

Angulorostrum, a New Genus
of Myodocopid Ostracoda
(Philomedidae: Pseudophilomedinae)

LOUIS S. KORNICKER

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SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY • NUMBER 340

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SMITHSONIAN INSTITUTION PRESS

City of Washington

1981

ABSTRACT

Kornicker, Louis S. *Angulorostrum*, a New Genus of Myodocopid Ostracoda (Philomedidae: Pseudophilomedinae). *Smithsonian Contributions to Zoology*, number 340, 20 pages, 11 figures, 2 plates, 1981.—A new genus, *Angulorostrum*, in the subfamily Pseudophilomedinae is proposed, and three new species referred to the genus are described and illustrated. The new species are from the continental slope of the Atlantic Ocean at depths of 210 to 1007 meters off Brazil, North Carolina, South Carolina, Portugal, and Spain. Keys are presented to the genera of Pseudophilomedinae and to the species of *Angulorostrum*.

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

Kornicker, Louis S., 1919-

Angulorostrum, a new genus of myodocopid Ostracoda (Philomedidae: Pseudophilomedinae) (Smithsonian contributions to zoology ; no. 340)

Bibliography: p.

1. *Angulorostrum*—Classification. 2. Crustacea—Classification. I. Title. II. Series
QLI.S54 no. 340 [QL444.O85] 591s 81-607892 [595.3'3] AACR2

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Louis S. Kornicker

Introduction

During the study of numerous collections, I have encountered several undescribed species in the subfamily Pseudophilomedinae that have morphological characters suggesting that these species may be links between species in the genera *Tetragonodon* Brady and Norman, 1896, and *Harbansus* Kornicker, 1978. Rather than expand one of these genera to include the new species, or combine both genera, I find it expedient at this time to propose a new genus, *Angulorostrum*, for the intermediate forms, because they possess characters permitting their separation from *Tetragonodon* and *Harbansus*, and at this early stage in classification I think it warranted to recognize the differences. Described and illustrated herein are three new species of *Angulorostrum* collected at bathyal depths in the east and west Atlantic.

Specimens with USNM (for the former United States National Museum) numbers are deposited in the National Museum of Natural History, Smithsonian Institution.

ACKNOWLEDGMENTS.—I wish to thank Dr. M. Segonzac, Centre National de Tri d'Océanographie Biologique (CENTOB), France, for specimens from off Portugal and Spain collected dur-

ing the French expedition *Thalassa* by Dr. L. Cabioch (Roscoff, France); Dr. John H. Day, Duke University Marine Laboratory, Beaufort, N.C., for a specimen from waters off North Carolina; Drs. Willis and Linda Pequegnat, Texas A & M University, for a specimen from waters off South Carolina; and Dr. Howard Sanders and Ms. Susan P. Garner, Woods Hole Oceanographic Institution, for specimens from waters off Brazil.

I am grateful to several people who assisted in the preparation of this paper: Mrs. Carolyn Gast rendered the shaded drawings of the carapaces; Ms. Kathryn Schroeder made most initial camera lucida drawings of appendages; Mrs. Anne Cohen criticized the complete manuscript, and Dr. Thomas E. Bowman criticized part. I also thank Mr. Donald C. Fisher, Smithsonian Institution Press, for editing and preparing the manuscript.

Species-Locality List

North Carolina, continental slope; Beaufort Shelf Transect, sta 60; 6 Apr 1965; 34°19'42"N, 75°52'00"W; 210 m; sand mud; 10-minute trawl (trawl 30" wide); collected by John H. Day.

Angulorostrum costatum: 1 adult female, USNM 156778

South Carolina, continental slope; Bureau of Land Management southeast coastal study; sta

Louis S. Kornicker, Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560.

0155-2 (2G); Feb 1977; 32°31'N, 78°31'W; 218 m; bottom sampler; received from Linda H. Pequegnat.

Angulorostrum costatum: 1 ovigerous female, USNM 157839

Brazil, continental slope; R/V *Atlantis II* cruise 31, sta 167; 20 Feb 1967; 07°58'00"S–07°50'00"S, 34°17'00"W; 943–1007 m; epibenthic sled; received from Susan P. Garner.

Angulorostrum monothrix: 1 ovigerous female, USNM 156960; 1 adult male, 157814; 2 adult females, USNM 156964A, 156962; 1 juvenile, USNM 156963 (carapace only); 41 specimens, USNM 156964B

Portugal, continental slope (west of northern end of Portugal); R/V *Thalassa*, sta Y 400; Sep 1972; 40°45'36"N, 09°09'00"W; 800 m; small dredge; received from Michel Segonzac.

Angulorostrum segonzaci: 1 adult female, holotype

Spain, continental slope (north of Spain, Bay of Biscay); R/V *Thalassa*, sta X 342; 16 Oct 1971; 44°07'30"N, 04°36'12"W to 44°07'42"N, 04°36'48"W; 700 m; small dredge; received from Michel Segonzac.

Angulorostrum segonzaci: 1 ovigerous female, USNM 158133

PHILOMEDIDAE Müller, 1906

PSEUDOPHILOMEDINAE Kornicker, 1967

With the addition of the new genus *Angulorostrum* proposed herein, the Pseudophilomedinae is comprised of 5 genera: *Pseudophilomedes* Müller, 1893, *Paramekodon* Brady and Norman, 1896, *Tetragonodon* Brady and Norman, 1896, *Harbansus* Kornicker, 1978, and *Angulorostrum*, new genus.

DIAGNOSIS.—Bristles on list of caudal infold of each valve of carapace broad, spinous, frondlike.

First Antenna: Sensory bristle of 5th joint of adult male with long filaments on bulbous segment occupying about the proximal one-fifth of the bristle (the proximal edge of the bulb projecting backwards).

Second Antenna: 3rd joint of exopodite of male slightly shorter than 2nd joint.

Sixth Limb: End joint with relatively slight posterior projection.

Key to Genera of Pseudophilomedinae

1. Tooth of 2nd exopodial joint of 5th limb of adult females or juvenile males and females with saber-like prolongation 2
Tooth of 2nd exopodial joint of 5th limb of adult females or juvenile males and females without saber-like prolongation (squarish) 3
2. 7th joint of female 1st antenna with b-bristle ***Pseudophilomedes***
7th joint of female 1st antenna without b-bristle ***Paramekodon***
3. Caudal furca with 3rd claw weaker than 4th ***Harbansus***
Caudal furca with 3rd claw not weaker than 4th 4
4. Bellonci organ elongate ***Angulorostrum***
Bellonci organ lacking ***Tetragonodon***

***Angulorostrum*, new genus**

ETYMOLOGY.—Generic name from the Latin *angulus* (corner, bend) plus *rostrum* (beak, snout) in reference to the pointed rostrum of the type-species. Gender neuter.

TYPE-SPECIES.—*Angulorostrum monothrix*, new species.

DISTRIBUTION.—Continental slope off Brazil, North Carolina, South Carolina, Portugal, and Spain. Known depth range 210–1007 m.

REMARKS.—The new genus contains three new species, *A. monothrix*, *A. costatum*, and *A. segonzaci*. The shape of the carapace of *Streptoleberis rectirostris* Brady and Norman, 1896, collected at abyssal

depths in the eastern Atlantic, suggests that it is also a member of the genus; however, until the appendages of the species are known it should remain in the category to which it was referred by Müller (1912:52), "Cypridinidarum genera dubia et species dubiae."

DIAGNOSIS.—*First Antenna:* 2nd joint with only 1 bristle (dorsal).

Fifth Limb: Distal sclerotized part of 2nd exopodial joint of female and juveniles of both sexes short, squarish, without saber-like prolongation.

Furca: Each lamella with 7 to 9 claws decreas-

ing in length and width posteriorly along lamella; claw 3 not weaker than claw 4.

Bellonci Organ: Segmented, elongate, but fairly short.

COMPARISONS.—The new genus *Angulorostrum* differs from *Tetragonodon* in that members possess a bellonci organ and from *Harbansus* in that members have a furca in which the 3rd claw is not weaker than the 4th. The 5th limb of the female and juvenile of species of *Angulorostrum* does not have a saber-like prolongation on the 2nd exopodial joint like that on species of *Pseudophilomedes* and *Paramekodon*.

Key to Species of *Angulorostrum*

1. Carapace with lateral ribs ***A. costatum***
Carapace without lateral ribs 2
2. Rostrum projecting past valve edge; 2nd endopodial joint of female 2nd antenna with 1 bristle; ventral margin of 2nd endopodial joint of mandible with 3 bristles ***A. monothrix***
Rostrum not projecting past valve edge; 2nd endopodial joint of female 2nd antenna with 2 bristles; ventral margin of 2nd endopodial joint of mandible with 4 bristles ***A. segonzaci***

Angulorostrum monothrix, new species

FIGURES 1-5, PLATES 1, 2

ETYMOLOGY.—The specific name from the Greek *mono* (one, single, alone) plus *thrix* (hair) in reference to the single bristle on the mandibular exopodite of the species.

HOLOTYPE.—USNM 156960, ovigerous female in alcohol and on slide.

ALLOTYPE.—USNM 157814, 1 adult male in alcohol and on slide; from same sample as holotype.

PARATYPES.—USNM 156964A, adult female; USNM 156962, adult female; USNM 156963, juvenile (valves only); USNM 156964B, 41 specimens. All paratypes from same sample as holotype.

TYPE-LOCALITY.—R/V *Atlantis II*, cruise 31, sta 167, off Brazil.

DESCRIPTION OF ADULT FEMALE (Figures 1-3).—Carapace with pointed rostrum and prominent caudal process; greatest height anterior to valve middle; ventral margin broadly rounded (Figures 1, 2*a,c,d*).

Ornamentation: Surface smooth with numerous bristles, especially along anteroventral margin. Carapaces in collection weakly calcified but with numerous microconcretions.

Infold: Infold of rostrum with 2 bristles near dorsal margin (Figure 2*c*); anteroventral infold with small bristle just ventral to lower end of rostrum and striations paralleling anteroventral curvature (Figure 2*a*); infold of caudal process with 6 broad frondlike bristles forming row (Figure 2*d*).

Selvage: Wide lamellar prolongation with marginal fringe present along free margin of valves except possibly along posteroventral end of caudal process (Figure 2*e*).



FIGURE 1.—*Angulorostrom monothrix*, new species, adult female, paratype, USNM 156962, length 1.67 mm, complete specimen, lateral view from right.

Central Adductor Muscle Attachments (Figures 1, 2*b*): Consisting of about 14 to 19 ovoid scars.

Size: USNM 156960, right valve with specimen removed, length only, 1.56 mm; USNM 156962, length 1.67 mm, height 0.92 mm; USNM 156964A, length 1.63 mm, height 1.10 mm.

First Antenna (Figure 2*f,g*): Joints 1–5 spinous. 2nd joint with spinous dorsal bristle. 3rd joint with 3 spinous bristles, 1 ventral, 2 dorsal. 4th joint short, with 3 spinous bristles, 2 ventral, 1 dorsal. Sensory bristle of long 5th joint with 3 short dorsal filaments and 2 hairs at tip. Short medial bristle of minute 6th joint with long proximal and short distal spines. 7th joint: a-bristle with spines along dorsal margin; b-bristle almost twice length of a-bristle, with 2 small dorsal filaments near middle and 2 hairs at tip; c-bristle about 3 times length of a-bristle, with 3 short dorsal filaments near middle and 2 hairs at tip. 8th joint: d- and e-bristles slightly longer than c-bristle, bare with blunt tips; f-bristle about same length as c-bristle, with 3 short marginal filaments and 2 hairs at tip; g-bristle slightly longer than c-bristle, with 3 short marginal filaments and 2 hairs at tip.

Second Antenna (Figures 2*h*, 3*g,h*): Protopodite bare. Endopodite 2-jointed: 1st joint with 1 or 2 short anterior bristles; 2nd joint minute with 1 long spinous terminal bristle. Exopodite 9-jointed: long 1st joint with minute terminal tubular bristle; joints 2–9 decreasing in size distally

along exopodite: joints 2–8 with long hairs along distal margins; bristles of joints 2–8 relatively short, with fairly stout ventral spines but no natatory hairs; 9th joint with 3 bristles, longer of these with ventral spines, remaining 2 shorter bristles with slender short hairlike spines along both margins.

Mandible (Figure 2*i*): Coxale endite consisting of large spinous bifurcate process without bristle near base. Basale: dorsal margin with 3 spinous bristles, 1 distal to middle, 2 terminal; ventral margin with 1 spinous subterminal bristle (this with base on medial side on some limbs); medial surface near ventral margin with 2 short spinous proximal bristles and 1 longer spinous bristle near middle; lateral surface near ventral margin with 3 spinous bristles near middle (these on ventral margin on some limbs); both medial and lateral surfaces with long hairs. Exopodite about one-third length of dorsal margin of 1st endopodial joint, with spines at tip, and with 1 long spinous terminal bristle. 1st endopodial joint with 2 long spinous terminal bristles on ventral margin and spines forming rows on medial surface. 2nd endopodial joint: dorsal margin with 4 long bristles forming cluster near middle; ventral margin with bristles forming 2 distal groups (1 bristle in proximal group, 2 in terminal group); medial surface with spines forming rows; end joint with 3 claws and 3 bristles.

Maxilla (Figure 2*j*): 3 endites present: endite I with 6 bristles; endite II with long slender lateral lobe with 3 bristles and shorter wider medial lobe with 2 bristles (medial lobe could be part of endite I); endite III narrow with 4 bristles. Precoxale and coxale with dorsal fringe of long hairs. Coxale with long slender lateral bristle with short marginal spines. Basale with 1 medial bristle near middle (this bristle could be a proximal bristle on endite I) and 2 bristles near ventral margin. Exopodite consisting of small lobe near ventral margin of basale with 2 long spinous bristles and 1 shorter slender bare bristle. Endopodite: 1st joint with 1 spinous alpha-bristle and 1 beta-bristle; end joint with 2 proximal spinous lateral



FIGURE 2.—*Angulorostrum monothrix*, new species, adult female, paratype, USNM 156962, length 1.67 mm: *a*, outline of complete specimen; *b*, central adductor muscle attachments of right valve, lateral view, anterior towards right. Adult female, holotype, USNM 156960, length of right valve 1.56 mm: *c*, anterior of right valve, inside view; *d*, caudal process of right valve, inside view; *e*, detail of ventral margin of left valve near posterior end showing fringed lamellar prolongation of selvage, ventral view; *f*, joints 1-4 of left 1st antenna, medial view; *g*, joints 5-8 of same 1st antenna shown in *f*, medial view; *h*, endopodite of right 2nd antenna, medial view; *i*, left mandible, medial view; *j*, left maxilla, lateral view; *k*, 5th limb.

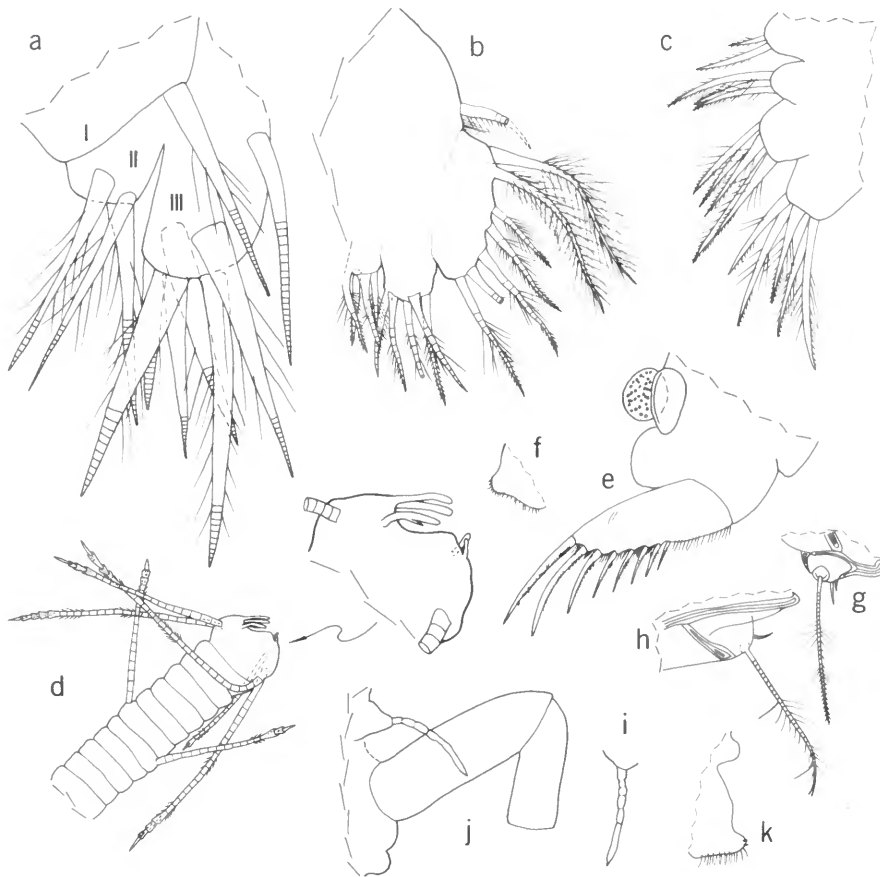


FIGURE 3.—*Angulorostrum monothrix*, new species, adult female, holotype, USNM 156960, length of right valve 1.56 mm: *a*, endites I–III of 5th limb; *b*, 6th limb (endites I and II missing); *c*, endites I–IV of 6th limb opposite that shown in *b*; *d*, 7th limb; *e*, left lamella of furca and left genitalia; *f*, upper lip, anterior to left. Adult female, paratype, USNM 156964A, length 1.63 mm: *g*, endopodite of right 2nd antenna, lateral view; *h*, endopodite of left 2nd antenna, medial view; *i*, distal part of medial eye and bellonci organ, dorsal view; *j*, upper part of anterior of body showing joints 1 and 2 of 1st antenna, medial eye, and bellonci organ; *k*, lower part of anterior of body showing anterior process and upper lip.

bristles, 3 slender proximal medial bristles, 1 anterior spinous bristle, and 2 stout terminal claws.

Fifth Limb (Figures 2*k*, 3*a*): 3 endites present: endite I with 1 spinous bristle; endite II with 3 spinous bristles; endite III with 7 spinous bristles. Exopodite: 1st joint with 2 anterior bristles (1 with short spines and 1 with long hairs); main tooth consisting of smooth tooth followed by 2 stout pectinate teeth and a slender spinelike pec-

tinate tooth; spinous bristle present proximal to slender tooth; an indistinct lobe with 2 distal minute teeth present near main tooth; 2nd joint consisting of large squarish tooth; a long and short bristle present on posterior side of 2nd joint just distal to a long bristle; 3rd joint with 3 spinous bristles on inner lobe (2 long and 1 short) and 2 short bristles on outer lobe; 4th and 5th joints fused, with total of 5 bristles. Epipodial appendage with 39 spinous bristles.

Sixth Limb (Figure 3*b,c*): Endite I with 2 spinous terminal bristles; endite II with 3 spinous terminal bristles; endite III and IV each with 5 spinous terminal bristles. End joint narrow, with 5 spinous anterior bristles followed by short space and then 2 long hirsute bristles; 1 short hirsute bristle present in place of epipodial appendage; limb hirsute.

Seventh Limb (Figure 3*d*): Each limb with 2 proximal bristles (1 on each side) and 5 terminal bristles (3 on one side, 2 on other) each bristle with distal marginal spines and 2 to 4 bells. Terminus with comb of about 6 alate teeth opposite 2 small bare pegs.

Furca (Figure 3*e*): Each lamella with 8 claws decreasing in length distally along lamella; all claws with teeth along posterior margins; claw 1 with stout small teeth forming groups between larger teeth; hairs at base of claws and following claws.

Bellonci Organ (Figure 3*i,j*): Elongate with about 3 or 4 faint sutures in proximal half, tip pointed.

Eyes: Medial eye small, unpigmented (Figure 3*i,j*). Lateral eyes absent.

Upper Lip (Figure 3*f,k*): Projecting anteriorly, with small anterior processes and abundant hairs.

Genitalia (Figure 3*e*): Consisting of oval cup with attached spermatophore.

Eggs: USNM 156960, 4 eggs; USNM 156964A, 1 egg; USNM 156962, 2 eggs.

DESCRIPTION OF ADULT MALE (Figures 4, 5*a,e*).—Carapace similar to that of adult female except for having greater slope of posterodorsal margin (Figure 4*a-c*).

Ornamentation (Figure 4*b,c*): Similar to that of adult female.

Infold: Similar to that of adult female.

Size: USNM 157814, length 1.63 mm, height 0.90 mm.

First Antenna (Figure 4*d*): 1st joint with faint lateral and medial spines. 2nd joint spinous, with 1 spinous dorsal bristle. 3rd joint short, spinous, with 1 or 2 hirsute dorsal bristles. 4th joint elongate, spinous, with 1 spinous dorsal bristle. 5th

joint small, wedged ventrally between 4th and 6th joints; sensory bristle with filamentous proximal bulb (proximal edge of bulb projecting backward) and stem with about 4 short filaments. 6th joint long, with spinous medial bristle. 7th joint: a-bristle spinous, about same length as bristle of 6th joint; b-bristle about twice length of a-bristle, with 4 marginal filaments; c-bristle long, with about 8 marginal filaments. 8th joint: d- and e-bristles bare, with blunt tips reaching past tip of sensory bristle of 5th joint, but not reaching tip of c-bristle; f- and g-bristles about same length as d- and e-bristles, each with about 6 marginal filaments.

Second Antenna (Figure 4*e,f*): Prodopodite bare. Endopodite 3-jointed: 1st joint short with 3 small anterior bristles; 2nd joint elongate with 2 proximal ventral bristles; 3rd joint elongate with unridged, pointed, sclerotized tip, and 2 small subterminal bristles. Exopodite: 1st joint elongate, with hairs forming clusters along ventral margin, and small, terminal, medial bristle with open tip; joints 2–9 progressively decreasing in size; bristles of joints 2–9 with natatory hairs but no ventral spines; bristle of 2nd joint about same length as exopodite, bristles of joints 3–8 much longer; 9th joint with 3 bristles (long ventral bristle with natatory hairs, short middle and dorsal bristles with short marginal spines); joints 2–8 with fairly long spines forming row along distal margin, but no basal spines.

Mandible (Figure 4*g,h*): Coxale endite represented by 2 minute subequal spines. Basale: medial surface spinous, with 3 short bristles near ventral margin (2 proximal, 1 near middle); ventral margin with 4 long spinous bristles (bases of some of these are on medial or lateral surface of joint); dorsal margin with 1 long spinous bristle distal to middle and 2 long spinous subterminal bristles. Exopodite about one-fourth length of 1st endopodial joint, with 1 long spinous terminal bristle. 1st endopodial joint with medial spines, and 2 long spinous ventral bristles. 2nd endopodial joint: ventral margin spinous, with bristles forming 2 groups (1 bristle in proximal group and 2 in distal group); dorsal margin spinous, with 4



FIGURE 4.—*Angulorostrum monothrix*, new species, adult male, allotype, USNM 157814, length 1.63 mm: *a*, outline of complete specimen, anterior to right; *b*, anterior of left valve, lateral view; *c*, posterior of left valve, lateral view; *d*, left 1st antenna, medial view (long proximal filaments of sensory bristle not shown); *e*, joints 1–4 of exopodite of right 2nd antenna, medial view; *f*, endopodite of left 2nd antenna, medial view; *g*, right mandible, medial view; *h*, distal part of basale, exopodite, and 1st endopodial joint of left mandible, lateral view; *i*, right maxilla, lateral view; *j*, left maxilla, lateral view.

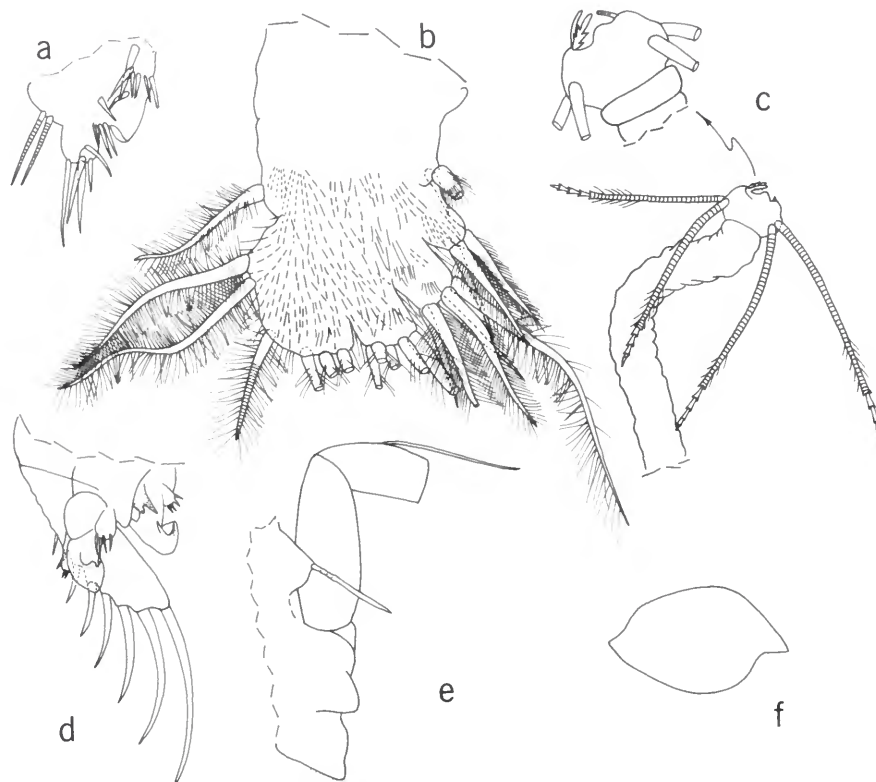


FIGURE 5.—*Angulostrum monothrix*, new species, adult male, allotype, USNM 157814, length 1.63 mm: *a*, 5th limb (epipodial appendage not shown); *b*, 6th limb (many bristles with distal parts broken); *c*, 7th limb; *d*, right lamella of furca and both limbs of copulatory organ; *e*, anterior of body showing 1st and 2nd joints of 1st antenna, medial eye, bellonci organ, anterior process, and upper lip. *f*, outline of juvenile carapace, paratype, USNM 156963, length 1.41 mm.

long bristles near middle; medial surface spinous. 3rd endopodial joint with 3 claws (2 long, 1 short) with teeth near middle, and 3 bristles.

Maxilla (Figure 4*i,j*): 3 endites with weakly developed bristles, some spinous. Precoxale and coxale with fringe of long hairs. Coxale with stout spinous dorsal bristle. Basale with long hairs and 1 long ventral bristle. Exopodite small, with 3 bristles, 2 long, 1 short. Endopodite: 1st joint with 1 alpha- and 1 beta-bristle; 2nd joint with 8 bristles.

Fifth Limb (Figure 5*a*): Reduced with weakly developed bristles.

Sixth Limb (Figure 5*b*): Endite I with 1 small

spinous medial bristle and 1 stout hirsute terminal bristle; endite II with 3 terminal bristles (2 hirsute, 1 with long proximal and short distal spines); endite III with 5 terminal bristles (3 hirsute, 2 with long proximal and short distal spines); endite IV with 5 stout terminal bristles (some hirsute, some spinous); end joint narrow, with 6 bristles (posterior 2 of these long, hirsute and separated by space from anterior bristles); 1 hirsute bristle in place of epipodial appendage.

Seventh Limb (Figure 5*c*): Each limb with 4 terminal bristles, each with distal marginal spines and 4 bells. Terminus consisting of comb with

about 4 spinous teeth opposite single elongate peg.

Furca (Figure 5d): Right lamella with 8 claws, left with 9; claws decreasing in length and width posteriorly along lamella; each claw with teeth along posterior margin (small teeth forming groups between larger teeth); posterior 4 or 5 claws with few proximal teeth along anterior margin; few hairs present at base of claw 1 and following claws.

Bellonci Organ (Figure 5e): Elongate but fairly short, with 3 or 4 weak sutures proximally, tip pointed.

Eyes: Medial eye unpigmented, bare (Figure 5e); Lateral eyes absent.

Upper Lip (Figure 5e): Similar to that of female.

Genitalia (Figure 5d): Each limb consisting of 3 lobes, one of these with sclerotized tip, others with bristles.

DESCRIPTION OF JUVENILE VALVES (Figure 5f, Plates 1, 2).—Carapace similar in outline to that of adult female.

Ornamentation: Surface appearing smooth but scanning electron microscope used at high magnifications (above $\times 1000$) revealing minute scattered pustules with central pore and abundant smaller pustules between them (Plates 1, 2). Surface with numerous bristles (Plate 1).

Size: USNM 156963, length 1.41 mm, height 0.87 mm.

Angulorostrum costatum, new species

FIGURES 6-8

ETYMOLOGY.—The specific name is from the Latin *costatus* (ribbed) in reference to the lateral ribs on the carapace of the species.

HOLOTYPE.—USNM 156778, adult female in alcohol and on slides.

PARATYPE.—USNM 157839, ovigerous female, in alcohol and on slide, from sta 0155-2 (2G), South Carolina continental slope.

TYPE-LOCALITY.—Beaufort Shelf Transect sta 60, North Carolina continental slope.

DESCRIPTION OF FEMALE (Figures 6-8).—Carapace elongate, widest near posterior end of lateral midrib (Figures 6, 7a,h). In medial view, rostrum triangular and with minute indentation representing incisur (Figure 7i); in lateral view, rostrum appearing subrectangular due to lateral overhang (Figure 6). Caudal process projecting posteriorly (Figures 6, 7a,j).

Ornamentation (Figures 6, 7a): Each valve with 3 lateral ribs connected near their posterior ends by weak vertical rib. Surface with shallow fossae and scattered bristles.

Infold: Rostral infold with 2 long spinous bristles in dorsal part and 2 minute bristles near incisur (Figure 7i); anteroventral infold with 1 bristle; ventral margin obscure but possibly with 3 bristles; infold of caudal process with 6 broad spinous bristles on ridge along anterior edge of pocket (Figure 7j); inner margin of infold in vicinity of caudal process with few small faint bristles.

Selvage: Broad lamellar prolongation present along free margin; fringed along ventral margin and possibly elsewhere.

Size: USNM 156778, length 1.18 mm, height 0.76 mm; USNM 157839, length 1.08 mm, height 0.67 mm.

Central Adductor Muscle Attachments (Figure 7a,b): Consisting of about 17 ovoid and elongate scars.



FIGURE 6.—*Angulorostrum costatum*, new species, adult female, holotype, USNM 156778, length 1.18 mm, complete specimen, lateral view from left.

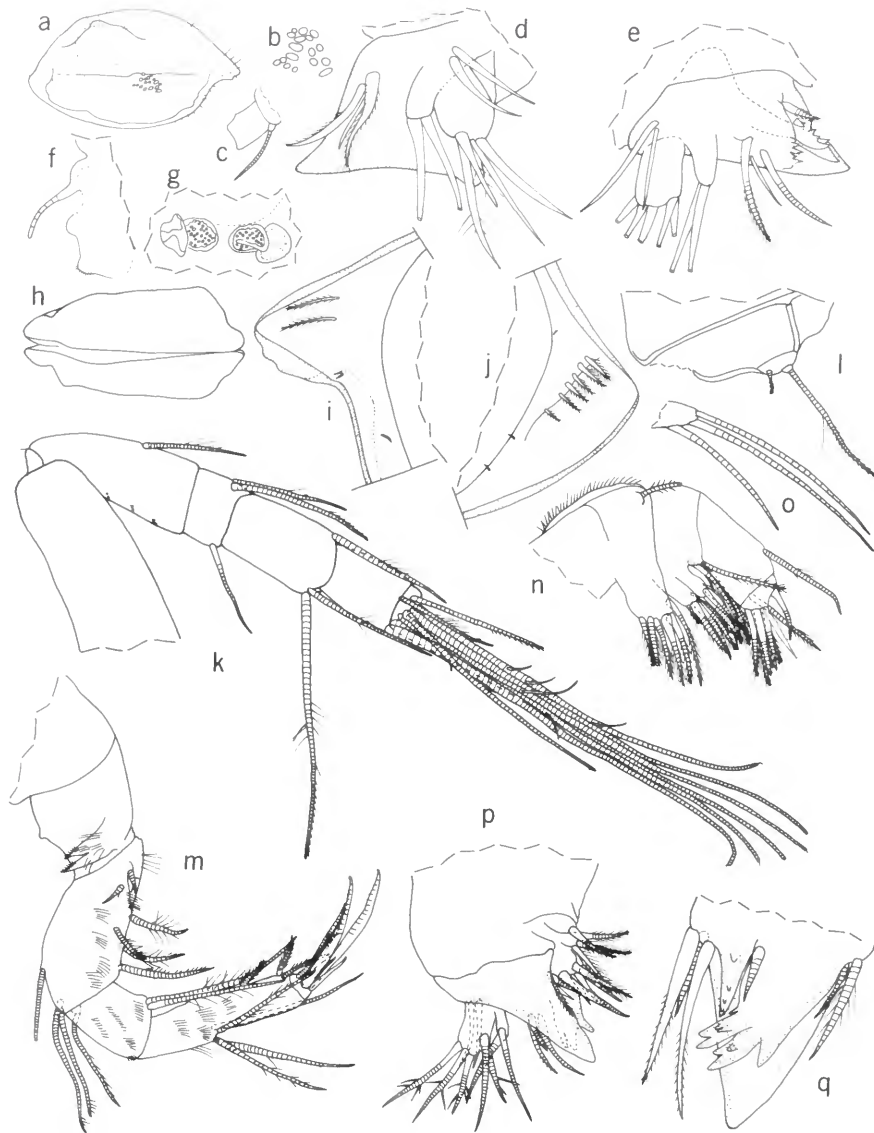


FIGURE 7.—*Angulostrum costatum*, new species, adult female, paratype, USNM 157839, length 1.08 mm: *a*, complete specimen showing appearance of central adductor muscle attachments and dashed outline of 2 of the eggs in marsupium; *b*, left ends of central adductor muscles with left valve removed, anterior to left; *c*, distal end of basale, exopodite, and 1st endopodial joint of right mandible, lateral view (only bristle of exopodite shown); *d*, exopodial joints 2–5 of right 5th limb, posterior view; *e*, exopodite of left 5th limb, posterior view; *f*, anterior of body showing medial eye and bellonci organ, anterior process, and upper lip; *g*, genitalia, ventral view. Adult female, holotype, USNM 156778, length 1.18 mm: *h*, complete specimen, ventral view (appendages not shown); *i*, anterior of right valve, inside view; *j*, caudal process of right valve, inside view; *k*, left 1st antenna, medial view; *l*, distal part of protopodite and endopodite of right 2nd antenna, medial view; *m*, right mandible, medial view; *n*, left maxilla, medial view; *o*, exopodite of left maxilla, medial view; *p*, 5th limb; *q*, distal part of 5th limb opposite that shown in *p*.

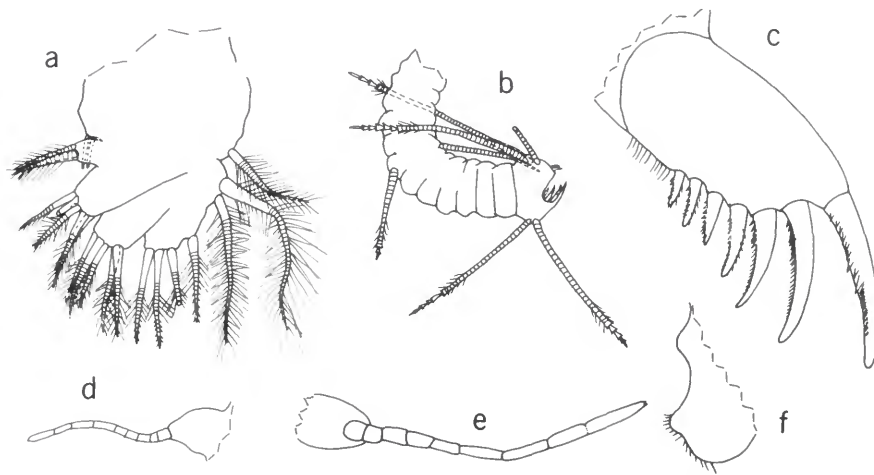


FIGURE 8.—*Angulostrum costatum*, new species, adult female, holotype, USNM 156778, length 1.18 mm: a, 6th limb; b, 7th limb; c, right lamella of furca, lateral view; d, medial eye and bellonci organ, lateral view; e, medial eye and bellonci organ, ventral view; f, lower part of anterior margin showing anterior process and upper lip.

First Antenna (Figure 7k): 1st joint bare. 2nd joint with 1 spinous dorsal bristle, spines forming distal row on lateral surface, and spines forming short rows medially along ventral margin. 3rd joint short with 3 bristles, 2 dorsal, 1 ventral. 4th and 5th joints with faint ventral and dorsal spines. 4th joint elongate, with 3 bristles, 1 dorsal, 2 ventral. 5th joint elongate, with sensory bristle bearing 2 or 3 short proximal filaments. 6th joint minute, with spinous medial bristle. 7th joint: a-bristle longer than bristle of 6th joint, with short marginal spines; b-bristle almost twice length of a-bristle, with 1 filament near middle; c-bristle about same length as sensory bristle of 5th joint, with 1 or 2 proximal filaments. 8th joint: d- and e-bristles about same length as c-bristle, bare with blunt tips; f- and g-bristles with 2 or 3 filaments.

Second Antenna (Figure 7l): Protopodite bare. Endopodite 2-jointed: 1st joint with 1 short anterior bristle; 2nd joint small with 1 long spinous terminal bristle. Exopodite: 1st joint with small medial terminal bristle or spine; bristles of joints 2–8 fairly short, with long segments and stout ventral spines; 9th joint with 3 bristles (1 long with stout ventral spines, remaining shorter bris-

gles bare or with few slender spines); joints 2–8 with minute spines forming row along distal margin.

Mandible (Figure 7c,m): Coxale endite bifurcate with proximal spines and distal teeth. Basale: dorsal margin with 3 bristles (1 distal to middle, 2 terminal); ventral margin with 1 terminal bristle; medial surface spinous, with 3 short bristles near ventral margin (2 proximal, 1 near middle); lateral surface with 2 or 3 spinous bristles (bases almost on ventral margin). Exopodite minute, with single spinous terminal bristle reaching past distal end of 1st endopodial joint. 1st endopodial joint with medial spines and 2 long spinous ventral bristles. 2nd endopodial joint: medial surface with spines forming rows; dorsal margin with 3 or 4 long bristles near middle; ventral margin spinous, with bristles forming 2 groups (1 bristle in proximal group, 2 in distal group). End joint with 2 long claws with teeth near middle, 1 short dorsal claw, and 3 bristles.

Maxilla (Figure 7n,o): Endite I broad with 6 terminal bristles; endite II narrow with 5 or 6 terminal bristles; endite III narrow with 4 terminal bristles and 1 proximal lateral bristle; all

endite bristles spinous. Precoxale and coxale with transparent dorsal lamella with marginal fringe. Coxale with spinous dorsal bristle. Basale with 2 ventral bristles (1 medial, 1 lateral). Exopodite short, with 3 bristles (Figure 7o). Endopodite: 1st joint with 1 spinous alpha-bristle and 1 beta-bristle; end joint with 7 spinous bristles (2 claw-like).

Fifth Limb (Figure 7d,e,p,q): Endite I small with 1 bristle with long marginal hairs; endite II with 3 bristles with long marginal hairs; endite III with 7 bristles. Exopodite: 1st joint with 2 anterior bristles on distal edge; main tooth with 1 smooth anterior tooth followed by 2 larger pectinate teeth and 2 or 3 small teeth and then 1 short bristle; a large pectinate indistinct tooth present near main tooth (difficult to interpret); 2nd joint large, triangular, with 3 posterior bristles; 3rd joint with 2 or 3 bristles on inner lobe and 2 on outer lobe; 4th and 5th joints fused, with total of 4 or 5 bristles.

Sixth Limb (Figure 8a): Endite I small with 2 short spinous bristles; endite II narrow with 3 spinous terminal bristles; endites III and IV broad, each with 5 spinous terminal bristles. End joint narrow, with 4 anterior bristles with long proximal and short distal marginal spines, and 2 longer plumose posterior bristles. 1 short plumose bristle in place of epipodial appendage.

Seventh Limb (Figure 8b): 2 bristles in proximal group, 1 on each side; 5 bristles in terminal group, 3 on one side, 2 on other; each proximal bristle with 1 bell, each terminal bristle with 1 to 4 bells; all bristles spinous distally. Terminus consisting of comb with 6 or 7 recurved teeth opposite 2 pegs.

Furca (Figure 8c): Each lamella with 7 or 8 claws decreasing in length and width posteriorly along lamella; hairs present following claws and medially at base of claws.

Bellonci Organ (Figures 7f, 8d,e): Elongate with 6 to 8 sutures and 1 or 2 minute spines at tip.

Eyes: Medial eye unpigmented (Figures 7f, 8d,e). Lateral eyes absent.

Upper Lip (Figures 7f, 8f): With rounded anterior projection, hirsute.

Genitalia (Figure 7g): Consisting of sclerotized

ring on each side of body anterior to furca; ovoid ?spermatophore attached to ring.

Eggs: USNM 156778 with small unextruded eggs; USNM 157839 with 4 eggs in marsupium.

VARIABILITY.—The specimen collected off South Carolina (USNM 157839) differs from the specimen collected off North Carolina (USNM 156778) in being more elongate, in having a narrower lateral overhang on the rostrum, and in having 7 or 8 rather than 7 furcal claws on each lamella. Because I could detect no other differences in either the carapaces or appendages, I have attributed the observed differences to intraspecific variability.

COMPARISONS.—The carapace of the new species *A. costatum* differs from the carapace of *A. monothrix* in having ribs and in having a lateral overlap on the rostrum.

Angulorostrum segonzaci, new species

FIGURES 9–11

ETYMOLOGY.—The species is named for Dr. M. Segonzac, Museum National d'Histoire Naturelle (CENTOB), Paris, France, who supplied the specimens.

HOLOTYPE.—Adult female in alcohol, Museum National D'Histoire Naturelle, Paris (MNHN Os 12).

PARATYPE.—USNM 158133, ovigerous female, R/V *Thalassa*, sta X 342, continental slope north of Spain, Bay of Biscay.

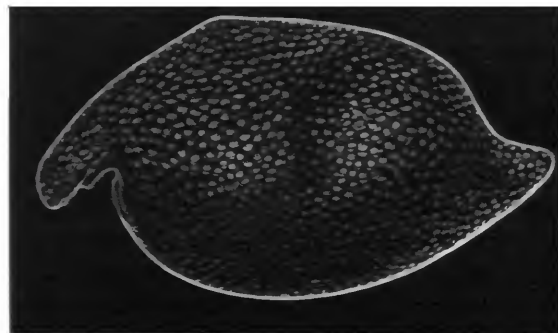


FIGURE 9.—*Angulorostrum segonzaci*, new species, adult female, holotype, length 1.42 mm, complete specimen, lateral view from left.

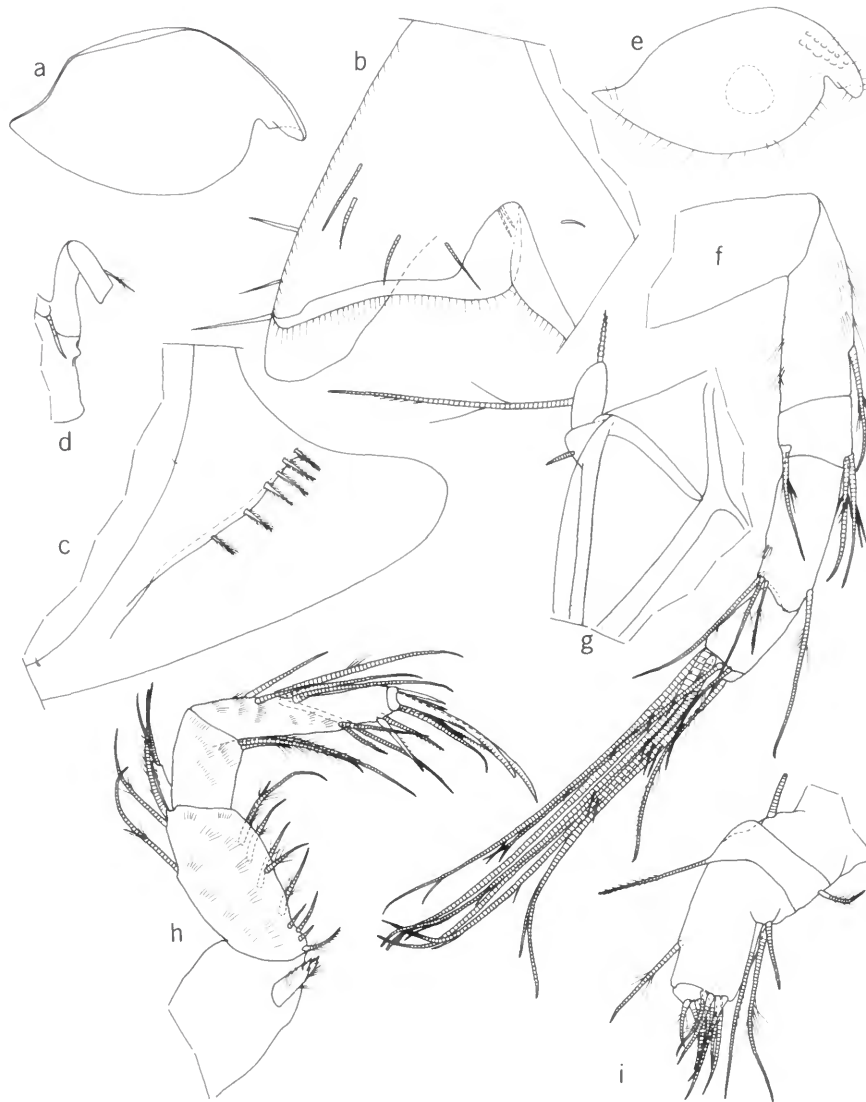


FIGURE 10.—*Angulostrum segonzaci*, new species, adult female, holotype, length 1.42 mm: *a*, complete specimen, lateral view from right side (fossae and bristles not shown); *b*, anterior tip of right valve, inside view; *c*, caudal process of right valve, inside view; *d*, anterior of body showing 1st and 2nd joints of left 1st antenna, medial eye, bellonci organ, anterior process and upper lip. Adult female, paratype, USNM 158133, length 1.36 mm: *e*, complete specimen showing position of central adductor muscle attachments (dashed circle) and some of the fossae and bristles, lateral view from right; *f*, left 1st antenna, medial view; *g*, endopodite and distal part of protopodite of left 2nd antenna, medial view; *h*, left mandible, medial view; *i*, left maxilla, lateral view (endites not shown).

TYPE-LOCALITY.—R/V *Thalassa*, sta Y 400, continental slope west of the northern end of Portugal.

DESCRIPTION OF ADULT FEMALE (Figures 9–11).—Carapace elongate with straight hingeline; greatest height anterior to middle; ventral margin convex; elongate rostrum with lateral overlap having rounded anterior end; caudal process prominent (Figures 9, 10a–c,e).

Ornamentation (Figures 9, 10e): Surface with abundant shallow fossae and few long hairs; hairs more abundant along ventral and anterior margins of valve (Figure 10e).

Infold (Figure 10b,c): Rostral infold with 4 bristles; 1 bristle present just ventral to inner end of incisur; anteroventral infold with about 7 ridges paralleling valve margin; infold of caudal process with 6 flat hirsute bristles forming row along list, and 1 or 2 small bristles near inner margin of infold.

Selvage (Figure 10b): Selvage with broad fringed lamellar prolongation along anterior and ventral margin; fringed lamellar prolongation narrower along posterior margin;

Size: USNM 158133, length 1.36 mm, height 0.75 mm; USNM 158135, length 1.42 mm, height 0.82 mm.

First Antenna (Figure 10d,f): 1st joint bare. 2nd joint spinous, with 1 spinous dorsal bristle. 3rd joint with 3 spinous bristles, 2 dorsal, 1 ventral. Long 4th joint spinous, with 4 spinous bristles, 1 dorsal, 3 ventral. Sensory bristle of long 5th joint with 5 marginal filaments. Minute 6th joint with 1 short spinous bristle. 7th joint: a-bristle spinous, almost twice length of bristle of 6th joint; b-bristle about one-third longer than a-bristle, with 2 short filaments, 1 proximal, 1 distal; c-bristle almost as long as sensory bristle of 5th joint, with 5 marginal filaments. 8th joint: d- and e-bristles long, bare, with blunt tips; f-bristle shorter than e-bristle, with 2 filaments, 1 proximal, 1 distal; g-bristle longer than f-bristle with 4 or 5 marginal filaments.

Second Antenna (Figure 10g): Protopodite bare. Endopodite 2-jointed: 1st joint with 1 short bare

bristle; 2nd joint with 1 long spinous ventral bristle and 1 short spinous terminal bristle. Exopodite: long 1st joint with small medial bristle on terminal margin; bristle of short 2nd joint reaching past end of 9th joint, with 1 proximal hair, otherwise bare; bristles of joints 3–8 only about one-third longer than bristle of 2nd joint, with a few proximal hairs, otherwise bare; 9th joint with 3 bristles (2 about same length as combined joints 2–9, other short), all with short marginal hairs; joints 2–8 with fairly long spines forming row along distal margin.

Mandible (Figure 10h): Coxale endite pectinate, hirsute, bifurcate at tip, without bristle near base. Basale: dorsal margin with 3 spinous bristles (1 distal to middle, 2 terminal); ventral margin, with 1 subterminal bristle; medial surface spinous, with 5 bristles near ventral margin (1 near middle, 4 proximal); lateral surface spinous, with 4 spinous bristles forming row near ventral margin. Exopodite hirsute, about one-half length of dorsal margin of 1st endopodial joint, with 2 subterminal bristles. 1st endopodial joint with medial spines and 3 ventral bristles. 2nd endopodial joint: medial surface spinous; dorsal margin with 6 bristles near middle; ventral margin with 4 spinous bristles forming 2 distal groups, 2 bristles in each group. End joint with 3 claws (dorsal of these small, bare, others long, spinous) and 3 bristles.

Maxilla (Figure 10i): 3 endites present, each with 6 or 7 bristles (not shown on illustrated limb). Precoxale and coxale with dorsal fringe of long hairs; coxale with single dorsal bristle. Basale with 2 or 3 bristles. Exopodite short, with 3 bristles (2 long, 1 short). Endopodite: 1st joint with 1 alpha-bristle and 2 beta-bristles; 2nd joint with about 6 additional claws and bristles.

Fifth Limb (Figure 11a–d): Endite I with 2 bristles; endite II with 5 bristles; endite III with about 9 bristles (not all shown on illustrated limb). Exopodite: 1st joint with main tooth consisting of 3 pectinate teeth followed by smooth peglike tooth (distal pectinate tooth with triangular anterior tooth); 1 spinous bristle proximal

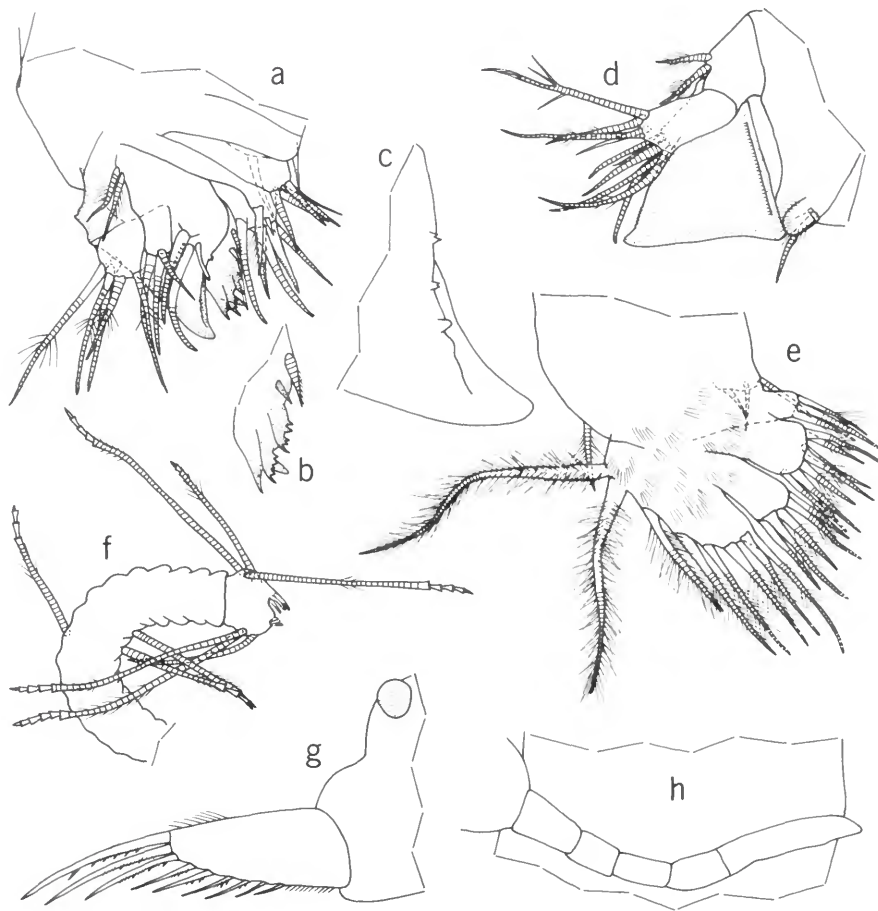


FIGURE 11.—*Angulorostrum segonzaci*, new species, adult female, paratype, USNM 158133, length 1.36 mm: *a*, left 5th limb, posterior view; *b*, detail of 1st exopodial joint of 5th limb, from *a*; *c*, detail of inner edge of tooth of 2nd exopodial joint of 5th limb, from *a*; *d*, exopodite of right 5th limb, posterior view; *e*, 6th limb; *f*, 7th limb; *g*, left lamella of furca and part of genitalia on left side of body; *h*, distal part of medial eye and bellonci organ and in background part of 1st joint of 1st antenna showing its width relative to length of bellonci organ.

to peglike tooth; anterior side of 1st joint with 2 slender bristles near middle (not shown on illustrated limbs) and 1 small bristle near outer corner. 2nd joint with large squarish tooth with 3 small processes along inner margin; posterior side of joint with 3 bristles forming group (long bristle in middle, shorter bristles on each side) and proximal long bristle. 3rd joint with 3 bristles on inner lobe and 2 on outer lobe. 4th and 5th joints fused, with total of 5 bristles.

Sixth Limb (Figure 11*e*): Endite I small, with 3 bristles; endite II with 3 terminal bristles; endite III broad, with 7 terminal bristles; endite IV narrower than 4th, with 5 terminal bristles; end joint not projecting posteriorly with 5 spinous bristles followed by 3 hirsute bristles (1 short, 2 long); 1 short spinous bristle in place of epipodial appendage.

Seventh Limb (Figure 11*f*): Proximal group with 2 or 3 bristles (1 or 2 on each side); terminal

group with 6 bristles (3 on each side); each bristle with marginal spines and up to 5 bells. Terminus consisting of comb of 6 or 7 teeth opposite 3 pegs forming row (inner peg longer than others).

Furca (Figure 11g): Each lamella with 9 claws, all separated from lamella by suture, and all decreasing in length and width posteriorly along lamella; claw 1 with single large tooth distal to middle of claw; claws 1-7 with small teeth of various lengths along posterior margins; long hairs present along anterior margin of lamellae and on lamellae following 9th claw.

Bellonci Organ (Figures 10d, 11h): Elongate but not much longer than width of 1st joint of 1st antenna, with 4 proximal segments and pointed tip.

Eyes: Medial eye small, unpigmented (Figures 10d, 11h). Lateral eyes absent.

Upper Lip (Figure 10d): Typical for family.

Genitalia (Figure 11g): Oval sclerotized area on each side of body anterior to furca.

Eggs: USNM 158133 with 1 egg in marsupium.

COMPARISONS.—The new species *A. segonzaci* differs from the previously described species of the genus in the shape of the carapace, especially in the rostrum, which projects anteriorly and ventrally a considerable distance from the valve's edge. The endopodite of the female 2nd antenna of *A. segonzaci* differs from the endopodites of *A. monothrix* and *A. costatum* in having 2 bristles on the 2nd joint.

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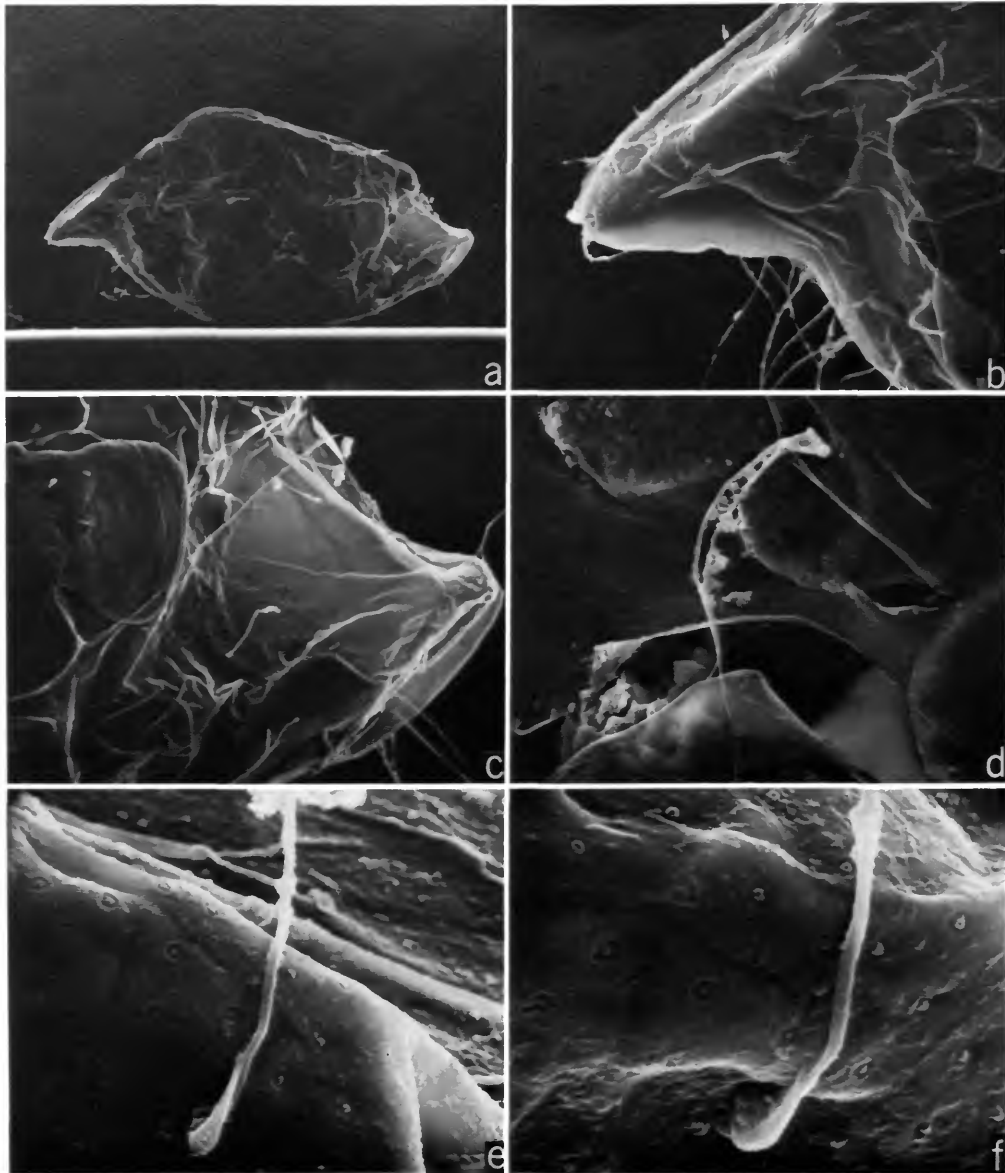


PLATE 1.—*Angulorostrum monothrix*, new species, juvenile, paratype, USNM 156963, connected valves: *a*, lateral view, anterior to left, $\times 70$; *b*, anterior of valves, from *a*, $\times 275$; *c*, posterior of valves, from *a*, $\times 250$; *d*, bristle near slit just below valve middle, from *a*, note edge of concretion in lower left emerging from between valve layers, $\times 800$; *e*, bristle near posterodorsal edge of left valve, from *a*, $\times 2000$; *f*, detail showing proximal part of a bristle and pores on valve surface, $\times 3000$. (Stated magnifications of micrographs are those used on SEM; micrographs reduced to 72 percent.)

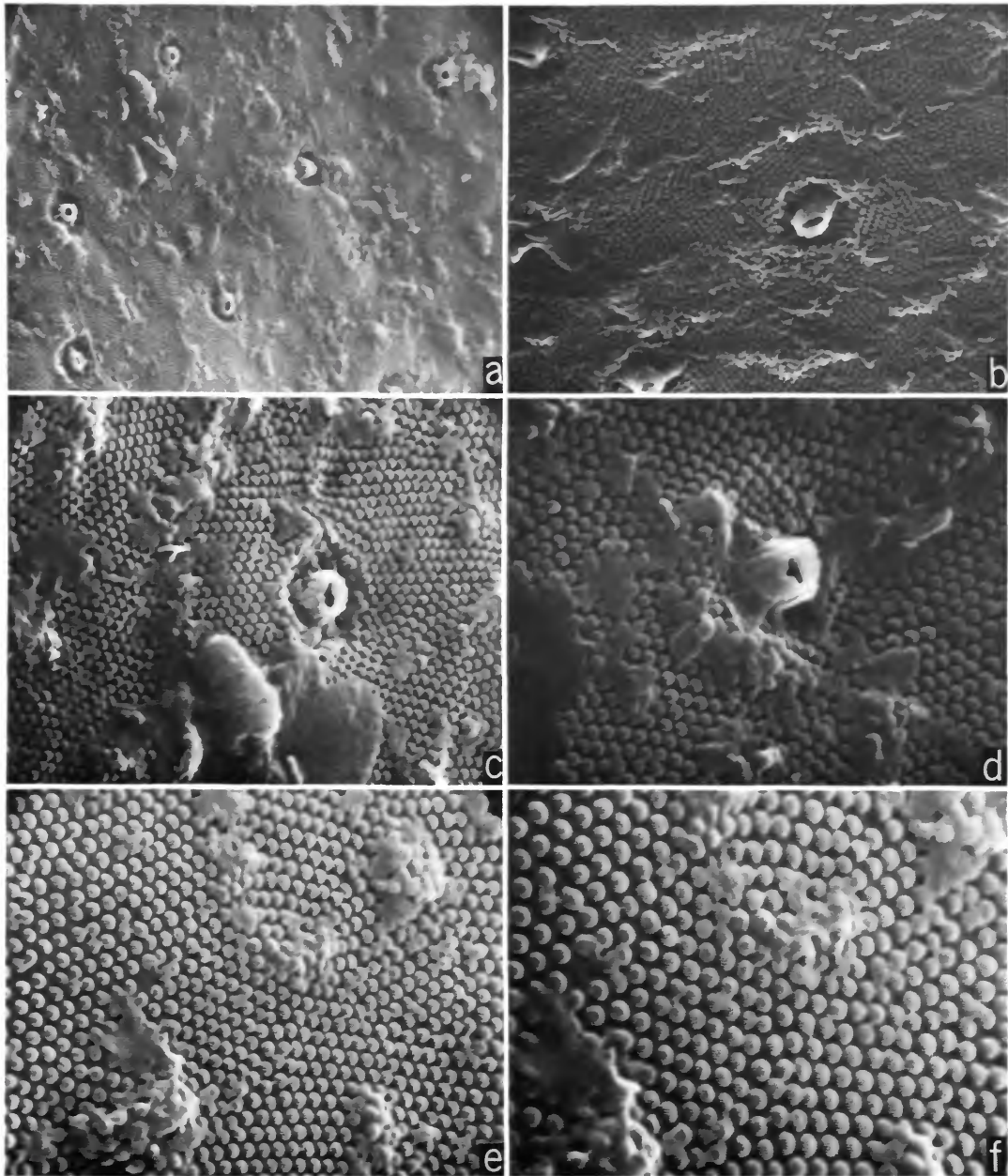


PLATE 2.—*Angulorostrum monothrix*, new species, juvenile, paratype, USNM 156963, details of pores and pustules of valve surface at different places and magnifications: *a*, $\times 5000$; *b*, $\times 10,000$; *c*, $\times 15,000$; *d,e*, $\times 20,000$; *f*, $\times 30,000$. (Stated magnifications of micrographs are those used on SEM; micrographs reduced to 77 percent.)

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