), plus nearly 200 specimens of *P. simulatrix* that would have been referred to the relinquished genus *Parapandalus* but that quite evidently belong to the *Plesionika martia* group, has revealed that the proportionate length of the rostrum cannot be relied upon to distinguish *P. semilaevis* from *P. martia*, as De Man (1920) and others have attempted to do. There are, however, other characters that, though variable, seem to suffice to separate Bate's species from the Atlantic *P. martia* and, especially, from its Indo-Pacific subspecies. Most apparent of these characters are the size and shape of the eye and the consequent configuration of the orbit. As noted by Bate (1888:645), the eye of *P. semilaevis* is generally broader and more nearly kidney-shaped (less orbicular) than that of *P. martia*.

Associated with the form and size of the eye are the length and proportions of the distal segments of the three posterior pairs of pereopods. Unfortunately, these long and somewhat fragile appendages are frequently lost, sometimes by natural causes, as indicated by the significant number of *Albatross* specimens in which the posterior pairs of pereopods were obviously regenerating at the time of capture. It was found, however, that this elongation of the thoracic appendages in the oriental form of *P. martia* is reflected in the greater length of the more durable pleopods, and this character is nearly as useful as the form of the eye in separating the closely related and sympatric species (Figure 54e).

To be sure, there are a few lots in the collection that defy positive identification by these morphological characters. Most notable are some or all of the specimens taken at station 5216 and 5387 in Burias Pass, south of southeastern Luzon; stations 5458 and 5459 in Albay Gulf, east of southern Luzon; station 5537 between Negros and Siquijor; and station 5551, west of Jolo Island in the Sulu Archipelago. It is to be hoped that less variable features—perhaps color patterns—will eventually prove to be helpful in diagnosing these quite obviously different shrimps. One indication that color pattern may be distinctive is suggested by the documentation of the material. Of the first 61 specimens of either of the two species taken during the early stages of the Expedition, no less than 54 are referable to *P. semilaevis*. The first good series (17 specimens) of *P. martia orientalis* (from station 5135 off Jolo Island) is accompanied by a color note, possibly indicating that this lot may have had a different appearance from most of those taken previously off Manila Bay, in Balayan Bay, northeast of Mindoro.

The available material of the two species suggests that *P. semilaevis* may be slightly smaller than *P. martia orientalis*, both in maximum size and in the size at which sexual maturity is attained. Also, in the former species, two or three of the teeth of the dorsal rostral series may be situated on the carapace posterior to the orbit,



FIGURE 54.—Frequency distribution of variable diagnostic characters of *Plesionika martia orientalis* (light gray) and *P. semilaevis* (dark gray) and of duplication of characters in the two species (black): A, major diameter of eye divided by carapace length; B, length of dactyl of 3rd pereopod divided by length of propodus; C, combined lengths of 3 distal segments of 4th pereopod divided by carapace length; D, combined lengths of 3 distal segments of 5th pereopod divided by carapace length; E, length of exopod of 3rd pleopod divided by carapace length.

whereas there are rarely fewer than three post-orbital teeth in *P. martia orientalis* and there may be as many as four or even five. The number of ventral rostral teeth also seems to be lower, on the average, than in the latter species. The telson

is usually a little shorter, proportionately, in *P. semilaevis* than it is in *P. martia orientalis*, but the difference is slight (averages, 1.02 versus 1.12 times length of sixth abdominal somite). Finally, the antennal scale is often distinctly broader in

P. semilaevis, but this character is variable and not always trustworthy.

Although the determination of the composition of the bottom by a sounding cup sample, as employed by the *Albatross*, may be of questionable reliability when trawl periods may be longer than half an hour over a changeable bottom, there is some indication from the available data that *P. semilaevis* was found most frequently on muddy bottoms; it also occurred on sand and mud and less commonly on relatively fine sand; it was never taken on coarse sand or sand mixed with fragments of coral, shells, or pebbles. *Plesionika martia orientalis*, on the other hand, seemed to prefer sandy bottoms or bottoms of both sand and mud and it was found somewhat more commonly on those with coarse fragments than it was on pure mud. Both species were taken at six different stations where the depth ranged from 296 to 558 meters and the bottom varied from green mud to fine sand, fine black sand, and dark gray sand.

Sampling of the extensive series of specimens collected by the *Albatross* in Hawaii in 1902 and identified by Rathbun (1906:914) as *Pandalus martius* indicates that this common Hawaiian shrimp is similar to *P. semilaevis* as regards the size of the eye, but the pereopods and pleopods are somewhat longer than they are in Philippine and Indonesian specimens and, most remarkably, the antennal scale is quite consistently narrower than it is in *P. semilaevis* or even in *P. martia orientalis*. It seems possible that an endemic species or subspecies occurs in Hawaiian waters.

Thanks again to the welcome cooperation of R.W. Ingle of the British Museum (Natural History), I have been privileged to examine five syntypes of *P. semilaevis* from *Challenger* station 200. Much to my surprise, the largest of these specimens, a female with a carapace length of 23.1 mm, proved to be a quite typical specimen of *P. martia orientalis*, with four teeth of the dorsal rostral series situated posterior to the level of the nearly vertical posterior margin of the orbit, the eye ovoid rather than kidney-shaped and with a diameter amounting to only 0.22 of

the carapace length, and with the exopod of the third pleopod measuring 0.73 as long as the carapace. I have therefore selected as lectotype one of the other four syntypes examined, all of which display the characters of *P. semilaevis*; it is a male with a carapace length of 18.8 mm, with only two teeth of the dorsal rostral series behind and one directly above the oblique posterior margin of the orbit, the eye distinctly kidney-shaped but too distorted to permit accurate measurement, and with the exopod of the third pleopod measuring 0.60 as long as the carapace.

*** 42. *Plesionika serratifrons* (Borradaile, 1899),
new combination**

FIGURES 55, 56

Pandalus (*Parapandalus*) *serratifrons* Borradaile, 1899:411, pl. 37: fig. 8 [type-locality: Blanche Bay, New Britain, Bismarck Archipelago; 91–183 meters].

Parapandalus serratifrons.—De Man, 1920:146, pl. 12: fig. 34a,c; pl. 13: fig. 34.—Crosnier, 1976:236.

DIAGNOSIS.—Rostrum far overreaching antennal scale, armed dorsally throughout length with 39–63 teeth, including 4–7 on carapace posterior to level of orbital margin, only posteriormost tooth sometimes with faint indication of basal suture, none with barbed tips, armed ventrally with 21–44 teeth; orbital margin obtusely angular in ventral part, concave posteriorly, and somewhat sinuous dorsally; abdomen without posteromedial tooth or median dorsal carina on 3rd somite, 4th somite with pleuron rounded, without marginal denticle, 5th somite with pleuron tapering to strong posteroventral tooth, 6th somite nearly as long as to fully 1¼ times as long as maximum height; telson usually slightly shorter than 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye rather broadly subpyriform, maximum diameter about ¼ carapace length, ocellus subcircular or transversely oval, in broad contact with cornea; stylocerite broadly acute, hardly reaching level of dorsal arc of distal margin of 1st antennular segment; an-

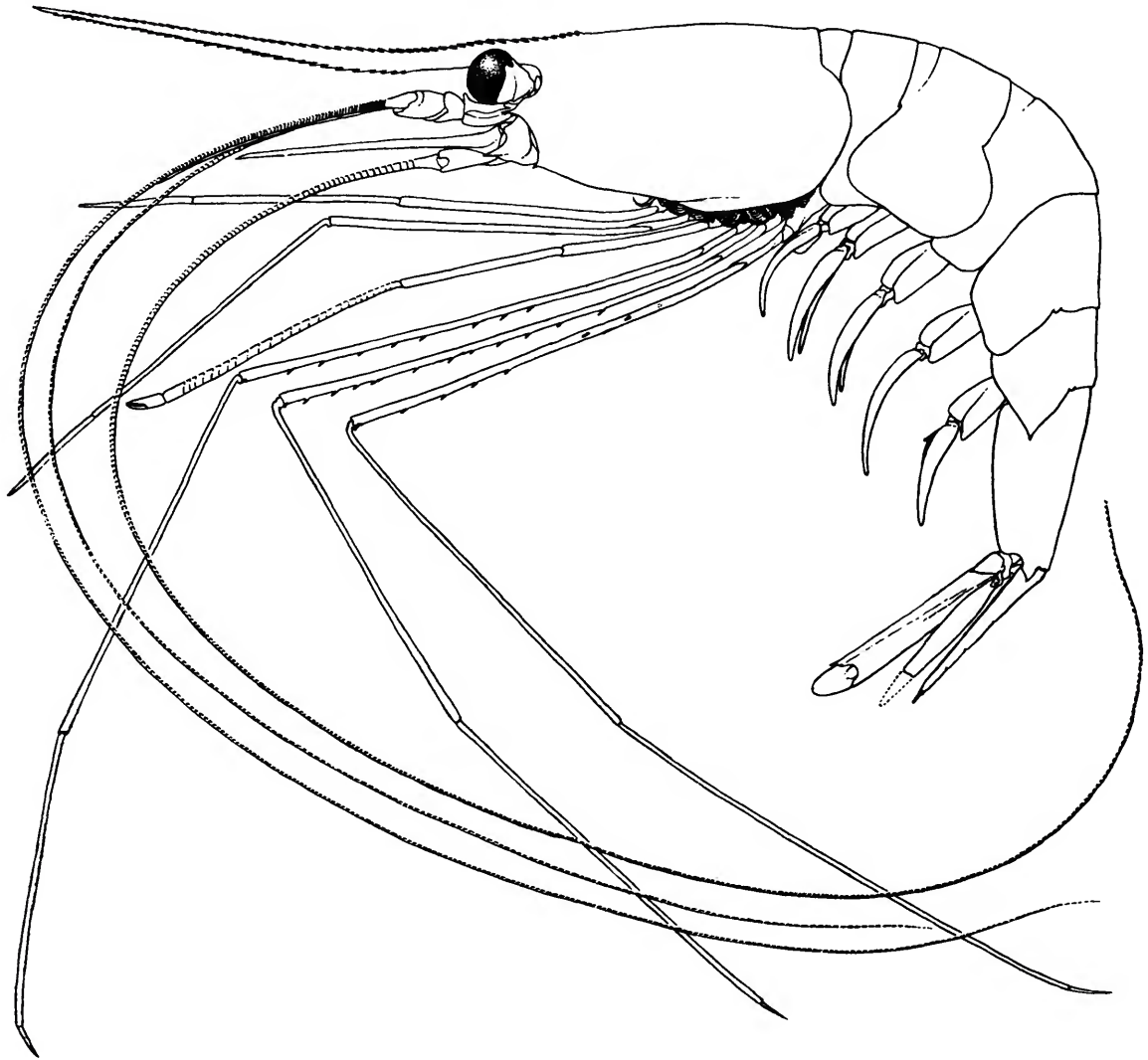


FIGURE 55.—*Plesionika serratifrons*, male from Albatross sta 5241, carapace length 13.2 mm.
(Magnification: $\times 2.9$.)

tennal scale usually 5–6 times as long as wide, distolateral tooth typically overreaching distal margin of blade; 3rd maxiliped with epipod, penultimate segment $1\frac{1}{2}$ – $2\frac{1}{2}$ times as long as terminal segment; pereopods without epipods, 2nd pair subequal, with 22–31 carpal articles, 3rd pair overreaching antennal scale by lengths of dactyl and propodus and slightly more or less

than length of carpus, dactyl about $\frac{1}{10}$ as long as propodus, accessory distal spine not overreaching basal $\frac{1}{4}$ of and somewhat divergent from main terminal spine, 3 distal segments, combined, $2\frac{1}{3}$ – $3\frac{1}{3}$ times as long as carapace, none of pereopods extremely slender or thread-like; 3rd pleopod with exopod $\frac{1}{2}$ – $\frac{3}{5}$ as long as carapace; maximum carapace length about 17 mm.

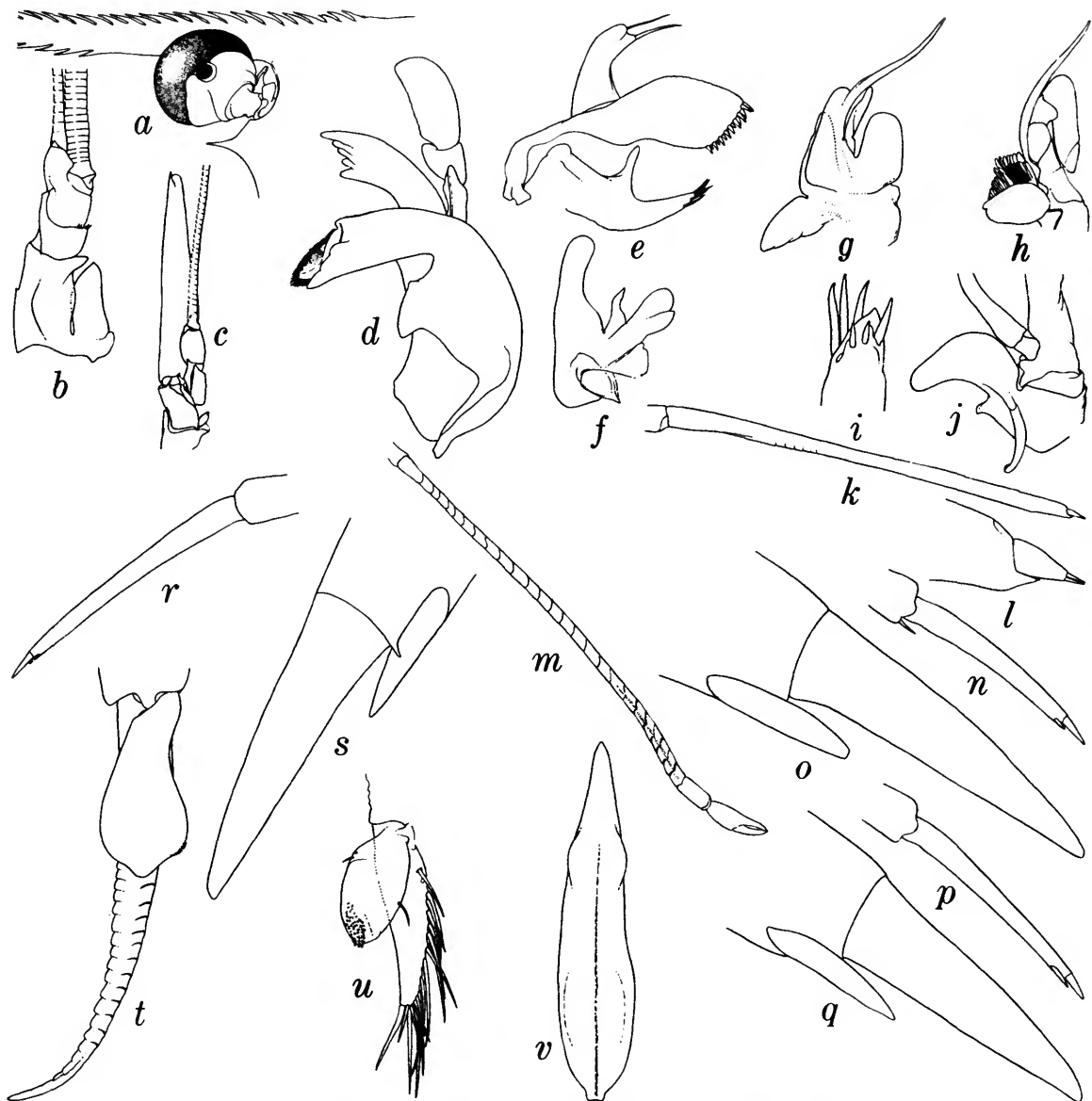


FIGURE 56.—*Plesionika serratifrons*, male from Albatross sta 5241, carapace length 13.2 mm: *a*, left eye and orbit; *b*, right antennule, mesiodorsal aspect; *c*, right antenna, ventral aspect; *d*, right mandible; *e*, right 1st maxilla; *f*, right 2nd maxilla; *g*, right 1st maxilliped; *h*, right 2nd maxilliped; *i*, distal end of right 3rd maxilliped; *j*, basal part of right 3rd maxilliped; *k*, "chela" of right 1st pereopod; *l*, same, distal end; *m*, carpus and chela of right 2nd pereopod; *n*, dactyl of right 3rd pereopod; *o*, same, distal end; *p*, dactyl of right 4th pereopod; *q*, same, distal end; *r*, dactyl of left 5th pereopod; *s*, same, distal end; *t*, endopod and exopod of left 1st pleopod; *u*, left appendix masculina and appendix interna, mesial aspect; *v*, tegumental scale from anterodorsal area of carapace. (Magnifications: *c*, $\times 2.6$; *a*, *b*, *f*–*h*, *m*, $\times 5.2$; *d*, *e*, *j*, *k*, *t*, $\times 10.8$; *n*, *p*, *r*, *u*, $\times 21.5$; *i*, *l* $\times 53.8$; *o*, *q*, *s*, *v*, $\times 223.6$.)

MATERIAL.—PHILIPPINES. Pujada Bay, south-eastern Mindanao: sta 5241; 6°50'45"N, 126°-14'38"E; 393 m; soft gray mud; 14 May 1908 (1505–1525); 9' *Albatross-Blake* beam trawl, mud bag (veered from 925 to 988 meters cable): 22♂ [9.8–14.3], 17 ♀ [10.0–15.6], 13 ovig [10.0–15.6], 2 juv [6.7, 6.7]; sta 5242; 6°51'53"N, 126°14'10"E; 349 m; soft gray mud; 17.8°C; 14 May 1908 (1603–1623); 9' *Albatross-Blake* beam trawl, mud bag: 9♂ [12.1–15.5], 1 ovig ♀ [14.0]; sta 5243; 6°50'55"N, 126°14'35"E; 399 m; gray mud; 17.6°C; 15 May 1908 (1312–1332); 12' Agassiz beam trawl, mud bag: 6♂ [12.2–14.7], 11♀ [12.0–16.8], 10 ovig [12.0–16.8]. Davao Gulf, Mindanao: sta 5255; 7°03'N, 125° 39'E; 183 m; soft mud; 18 May 1908 (1813–1833); 12' Agassiz beam trawl, mud bag (made after dark): 1♂ [13.1], 1 ovig ♀ [15.9].

RANGE.—In addition to the Mindanao localities listed above and the type-locality at New Britain, *P. serratifrons* has been recorded by De Man (1920) from two localities in the Lesser Sunda Islands, Indonesia, in depths of 247 and 274 meters. It seems rather remarkable that, in the entire two-year *Albatross* operation in the Philippines involving the occupation of more than 575 trawling stations, this species was found at only three consecutive stations in Pujada Bay—where 68 specimens were taken—and about 75 kilometers away in Davao Gulf—where a single pair was obtained. Although *P. serratifrons* seems to have restricted habitat preferences, as suggested by its sporadic distribution, it appears to be abundant where it does occur; the *Siboga* took no less than 217 specimens at the two stations where the species was found in Indonesia. It seems to be represented in Hawaii by the closely related but apparently distinct *P. pacifica* Edmondson, 1952.

REMARKS.—There is little doubt that the *Albatross* specimens belong to the same species as the Indonesian material identified as *Parapandalus serratifrons* by De Man (1920). In view of the obscure distinctions between the species of the *P. narval* group, however, there is no certainty that the species is the same as the New

Britain one described by Borradaile. As reported by De Man (1920:146), Calman was able to dismiss some of the discrepancies in Borradaile's description, by examining the syntypes in the British Museum (Natural History); he found that the rostrum is ascendant, rather than straight as illustrated by Borradaile, that the rostral teeth are fixed rather than movable, and that the third maxilliped and first pereopod are shorter than indicated by Borradaile. It would still be interesting to know whether the dactyls of the posterior pairs of pereopods, described and figured as "small," are really as long as they are in the *Siboga* and *Albatross* material.

Also, there is a possibility that De Man (1920:149) was mistaken in his conclusions regarding the four specimens from New Britain and the Papuan D'Entrecasteaux Islands, called *Pandalus (Parapandalus tenuipes)* by Borradaile: "The description agrees almost literally with that of *Parap. serratifrons* and no characters are mentioned by which both forms can be distinguished." Apparently De Man overlooked the note in the legend to the illustration of *P. tenuipes* (Borradaile, 1899:427): "The drawing does not adequately represent the thread-like appearance of the carpopodite and propodite of the legs, nor the fact that they are slightly swollen at the outer ends. These limbs are in the above respect unlike those of *P. serratifrons*." Re-examination and comparison of the syntypes of these two forms would seem to be in order.

De Man (1920:150) was quite correct in believing that *P. serratifrons* is close to the Mediterranean *P. narval* (Fabricius, 1787) [= *P. pristis* (Risso, 1816)]. Actually, there is an additional character—not mentioned by De Man—linking the two species; *P. narval*, *P. serratifrons*, and *P. pacifica* are the only members of the abandoned *Parapandalus* in which I have observed epipods on the third maxillipeds. *Plesionika serratifrons* can be separated from *P. narval* by the distinctive form of the dactyls of the posterior pairs of pereopods, as noted by De Man (1920:150); also, the number of dorsal rostral teeth is usually greater in the Mediterranean (58–70) than in the

Indo-Pacific species (usually 48–56). Curiously, the form of the *P. narval* group that occurs in the eastern Atlantic outside of the Mediterranean—for which the name *Pandalus escatilis* Stimpson, 1860, may have to be revived—seems to have the number of rostral teeth (31–54) and the form of the dactyl of the posterior pereopods similar to those of *P. serratifrons*; the absence of an epipod on the third maxilliped in the Atlantic form seems to be the only satisfactory means of separating it from the Indo-Pacific one.

As mentioned in the introduction to the key to the species of *Plesionika*, *P. pacifica* also shows a close affinity with *P. serratifrons* but it seems to differ in the proportionately longer sixth abdominal somite, the proportionately shorter penultimate segment of the third maxilliped, and the slightly smaller size at maturity.

* 43. *Plesionika simulatrix*, new species

FIGURE 57

DIAGNOSIS.—Rostrum far overreaching antennal scale, armed dorsally, on basal crest only, with 6–9 teeth, including 2–4 on carapace posterior to level of orbital margin, 1 or more posteriormost teeth sometimes with faint, incomplete basal suture, none with barbed tips, armed ventrally with 29–49 teeth; orbital margin composed of 2 convex lobes, 1 in ventral part, other in vertical plane posteriorly; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th somite with pleuron rounded, 5th with pleuron bearing minute tooth posteroventrally, 6th somite 2–2½ times as long as maximum height; telson from ⅔ as long to slightly longer than 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye broadly subpyriform, maximum diameter about ¼ carapace length, ocellus represented by tapering, subtruncate lobe, broadening slightly rather than constricted at juncture with cornea; stylocerite bluntly acute, overreaching dorsal arc of distal margin of 1st antennular segment; antennal scale from less

than 5 to more than 5½ times as long as wide, distolateral tooth usually falling short of level of distal margin of blade; 3rd maxilliped with epipod, penultimate segment from 1⅒ to more than 1⅓ times as long as terminal segment; pereopods without epipods, 2nd pair subequal, with 14–21 carpal articles, 3rd pair overreaching antennal scale by lengths of dactyl and propodus and nearly ⅔ of carpus, dactyl from ¼ to less than ½ as long as propodus, accessory distal spine very short, in contact with base of main terminal spine, 3 distal segments from less than 1½ to nearly 1¾ times as long as carapace, none of pereopods extremely slender or thread-like; 3rd pleopod with exopod about ¾ as long as carapace; maximum carapace length slightly more than 15 mm.

DESCRIPTION.—Rostrum (Figure 57a) directed somewhat dorsad, distinctly overreaching antennal scale, varying from less than twice to 2½ times as long as carapace in adults and from 2½ to 3 times as long in immature and juvenile specimens; dorsal margin armed with 6–9 (usually 7 or 8) teeth on basal portion, unarmed anterior to level of distal end of antennular peduncle, posterior 2 or 3 (rarely 4) teeth situated on carapace posterior to level of orbital margin, 1 or more posteriormost teeth sometimes with faint and partial basal suture, none with barbed tips; ventral margin armed with 29–49 (usually 36–44) teeth, overlapping in posterior part of series, becoming somewhat more widely spaced anteriorly. Orbit convex in ventral portion posterior to antennal spine, nearly vertical or somewhat convex again posteriorly. Antennal spine slightly longer than pterygostomial spine. Median postrostral ridge carinate, faintly convex, extending posteriorly to about midlength of carapace.

Abdomen (Figure 57b) with 3rd somite rounded posteriorly, unarmed, without median carina, feebly arched dorsally in lateral aspect. Pleura of 4 anterior somites rounded, that of 5th acute and armed with minute tooth posteroventrally. Sixth somite from about 2 to more than 2½ times as long as 5th and from 2 to 2½ times

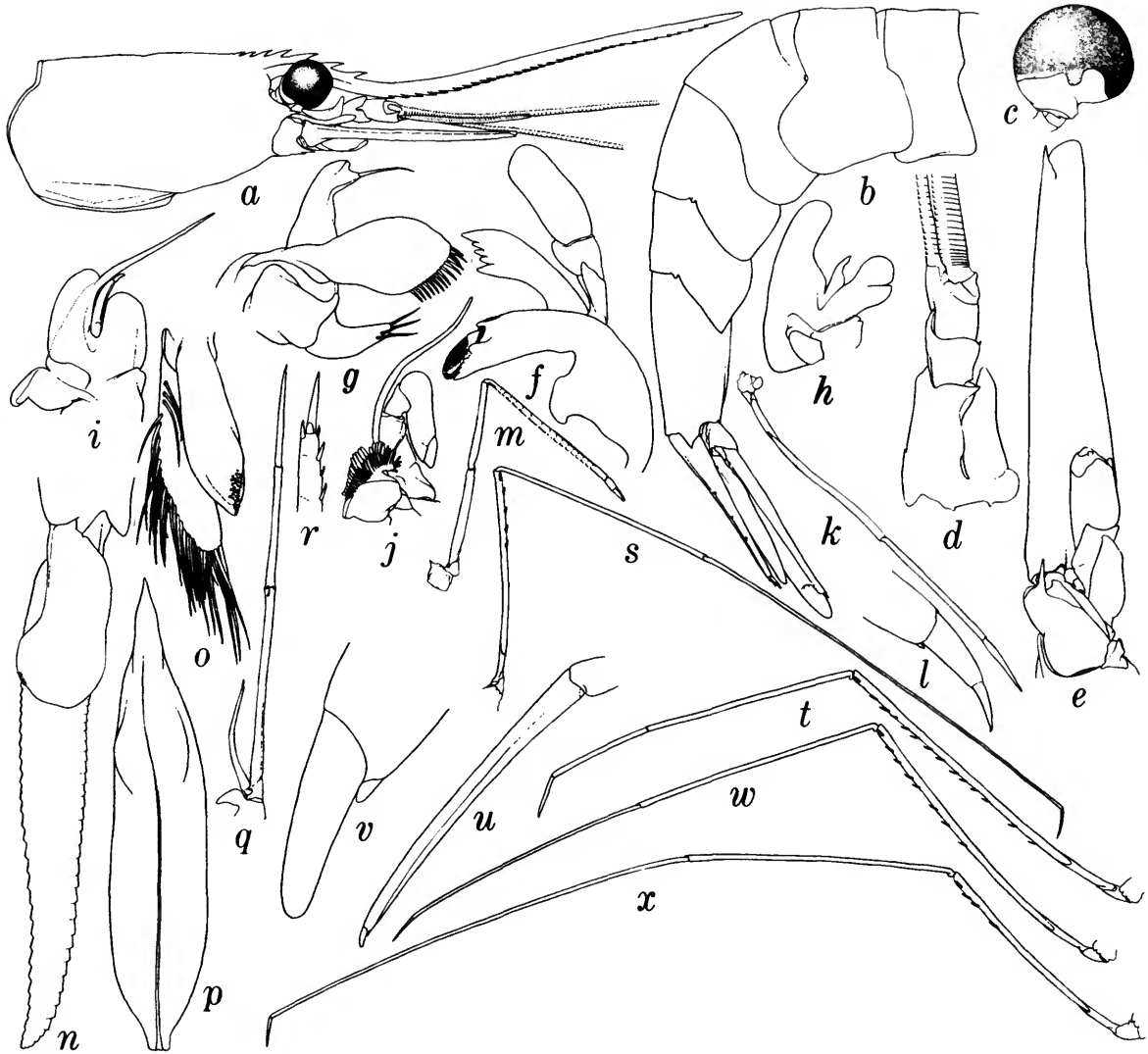


FIGURE 57.—*Plesionika simulatrix*, new species; *a-p*, male holotype from *Albatross* sta 5391 (Samar Sea, Philippines), carapace length 13.0 mm; *q, r*, male paratype from *Albatross* sta 5391, carapace length 14.2 mm; *s*, male paratype from *Albatross* sta 5391, carapace length 12.7 mm; *t-x*, male paratype from *Albatross* sta 5547 (Sulu Archipelago, Philippines), carapace length 14.0 mm: *a*, carapace and anterior appendages, right aspect; *b*, abdomen, right aspect; *c*, right eye, dorsal aspect; *d*, right antennule, mesiodorsal aspect; *e*, right antenna, ventral aspect; *f*, right mandible; *g*, right 1st maxilla; *h*, right 2nd maxilla; *i*, right 1st maxilliped; *j*, right 2nd maxilliped; *k*, right 1st pereopod; *l*, same, distal end of "chela"; *m*, right 2nd pereopod; *n*, endopod and exopod of right 1st pleopod, posterior aspect; *o*, right appendix masculina and appendix interna, mesial aspect; *p*, tegumental scale from carapace; *q*, right 3rd maxilliped; *r*, same, distal end; *s*, right 5th pereopod; *t*, left 3rd pereopod; *u*, same, dactyl; *v*, same, distal end; *w*, left 4th pereopod; *x*, left 5th pereopod. (Magnifications: *a, b, k, m, q, s, t, w, x*, $\times 2.6$; *c-e, h-j*, $\times 5.2$; *f, g, n*, $\times 10.8$; *o, r, u*, $\times 21.5$; *l*, $\times 53.8$; *p, v*, $\times 223.6$.)

as long as maximum height. Telson from $\frac{4}{5}$ as long to slightly longer than 6th somite, with 4 pairs of dorsolateral spinules, posteriormost pair situated dorsolateral to base of long, lateral spine of 2 posterior pairs.

Tegumental scales of carapace (Figure 57*p*) with nearly entire margins and with pair of curved flanges forming parentheses-like pattern embracing midline proximal to somewhat discrete distal portion.

Eye (Figure 57*c*) broadly subpyriform, about as broad as long, maximum diameter about $\frac{1}{4}$ carapace length; ocellus represented by tapering, subtruncate lobe broadening slightly rather than constricted at juncture with cornea.

Antennular peduncle (Figure 57*d*) with minute tooth on ventromesial margin of basal segment. Stylocerite overreaching basal segment, very bluntly acute distally.

Antennal scale (Figure 57*e*) with lateral margin faintly sinuous, $\frac{9}{10}$ as long to fully as long as carapace, from less than 5 to more than $5\frac{1}{2}$ times as long as wide, distolateral tooth very rarely reaching to or slightly beyond level of distal margin of blade.

Mouthparts as illustrated (Figure 57*f-j, q, r*). Third maxilliped with well-developed epipod, overreaching antennal scale by about $\frac{2}{3}$ length of terminal segment, latter ending in long, stout distal spine (Figure 57*r*), penultimate segment from $1\frac{1}{10}$ to more than $1\frac{1}{3}$ times as long as terminal segment (Figure 57*q*).

Pereopods without epipods. First pereopod (Figure 57*k*) overreaching antennal scale by about $\frac{1}{3}$ length of "chela;" microscopic denticle at end of flexor margin of propodus (Figure 57*l*) forming very obscure chela. Second pereopods subequal, reaching distal $\frac{1}{10}$ of antennal scale, carpus (Figure 57*m*) composed of 14–21 (usually 17 or 18) articles. Third pereopod (Figure 57*t*) overreaching antennal scale by lengths of dactyl and propodus and nearly $\frac{2}{3}$ of carpus; dactyl (Figure 57*u*) from $\frac{1}{4}$ to less than $\frac{1}{2}$ as long as propodus, about $\frac{1}{6}$ as long as carapace, accessory distal spine (Figure 57*v*) very short, in contact with base of main terminal spine; carpus from

$1\frac{1}{3}$ to more than twice as long as propodus; 3 distal segments, combined, from less than $1\frac{1}{2}$ to nearly $1\frac{3}{4}$ times as long as carapace. Fourth pereopod (Figure 57*w*) overreaching antennal scale by lengths of dactyl, propodus, and $\frac{1}{3}$ of carpus; dactyl shorter than dactyl of 3rd pereopod; 3 distal segments, combined, more than twice as long as carapace. Fifth pereopod (Figure 57*x*) overreaching antennal scale by lengths of dactyl and propodus; dactyl similar to that of 4th pereopod; 3 distal segments, combined, about 3 times as long as carapace.

Endopod of 1st pleopod of male (Figure 57*n*) rather abruptly expanded beyond midlength into subcircular distal portion without obvious notch. Appendix masculina on 2nd pleopod (Figure 57*o*) overreaching appendix interna and bearing more than 30 long spines on anteromesial and distal margin. Exopod of 3rd pereopod about $\frac{3}{4}$ as long as carapace. Mesial branch of uropod not reaching posterior margin of telson proper; lateral branch overreaching telson and bearing movable spine mesial to distolateral tooth.

SIZE.—Carapace length of male holotype, 13.0 mm; of male paratypes, 10.0–15.0 mm; of non-ovigerous female paratypes, 10.8–12.1 mm; of ovigerous female paratypes, 11.4–15.5 mm. Most of the smaller specimens not assigned to the type series show evidence of immaturity. In males identified by the shape of the endopod of the first pleopod, the appendix masculina is quite invisible in specimens with carapace lengths of 8.3–9.6 mm, a barely discernible bud at 7.5–8.8 mm, from $\frac{1}{4}$ to $\frac{3}{4}$ as long as the appendix interna at 8.1–10.7 mm, and fully developed in 1 male with a carapace length of 9.2 mm.

MATERIAL.—PHILIPPINES. Southwest of Lubang Islands: sta 5265; $13^{\circ}41'15''\text{N}$, $120^{\circ}00'50''\text{E}$; 247 m; sand, mud; 6 Jun 1908 (1109–1129); 12' Agassiz beam trawl, mud bag: 44♂ [7.5–8.9], 110♀ [7.3–9.0], 5 juv [6.3–7.2]. Batangas Bay, southern Luzon: sta 5268; $13^{\circ}42'\text{N}$, $120^{\circ}57'15''\text{E}$; 311 m; sand, pebbles; 8 Jun 1908 (1114–1134); 12' Agassiz beam trawl, mud bag: 1y♂ [8.6], 3♀ [8.5–10.2], 1? [8.2]; sta 5298; $13^{\circ}43'25''\text{N}$, $120^{\circ}57'40''\text{E}$; [256 m];

[sand]; 24 Jul 1908 (1509–1519); 12' Agassiz beam trawl, mud bag: 5y♂ [8.4–10.7], 5♀ [8.9–9.8], 1 juv [7.3]. Verde Island Passage, north of Mindoro: sta 5291; 13°29'40"N, 121°00'45"E; 316 m; fine black sand; 10.8°C; 23 Jul 1908 (1345–1405); 12' Agassiz beam trawl, mud bag: 1♂ [9.2].

Samar Sea, east of Masbate: sta 5391; 12°13'15"N, 124°05'03"E; [216 m]; 13 Mar 1909 (0907–0927); 12' Agassiz beam trawl, mud bag: 7♂ [12.7–14.7], 3♀ [12.1–15.5], 2 ovig [13.0, 15.5], 1♂ is holotype (USNM 205218); sta 5395; 11°56'40"N, 124°14'E; 256 m; green mud; 15 Mar 1909 (0855–0914); 12' Agassiz beam trawl, mud bag: 3♂ [14.0–15.0], 1 ovig ♀ [11.4], paratypes. Off Jolo Island, Sulu Archipelago: sta 5173; 6°02'55"N, 120°53'E; 340 m; shells, coral; 5 Mar 1908 (1457–1503); 9' Johnston oyster dredge: 1♂ [10.0], 3♀ [7.3–9.2]; sta 5547; 6°09'20"N, 121°13'40"E; 284 m; fine sand; 13.5°C; 15 Sep 1909 (1351–1411); 9' Tanner beam trawl: 9♂ [10.0–15.0], 14♀ [10.8–14.7], 7 ovig [12.5–14.7], paratypes.

TYPE-LOCALITY.—Samar Sea, east of Masbate, Philippines; 12°13'15"N, 124°05'03"E; 216 meters.

RANGE.—Known only from the Philippine localities cited above; 216 to 472 meters.

REMARKS.—This species is almost certainly related to *P. martia* in spite of the absence of epipods on the pereopods, further reinforcing the justification for discarding the genus *Parapandalus*. Although similar in size to *Plesionika parvimartia*, *P. simulatrix* differs from that species, as well as from the two larger Philippine-Indonesian members of the group—*P. martia orientalis* and *P. semilaevis*—in the smaller eyes, as well as the absence of pereopodal epipods.

There is little doubt that the numerous subadult specimens taken at several Philippine localities from off the Lubang Islands to the Sulu Archipelago belong to this species, but it seems best to restrict the type series to the mature specimens from the Samar Sea east of Masbate and the good lot from station 5547 off Jolo Island.

ETYMOLOGY.—The Latin *simulatrix* (imitator) relates to the resemblance of this species to the widespread and common *Plesionika martia*,

* 44. *Plesionika spinensis*, new species

FIGURES 58, 59

DIAGNOSIS.—Rostrum far overreaching antennal scale, armed dorsally throughout length with 13–24 teeth, including 2 or 3 on carapace posterior to level of orbital margin, posterior-most tooth with faint, incomplete basal suture, none with barbed tips, armed ventrally with 25–39 teeth; orbital margin convex in ventral part, nearly vertically convex again in dorsal ½; abdomen typically with posteromesial tooth but without median dorsal carina on 3rd somite, 4th somite with pleuron rounded, 5th somite with strong posteroventral tooth on pleuron, 6th somite 2½–2¾ times as long as maximum height; telson from ¾ to nearly 9/10 as long as 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye very broadly subpyriform, maximum diameter nearly or quite ½ carapace length, ocellus subcircular, somewhat constricted at juncture with cornea; stylocerite acute, barely overreaching level of dorsal arc of distal margin of 1st antennular segment; antennal scale from slightly more than 5 to 7½ times as long as wide, distolateral tooth distinctly overreaching distal margin of blade; 3rd maxilliped with epipod, penultimate segment slightly shorter or longer than terminal segment; pereopods with well-developed epipods on 4 anterior pairs, 2nd pair subequal, with 14–23 carpal articles, 3rd pair overreaching antennal scale by lengths of dactyl and propodus, dactyl 2/5–½ as long as propodus, 2 accessory distal spines in close contact with main terminal spine, 3 distal segments, combined, from 1½ to 1½ times as long as carapace; none of pereopods extremely slender or thread-like; 3rd pleopod with exopod usually slightly less or slightly more than ½ as long as carapace; maximum carapace length about 13 mm.

DESCRIPTION.—Rostrum (Figure 58) directed slightly dorsad, distinctly overreaching antennal scale, $2\frac{1}{4}$ –3 times as long as carapace (average 2.62); dorsal margin armed with 13–24 teeth (average 18.5) throughout length, posterior 2 (exceptionally 3) teeth situated on carapace posterior to level of orbital margin, posteriormost tooth with indistinct and partial basal suture, none with barbed tips; ventral margin armed with 25–39 teeth (average 34.4), overlapping in posterior part of series, becoming considerably more widely spaced anteriorly. Orbit (Figure 59a) convex in ventral portion posterior to antennal spine, dorsal portion also somewhat convex but in vertical plane or directed posterodorsad. Antennal and pterygostomial spines similar. Median postrostral ridge straight, blunt, gradu-

ally fading away at about midlength of carapace.

Abdomen (Figure 58) with 3rd somite (and rarely 4th) armed with strong posterodorsal tooth, without median carina, somewhat flattened rather than fully arched in lateral aspect. Pleura of 4 anterior somites rounded, that of 5th drawn out posteroventrally to long, sharp spine, ventral margin strongly sinuous. Sixth somite $2\frac{1}{10}$ to nearly $2\frac{3}{4}$ times as long as 5th somite (average 2.44) and $2\frac{1}{3}$ – $2\frac{3}{4}$ times as long as maximum height. Telson from $\frac{3}{4}$ to nearly $\frac{9}{10}$ as long as 6th somite (average 0.80), with 4 pairs of dorsolateral spinules, posteriormost pair situated dorsolateral to base of long lateral spine of 2 posterior pairs.

Tegumental scales (Figure 59s) with margins entire, tapering rather regularly in distal $\frac{1}{2}$, and

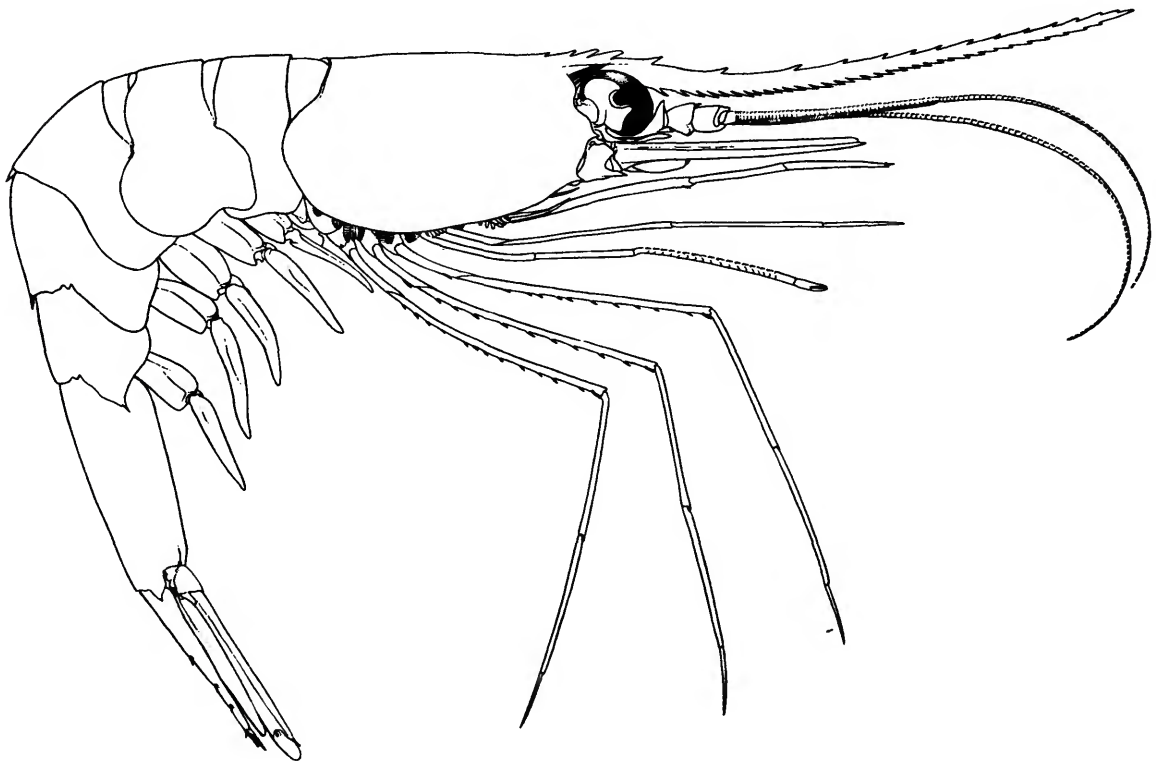


FIGURE 58.—*Plesionika spinensis*, new species, male holotype from *Albatross* sta 5517 (Mindanao Sea, Philippines), carapace length 11.1 mm (2nd pereopod probably regenerating). (Magnification: $\times 3.3$.)

with barely visible pair of curved flanges forming parentheses-like pattern in distal $\frac{1}{2}$ and diverging proximally.

Eye (Figure 59a) much wider than long, major diameter nearly or fully $\frac{1}{3}$ of carapace length; ocellus prominent, subcircular, constricted somewhat at juncture with cornea.

Antennular peduncle (Figure 59b) with ventromesial margin of basal segment unarmed. Stylocerite acute, reaching to or very slightly beyond dorsal arc of distal margin of basal segment.

Antennal scale (Figure 59c) with lateral margin slightly sinuous, about as long as carapace, $5\frac{1}{3}$ – $7\frac{1}{2}$ times as long as wide, distolateral tooth distinctly overreaching distal margin of blade.

Mouthparts as illustrated (Figure 59d–i). Third maxilliped with epipod, overreaching antennal scale by about $\frac{1}{4}$ of terminal segment, armed terminally with long apical spine and several rather slender subapical spines (Figure 59i), penultimate segment slightly shorter or longer than terminal segment (average 1.05).

Pereopods with well-developed epipods on 4 anterior pairs. First pereopod overreaching antennal scale by about $\frac{1}{2}$ length of chela (Figure 59j); dactyl (Figure 59k) terminating in 2 strong spines and closing against pair of contiguous spines in lieu of fixed finger. Second pereopods subequal (right member of pair regenerating in holotype), falling short of distal end of antennal scale by less than length of chela, carpus (Figure 59l) composed of 14–23 (usually 17–19) articles. Third pereopod overreaching antennal scale by lengths of dactyl and propodus; dactyl $\frac{2}{3}$ to $\frac{1}{2}$ as long as propodus (average 0.46), fully $\frac{1}{4}$ as long as carapace, terminating in cluster of stout spines; carpus from slightly shorter to somewhat longer than propodus (average 1.03); 3 distal segments, combined $1\frac{1}{3}$ to slightly more than $1\frac{1}{2}$ times as long as carapace (average 1.46). Fourth pereopod overreaching antennal scale by length of dactyl and $\frac{2}{3}$ of propodus; dactyl (Figure 59m) similar to that of 3rd pereopod; 3 distal segments, combined $1\frac{1}{3}$ – $1\frac{2}{3}$ times as long as carapace (average 1.47). Fifth pereopod overreaching anten-

nal scale by length of dactyl and $\frac{1}{2}$ of propodus; dactyl (Figure 59o, *p*) similar to those of 2 preceding pairs; 3 distal segments, combined, $1\frac{1}{4}$ – $1\frac{3}{5}$ times as long as carapace (average 1.46).

Endopod of 1st pleopod of male (Figure 59q) with mesial margin rather strongly concave and with feeble notch in distal margin. Appendix masculina on 2nd pleopod (Figure 59r) overreaching appendix interna, armed with about 40 long spines on anteromesial and distal margins. Exopod of 3rd pleopod about $\frac{1}{2}$ as long as carapace. Mesial branch of uropod barely overreaching telson proper; lateral branch longer and bearing movable spine at distolateral angle.

SIZE.—Carapace length of male holotype, 11.1 mm; of male paratypes, 7.5–12.3 mm; of nonovigerous female paratypes, 9.0–11.1 mm; of ovigerous female paratypes, 8.2–12.9 mm.

MATERIAL.—PHILIPPINES. Southwest of Manila Bay, Luzon: sta 5273; $13^{\circ}58'45''N$, $120^{\circ}21'35''E$; 209 m; mud, shells, coral sand; 14 Jul 1908 (1047–1117); 12' Agassiz beam trawl: 5 ovig ♀ [8.8–10.3]. Balayan Bay, southern Luzon: sta 5117; $13^{\circ}52'22''N$, $120^{\circ}46'22''E$; 216 m; 21 Jan 1908 (0927–0947); 12' Tanner beam trawl, mud bag: 1♀ [9.0]. Eastern end of Verde Island Passage, north of Mindoro: sta 5121; $13^{\circ}27'20''N$, $121^{\circ}17'45''E$; 198 m; dark green mud; 2 Feb 1908 (0830–0850); 12' Tanner beam trawl, mud bag: 7♂ [7.5–10.9], 1 ovig ♀ [11.2]. Western Mindanao Sea: sta 5516; $8^{\circ}46'N$, $123^{\circ}32'30''E$; 320 m; globigerina; $12.4^{\circ}C$; 9 Aug 1909 (1021–1041); 12' Tanner beam trawl: 2♂ [10.0, 10.3], 2 ovig ♀ [10.6, 10.8]; sta 5517; $8^{\circ}45'30''N$, $123^{\circ}33'45''E$; 309 m; globigerina; $12.4^{\circ}C$; 9 Aug 1909 (1121–1139); 12' Tanner beam trawl: 34♂ [8.3–12.3], 29♀ [9.6–12.9], 28 ovig [9.6–12.9], 1♂ is holotype (USNM 205219); sta 5543; $8^{\circ}47'15''N$, $123^{\circ}35'00''E$; 296 m; sand; $12.5^{\circ}C$; 20 Aug 1909 (0904–0921); 12' Tanner beam trawl: 1♂ [8.2, variety].

Western entrance to Mindanao Sea near Silino Island: sta 5519; $8^{\circ}47'N$, $123^{\circ}31'15''E$; 333 m; globigerina, sand; $12.4^{\circ}C$; 9 Aug 1909 (1356–1439); 12' Tanner beam trawl: 3♂ [9.8–11.0], 8



FIGURE 59.—*Plesionika spinensis*, new species, male holotype from *Albatross* sta 5517 (Mindanao Sea, Philippines), carapace length 11.1 mm: *a*, anterior carapace and eye, left aspect; *b*, left antennule, mesiodorsal aspect; *c*, left antenna, ventral aspect; *d*, left mandible; *e*, left 1st maxilla; *f*, left 2nd maxilla; *g*, left 1st maxilliped; *h*, left 2nd maxilliped; *i*, distal end of left 3rd maxilliped; *j*, “chela” of left 1st pereopod; *k*, same, distal end; *l*, carpus and chela of left 2nd pereopod; *m*, dactyl of left 4th pereopod; *n*, same, distal end; *o*, dactyl of left 5th pereopod; *p*, same, distal end; *q*, endopod and exopod of left 1st pleopod, posterior aspect; *r*, left appendix masculina and appendix interna, mesial aspect; *s*, tegumental scale from carapace. (Magnifications: *a-c, l*, $\times 5.2$; *f-h*, $\times 8.6$; *d, e, q*, $\times 10.8$; *j, m, o*, $\times 21.5$; *i, r*, $\times 53.8$; *k, n, p, s*, $\times 223.6$.)

ovig ♀ [9.1–12.2]. Off Bongo Island, Illana Bay, western Mindanao: sta 5256; 7°21'45"N, 124°07'15"E; 289 m; mud; 22 May 1908 (0954–1014); 12' Agassiz beam trawl, mud bag: 1 ovig ♀ [10.3, variety]. Southwest of Balabac Island: sta 5353; 7°50'45"N, 116°43'15"E; 271 m; 1 Jan 1909 (0710–0744); 9' Tanner beam trawl, mud bag: 8♂ [8.0–9.0], 6 ovig ♀ [8.2–9.2].

TYPE-LOCALITY.—Western Mindanao Sea off Murcielagos Bay, Philippines; 8°45'30"N, 123°33'45"E; 309 meters.

RANGE.—Known only from the Philippine localities listed above; 199 to 333 meters.

REMARKS.—This species seems to have its closest affinity with the *P. ensis* group. It resembles *P. reflexa* in the dentition of the rostral crest, the form of the orbit, the posteromesial tooth on the third abdominal somite, the large eye, the antennule and antenna, the mouthparts, and the appendix masculina. It differs most obviously from that species in its smaller size, dentate dorsal rostral margin, and proportionately longer pos-

terior pereopods with longer and morphologically different dactyls.

ETYMOLOGY.—The Latin *spina* (thorn) plus the specific name *ensis* (a sword) calls attention to the most evident character—the dentate dorsal margin of the rostrum—that distinguishes this species from the similar *P. ensis* and its Indo-Pacific counterpart, *P. reflexa*.

*** 45. *Plesionika spinidorsalis* (Rathbun, 1906)**

FIGURES 60, 61

Pandalus spinidorsalis Rathbun, 1906:917, pl. 21: fig. 5 [type-locality: Vicinity of Kauai Island, Hawaii (Hana-maulu Warehouse, S. 37°30', W. 6.5'); 662–101 meters].

DIAGNOSIS.—Rostrum overreaching antennal scale, armed dorsally throughout length with 12–15 teeth, including 7–10 on carapace posterior to level of orbital margin, none with basal suture or barbed tip, armed ventrally with 4–8 teeth; orbital margin with subquadrate lobe, thence

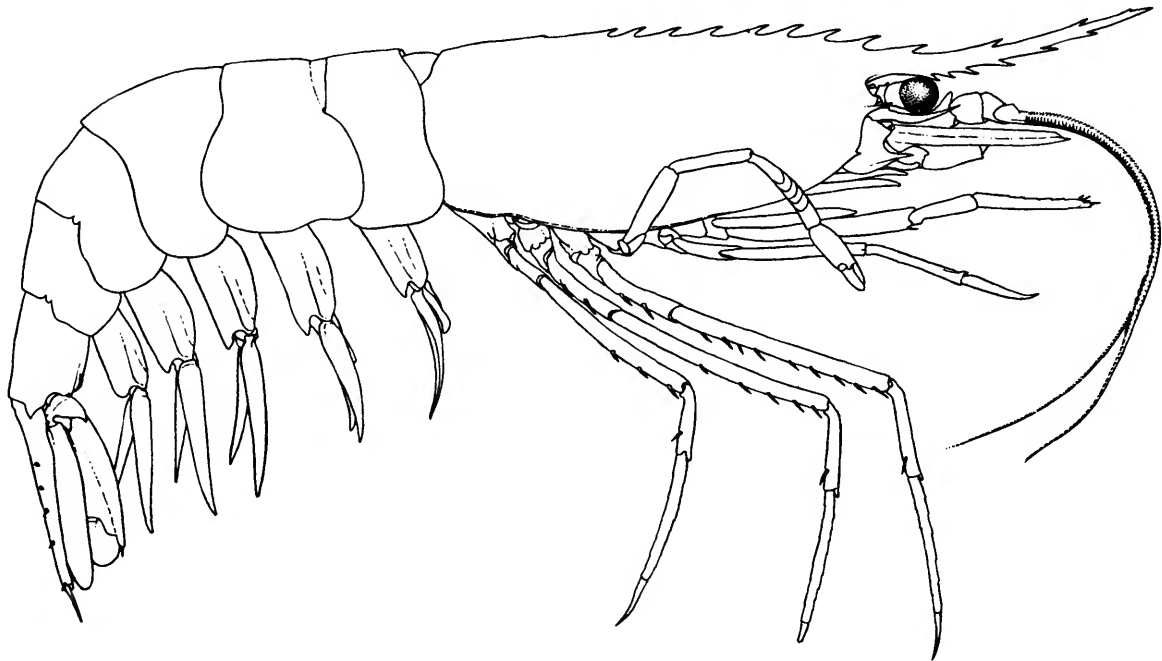


FIGURE 60.—*Plesionika spinidorsalis*, male from Albatross sta 5444 (north of Samar, Philippines), carapace length 17.3 mm. (Magnification: $\times 3.5$.)

trending posterodorsally in nearly straight line and, finally, bending sharply anterodorsally at extreme dorsal limit; abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th somite with pleuron rounded, without marginal denticle, 5th somite with pleuron subrectangular, with or without marginal denticle, 6th somite $1\frac{1}{3}$ – $1\frac{1}{2}$ times as long as maximum height; telson $1\frac{1}{2}$ to nearly twice as long as 6th somite, with 5 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye pyriform, maximum diameter about $\frac{1}{8}$ carapace length, without ocellus; stylocerite slender and sharp, overreaching dorsal arc of distal margin of 1st antennular segment; antennal scale 4 – $4\frac{1}{4}$ times as long as wide, distolateral tooth far overreaching oblique distal

margin of blade; 3rd maxilliped with epipod, penultimate segment slightly more than $\frac{1}{2}$ to $\frac{2}{3}$ as long as terminal segment; pereopods with epipods on 4 anterior pairs, 2nd pair unequal and dissimilar, right member shorter, more robust, and with 5 or 6 carpal articles, left member with 13–16 carpal articles, 3rd pair overreaching antennal scale by length of dactyl and about $\frac{1}{3}$ as long as propodus, dactyl from less than $\frac{1}{4}$ to nearly $\frac{2}{3}$ as long as propodus, without accessory distal spine, 3 distal segments, combined, about $\frac{2}{3}$ as long as carapace, none of pereopods extremely slender or thread-like; 3rd pleopod with exopod slightly more than $\frac{1}{3}$ as long as carapace; maximum carapace length nearly 20 mm.

MATERIAL.—PHILIPPINES. Tayabas Bay, southern Luzon: sta 5221; $13^{\circ}38'15''N$, 121°

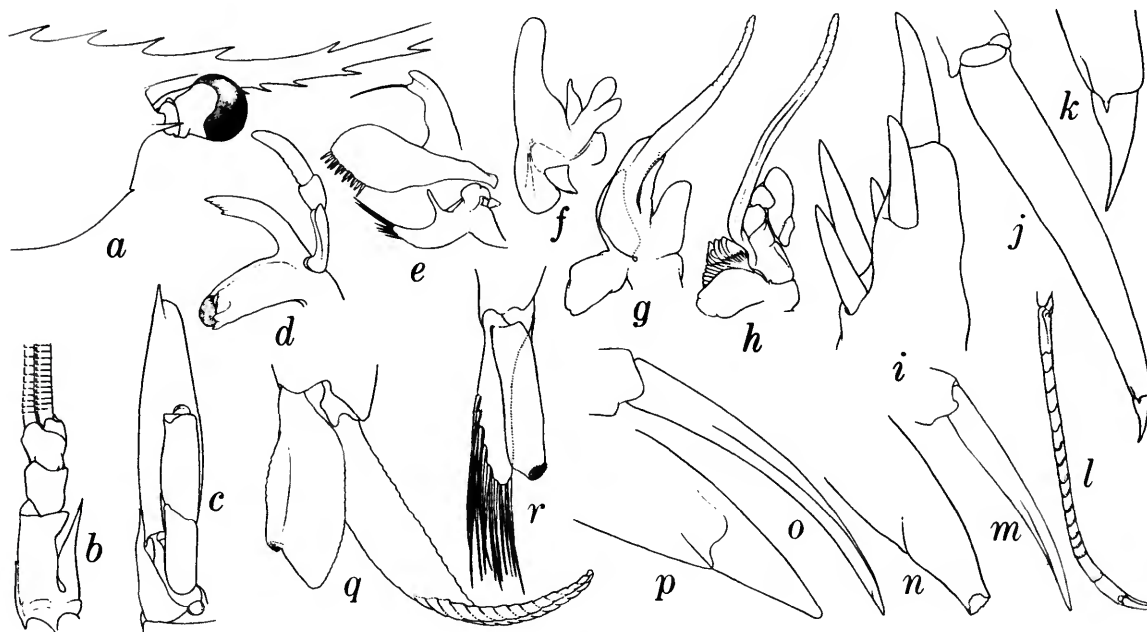


FIGURE 61.—*Plesionika spinidorsalis*, male from Albatross sta 5444 (north of Samar, Philippines), carapace length 17.3 mm: a, anterior carapace and eye, right aspect; b, right antennule, mesiodorsal aspect; c, right antenna, ventral aspect; d, right mandible; e, left 1st maxilla; f, right 2nd maxilla; g, right 1st maxilliped; h, right 2nd maxilliped; i, distal end of right 3rd maxilliped; j, "chela" of right 1st pereopod; k, same, distal end; l, carpus and chela of left 2nd pereopod; m, dactyl of right 3rd pereopod; n, same, distal end; o, dactyl of right 5th pereopod; p, same, distal end; q, endopod and exopod of right 1st pleopod, posterior aspect; r, right appendix masculina and appendix interna, mesial aspect. (Magnifications: a–c, f–h, l, $\times 5.2$; d, e, q, $\times 10.8$; j, m, o, r, $\times 21.5$; i, k, $\times 53.8$; n, p, $\times 223.6$.)

48'15"E; 353 m; green mud; 11.3°C; 24 Apr 1908 (1525–1545); 12' Agassiz beam trawl, mud bag: 1♀ [14.5]. Northeast of Mindoro: sta 5122; 13°21'30"N, 120° [probably 121°]30'33"E; 402 m; green mud; 2 Feb 1908 (1059–1119); 12' Tanner beam trawl, mud bag: 1♀ [14.5]. North of Samar: sta 5444; 12°43'51"N, 124°58'50"E; 564 m; green mud; 7.4°C; 3 Jun 1909 (1032–1049); 12' Agassiz beam trawl: 2♂ [15.0, 17.3], 1♀ [14.2]. Northwest of Panay: sta 5259; 11°57'30"N, 121°42'15"E; 571 m; gray mud, globigerina; 9.6°C; 3 Jun 1908 (1031–1051); 12' Agassiz beam trawl, mud bag: 1 ovig ♀ [15.7]. Between Negros and Siquijor: sta 5537; 9°11'00"N, 123°23'00"E; 465 m; green mud; 11.9°C; 19 Aug 1909 (1539–1559); 12' Tanner beam trawl: 1♂ [12.0]. Macajalar Bay, northern Mindanao: sta 5504 or 5505; 8°35'30"N, 124°36'E or 8°37'15"N, 124°36'E; 366 [or 402] m; green mud or ?; 5 Aug 1909 (0615–0657 or 0725–0749); 12' Tanner beam trawl: 1♂ [14.0].

INDONESIA. West of Halmahera: sta 5626; 0°07'30"N, 127° 29'00"E; 485 m; gray mud, fine sand; 29 Nov 1909 (1534–1552); 12' Agassiz beam trawl: 1♂ [18.3].

RANGE.—Known previously from the extensive original series from Hawaii, in 100 to 1250 meters, and probably from the South China Sea, in 305 meters (Zarenkov, 1971:183, see "Remarks").

REMARKS.—The nine specimens collected by the *Albatross* in 1908 and 1909 have been compared with 18 specimens from four stations selected at random from the original series of *P. spinidorsalis* collected by the same vessel in Hawaii in 1902. The Philippine-Indonesian specimens seem to differ from the Hawaiian ones only in the following particulars. The rostrum in the Philippine-Indonesian population may be slightly shorter, amounting to only 0.70 of the carapace length, as compared with 1.76 in the Hawaiian series, but the number of ventral rostral teeth is greater (6–8) in the Philippine specimens than in those from Hawaii (4–6). The sixth abdominal somite may be slightly shorter, relative to its

height, in the Philippine series. The eyes also seem to be slightly smaller in the Philippine material, the major diameter averaging only 0.123 of the carapace length, as opposed to 0.137 in the Hawaiian series. Finally, the third and fourth pereopods of the Philippine specimens may be slightly shorter, as indicated by the proportionate lengths of the three distal segments; they average 0.63 and 0.59 of the carapace length, respectively, in that population, compared with averages of 0.67 and 0.64 in the Hawaiian examples. None of these differences seem to be of even subspecific significance at this time.

The specimen collected by the *Orlik* in the South China Sea and assigned to *P. spinidorsalis* by Zarenkov (1971:183) is probably identified correctly, even though that author describes the dorsal rostral teeth as "all movable."

The general appearance of this species—somewhat similar to the facies of *Chlorotocus* and *Dorodotes*—seems to isolate it sufficiently from most of the species of *Plesionika* to suggest consideration of generic distinction, but I am leaving that possibility undecided for the time being.

* 46. *Plesionika unidens* Bate, 1888

Plesionika unidens Bate, 1888:648, pl. 113: fig. 4 [type-locality: Admiralty Islands; 1°54'00"S, 146°39'48"E; 274 meters].—De Man, 1920:129, pl. 11: fig. 28a,b; pl. 12: fig. 28.

DIAGNOSIS.—Rostrum far overreaching antennal scale, armed dorsally with 7 or 8 teeth, including 3 on carapace posterior to level of orbital margin and 1 isolated in anterior ¼ of rostrum, 3 posteriormost teeth with distinct basal sutures but none with barbed tips, armed ventrally with 10–20 teeth; orbital margin concave in ventral part, with distinct obtuse angle and nearly vertical border dorsally; abdomen with 3rd somite lacking posteromesial tooth but with median dorsal carina typically forming obtuse tooth anterior to posterior margin of somite, 4th and 5th somites with marginal tooth on pleuron, 6th somite fully twice as long as maximum

height; telson fully as long as 6th somite, with 4 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines; eye kidney-shaped, maximum diameter about $\frac{1}{3}$ carapace length, ocellus obliquely oval, slightly constricted at junction with cornea; stylocerite acute, not reaching level of dorsal arc of distal margin of 1st antennular segment; antennal scale 5–5½ times as long as wide, distolateral tooth reaching nearly to or slightly beyond level of distal margin of blade; 3rd maxilliped with epipod, penultimate segment about $\frac{4}{5}$ as long as terminal segment; pereopods with epipods on 4 anterior pairs, 2nd pair very unequal, left member longer, with more than 200 carpal articles, right with 33–36, 3rd pair overreaching antennal scale by length of dactyl and about $\frac{3}{4}$ of propodus, dactyl $\frac{1}{4}$ – $\frac{1}{2}$ as long as propodus, accessory distal spine reaching distal $\frac{1}{4}$ of and in fairly close contact with main terminal spine, 3 distal segments, combined, about as long as carapace, none of pereopods extremely slender or thread-like; 3rd pleopod with exopod slightly more than $\frac{2}{5}$ as long as carapace; maximum carapace length about 14 mm.

MATERIALS.—PHILIPPINES. Southwest of Manila Bay, Luzon: sta 5279; 13°57'30"N, 120°22'15"E; 214 m; green mud; 17 Jul 1908 (1326–1335); 12' Agassiz beam trawl, mud bag (net torn, 1 bridle stop carried away): 1 ovig ♀ [10.7]. East of southern Luzon: sta 5475; 12°55'26"N, 124°22'12"E; 357 m; shells; 15.2°C; 24 Jun 1909 (0915–0931); 12' Agassiz beam trawl: 1♂ [11.1]. Samar Sea, east of Masbate: sta 5393; 12°03'30"N, 124°03'36"E; 249 m; hard sand; 13 Mar 1909 (1404–1412); 12' Agassiz beam trawl, mud bag: 1♀ [8.6].

RANGE.—Bay of Bengal, South China Sea, Philippines, Indonesia, and Admiralty Islands; 214–400 meters.

REMARKS.—None of the Philippine specimens has the dorsal carina on the third abdominal somite forming a tooth as distinct as the one described by previous authors. Also, the ovigerous female has the dactyls of the three posterior pairs of pereopods about twice as long as do the

other two specimens, but there seems to be agreement in other characters.

* *Stylopandalus* Coutière, 1905

Stylopandalus Coutière, 1905a:1115 [type-species, by monotypy: *Pandalus* (*Stylopandalus*) *Richardi* Coutière, 1905a:1115; gender: masculine].

DIAGNOSIS.—Rostrum immovably attached to remainder of carapace, armed with mostly fixed teeth on both margins; carapace without supraorbital spines or lateral carinae, dorsally carinate anteriorly, rounded posteriorly; 3rd abdominal somite bearing movable posteromesial spine (frequently lost); cornea wider than eyestalk; 2nd maxilliped with terminal segment longer than wide; 3rd maxilliped with well-developed exopod; pereopods without epipods, 2nd pair subequal, carpus divided into more than 3 articles.

RANGE.—Most tropical and temperate seas, except South and East China and Japanese seas and extreme eastern Pacific region off America; pelagic from surface to 3600 meters.

REMARKS.—As noted by Burukovsky (1982: 45), the single pelagic species that prompted Coutière to propose the subgenus *Stylopandalus* of the genus *Pandalus* seems sufficiently distinct from the members of the genus *Parapandalus* [= *Plesionika*] to justify generic recognition. Perhaps most significantly from a taxonomic standpoint is the elongate terminal segment of the second maxilliped (Figure 62g), but other of the mouthparts are somewhat different from those in *Plesionika*. Possibly also of generic importance are the slender, movable, posteromedian spine on the third abdominal somite (Figure 62m); the short pereopods, the first terminating in a simple, unopposed dactyl (Figure 62l), and the three posterior ones with slender dactyls bearing a single distal spine more than $\frac{3}{4}$ as long as the proximal part of the segment (Figure 62n); and the appendix masculina on the second pleopod of the male unusually slender and bearing long spines rather sparsely distributed along the anterior margin (Figure 62p).

Only one species is currently recognized.

* 47. *Stylopandalus richardi* (Coutière, 1905)

FIGURE 62

Pandalus (*Stylopandalus*) *Richardi* Coutière, 1905a:1115 [type-locality: On page 1113, Coutière lists 2 *Princesse-Alice* stations: west of Madeira at 32°18'N, 23°58'W, 2000–0 meters, and Canary Islands at 27°43'N, 18°28'W, 3000–0 meters]; 1905b:18, fig. 6.

Stylopandalus Richardi.—Richard, 1905:11.

Parapandalus zur strasseni Balss, 1914b:597 [type-locality: the type series came from 2 localities in the Indian Ocean: north of Cocos (Keeling) Islands; 10°08'S, 97°14'E; 2400–0 meters, and northeast of Seychelles; 3°24'S, 58°38'E; 2000–0 meters].

Pandalus (*Plesionika*) *gracilis* Borradaile, 1915:208 [type-locality: Western Indian Ocean, 366 meters].

Pandalus (*Plesionika*) *gracilis*.—Borradaile, 1917:398, pl. 58: fig. 1.

Parapandalus Zur Strasseni.—De Man, 1920:141, pl. 12: fig. 32.

Parapandalus Zurstrasseni.—Balss, 1925:281, figs. 53–59, pl. 27.

Parapandalus richardi.—Crosnier and Forest, 1973:224, fig. 69b.

Stylopandalus richardi.—Burukovsky, 1982:45.

DIAGNOSIS.—Rostrum curving somewhat dorsad anteriorly, far overreaching antennal scale, nearly or quite 3 times as long as carapace, armed dorsally with 15–21 teeth, including 1 on carapace posterior to level of orbital margin, larger one anterior thereto, and much smaller ones extending at irregular intervals nearly to tip of rostrum, only postorbital spine sometimes with distinct basal suture, and ventrally with 16–27 small teeth; 6th abdominal somite nearly or slightly more than 2 $\frac{2}{3}$ times as long as 5th and nearly or quite 3 times as long as maximum height; telson slightly shorter than 6th somite; eye pyriform, maximum diameter $\frac{1}{7}$ – $\frac{1}{6}$ of carapace length, ocellus obscurely suggested by skewed, sharply triangular intrusion into margin of orbit; antennal scale 5–6 $\frac{1}{3}$ times as long as wide, distolateral tooth overreaching blade; 3rd maxilliped with penultimate segment nearly or quite $\frac{9}{10}$ as long as terminal segment; 1st pereopod not chelate, 2nd with 7–13 carpal articles; 3rd with dactyl less than $\frac{3}{10}$ to more than $\frac{4}{10}$ as long as propodus, and carpus 1 $\frac{1}{8}$ –1 $\frac{1}{4}$ times as

long as propodus, 3 distal segments of 3rd pereopod, combined, $\frac{2}{3}$ – $\frac{3}{4}$ of carapace length, 3 distal segments of 4th pereopod, combined, $\frac{7}{10}$ – $\frac{8}{10}$ of carapace length, 3 distal segments of 5th pereopod, combined, also $\frac{7}{10}$ – $\frac{8}{10}$ of carapace length; exopod of 3rd pleopod slightly more than $\frac{1}{2}$ as long as carapace; maximum carapace length less than 10 mm.

MATERIAL.—PHILIPPINES. Verde Island Passage, north of Mindoro: sta 5287; 13°37'40"N, 120°39'E; 694 m; gray sand; 6.3°C; 20 Jul 1908 (1458–1548); 3-meter open net towed horizontally at 567 meters for 20 minutes, then raised vertically to surface in 24 minutes: 1 ovig ♀ [8.0]. Panay Gulf northwest of Sojoton Point, Negros: sta 5185; 10°05'45"N, 122°18'30"E; 1167 m; green mud; 9.9°C; 30 Mar 1908 (1726–1834); 3-meter open net towed horizontally at 1000 meters for 20 minutes, then raised vertically to surface in 48 minutes: 2 ovig ♀ [8.1]. Central Sulu Sea: sta 5359; 8°12'45"N, 120°37'15"E (longitude and latitude approximate); 4160 m; 9 Jan 1909 (1531–?); 12' Agassiz beam trawl, reversible net: 1 ovig ♀ [8.0]. South of Pujada Bay, Mindanao: sta 5246; 6°29'15"N, 126°18'45"E; 15 May 1908 (1910–1938); 3-meter open net towed horizontally at 183 meters for 20 minutes, then raised vertically to surface in 8 minutes: 1 ovig ♀ [8.2].

RANGE.—If Crosnier and Forest (1973:224) are correct in believing that *Parapandalus zurstrasseni*, described from specimens from the Indian Ocean, is identical with Coutière's species from the eastern Atlantic—and I have found no evidence to refute that conclusion—*Stylopandalus richardi* probably occurs in all major tropical and temperate seas, from the surface to a mid-water depth of 3600 meters. It has been recorded in the literature from the western and eastern Atlantic, the Indian Ocean from its southwestern reaches off Natal to its eastern limits west of Australia, and in Indonesia eastward to the Banda Sea. The *Albatross* collections now reveal that it occurs, perhaps sparingly, in the Philippines, and there are specimens in the Smithsonian holdings from the Tasman Sea as far east as



FIGURE 62.—*Stylopandalus richardi*, a–g, ovigerous female from *Albatross* sta 5246 (off southeastern Mindanao, Philippines), carapace length 8.2 mm; h–k, ovigerous female from *Albatross* sta 5359 (Sulu Sea, Philippines), carapace length 8.0 mm; l, m, ovigerous female from *Albatross* sta 5287 (off northern Mindoro, Philippines), carapace length 8.0 mm; n, o, male from *Pillsbury* sta 265 (off Gabon, Africa), carapace length 7.3 mm: a, anterior carapace and eye, left aspect; b, right mandible; c, left mandible; d, right 1st maxilla; e, right 2nd maxilla; f, right 1st maxilliped; g, right 2nd maxilliped; h, tegumental scale from near base of rostrum; i, basal rostral teeth, left aspect; j, distal end of right 3rd maxilliped; k, distal end of right 1st pereopod; l, same, dactyl; m, posteromesial spine on 3rd abdominal somite; n, dactyl of left 3rd pereopod; o, endopod and exopod of right 1st pleopod, posterior aspect; p, right appendix masculina and appendix interna, mesial aspect. (Magnifications: a, d–g, $\times 10.8$; b, c, i, o, $\times 21.5$; j, k, m, n, p, $\times 53.8$; h, l, $\times 223.6$.)

155° east longitude, received from W. Dall in 1955. Although there seem to be no published records of its presence in the Pacific Ocean, *per se*, Robert A. Wasmer has informed me that the species was represented in collections made for the Oceanography Department of Oregon State University by the R/V *Yaquina* on a cruise from Hawaii to Adak, Alaska, in 1966. On the other hand, it seems not to have been taken during intensive operations by the same university from 120 to 1242 km off the Oregon coast since 1961. Although more than 20 specimens were collected by a Japanese vessel in the Indian Ocean from 1962 to 1964 (Hayashi and Miyake, 1969:73), even as far south as 31°49' south latitude, the species seems to be missing from Japanese collec-

tions from the South and East China seas, as well as off the large islands of Japan.

REMARKS.—The inclusion of *Pandalus (Plesionika) gracilis* in the synonymy of *Stylopandalus richardi* must be credited to L. B. Holthuis, who expressed the opinion, in correspondence, that this disposition was probably correct, without noting that the decision was based on the examination of the type specimen of Borradaile's species. I consequently referred the matter to C.B. Goodhart, who very kindly examined the type in the University Museum of Zoology at Cambridge, dispelled all doubt that the species is conspecific with *S. richardi*, and informed me that Holthuis had reached the same conclusion when he visited Cambridge in 1956.

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