

The Caridean Shrimps
(Crustacea: Decapoda) of the
Albatross Philippine Expedition,
1907–1910, Part 4: Families
Oplophoridae and Nematocarcinidae

FENNER A. CHACE, JR.

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ABSTRACT

Chace, Fenner A., Jr. The Caridean Shrimps (Crustacea: Decapoda) of the Albatross Philippine Expedition, 1907–1910, Part 4: Families Oplophoridae and Nematocarcinidae. *Smithsonian Contributions to Zoology*, number 432, 82 pages, 42 figures, 1986.—Keys are offered for identifying all of the taxa currently recognized in the family Oplophoridae, including three new monotypic genera: *Heterogenys* for *Acanthephyra microphthalmia*, *Janicella* for *Oplophorus spinicauda*, and *Kemphyra* for *Notostomus corallinus*. Of the 27 species remaining in the genus *Acanthephyra*, 14 are now known from the Philippine-Indonesian region. One new species is proposed in the genus *Ephyrina*; *E. childressi* was collected in the Halmahera Sea by the *Alpha Helix* in 1975, bringing to six the number of species recognized in that genus; two of the three species encountered in the Philippine-Indonesian region—*E. figueirai* and *E. ombango*—were originally described from the eastern Atlantic. Four species are currently recognized in the genus *Hymenodora*, but none of them have been definitely recorded from the Philippines or Indonesia. Five species are represented in the genus *Meningodora*, but some doubt is expressed about the inclusion of other than the type-species, *M. mollis*. The eight species recognized in the genus *Notostomus* are distinguished in a distinctly provisional key. Four species remain in the genus *Oplophorus* after the removal of *O. spinicauda*. All five species currently known in the genus *Systellaspis* are recorded from the Philippine-Indonesian region. Illustrations are offered of as many oplophorid species as possible, especially of the mandibles, first and second maxillipeds, endopods of the first male pleopods, and the appendices internae and masculinae, all of which proved to be variably significant as diagnostic generic and/or specific characters. Seven species are covered in a key to the Philippine-Indonesian species of the genus *Nematocarcinus*, including a new species, *N. bituberculatus* from Lagonoy Gulf, southeastern Luzon, and off the west coast of Halmahera.

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The Caridean Shrimps (Crustacea: Decapoda) of the *Albatross* Philippine Expedition, 1907–1910, Part 4: Families Oplophoridae and Nematocarcinidae

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 are common to all 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 minimum and maximum 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).

Inasmuch as most of the available study material was not collected with closing nets and as many of the pelagic oplophorids are believed to

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migrate diurnally over a considerable bathymetric distance, it has been impossible to indicate accurate depth ranges for most of those species. In general, those that are collected most commonly above 1000 meters have been called "mesopelagic," and those that seem to occur below 1000 meters and that probably do not approach the surface at night are referred to as "bathypelagic."

ACKNOWLEDGMENTS.—At least a half dozen biologists in other institutions have contributed importantly to the preparation of this fourth part of the report on the Caridea of the *Albatross* Philippine Expedition. James J. Childress of the Marine Science Institute at the University of California, Santa Barbara, induced me to abandon my determination to shun involvement with any but the *Albatross* collections by donating unexpectedly titillating pelagic oplophorid material collected by the *Alpha Helix* Southeast Asian Expedition in the Banda, Halmahera, and Sulu seas in 1975. Early in the project, Alain Crosnier of the Muséum National d'Histoire Naturelle in Paris made available various parts of the manuscript by him and J. Forest, which was subsequently published in 1973, and he later reviewed the manuscript of this report with his usual competence and tact. Also at an early stage, Ken-Ichi Hayashi, then at the Marine Parks Center of Japan, in Tokyo, provided welcome information about the identity of the genus *Hoplophasiphaea*. The penultimate draft of the manuscript was reviewed by L.B. Holthuis of the Rijksmuseum van Natuurlijke Historie in Leiden with his usual promptness and attention to detail. The abundant collections of mesopelagic shrimps received from the Woods Hole Oceanographic Institution, through the kind cooperation of David C. Judkins, furnished invaluable comparative study material. W.G. Percy of the School of Oceanography, Oregon State University, loaned material of *Hymenodora acanthitelsonis*. Mrs. M.G. van der Merwe of the South African Museum in Cape Town sent unusually fine specimens of the rare *Kemphyra*. A.L. Rice examined the holotype of *Acanthephyra kingsleyi* in the Brit-

ish Museum (Natural History) for me. Robert A. Wasmer of Columbia Union College, Takoma Park, Maryland, suggested the means of obtaining an adult male of the uncommon *Hymenodora acanthitelsonis* and reviewed the entire manuscript, which resulted in the gain of valuable knowledge about range extensions and other aspects of the report gleaned from the study of northeastern Pacific material. Among my Smithsonian colleagues, my thanks go to Roger F. Cressey, Jr., for preliminary arrangements leading to the examination of the holotype of *Acanthephyra kingsleyi*, to Brian Kensley for his assistance in expediting the opportunity to study the exceptional material of *Kemphyra* in the South African Museum and for reviewing the manuscript, to Lilly King Manning for assistance with the preparation of the illustrations in this report, to Marian H. Pettibone for translating Russian literature on the Oplophoridae, and, finally, to Horton H. Hobbs, Jr., Raymond B. Manning, and Austin B. Williams for continuing technical assistance and encouragement.

*OPLOPHORIDAE Dana, 1852

OPLOPHORINAE Dana, 1852:18, 27.

DIAGNOSIS.—Rostrum immovably attached to remainder of carapace, otherwise variable; antennular flagella simple, without accessory branches; mandible with palp, molar and incisor processes not deeply separated; 3rd maxilliped elongate, not unusually expanded, 5-segmented, bearing well-developed exopod; all pereopods with well-developed exopod, 3 anterior pairs, at least, bearing straplike epipod with endpiece extending perpendicularly into branchial chamber, 2 anterior pairs with well-developed chela and undivided carpus, 3 posterior pairs not unusually long, carpus shorter than propodus; pleopods bearing appendices interna; probably all species capable of some form of bioluminescence (Herring, 1976:1041).

RANGE.—Cosmopolitan; usually mesopelagic, with nocturnal migration toward surface, except

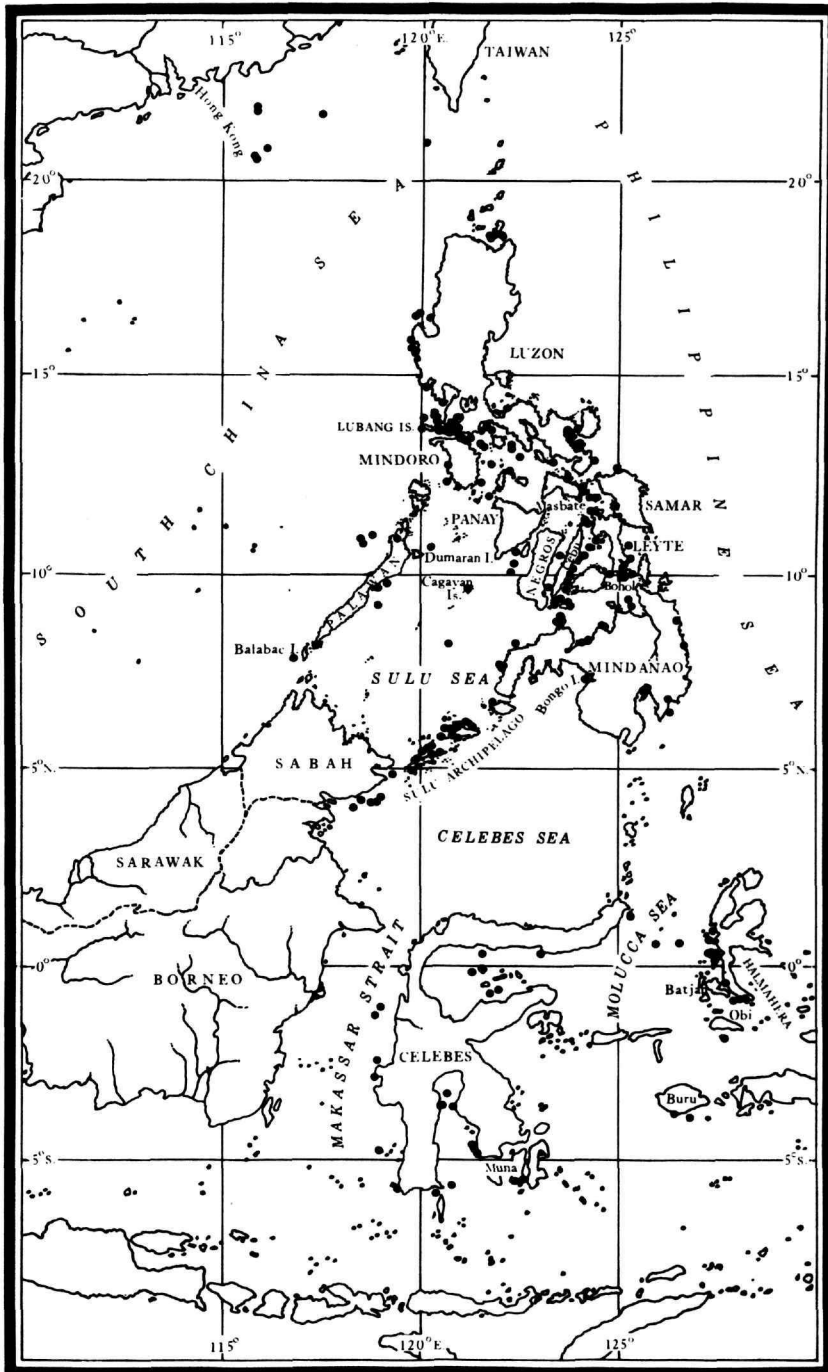


FIGURE 1.—The Philippines and central Indonesia, showing the positions of the more than 330 *Albatross* offshore stations at which caridean shrimps were collected.

5–7 species apparently benthic as adults in 315–5300 m.

CLASSIFICATION.—Keys to all of the approximately 61 oplophorid species currently recognized represent one final attempt to understand the relationships in this family that has held my attention sporadically for more than 50 years. In that endeavor, I have concentrated on features that were found to be somewhat variable during that study. The characters that seemed most promising generically were (1) the somital distribution of dorsomesial carinae on the abdomen, (2) the form of the posterior extremity of the telson, (3) the form of the eye, especially the comparative diameter of the cornea, (4) the structure and bilateral symmetry of the incisor and molar processes of the mandibles, (5) the form of the proximal endite of the second maxilla, (6) the configuration of the lateral lobe and the segmentation of the slender central lobe of the first maxilliped, (7) the shape of the terminal segment of the second maxilliped, (8) the width and flexibility of the exopod on the third maxilliped and anterior pairs of pereopods, (9) the number of pairs of pereopods with a straplike epipod, (10) the presence or absence, comparative length, and setation of the appendix masculina on the second pleopod of the male, and (11) the size and number of eggs produced by the female.

The unusual construction of the molar process of the mandibles in *Oplophorus* and *Systellaspis* suggested the possibility of restricting the earliest family name to these two genera and restoring the name Acanthephyridae Bate, 1888, for the other genera, but it seems unlikely that this one character is more important than any of the others that are shared with one or more of the remaining genera, such as the absence of a dorsal carina and posteromesial tooth on the sixth abdominal somite, a nearly complete epipod on the fourth pair of pereopods, and eggs of large size and few in number. Also, one wonders if the unusual form of the molar process of the mandible is more important than the similarly unusual partially unarmed incisor process, a char-

acter that is restricted to *Ephyrina*, *Meningodora*, and *Notostomus*. The nonexistence of a deep separation between the incisor and molar processes of the mandible, the presence of well-developed exopods on all of the pereopods, and the perpendicular terminal extension of the epipods combine to distinguish the genera here assigned to the Oplophoridae from all other caridean shrimps except for the genus *Procaris* Chace and Manning, 1972 (the Procarididae differ from the Oplophoridae and all other caridean families by having the third maxilliped composed of seven distinct segments and none of the pereopods chelate or subchelate). It hardly seems desirable to consider the establishment at this time of other supergeneric categories within or collateral with such a tenable grouping as this family.

The analysis here attempted failed to indicate the feasibility of subdividing the possibly polyphyletic genus *Acanthephyra*. I had hoped that it might support the restoration of *Bentheocaris* Bate, 1888, for those species of *Acanthephyra* that resemble *Meningodora* in having a thin, sometimes membranous integument and a sharp lateral carina extending onto the posterior half of the carapace but that differ from the latter genus in having the incisor process of the mandible dentate throughout the extent of the opposable margin. There was no evidence from the survey of the other characters, however, that the species considered for transfer from *Acanthephyra* to *Bentheocaris* represent a homogeneous assemblage.

The study did suggest, however, that three species—*Acanthephyra microphthalmia*, *Notostomus corallinus* (= *Acanthephyra valdiviae*), and *Oplophorus spinicauda* (= *O. foliaceus* and *Acanthephyra anomala*)—are so different from other members of the genera to which they have been assigned that a more logical arrangement could be achieved by transferring those species to three new monotypic genera, thereby raising the count of oplophorid genera to 10. Some consideration was also given to the possibility of restoring *Meningodora* to its original monotypic status and proposing a distinct genus for the four species pre-

sumably incorporated in *Meningodora* by Holthuis (1955:13) and Sivertsen and Holthuis (1956:12), but that idea has been abandoned for

the time being (see "Classification" under *Meningodora* below).

Key to the Genera of Oplophoridae

1. Abdomen carinate in dorsal midline of 4 posterior somites at least; eggs small to medium-sized and numerous (more than 80)2
 Abdomen not carinate in dorsal midline of 6th somite; eggs large and few (less than 50)6
2. Carapace usually without uninterrupted lateral carina extending from near orbit to near posterior margin, posterior margin of hepatic furrow usually not abruptly delimited by oblique carina; mandible with incisor process dentate over entire extent of opposable margin3
 Carapace with continuous lateral carina extending from near orbit to near posterior margin, posterior margin of hepatic furrow abruptly delimited by oblique carina; mandible with incisor process unarmed for about 1/2 of opposable margin nearest palp.5
3. Carapace bearing hepatic spine and 3 sharp carinae on posterior 1/2 of lateral surface *Kemphyra*
 Carapace without hepatic spine, with only 2 carinae, at most, on posterior 1/2 of lateral surface4
4. Rostrum with at least as many dorsal as ventral teeth; abdomen with 4th and 5th somites usually armed with posteromesial tooth (if not, tooth on 3rd somite less than 1/4 as long as 4th somite and cornea wider than eyestalk in lateral aspect, not including papilla); left mandible with incisor process not tapering sharply toward opposable margin, armed with 9-14 subacute teeth *Acanthephyra*
 Rostrum with fewer dorsal than ventral teeth; abdomen with posteromesial tooth on 3rd somite slender and overreaching 4th somite, 4th and 5th somites without posteromesial tooth; cornea little more than 1/2 as wide as maximum width of eyestalk; left mandible with incisor process tapering sharply toward opposable margin, armed with 6 blunt teeth *Heterogenys*
5. Carapace with single lateral longitudinal carina, dorsal margin not denticulate on posterior 3/4 of length; abdomen without median dorsal carina on 1st somite *Meningodora*
 Carapace with more than 1 lateral longitudinal carina, dorsal margin denticulate over nearly entire length; abdomen dorsally carinate in midline on every somite *Notostomus*
6. Fourth pereopod with epipod vestigial or absent7
 Fourth pereopod with epipod well-developed except for vertical component8
7. Rostrum laterally compressed into anteriorly truncate, dorsally unarmed crest; cornea at least as wide as eyestalk, darkly pigmented; 1st maxilliped with slender central lobe subdivided by 2 distinct transverse

- sutures; pereopods with ischium and merus unusually wide and compressed **Ephyrina*
- Rostrum not forming thin, high crest, armed with dorsal teeth; cornea narrower than eyestalk, lightly pigmented; 1st maxilliped with slender central lobe subdivided by only 1 distinct transverse suture; pereopods not usually wide or compressed *Hymenodora*
8. Abdomen with 2nd somite armed with long, carinate posteromesial spine, 5th somite unarmed; mandibles with molar process reduced to small, subtriangular excavation on proximal margin of appendage, not opposing nearly identical structure on other member of pair; 1st maxilliped with slender central lobe subdivided by only 1 transverse suture; no appendix masculina on 2nd pleopod of male **Janicella*
- Abdomen with 2nd somite unarmed, 5th somite with posteromesial tooth, sometimes small; mandibles with molar process composed of deep channel flanked by rather high, thin walls opposing similar structure on other member of pair; 1st maxilliped with slender central lobe subdivided by 2 transverse sutures; appendix masculina on 2nd pleopod of male much longer than appendix interna 9
9. Abdomen with 6th somite shorter than 5th (not including posteromesial spine); telson simply pointed posteriorly, not terminating in spinose endpiece; 3rd maxilliped and 1st pereopod with broadly compressed, rigid exopods **Oplophorus*
- Abdomen with 6th somite nearly twice to more than twice as long as 5th (not including posteromesial spine); telson terminating posteriorly in spinose endpiece flanked at base by pair of long lateral spines; 3rd maxilliped and 1st pereopod with exopods neither broadly compressed nor rigid **Systellaspis*

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

FIGURES 2-14

Acantheephyra A. Milne-Edwards, 1881b:12. [Type-species, by original designation: *Acantheephyra armata* A. Milne-Edwards, 1881b:12; gender: feminine.]

DIAGNOSIS.—Rostrum with at least as many dorsal as ventral teeth; carapace not denticulate dorsally, usually without uninterrupted lateral carina extending from near orbit to near posterior margin, without hepatic spine, posterior slope of hepatic furrow usually not abruptly delimited by oblique carina; abdomen dorsally carinate on at least 3rd through 6th somites; telson superficially blunt or subtruncate posteriorly, not tapering regularly to sharply acute posterior end, without spinose endpiece; antennal scale without

lateral teeth proximal to distolateral spine; mandibles dissimilar, molar process with transverse distal surface triangular on right member, compressed, sub-bilinear on left, incisor process toothed along entire opposable margin; 2nd maxilla with proximal endite bearing papilla and submarginal lamina; 1st maxilliped with slender central lobe subdivided by 2 transverse sutures; 2nd maxilliped with distal segment subtriangular, attached diagonally to preceding joint; 3rd maxilliped and 1st pereopod with exopods not unusually broad or rigid; pereopods with ischium and merus not broadly compressed, 4th pair with epipod vestigial or absent; appendix masculina present on 2nd pleopod of males; eggs small to medium-sized and numerous (more than 80).

RANGE.—Like that of the family, all tropical and temperate seas and some subarctic and

subantarctic regions; usually mesopelagic, with nocturnal migration toward the surface, except for four to six species that are apparently benthic as adults in 315–5300 m.

CLASSIFICATION.—As understood herein, the

probably polyphyletic genus *AcanthePHYra* currently encompasses the 27 species incorporated in the following key; 14 of the species are now known from the Philippine-Indonesian region.

Key to the Species of *AcanthePHYra*

1. Carapace without strong longitudinal ridge or carina on posterior ½ of lateral surface 2
 Carapace with at least 1 well-marked ridge or sharp carina on posterior ½ of lateral surface 20
2. Carapace strongly carinate throughout length of dorsal midline 3
 Carapace without prominent carina on at least posterior ⅓ of dorsal midline 5
3. Carapace dorsally sinuous in lateral aspect; abdomen without carina in dorsal midline of 1st somite *6. *A. eximia*
 Carapace regularly slightly convex in lateral aspect; abdomen carinate in at least posterior ½ of dorsal midline of 1st somite 4
4. Rostrum not extending anteriorly as far as distal end of antennal scale; abdomen carinate in entire dorsal midline of 1st somite; telson sulcate in dorsal midline 1. *A. acutifrons*
 Rostrum usually overreaching antennal scale; abdomen with carina in dorsal midline of 1st somite restricted to posterior ½; telson with indistinct ridge in dorsal midline, not sulcate *3. *A. carinata*
5. Telson with blunt ridge in anterior part of dorsal midline 6
 Telson flattened or sulcate in dorsal midline 7
6. Carapace without carina supporting branchiostegal spine; abdomen with posterior margin of 3rd somite distinctly excavate either side of posteromedian tooth *2. *A. armata*
 Carapace with strong carina extending from branchiostegal spine to branchial region; abdomen with posterior margin of 3rd somite not distinctly excavate either side of posteromedian tooth *7. *A. fimbriata*
7. Integument thin, body consequently soft; rostrum unarmed ventrally 8
 Integument not very thin, body firm; rostrum with 1 or more teeth on ventral margin 10
8. Carapace with branchiostegal spine buttressed by long, carina-like ridge; abdomen without posteromedian tooth on 3rd somite 11. *A. rostrata*
 Carapace without carina-like ridge supporting branchiostegal spine; abdomen with posteromedian tooth on 3rd somite 9
9. Carapace dorsally sinuous in lateral aspect; abdomen with large, fleshy

- posteromedian tooth on 3rd somite overreaching 4th somite
 *A. brevirostris* Smith, 1885:504
 (Southwestern Indian Ocean, eastern
 tropical Pacific, and North and
 South Atlantic; 1200–5300 m)
- Carapace nearly straight dorsally in lateral aspect; abdomen with posteromedian tooth on 3rd somite short, not large and fleshy
 *A. tenuipes* (Bate, 1888:836)
 (Western Indian Ocean and Coral
 Sea; probably mesopelagic)
10. Rostrum armed ventrally with 1 or 2 teeth; carapace with strong carina extending at least halfway from branchiostegal spine to branchial region 11
 Rostrum armed ventrally with more than 2 teeth; carapace with branchiostegal spine buttressed, if at all, by short carina extending less than halfway to branchial region 13
11. Branchiostegal spine buttressed by carina reaching posteriorly no more than $\frac{3}{5}$ of distance to end of hepatic groove
 *A. brevicarinata* Hanamura, 1984
 (Eastern Pacific from Gulf of California to Golfo
 de Panama and westward to 120° W; mesopelagic)
- Branchiostegal spine buttressed by carina reaching posteriorly to end of hepatic groove 12
12. Rostrum less than $\frac{1}{2}$ as long as carapace, armed dorsally with 6–10 teeth *5. *A. curtirostris*
 Rostrum more than $\frac{3}{4}$ as long as carapace, armed dorsally with 11–13 teeth *9. *A. media*
13. Carapace with short, sharp carina supporting branchiostegal spine . . 14
 Carapace with branchiostegal spine supported, if at all, by rounded ridge 17
14. Telson armed with 4 pairs of dorsolateral spines 15
 Telson armed with 7–19 pairs of dorsolateral spines 16
15. Abdomen with posteromedian tooth on 4th somite
 *10. *A. quadrispinosa*
 Abdomen lacking posteromedian tooth on 4th somite
 *A. purpurea* A. Milne-Edwards, 1881a:933
 (North Atlantic north of 20° N; mesopelagic)
16. Telson armed with 7–11 pairs of dorsolateral spines
 *A. pelagica* (Risso, 1816:91)
 It is possible that Risso's name should be assigned to the other Mediterranean species of the genus (see *A. eximia*, "Remarks"); if so, this species should be known as *A. haeckelii* (Von Martens, 1868).]
 (North Atlantic north of 13° N, Mediterranean, and, perhaps, panantarctic north to 24° S; mesopelagic) [The name
A. sica Bate, 1888, has been restored by Burukovsky and
 Romensky (1982:1799) for the southern form of
 this shrimp, in which the carapace may be

- more distinctly and extensively carinate in the dorsal midline than it is in the North Atlantic variety.]
- Telson armed with 13–19 pairs of dorsolateral spines
- *A. acanthitelsonis* Bate, 1888:745
(Central and South Atlantic between 14° N and 28° S; mesopelagic)
17. Telson armed with 3 pairs of dorsolateral spines 18
Telson armed with 4–6 pairs of dorsolateral spines 19
18. Abdomen with posteromedian tooth of 3rd somite much larger than that of 4th, 6th somite twice as long as posterior height
- *A. trispinosa* Kemp, 1939:577
(Eastern Pacific between 7° N and 4° S, westward to 116° W; mesopelagic)
- Abdomen with posteromedian tooth of 3rd somite not much larger than that of 4th, 6th somite no more than 1½ times as long as posterior height 14. *A. smithi*
19. Abdomen with posteromedian tooth on 4th and 5th somites; telson armed with 4 pairs of dorsolateral spines *12. *A. sanguinea*
Abdomen with 4th and 5th somites unarmed posteriorly; telson armed with 5 or 6 pairs of dorsolateral spines *A. kingsleyi* Bate, 1888:751
(Central Atlantic from 17° N to 18° S; mesopelagic)
20. Carapace carinate on posterior ¼ of dorsal midline 21
Carapace rounded, not carinate, on posterior ¼ of dorsal midline . . 23
21. Carapace with dorsal carina interrupted by cervical groove; abdomen without posteromedian tooth on 3rd somite 13. *A. sibogae*
Carapace without distinct cervical groove, dorsal carina continuous; abdomen with posteromedian tooth on 3rd somite 22
22. Rostrum not nearly overreaching antennal scale, armed ventrally with 1 (rarely 2) teeth; abdomen rounded, not carinate, in dorsal midline of 2nd somite *A. chacei* Krygier and Forss, 1981:96
(Northeastern Pacific between 44° and 46° N; mesopelagic between 1500 and 2400 meters)
- Rostrum overreaching antennal scale, armed ventrally with 4–7 teeth; abdomen sharply carinate on dorsal midline of 2nd somite
- *A. faxoni* Calman, 1939:191
(Western Indian Ocean and eastern tropical Pacific; probably mesopelagic)
23. Carapace without carina supporting branchiostegal spine 24
Carapace with strong carina extending from branchiostegal spine to posterior branchial region 25
24. Abdomen without carina on dorsal midline of 2nd somite, posterodorsal tooth on 3rd somite low and offset to left
- *A. gracilipes* Chace, 1940:149
(North Atlantic between 28° and 32° N; mesopelagic)
- Abdomen carinate in dorsal midline of 2nd somite, posterodorsal tooth on 3rd somite high and not offset to either side

- *A. prionota* Foxton, 1971:35
 (Probably pantropical between 23°N and 18°S;
 mesopelagic in 700–1300 meters)
25. Carapace with 2 lateral carinae, one (interrupted) originating posterior to orbit, other at branchiostegal spine; eyestalk bearing bluntly triangular papilla directed dorsomesially, not reaching nearly as far as distal surface of cornea *8. *A. indica*
 Carapace with single lateral carina originating at branchiostegal spine; eyestalk bearing elongate dorsomesial papilla directed distally, reaching nearly as far as distal surface of cornea 26
26. Rostrum with "ventral" margin vertical except for horizontal acuminate tip; telson armed with 4 pairs of dorsolateral spines *4. *A. cucullata*
 Rostrum with "ventral" margin oblique except for acuminate tip directed anteroventrad; telson armed with 3 pairs of dorsolateral spines
 *A. stylostratis* (Bate, 1888:729)
 (Off South Africa, central South Pacific, and North Atlantic, including Gulf of Mexico, between 0° and 40°N; mesopelagic)

1. *AcanthePHYra acutifrons* Bate, 1888

FIGURES 2b, 4b, 5b

AcanthePHYra acutifrons Bate, 1888:749 [in part], pl. 126: fig. 3 [type-locality, restricted by Kemp (1906:20): off Kepulauan Aru, Indonesia; 5°41'S, 134°04'30"E; 1463 m].—Chace, 1940:146, fig. 23.

DIAGNOSIS.—Integument thin but not membranous; rostrum slightly less than 1/2 as long as carapace, not reaching level of distal end of antennal scale, ventral margin oblique, armed with 1 tooth; carapace with dorsal margin carinate over nearly entire length, nearly straight, not interrupted by cervical groove, branchiostegal spine buttressed by very short, blunt carina, suprbranchial ridge perceptible but little elevated; abdomen dorsally carinate on all 6 somites, with posteromesial tooth on posterior 4, 3rd somite with posterior margin rather deeply excavate either side of median tooth, 6th somite about 1 1/2 times as long as posterior height; telson shallowly sulcate in dorsal midline, with 5 or 6 pairs of inconspicuous dorsolateral spines; eyestalk bearing small papilla barely reaching juncture with cornea; maximum carapace length 55 mm.

RANGE.—Material in the Smithsonian collections (USNM) indicates that *A. acutifrons* occurs in the Indian Ocean and Indonesia and in the tropical and subtropical Atlantic, both western and eastern; both adults and juveniles are mesopelagic, at least part of the time.

*2. *AcanthePHYra armata* A. Milne-Edwards, 1881

FIGURES 2c, 4c, 5b, 6b, 8b, 11

AcanthePHYra armata A. Milne-Edwards, 1881b:12 [type-locality: off St. Lucia, Lesser Antilles, 772 m].—Bate, 1888:744, pl. 125: fig. 2.

DIAGNOSIS.—Integument firm; rostrum 3/4–1 1/2 times as long as carapace, overreaching antennal scale, ventral margin convex, armed with 1 tooth; carapace with dorsal margin carinate, very obscurely so on posterior 1/4, nearly straight, not interrupted by cervical groove, branchiostegal spine buttressed by variably sharp carina extending posteriorly little more than length of spine, suprbranchial ridge distinct, sharp subbranchial carina near ventral margin of carapace;



FIGURE 2.—Extensor (ventral) surfaces of incisor and molar processes of right mandibles of species of *Acanthephyra*: a, *A. acanthitelsonis*, male [25.1 mm], Pillsbury sta 21, off Ghana; b, *A. acutifrons*, ovigerous female [48.0 mm], Albatross sta 2384, Gulf of Mexico; c, *A. armata*, male [30.0 mm], Oregon sta 640, Gulf of Mexico; d, *A. brevicarinata*, male [22.0 mm], Albatross sta 3010, Gulf of California; e, *A. brevirostris*, male [23.7 mm], Albatross sta 2566, east of Chesapeake Bay; f, *A. carinata*, male [36.2 mm], Albatross sta 5524, Mindanao Sea; g, *A. chacei*, male paratype [25.2 mm], Wecoma cruise 7606B, sta NH65, haul 2361, bkt 3, west of Yaquina Head, Oregon; h, *A. cucullata*, male [14.0 mm], Alpha Helix sta 71, Banda Sea; i, *A. curtirostris*, male [17.0 mm], Alpha Helix sta 61, Banda Sea; j, *A. eximia*, male [39.2 mm], Albatross sta 5603, Teluk Tomini, Celebes; k, *A. faxoni*, male [13.4 mm], Albatross sta 4653, off Peru; l, *A. fimbriata*, male [37.2 mm], Albatross sta 5495, Mindanao Sea.



FIGURE 3.—Extensor (ventral) surfaces of incisor and molar processes of right mandibles of species of *Acantheephyra*: a, *A. gracilipes*, female [13.0 mm], *Atlantis II* sta RHB1421, east of Bahia, Brazil; b, *A. indica*, male [8.0 mm], *Alpha Helix* sta 87, Banda Sea; c, *A. kingsleyi*, male [19.7 mm], *Pillsbury* sta 265, Gulf of Guinea; d, *A. media*, male [21.0 mm], *Albatross* sta 5628, Selat Patinti, Halmahera; e, *A. pelagica*, male [18.0 mm], off Messina, Sicily (R.B. Manning); f, *A. prionota*, male paratype [6.2 mm], *Discovery* sta 7089#32, north of Cape Verde Islands; g, *A. purpurea*, male [17.5 mm], *Chain* sta RHB2574, northeast of Madeira Islands; h, *A. quadrispinosa*, male [16.9 mm], *Albatross* sta 5618, west of Halmahera; i, *A. sanguinea*, male [16.0 mm], *Albatross* sta 5287, Verde Island Passage, Philippines; j, *A. sibogae*, male [14.0 mm], *Alpha Helix* sta 110, Banda Sea; k, *A. smithi*, male [17.0 mm], *Te Vega* sta 189, southwest of Maldive Islands; l, *A. stylostratis*, male [10.8 mm], *Knorr* sta 3126, east of Bermuda; m, *A. trispinosa*, male [13.8 mm], *Albatross* sta 3398, off Ecuador.

abdomen dorsally carinate on 5 posterior somites, rarely with faint ridge on anteriormost, 4 posterior somites with posteromesial tooth, 3rd somite with posterior margin rather deeply excavate either side of median tooth, 6th somite about $1\frac{1}{2}$ times as long as posterior height; telson

with strong rounded ridge in anterior $\frac{1}{2}$ of dorsal midline, with 3, rarely 4, pairs of small dorsolateral spines; eyestalk with slight elevation, but no true papilla, on mesial surface near juncture with cornea; maximum carapace length 44 mm.

MATERIAL.—PHILIPPINES. *Western end of Verde*

Island Passage, east of Lubang Islands: sta 5119; 13°45'05"N, 120°30'30"E; 720 m; green mud, sand; 6.5°C; 21 Jan 1908 (1324–1356); 12' Tanner beam trawl: 1♂ [30.0]. *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: 1♀ [42.8]; sta 5463; 13°40'57"N, 123°57'45"E; [549 m]; [sand]; 16 Jun 1909 (1028–1044); 12' Agassiz beam trawl, mud bag: 7♂ [14.1–40.8] 10♀ [11.9–36.0], 2 ovig [28.2, 36.0]. *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: 1♀ [30.0]. *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♂ [38.5] 1♀ [24.2].

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: 1♂ [25.3] 3♀ [26.8–30.9]; sta 5587; 4°10'35"N, 118°37'12"E; 759 m; green mud, sand, coral; 5.7°C; 28 Sep 1909 (1511–1532); 9' Tanner beam trawl, mud bag: 1♂ [30.1] 1 ovig ♂ [40.0]. *Makassar Strait west of Celebes*: sta 5667; 2°56'00"S, 118°47'30"E; 671 m; gray sand, mud; 5.4°C; 29 Dec 1909 (0955–1025); 12' Agassiz beam trawl: 1♂ [27.9] 1 ovig ♀ [35.0]. *Teluk Bone, Celebes*: sta 5656; 3°17'40"S, 120°36'45"E; 885 m; gray mud; 5.1°C; 19 Dec 1909 (0837–1842); 12' Agassiz beam trawl: 1♂ [30.0]. *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♂ [38.9] 1 ovig ♀ [36.1]. *Selat Butung, Celebes*: 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: 1♂ [43.5]. *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: 1♂ [34.8]; 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: 5♂ [27.8–32.0]; sta 5620; 0°21'30"N, 127°16'45"E; 655 m; gray mud; 28 Nov 1909

(0624–0645); 12' Agassiz beam trawl: 6♀ [21.1–35.0], 3 ovig [33.7–35.0].

RANGE.—This species seems to have been recorded from only three major parts of the world: the southwestern Indian Ocean off Zululand (Kensley, 1977:31), the Philippines and Indonesia, and the Gulf of Mexico and the West Indies. There is little doubt that it is a benthic species living on continental and, especially, insular slopes from 365–1570 meters.

*3. *Acanthephyra carinata* Bate, 1888

FIGURES 2f, 4f, 5f, 6e, 8e

Acanthephyra carinata Bate, 1888:748, pl. 126: fig. 2 [type-locality: Estrecho Sarmiento, southern Chile; 51°27'30"S, 74°03'00"W; 732 m].

Acanthephyra approxima Bate, 1888:755, pl. 126: fig. 8 [type-locality: same as above].

DIAGNOSIS.—Integument firm; rostrum variable in length, slightly more than ½ as long as carapace and slightly overreaching antennal scale in adults, ventral margin convex, armed with 1 tooth; carapace with dorsal margin sharply carinate throughout most of length, nearly straight, not interrupted by cervical groove, branchiostegal spine buttressed by variably sharp carina extending posteriorly little more than length of spine, suprbranchial ridge discernible but not prominent, 2 submarginal carinae below and extending somewhat beyond branchial region longitudinally; abdomen dorsally carinate on posterior ½ of 1st somite and on all 5 posterior somites, 4 posterior somites with posteromesial tooth, 3rd somite with posterior margin very little excavate either side of median tooth, 6th somite about 1¼ times as long as posterior height; telson with strong rounded ridge on anterior ½ of dorsal midline, with 3 barely visible pairs of dorsolateral spines; eyestalk with subrectangular prominence on mesial margin, but no true papilla; maximum carapace length 42 mm.

MATERIAL.—PHILIPPINES. *Batangas Bay, southern Luzon*: sta 5289; 13°41'50"N, 120°58'30"E; 315 m; broken shells, sand; 22 Jul 1908 (0925–

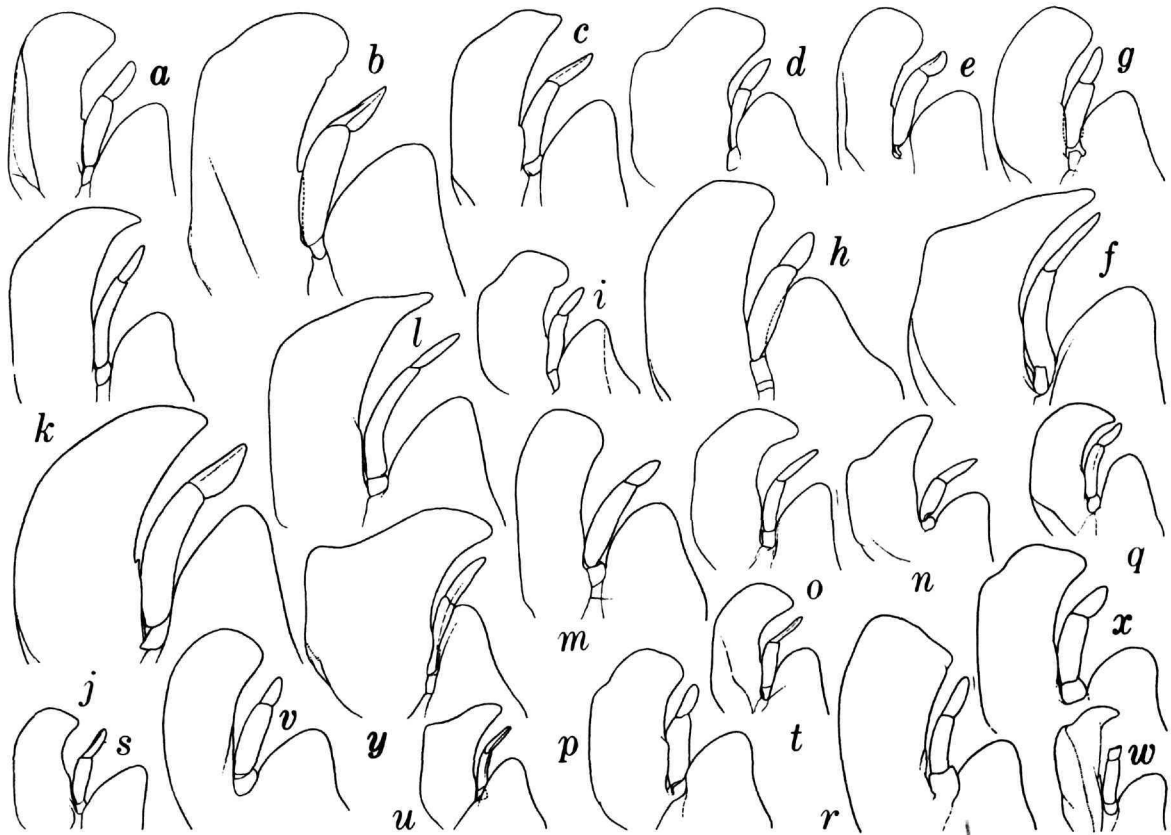


FIGURE 4.—Distal part of right 1st maxillipeds of species of *Acanthephyra*: a, *A. acanthitelsonis*, male [25.1 mm], Pillsbury sta 21, off Ghana; b, *A. acutifrons*, ovigerous female [48.0 mm], Albatross sta 2384, Gulf of Mexico; c, *A. armata*, male [30.0 mm], Oregon sta 640, Gulf of Mexico; d, *A. brevicarinata*, male [22.0 mm], Albatross sta 3010, Gulf of California; e, *A. brevirostris*, male [23.7 mm], Albatross sta 2566, east of Chesapeake Bay; f, *A. carinata*, male [36.2 mm], Albatross sta 5524, Mindanao Sea; g, *A. chacei*, male paratype [25.2 mm], Wecoma cruise 7606B, sta NH65, haul 2361, bkt 3, west of Yaquina Head, Oregon; h, *A. cucullata*, male [14.0 mm], Alpha Helix sta 71, Banda Sea; i, *A. curtirostris*, male [17.0 mm], Alpha Helix sta 61, Banda Sea; j, *A. eximia*, male [39.2 mm], Albatross sta 5603, Teluk Tomini, Celebes; k, *A. faxoni*, male [13.4 mm], Albatross sta 4653, off Peru; l, *A. fimbriata*, male [37.2 mm], Albatross sta 5495, Mindanao Sea; m, *A. gracilipes*, male [13.0 mm], Atlantis II sta RHB1421, east of Bahia, Brazil; n, *A. indica*, male [8.0 mm], Alpha Helix sta 87, Banda Sea; o, *A. kingsleyi*, male [19.7 mm], Pillsbury sta 265, Gulf of Guinea; p, *A. media*, male [21.0 mm], Albatross sta 5628, Selat Patinti, Halmahera; q, *A. pelagica*, male [18.0 mm], off Messina, Sicily (R.B. Manning); r, *A. prionota*, male paratype [6.2 mm], Discovery sta 7089#32, north of Cape Verde Islands; s, *A. purpurea*, male [17.7 mm], Chain sta RHB2574, northeast of Madeira Islands; t, *A. quadrispinosa*, male [16.9 mm], Albatross sta 5618, west of Halmahera; u, *A. sanguinea*, male [16.0 mm], Albatross sta 5287, Verde Island Passage, Philippines; v, *A. sibogae*, male [14.0 mm], Alpha Helix sta 110, Banda Sea; w, *A. smithi*, male [17.0 mm], Te Vega sta 189, southwest of Maldiv Islands; x, *A. stylostratis*, male [10.8 mm], Knorr sta 3126, east of Bermuda; y, *A. trispinosa*, male [13.8 mm], Albatross sta 3398, off Ecuador.

0945); 12' Agassiz beam trawl, mud bag: 1 juv [14.3]. *Verde Island Passage*: 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: 2♂ [15.2, 34.5] 1 juv [13.8]. *Tayabas Bay, southern Luzon*: 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♂ [31.2]. *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: 2♀ [34.0, 38.4]. *Masbate Pass, east of Masbate*: sta 5215; 12°31'30"N, 123°35'24"E; 1104 m; green mud; 10.3°C; 21 Apr 1908 (1027–1132); 12' Agassiz beam trawl, mud bag: 1♂ [37.9]. *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: 1♀ [31.0] 1 juv [12.5]; 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♂ [39.8]. *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: 3♂ [33.8–39.0]. *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♂ [35.9] 1 ovig ♀ [32.9]; sta 5529; 9°23'45"N, 123°39'30"E; 807 m; gray mud, globigerina; 11.7°C; 11 Aug 1909 (1644–1719); 12' Tanner beam trawl, mud bag: 3♂ [20.0–33.0]. *Western Mindanao Sea*: sta 5524; 8°58'07"N, 123°32'45"E; 658 m; sand; 11.6°C; 10 Aug 1909 (1306–1351); 12' Tanner beam trawl: 1♂ [36.2]. *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: 2 ovig ♀ [37.0, 38.8]. *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♀ [19.3].

INDONESIA. *Teluk Tomini, Celebes*: sta 5603; 0°24'00"N, 123°03'45"E; 1469 m; sand; 15

Nov 1909 (1312–1437); 12' Agassiz beam trawl: 1♂ [40.7].

RANGE.—Except for the holotypes of *A. carinata* and *A. approxima*, which were taken at the same *Challenger* station near the Pacific end of the Straits of Magellan, this species is known only from the Philippines and Indonesia, including the female with a carapace length of 29 mm taken west of Sumatra by the *Valdivia* (Bals, 1925:257). It is evidently a benthic species living in depths of 315–1469 meters.

REMARKS.—Calman (1939:193) was almost certainly correct in believing that *A. approxima* was described from an immature specimen of *A. carinata*. Such specimens as the former have a very different appearance from the adults because of the longer rostrum, but they agree in all other characters. In the smallest recognizable male in the *Albatross* collections, with a carapace length of 15.2 mm, the appendix masculina is little more than a bud; all specimens smaller than this have therefore been designated as juveniles.

*4. *Acanthephyra cucullata* Faxon, 1893

FIGURES 2h, 4h, 5h, 8g

Acanthephyra cucullata Faxon, 1893:206 [type-locality: northeast of Isla de Malpelo, Colombia; 4°56'00"N, 80°52'30"W; 3241 m]; 1895:167, pl. 44: figs. 1–16.

DIAGNOSIS.—Integument soft and membranous; rostrum very short, about $\frac{1}{8}$ as long as carapace, slightly overreaching anteriorly extended eyes, ventral margin nearly vertical, unarmed; carapace with high, sharp keel anteriorly becoming indistinct posteriorly and disappearing on posterior $\frac{1}{4}$ just behind cervical groove, nearly straight, with hardly perceptible depression at cervical groove, branchiostegal spine buttressed by long, sharp carina extending posteriorly to posterior branchial region, supra-branchial ridge fairly distinct; abdomen dorsally carinate on all but anterior somite, 4 posterior somites with posteromesial tooth, 3rd somite with posterior margin very little excavate either side of median tooth, 6th somite about $2\frac{1}{2}$ times

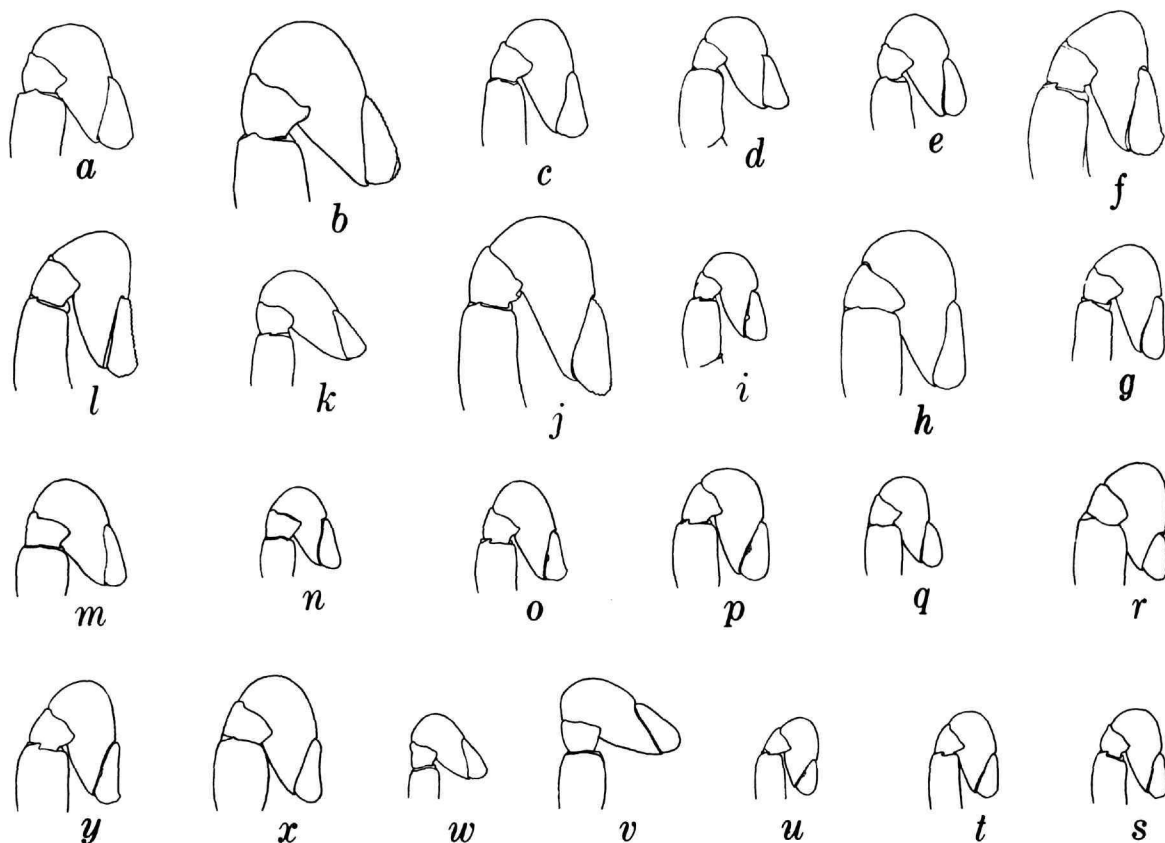


FIGURE 5.—Terminal segments of right 2nd maxillipeds of species of *Acantheephyra*: a, *A. acanthitelsonis*, male [25.1 mm], Pillsbury sta 21, off Ghana; b, *A. acutifrons*, ovigerous female [48.0 mm], Albatross sta 2384, Gulf of Mexico; c, *A. armata*, male [30.0 mm], Oregon sta 640, Gulf of Mexico; d, *A. brevicarinata*, male [22.0 mm], Albatross sta 3010, Gulf of California; e, *A. brevirostris*, male [23.7 mm], Albatross sta 2566, east of Chesapeake Bay; f, *A. carinata*, male [36.2 mm], Albatross sta 5524, Mindanao Sea; g, *A. chacei*, male paratype [25.2 mm], Wecoma cruise 7606B, sta NH65, haul 2361, bkt 3, west of Yaquina head, Oregon; h, *A. cucullata*, male [14.0 mm], Alpha Helix sta 71, Banda Sea; i, *A. curtirostris*, male [17.0 mm], Alpha Helix sta 61, Banda Sea; j, *A. eximia*, male [39.2 mm], Albatross sta 5603, Teluk Tomini, Celebes; k, *A. faxoni*, male [13.4 mm], Albatross sta 4653, off Peru; l, *A. fimbriata*, male [37.2 mm], Albatross sta 5495, Mindanao Sea; m, *A. gracilipes*, female [13.0 mm], Atlantis II sta RHB1421, east of Bahia, Brazil; n, *A. indica*, male [8.0 mm], Alpha Helix sta 87, Banda Sea; o, *A. kingsleyi*, male [19.7 mm], Pillsbury sta 265, Gulf of Guinea; p, *A. media*, male [21.0 mm], Albatross sta 5628, Selat Patinti, Halmahera; q, *A. pelagica*, male [18.0 mm], off Messina, Sicily (R.B. Manning); r, *A. prionota*, male paratype [6.2 mm], Discovery sta 7089#32, north of Cape Verde Islands; s, *A. purpurea*, male [17.7 mm], Chain sta RHB2574, northeast of Madeira Islands; t, *A. quadrispinosa*, male [16.9 mm], Albatross sta 5618, west of Halmahera; u, *A. sanguinea*, male [16.0 mm], Albatross sta 5287, Verde Island Passage, Philippines; v, *A. sibogae*, male [14.0 mm], Alpha Helix sta 110, Banda Sea; w, *A. smithi*, male [17.0 mm], Te Vega sta 189, southwest of Maldives Islands; x, *A. stylorostris*, male [10.8 mm], Knorr sta 3126, east of Bermuda; y, *A. trispinosa*, male [13.8 mm], Albatross sta 3398, off Ecuador.

as long as posterior height; telson sulcate in dorsal midline, with 4 pairs of dorsolateral spines; eyestalk with cylindrical papilla arising from mesial margin at juncture with cornea and extending distally nearly to level of distal surface of cornea; maximum carapace length 27 mm.

MATERIAL.—INDONESIA. *Teluk Bone, Celebes*: sta 5660; 5°36'30"S, 120°49'00"E; 1266 m; gray mud, sand; 4.0°C; 20 Dec 1909 (0914–1005); 12' Agassiz beam trawl: 1♀ [9.9].

RANGE.—Off eastern Africa, Maldiv Islands, Indonesia, and tropical American Pacific; meso-pelagic.

***5. *Acanthephyra curtirostris* Wood-Mason, 1891**

FIGURES 2i, 4i, 5i, 6g, 8h

Acanthephyra acutifrons Bate, 1888:749 [in part].

Acanthephyra curtirostris Wood-Mason, in Wood-Mason and Alcock, 1891:195 [type-locality: the type-series came from two localities in the Indian Ocean: Bay of Bengal off Andhra Pradesh; 16°55'41"N, 83°21'18"E, 1536 m; and Laccadive Sea off Elicalpeni Bank; 11°12'47"N, 74°25'30"E, 1829 m].—Wood-Mason and Alcock, 1892:364, fig. 5.

DIAGNOSIS.—Integument reasonably firm; rostrum less than 1/2 as long as carapace, not

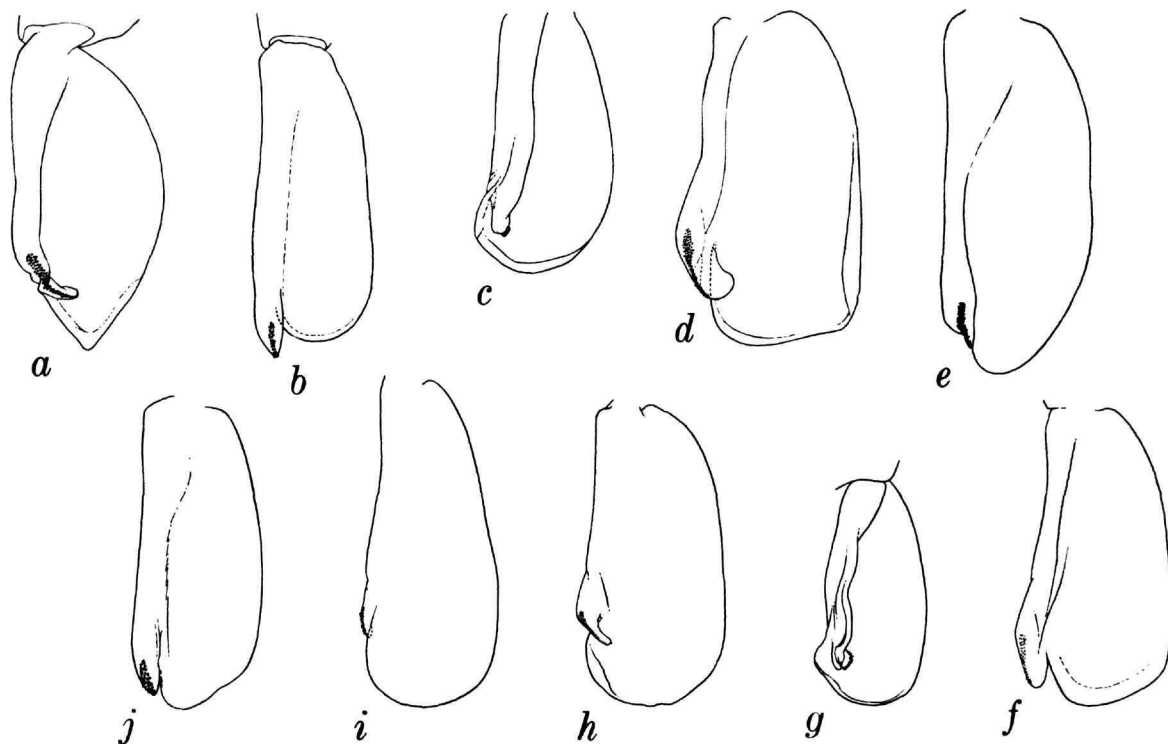


FIGURE 6.—Endopods of male right 1st pleopods of species of *Acanthephyra*: a, *A. acanthitelsonis* [25.1 mm], Pillsbury sta 21, off Ghana; b, *A. armata* [30.0 mm], Oregon sta 640, Gulf of Mexico; c, *A. brevicarinata* [22.0 mm], Albatross sta 3010, Gulf of California; d, *A. brevirostris* [23.7 mm], Albatross sta 2566, east of Chesapeake Bay; e, *A. carinata* [36.2 mm], Albatross sta 5524, Mindanao Sea; f, *A. chacei*, paratype [25.2 mm], Wecoma cruise 7606B, sta NH65, haul 2361, bkt 3, west of Yaquina Head, Oregon; g, *A. curtirostris* [14.7 mm], Alpha Helix sta 81, Banda Sea; h, *A. eximia* [39.2 mm], Albatross sta 5603, Teluk Tomini, Celebes; i, *A. faxoni* [13.4 mm], Albatross sta 4653, off Peru; j, *A. fimbriata* [37.2 mm], Albatross sta 5495, Mindanao Sea.

nearly reaching end of antennal scale, ventral margin oblique, armed with 1 tooth; carapace rounded, not carinate, on posterior 1/2 of dorsal midline, nearly straight, with hardly perceptible depression at cervical groove, branchiostegal spine buttressed by carina extending posteriorly to branchial region, suprbranchial ridge fairly distinct; abdomen dorsally carinate on all but anterior somite, 4 posterior somites with posteromesial tooth, 3rd somite with posterior margin slightly excavate either side of median tooth, 6th somite about 2 1/3 times as long as posterior height; telson slightly sulcate in anterior 1/2 of dorsal midline, with 6 or more pairs of dorsolateral spines; eyestalk with acute papilla arising from mesial margin at juncture with cornea and directed distad but not nearly reaching level of distal surface of cornea; maximum carapace length about 20 mm.

MATERIALS.—PHILIPPINES. *South China Sea off western Luzon*: sta 5437; 15°45'54"N, 119°42'45"E; 8 May 1909 (1207–1256); 3-meter open net towed horizontally at 823 m: 1y♂ [7.8]. *Lagonoy Gulf, east of southern Luzon*: sta 5471; 13°34'57"N, 123°47'06"E; 1039 m; 19 Jun 1909 (0917–0946); 12' Agassiz beam trawl: 1♂ [19.8] 1♀ [16.3]. *Northern Palawan Passage*: 10°46'40"N, 118°29'E; 942 m; gray mud; 27 Dec 1908 (1610–1714); 12' Tanner beam trawl: 1♀ [11.0].

INDONESIA. *Teluk Tomini, Celebes*: sta 5607; 0°04'00"S, 121°36'00"E; 1392 m; fine sand; 18 Nov 1909 (0920–0940); 12' Agassiz beam trawl: 1♀ [19.0]. *Off southern Buru*: sta 5638; 3°47'15"S, 126°23'40"E; 946 m; fine gray sand; 10 Dec 1909 (1400–1436); 12' Agassiz beam trawl: 1♀ [13.3].

RANGE.—*Acantheephyra curtirostris* has been recorded from lower latitudes around the world to nearly 51°N in the eastern Pacific (Butler, 1980:62), but the recognition by Hanamura (1984) of a distinct species (*A. brevicarinata*) in the eastern tropical Pacific and that author's observation (1984:69) that specimens recorded from the northeastern Pacific are larger and produce more than three times as many eggs

than specimens of *A. curtirostris* from Hawaii may suggest the existence of a species complex, similar to the one centered about *A. purpurea*, of which typical *A. curtirostris* and *A. media* may represent the extremes. It is not clear from Hanamura (1983:53, 54, 74) whether he believes that the true *A. curtirostris*, as well as *A. brevicarinata*, occurs in the far eastern Pacific, but it would seem that he does. Although only one of the *Albatross* specimens was taken in a midwater net, the species is almost certainly mesopelagic, probably in depths of 190 to more than 1500 m; Krygier and Percy (1981:81) noted that there was no indication of diurnal vertical migration in the northeastern Pacific population.

*6. *Acantheephyra eximia* Smith, 1884

FIGURES 2j, 4j, 5j, 6h, 9a

[?] *Alpheus Pelagicus* Risso, 1816:91, pl. 2: fig. 7 [type-locality: "sur le grand banc de calcaire compacte, qui traverse, de l'est à l'ouest, la mer de Nice . . . dans les grande profondeur de notre mer."].

Acantheephyra eximea Smith, 1884:376 (*eximia* on p. 377) [type-locality: off Cape Hatteras, North Carolina; 35°09'50"N, 74°57'40"W; 1716 m]; 1886b:63[667], pl. 14: fig. 1.

Acantheephyra angusta Bate, 1888:737, pl. 124: fig. 6 [type-locality: off Kepulauan Banda, Indonesia; 4°34'00"S, 129°57'30"E; 366 m].

Acantheephyra edwardsii Bate, 1888:747, pl. 126: fig. 1 [type-locality: off Aracaju, Brazil; 10°46'S, 36°08'W; 1408 m].

Acantheephyra brachytelsonis Bate, 1888:753, pl. 126: fig. 7 [type-locality: the *Challenger* material was taken at eight widely separate stations: near Kepulauan Talaud, 914 m, and off Kepulauan Banda, 366 m, Indonesia; Sagami Nada, Japan, 631 and 1417 m; off the Kermadec Islands, South Pacific, 951, 1097, and 1152 m; and the western South Atlantic east of Peninsula Valdís, Argentina, 3731 m].

[?] *Acantheephyra pulchra* A. Milne-Edwards, 1890:163 [type-locality: off Monaco (1650 m)].

Acantheephyra eximia.—Crosnier and Forest, 1973:34, fig. 7c–d.

DIAGNOSIS.—Integument reasonably firm; rostrum very variable in length, in adults usually about 1/5 as long as carapace and often overreaching antennal scale, ventral margin convex, armed

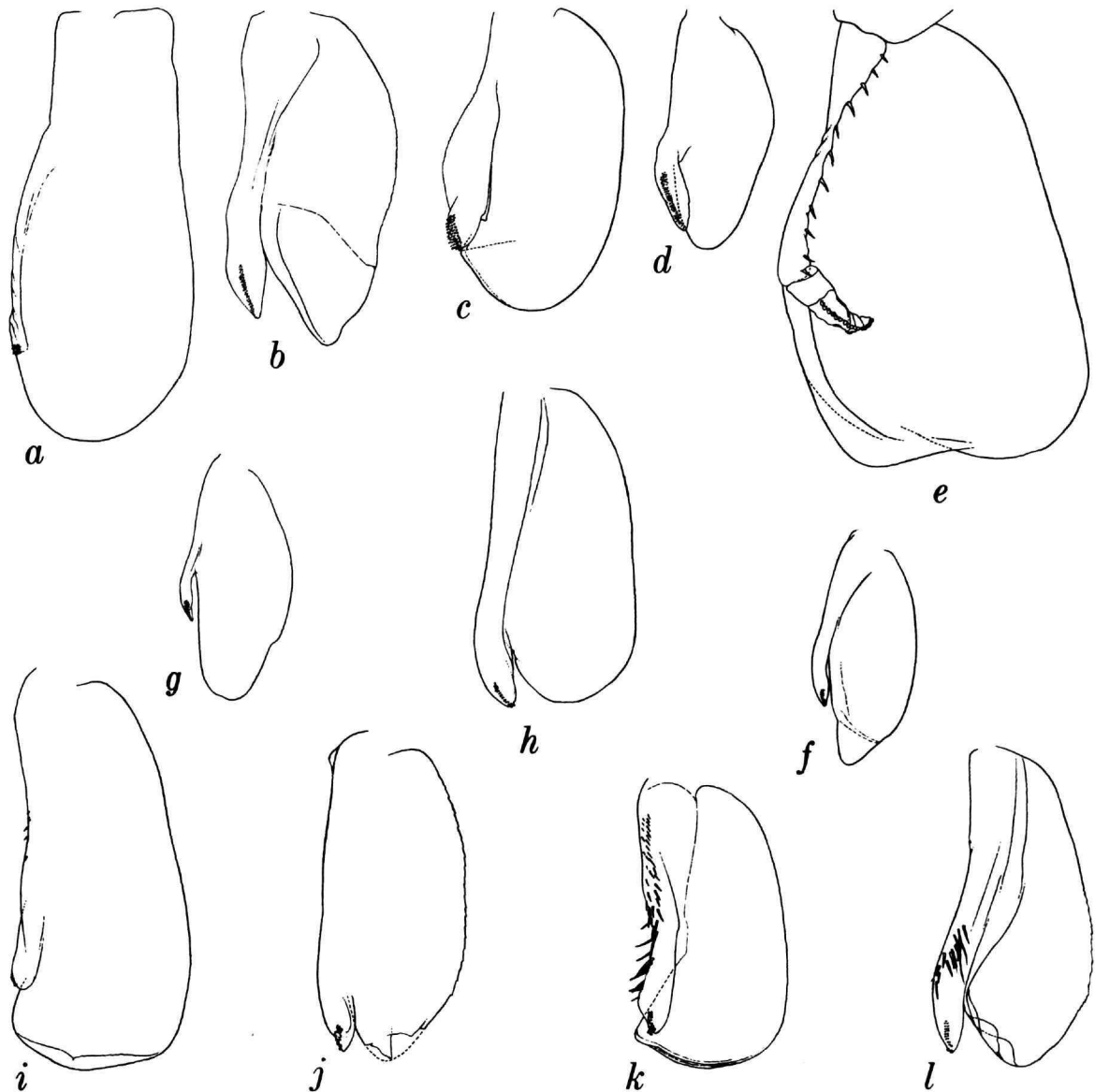


FIGURE 7.—Endopods of male right 1st pleopods of species of *Acanthephyra*: a, *A. indica* [8, 0 mm], *Alpha Helix* sta 87, Banda Sea; b, *A. kingsleyi* [18.0 mm], *Pillsbury* sta 269, Gulf of Guinea; c, *A. media* [21.0 mm], *Albatross* sta 5628, Selat Patinti, Halmahera; d, *A. pelagica* [19.2 mm], *Atlantis II* sta RHB1859, Mediterranean Sea; e, *A. prionota* paratype [6.2 mm], *Discovery* sta 7089#32, north of Cape Verde Islands; f, *A. purpurea* [17.7 mm], *Chain* sta RHB2574, northeast of Madeira Islands; g, *A. quadrispinosa* [16.9 mm], *Albatross* sta 5618, west of Halmahera; h, *A. sanguinea* [16.8 mm], *Te Vega* sta 189, southwest of Maldive Islands; i, *A. sibogae* [14.0 mm], *Alpha Helix* sta 110, Banda Sea; j, *A. smithi* [17.0 mm], *Te Vega* sta 189, southwest of Maldive Islands; k, *A. stylostratis* [10.8 mm], *Knorr* sta 3126, east of Bermuda; l, *A. trispinosa* [13.8 mm], *Albatross* sta 3398, off Ecuador.

with 1–5, usually 3, teeth; carapace with dorsal margin sharply carinate throughout most of length, usually distinctly sinuous in lateral aspect, branchiostegal spine without distinct buttress, suprabranchial ridge distinct; abdomen dorsally carinate on all but anterior somite, 4 posterior somites with posteromesial tooth, 3rd somite with posterior margin slightly excavate either side of median tooth, 6th somite at least 1½ times as long as posterior height; telson with moderate ridge in anterior ⅓ of dorsal midline, with 3–5, usually 4, pairs of dorsolateral spines; eyestalk with blunt projection arising from mesial margin; maximum carapace length 41 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: 2♂ [17.0, 21.8].

PHILIPPINES. *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♂ [25.0]. *Western end of Verde Island Passage, east of Lubang Islands*: sta 5119; 13°45'05"N, 120°30'30"E; 720 m; green mud, sand; 6.5°C; 21 Jan 1908 (1324–1356); 12' Tanner beam trawl: 1♀ [20.0]. *Western end of Verde Island Passage, north of Mindoro*: sta 5286; 13°38'15"N, 120°34'20"E, 823 m; gray sand, mud; 5.8°C; 20 Jul 1908 (1231–1309); 12' Agassiz beam trawl, mud bag: 2♂ [21.2, 28.0]. *Verde Island Passage, north of Mindoro*: sta 5114; 13°36'11"N, 120°45'26"E; 622 m; fine sand; 20 Jan 1908 (1049–1117); 12' Tanner beam trawl, mud bag: 1♀ [27.0]; sta 5115; 13°37'11"N, 120°43'40"E; 622 m; 20 Jan 1908 (1341–1401); 12' Tanner beam trawl, mud bag: 1♀ [27.0].

Lagonoy Gulf, east of southern Luzon: sta 5465; 13°39'42"N, 123°40'39"E; [914 m]; gray mud; 17 Jun 1909 (0839–0859); 12' Agassiz beam trawl, mud bag: 1♂ [26.8] 2♀ [28.1, 28.4]; sta 5466; 13°38'36"N, 123°41'45"E; [988 m]; gray mud; 17 Jun 1909 (1040–1102); 12' Agassiz beam trawl, mud bag: 3♂ [21.7–23.1]; sta 5467; 13°35'27"N, 123°37'18"E; [878 m]; gray mud;

18 Jun 1909 (0752–0834); 12' Agassiz beam trawl, mud bag: 6♂ [12.3–27.5] 3♀ [13.1–22.2]; sta 5468; 13°35'39"N, 123°40'28"E; 1041 m; green mud; 18 Jan 1909 (0958–1031); 12' Agassiz beam trawl, mud bag: 4♂ [16.0–23]; sta 5469; 13°36'48"N, 123°38'24"E; [914 m]; green mud; 18 Jun 1909 (1329–1411); 12' Agassiz beam trawl: 5♂ [13.9–23.8] 4♀ [17.3–24.9]; sta 5470; 13°37'30"N, 123°41'09"E; [1024 m]; [mud]; 18 Jun 1909 (1526–1600); 12' Agassiz beam trawl: 1♂ [23.4]. *Off Arangasa Islands, eastern Mindanao*: sta 5236; 8°50'45"N, 126°26'52"E; 903 m; fine gray sand; 5.1°C; 11 May 1908 (1027–1102); 12' Agassiz beam trawl, 3 mud bags: 1♀ [22.9].

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♂ [16.8]. *Makassar Strait west of Celebes*: sta 5666; 2°54'30"S, 118°47'00"E; 497 m; green mud; 8.6°C; 29 Dec 1909 (0839–0918); 12' Agassiz beam trawl: 1♂ [22.0] 1♀ [20.2]; sta 5667; 2°56'00"S, 118°47'30"E; 671 m; gray sand, mud; 5.4°C; 29 Dec 1909 (0955–1025); 12' Agassiz beam trawl: 11♂ [17.0–24.0] 4♀ [15.8–23.9], 1 ovig [23.9], 3 juv [8.6–11.2]. *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♀ [21.6]. *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 juv [?]; 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: 1♂ [25.0] 2 juv [8.2, 9.2]; 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 ♀ [23.0]; 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♂ [22.9]; sta 5658; 3°32'40"S, 120°31'30"E; 933 m; gray mud; 5.1°C; 18 Dec 1909 (1423–1443); 12' Agassiz beam trawl: 2♀ [15.9, 23.9].

Selat Butung, 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♂ [15.7] 2♀ [14.2, 19.8] 4 juv [10.5–13.3]; sta 5647; 5°34'00"S, 122°18'15"E; 950 m; green mud; 16 Dec 1909 (1444–1504); 12' Agassiz beam trawl: 3y♂ [12.9–15.0]. *Teluk Tomini, Celebes*: sta 5603; 0°24'00"N, 123°03'45"E; 1469 m; sand; 15 Nov 1909 (1312–1437); 12' Agassiz beam trawl: 1♂ [39.2] 1♀ [21.0]; sta 5605; 0°21'33"N, 121°34'10"E; 1183 m; 16 Nov 1909 (1025–1046); 12' Agassiz beam trawl: 1♂ [23.8]; sta 5607; 0°04'00"S, 121°36'00"E; 1392 m; fine sand; 18 Nov 1909 (0920–0940); 12' Agassiz beam trawl: 1y♂ [13.6]; sta 5610; 0°36'00"S, 122°01'00"E; 1240 m; gray mud; 19 Nov 1909 (1650–1717); 12' Agassiz beam trawl: 2♂ [19.0, 20.0] 4♀ [15.1–25.2]. *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: 2♂ [13.9, 20.1] 1 juv [9.1]. *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: 1♀ [18.9]; 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: 5♂ [14.2–25.2] 4♀ [18.4–27.2], 2 ovig [25.8, 27.2].

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 (0936–1000); 12' Agassiz beam trawl: 2♀ [20.8, 29.8], 1 ovig [29.8]; sta 5631; 1°53'30"S, 127°39'00"E; 732 m; coral rock, soapstone; 3 Dec 1909 (0956–1001); 12' Agassiz beam trawl: 1y♀ [12.9]. *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♂ [22.6]. *Off southern Buru*: sta 5638; 3°47'15"S, 126°23'40"E; 946 m; fine gray sand; 10 Dec 1909 (1400–1436); 12' Agassiz beam trawl: 2♂ [13.0, 39.3].

RANGE.—This species has been recorded off most tropical and temperate coasts of the world. It is widespread in the Indo-Pacific region from South and eastern Africa to Japan, Hawaii, and the Erben Seamount about 650 miles off Califor-

nia. Although juvenile specimens have been taken in midwater nets on a few occasions, adults probably live on or near the bottom in depths of 200 to more than 4700 m.

REMARKS.—Although most of his colleagues have understandably accepted the opinion of Holthuis (1947:315; 1977:46, pl. 2: fig. c) that the species called *Alpheus Pelagicus* by Risso (1816:91, pl. 2: fig. 7) is the one referred to *Acanthephyra haeckeli* (Von Martens, 1868) by Kemp (1939:575), it seems possible to me that Risso's species could just as well be a senior synonym of *Acanthephyra pulchra* A. Milne-Edwards, 1890, which may or may not be a junior synonym of *A. eximia*. As noted by Holthuis (1947), the identity of the species cannot be determined from Risso's original description and illustration, the latter apparently based on a specimen with an incomplete rostrum. The much superior rendition of a specimen of "*Ephyra Pelagica*" retrieved from Risso's unpublished manuscripts by Monod (1931: fig. 1) and republished by Holthuis (1977) leaves little doubt that the species is assignable to *Acanthephyra* but, in my opinion, it does not satisfactorily indicate which of the two known Mediterranean species is represented. The rostrum depicted in Risso's manuscript illustration fails to agree with that of either of the species, but its length—greater than is typical of *A. eximia*—is not incompatible with the statement by Crosnier and Forest (1973:36) that the rostrum in the type-series of *A. pulchra* and in other Mediterranean examples assigned to *A. eximia* is unusually long. They noted, "Il semble donc qu'il existe, en Méditerranée et au voisinage, une population d'*A. eximia* homogène quant aux caractères du rostre." [It seems that a population of *A. eximia*, consistent in the characters involving the rostrum, exists in and near the Mediterranean.] The abdomen shown in Risso's manuscript figure could represent either species; unfortunately we cannot determine whether the telson was sulcate in the dorsal midline, as in *A. haeckelii*, or ridged, as in *A. eximia*. Only the carapace remains, therefore, as the last clue to the identity of Risso's species, and it seems to me

that it may be significant. Virtually the only feature common to both of Risso's illustrations (the one that accompanied his published description of *Alpheus Pelagicus* and the one retrieved later by Monod and Holthuis) is the sinuous dorsal profile of the carapace, a character that is distinctive of nearly all specimens of *Acantheephyra eximia* wherever it occurs in the world. It may be desirable, for the sake of nomenclatural stability, to continue recognition of the Holthuis concept of Risso's species, but it may also be beneficial to mention here the possible alternative.

***7. *Acantheephyra fimbriata*
Alcock and Anderson, 1894**

FIGURES 2l, 4l, 5l, 6j, 9c

Acantheephyra armata.—Wood-Mason and Alcock, 1892:359, fig. 2 [not *A. armata* A. Milne-Edwards].

Acantheephyra armata var.—Wood-Mason, 1892, pl. 3: fig. 1.
Acantheephyra armata var. *fimbriata* Alcock and Anderson, 1894: 156 [type-locality: the original specimen, described and illustrated but not named in 1892, was taken in the Andaman Sea off Little Andaman; 11°25'05"N, 92°27'06"E, 741 m; the two additional specimens reported in 1894 came from the Bay of Bengal off Madras; 12°50'N, 81°30'E, 869 m and the Arabian Sea off Goa; 15°29'N, 72°41'E, 1023 m].

A[cantheephyra] fimbriata.—Chace, 1936:27.

DIAGNOSIS.—Integument firm; rostrum 1–1½ times as long as carapace, overreaching antennal scale, ventral margin convex, armed with 1 tooth; carapace with dorsal margin carinate, very obscurely so on posterior ¼, nearly straight, not interrupted by cervical groove, branchiostegal spine buttressed by strong, sharp carina extending posteriorly nearly to branchial region, supra-branchial ridge distinct, sharp subbranchial carina near ventral margin of carapace; abdomen

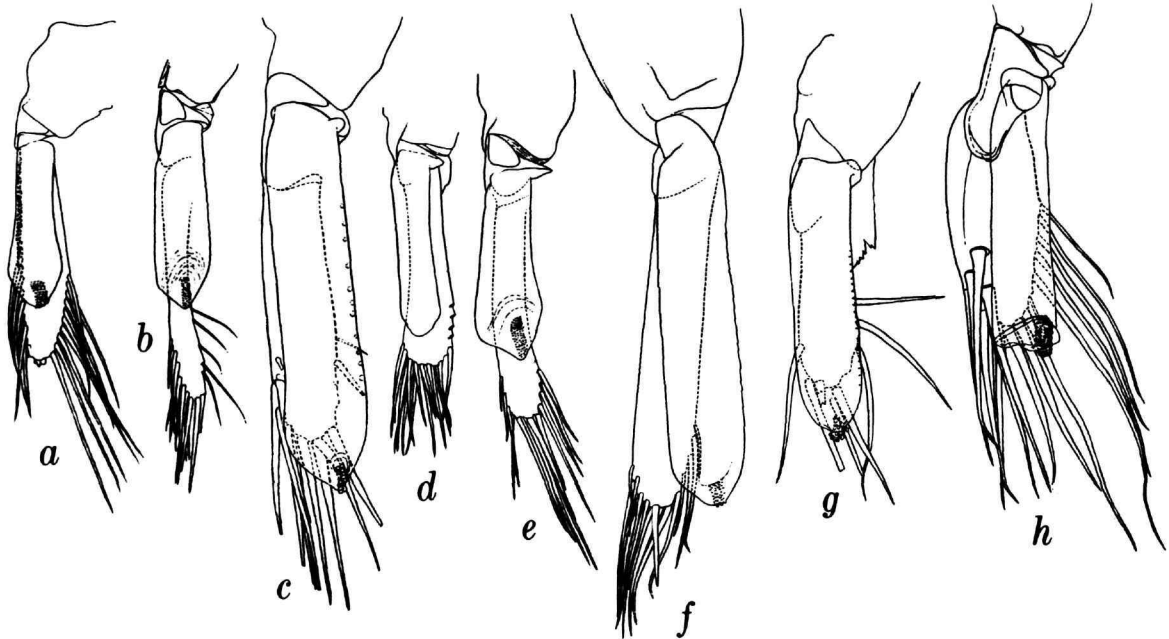


FIGURE 8.—Right appendices internae and masculinae of species of *Acantheephyra*: a, *A. acanthitelsonis* [25.1 mm], Pillsbury sta 21, off Ghana; b, *A. armata* [30.0 mm], Oregon sta 534, Gulf of Mexico; c, *A. brevicarinata* [22.0 mm], Albatross sta 3010, Gulf of California; d, *A. brevirostris* [23.7 mm], Albatross sta 2566, east of Chesapeake Bay; e, *A. carinata* [36.2 mm], Albatross sta 5524, Mindanao Sea; f, *A. chacei* paratype [25.2 mm], Wecoma crusie 7060B, sta NH65, haul 2361, bkt 3, west of Yaquina Head, Oregon; g, *A. cucullata* [14.0 mm], Alpha Helix sta 71, Banda Sea; h, *A. curtirostris* [17.0 mm], Alpha Helix sta 61, Banda Sea.

dorsally carinate on 5 posterior somites, 4 posterior somites with posteromesial tooth, 3rd somite not deeply excavate either side of median tooth, 6th somite about 1½ times as long as posterior height; telson with strong rounded ridge in anterior ½ of dorsal midline, with 3, rarely 4, pairs of small dorsolateral spines; eyestalk with strong, subquadrate elevation on mesial surface near junction with cornea; maximum carapace length 44 mm.

MATERIAL.—PHILIPPINES. *Mompog Pass east of Marinduque*: sta 5219; 13°21'N, 122°18'45"E; 969 m; green mud; 10.4°C; 23 Apr 1908 (1357–1437); 12' Agassiz beam trawl, mud bag: 2♂ [26.0, 26.8]. *Sogod Bay, southern Leyte*: sta 5488; 10°N, 125°06'45"E; 1412 m; green mud; 11.3°C; 31 Jul 1909 (1652–1738); 12' Agassiz beam trawl: 1y♂ [18.0]. *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: 3♀ [30.5–40.2], 2 ovig [37.1, 40.2]. *North of Siquijor Island*: sta 5526; 9°12'45"N, 123°45'30"E; 1472 m; green mud, globigerina; 11.3°C; 11 Aug 1909 (0929–1036); 12' Tanner beam trawl: 1 ovig ♀ [43.7]; 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: 3 ovig ♀ [41.4–42.7]; sta 5529; 9°23'45"N, 123°39'30"E; 807 m; gray mud, globigerina; 11.7°C; 11 Aug 1909 (1644–1719); 12' Tanner beam trawl, mud bag: 1♀ [19.7]. *Eastern Mindanao Sea*: 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♀ [32.1]; sta 5495; 9°06'30"N, 125°00'20"E; 1785 m; gray mud; 11.3°C; 2 Aug 1909 (1244–1354); 12' Agassiz beam trawl: 3♂ [28.2–37.2] 1 ovig ♀ [39.1]. *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: 3♀ [30.7–40.0], 2 ovig [32.0, 40.0]; sta 5512; 8°16'02"N, 123°58'26"E, 814 m; gray mud, fine sand; 11.6°C; 7 Aug 1909 (1309–1346); 12' Tanner beam trawl: 3 ovig ♀ [37.8–38.5]; sta 5513; 8°16'45"N, 124°02'48"E; 923 m; gray mud, fine sand; 11.6°C; 7 Aug 1909

(1507–1553); 12' Tanner beam trawl: 1♀ [37.2]. *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♀ [42.7]; 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: 3♀ [28.8–37.6].

RANGES.—Gulf of Aden, Arabian Sea, Laccadive Sea, Bay of Bengal, Andaman Sea, and the Philippines. This is a benthic species that lives in depths of 412–1785 meters. Although both *A. fimbriata* and the closely related *A. armata* occur in similar situations in the Philippines—perhaps the only region shared by the two species—it may be significant that they were never taken at the same station by the *Albatross*.

*8. *Acanthephyra indica* Balss, 1925

FIGURES 3b, 4n, 5n, 7a, 9d

Acanthephyra sp.—De Man, 1920:68, pl. 6: fig. 16.

Acanthephyra indica Balss, 1925:264, figs. 34, 35 [type-locality: Indian Ocean east of Sri Lanka; 7°01'N, 85°56'E; 0–2500 m].

Acanthephyra cucullata.—Balss, 1927:268 [in part].

DIAGNOSIS.—Integument soft and membranous; rostrum triangular, little more than ⅓ as long as carapace, not overreaching antennular peduncle, ventral margin oblique, unarmed; carapace with sharp carina in dorsal midline disappearing on posterior ¼ behind cervical groove, nearly straight with faint notch at cervical groove, branchiostegal spine buttressed by sharp carina extending posteriorly nearly to posterior margin of branchial region, second carina (interrupted) extending posteriorly from near orbit nearly to posterior margin; abdomen dorsally carinate on all but anterior somite, 4 posterior somites with posteromesial tooth, 3rd somite with posterior margin not excavate either side of median tooth, 6th somite about 3½ times as long as posterior height; telson faintly sulcate in dorsal midline, armed with 4 pairs of dorsolateral spines; eyestalk with bluntly triangular papilla arising from mesial margin at juncture with cor-

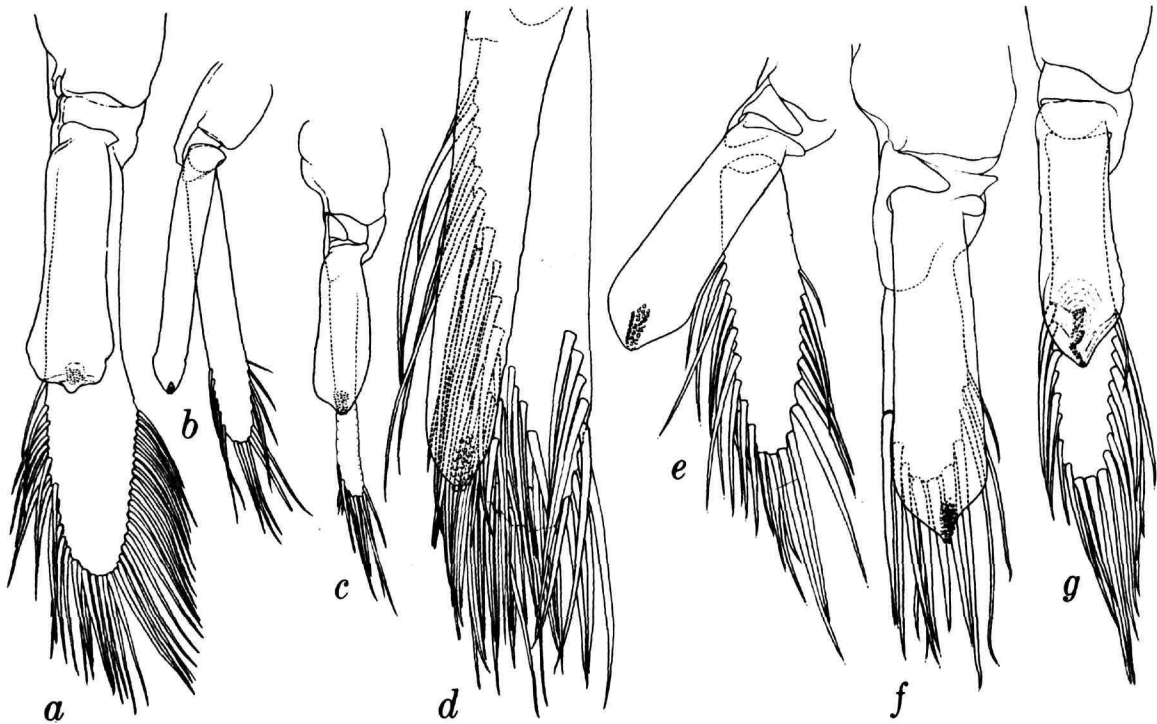


FIGURE 9.—Right appendices internae and masculinae of species of *Acanthephyra*: a, *A. eximia* [39.2 mm], Albatross sta 5603, Teluk Tomini, Celebes; b, *A. faxoni* [13.4 mm], Albatross sta 4653, off Peru; c, *A. fimbriata* [37.2 mm], Albatross sta 5495, Mindanao Sea; d, *A. indica* [8.0 mm], Alpha Helix sta 87, Banda Sea; e, *A. kingsleyi* [19.7 mm], Pillsbury sta 265, Gulf of Guinea; f, *A. media* [21.0 mm], Albatross sta 5628, Selat Patinti, Halmahera; g, *A. pelagica* [18.0 mm], off Messina, Sicily (R.B. Manning).

nea and directed dorsomesially, not nearly reaching level of distal surface of cornea; maximum carapace length 9 mm.

MATERIAL.—PHILIPPINES. *Northern Palawan Passage*: sta 5350; 10°46'40"N, 118°29'E; 942 m; gray mud; 27 Dec 1908 (1610–1714); 12' Tanner beam trawl, mud bag: 1 ovig ♀ [8.9].

RANGE.—Indian Ocean, Indonesia, and the Philippines; mesopelagic.

REMARKS.—Comparison of specimens of *A. indica* with material of *A. cucullata* fails to support Balss (1927) in his belief that the former species is a junior synonym of the latter. Not only does *A. indica* have two, rather than one, lateral carinae on the carapace, the "ventral" margin of the rostrum oblique rather than vertical, and a

cornea and eyestalk very unlike those of *A. cucullata*, but the dentition on the incisor process of the mandible is different in the two forms (Figures 2*h*, 3*b*).

*9. *Acanthephyra media* Bate, 1888

FIGURES 3*d*, 4*p*, 5*p*, 7*c*, 9*f*

Acanthephyra media Bate, 1888:736, pl. 124: fig. 5 [type-locality: between Tablas and Sibuyan islands, Philippines; 12°21'N, 122°15'E; 1280 m total depth].

Acanthephyra media var. *obliquirostris* De Man, 1916:150 [type-locality: Halmahera Sea, Indonesia; 0°17.6'S, 129°14.5'E; 1855 m total depth].

DIAGNOSIS.—Integument reasonably firm;

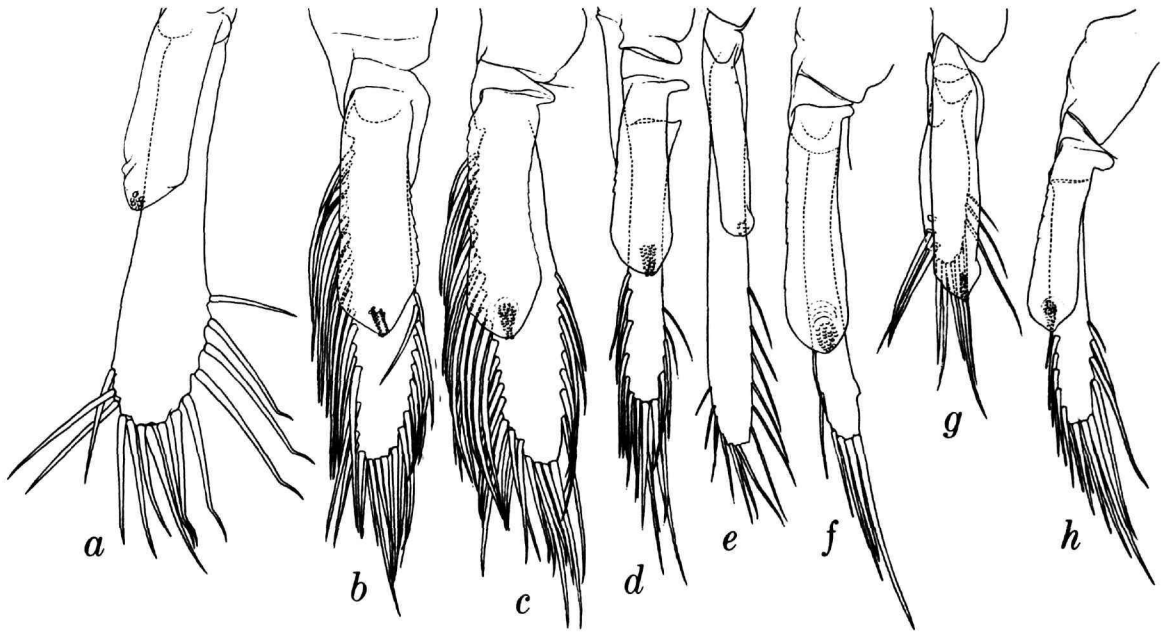


FIGURE 10.—Right appendices internae and masculinae of species of *Acanthephyra*: a, *A. prionota*, paratype [6.2 mm], *Discovery* sta 7089 32, north of Cape Verde Islands; b, *A. quadrispinosa* [16.9 mm], *Albatross* sta 5618, west of Halmahera; d, *A. sanguinea* [16.0 mm], *Albatross* sta 5287, Verde Island Passage, Philippines; e, *A. sibogae* [14.0 mm], *Alpha Helix* sta 110, Banda Sea; f, *A. smithi* [17.0 mm], *Te Vega* sta 189, southwest of Maldive Islands; g, *A. stylostratis* [10.8 mm], *Knorr* sta 3126, east of Bermuda; h, *A. trispinosa* [13.8 mm], *Albatross* sta 3398, off Ecuador.

rostrum more than $\frac{3}{4}$ as long as carapace, extending nearly as far as or beyond end of antennal scale, ventral margin oblique posteriorly, armed with 1 or 2 long spines; carapace rounded, not carinate, on posterior $\frac{1}{2}$ of dorsal midline, nearly straight, branchiostegal spine buttressed by carina extending posteriorly to branchial region, suprbranchial ridge fairly distinct; abdomen dorsally carinate on all but anterior somite, 4 posterior somites with posteromesial tooth, 3rd somite with posterior margin not clearly excavate either side of median tooth, 6th somite fully twice as long as posterior height; telson slightly sulcate in anterior $\frac{1}{2}$ of dorsal midline, with 6 or more pairs of dorsolateral spines; eyestalk with blunt papilla arising from mesial surface at junction with cornea and directed slightly obliquely distad but not nearly reaching level of distal surface of

cornea; maximum carapace length 21 mm.

MATERIAL.—PHILIPPINES. *Panay Gulf northwest of Sojoton Point, Negros*: sta 5185; $10^{\circ}05'45''N$, $122^{\circ}18'30''E$; 1167 m; green mud; $9.8^{\circ}C$; 30 Mar 1908 (1726–1834); 3-meter open net towed horizontally at 1000 m for 20 minutes, then raised vertically to surface in 48 minutes: 1♀ [15.6]. *Eastern Mindanao Sea*: sta 5497; $9^{\circ}07'15''N$, $124^{\circ}59'30''E$; 1756 m; green mud, fine sand; $11.3^{\circ}C$; 3 Aug 1909 (0955–1059); 3-meter open net towed horizontally at 1463 m: 1♂ [15.8] 1♀ [11.9]. *Sulu Sea northwest of Mindanao*: sta 5544; $8^{\circ}16'30''N$, $122^{\circ}26'30''E$; 1389 m; green mud, fine sand; $9.9^{\circ}C$; 6 Sep 1909 (1034–1117); 3-meter open net towed horizontally at 1097 m: 1y♂ [8.3].

INDONESIA. *Selat Patinti, Halmahera*: sta 5628; $0^{\circ}28'30''S$, $127^{\circ}45'00''E$; 2361 m; gray mud;

30 Nov 1909 (1122–1245); 12' Agassiz beam trawl: 1♂ [21.0].

RANGE.—Philippines and off Halmahera, Indonesia; mesopelagic.

REMARKS.—This species is obviously closely related to *A. curtirostris* but its elongate rostrum gives it a very different appearance (see "Range" under that species).

***10. *Acanthephyra quadrispinosa* Kemp, 1939**

FIGURES 3h, 4t, 5t, 7g, 10c, 14

Acanthephyra batei Stebbing, 1905:107, pl. 24B [type-locality: Cape Point Lighthouse, South Africa, S 83° E, 35½ miles; 659 m; not *A. batei* Faxon, 1895].

Acanthephyra quadrispinosa Kemp, 1939:571, 572, 576, 578 [type-locality: Indo-Pacific from South and eastern Africa to 163° W, and from 25° N to 42° S; South Atlantic from 32° S to 40° S; mesopelagic between about 1500 m and the surface].

DIAGNOSIS.—Integument firm; rostrum in adults usually longer than carapace and usually overreaching antennal scale, ventral margin slightly convex, armed with 3–7 teeth; carapace with dorsal margin consisting of low, blunt ridge anteriorly, broadly rounded posteriorly, nearly level, branchiostegal spine buttressed by sharp carina usually extending posteriorly about twice length of spine, suprbranchial ridge indistinct; abdomen dorsally carinate on all but anterior somite, 4 posterior somites with posteromesial tooth, 3rd somite with posterior margin excavate either side of median tooth, 6th somite at least 2½ times as long as posterior height; telson sulcate in dorsal midline, with 4 pairs of dorsolateral spines; eyestalk with bluntly triangular projection directed anteromesially from mesial margin; maximum carapace length 23 mm.

MATERIAL.—PHILIPPINES. *Luzon Strait west of Batan Islands*: sta 5320; 20°58'N, 120°03'E; 3300 m; gray mud; 2.3°C; 6 Nov 1908 (1518–1551); 3-meter open net or ½ meter plankton net towed horizontally at 914 m: 1 juv [5.0]. *South China Sea off western Luzon*: sta 5437; 15°45'54"N, 119°42'45"E; 8 May 1909 (1207–1256); 3-meter open net towed horizontally at 823 m: 1♂ [12.5] 1♀ [14.7]. *Western end of Verde*

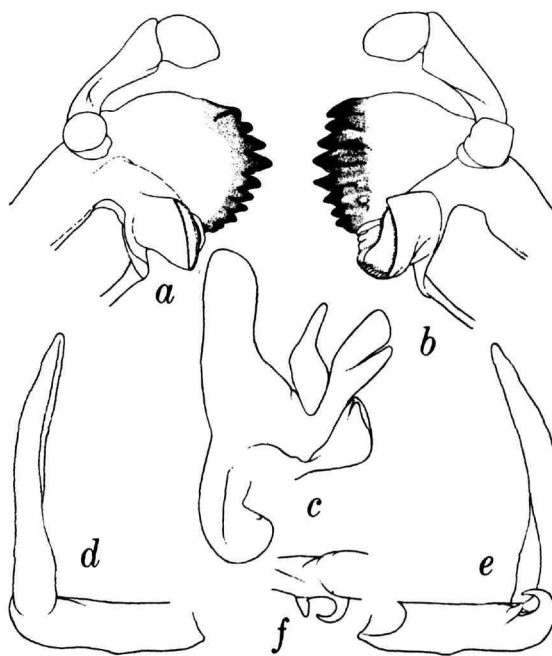


FIGURE 11.—*Acanthephyra armata*: a, left mandible (flexor or dorsal surface) of male [43.5 mm], Albatross sta 5648, Selat Butung, Celebes; b, right mandible of same specimen; c, right 2nd maxilla of male [30.0 mm], Oregon sta 640, Gulf of Mexico; d, epipod (lateral aspect) from right 2nd pereopod of same specimen; e, same (mesial aspect); f, same, mesial teeth (dorsal aspect).

Island Passage, east of Lubang Islands: sta 5120; 13°45'30"N, 120°30'15"E; 719 m; green mud, sand; 6.5°C; 21 Jan 1908 (1441–1510); 3-meter open net towed horizontally at 640 m: 1 ovig ♀ [14.8]. *Verde Island Passage, north of Mindoro*: sta 5287; 13°37'40"N, 120°39'E; 694 m; gray mud; 6.3°C; 20 Jul 1908 (1458–1542); 3-meter open net towed horizontally at 567 m for 20 minutes, then raised vertically to surface in 24 minutes: 3♂ [7.0–10.0] 1♀ [12.0]. *Tayabas Bay, southern Luzon*: 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♂ [10.8]. *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: 1♀ [13.0]. *Mompog Pass east of Marinduque*: sta 5219; 13°21'N,