

Anthuridean Isopod Crustaceans
from the International
Indian Ocean Expedition, 1960-1965,
in the Smithsonian Collections

BRIAN KENSLEY

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY • NUMBER 304

SERIES PUBLICATIONS OF THE SMITHSONIAN INSTITUTION

Emphasis upon publication as a means of “diffusing knowledge” was expressed by the first Secretary of the Smithsonian. In his formal plan for the Institution, Joseph Henry outlined a program that included the following statement: “It is proposed to publish a series of reports, giving an account of the new discoveries in science, and of the changes made from year to year in all branches of knowledge.” This theme of basic research has been adhered to through the years by thousands of titles issued in series publications under the Smithsonian imprint, commencing with *Smithsonian Contributions to Knowledge* in 1848 and continuing with the following active series:

Smithsonian Contributions to Anthropology
Smithsonian Contributions to Astrophysics
Smithsonian Contributions to Botany
Smithsonian Contributions to the Earth Sciences
Smithsonian Contributions to Paleobiology
Smithsonian Contributions to Zoology
Smithsonian Studies in Air and Space
Smithsonian Studies in History and Technology

In these series, the Institution publishes small papers and full-scale monographs that report the research and collections of its various museums and bureaux or of professional colleagues in the world of science and scholarship. The publications are distributed by mailing lists to libraries, universities, and similar institutions throughout the world.

Papers or monographs submitted for series publication are received by the Smithsonian Institution Press, subject to its own review for format and style, only through departments of the various Smithsonian museums or bureaux, where the manuscripts are given substantive review. Press requirements for manuscript and art preparation are outlined on the inside back cover.

S. Dillon Ripley
Secretary
Smithsonian Institution

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY • NUMBER 304

Anthuridean Isopod Crustaceans
from the International
Indian Ocean Expedition, 1960-1965,
in the Smithsonian Collections,

Brian Kensley
...



SMITHSONIAN INSTITUTION PRESS

City of Washington

1980

A B S T R A C T

Kensley, Brian. Anthuridean Isopod Crustaceans from the International Indian Ocean Expedition, 1960–1965, in the Smithsonian Collections. *Smithsonian Contributions to Zoology*, number 304, 37 pages, 25 figures, 1980.—In the family Paranthuridea, four species are recorded, with *Colanthura pigmentata* described as new. In the family Anthuridae, 11 genera are recorded, of which four are described as new: *Alloanthura*, *Diaphoranthura*, *Exallanthura*, and *Heteranthura*. Fifteen species are recorded, of which the following 11 are described as new: *Alloanthura sculpta*, *Apanthura microps*, *Cyathura rudloei*, *Diaphoranthura cracens*, *D. hapla*, *Exallanthura sexpes*, *Haliophasma poorei*, *Heteranthura anomala*, *Malacanthura mombasa*, *Mesanthura protei*, and *Panathura macronesia*.

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

Kensley, Brian Frederick.

Anthuridean isopod crustaceans from the International Indian Ocean Expedition, 1960–65, in the Smithsonian Institution.

(Smithsonian contributions to zoology ; no. 304)

Bibliography: p.

1. Anthuridae. 2. Paranthuridae. 3. International Indian Ocean Expedition, 1960–1965. 4. Smithsonian Institution. 5. Crustacea—Indian Ocean. I. Title. II. Series: Smithsonian Institution. Smithsonian contributions to zoology ; no. 304.

QL1.S54 no. 304 [QL444.M34] 591'.08s [595'.372] 79-607053

Contents

	<i>Page</i>
Introduction	1
Abbreviations and Terms	1
Acknowledgments	2
Species and Station List	2
Family PARANTHURIDAE	3
Genus <i>Accalathura</i>	3
<i>Accalathura sladeni</i> (Stebbing, 1910)	3
Genus <i>Colanthura</i>	5
<i>Colanthura pigmentata</i> , new species	5
Genus <i>Leptanthura</i>	5
<i>Leptanthura laevigata</i> (Stimpson, 1855)	5
Genus <i>Paranthura</i>	8
<i>Paranthura</i> sp.	8
Family ANTHURIDAE	8
<i>Alloanthura</i> , new genus	8
<i>Alloanthura sculpta</i> , new species	8
Genus <i>Apanthura</i>	10
<i>Apanthura microps</i> , new species	10
<i>Apanthura sandalensis</i> Stebbing, 1900	12
Genus <i>Cyathura</i>	12
<i>Cyathura rudloei</i> , new species	12
<i>Diaphoranthura</i> , new genus	15
<i>Diaphoranthura cracens</i> , new species	15
<i>Diaphoranthura hapla</i> , new species	18
<i>Exallanthura</i> , new genus	18
<i>Exallanthura sexpes</i> , new species	20
Genus <i>Haliophasma</i>	22
<i>Haliophasma poorei</i> , new species	22
<i>Heteranthura</i> , new genus	24
<i>Heteranthura anomala</i> , new species	24
Genus <i>Malacanthura</i>	26
<i>Malacanthura mombasa</i> , new species	26
Genus <i>Mesanthura</i>	29
<i>Mesanthura</i> cf. <i>maculata</i> (Haswell, 1881)	29
<i>Mesanthura protei</i> , new species	30
Genus <i>Natalanthura</i>	32
<i>Natalanthura foveolata</i> Kensley, 1978	32
Genus <i>Panathura</i>	32
<i>Panathura amstelodami</i> Kensley, 1976	32
<i>Panathura macronesia</i> , new species	32
Literature Cited	36

Anthuridean Isopod Crustaceans from the International Indian Ocean Expedition, 1960-1965, in the Smithsonian Collections

Brian Kensley

Introduction

This report deals with the largest single collection of anthurideans (18 species from 73 stations) from the Indian Ocean. Collected during the International Indian Ocean Expedition of 1960-1965, the material includes specimens from off the east coast of South Africa, off Mozambique, Madagascar, Kenya, Somalia, Mauritius, the Comoro Islands, the Arabian Sea, India, and across to the Andaman Islands and Malaysia. In many cases, only a few specimens were taken from scattered stations, anthurids usually being incidental in dredge and trawl samples. Only at Nosi Bé, northern Madagascar, was a fairly comprehensive collection made through the extensive shallow-water collecting of Mr. J. Rudloe, who was employed by the Smithsonian Institution for this purpose.

Previous records of Anthuridea from the Indian Ocean are sparse. Stebbing (1910) recorded three species from the Percy Sladen Trust Expedition. Barnard (1925a), in his major work on the group, recorded about 10 species from the Indian Ocean (excluding the species from the east coast of South Africa). Nierstrasz (1941) added two further species, while Pillai (1963, 1966) and Pillai and Eapen (1966) added several new records and about four

new names to the list. Kensley (1976) recorded three species from the St. Paul and Amsterdam Islands, southern Indian Ocean, and 10 species from the east coast of South Africa, north of Durban (Kensley 1978).

The present collection emphasizes the lack of knowledge about the group: the 18 species (including 12 new species) belong to 15 genera, four of which are new. These numbers are also a good indication of the diversity of the group and reflect their success at adapting to a range of microhabitats. This is borne out by the presence of eight species from the shallow-water/intertidal of Nosi Bé, Madagascar.

Included in the report is a single large sample of *Cyathura rudloei*, collected by the Danish Theo Mortensen Expedition of 1900. As this species was also collected at Nosi Bé, it was decided to deal with all the available material.

The holotype and some paratypes of the above-mentioned *Cyathura rudloei* have been deposited in the Zoological Museum, Copenhagen. All other material is in the National Museum of Natural History, Smithsonian Institution, Washington, D.C.

ABBREVIATIONS AND TERMS.—

AB	R/V <i>Anton Bruun</i>
Doty-SI	material collected by Dr. M. Doty of the University of Hawaii
HA	material collected by Dr. H. A. Feldman of the Smithsonian Oceanographic Sorting Center

Brian Kensley, Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560.

JR	material collected by Mr. J. Rudloe
TV	R/V <i>Te Vega</i>
USNM	United States National Museum collections (in the National Museum of Natural History, Smithsonian Institution, Washington, D.C.)
ovig	ovigerous (female)
sub ♂	refers to a specimen that possesses some male features, but not yet fully mature; e.g., the antennules have become elongate but do not possess whorls of filiform aesthetascs
Body Proportion Formula, e.g., C < 1 < 2 < 3 = 4 > 5 > 6 > 7	a simple if inexact way of describing the relative proportions of the cephalon (C) and the seven pereonites (adapted from Miller and Menzies, 1952)

The gender of each of the four new genera described is feminine.

ACKNOWLEDGMENTS.—The bulk of this paper was completed while the author was a postdoctoral fellow in the Department of Invertebrate Zoology, Smithsonian Institution. My sincere thanks are due to all the staff of the Crustacean Division for their kindness and support, and especially to Dr. Thomas E. Bowman, who also read the manuscript and made many valuable criticisms. I am grateful to Dr. Frank Ferrari of the Smithsonian Oceanographic Sorting Center for making the material available; to Dr. Torben Wolff of the Zoological Museum, Copenhagen, for the loan of the *Theo Mortensen* anthurideans; and to Dr. O. G. Kusakin of the Institute of Marine Biology, Vladivostok, for allowing me to examine the type of *Austranthura elegans*.

Species and Station List

Taxon	Station	Locality	Depth (m)
PARANTHURIDAE			
<i>Accalathura sladeni</i> (Stebbing)	AB 18A	07°34'N 98°00'E off Phuket, Thailand	77
	AB 28A	11°52'N 92°49'E off Andaman Islands	66
	AB 124E	19°54'S 57°36'E east of Mauritius	
	AB 401B	19°50'S 36°21'E south of Beira, Mozambique	65
	AB 401C	19°51'S 36°21'E south of Beira, Mozambique	62
	AB 400C	20°30'S 35°43'E off Beira, Mozambique	62
	AB 403E	19°09'S 36°55'E north of Beira, Mozambique	88
	AB 437	09°25'N 50°54'E off Somalia	90
	AB 449	10°03'N 51°15'E off Somalia	39
	AB 456	11°14'N 51°08'E off Somalia	31
	TV 82	09°26'N 103°59'E Andaman Sea off Malaysia	intertidal
	TV 93	05°33'N 95°09'E off Sumatra	intertidal
	JR 19	Nosi Bé, Madagascar	intertidal
	JR 29	Nosi Bé, Madagascar	1.5
	JR 33A	Nosi Bé, Madagascar	1.0
<i>Colanthura pigmentata</i> , new species	JR 29	Nosi Bé, Madagascar	1.5
	JR 31	Nosi Bé, Madagascar	intertidal
	JR 35	Nosi Bé, Madagascar	intertidal
<i>Leptanthura laevigata</i> (Stimpson)	AB 124F	21°21'S 65°52'E east of Mauritius	
	AB 360B	27°39'S 33°23'E between Durban and Maputo	1360
	AB 364A	23°20'S 43°46'E near Tulear, Madagascar	51
	AB 371F	24°46'S 35°18'E off Inhambane, Mozambique	110
	AB 371G	24°49'S 35°13'E off Inhambane, Mozambique	73
	AB 372B	24°48'S 34°59'E off Inhambane, Mozambique	42
	AB 373F	26°02'S 33°08'E off Maputo, Mozambique	366
	AB 409E	16°11'S 43°42'E mid-Mozambique Channel	62
	TV 93	05°33'N 95°09'E off Sumatra	intertidal
	<i>Paranthura</i> sp.	AB 456	11°14'N 51°08'E off Somalia
JR 29		Nosi Bé, Madagascar	1.5
JR 35		Nosi Bé, Madagascar	intertidal
JR 38		Nosi Bé, Madagascar	intertidal

ANTHURIDAE

<i>Alloanthura sculpta</i> , new species	AB 373B	26°00'S 33°05'E off Maputo, Mozambique	135
<i>Apanthura microps</i> , new species	AB 206A	20°23'N 70°00'E eastern Arabian Sea	79
	AB 372B	24°48'S 34°59'E off Inhambane, Mozambique	42
	AB 437	09°25'N 50°54'E off Somalia	95
<i>Apanthura sandalensis</i> Stebbing	AB 124E	19°54'S 57°36'E east of Mauritius	
	AB 400C	20°30'S 35°43'E south of Beira, Mozambique	62
	TV 93	05°33'N 95°09'E off Sumatra	intertidal
<i>Cyathura rudloei</i> , new species	AB 371G	24°49'S 35°13'E south of Inhambane, Mozambique	73
	JR 24A	Nosi Bé, Madagascar	intertidal
	JR 38	Nosi Bé, Madagascar	intertidal
	JR 63	Nosi Bé, Madagascar	intertidal
<i>Diaphoranthura cracens</i> , new species	AB 372B	24°48'S 34°59'E south of Inhambane, Mozambique	42
	AB 447	10°00'N 51°15'E off Somalia	61
<i>Diaphoranthura hapla</i> , new species	AB 346A	19°24'S 65°30'E east of Mauritius	
	AB 371F	24°46'S 35°18'E south of Inhambane, Mozambique	110
	JR 29	Nosi Bé, Madagascar	1.5
<i>Exallanthura sexpes</i> , new species	AB 453	11°11'N 51°14'E off Somalia	49
	TV 63	01°24'N 103°59'E off Singapore	intertidal
<i>Haliophasma poorei</i> , new species	AB 201A	17°54'N 72°27'E off Bombay, India	55
	AB 437	09°25'N 50°54'E off Somalia	95
<i>Heteranthura anomala</i> , new species	JR 33A	Nosi Bé, Madagascar	1
	JR 29	Nosi Bé, Madagascar	1.5
<i>Malacanthura mombasa</i> , new species	AB HA2	05°05'S 39°40'E reef south of Mombasa harbor entrance	3.5
<i>Mesanthura cf maculata</i> (Haswell)	AB 381B	33°13'S 43°51'E south of Madagascar	38
	Doty-SI M7		
<i>Mesanthura protei</i> , new species	AB 372P	25°57'S 33°02'E south of Inhambane, Mozambique	37
	JR 20	Nosi Bé, Madagascar	intertidal
	JR 29	Nosi Bé, Madagascar	1.5
	JR 30	Nosi Bé, Madagascar	intertidal
	JR 31	Nosi Bé, Madagascar	1
	JR 33A	Nosi Bé, Madagascar	1
<i>Natalanthura foveolata</i> Kensley	AB 400C	19°51'S 36°21'E south of Beira, Mozambique	62
<i>Panathura amstelodami</i> Kensley	AB 381A	33°13'S 43°51'E south of Madagascar	46
	AB 381B	33°13'S 43°51'E south of Madagascar	38
	AB 400C	19°51'S 36°21'E south of Beira, Mozambique	62
<i>Panathura macronesia</i> , new species	AB 124F	21°21'S 65°52'E east of Mauritius	
	AB 124E	19°54'S 57°36'E east of Mauritius	
	JR 29	Nosi Bé, Madagascar	1.5
	JR 30	Nosi Bé, Madagascar	intertidal
	JR 33A	Nosi Bé, Madagascar	1

Family PARANTHURIDAE

Genus *Accalathura**Accalathura sladeni* (Stebbing, 1910)

FIGURE 1

Calathura sladeni Stebbing, 1910:91, pl. 7A.

Accalathura sladeni.—Barnard, 1925a:148.—Hale, 1937:14.

MATERIAL.—Sta AB 18A, 1 ♀; Sta AB 28A, 2 juvs; Sta TV 82, 1 ♀; Sta TV 93, 1 ♀; Sta AB 124E, 1 ♂, 1 sub ♂, 1 ♀, 2 juvs; Sta AB 400C, 1 ovig ♀, 1 ♀; Sta AB 401B, 2 ovig ♀; Sta AB 401C, 1 sub ♂; Sta AB 403E, 1 ♀; Sta AB 437, 1 ovig ♀, 5 juvs;

Sta AB 449, 1 ovig ♀; Sta AB 456, 1 sub ♂, 1 ♀; Sta JR 19, 1 ♀; Sta JR 29, 1 juv; Sta JR 33A, 3 juvs.

REMARKS.—Three species of *Accalathura* must be considered in deciding the identity of the present material, viz: *A. gigas* (Whitelegge, 1901), *A. borradalei* (Stebbing, 1904), and *A. sladeni* (Stebbing, 1910). All three are closely related and have been recorded from the Indian Ocean. *A. borradalei*, however, possesses a distally rounded telson and a relatively broad uropodal exopod, while the other two species possess lanceolate telsons and narrow uropodal exopods. Barnard (1925a) synonymized *A.*

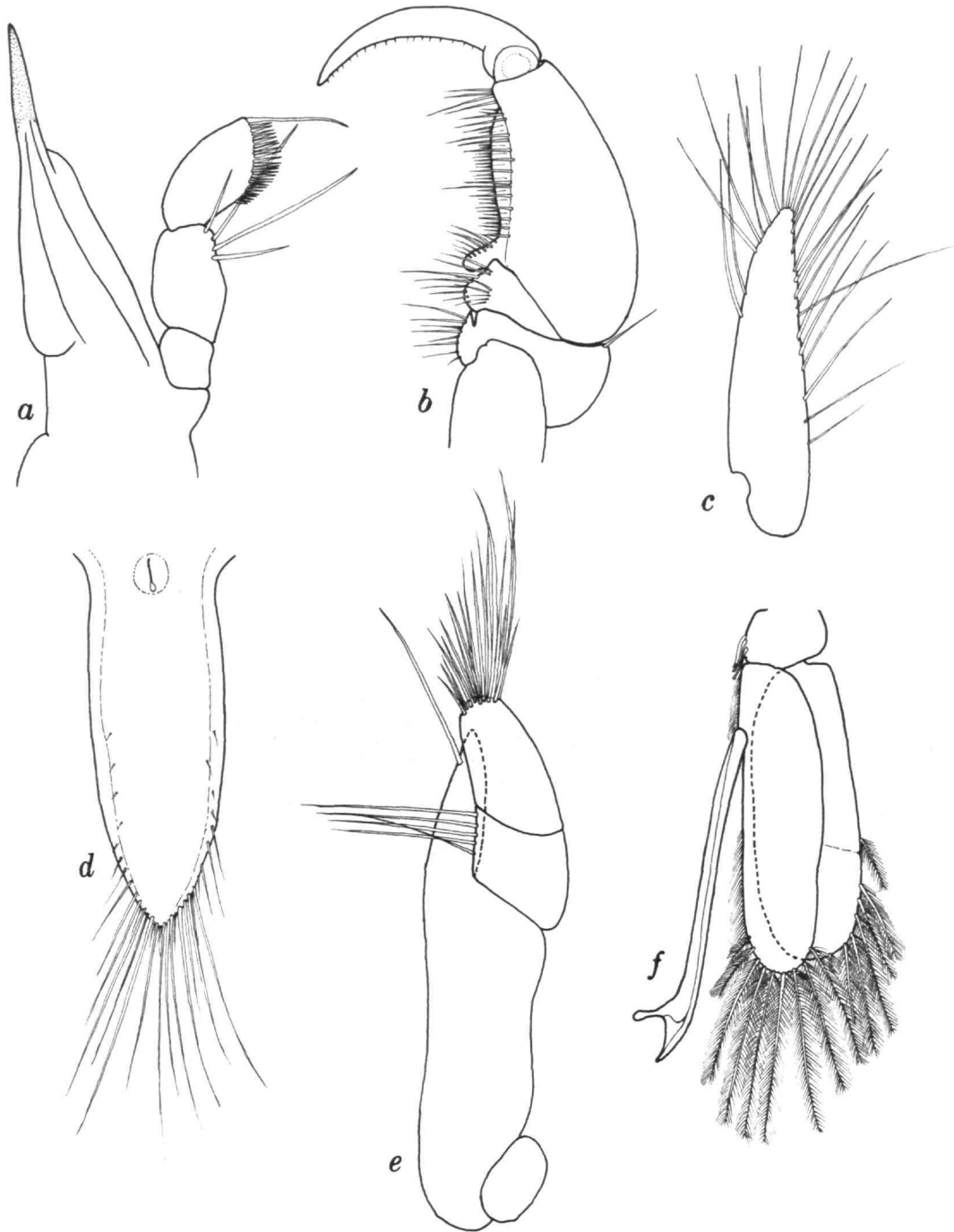


FIGURE 1.—*Accalathura sladeni* (Stebbing, 1910): *a*, mandible; *b*, pereopod 1; *c*, uropodal exopod; *d*, telson; *e*, maxilliped; *f*, pleopod 2 ♂.

sladeni with *A. gigas* but noted the lack of eyes in *A. gigas*. Hale (1937:14) examined the type material of *A. gigas* and concluded that it differed from *A. sladeni*, chiefly in the lack of eyes and in having a broader uropodal exopod. Stebbing's figure of the stylet of pleopod 2♂ in *A. sladeni* (1910, pl. 7A) shows a simple structure, whereas the present material possesses a distally bifid stylet, similar to that illustrated by Thomson (1951, fig. 1) for *A. gigas* from Western Australia; however, it is possible that Stebbing had an immature male, or that he overlooked the apical structure of the stylet in his material. Because of these elements of doubt, the mandible, pereopod 1♂, and pleopod 2♂ are figured.

Juveniles of this species up to 8.1 mm total length still lack the seventh pair of pereopods; at 11 mm this last pair of legs has appeared.

PREVIOUS RECORDS.—South Australia; Cargados Carajos and Saya de Malha, Indian Ocean.

Genus *Colanthura*

Colanthura pigmentata, new species

FIGURES 2, 3

MATERIAL.—Holotype: USNM 171684, Sta JR 29, ovig ♀, TL 3.4 mm. Allotype: USNM 171685, Sta JR 29, 1♂, TL 2.9 mm. Paratypes: USNM 171686, Sta JR 29, 2 ovig ♀, 3 ♀. Additional material: Sta JR 31, 2 ovig ♀, 2 ♀, 1♂; Sta JR 35, 1 ♀.

DESCRIPTION.—Integument bearing tiny scales (often difficult to see), and with diffuse dark brown pigmentation (apparently not in discrete chromatophores). Body proportions: $C < 1 < 2 = 3 < 4 > 5 > 6 > 7$. Pereonite 7 very short. Pleonites 1–6 free, pleonite 1 twice length of pleonite 2; pleonites 2–5 subequal, pleonite 6 longer, with middorsal slit in posterior margin. Telson elongate-oval, distally broadly rounded, with several setae, and hyaline margin. Eyes dorsolateral.

Antennular peduncle 3-segmented, basal segment largest; flagellum of six articles bearing filiform aesthetascs. Antennal peduncle 5-segmented; flagellum reduced to single short setiferous article. Mandible reduced to blunt lobe, lacking palp. Maxilla slender, with nine distal serrations. Maxilliped elongate, of single segment (or possibly with additional tiny terminal segment), tapering distally,

with several setae. Pereopod 1 larger than following pereopods, propodus enlarged; unguis about one-fifth length of dactylus; propodal palm evenly convex with proximal triangular process, and 11 fringed spines on inner proximal face. Pereopods 2 and 3 subchelate, propodal palm with five fringed sensory spines; carpus short, triangular. Pereopods 4–6 with three ventral, fringed sensory spines and several delicate fringed scales on posterior margin of rectangular propodus; carpus half length of propodus, rectangular, with two spines on posterior margin. Pereopod 7 absent. Pleopod 1 exopod operculiform, with distal fringed setae; endopod as long as, but one-quarter width of exopod. Pleopod 2 exopod with six distal plumose setae; endopod only slightly shorter and narrower than exopod, with three distal plumose setae; slender copulatory stylet on inner margin extending well beyond rami, with distal recurved hook in male. Uropodal exopod broadly oval, outer margin serrate, with plumose and simple setae; endopod oval, with numerous marginal setae; almost reaching end of telson.

REMARKS.—The present material shows a strong resemblance to the Japanese *Colanthura nigra* Nunomura, 1975, especially in the presence of overall dark pigmentation, general form of the appendages, and in pleonite proportions. Several differences can be detected, however, which separate the two species. These include an apparently marginally serrate telson (from Nunomura, 1975, fig. 4κ), fewer spines on the inner propodal face of pereopod 1 in the female (8, as against 10 in *C. nigra*), a strongly convex propodal palm of pereopod 1, with a strong triangular proximal process (the palm is more or less straight, and no process is figured for the Japanese species), and a more setose maxilliped in *C. pigmentata*.

Colanthura uncinata Kensley, 1978, recorded from much deeper water from the southwest Indian Ocean, also possesses an apically hooked copulatory stylet but lacks any pigmentation and is a larger species, with a narrower uropodal exopod.

ETYMOLOGY.—The species is named for the dark brown pigmentation of the integument.

Genus *Leptanthura*

Leptanthura laevigata (Stimpson, 1855)

Anthura laevigata Stimpson, 1855:393.

Leptanthura faurei Barnard, 1914:345a, pl. 29b.

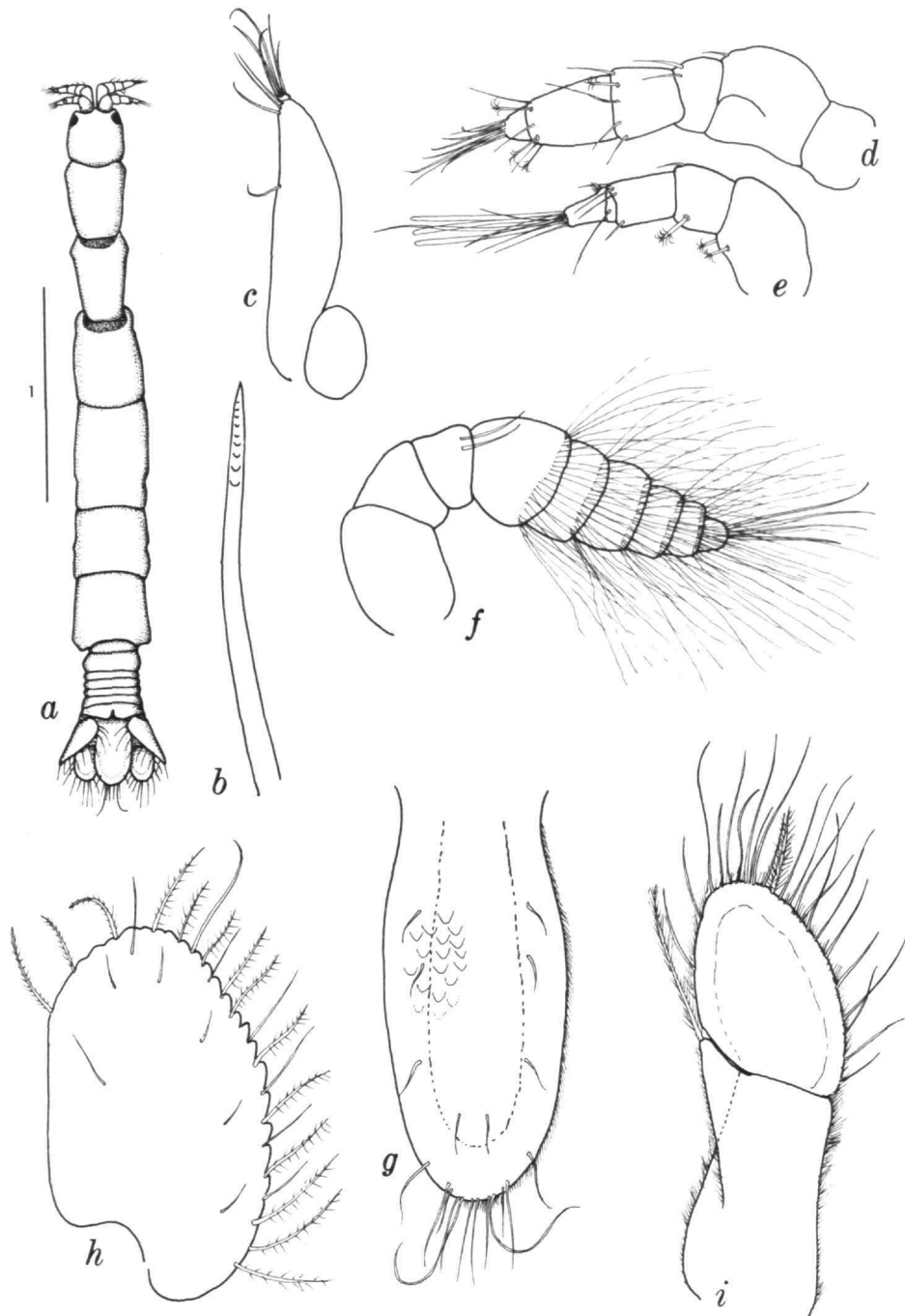


FIGURE 2.—*Colanthura pigmentata*, new species: a, ♀ dorsal view; b, maxilla; c, maxilliped; d, antenna; e, antennule ♀; f, antennule ♂; g, telson; h, uropodal exopod; i, uropodal endopod and basis.

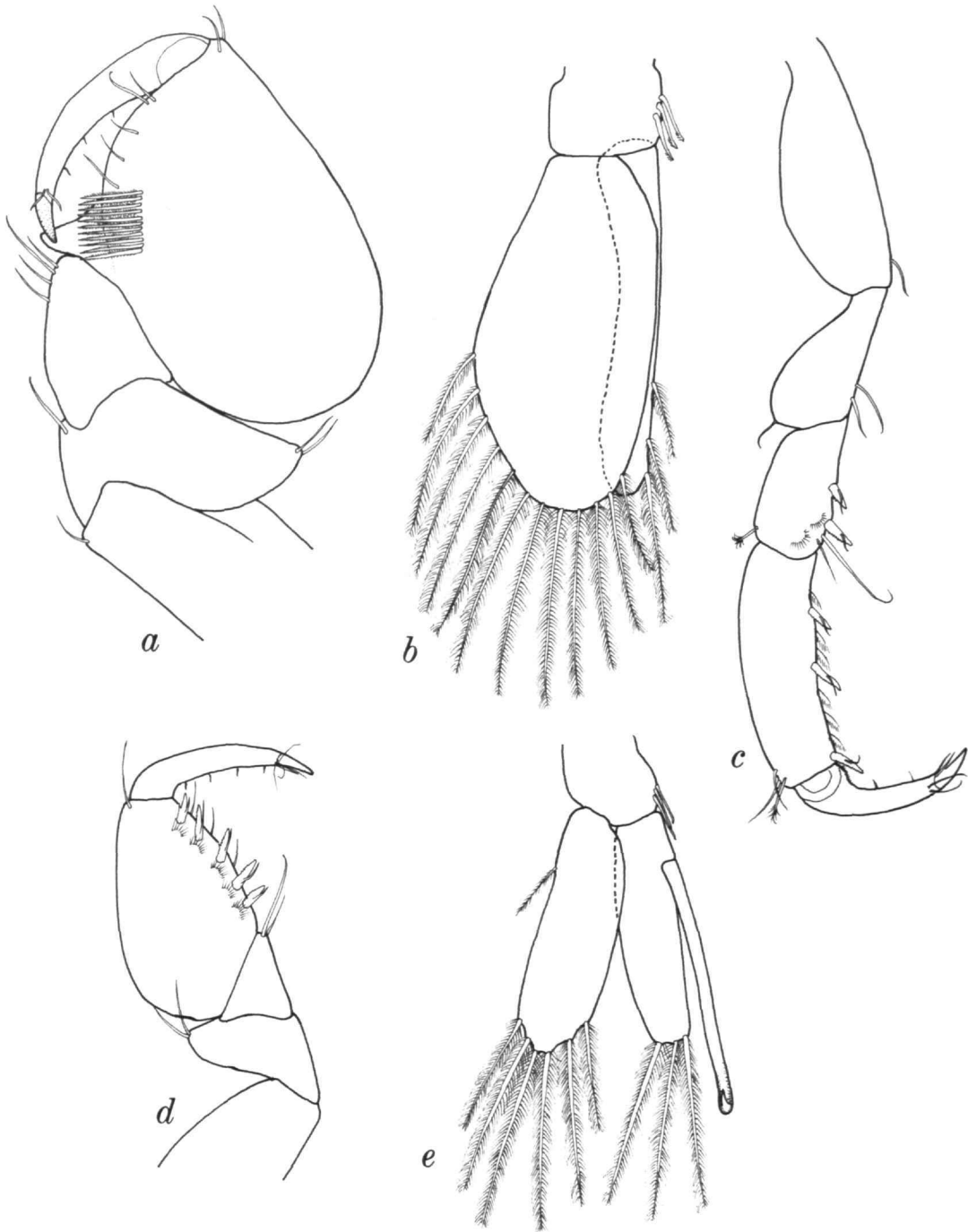


FIGURE 3.—*Colanthurus pigmentatus*, new species; a, pereopod 1 ♂; b, pleopod 1; c, pereopod 6; d, pereopod 2; e, pleopod 2 ♂.

Leptanthura laevigata.—Vanhöffen, 1914:492, fig. 30.—Barnard, 1925a:151; 1925b:381; 1940:490, 497.—Nierstrasz, 1941:242.—Kensley, 1975:38.

MATERIAL.—Sta TV 93, 1 ♀; Sta AB 124F, 1 juv; Sta AB 360B, 3 ♀, 1 juv; Sta AB 364A, 1 ovig ♀; Sta AB 371F, 1 ♂; Sta AB 371G, 1 ovig ♀, 4 ♀, 3 juvs, Sta AB 372B, 2 ♂, 1 ♀, 2 juvs; Sta AB 373F, 1 ♂ 5 ♀; Sta AB 409E, 1 ♀.

REMARKS.—The record from east of Mauritius represents a considerable extension of the range of this species.

PREVIOUS RECORDS.—Orange River mouth to Natal, South Africa.

Genus *Paranthura*

Paranthura sp.

MATERIAL.—Sta AB 456, 2 ♂, 2 ovig ♀, 1 ♀; Sta JR 29, 4 ♀; Sta JR 33, 1 ♂, 2 ♀; Sta JR 35, 1 ♀; Sta JR 38, 1 ♀.

REMARKS.—As the present specimens are not in good condition, and many poorly described nominal species exist in the literature, no attempt has been made to identify this material.

Family ANTHURIDAE

Alloanthura, new genus

DIAGNOSIS.—Eyes present. Integument indurate, sculptured. Antennular flagellum of two articles; antennal flagellum of five articles. Mandibular palp 3-segmented; well-developed incisor, lacinia, and molar present. Maxilliped 5-segmented, lacking endite. Pereopod 1 subchelate, larger than pereopods 2 and 3, latter not subchelate. Pereopods 4–7 with carpus roughly rectangular, not overriding propodus. Pleopod 1 exopod operculiform. Pleonites 1–5 fused; pleonite 6 fused with telson. Uropodal exopod very reduced.

TYPE-SPECIES.—*Alloanthura sculpta* Kensley.

ETYMOLOGY.—The generic name is derived from Greek *alloios* (of a different kind) plus *anthos* (a flower).

REMARKS.—The very reduced uropodal exopod immediately separates the present specimen from any previously described anthurid genus. (*Pseudanthura* Richardson is the only paranthurid genus with a reduced uropodal exopod.) This feature in combination with the fused pleonites 1–5 (pleonite

6 being fused with the telson), the highly sculptured and indurate integument, and the rectangular carpus of the last three pairs of pereopods requires the formation of a new genus.

Alloanthura sculpta, new species

FIGURES 4, 5

MATERIAL.—Holotype: USNM 171689, Sta AB 373B, 1 ♀, TL 10.2 mm.

DESCRIPTION.—Cephalon almost two-thirds length of pereonite 1, with large dorsolateral eyes, impressed sinuous line behind eyes plus irregular, shallow dorsal pits; lateral margin a rounded ridge. Body proportions: C < 1 < 2 = 3 = 4 = 5 > 6 > 7. Pereonites each with strong, rounded dorsolateral ridge and groove and shallow, irregular sculpture. Pleonites 1–5 fused, but lines of fusion marked by distinct shallow grooves; fused pleonite 1 larger than 2, 2–5 equal in length; pleonite 6 fused to telson. Latter strongly indurate, ventral surface concave; dorsally with strong, rounded median ridge running entire length, with pair of statocysts at base; distal half of telson narrowed, apex narrowly rounded.

Antennular peduncle 4-segmented, basal segment almost as long as three distal segments together, fourth segment one-third length of third; flagellum of two articles, proximal article five times length of terminal article. Antennal peduncle 5-segmented, second segment largest, grooved to accommodate antennule; flagellum of six short articles. Mandibular palp 3-segmented, first and third segments subequal, terminal segment with six distal serrate spines; incisor of three blunt, rounded cusps; lacinia of five serrations; molar oblong-truncate. Maxilla with one large and six smaller, apically hooked spines distally. Maxilliped 5-segmented; terminal segment oblique, with four setae on median margin; endite lacking; outer face bearing numerous fine setules. Pereopod 1 unguis almost half length of dactylus; palm of propodus straight, bearing five fringed setae, palmar surface covered with tiny pectinate scales; remaining segments with fine, dense setules. Pereopods 2–7 similar, unguis one-quarter length of dactylus, posterior margin of propodus straight, with single distal spine; carpus about half length of propodus, barely overriding propodus. Exopod of pleopod 1 operculiform, in-

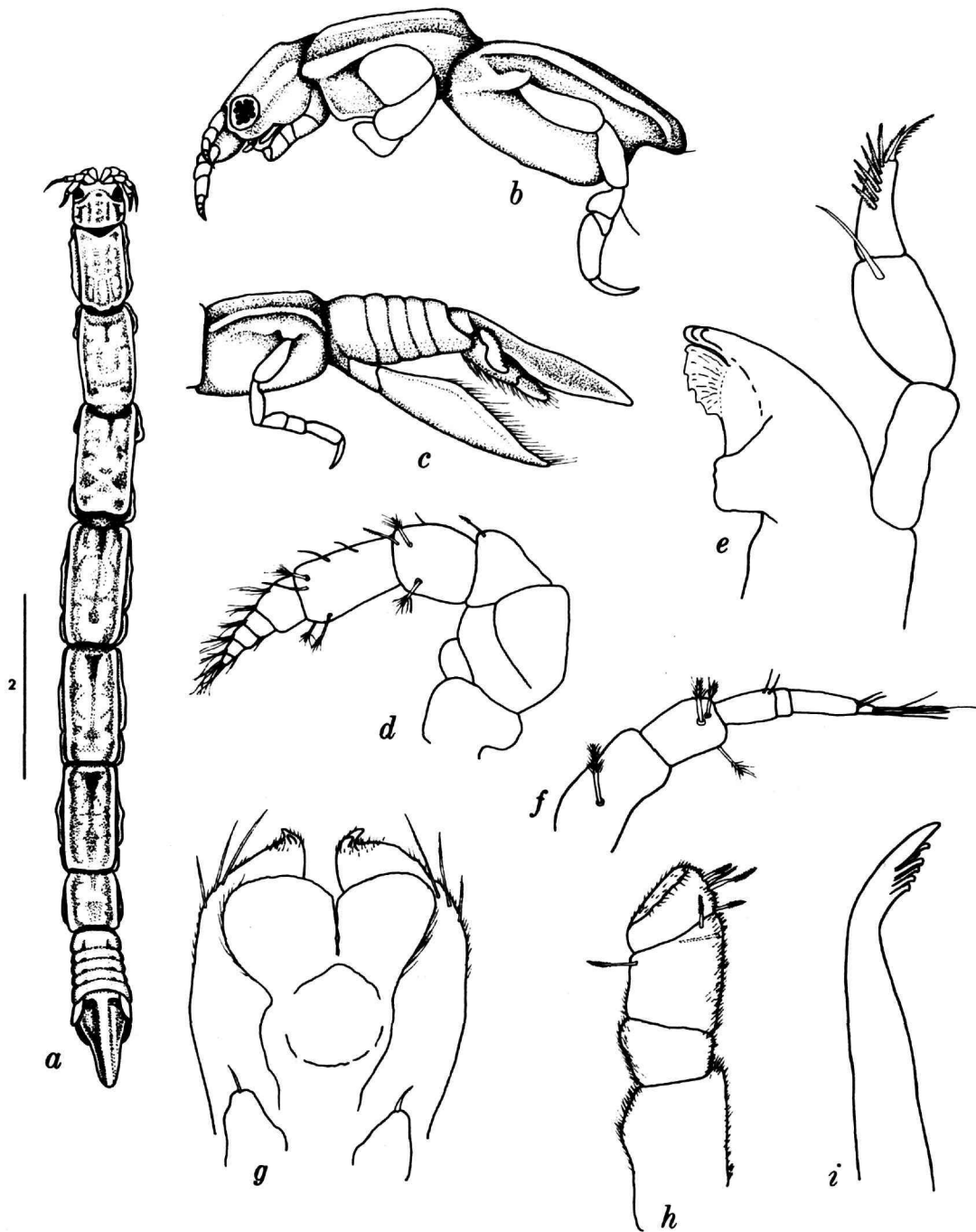


FIGURE 4.—*Alloanthura sculpta*, new genus, new species: *a*, holotype in dorsal view; *b*, cephalon and pereonites 1 and 2 in lateral view; *c*, pereonite 7 and pleon in lateral view; *d*, antenna; *e*, mandible; *f*, antennule; *g*, lower lip complex; *h*, maxilliped; *i*, maxilla.

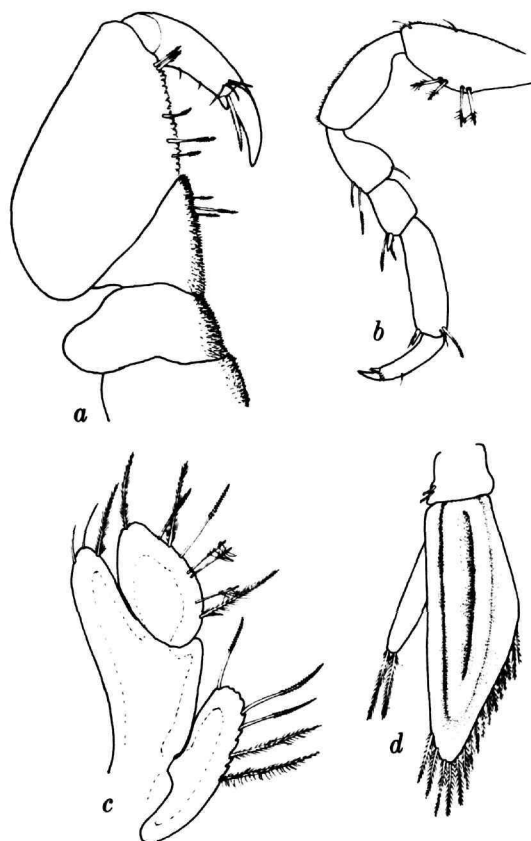


FIGURE 5.—*Alloanthura sculpta*, new genus, new species: a, pereopod 1; b, pereopod 7; c, uropod; d, pleopod 1.

durate, with two rounded ridges on anterior (outer) surface; endopod considerably shorter and narrower, with two distal plumose setae. Uropodal exopod very reduced, folded over proximal part of telson, narrow, not reaching midlength of basis, outer margin serrate and setose; endopod oval, margin serrate; basis produced on inner (median) margin into broad lobe, almost reaching apex of endopod.

Genus *Apanthura*

Apanthura microps, new species

FIGURE 6

MATERIAL.—Holotype: USNM 171690, 1 ♀, TL 4.3 mm. Paratypes: USNM 171691, 17 ♀, TL 3.0–4.3 mm, Sta AB 206A; Sta AB 372B, 2 ♀; Sta AB 437, 5 ♀.

DESCRIPTION.—Body small, not indurate. Cephalon with tiny dorsolateral eyes; anterolateral corners rounded. Body proportions: $C = 1 = 2 = 3 < 4 = 5 > 6 > 7$. Pleon longer than pereonite 7; pleonites 1–5 fused, but with dorsal lines of fusion marked by shallow grooves; pleonite 6 free, posterior margin broadly bilobed. Telson equal in length to pleon, very slightly convex dorsally, broadest at midlength, distally tapering to rounded apex bearing several long and short setae; two large basal statocysts present.

Antennular peduncle 4-segmented, basal segment equal in length to three distal segments together, fourth segment very short, set obliquely in apex of third; flagellum reduced, of two articles. Antennal peduncle 5-segmented, second segment grooved to accommodate antennule; flagellum reduced, of four articles, basal article equal in length to distal articles together. Mandibular palp 3-segmented, basal segment almost two-thirds length of middle segment; distal segment one-third length of middle segment, with three simple setae; incisor of four blunt cusps; lacinia thin, with four serrations; molar truncate. Maxilla armed with six distal spines, distal one strongest. Maxilliped 5-segmented, second segment equal to third and fourth segments together; terminal segment short, set obliquely on outer distal angle of fourth segment, bearing four stout setae; endite lacking. Pereopod 1 unguis one-quarter length of dactylus; propodal palm straight, bearing few short, simple setae. Pereopod 2 propodus and carpus bearing pile of short setules on posterior margin; carpus triangular, anterior margin covered by propodus and merus; propodus with single strong posterodistal spine. Posterior pereopods, propodus with strong posterodistal spine; carpus short, underriding propodus. Pleopod 1 exopod operculiform; basis with two retinaculae; endopod less than one-third width of exopod, subequal in length. Uropodal exopod apically with shallow notch, bearing numerous marginal plumose setae, reaching just beyond basis; endopod two and one-half times longer than wide, distally rounded, bearing numerous elongate, simple setae.

REMARKS.—*Apanthura xenocheir* Stebbing, 1910, recorded from the Seychelles, the locality closest to the present stations, differs from *A. microps* in possessing a more rounded uropodal endopod and a differently shaped telson.

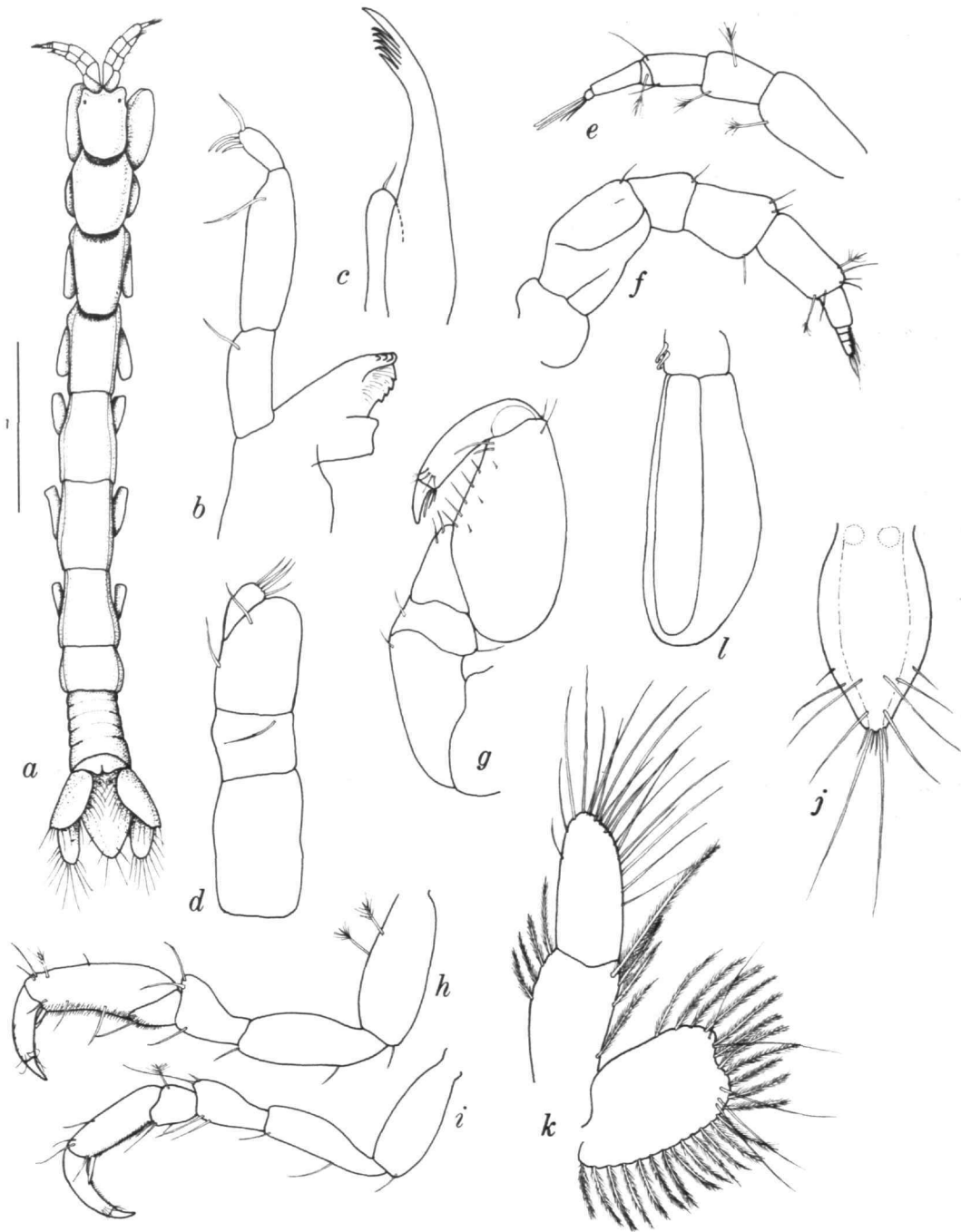


FIGURE 6.—*Aphantura microps*, new species: a, ♀ dorsal view; b, mandible; c, maxilla; d, maxilliped; e, antennule; f, antenna; g, pereopod 1; h, pereopod 2; i, pereopod 7; j, telson; k, uropod; l, pleopod 1.

All the species of *Apanthura* are very similar, differences being very subtle and most marked in the presence or absence of a notch in the uropodal exopod, the presence or absence of a tooth or notch on the palm of pereopod 1, and the shape and proportions of the mandibular palp. On this basis, the present species most closely resembles *A. signata* Menzies and Glynn, 1968, from Puerto Rico. The main difference would seem to be the presence of a tooth on the palm of pereopod 1 in the Caribbean species.

ETYMOLOGY.—The specific name *microps* is the Greek word meaning "small eye" and refers to this feature of the species.

Apanthura sandalensis Stebbing, 1900

FIGURE 7

Apanthura sandalensis Stebbing, 1900:621, pl. 65A.—Chilton, 1924:881, fig. 2.—Barnard, 1925a:141; 1935:306; 1940:387.—Nierstrasz, 1941:7.—Pillai, 1966:154, fig. 1.
Apanthura dubia Barnard, 1914:342a, pl. 28b; 1955:5.

MATERIAL.—Sta AB 124E, 1 sub ♂, 1 ♀, 1 juv; Sta AB 400C, 1 ♀, 1 juv; Sta TV 93, 1 ♀.

REMARKS.—No differences could be detected between the present material and the South African specimens that Barnard had compared with the type. Pillai (1966) describes the pleon as fully segmented, but, as is typical for the genus, pleonites 1–5 are fused, with lateral incisions indicating the individual pleonites, and with shallow grooves running across the dorsum, and pleonite 6 free.

Genus *Cyathura*

Cyathura rudloei, new species

FIGURES 8, 9

MATERIAL.—Holotype (Copenhagen Museum): 1 ♂, TL 3.5 mm. Paratypes (Copenhagen Museum): 1 ♂, TL 3.5 mm, 20 ovig ♀, ± 200 ♀ [Theo Mortensen Expedition, 1900; Koh Chang, Gulf of Thailand]. Paratypes: USNM 171694, Sta JR 24A, 1 ovig ♀, 1 ♀; USNM 171694, Sta JR 38, 1 ovig ♀, 1 ♀, 1 juv; USNM 171697, Sta JR 63–2, 1 ovig ♀, 5 juvs; USNM 171695, Sta AB 371G, 1 ♂, 1 ♀.

DESCRIPTION.—*Female*: Integument not indurate, minutely setose, setation more obvious posteriorly. Body proportions: C < 1 > 2 = 3 = 4 = 5 > 6 > 7. Dorsal surface of cephalon, pereonites, and pleon with shallow reticulation of grooves. Eyes dor-

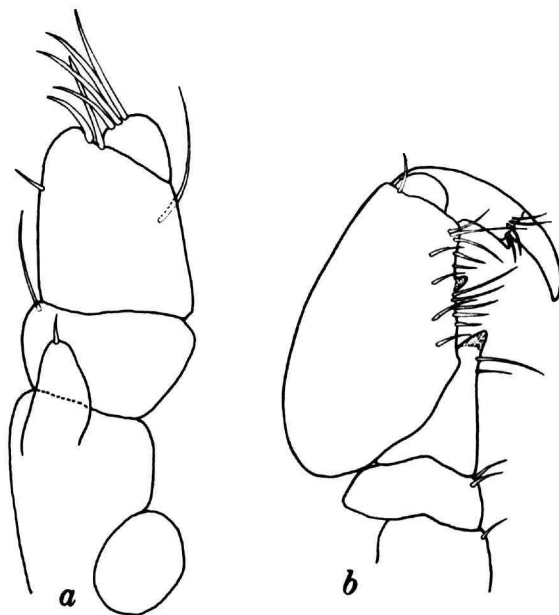


FIGURE 7.—*Apanthura sandalensis* Stebbing, 1900: a, maxilliped; b, pereopod 1.

solateral; rostrum broadly triangular, extending slightly beyond anterolateral corners. Shallow dorsal pits present on pereonites 3–5. Pleonites 1–5 fused, shorter than pereonite 7; pleonite 6 laterally distinct, medially fused with telson. Latter parallel sided with middorsal proximal indentation, distally evenly rounded.

Antennular peduncle 4-segmented, basal segment broad, equal in length to second and third segments together; fourth segment minute; flagellum of 2 articles, short distal article bearing three aesthetascs and few setae. Antennal peduncle 5-segmented, flagellum reduced to three very short setose articles. Mandibular palp 3-segmented, basal segment about half length of second segment; third segment two-thirds length of second segment, with elongate strongly serrate spine and three shorter finely serrate spines; incisor of three cusps; lacinia with 12 or 13 serrations; molar narrowly triangular. Maxilla with strong distal spine plus six smaller spines; short inner ramus bearing single apical seta. Maxilliped 4-segmented, with numerous short setules, terminal segment set obliquely on penultimate segment, with five simple setae on inner distal margin. Pereopod 1 unguis slightly more than half length of dactylus,

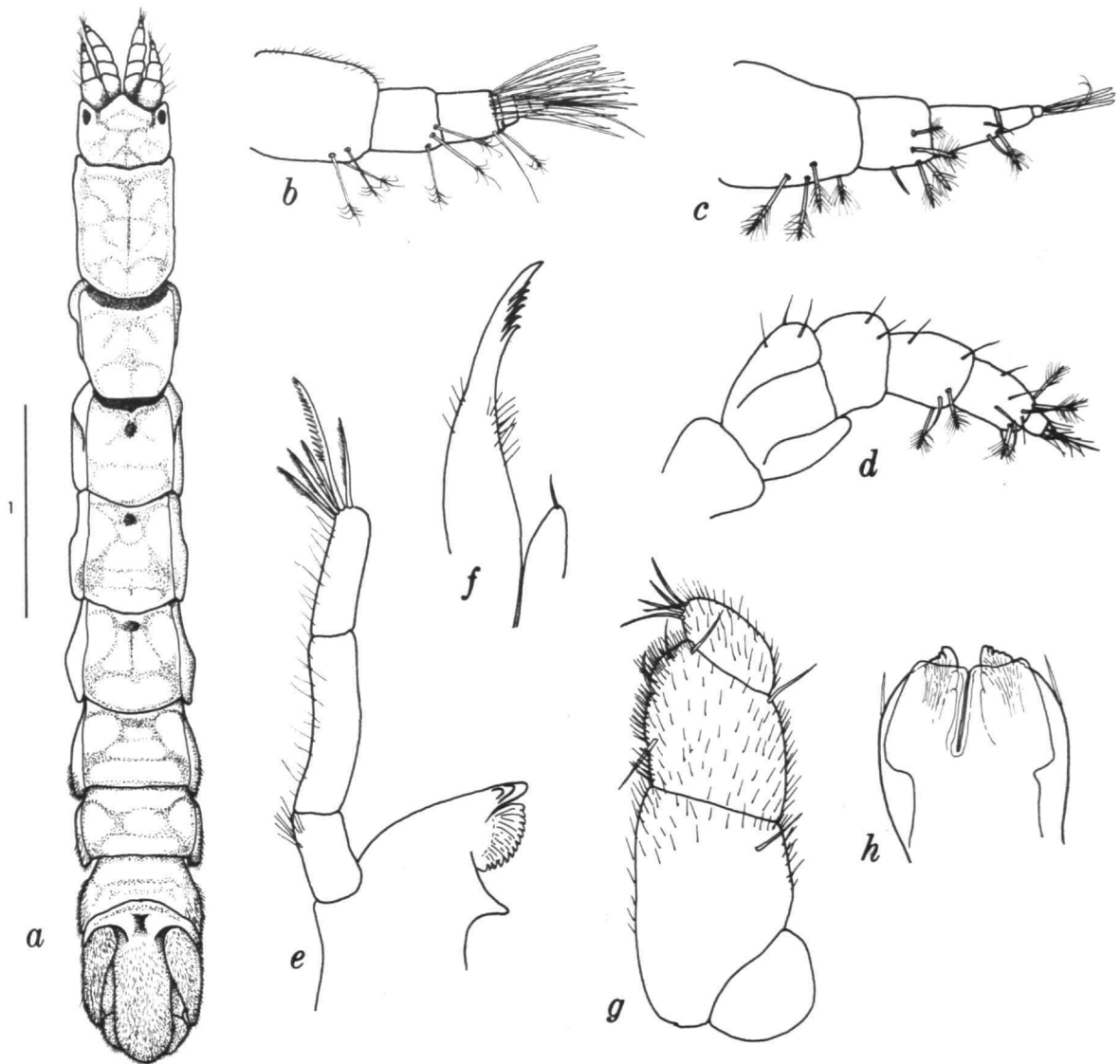


FIGURE 8.—*Cyathura rudloei*, new species: *a*, ♀ in dorsal view; *b*, antennule ♂; *c*, antennule ♀; *d*, antenna; *e*, mandible; *f*, maxilla; *g*, maxilliped; *h*, lower lip complex.

with strong supplementary spine; propodus broad, palm with strong, proximal rounded lobe and three serrate spines near dactylar base; carpus triangular, distally projecting as a rounded lobe; posterior margin of dactylus, propodal palm, and carpus bearing short spinose scales. Pereopod 2 propodus cylindrical, with single serrate posterodistal spine. Pereopod 7 with posterior (ventral) surface of propodus bear-

ing spine-scales, and single serrate distal spine; carpus triangular, slightly underriding propodus. Pleopod 1 exopod operculiform, broad, not indurate, with numerous distal plumose setae; endopod reduced to short, narrow lamella; basis with four retinaculae. Uropodal exopod reaching to base of endopod, latter basally broader than basis; entire appendage bearing dense pile of very short setules.

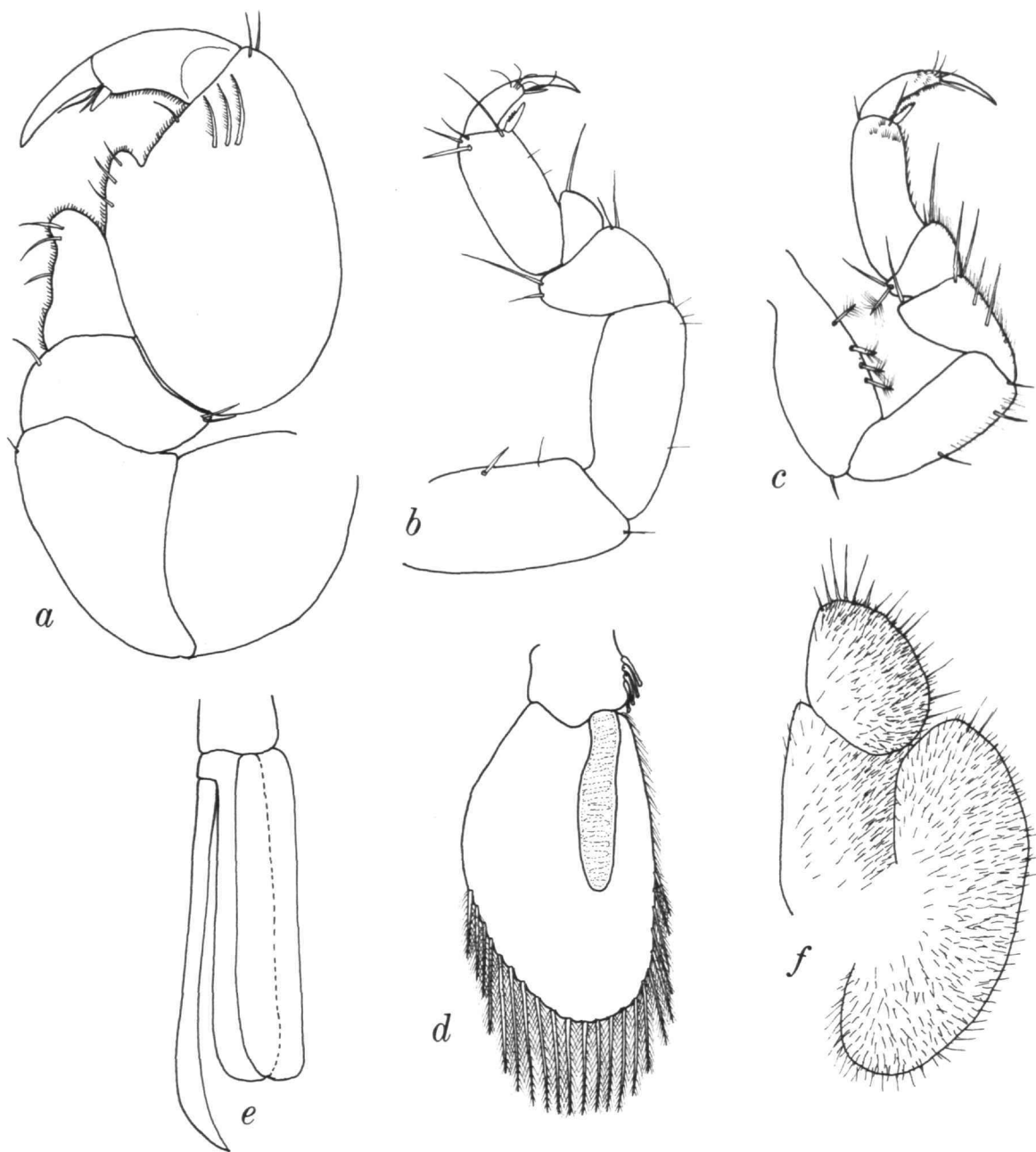


FIGURE 9.—*Cyathura rudloei*, new species: *a*, pereopod 1; *b*, pereopod 2; *c*, pereopod 7; *d*, pleopod 1; *e*, pleopod 2 ♂; *f*, uropod.

Male: Body and appendages as in female except for antennule, mandibular palp, and pleopod 2. Antennular flagellum short, of three articles bearing clusters of aesthetascs. Terminal segment of mandibular palp with eight spines (five in female). Pleopod 2 copulatory stylet on endopod distally curved, sabre shaped, extending beyond rami.

REMARKS.—*Cyathura indica* Barnard, 1925a, recorded from India, Ceylon, Thailand, and Singapore is a smoother and less setose species than *C. rudloei*, as is *C. estuaria* Barnard, 1914, from the east coast of South Africa. *Cyathura rudloei* possesses very distinctive, shallow dorsal sculpturing, a parallel-sided telson (evenly lanceolate in *C. indica*), while pleonite 6 is medially fused with the telson (completely free in *C. indica*). This fusion of pleonite 6 and telson is also seen in *Cyathura polita* from the east coast of the United States (see Miller) and Burbanck, 1961, fig. 6).

ETYMOLOGY.—The species is named for Mr. J. Rudloe, who was employed as a biological collector at Nosi Bé, Madagascar, by the Smithsonian Institution.

Diaphoranthura, new genus

DIAGNOSIS.—Eyes present. Antennular flagellum of two articles; antennal flagellum of six articles. Mandibular palp 3-segmented; incisor, lacinia, and molar developed. Maxilliped 6-segmented, with endite. Pereopods 1–3 subchelate; pereopods 4–7 with triangular carpus overriding propodus. Pleopod 1 exopod operculiform. Pleonites 1–6 free. Telson with single median statocyst.

TYPE-SPECIES.—*Diaphoranthura cracens* Kensley.

ETYMOLOGY.—The generic name is a combination of the Greek *diaphoros* (different) plus *anthos* (a flower).

REMARKS.—Until now, *Austranthura* Kussakin, 1967, was the only anthuridean genus showing features of both the Anthuridae and the Paranthuridae. The mouthparts (especially the mandible and maxilla) are typically anthurid, while the single telsonic statocyst was regarded as typically paranthurid. Kussakin thus claimed that Barnard's (1925a) division of the family into two groups (later raised to family status by Menzies and Glynn, 1968) was artificial.

When the differences in structure between the

acute mandible, lancet-like maxilla, and slender maxilliped of the paranthurids, and the incisor, lacinia, and molar of the mandible, the distally multispinose maxilla, and broad maxilliped of the anthurids are considered, the presence of a single or a pair of statocysts seems of lesser importance. The author thus regards *Austranthura* as being a true anthurid, and statocyst features are no longer regarded as being of familial importance.

Austranthura and *Diaphoranthura* are undoubtedly closely related, showing similar maxillipedal, posterior pereopodal, pleonal, and telsonic structure. The most important single difference lies in the nature of the three anterior pairs of pereopods. In *Austranthura*, the first pair of pereopods are strong, subchelate, and much larger than pereopods 2 and 3, which are ambulatory. In *Diaphoranthura* (both species of which are tiny animals, with no induration), pereopods 1–3 are subequal in size and subchelate. A secondary difference lies in the flagella of the antenna and antennule. *Austranthura* has a 6-articulate antennular and an 11-articulate antennal flagellum, while *Diaphoranthura* has a 2- and 6-articulate flagella, respectively.

Diaphoranthura cracens, new species

FIGURES 10, 11

MATERIAL.—Holotype: USNM 171698, 1 ♂, 4.1 mm. Allotype: USNM 171699, 1 ovig ♀, TL 4.1 mm. Paratypes: USNM 171700, 3 ♂, 2 ♀, Sta AB 447; Sta AB 372B, 1 ♂.

DESCRIPTION.—**Male:** Body very slender, not indurate. Body proportions: C = 1 < 2 > 3 < 4 = 5 > 6 > 7. Cephalon with relatively large rostrum, well-developed dorsal eyes. Pleonites 1–6 free; pleonite 1 slightly longer than subequal pleonites 2–5; pleonite 6 posteriorly bilobed. Telson elongate-oval, with broad transparent border, several distal setae; single very large, spherical statocyst with large dorsal pore.

Antennular peduncle 4-segmented, basal segment largest; flagellum of 10–12 articles, each bearing whorl of filiform aesthetascs. Antennal peduncle 5-segmented, second segment largest and broadest, grooved to accommodate antennule; flagellum of 6 articles. Mandibular palp 3-segmented, terminal segment with five distal, finely serrate spines; incisor of three cusps; lacinia with five serrations; molar with hollowed distal surface. Maxilla with one

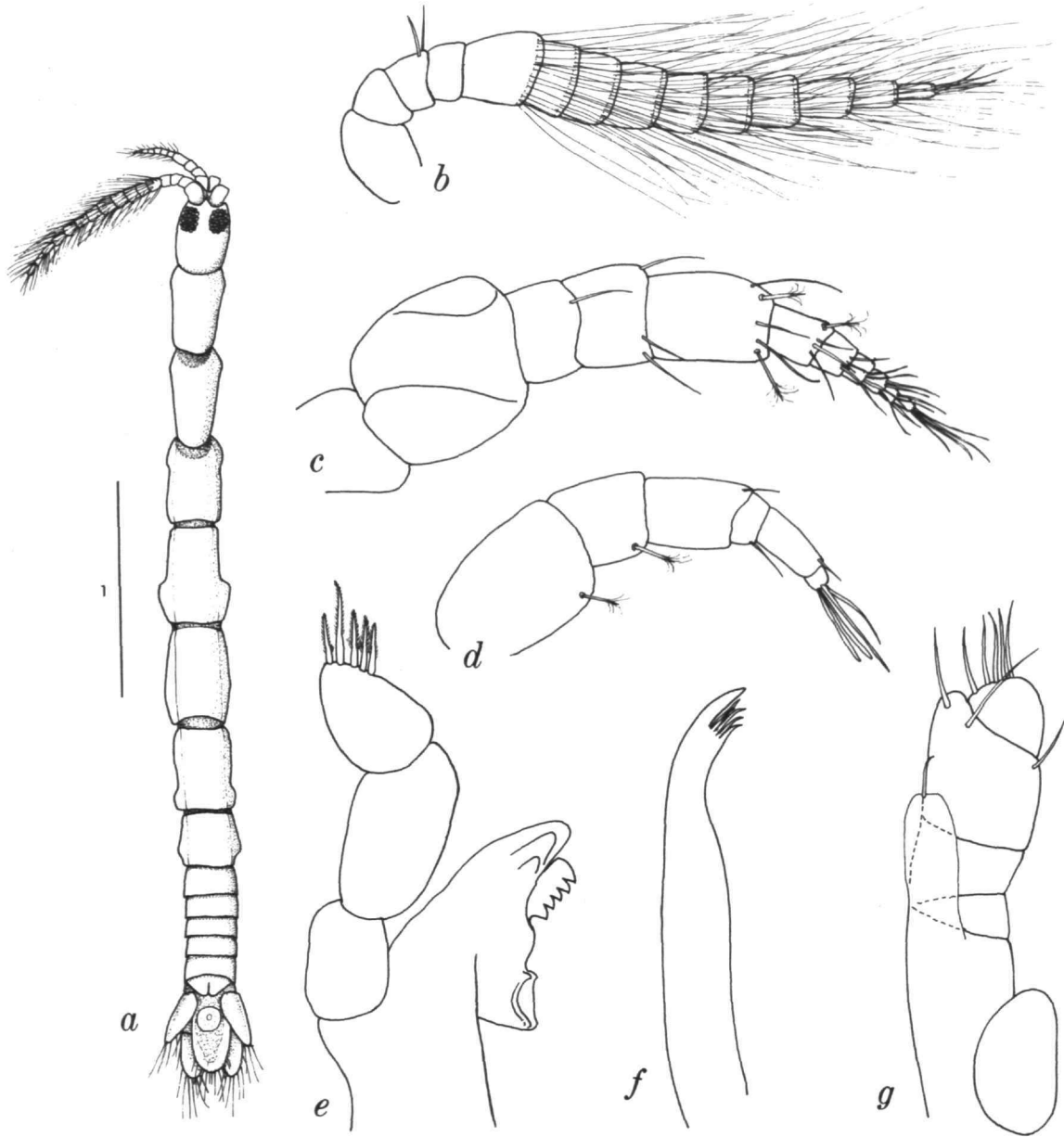


FIGURE 10.—*Diaphoranthura cracens*, new genus, new species: a, ♂ in dorsal view; b, antennule ♂; c, antenna; d, antennule ♀; e, mandible; f, maxilla; g, maxilliped.

strong and four smaller distal spines. Maxilliped 6-segmented, terminal segment set obliquely into fifth segment, bearing five simple setae; third segment very short; thin-walled endite present, with single terminal seta. Pereopod 1 unguis one-third length

of dactylus; propodus relatively slender, only slightly broadened proximally, palm faintly sinuous, armed with 12 simple setae and two longer setae; carpus triangular, with two distal setae. Pereopod 2 unguis one-quarter length of dactylus; propodus

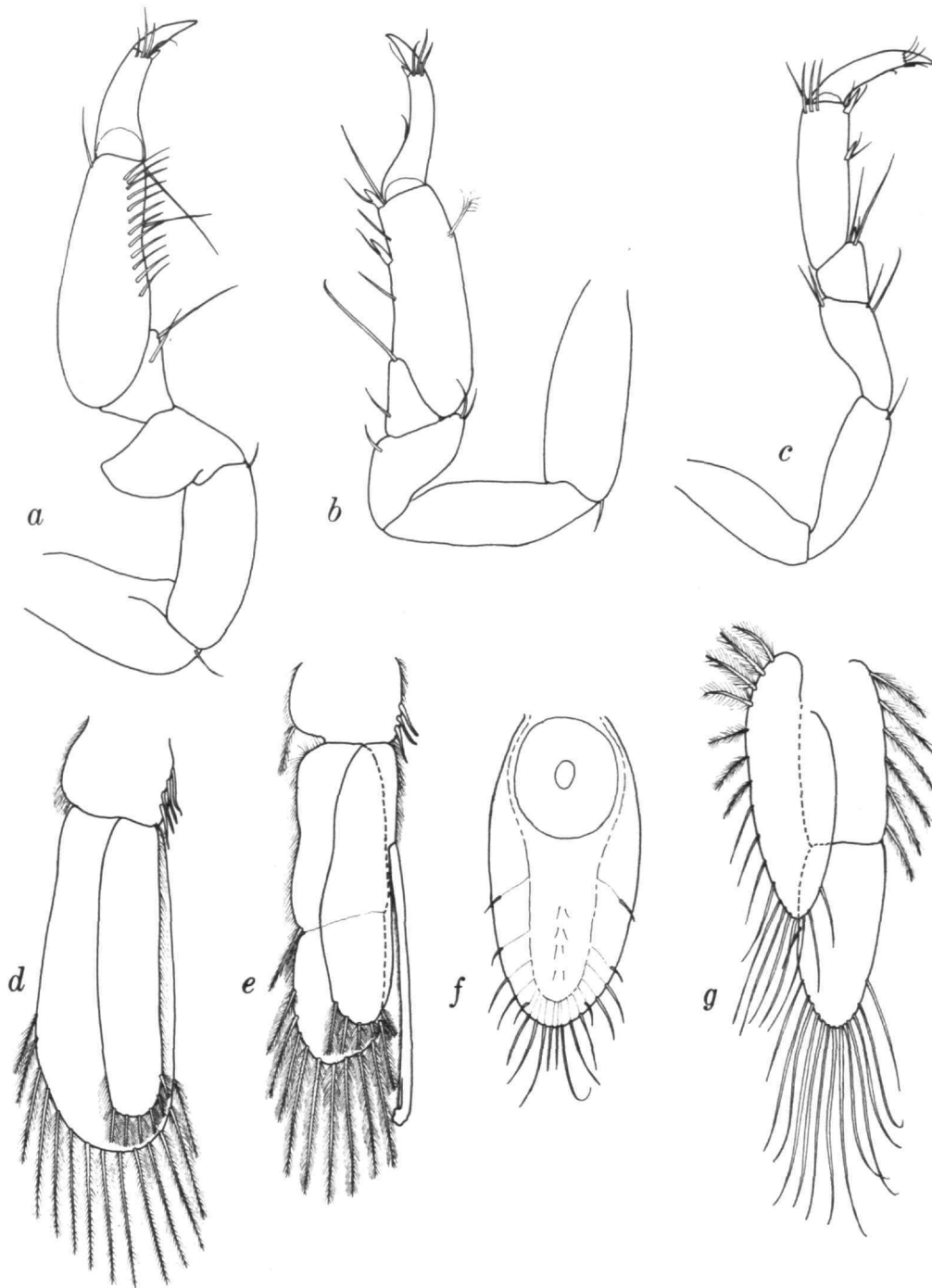


FIGURE 11.—*Diaphoranthura cracens*, new genus, new species: a, pereopod 1 ♂; b, pereopod 2; c, pereopod 7; d, pleopod 1; e, pleopod 2 ♂; f, telson; g, uropod.

cylindrical, with two sensory spines on posterior margin; carpus triangular, with elongate distal seta. Posterior pereopods with distal serrate-sensory spine and single sensory spine on posterior margin of propodus; carpus triangular, slightly underriding propodus, with short, sensory distal spine. Pleopod 1 operculiform, not indurate; exopod twice width and slightly longer than endopod, both rami with elongate distal plumose setae; basis with four retinaculae. Pleopod 2 endopod slightly shorter than exopod; copulatory stylet extending well beyond rami, apically slightly expanded and rounded. Uropodal exopod narrow-lanceolate, almost reaching midlength of endopod, with simple distal setae and proximal fringed setae; endopod extending beyond telson, with numerous, elongate, simple setae distally.

Female: Antennular peduncle 4-segmented, fourth segment one-quarter length of third; flagellum of two articles.

ETYMOLOGY.—The specific name is the Latin word meaning "slender," which describes the general body form.

Diaphoranthura hapla, new species

FIGURES 12, 13

MATERIAL.—Holotype: USNM 171702, 1 ovig ♀, TL 4.3 mm. Allotype: USNM 171703, 1 sub ♂, TL 4.1 mm, Sta AB 346A. Paratypes: USNM 171704, 371F, 1 ♀, TL 5.5 mm; USNM 171705, Sta JR 29, 1 ♀, TL 3.8 mm, 1 juv.

DESCRIPTION.—*Female*: Integument very thin, not indurate. Body proportions: $C = 1 < 2 = 3 < 4 = 5 > 6 > 7$. Cephalon with tiny dorsolateral eyes of seven or eight ocelli each; rostral point very low. Pleonites free, 1–5 subequal in length, pleonite 6 slightly longer, with middorsal slit in posterior margin. Telson thin, lanceolate, apically narrowly rounded, with single very large median statocyst opening on dorsal surface.

Antennular peduncle 4-segmented, basal segment broadest and longest, distal segment short; flagellum of two articles, terminal article tiny. Antennal peduncle 5-segmented, second segment grooved to accommodate antennule; flagellum of six articles. Mandibular palp 3-segmented, middle segment longest, with single elongate distal seta; terminal segment with four finely serrate spines; incisor of two cusps, outer cusp distally notched; lacinia with

six serrations; molar blunt. Maxilla with single strong spine and three indistinct, smaller spines distally. Maxilliped with thin-walled endite on inner surface, tipped with two fine setae; palp of six segments, third segment short, oblique; terminal segment obliquely set on outer distal margin of penultimate segment, bearing five simple setae. Pereopod 1 unguis one-third length of dactylus; propodal palm with low crenulations bearing fine spinules. Pereopod 2 propodal palm with strong sensory spine distally at midpoint; carpus with posterodistal spine. Pereopod 3 similar to 2. Pereopods 4–7 with very short unguis; propodus with three anterodistal fringed spines; carpus triangular, underriding propodus. Pleopod 1 exopod operculiform, distal margin broadly rounded, fringed with numerous plumose setae; endopod much shorter and narrower, with three distal plumose setae; basis with two retinaculae. Uropodal exopods folding dorsally over telson, elongate-oval, tapering distally to point, with elongate simple setae and few plumose setae on outer margin; reaching midlength of endopod; latter equal in length to basis, with numerous elongate, simple setae distally.

Submale: Antennular flagellum elongate, reaching back to pereonite 4, but lacking setae or aesthetascs. Pereopod 1 propodus more elongate and slender than female, palm straight, unarmed. Pleopod 2 copulatory stylet not completely separate from endopod, distal part extending beyond rami.

REMARKS.—*Diaphoranthura hapla* differs from *D. cracens* in several respects: the latter is more slender, both rami of pleopod 1 are more elongate, the telson is more elliptical in outline, the statocyst is relatively larger, the uropodal exopod is narrower and more lanceolate than the former, while the first pereopod in the female of *D. hapla* lacks the row of simple setae on the propodal palm.

ETYMOLOGY.—The specific name, taken from the Greek word meaning "single," refers to the single telsonic statocyst.

Exallanthura, new genus

DIAGNOSIS.—Eyes present. Antennular flagellum of two articles, antennal flagellum of two articles. Mandibular palp of one segment; lacinia, incisor, and molar present. Maxilliped 3-segmented, lacking endite. Pereopod 1 subchelate; pereopods 2 and 3

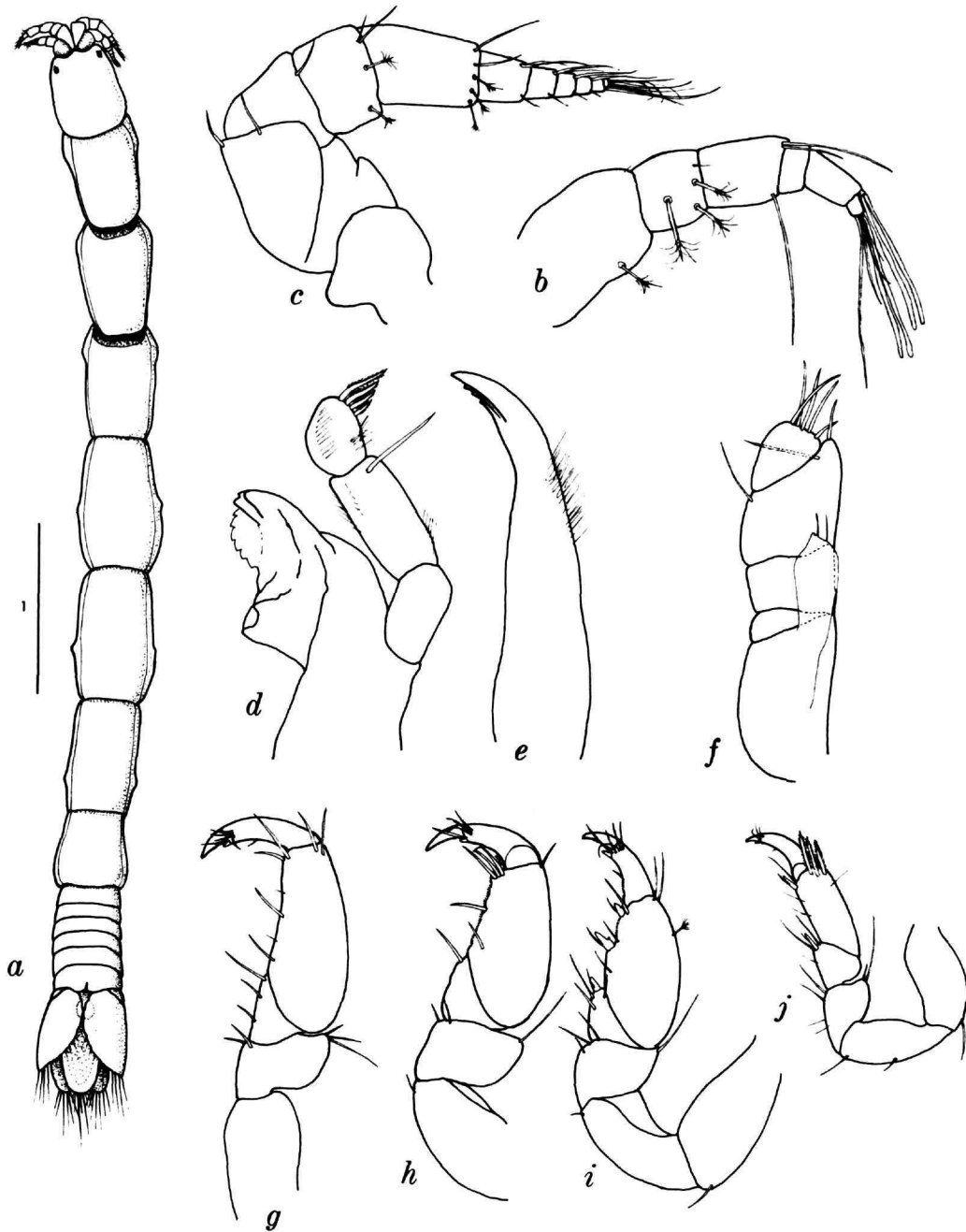


FIGURE 12.—*Diaphoranthura hapla*, new genus, new species: *a*, ♀ in dorsal view; *b*, antennule; *c*, antenna; *d*, mandible; *e*, maxilla; *f*, maxilliped; *g*, pereopod 1 ♂; *h*, pereopod 1 ♀; *i*, pereopod 2; *j*, pereopod 7.

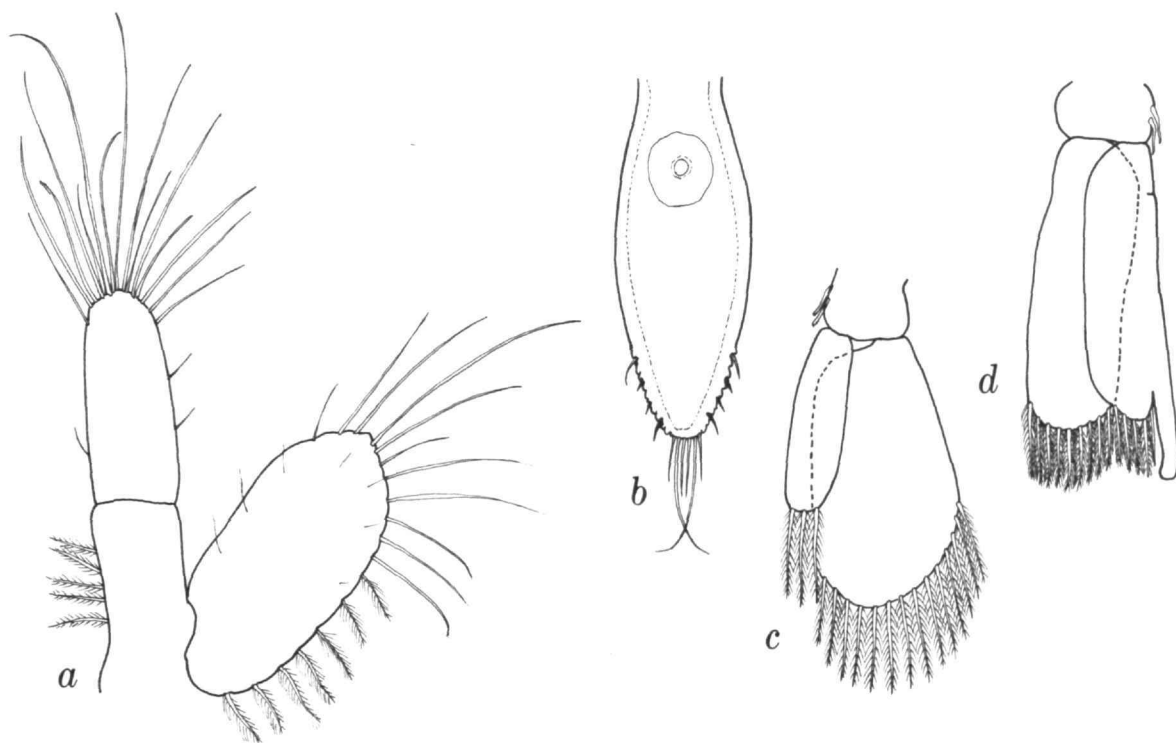


FIGURE 13.—*Diaphoranthura hapla*, new genus, new species: a, uropod; b, telson; c, pleopod 1; d, pleopod 2 sub ♂.

ambulatory; pereopods 4–6 with carpus more or less rectangular, not underriding propodus. Pereopod 7 absent. Pereonites 3–6 with middorsal pits. Pereonite 7 very short. Pleonites 1–5 fused, pleonite 6 free. Pleopod 1 exopod operculiform.

TYPE-SPECIES.—*Exallanthura sexpes* Kensley.

ETYMOLOGY.—The generic name is derived from the Greek *exallos* (quite different) plus *anthos* (a flower).

REMARKS.—Three features in combination immediately separate the present genus. These are the reduced seventh pereonite (and thus the lack of a pair of pereopods) and the mandibular palp, consisting of a single segment. Reduced seventh pereonites are known only in *Colanthura* and *Neoanthura*, both members of the Paranthuridae. The present genus, with its cutting and biting mouthparts is obviously an anthurid, amongst whose genera only *Caenanthura*, *Pendantthura*, and *Ptilanthura* possess 1-segmented mandibular palps. *Exallanthura* does not have the very shortened pleon of

Pendantthura, neither does it possess a seventh pair of pereopods as found in *Ptilanthura* and *Caenanthura*.

Exallanthura sexpes, new species

FIGURES 14, 15

MATERIAL.—Holotype: USNM 171706, 1 ♀, TL 8.5 mm, Sta TV 63; Sta AB 453, 1 ♀, TL 4.5 mm.

DESCRIPTION.—*Female*: Body not indurate, widening posteriorly. Body proportions: $C < 1 < 2 < 3 > 4 > 5 > 6 > 7$. Pereonites 3–6 each with single middorsal pit, that of pereonite 3 transversely oval, sharply defined, those of pereonites 4–6 elongate-oval depressions; pereonite 7 very reduced, overlapped laterally by lobes of pereonite 6, lacking pereopods. Pleonites 1–5 fused, ventrolateral margins of fused segments barely indicated, posterior margin of fused pleonite 5 sinuous; pleonite 6 free, posterior margin sinuous. Telson longer than pleon, narrow, widening slightly distally, with low distinct mid-

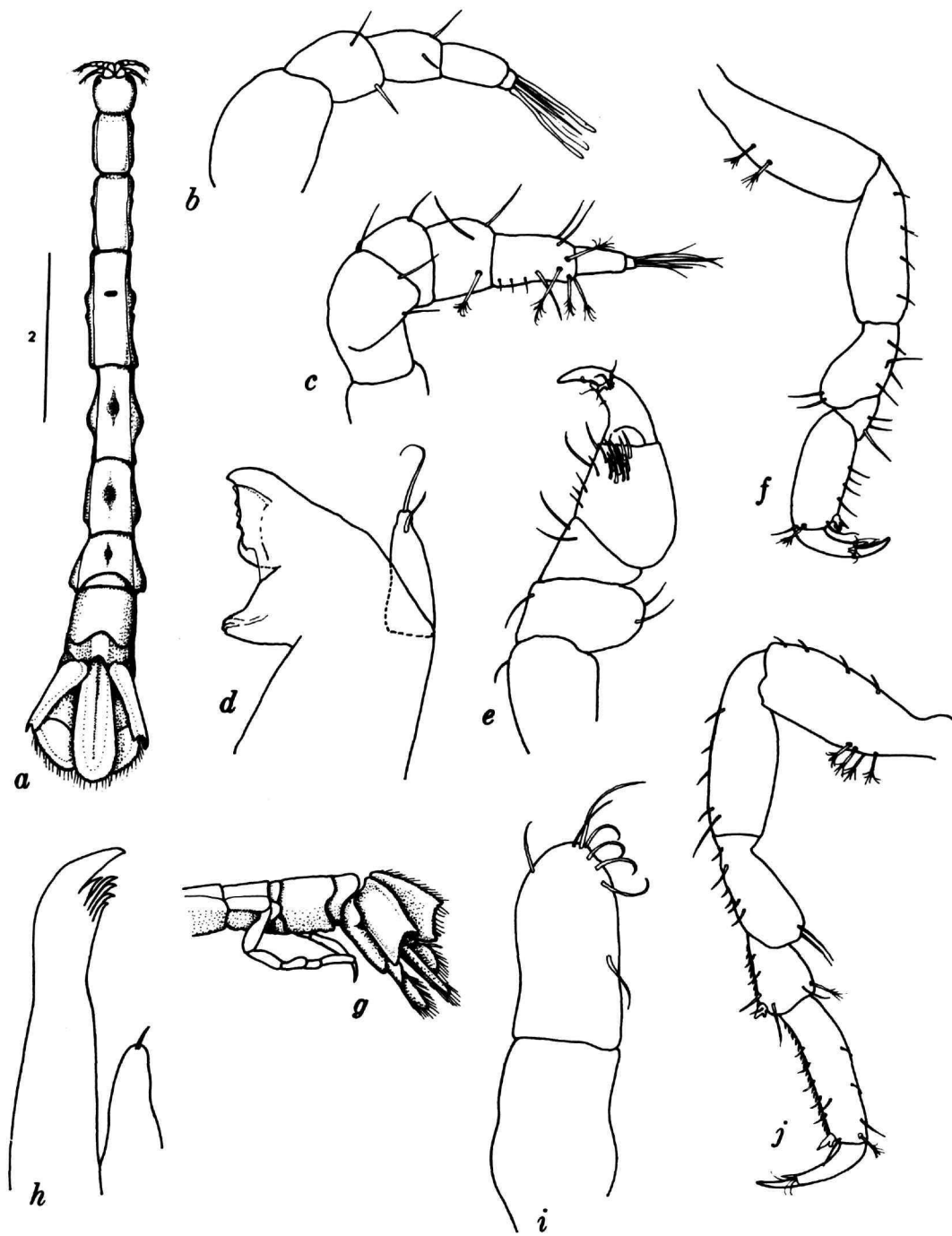


FIGURE 14.—*Exallanthura sexpes*, new genus, new species: *a*, holotype in dorsal view; *b*, antennule; *c*, antenna; *d*, mandible; *e*, pereopod 1; *f*, pereopod 2; *g*, posterior pereonites and pleon in lateral view; *h*, maxilla; *i*, maxilliped; *j*, pereopod 6.

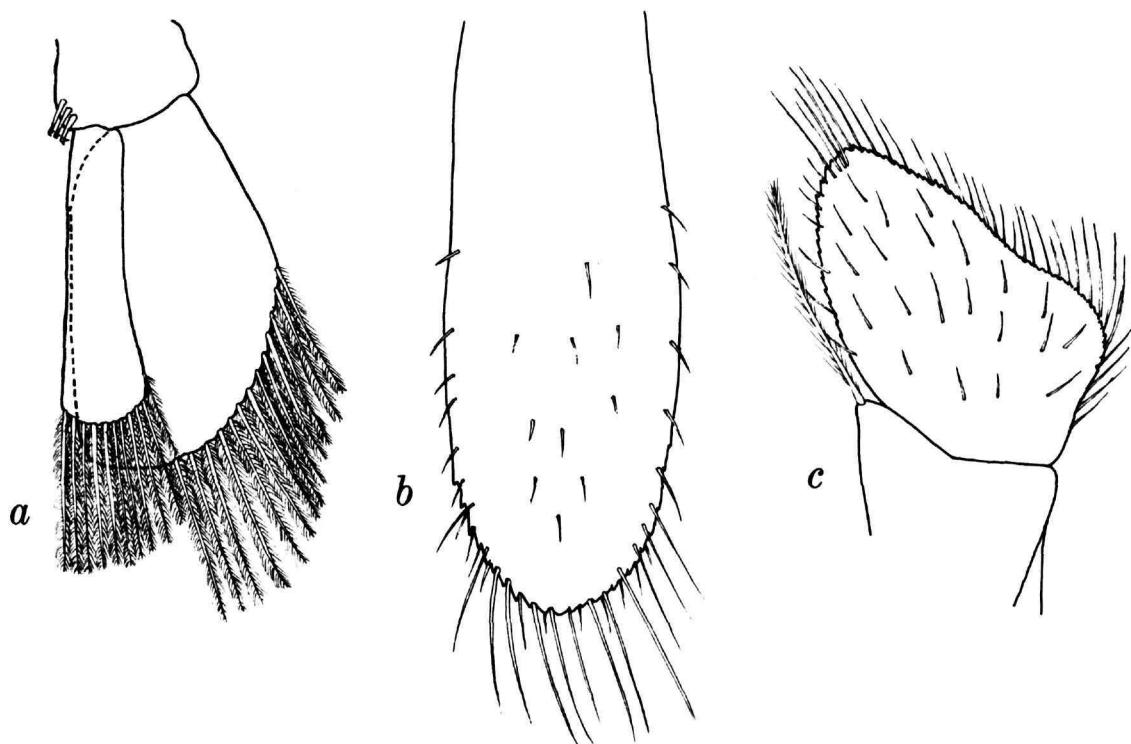


FIGURE 15.—*Exallanthura sexpes*, new genus, new species: *a*, pleopod 1; *b*, telson; *c*, uropodal endopod.

dorsal keel becoming obsolete distally; distal margin serrate, setose.

Antennular peduncle of three segments, basal segment broadest and longest; flagellum of two articles, distal article about one-quarter length of proximal, with three aesthetascs. Antennal peduncle 5-segmented, second segment grooved to accommodate antennule; flagellum of two articles, terminal article very short. Mandibular palp of one segment, with one terminal and one subterminal seta; molar with broad base tapering to rounded tip; incisor broad, individual cusps not evident, strongly sclerotized; lacinia lying parallel to incisor, with four large triangular serrations distally and clump of several minute serrations proximally. Maxilla with single, large terminal spine and five smaller spines. Maxilliped 3-segmented, two free segments subequal in length, distally rounded, bearing few setae; endite absent. Pereopod 1, unguis one-third length of dactylus, with short blunt spine at base; palm of propodus straight, median face with clump of spines distally. Pereopod 2 propodus

rectangular, with bifid posterodistal spine; carpus small, triangular. Pereopod 6 propodus and carpus both with fine spinules on posterior margin, and bifid posterodistal spine; carpus almost rectangular, hardly underriding propodus. Pleopod 1 exopod operculiform, about three times wider and little longer than endopod; both rami with distal plumose setae; basis with three retinaculae. Uropodal endopod almost reaching telsonic apex, margin finely dentate and setose; exopod rectangular, distal margin concave, dentate.

ETYMOLOGY.—The specific name alludes to the six pairs of legs possessed by this species (rather than the more usual seven pairs).

Genus *Haliophasma*

Haliophasma poorei, new species

FIGURE 16

MATERIAL.—Holotype: USNM 171708, 1 ♀, TL 14.7 mm, Sta AB 201A. Paratype: USNM 171709, 1 ♀, TL 9.4 mm, Sta AB 437.

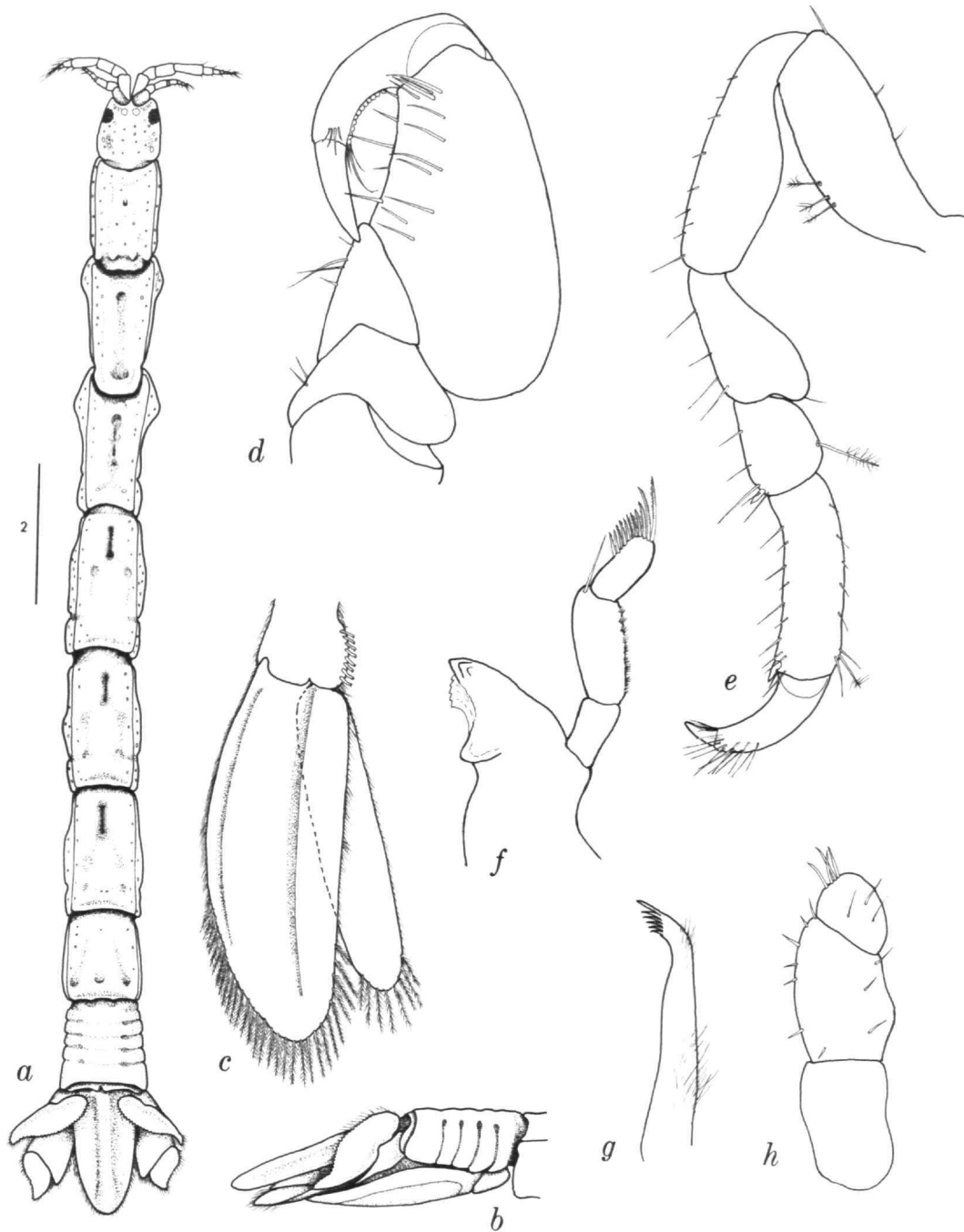


FIGURE 16.—*Haliophasma poorei*, new species: a, holotype in dorsal view; b, pleon in lateral view; c, pleopod 1; d, pereopod 1; e, pereopod 7; f, mandible; g, maxilla; h, maxilliped.

DESCRIPTION.—*Female*: Integument somewhat indurate, with tiny scattered pits. Body proportions: $C < 1 < 2 < 3 < 4 = 5 > 6 > 7$. Cephalon with short rostrum; eyes present. Pereonite 1 with small middorsal anterior pit, four rounded posterodorsal tubercles, inner pair stronger; pereonites 2–6 with middorsal longitudinal groove, posterior three grooves shorter but deeper than anterior two. Pereonite 7 with three shallow posterodorsal depressions. Pleonites 1–5 fused, with lateral grooves indicating lines of fusion; pleonite 6 free, very short. Telson strongly indurate, with rounded longitudinal ridge; distal margin rounded.

Antennular peduncle 4-segmented, fourth segment short; flagellum of four articles, basal article equal in length to three distal articles together. Antennal peduncle 5-segmented, fifth segment equal in length to third and fourth together; flagellum of five articles. Mandibular palp 3-segmented, terminal segment with 12 serrate spines; incisor of three cusps; lacinia with five serrations; molar blunt, rounded. Maxilla with six distal spines. Maxilliped 4-segmented, terminal segment semi-circular, set obliquely on third segment, with four mediobasal setae; third segment longer than second. Pereopod 1 robust, propodus basally broad, palm very slightly concave, armed with few simple setae; unguis about half length of dactylus, latter with row of rounded scales on inner (posterior) margin. Pereopods 4–7 unguis about one-fifth length of dactylus; propodus and carpus with strong posterodistal spine; carpus not overriding propodus, anterior margin slightly shorter than posterior. Pleopod 1 exopod operculiform, indurate, with two grooves on outer (anterior) surface; numerous short distal fringed setae; endopod shorter and narrower than exopod; basis with eight retinalae. Uropodal exopod not reaching inner distal angle of basis, with sinuous and finely denticulate outer margin; endopod short, apically acute, distal margin finely dentate.

REMARKS.—The present material agrees with Poore's diagnosis (1975:504) of *Haliophasma*, especially in the 4-segmented maxilliped and the dorsal pits. Only in the flagellum of the antennule is a difference seen. Poore defines *Haliophasma* as having a 2-articulate antennular flagellum, while the present species has a 4-articulate flagellum. Considering all the strong similarities, it would seem unnecessary to exclude this species from *Haliophasma*

on such a minor difference. In the shape of the maxilliped, mandible, and telson, *H. poorei* resembles *H. purpureum* from Australia, but this latter species does not have the four tubercles on the first pereonite, while the notched uropodal exopod also differs.

ETYMOLOGY.—The species is named for Dr. Gary C. B. Poore of Melbourne, Australia, in recognition of his work on the genus *Haliophasma*.

Heteranthura, new genus

DIAGNOSIS.—Eyes present. Antennular flagellum 6-articulate; antennal flagellum 4-articulate. Mouthparts somewhat produced anteriorly. Mandible columnar, lacking palp, lacinia, and molar. Maxilliped slender-elongate, 7-segmented, lacking endite. Pereonites 1–6 each with middorsal pit. Pereopods 1–3 subchelate; pereopods 4–7 with carpus more or less rectangular, not overriding propodus. Pleonites 1–6 free. Pleopod 1 rami fused, operculiform.

TYPE-SPECIES.—*Heteranthura anomala* Kensley.

ETYMOLOGY.—The generic name is derived from the Greek words *heteros* (different) plus *anthos* (a flower).

REMARKS.—The present material, with the anteriorly produced mouthparts, appears superficially to be a paranthurid when seen in lateral view. Detailed examination, however, shows the maxilla to be of the anthurid type, with several separate distal spines. No previously described anthurid displays the modified mandible and maxilliped, nor the fused rami of the first pair of pleopods.

Heteranthura anomala, new species

FIGURES 17, 18

MATERIAL.—Holotype: USNM 171710, 1 ♀, TL 3.0 mm, Sta JR 33A. Paratype: USNM 171711, 1 juv TL 2.0 mm, Sta JR 29.

DESCRIPTION.—*Female*: Integument indurate. Body proportions: $C > 1 < 2 = 3 > 4 > 5 > 6 > 7$. Cephalon with eyes situated in broadly rounded anterolateral lobes; rostrum low, rounded. Pereonites 1–6 each with middorsal pit. Pleonites free, 1–5 subequal, 6 with middorsal rounded lobes on posterior margin; each pleonite with prominent plumose seta laterally. Telson broadening distally, indurate, with strong middorsal ridge becoming obsolete distally;

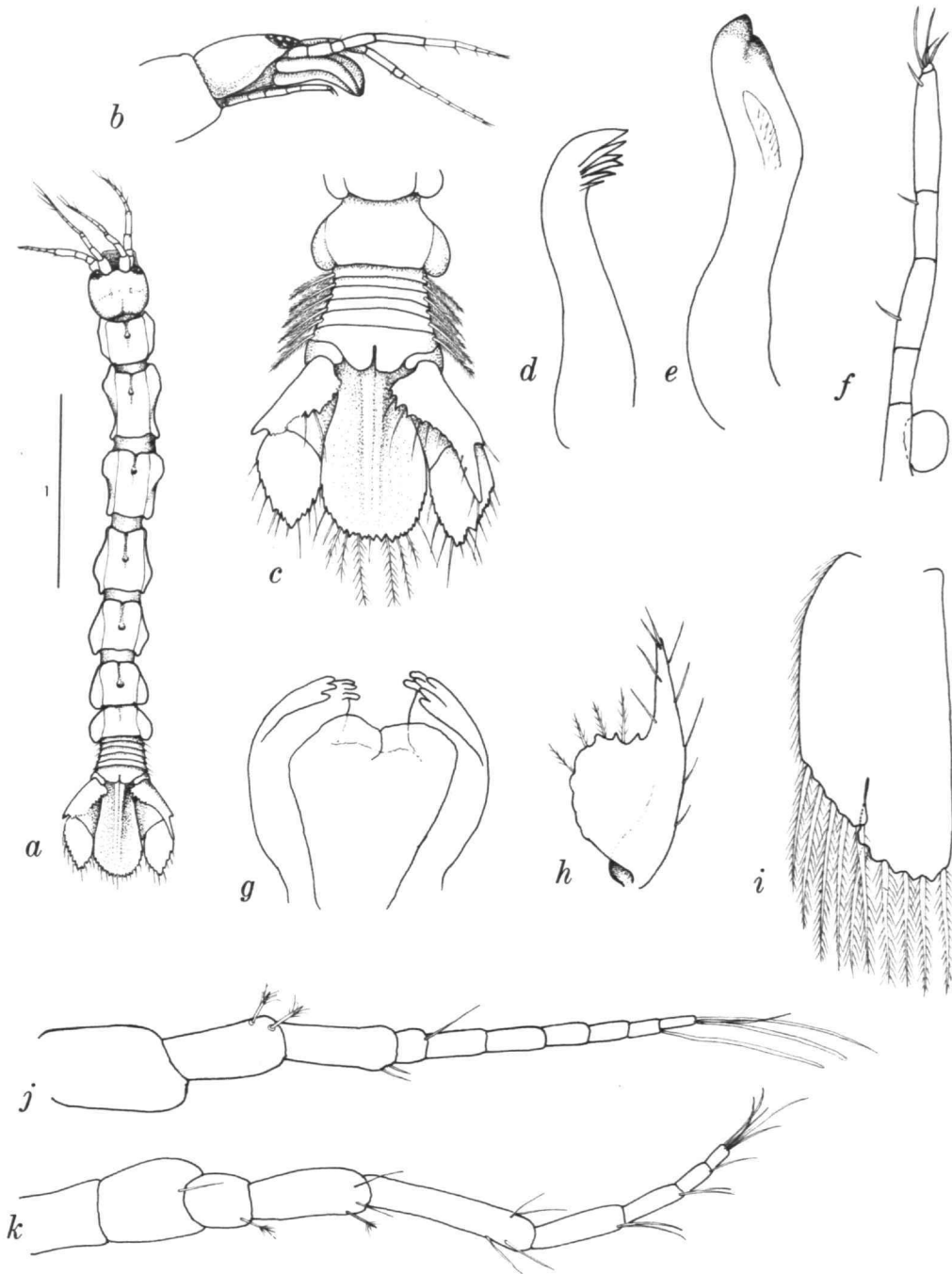


FIGURE 17.—*Heteranthura anomala*, new genus, new species: *a*, holotype in dorsal view; *b*, cephalon in lateral view; *c*, pleon in dorsal view; *d*, maxilla; *e*, mandible; *f*, maxilliped; *g*, lower lip complex; *h*, uropodal exopod; *i*, pleopod 1; *j*, antennule; *k*, antenna.

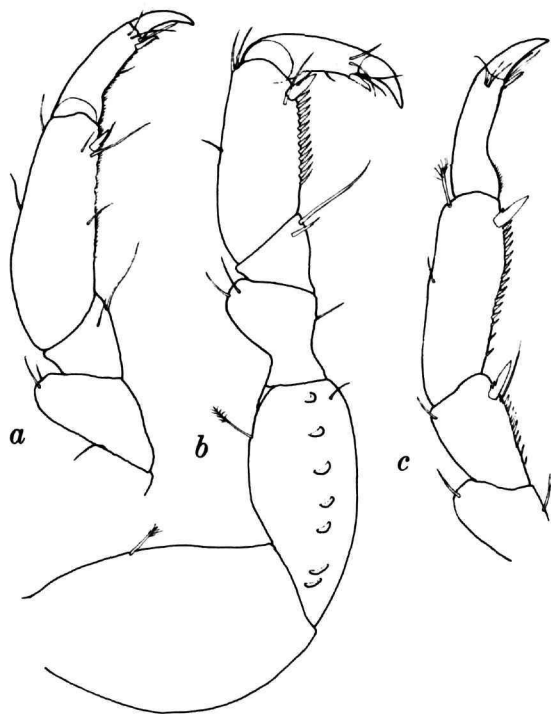


FIGURE 18.—*Heteranthura anomala*, new genus, new species: a, pereopod 1; b, pereopod 2; c, pereopod 7.

distal margin serrate, with few simple and few plumose setae; pair of statocysts situated proximally beneath rounded posterior lobes of pleonite 6.

Antennule elongate-slender, three proximal peduncular segments subequal in length, basal segment broadest, fourth segment one-third length of third; flagellum of six articles, with few aesthetascs distally. Antenna slender-elongate, peduncle 5-segmented, two proximal segments subequal in length, third segment shorter, fourth twice length of third, fifth longer but more slender than fourth; flagellum of four articles. Mouthparts, viewed laterally, elongate and drawn out anterodorsally beyond anterior border of cephalon, beneath shieldlike upper lip. Mandible lacking palp, strongly indurate, armed distally with two strongly sclerotized cusps. Maxilla elongate, indurate, distally strongly curved, armed with one strong and five smaller spines. Maxilliped very elongate-slender, about 14 times longer than wide, 7-segmented, terminal segment tiny, penultimate segment longest. Pereopod 1 unguis half length of dactylus, propodus elongate,

palm straight, unarmed except for sensory spine at posterodistal corner. Pereopods 2-4 propodus armed with strong sensory posterodistal spine, and row of about 12 short spines on posterior margin; carpus triangular, unarmed; ischium with six or seven rounded peglike processes. Pereopods 5-7 propodus with strong posterodistal spine, row of about 15 short spines on posterior margin; carpus roughly rectangular, not underriding propodus, with strong posterodistal spine and about 10 short spines on posterior margin. Pleopod 1 exopod and endopod not distinct, fused, forming single plate with slit in distal margin, latter with plumose setae; not strongly indurate, operculiform. Uropodal exopod folding dorsally over telson, bipartite, consisting of elongate, spike-like, basally serrate dorsal section, and rounded ventral part; endopod oval, distally acute, margins serrate, reaching to telsonic apex.

REMARKS—The mouthparts of this species are obviously adopted either to a specialized food or form of feeding. This is seen in the loss of a palp on the strong columnar mandible, which has also lost all trace of a lacinia or molar. The maxilla is also columnar and distally curved toward the midline, with the teeth meeting just below the mandibular cusps. The maxilliped has lost its usual role of ventral shield or plate protecting the mouthparts; it is slender and delicate and, with the few terminal setae it possesses, probably plays only a sensory role in feeding.

The specimens were collected along with some live coral, sponges, and alcyonarians. The unusual mouthparts are probably adapted to feeding on one of these organism types.

ETYMOLOGY.—The specific name is derived from the Greek word *anomalos* (unusual, abnormal, or inconsistent) and refers to the mouthparts.

Genus *Malacanthura*

Malacanthura mombasa, new species

FIGURES 19, 20

MATERIAL.—Holotype: USNM 171712, 1♂, TL 20.2 mm, Sta HA2.

DESCRIPTION.—*Male*: Integument moderately indurate. Body proportions: C<1>2>3<4=5=6>7. Cephalon with large eyes; rostrum small, not extending beyond anterolateral corners. Pereonites 2

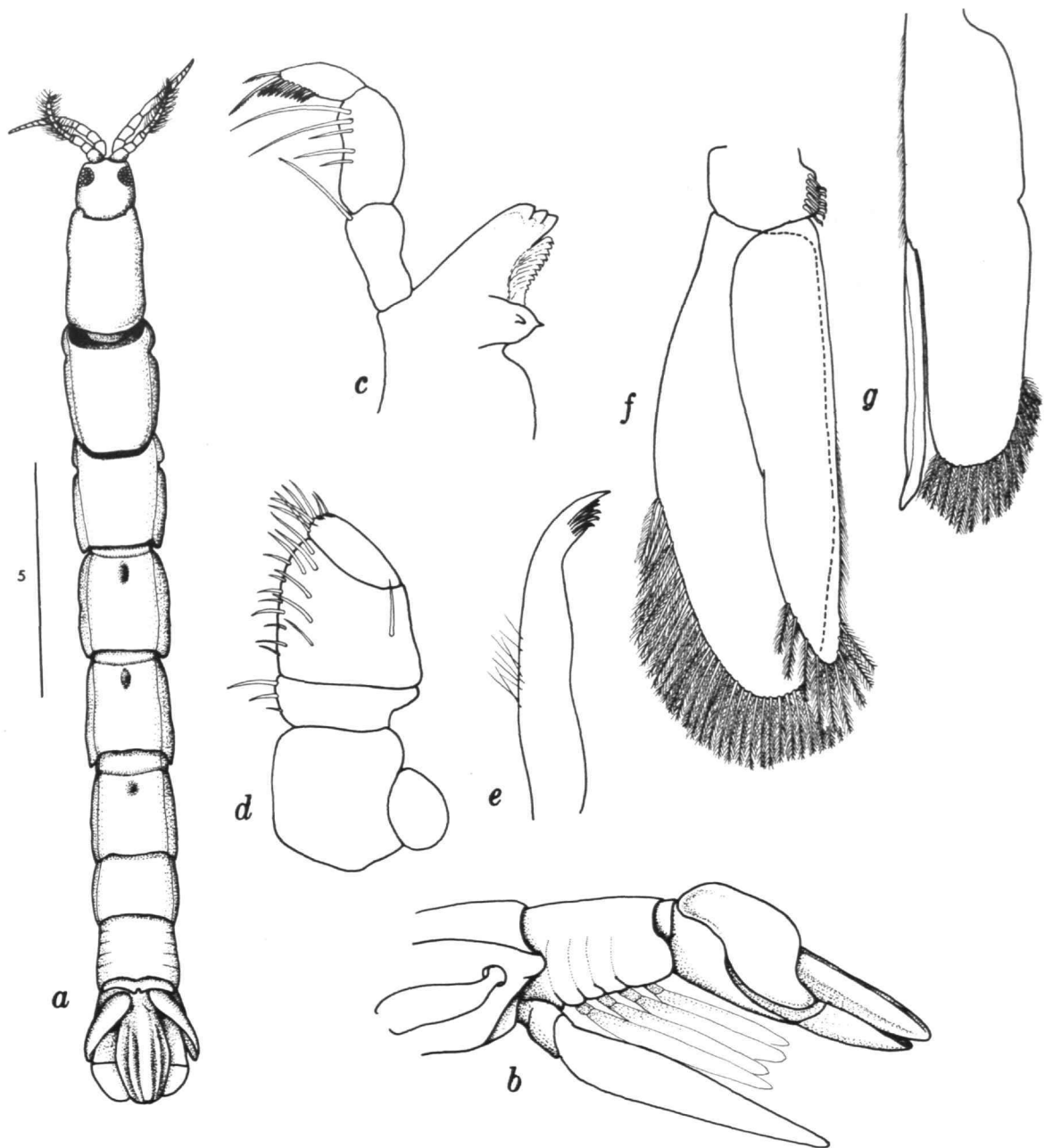


FIGURE 19.—*Malacanthura mombasa*, new species: *a*, holotype in dorsal view; *b*, pleon in lateral view; *c*, mandible; *d*, maxilliped; *e*, maxilla; *f*, pleopod 1; *g*, pleopod 2 ♂ endopod.

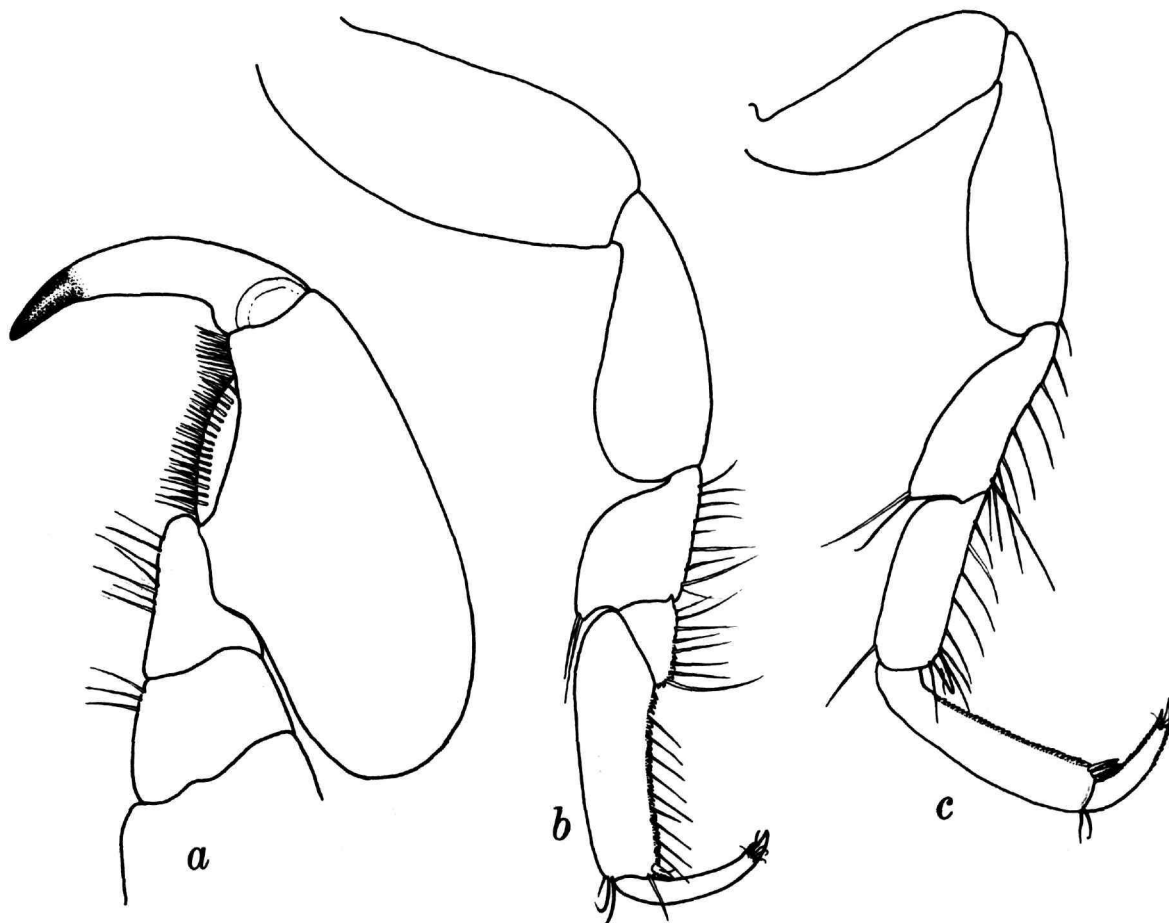


FIGURE 20.—*Malacanthura mombasa*, new species: *a*, pereopod 1; *b*, pereopod 2; *c*, pereopod 7.

and 3 with transverse anterodorsal hollowed area; pereonites 4–6 each with shallow middorsal pit. Pleonites 1–5 fused, suture lines indicated laterally; pleonite 6 free, with small middorsal notch in posterior margin. Telson broadest at midlength, distally broadly rounded, with three longitudinal rounded ridges dorsally, more distinct in distal half; two proximal statocysts with dorsal slitlike openings.

Antennular peduncle 4-segmented, fourth segment short; flagellum of 10 articles each bearing whorl of filiform aesthetascs. Antennal peduncle with fifth segment longest; flagellum of seven articles. Mandibular palp 3-segmented, basal segment with simple seta, second segment with five

simple setae, third segment with 12 fringed spines; incisor of three cusps, lacinia with about 10 serrations; molar with two distal spiniform processes. Maxilla with eight distal spines. Maxilliped 5-segmented, third segment short, slightly constricted, fourth segment with several simple setae on median margin; fifth segment narrow, oblique, with about seven simple setae at mediobasal area. Pereopod 1 unguis about one-third length of dactylus; propodus broad, palm with outer part concave, median part with evenly rounded flange bearing row of setae; dense cluster of setae on inner face of propodus; carpus triangular, distally rounded. Pereopod 2 unguis about one-quarter length of dactylus, with single posterodistal sensory spine and row of simple

setae and tiny spinule-like scales on posterior margin; carpus small, triangular, with scales on posterior margin. Posterior pereopods with dactylus having scales on both anterior and posterior margins; propodus slender, posterior margin bearing scales, with two fringed posterodistal spines; carpus rectangular, not underriding propodus, with one strong posterodistal sensory spine. Pleopod 1 endopod half width and subequal in length to operculiform and indurate exopod; both rami with distal plumose setae; basis with six retinaculae. Pleopod 2 endopod with sabre-shaped, apically acute copulatory stylet. Propodal exopod with outer margin strongly sinuous, just reaching distal margin of basis; endopod distally rounded, almost reaching telsonic apex.

REMARKS.—The 5 segmented maxilliped that lacks an endite, the rectangular carpus of the posterior three pairs of pereopods, pleonites 1–5 fused, pleonite 6 free, two basal telsonic statocysts, and the presence of middorsal pits on pereonites 4–6 all place this specimen in *Malacanthura*.

The two previously described species of *Malacanthura* both differ markedly from this species: *M. linguicauda* (Barnard, 1920) lacks the carinate telson seen in *M. mombasa*, while *M. caribbica* Paul and Menzies, 1971 (of which *M. cumanensis* Paul and Menzies, 1971, is a synonym), possesses a unicarinate rather than a tricarinate telson.

ETYMOLOGY.—The holotype of this species was captured at the mouth of the harbor of the east African port of Mombasa, hence the specific name.

Genus *Mesanthura*

Mesanthura cf. *maculata* (Haswell, 1881)

FIGURE 21

Haliophasma maculata Haswell, 1881:477, pl. 18: fig. 3.

Anthura affinis Chilton, 1883:72, pl. 1: fig. 4.

Mesanthura maculata.—Barnard, 1925a:144, fig. 9b.—Hale, 1929:245, fig. 238.—Kirtisinghe, 1931:129, pl. 30.—Nierstrasz, 1941:241.—Hurley, 1961:255.—Pillai, 1966:156, fig. 2.

MATERIAL.—Sta AB 381B, 1 ♀, TL 10.9; Sta Doty-SI M7, 1 ♀, TL 8.5 mm.

REMARKS.—Whether all the above-quoted records refer to the same species is open to doubt. Only

Pillai (1966) gives a detailed description and figures of the specimens from Kerala, India. What all the records have in common is a pattern consisting of a solid, dorsal pigment patch on the cephalon, pereon, pleon, and telson. Pillai's figure of the first pereopod, however, does not show a rounded setose lobe on the propodal palm, while his figure of the pleon shows two incomplete sutures in dorsal view. The present specimens do have a proximal constriction on the pleon but no sutures visible in dorsal view.

PREVIOUS RECORDS.—New Zealand, Australia, Ceylon, India.

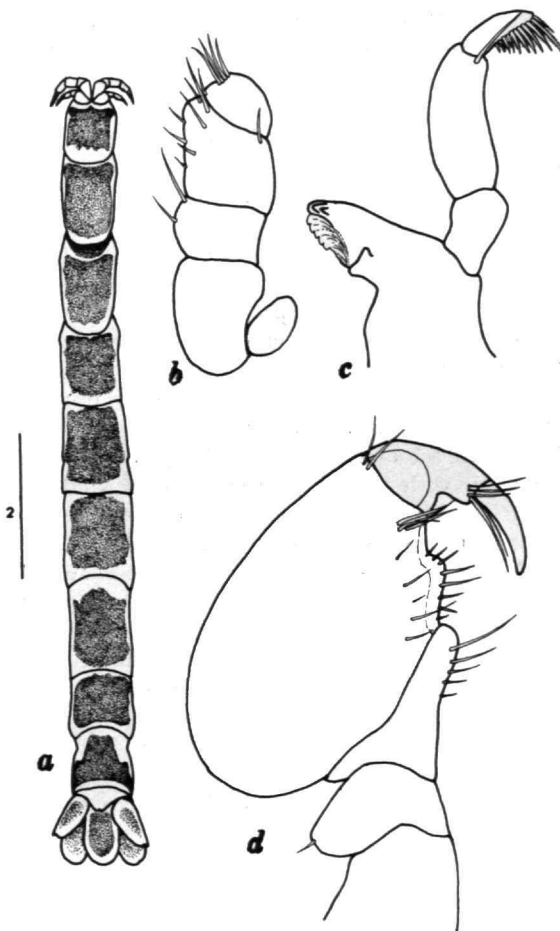


FIGURE 21.—*Mesanthura* cf. *maculata* (Haswell, 1881): a, ♀ in dorsal view; b, maxilliped; c, mandible; d, pereopod 1.

Mesanthura protei, new species

FIGURES 22, 23

MATERIAL.—Holotype: USNM 171713, 1 ovig ♀, TL 8.0 mm, Sta AB 372P. Paratypes: USNM 171714, 1 ♂, TL 5.6 mm, 1 ♀, TL 3.8 mm, 3 juvs; Sta JR 29; USNM 171715, 1 ♂, TL 3.9 mm, 2 ovig ♀, TL 5.5–6.5 mm, 3 ♀, TL 3.6–4.0 mm. Additional material: 4 ♀, Sta JR 29; 1 ♀, Sta JR 20; 2 ♀, Sta JR 30; 3 juvs, Sta JR 31.

DESCRIPTION.—Body proportions: $C < 1 = 2 = 3 < 4 > 5 > 6 > 7$. Eyes present. Rostrum low. Pleonites 1–5 fused, pleonite 6 free. Telson distally broadly rounded, with few mediobasal setae, and two proximal statocysts. Antennular peduncle with basal segment broadest and longest; fourth segment very short; flagellum of two articles. Antennal peduncle with second segment broadest and longest, third segment short; flagellum of three (possibly four) articles. Mandibular palp 3-segmented, terminal segment with nine spines; incisor of three cusps; lacinia with about eight serrations; molar blunt, somewhat reduced. Maxilla slender, with six terminal spines. Maxilliped 5-segmented, second segment longest, third segment slightly narrower than flanking segments; terminal segment narrower than fourth, with single short plumose seta basally, and three simple setae and one plumose seta mediobasally. Pereopod 1 unguis one-third length of dactylus; propodus broad, palm with rounded setose lobe; carpus triangular, distally rounded. Pereopods 4–7 unguis one-third length of dactylus; propodus with strong ventrodorsal spine and five short spinules; carpus short, triangular, with strong ventrodorsal sensory spine. Pleopod 1 exopod operculiform, distal margin bearing plumose setae, two and one-half times wider than endopod, subequal in length; basis with five retinaculae. Uropodal exopod with setose margin, barely discernible notch on outer margin; endopod extending slightly beyond telsonic apex.

Male: Eyes well developed, larger than in female. Antennule with brushlike flagellum of 12–14 articles bearing dense whorls of filiform aesthetascs. Pereopod 1 with rounded setose process on palm, as in female, plus numerous short curved spines along entire inner margin of palm. Pleopod 2 with copulatory stylet on endopod extending well beyond ramus, apically rounded. Uropodal exopod slightly smaller than in female.

Pigment Pattern: No distinct pigment pattern

can be seen in the males, where the chromatophores are scattered over the dorsal and ventral surfaces of the body. In the females, three pigment patterns can be seen:

1. Strong, almost solid band on cephalon, just posterior to eyes; scattered chromatophores on pereon and pleon.

2. Two irregular longitudinal bands on cephalon, pereon, and pleon, linked anteriorly on pereonites 1–3, linked posteriorly on cephalon and pereonites 4–7.

3. Broad almost solid band across cephalon just posterior to eyes; irregular patch on pereonites and pleon, each patch with unpigmented central median line.

REMARKS.—Barnard (1925a) described *Mesanthura albolineata* from Singapore and *M. ocellata* from Thailand. He provided a semidiagrammatic dorsal view of each, with almost no further information. He noted the similarity of the mandibular palps of the two species. The pigment pattern of *M. albolineata* is similar to that of the first form described above, while *M. ocellata* is similar to the second form. Examination of the type material of Barnard's two species revealed no structural differences between them and the present species. Unfortunately the pigment patterns of the former have faded. The possibility exists that there is a single polychromatic species of *Mesanthura* distributed throughout the northern Indian Ocean. Further collecting and examination of fresh material from Singapore and Thailand is necessary before this situation can be resolved.

Polychromatism amongst isopods has been recorded in the Sphaeromatidae, e.g., Hoestlandt (1967) mentions 11 phenotypes of *Sphaeroma serratum* based on color variation, while Hoestlandt (1964) mentions two color forms of *Gnorimosphaeroma oregonense* Burbanck, and Burbanck (1961) mentions variations in the dorsal pigment pattern of the anthurid *Cyathura polita*. In all these cases, it was suggested that color or pigment pattern was inherited. This may well be the case with the present species of *Mesanthura*, as juveniles as well as ovigerous females with all three patterns are represented in the material. This seems to indicate that the pattern is genetically determined and varies little with growth and molting. As at least two of the three patterns may occur together, this would not seem to be a case of populations becom-

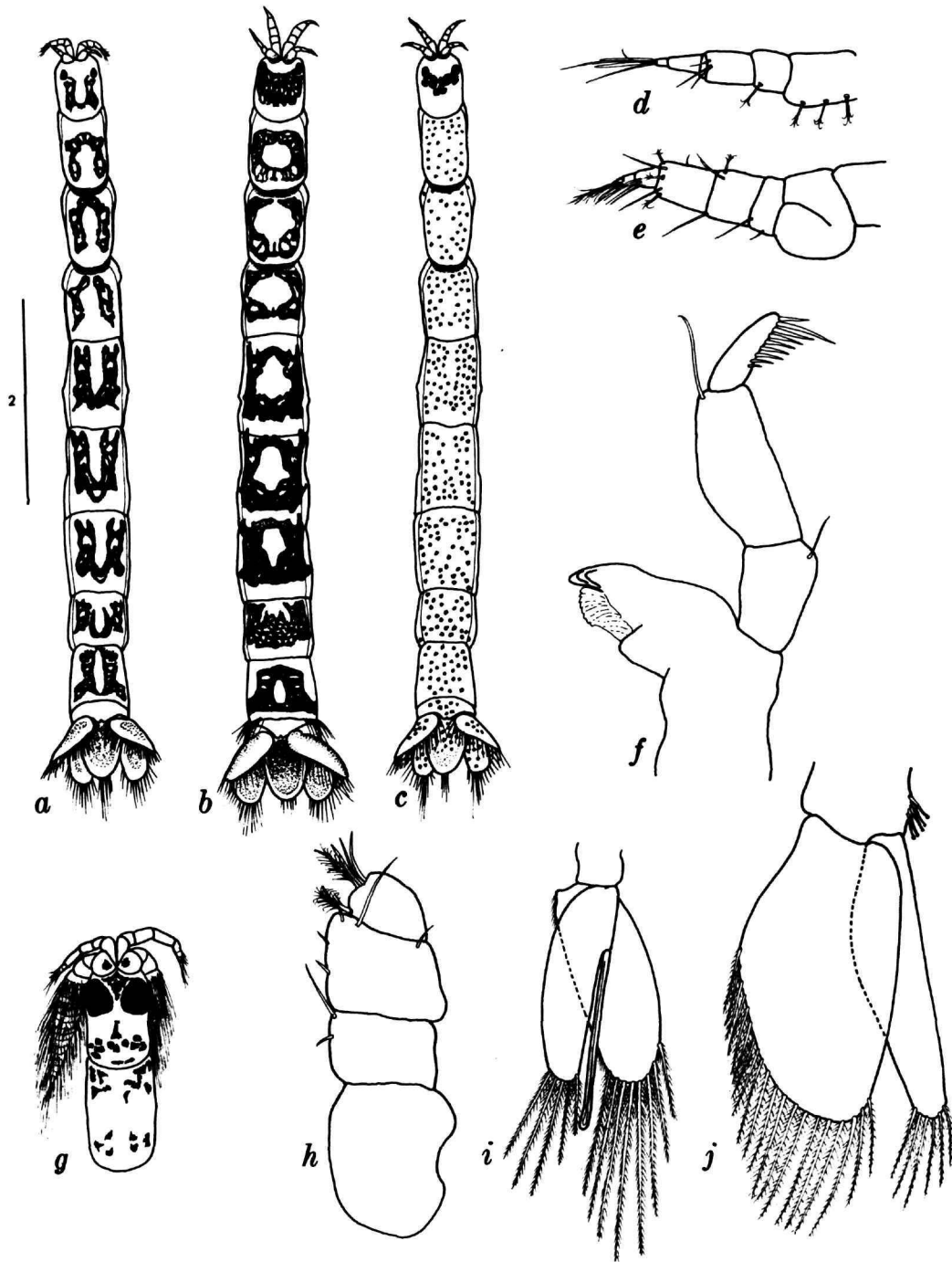


FIGURE 22.—*Mesanthura protei*, new species: a, b, c, ♀♀ showing 3 color patterns; d, antennule; e, antenna; f, mandible; g, cephalon ♂; h, maxilliped; i, pleopod 2 ♂; j, pleopod 1.

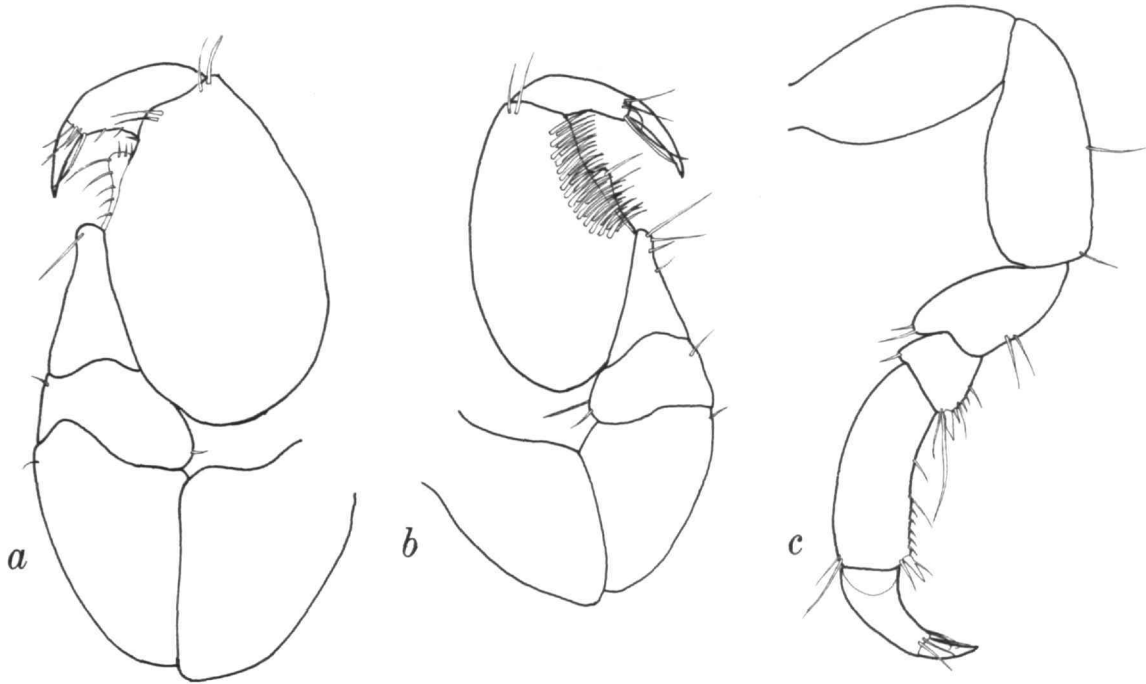


FIGURE 23.—*Mesanthura protei*, new species: *a*, pereopod 1 ♀; *b*, pereopod 1 ♂; *c*, pereopod 7.

ing isolated and leading to the formation of subspecies.

ETYMOLOGY.—The specific name is derived from Proteus, the Greek sea god capable of changing into many forms.

Genus *Natalanthura*

Natalanthura foveolata Kensley, 1978

Natalanthura foveolata Kensley, 1978:6, figs 3, 4.

MATERIAL.—1 ♀, Sta AB 400C.

PREVIOUS RECORDS.—Off Natal, South Africa, 550–850 m.

Genus *Panathura*

Panathura amstelodami Kensley, 1976

Panathura amstelodami Kensley, 1976:277, figs. 4, 5; 1977:239; 1978:54, fig. 23d.

MATERIAL.—3 ♂, 1 ovig ♀, 4 ♀, 1 juv, Sta AB 381A; 1 ♂, 2 ovig ♀, 8 ♀, 6 juvs, Sta AB 381B; 11 ♂, 6 ovig ♀, 31 ♀, Sta AB 400C.

PREVIOUS RECORDS.—St Paul and Amsterdam Islands, southern Indian Ocean; Walter's Shoal, southwest Indian Ocean.

Panathura macronesia, new species

FIGURES 24, 25

MATERIAL.—Holotype: USNM 171719, 1 ♂, TL 2.2 mm, Sta AB 124F. Allotype: USNM 171720, 1 ovig ♀, TL 2.7 mm, Sta 124F. Paratypes: USNM 171721, 6 ♀, Sta 124F; USNM 171722, 5 ovig ♀, 12 ♀, Sta 124E; USNM 171723, 2 ♀, Sta JR 29; USNM 171724, 1 ♂, 7 ovig ♀, 5 ♀, Sta JR 30; USNM 171725, 1 sub ♂, 3 ovig ♀, 5 ♀, Sta JR 33A.

DESCRIPTION.—*Female*: Body small, integument thin, not indurate. Body proportions: C<1>2=3=4=5>6>7. Eyes small, dorsal. Pereonite 7 about one-half length pereonite 6, with posterolateral lobes projecting over pleonites 1 and 2. Pleonites free, 1–4 subequal, short; pleonite 5 twice length of 4, with strong dorsolateral fringe of plumose setae; pleonite 6 slightly longer than 5, with rounded middorsal lobe on posterior margin. Telson spoon shaped, proximally narrow, widening distally to evenly rounded margin bearing simple

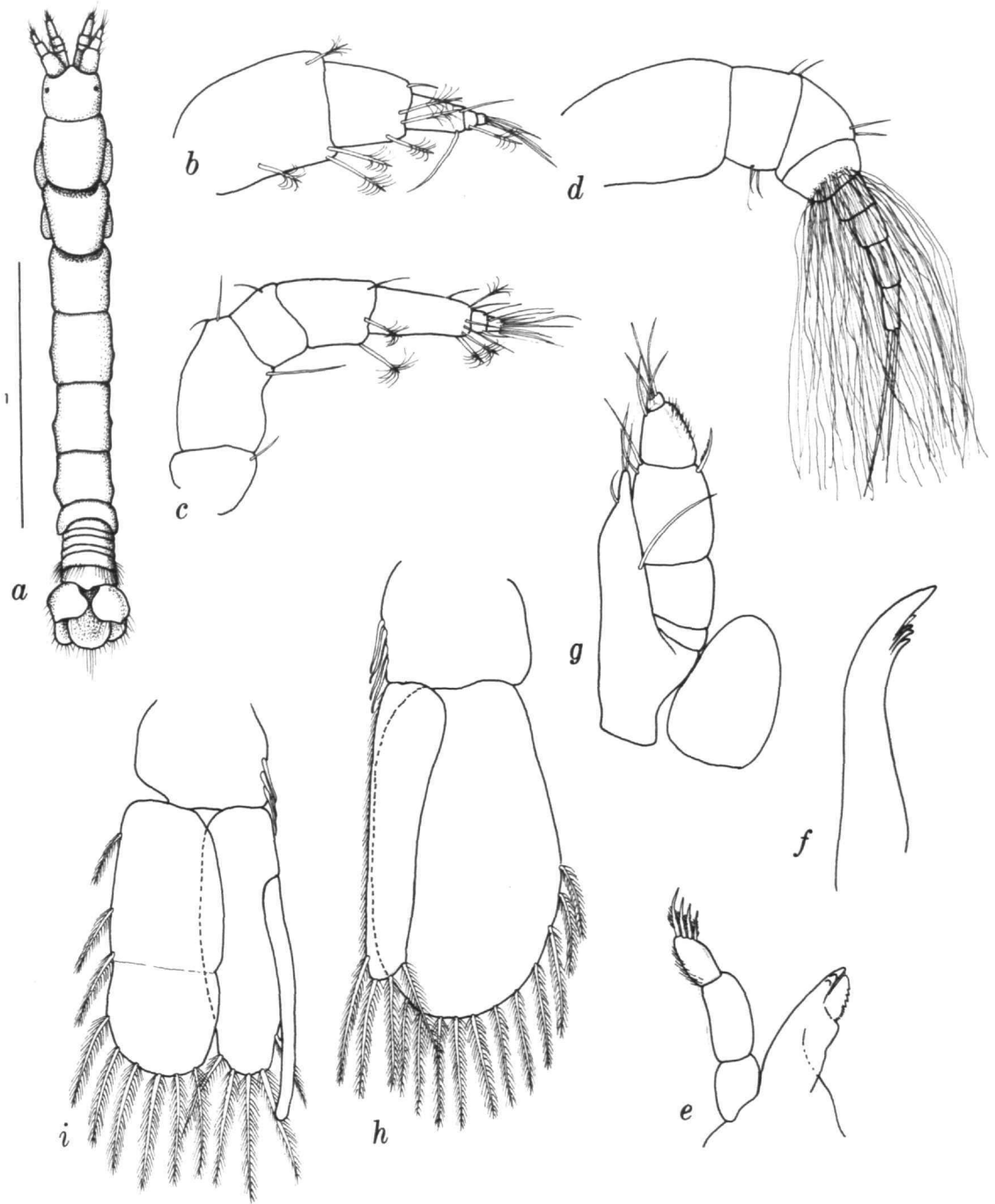


FIGURE 24.—*Panathura macronesia*, new species: a, ♀ in dorsal view; b, antennule ♀; c, antenna; d, antennule ♂; e, mandible; f, maxilla; g, maxilliped; h, pleopod 1; i, pleopod 2 ♂.

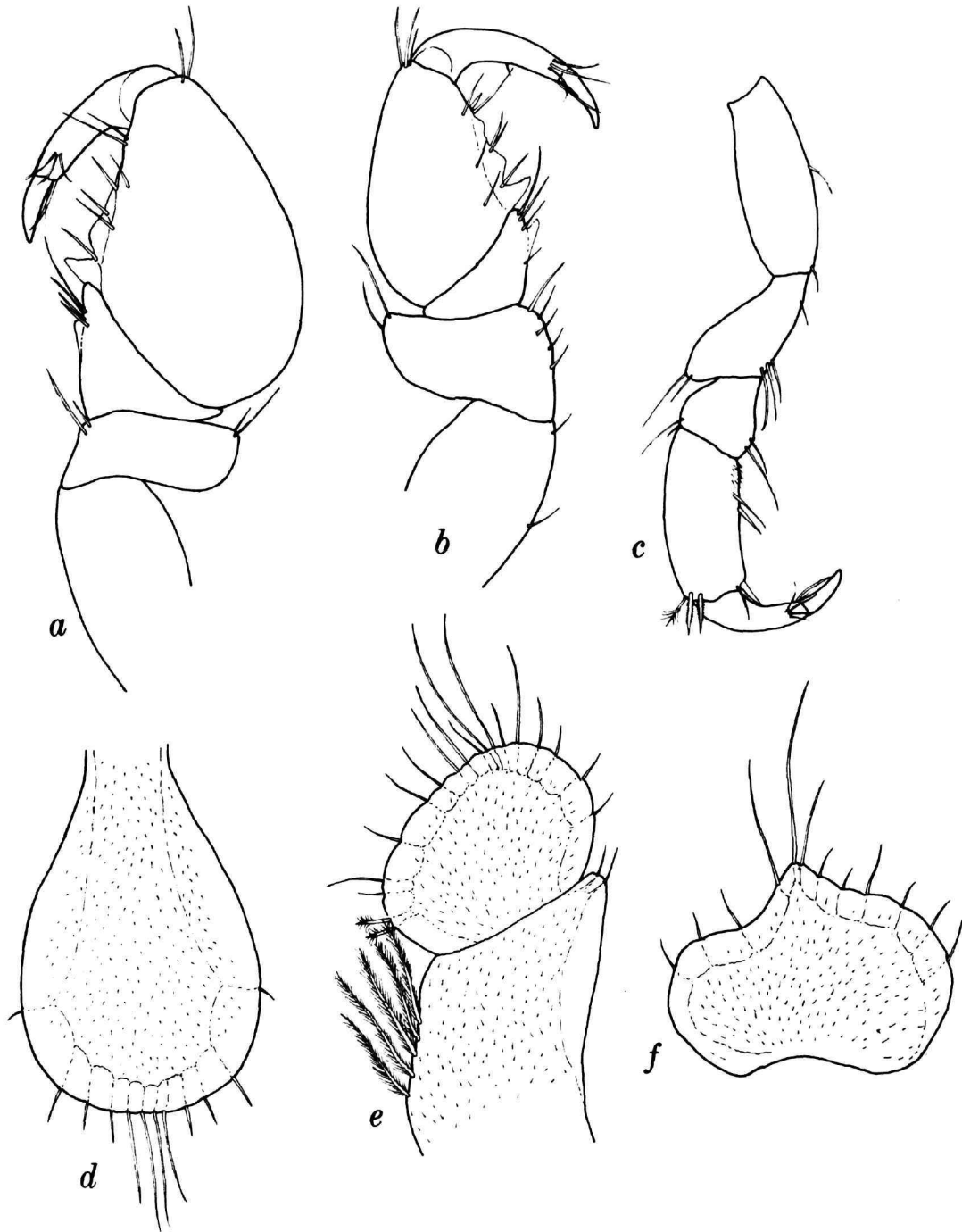


FIGURE 25.—*Panathura macronesia*, new species: *a*, pereopod 1; *b*, pereopod 2; *c*, pereopod 7; *d*, telson; *e*, uropodal endopod and basis; *f*, uropodal exopod.

setae; dorsally hollowed, with numerous short, fine setules, and broad hyaline margin.

Antennular peduncle 4-segmented, basal segment very broad, as long as remainder of appendage; flagellum reduced to single article. Antennal peduncle 5-segmented, second segment longest; flagellum of two short setiferous articles. Mandibular palp 3-segmented, second segment longest, first and third subequal; distal segment armed with four spines; incisor of three cusps; molar reduced to slight bulge; lacinia with four large serrations and several fine proximal spinules. Maxilla slender, armed with one strong and four small distal spines. Maxilliped 6-segmented, endite strong, reaching to end of fourth segment; second segment short; terminal segment tiny, bearing three apical setae. Pereopod 1 unguis one-third length of dactylus; propodal palm with thin transparent margin, widened proximally into triangular tooth and rounded bulge, with few simple setae; triangular carpus with thin low bulge on posterior margin. Pereopods 2 and 3 similar to 1, but propodi slightly less robust. Posterior pereopods with carpus roughly triangular, slightly underriding propodus. Brood pouch formed by four pairs of oostegites. Pleopod 1 exopod operculiform, not indurate, slightly longer than endopod; basis with four retinaculae. Uropodal exopod broadly oval, with triangular extension on distal margin; thin hyaline margin present; entire surface bearing tiny setules; endopod broadly oval, also bearing fine setules and several, simple marginal

setae; basis triquetrous, with inner distal margin extending beyond outer distal margin.

Male: Antennule with three stout peduncular segments; basal flagellar article broad, four distal articles more slender, dense brushlike whorls of filiform aesthetascs on all five articles. Pereopod 1 similar to female. Pleopod 2 basis with three retinaculae; exopod as long as, but slightly broader than, endopod, with distinct suture in distal half; copulatory stylet of endopod extending beyond rami, apically rounded.

REMARKS.—This is the fourth species of *Panathura* to be described and can easily be distinguished from the other two Indian Ocean species by the shape of the uropodal exopod; that of *P. amstelodami* is lanceolate, while that of *P. serri-cauda* (Barnard) is oval without a triangular projection, and with serrate margins. The telson also serves to separate these three species, being serrate in the established species, entire in *P. macronesia*. *Panathura formosa* Menzies and Frankenberg (1966) from the coast of Georgia has a similar uropodal exopod, but the telsonic margin is serrate, pereonite 7 is relatively longer, the pleonites are all subequal, and the maxillipedal endite is not as strong as in *P. macronesia*.

ETYMOLOGY.—The specific name is derived from the Greek words *macros* (large) plus *nesios* (an island), the translation for Nosi Bé, the Madagascan locality where several specimens were collected.

Literature Cited

- Barnard, K. H.
1914. Contributions to the Crustacean Fauna of South Africa, 3: Additions to the Marine Isopoda, with Notes on Some Previously Incompletely Known Species. *Annals of the South African Museum*, 10:325a-442.
1920. Contributions to the Crustacean Fauna of South Africa, 6: Further Additions to the List of Marine Isopoda. *Annals of the South African Museum*, 17:319-438.
- 1925a. A Revision of the Family Anthuridae (Crustacea Isopoda), with Remarks on Certain Morphological Peculiarities. *Journal of the Linnaean Society of London (Zoology)*, 36:109-160
- 1925b. Contributions to the Crustacean Fauna of South Africa, 9: Further Additions to the List of Isopoda. *Annals of the South African Museum*, 20:381-412.
1935. Report of Some Amphipoda, Isopoda, and Tanaidacea in the Collections of the Indian Museum. *Records of the Indian Museum*, 37:279-319.
1940. Contributions of the Crustacean Fauna of South Africa, 12: Further Additions to the Tanaidacea, Isopoda, and Amphipoda, Together with Keys for the Identification of the Hitherto Recorded Marine and Freshwater Species. *Annals of the South African Museum*, 32:381-543.
1955. Additions to the Fauna-List of South African Crustacea and Pycnogonida. *Annals of the South African Museum*, 43:1-107.
- Burbanck, W. D., and M. P. Burbanck
1961. Variations in the Dorsal Pattern of *Cyathura polita* (Stimpson) from Estuaries along the Coasts of Eastern United States and the Gulf of Mexico. *Biological Bulletin*, 121:257-264.
- Chilton, C.
1883. Further Additions to Our Knowledge of the New Zealand Crustacea. *Transactions of the New Zealand Institute*, 15:72-73.
1924. Fauna of the Chilka Lake: Tanaidacea and Isopoda. *Memoirs of the Indian Museum*, 5:875-895.
- Hale, H. M.
1929. *The Crustaceans of South Australia*. Part II, 380 pages. Adelaide: Government Printer.
1937. Isopoda and Tanaidacea. *Scientific Reports of the Australasian Antarctic Expedition 1911-14, Series C (Zoology and Botany)*, 11(2):5-45.
- Haswell, W. A.
1881. On Some New Australian Marine Isopoda, part 1. *Proceedings of the Linnaean Society of New South Wales*, 5:470-481.
- Hoestlandt, H.
1964. Examen comparé de reces polychromatiques de Sphéromes (Crustacés Isopodes) des Côtes atlantique européenne et pacifique américaine. *Verhandlungen der Internationale Verein Limnologie*, 15:871-878.
1967. Sur le polychromatisme des *Sphaeroma serratum* (F.) du littoral marocain. *Comptes Rendus des Academie des Sciences (Paris)*, 265:1540-1542.
- Hurley, D. E.
1961. A Checklist and Key to the Crustacea Isopoda of New Zealand and Subantarctic Islands. *Transactions of the Royal Society of New Zealand (Zoology)*, 1:259-292.
- Kensley, B. F.
1975. Marine Isopoda from the Continental Shelf of South Africa. *Annals of the South African Museum*, 67: 35-89.
1976. Isopodan and Tanaidacean Crustacea from the St. Paul and Amsterdam Islands, Southern Indian Ocean. *Annals of the South African Museum*, 69: 261-323.
1977. New Records of Marine Crustacea Isopoda from South Africa. *Annals of the South African Museum*, 72:239-265.
1978. The South African Museum's Meiring Naude Cruises, 8: The Isopoda Anthuridea from the 1975, 1976, and 1977 Cruises. *Annals of the South African Museum*, 77:1-25.
- Kirtisinghe, P.
1931. Note on an Isopod (*Mesanthura maculata*) New to the Fauna of Ceylon. *Spolia Zeylanica*, 16:129-130.
- Kussakin, O. G.
1967. Fauna of Isopoda and Tanaidacea in the Coastal Zones of the Antarctic and Subantarctic Waters. In *Biological Reports of the Soviet Antarctic Expedition (1955-1958)*, 3:220-389.
- Menzies, R. J., and D. Frankenberg
1966. *Handbook on the Common Marine Isopod Crustacea of Georgia*. Athens, Georgia: University of Georgia Press.
- Menzies, R. J., and P. W. Glynn
1968. The Common Marine Isopod Crustacea of Puerto Rico. *Studies on the Fauna of Curaçao and Other Caribbean Islands*, 27:1-133.
- Miller, M. A., and W. D. Burbanck
1961. Systematics and Distribution of an Estuarine Isopod Crustacean, *Cyathura polita* (Stimpson, 1855), new comb., from the Gulf and Atlantic Seaboard of the United States. *Biological Bulletin*, 120:62-64.

- Miller, M. A., and R. J. Menzies.
 1952. The Isopoda Crustacea of the Hawaiian Islands, III: Superfamily Flabellifera, Family Anthuridae. *Occasional Papers of the Bernice P. Bishop Museum*, 21:1-15.
- Nierstrasz, H. F.
 1941. Die Isopoden der Siboga-Expedition, IV: Isopoda Genuina, III: Gnathiidea, Anthuridea, Valvifera, Asellota, Phreatoicoidea. In *Siboga Expedition Monographs*, 32d:1-308.
- Nunomura, N.
 1975. Marine Isopoda from the Rocky Shore of Osaka Bay, Middle Japan. *Bulletin of the Osaka Museum of Natural History*, 29:15-35.
- Paul, A. Z., and R. J. Menzies
 1971. Subtidal Isopods of the Fosa de Cariaco, Venezuela, with Descriptions of Two New Genera and Twelve New Species. *Boletín del Instituto Oceanográfico de Universidad Oriente*, 10:29-48.
- Pillai, N. K.
 1963. Observations on the Genus *Xenanthura* (Isopoda, Anthuridea). *Crustaceana*, 5:263-270.
 1966. Littoral and Parasitic Isopods from Kerala: Family Anthuridea. *Journal of the Bombay Natural History Society*, 63:152-161.
- Pillai, N. K., and K. C. Eapen
 1966. On a New Genus of Anthurid Isopod *Indanthura* from South India. *Bulletin of the Department of Marine Biology and Oceanography, University of Kerala*, 2:13-17.
- Poore, G. C. B.
 1975. Australian Species of *Haliophasma* (Crustacea: Isopoda: Anthuridae). *Records of the Australian Museum*, 29:503-533.
- Stebbing, T. R. R.
 1900. On Crustacea Brought by Dr. Willey from the South Seas. *Willey's Zoological Results*, 5:605-690.
 1904. Marine Crustacea, XII: Isopoda, with Descriptions of a New Genus. *The Fauna and Geography of the Maldive and Laccadive Archipelagoes*, 2:699-721.
 1910. Isopoda from the Indian Ocean and British East Africa. *Transactions of the Linnaean Society of London (Zoology)*, 14:83-122.
- Stimpson, W.
 1855. Descriptions of Some New Marine Invertebrata from the Chinese and Japanese Seas. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 7:375-397.
- Thomson, J. M.
 1951. The Fauna of Rottnest Island, X: Anthuridae. *Journal of the Royal Society of Western Australia*, 35:1-8.
- Vanhöffen, E.
 1914. Die Isopoden der Deutschen Südpolar-Expedition 1901-1903. In *Deutsche Südpolar-Expedition 1901-1903*, 15:447-598.
- Whitelegge, T.
 1901. Isopoda (Part I), Crustacea (Part II). In *Scientific Results of the Trawling Expedition H.M.C.S. "Thetis" off the Coast of New South Wales. Memoirs of the Australian Museum*, 4:203-246.

REQUIREMENTS FOR SMITHSONIAN SERIES PUBLICATION

Manuscripts intended for series publication receive substantive review within their originating Smithsonian museums or offices and are submitted to the Smithsonian Institution Press with approval of the appropriate museum authority on Form SI-36. Requests for special treatment—use of color, foldouts, casebound covers, etc.—require, on the same form, the added approval of designated committees or museum directors.

Review of manuscripts and art by the Press for requirements of series format and style, completeness and clarity of copy, and arrangement of all material, as outlined below, will govern, within the judgment of the Press, acceptance or rejection of the manuscripts and art.

Copy must be typewritten, double-spaced, on one side of standard white bond paper, with 1 $\frac{1}{4}$ " margins, submitted as ribbon copy (not carbon or xerox), in loose sheets (not stapled or bound), and accompanied by original art. Minimum acceptable length is 30 pages.

Front matter (preceding the text) should include: **title page** with only title and author and no other information, **abstract page** with author/title/series/etc., following the established format, **table of contents** with indents reflecting the heads and structure of the paper.

First page of text should carry the title and author at the top of the page and an unnumbered footnote at the bottom consisting of author's name and professional mailing address.

Center heads of whatever level should be typed with initial caps of major words, with extra space above and below the head, but with no other preparation (such as all caps or underline). Run-in paragraph heads should use period/dashes or colons as necessary.

Tabulations within text (lists of data, often in parallel columns) can be typed on the text page where they occur, but they should not contain rules or formal, numbered table heads.

Formal tables (numbered, with table heads, boxheads, stubs, rules) should be submitted as camera copy, but the author must contact the series section of the Press for editorial attention and preparation assistance before final typing of this matter.

Taxonomic keys in natural history papers should use the aligned-couplet form in the zoology and paleobiology series and the multi-level indent form in the botany series. If cross-referencing is required between key and text, do not include page references within the key, but number the keyed-out taxa with their corresponding heads in the text.

Synonymy in the zoology and paleobiology series must use the short form (taxon, author, year:page), with a full reference at the end of the paper under "Literature Cited." For the botany series, the long form (taxon, author, abbreviated journal or book title, volume, page, year, with no reference in the "Literature Cited") is optional.

Footnotes, when few in number, whether annotative or bibliographic, should be typed at the bottom of the text page on which the reference occurs. Extensive notes must appear at the end of the text in a notes section. If bibliographic footnotes are required, use the short form (author/brief title/page) with the full reference in the bibliography.

Text-reference system (author/year/page within the text, with the full reference in a "Literature Cited" at the end of the text) must be used in place of bibliographic footnotes in all scientific series and is strongly recommended in the history and technology series: "(Jones, 1910:122)" or ". . . Jones (1910:122)."

Bibliography, depending upon use, is termed "References," "Selected References," or "Literature Cited." Spell out book, journal, and article titles, using initial caps in all major words. For capitalization of titles in foreign languages, follow the national practice of each language. Underline (for italics) book and journal titles. Use the colon-parentheses system for volume/number/page citations: "10(2):5-9." For alinement and arrangement of elements, follow the format of the series for which the manuscript is intended.

Legends for illustrations must not be attached to the art nor included within the text but must be submitted at the end of the manuscript—with as many legends typed, double-spaced, to a page as convenient.

Illustrations must not be included within the manuscript but must be submitted separately as original art (not copies). All illustrations (photographs, line drawings, maps, etc.) can be intermixed throughout the printed text. They should be termed **Figures** and should be numbered consecutively. If several "figures" are treated as components of a single larger figure, they should be designated by lowercase italic letters (underlined in copy) on the illustration, in the legend, and in text references: "Figure 9b." If illustrations are intended to be printed separately on coated stock following the text, they should be termed **Plates** and any components should be lettered as in figures: "Plate 9b." Keys to any symbols within an illustration should appear on the art and not in the legend.

A few points of style: (1) Do not use periods after such abbreviations as "mm, ft, yds, USNM, NNE, AM, BC." (2) Use hyphens in spelled-out fractions: "two-thirds." (3) Spell out numbers "one" through "nine" in expository text, but use numerals in all other cases if possible. (4) Use the metric system of measurement, where possible, instead of the English system. (5) Use the decimal system, where possible, in place of fractions. (6) Use day/month/year sequence for dates: "9 April 1976." (7) For months in tabular listings or data sections, use three-letter abbreviations with no periods: "Jan, Mar, Jun," etc.

Arrange and paginate sequentially EVERY sheet of manuscript—including ALL front matter and ALL legends, etc., at the back of the text—in the following order: (1) title page, (2) abstract, (3) table of contents, (4) foreword and/or preface, (5) text, (6) appendixes, (7) notes, (8) glossary, (9) bibliography, (10) index, (11) legends.

