Shallow-Water Pycnogonida of the Isthmus of Panama and the Coasts of Middle America

G. ALLAN CHILD

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ABSTRACT

Child, C. Allan. Shallow-Water Pycnogonida of the Isthmus of Panama and the Coasts of Middle America. *Smithsonian Contributions to Zoology,* number 293, 86 pages, 25 figures, 1979.—The collections made by the Smithsonian Tropical Research Institute's Environmental Protection Agency supported oil pollution study, the National Museum of Natural History Panama Survey, and other collections from Middle America contain 64 species of Pycnogonida, including 17 previously undescribed species. Twenty-eight species are discussed from Pacific localities and 35 species from the Caribbean. Sixteen species are now known to be found on both shores of Middle America. Previous literature on Middle American pycnogonids is reviewed and a resumé of faunal affinities is given for both oceans. It is proposed that there is no endemic pycnogonid fauna on either the Caribbean or Pacific coasts of Middle America. Diagnostic keys, references, and distribution records are provided for all shallow-water pycnogonids of this region.

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Contents

Shallow-Water Pycnogonida of the Isthmus of Panama and the Coasts of Middle America

C. Allan Child

Introduction

This is the first comprehensive report on the shallow-water Pycnogonida of Panama and Middle America. The report is based on two major collections from Panama: the Smithsonian Tropical Research Institute's (STRI) oil pollution study collection made under the auspices of the U.S. Environmental Protection Agency (EPA), and the Smithsonian Institution's Panama Survey collection made by research-collector teams from the National Museum of Natural History (NMNH) of the Smithsonian Institution and other institutions. These collections were supplemented by a number of smaller collections from Panama and the coasts of Middle America. These include USNM (former United States National Museum) collections originating from Allan Hancock Foundation Expeditions, using the *Velero III,* mainly along the Pacific coast, the Smithsonian-Bredin Quintana Roo, Mexico Expedition of 1960, and the collections of J. L. Barnard from Panama and Mexico, and R. Brusca from Mexico. Many other collectors contributed material reported here and the existing collections of the USNM were examined for Middle American material. The Pycnogonida of Belize are excluded from this report as they are being reviewed elsewhere (Child, in prep.) and their inclusion here would only result in unnecessary duplication.

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HISTORICAL BACKGROUND.—There are no reports treating exclusively the pycnogonid fauna of either Panama or the remainder of Middle America (except for Belize), and the fauna has remained little known. The Middle American pycnogonids recorded in the literature are only treated as parts of collections covering much larger geographic areas or depths outside the scope of this report.

Schimkewitsch (1889) was the first to record a pycnogonid from Middle America (Gulf of Panama) when he described *Tanystylum calicirostrum,* unfortunately from a female specimen lacking full diagnostic characters.

Hilton (1942b) listed *Nymphon pixellae, Anoplodactylus erectus, A. robustus* (= *A. portus*), *Nymphopsis spinosissima* and *N. duodorsospinosa* from either the western side of Baja California, Mexico, or the Gulf of California. I have been unable to confirm his record of *N. spinosissima* with any other records or specimens from Mexico, and for the moment will regard this as an erroneous identification of *N. duodorsospinosa,* a species which appears rather commonly in these waters. The presence of *Nymphon pixellae* is questionable in Mexico, although I have included two definite, if fragmentary records for this species in Mexican waters. It is included here for these two records even though it is a deeper water species. Hilton (1942b) also described *Pycnogonum panamum* from Bahia Honda and the Islas Secas, Panama.

Hilton (1942c, 1942e, 1942f) in his series of preliminary papers treating families of pycnogonids of

the Pacific coast, listed *Oropallene heterodenta* (= *Anoropallene palpida*), and *Tanystylum oculospinosum* from Baja California, Mexico, *Anoplodactylus erectus* from Costa Rica, and *Tanystylum panamum* (= *T. intermedium*) from Panama.

Hedgpeth (1948:279) recorded *Pycnogonum reticulatum* from the coast of El Salvador, and Stock (1954a:129) reiterated Hedgpeth's cross-isthmian distribution for this species.

Stock (1955) listed Pacific coast records for *Anoplodactylus portus* from Nicaragua, *A. erectus, Tanystylum isthmiacum* and *Tanystylum* species from Islas Taboga and Taboguilla, Panama, and *Anoplodactylus* species 2 from Islas Perlas, Panama. In his discussion of specimens in the Hamburg Museum, Stock (1956) described *Anoropallene crenispina* (= *A. palpida*) from the Pacific coast of Guatemala, and in his second paper (1957:82) on Hamburg Museum specimens, he listed a paratype of his new species *Ascorhynchus castellioides* from Colón, Panama.

The only other report treating any shallow-water pycnogonids from Middle America, as far as I can determine, is Stock's (1975a) Atlantic paper in which he listed five species taken from the Panama Caribbean coast and one from Honduras. These are *Anoplodactylus insigniformis, Endeis mollis,* and *Ascorhynchus castellioides* from Cristobal, *Ascorhynchus massiliformis* from Colón, and an unnamed *Nymphopsis* species from Limon Bay. The species found in Honduras was *Pallenopsis schmitti.* From the Pacific side, Stock listed the single species, *Ammothella appendiculata* from Punta Paitilla, Panama City.

These 26 records which include 21 species (3 unnamed) form, as far as I can determine, the sum of our previous knowledge concerning shallow-water pycnogonids of the coasts of Middle America.

CURRENT KNOWLEDGE OF THE FAUNA.—This report includes all records now available of shallow-water pycnogonids from Middle America, excluding the Belizean fauna. The shallow-water fauna now comprises 64 species (with 2 species unnamed for lack of males) in 16 genera and 7 families. Approximately 3200 specimens were examined from slightly more than 300 stations for purposes of completing this report. Seventeen species (27 % of the fauna) in 7 genera and 5 families are described as new.

There are now 16 known genera common to both coasts of Middle America although 2 are known only from species found in deeper water. There are also 16 species found on both the Pacific and Caribbean coasts, if the Florida and West Indies fauna are included. The incredibly rich shores of Panama itself now have 26 species (6 new) from the Pacific side and 34 species (4 new) from the Caribbean side. Nine of these species in 6 genera are cross-isthmian species found on both coasts of Panama. Three other new species presented here are not found in Panama (thus far): one is Mexican, one is from Isla Malpelo, and the other is from the Caribbean coast of Colombia. The Colombian fauna does not form part of this report, but the 2 new species were included here rather than propose them separately.

ZOOGEOGRAPHICAL REMARKS.—Pycnogonid affinities with other geographical areas are as follows (Figure 1): number of Panamanian (Pacific) species found extending north to Mexico is 13; extending north to California and beyond, 6; also in western Pacific and/or Hawaii, 4; also in Indian Ocean or Red Sea, 5. From these figures, it is indicated that the Panama fauna has its closest affinity with pycnogonids found north through Mexico, as would be expected. The affinities of Panamanian species with those of northern South America must await examination of collections from this area. Almost nothing is known of the South American Pacific fauna.

The number of Panamanian (Caribbean) species found elsewhere in the Caribbean is 27; in the western North Atlantic, 19; south to the Guianas and Brazil, 12; also in West Africa, 10; and also in the Mediterranean, 6. The Caribbean Panamanian fauna has its greatest affinity with the Caribbean Antillean fauna, again to be expected. There are many more Caribbean and western Atlantic species known than are represented in this report. This is also true for amphi-Atlantic species, of which Stock (1955:211) counted 23. There have been several others added to the list since that date. There are three pantropical species represented in Panama and possibly one other, *Endeis flaccida,* which has been collected in most, but not all, tropical seas.

The genus *Anoplodactylus* is by far the most common (19 species, 1263 specimens) of the 16 genera found in Middle America. There are almost twice the number of specimens of *Anoplodactylus* in this report than the next largest genus, *Tanysty-*

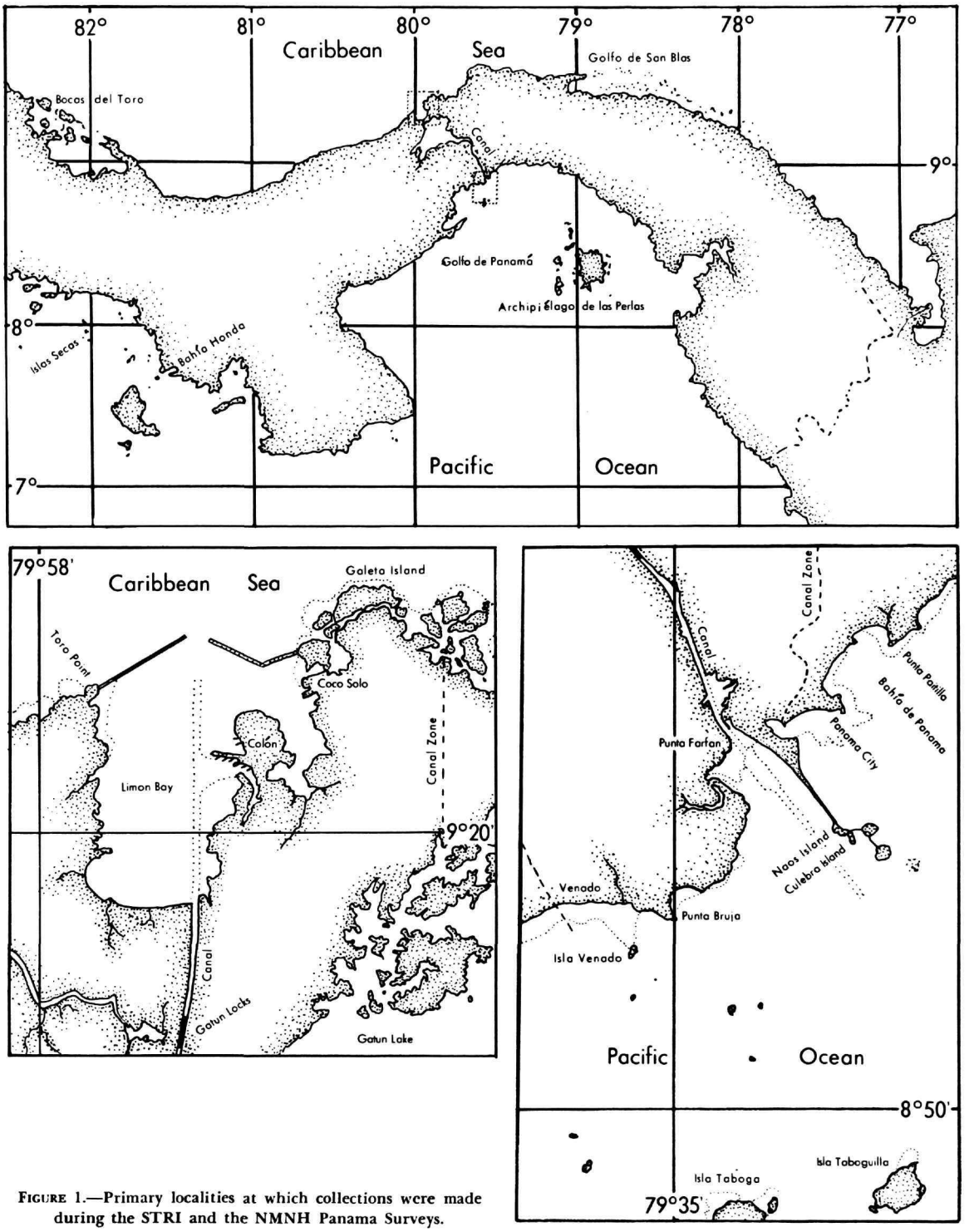

FIGURE 1.—Primary localities at which collections were made during the STRI and the NMNH Panama Surveys.

lum (11 species, 668 specimens). *Ammothella* is the next most common genus (375 specimens), followed by *Ascorhynchus* (303 specimens) and *Anoropallene* (176 specimens). The other 11 genera each have less than 100 specimens.

There are a number of species that could be expected along the Caribbean shores of Middle America, but were not found during the course of these various investigations. The *Sargassum*-transported species of *Anoplodactylus maritimus* and *A. petiolatus* are known from the West Indies and could conceivably be carried to Middle America. *Anoplodactylus lentus* and *A. insignis* have both been found in the deeper water of the Yucatan Channel, but not as yet in Middle American shallows. Another common Caribbean species not found in Middle America to date is *Callipallene brevirostris. Tanystylum orbiculare* has a few Caribbean records, but again has not been found as far west as Middle America. Further collecting north of Panama may reveal any or all of these species.

All collections examined from the Caribbean coasts of Middle America lie within the Caribbean faunal province, which extends in the west from the northeastern tip of the Yucatan Peninsula to Colombia. There were no pycnogonid collections examined or known to me from the Mexican Gulf coast.

With regard to the Pacific coast, Briggs (1961:548) defines the Panamanian Region (Eastern Pacific Tropical Faunal Region) as roughly that area enclosed by the winter 20° C surface isotherm. This area, poorly documented for most marine invertebrates, includes the outer coast of Baja California, from about Bahía Magdalena (24°40'N), the Gulf of California, the entire Middle American coastline to Colombia and Peru, ending at about Punta Aguja, Peru (5°48'S).

This report includes 6 species found to the north of Bahia Magdalena that fall within the Californian faunal region. At least 6 other species apparently terminate their northern distribution on the outer Baja California coast, so the Bahía Magdalena line is restrictive to the extent of reducing by 50% the number of Middle American or Mexican species.

Briggs (1974:43) subdivided the Panamanian Province into 3 different provinces: the Mexican, Panamanian, and the Galapagan. He limited the Mexican Province to the area north of Bahía Tangola-Tangola, at the northern end of the Golfo de Tehuantepec. South of this is the Panamanian, including Isla Coco (5°33'N, 86°59'W) and Isla Malpelo (4°03'N, 81°36'W), and extending variously to either Guayaquil, Ecuador, or Paita, Peru, depending on the particular marine fauna under consideration. The Galapagos Province does not fall within the scope of this paper, although the shore fauna is related to that of the Panamanian Province by the presense of 3 pycnogonid species found in both localities.

The ultimate determining factor in delineating a faunal province is its endemism. There are no endemic pycnogonid genera known in the Panamanian Province or the 3 subdivisions as listed above. This does not mean that future intensive localized collecting will not turn up endemics, but it would be surprising if an endemic genus was revealed at the Pacific terminus of the Panama Canal after long and intensive collecting in that place. The remainder of the Middle American Pacific coast is sparsely collected in terms of pycnogonids, and most other marine invertebrates, and could very well yield one or more endemic genera.

There are several endemic genera in the rich Caribbean Province, but none of them have been found thus far along the coasts of Middle America except for *Hedgpethius* in Belize (Child, in prep). Most are deep-water genera, beyond the shallow-water collections in this report. There are possibly several endemic species on either coast, but any possible endemics subject to consideration are only known from capture records provided with original descriptions or, at most, records from nearby localities. There are far too many disparities in pycnogonid distribution records for anyone to predict which species will eventually be regarded as endemic.

TERMINOLOGY.—A set of keys to the Middle American shallow-water families, genera, and species are provided. In compiling keys to the Middle American genera and species, I have attempted not only to provide characters which separate each, but have endeavored to define each genus and species within the several keys. Terminology used within the keys and descriptions is presented in diagrammatic form in Figure 2. The terms are those commonly used and accepted in most recent literature, except for the new term, "strigilis," proposed here.

It has been recognized for many years that the ovigers in some but not all pycnogonid genera are

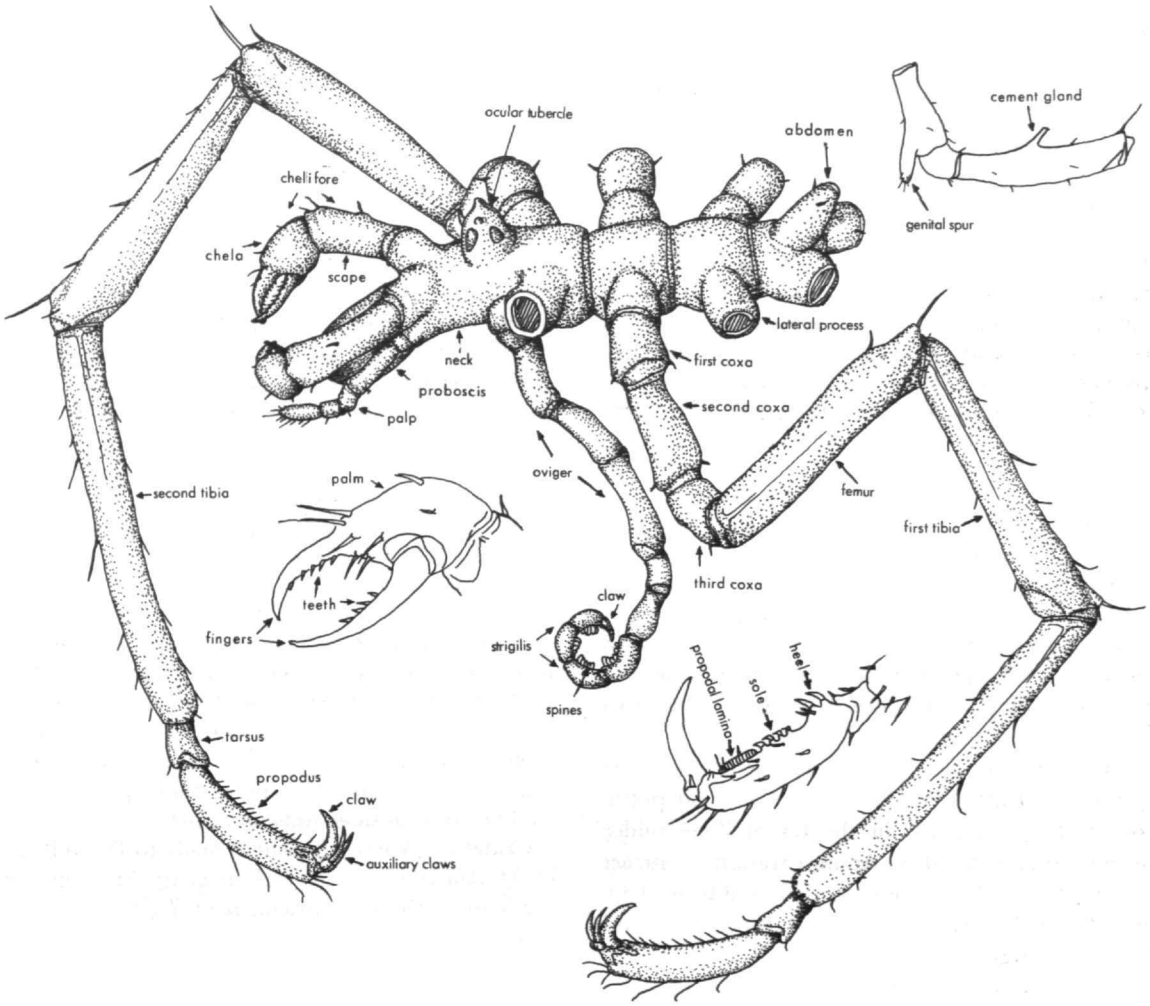

FIGURE 2.—Diagramatic pycnogonid, with insets of other pycnogonid appendages, showing terms used in description.

used to clean the appendages of adherent debris (Calman, 1929:96-97; King, 1973:30). The 4 or 5 terminal segments are curved into a loop or hook and variously provided with denticulate or plain spines and often a terminal claw. Although all ovigers are curved, in many genera they are not provided with a claw and strong terminal segments bearing denticulate spines. For those genera so provided, the term "strigilis" is proposed to denote that terminal part of the oviger used to clasp and clean the appendages. A strigilis was a curved instrument, usually of metal or bone, used in Greek and Roman antiquity to scrape the body clean after the bath.

The strigilis thus becomes another diagnostic character among the families and genera of pycnogonids, useful in separating those with the organ from those without it. Many genera, although they possess denticulate terminal oviger spines and perhaps a terminal oviger claw, have never been observed using the strigilis as a cleaning organ. This cleaning phenomenon has been observed in at least one genus, *Nymphon*, and perhaps others. Configuration of the strigilis in several genera (e.g., *Asco-*

rhynchus, Callipallene, and *Pallenopsis*) indicates that each has most or all of the attributes necessary to serve as cleaners. Other genera (e.g., *Anoplodactylus, Achelia, Ammothella, Tanystylum*) lack the proper oviger length, curvature, and spines for cleaning, or else have appendages that do not lend themselves to cleaning with a strigilis. Many of these genera are usually found covered with debris, *Ammothella* being the one most commented on in the literature. Whether or not all of those genera and species equipped with a proper strigilis actually use it for cleaning must await studies with live specimens of the various species. This may be impossible with such predominantly deep-water genera as *Colossendeis,* but most genera (including *Colossendeis* in the Antarctic) have shallow-water species that lend themselves to live observation.

ACKNOWLEDGMENTS.—So many people provided from one to hundreds of specimens, information, or encouragement for this report that a full listing is impossible. I thank, however, all of those who have supported this work and list here the main collectors with apologies to those whose names I regrettably omit. Many other names of collectors are in the station list.

The largest collection reported here was made by the STRI-EPA group in their 3-year oil pollution study (1971–1974) in the Canal Zone under Federal Water Quality Administration Contract no. 14–12–874. This group was admirably lead by Drs. Peter W. Glynn, Charles Birkeland, and Amada A. Reimer, with the invaluable help of Joyce R. Young, Ina Tumlin, Kay Kerwin, Betty Womble, Caryl Buford, James P. Stames, and many others.

The next largest number of specimens were collected by the many participants of the NMNH Panama Survey under the leadership of Dr. Meredith L. Jones, with funding provided by the Smithsonian Institution Environmental Science Program under Dr. David Challinor, Assistant Secretary of Science. This survey, beginning in 1971, has succeeded in providing the largest baseline faunal study ever attempted on the shores of Middle America and has vastly enriched our knowledge of existing faunal communities of the Canal Zone.

Acknowledgment is made to Mr. J. Bruce Bredin, who generously provided support for the Smithsonian-Bredin-Expedition to Quintana Roo, Mexico, in 1960, and to the members of that expedition for the specimens collected.

Many miscellaneous collections were made available through the efforts of the following people and grateful acknowledgment is made to: Larry G. Abele, Peter W. Glynn, and Don L. Meyer for specimens from Panama, J. Laurens Barnard for specimens from Panama and Mexico, Richard C. Brusca for specimens from Mexico, along with Joel W. Hedgpeth, M. Joerger, and C. Flanagan. Thanks to Charles E. Dawson who, with the writer, drove 6100 miles during a survey of the Pacific coast of Middle America in 1972, many more pycnogonids are known from those difficult coasts.

Grateful acknowledgment is made to Dr. Willard D. Hartman of the Yale University Museum for the loan of the only specimen of *Tanystylum calicirostrum* known to exist.

I thank Dr. Thomas E. Bowman, Department of Invertebrate Zoology (Crustacea), National Museum of Natural History, Smithsonian Institution, for providing critical comments on the manuscript.

PYCNOGONIDA

Key to the Middle American Families

(adapted from Hedgpeth, 1948)

1. Chelifores and palps present; ovigers in both sexes 2
   Chelifores or palps, or both, lacking or greatly reduced; ovigers in both sexes or male only 4
2(1). Chelifores or chela, or both, vestigial (some achelate); palps of 4 to 10 segments; ovigers 9- or 10-segmented, with or without feeble strigilis and terminal claw, with simple or denticulate spines ..... AMMOTHEIDAE
   Chelifores and chela well developed, functional 3
3(2). Palps of 5 segments; oviger of 10 segments with strong strigilis, terminal claw and denticulate spines; propodus with auxiliary claws ..... NYMPHONIDAE

Palps lacking, reduced to small knobs, or with 4 segments; oviger of 10 segments, with strigilis, simple or denticulate spines, with or without terminal claw; propodus with or without auxiliary claws ..... CALLIPALLENIDAE

4(1). Palps of 4 segments; chelifores lacking; ovigers of 10 segments in both sexes, with weak strigilis, terminal claw and spines with feeble denticulations; propodus with auxiliary claws ..... COLOSSENDEIDAE

Palps lacking; chelifores present or lacking; ovigers in male only 5

5(4). Chelifores present, functional; ovigers of 5 or 6 segments in male only (except *Anoplodactylus jonesi*), lacking strigilis and terminal claw, spines simple; auxiliary claws lacking or tiny and weak ..... PHOXICHILIDIIDAE

Chelifores and palps lacking; ovigers in male only 6

6(5). Body and legs slender (*Anoplodactylus*-like); ovigers of 7 segments, lacking strigilis and terminal claw, spines simple; strong auxiliary claws ..... ENDEIDAE

Body and legs stout, short, with or without reticulations; ovigers of 7 to 9 segments, lacks strigilis; terminal claw and simple or bifid spines present; auxiliary claws small or lacking ..... PYCNOGONIDAE

Family AMMOTHEIDAE

Key to the Middle American Genera

(adapted from Hedgpeth, 1948)

1. Body circular or discoidal, lateral processes touching or only narrowly separated distally; scape 1-segmented; palps 4- to 8-segmented 2

Body more slender, lateral processes separated by half their length or widely separated; scape with 1 or 2 segments; palps 9- or 10-segmented 3

2(1). Palp 8-segmented; chela present but vestigial; proboscis pyriform; 1st and 2nd coxae with tall dorsolateral tubercles ..... ***Achelia***

Palp with 4 to 7 segments; chela usually absent, scape reduced to short knob; proboscis usually a tapering cylinder or tubular; 1st coxae only with low rounded tubercles ..... ***Tanystylum***

3(1). Proboscis of 2 segments, a proximal cylinder articulated with pyriform proboscis; most appendages with large pointed spines; abdomen large, spinose; chela vestigial; palps and ovigers 10-segmented; without auxiliary claws ..... ***Eurycyde***

Proboscis of usual single segment, pyriform, ovoid, or cylindrical, with constrictions 4

4(3). Proboscis ovoid or modified cylindrical; palps of 9 segments 5

Proboscis pyriform; palps 9- or 10-segmented 6

5(4). Proboscis ovoid, egg-shaped; trunk with 2 tall median tubercles; legs with tall setose tubercles; chelifores with 3 segments; abdomen long, bent posteriorly ..... ***Nymphopsis***

Proboscis cylindrical, ends constricted; tall tubercles lacking; chelifores blunt, with 2 segments; ocular tubercle a low cone; abdomen short, blunt ..... ***Ammothea***

6(4). Palps 10-segmented, first 2 segments tiny; chelifores 2-segmented, small, chela vestigial; propodus without heel or large spines, without auxiliary claws; dorsal trunk segments with large flaring posterior rims ..... ***Ascorhynchus***

Palps 9-segmented; chelifores 3-segmented, large, chela vestigial; propodus curved, with large heel spines and auxiliary claws; trunk segments without flaring rims .... ***Ammothella***

Genus *Achelia* Hodge, 1864

Achelia sawayai Marcus

Achelia sawayai Marcus, 1940:81–86, figs. 10a–f, 17.—Fry and Hedgpeth, 1969:104 [literature].—Child, 1974:497.—Stock, 1975a:982–983.—Birkeland, et al., 1976:133.—Krapp and Kraeuter, 1976:342–343.—Stock, in press.—Child, in prep.

MATERIAL EXAMINED.—Panama Caribbean: Golfo de San Blas, NMNH Sta. 116–1 and 116–4 (2 ♂ with eggs, 1y). Bahía Portobelo, Misc. STRI Sta., 26 Aug 1973 (1 ♂, 1 ♀, 1y). Galeta Island, STRI *Acanthophora* 9 (1 ♂, 1 ♀), 11 (1 ♂, 1 ♀), 12 (1 ♀, 1y), 16 (1 ♂, 2 ♀, 3y), 17 (2 ♂), 19 (1 ♂, 1 ♀), 20 (1 ♂, 1y); STRI Coralline 7 (1 ♀), 13 (1 ♀), 15 (1 ♂), 24 (1 ♂), 25 (2 ♀); STRI *Laurencia* 7 (1 ♀), 11 (1 ♂ with eggs, 1 ♀), 13–A (1 ♂), 13–B (1 ♂), 14–A (2 ♂), 15–A (1 ♀), 15–B (1 ♀), 16–A (1 ♀), 18 (2 ♂, 3 ♀), 24 (1 ♀); STRI *Laurencia* oil spill, 17 Mar 1972 (1 ♂ with eggs), 21 Mar 1972 (1 ♀); STRI *Thalassia* 8 (1 ♀), 10 (1 ♀), 15–A (1 ♂), 16–A (1 ♀); STRI Zoanthus 12 (1 ♂ with eggs, 1 ♂), 14 (1 ♀), 20 (1 ♂); Barnard PAN–11 (1 ♂ with eggs, 1 larva), PAN–15 (2 ♂, 2 ♀); NMNH Sta. 15 (1 ♀, 1y); Misc. STRI Sta., 5 Mar 1972 (1 ♀).

Mexico Caribbean: Quintana Roo, Smithsonian-Bredin 44–60 (1 ♂ with eggs), 77–60 (2 ♂ with eggs, 2 ♂, 1 ♀ ovig.).

REMARKS.—This species has yet to be collected on the Pacific coast, but is very common throughout the Caribbean, for which these are the westernmost records. It is distributed from Georgia in the United States to Brazil, West Africa, the Cape Verde Islands, and Madagascar. Perhaps its Pacific coast counterpart is *Tanystylum intermedium*, which looks superficially like *A. sawayi*. None of the specimens examined have the more slender appearance of *A. besnardi*, a very similar Atlantic species.

Genus *Ammothea* Leach, 1814

Ammothea hilgendorfi (Böhm)

Corniger hilgendorfi Böhm, 1879:187–189, pl. 2: figs. 3, 3d.
Ammothea hilgendorfi.—Child, 1970:292 [literature].

MATERIAL EXAMINED.—Mexico Pacific: Baja California, *Velero III* 283-34 (2y—chelate).

REMARKS.—These 2 juveniles have chelae with only finger buds remaining. Evidently, the ovigers do not begin to form until the chelae become fully atrophied. In the adult, the chelae are lost completely and the chelifore becomes a single cylindrical segment. There are specimens in the USNM collections, on the other hand, that retain the vestigial chelae while appearing to be fully adult with fully developed sex pores and ovigers. None of the male specimens have eggs and also chelae buds. Neither of the above specimens have any visible oviger development. This phenomenon is discussed and figured by Lou (1936:150–152, pl. 18) for Chinese specimens.

As far as I can determine now, the southern limit to the known range of *A. hilgendorfi* on the American coast is outer Baja California, Mexico. The species has not been taken in the Gulf of California or further south along the Middle American coast. It has an extremely broad distribution around the northern rim of the Pacific to as far south as the China coast. It has also been found in the Society Islands and in Hawaii (as *L. ovatus* Hilton).

Genus *Ammothella* Verrill, 1900

Key to the Middle American Species of *Ammothella*

1. Trunk with tall median tubercles or short tubular spines 2
   Trunk without median tubercles or spines 3

2(1). Trunk, abdomen, and posterior of ocular tubercle with tall thin median tubercles; proboscis ovoid; lateral processes and 1st coxae with many thin tubercles; longer setae plumose; without tubular spines; 1st chelifore segment longer than 2nd, chelifores almost as long as proboscis; anterior corners of ocular segment with 2 or 3 robust tubercles ..... ***A. exornata***
   Trunk with 1 to 5 (usually 2) small median tubular spines; lateral processes with 2, 1st coxae with 4 anterior and posterior pointed spines and 1 to 3 dorsal tubular spines; 1st chelifore segment only two-fifths length of 2nd, chelifores three-fifths to seven-tenths length of proboscis; anterior corners of ocular segment with 1 or 2 thin tubercles ..... ***A. spinifera***

3(1). Chelifore scape about one-half length of proboscis; ocular tubercle length less than twice its diameter; anterior corners of ocular segment with low rounded tubercle with papilla; femur almost glabrous ..... ***A. symbius***, new species
   Chelifore scape about three-fourths or more the length of proboscis; ocular tubercle more than twice as long as its diameter; anterior corners of ocular segment with tall thin tubercles or spines; femur usually with ventral spine and setae 4

4(3). Lateral processes with paired anterior and posterior pointed spines; coxae with 2 tall tubercles, 2 or 3 tall tubular spines and paired anterior and posterior pointed spines; chelifore 1st segment almost as long as 2nd, both with many lateral tubular spines; anterior corners of ocular segment with single thick papillose tubercles; propodus robust, sole almost straight ..... ***A. marcusi***
   Lateral processes with single anterior and posterior spines; coxae with 2 or 3 (usually 2) long tubular spines and paired anterior and posterior pointed spines; 1st scape segment from less than half as long to four-fifths as long as 2nd, 1st segment with or without tubular spine, 2nd with several tubular and pointed spines; ocular tubercle length variable, usually long; propodus thin, well curved ..... ***A. appendiculata*** and ***A. rugulosa***

Ammothella appendiculata (Dohrn)

Ammothea appendiculata Dohrn, 1881:152–155, pl. 7: figs. 1–5.
Ammothella appendiculata.—Birkeland, et al., 1976:133.—Stock, in press.—Child, in prep. [literature].

MATERIAL EXAMINED.—Panama Caribbean: Galeta Island reef, STRI settling plates, 10 Feb 1972 (1y).

REMARKS.—The controversy over the status of this and the following species, *A. rugulosa*, has been discussed elsewhere (Stock, 1975a:972–975; Child, in prep.). It appears strange, at the moment, that this single juvenile is the only specimen having a long ocular tubercle, first and second scape segments unequal, and spine number and placement to qualify it as *A. appendiculata* under the latest definition. Either there should have been more specimens of this common species or they all fall within the definition of *A. rugulosa* with shorter ocular tubercle, almost subequal scape segments, and slightly different spination.

Stock (1975a:973) listed one record of this species from the Pacific side of Panama. No other Pacific records can be added here nor can any *A. rugulosa* be found from the Pacific material examined here. The single tentative identification above places this species on both sides of the Isthmus along with its circum-Caribbean, Atlantic, and Mediterranean distribution records.

Ammothella exornata Stock

FIGURE 3*a–c*

Ammothella exornata Stock, 1975a:974–978, figs. 7c–d, 8.—Stock, in press.—Child, in prep.

MATERIAL EXAMINED.—Panama Caribbean: Galeta Island reef, Misc. STRI Sta., 30 Jun 1971 (1♀); NMNH Sta. 1–5 (1y); STRI settling plates, 11 Sep 1972 (1y). Golfo de San Blas, NMNH Sta. 116–4 (1♂).

REMARKS.—The Golfo de San Blas specimen is the first male of this species to be found and I include figures of the 3rd leg and oviger to complete the illustrations of this easily recognized species. The male shows variations from the female, most of which are undoubtedly sexual characters. It is smaller and more robust than the female and the lateral processes are closer together. It is also generally more setose and tubercular than the female. The median trunk tubercles and those of the lateral processes are longer and there are more tiny tubercles distally on the lateral processes than on the female. The 2 scape segments are subequal, have more tubercles, and have a long lateral seta on the 1st segment of the male. The ocular tubercle is carried erect in all 4 of the above specimens.

The differences in the legs and ovigers between males and females are more marked. The male 2nd coxae of the 3rd and 4th legs have genital spurs equal to almost half the length of that segment and the spurs are armed laterally with a fringe of setae longer than the spur diameter. The more slender male femur has several more setae, all of which are longer than those of the female. The exterior part of the femoral cement gland is a curved dorsodistal tube not as long as the segment diameter. The male propodus is more slender and all the long setae of the legs and those of all other appendages are distally plumose (sometimes called barbed or feathered setae). There are no spatulate or clubbed (tubular) spines on this species.

The ovigers of the male are larger with longer segments than on the female. Of the 2 longest segments, the 4th is slightly longer than the 5th. The 7th segment is placed anaxially on the 6th and is armed with 2 long setae. The denticulate spines appear the same size as on the female oviger except that there appears to be 1 spine on the 7th segment instead of the female's 2.

This littoral species, like many others listed in this report, was previously known from the eastern Caribbean (Netherland Antilles) and also from Belize. Its distribution is extended to the Caribbean coast of Panama.

Ammothella marcusi Hedgpeth

Ammothella marcusi Hedgpeth, 1948:247–249, fig. 39a–g; 1954:427.—Stock, 1975a:975, fig. 7a, b.—Stock, in press.—Child, in prep.

MATERIAL EXAMINED.—Panama Caribbean: Galeta Island reef, Barnard PAN-1 (1♀), PAN-7 (1♂, 1♀, 2y), PAN-11 (2♂, 2y), PAN-15 (1y); STRI *Laurencia* 7 (1♂, 1♀), 10 (2♂, 1♀), 11 (1♂, 3♀), 14-B (1♀), 16-A (1♀), 16-B (1♂ with eggs), 17 (1♂), 22 (1♀), 23 (1♂, 1♀); STRI *Laurencia* oil spill, 17 Mar 1972 (1♂), 20 Mar 1972 (1♀), 21 Mar 1972 (1♂), 27 Mar 1972 (3♂, 1♀), 17 Apr 1972 (3♂, 2♀); STRI *Zoanthus* 6 (1♂ with eggs), 12 (2♀, 1y), 15 (3♂); STRI *Acanthophora* 12 (1♂); STRI Coralline 5 (1♂ with eggs, 2♂, 2♀, 1y), 7 (1♂), 9 (1♂ with eggs), 11 (1♂), 12 (1♂, 3y), 13 (1♂ with eggs, 1♀), 15 (1♂, 1♀), 17 (1♂, 2♀, 1y), 20-A (2♂, 1♀), 21 (2♂, 1♀), 24 (1♂, 2♀), 25 (1♂, 2♀, 1y); NMNH Sta. 15–3 (1♀), 104–2 (1y).

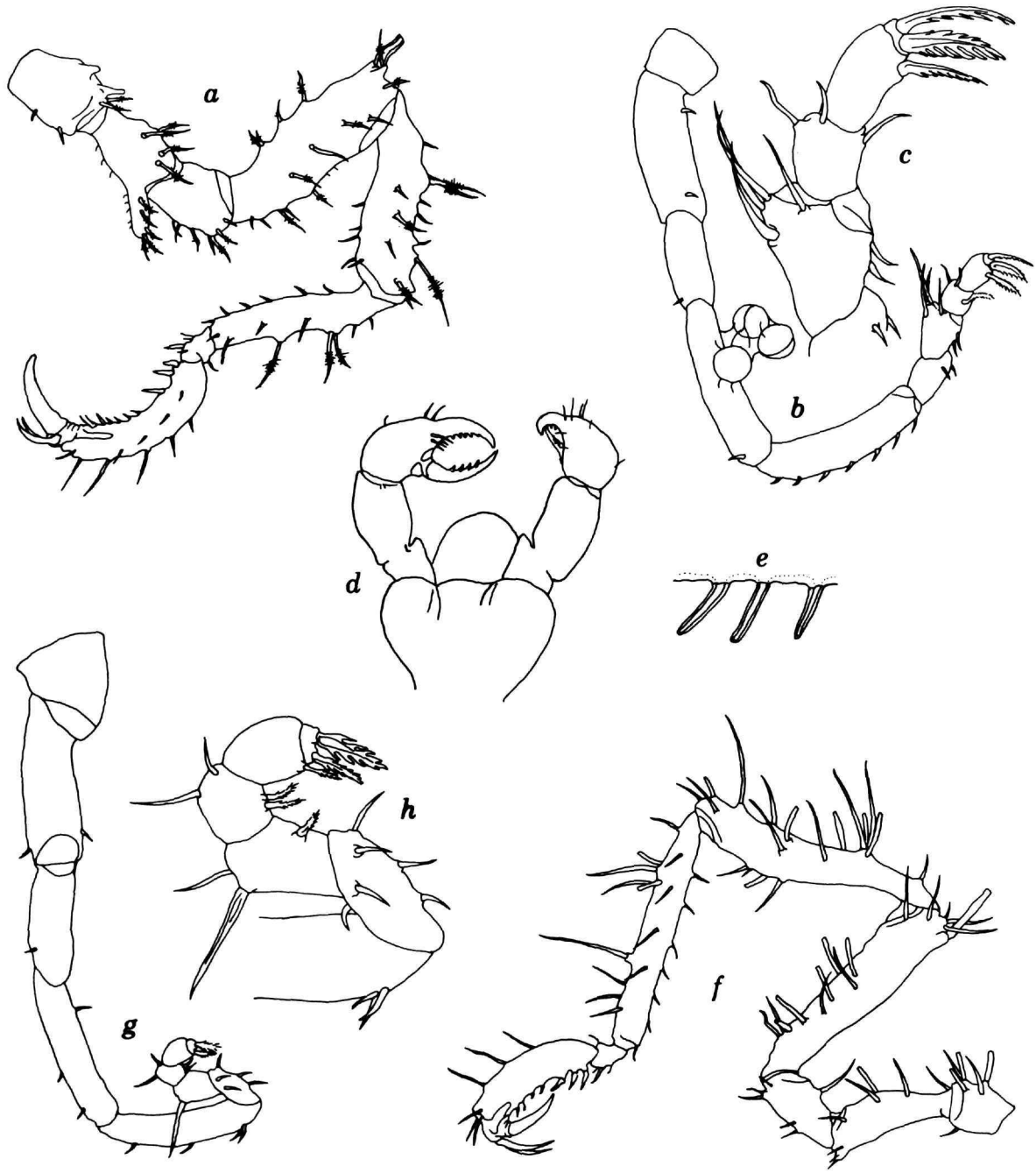

FIGURE 3.—*Ammothella exornata*, Golfo de San Blas specimen: *a*, male third leg; *b*, male oviger with 3 adherent eggs; *c*, terminal segments of male oviger, enlarged. *Anoropallene palpida: d*, Walker specimen, showing abnormal regeneration of chelifores; *e*, male cement glands on ventral femur. *Ammothella spinifera: f*, male third leg; *g*, male oviger; *h*, terminal segments of male oviger, enlarged.

Mexico Pacific: Isla Tangola, Oaxaca, *Velero III* 260–34 (1 ♂ with eggs), 261–34 (1 ♂).

REMARKS.—The reexamination of Hedgpeth's type-specimen from the Dry Tortugas, Florida, confirms these identifications although there is some variation in the spination of the 83 specimens listed above. The smaller of the anterior and posterior spines on the lateral processes may be lacking or very reduced and the lateral tubercles on the "collar" above the palp insertion show such variation also. The collar lateral tubercles are of various sizes from quite large to modest, but they all have a papillose or granular texture. Some of the specimens, particularly males, have a more robust appearance with the lateral processes closer together. There also may be 2 or 3 sets of long spines on the abdomen, but it is more usual to find 2 sets only.

Leg spination varies considerably. There are always 2 large tubular "clubbed" spines dorsodistally on the 1st coxa and there may or may not be 2 shorter clubbed spines proximal to these. This is in addition to the other tubular or pointed spines on the 1st coxa. The greatest variation in number of spines occurs on the ventral surface of the legs. There are often many more long tubular spines than are shown in Hedgpeth's (1948:248, fig. 39c) figure of the leg. He also figured many of the tubular and pointed spines with a pilose or "feathered" texture. These are present in the Panama material, but the spines most often have only a few distal microsetae or none.

The length relationship of scape segments varies among these specimens. In the type-specimen, the 1st segment is almost as long as the 2nd. In a number of Panama specimens, the first scape segment is only three-fourths as long as the 2nd. The palp is quite uniform: heavily setose and bearing the typical long terminal segment of the species. The propodal heel spines show variation in length with some measuring twice as long as the sole spines while others are shorter.

This species was previously known from a few specimens taken in Florida, Belize, the Virgin Islands, and the Netherlands Antilles at Bonaire. The above collections reveal the species to be a common inhabitant of the Caribbean littoral in Panama and again show what intensive investigation of microhabitats can do to extend our knowledge of many forms of marine life, including pycnogonids.

The 2 males from Oaxaca, Mexico, present a distributional enigma, but are far from the first species of pycnogonid to be found on the Pacific American coast after being known previously only from an Atlantic distribution. The 2 specimens conform very well with the Atlantic specimens except that the tubular or clubbed leg spines are fewer in number, particularly on the ventral leg surfaces. Both Mexican specimens are less robust and have generally fewer spines than most Atlantic specimens, but they agree in all other particulars with *A. marcusi*.

Ammothella rugulosa (Verrill)

Ammothea rugulosa Verrill, 1900:581, figs. 2, 3, pl. 70: fig. 9.
Ammothella rugulosa.—Stock, 1975a:972 [literature].—Stock, in press.—Child, in prep.

MATERIAL EXAMINED.—Panama Caribbean: Galeta Island reef, STRI *Laurencia* 5 (1 ♀, 1y), 6 (1y), 14–A (1y), 14–B (1 ♀), 15–B (1y), 16–B (1 ♀), 17 (1 ♂, 1 ♀), 18 (1 ♂, 1 ♀), 19–A (1 ♂ with eggs), 20 (1y), 23 (1y), 24 (1 ♂ with eggs, 1 ♀); STRI *Laurencia* oil spill, 17 Mar 1972 (1 ♀), 27 Mar 1972 (1 ♂), 17 Apr 1972 (1 ♂ with eggs, 1 ♂); STRI *Acanthophora* 16 (1 ♂ with eggs, 2 ♂, 1 ♀, 4y); STRI settling plates, 16 Apr 1971 (2y), 24 Jun 1971 (5y), 15 Feb 1973 (1 ♀, 1y, 4 larva); Misc. STRI Sta., 22 Mar 1973 (1 ♂). Golfo de San Blas, NMNH Sta. 116–1 (2 ♂ with eggs).

Mexico Caribbean: Quintana Roo, Smithsonian-Bredin 85–60 (1 ♀ ovig.), 100–60 (1y).

REMARKS.—All of these specimens have the short ocular tubercle and almost equal scape segments of *A. rugulosa*, but there appears to be sufficient variation within *A. appendiculata* (which see) probably to sink Verrill's species within this complex species. All gradations from one species to the other have not been found, to my knowledge, so further examination of collections of both is necessary.

Distribution records for *A. rugulosa* are scattered from Bermuda and Florida, the eastern and western Caribbean, to Brazil.

Ammothella spinifera Cole

FIGURE 3*f–h*

Ammothella spinifera Cole, 1904:275–277, pl. 12: fig. 8, pl. 20: figs. 7–9, pl. 21: figs. 1–6.—Hall, 1913:132 [key].—Hedgpeth, 1941:256 [key], pl. 10.—Stock, 1954b:119 [key]; 1955:253.
Amothella [sic] *spinifera*.—Hilton, 1942:97.

MATERIAL EXAMINED.—Mexico Pacific: Puerto Peñasco, Sonora, Abbott coll. 21 May 1966 (1 ♂); Joerger coll. Jun 1972 (1 ♂). Mazatlán, Sinaloa, Misc. Sta. 1555 (1 ♂ with eggs). Baja California, Barnard PAZ–10 (1 ♀, 4y), PAZ–24 (4 ♂, 1 ♀, 7y). Bahia Petatlan, Guerrero, *Velero III* 264–34 (1 ♂).

Costa Rica Pacific: Golfo de Nicoya, Misc. Sta. 1567 (1 ♂, 1 ♀).

Panama Pacific: Canal Zone, Barnard PAN–3 (4y); NMNH Sta. 28–1 (1y), 28–2 (1 ♂, 1y).

Panama Caribbean: Galeta Island reef, Barnard PAN–1 (1 ♂); STRI *Laurencia* 14–B (2y), 16–B (1 ♂ with eggs); STRI *Laurencia* oil spill, 17 Mar 1972 (1 ♂), 20 Mar 1972 (1 ♂ with eggs); STRI *Acanthophora* 17 (♀); STRI settling plate, 8 Jan 1971 (3y), 29 Jan 1971 (1 ♂, 4 ♀, 1y), 27 Jul 1971 (1 ♀, 3y), 21 Dec 1971 (1y), 12 Jun 1972 (1 ♀), 11 Sep 1972 (1y), 8 Jun 1973 (1 ♂, 1y), 13 Feb 1974 (1 ♀), 14 Nov 1974 (1 ♂); NMNH Sta. 15 (1 ♂, 1 ♀, 1y). Punta Guanche, Misc. STRI Sta., 29 Apr 1972 (1 ♀, 1y). Bahía Portobelo, Misc. STRI Sta. 26 Aug 1973 (3 ♀, 1y). Golfo de San Blas, NMNH Sta. 116–4 (1 ♀).

REMARKS.—One of Cole's paratype specimens, a female, was examined for comparison with the above specimens. Along with the wide range of collecting localities for this species, there exists as much or more variation in spination, segment length ratios, and length of appendages as exists with *A. appendiculata.*

The single constant diagnostic character is the presence of 1 or 2 (almost always 2) small tubular tubercles on the posterior margin of the 2nd trunk segment, hereafter referred to as tubes to avoid confusion with regular conical tubercles. Another almost constant character is a single tube on the anterior lateral margins of the cephalic segment. This single tube is often accompanied by another smaller tube or in some cases, the single tube may be bifurcated. All other trunk tubes are extremely variable in number and placement. There may be as many as 10 other tubes on the trunk, concentrated anteriorly. Cole's paratype has 4 tubes posterior to the ocular tubercle and 1 on its base. The specimen from Guerrero, Mexico, has 4 tubes arranged on the 4 corners around the ocular tubercle, plus 2 on the posterior margin of the ocular segment and the usual 2 on the posterior margin of the 2nd segment.

The lateral process tubercles (not tubes) display great variation in height, but are always thin and cylindrical. It should be emphasized that the tubercles of this species, unlike those of most *Ammothella* species, are cylindrical rather than conical and never bear a seta.

The 1st scape segment is always less than three-fourths length of the 2nd segment, but its length varies from one-half to three-fourths the length of the 2nd segment. The scape spination also varies, but there are always several tubular and pointed spines on the dorsal and lateral surfaces.

The ocular tubercle is always fairly long, but may not have the conical cap that is found on most of the specimens. Specimens from Sonora, Mexico, have a shorter ocular tubercle and a more robust appearance, but conform in most other characters with specimens to the north and south.

Leg spination is so variable as to defy description except that there are always long dorsodistal spines and several dorsal fields of tubular and pointed spines. A typical male leg and oviger are illustrated here (Figure 3*f-h*) for the first time. The species was described from a female and there has never been an adequate figure of male sexual differences.

Palps and ovigers show a close similarity among the many specimens examined, except for slight variations in segment length ratios and number of simple spines. The palp figured by Cole (1904, pl. 21: fig. 6) is squashed flat on a slide, imparting the appearance of a greater diameter to the segments than they would have naturally.

A few specimens of this species have been found over the years in many places in southern California, but as far as I can discover, it has never appeared in reports on collections from Middle America. This is due probably more to the difficulties involved in making littoral collections along these usually remote and often difficult shores than to the scarcity of the species in Middle America. This species is possibly more common in Panama, but the greater numbers are probably due to the intensity of collecting here rather than a reflection of true distribution. The distribution of *A. spinifera* is now extended from southern California to Middle America and to both sides of the Isthmus of Panama.

Ammothella symbius, new species

FIGURE 4

MATERIAL EXAMINED.—Costa Rica Pacific: Isla Cocos, Barnard COCOS–3 (1 ♂, holotype, USNM 171307). Playa del Coco, Misc. Sta. 1566 (2y, paratypes).

Mexico Pacific: Mazatlán, Sinaloa, Misc. Sta. 1555 (1 ♂ with eggs, paratype).

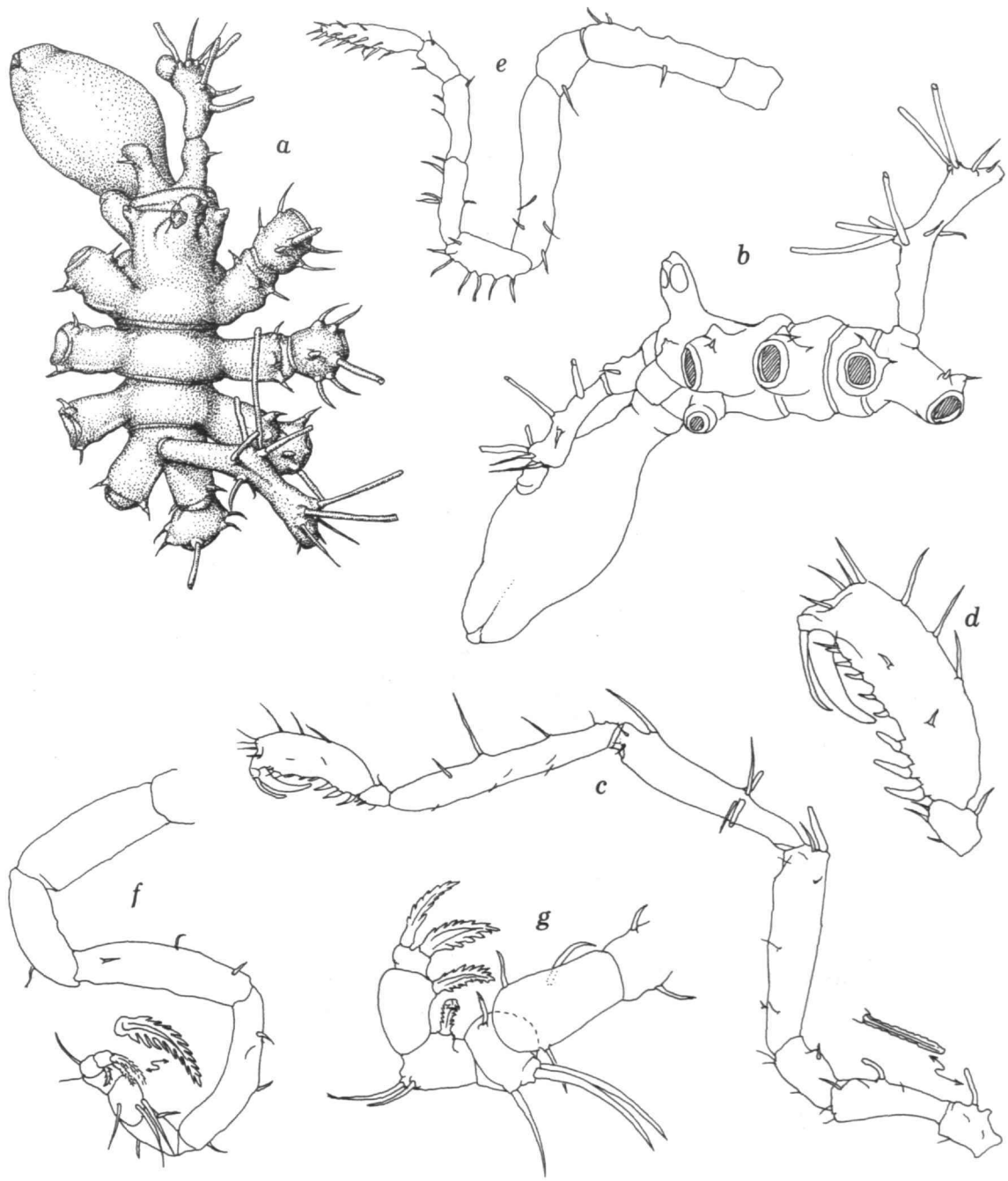

FIGURE 4.—*Ammothella symbius*, new species, holotype, male: *a*, trunk in dorsal view; *b*, trunk, laeral view; *c*, third leg; *d*, terminal segments of third leg, enlarged; *e*, palp; *f*, oviger, with enlargement of typical spine; *g*, terminal segments of oviger, enlarged.

Panama Pacific (all paratypes): Canal Zone, Barnard PAN–3 (1♀, 3y), PAN–8 (52 specimens, mostly young); PAN–10 (1♂, 2♀, 10y), PAN–17 (27 specimens, mostly young); NMNH Sta. 22–1 (1y♀), 56–1 (2♀), 86–2 (2♂ with eggs), 91 (1y), 106 (1♂); Glynn, Mar 1976 (3♂, 1♀). Panama City, Barnard PAN–5 (1♂, 1♀, 7y), PAN–16 (1y); NMNH Sta. 25–1 (2♂, 3♀, 5y), 58–4 (1♂, 4y), 84–B (2♀, 3y), 129–2a (1♂ with eggs); STRI *Abietinaria* 1 (2♂, 1♀, 2y), 2 (1♂, 2♀, 1y), 3 (1♂ with eggs, 1♂, 4♀, 3y), 4 (1♂, 2♀), 6 (1♂ with eggs, 2♂, 11♀, 3y). Isla Taboguilla, STRI *Pocillopora*, 15 May 1975 (1♂ with eggs, 2♀). Archipiélago de las Perlas, NMNH Sta. 33–3 (1y).

DESCRIPTION.—Trunk oval, fully segmented. Lateral processes separated by less than their diameters, each armed with 1 anterior and 1 posterior spine and 3 tiny dorsodistal tubercles. Lateral corners of neck with broad low tubercle, not as tall as wide, capped with a nipple-like papilla. Ocular tubercle rather short, twice its diameter or less, terminating with 2 tiny lateral tubercles and 1 larger median tubercle. Eyes large, well pigmented.

Abdomen long, bent posteriorly at midpoint where 4 long tubular dorsal spines insert and distally where 2 long tubular spines insert. Also armed with 2 ventral setae and 4 distal setae.

Proboscis typical for genus: a long oval with proximal and distal constrictions.

Chelifores short, 2-segmented scape only half as long as proboscis. First scape segment half as long or less than the 2nd, armed with single laterodistal seta. Second segment armed with 2 median and 2 distal tubular spines and 2 distal pointed spines. Dorsodistal surface of 1st segment may or may not be armed with from 1 to 3 low tubercles. Chela ovoid with knob as rudiment of movable finger.

Palp 9-segmented. Second segment equal to 4th in length, 2nd with several low dorsal tubercles and 3 or 4 setae. Sixth and 7th segments equal in combined length to 4th. Eighth segment less than half as long as terminal segment. Terminal segments armed ventrally with short setae.

Oviger 10-segmented, strigilis weak. Fourth segment longest. First 6 segments armed with several short setae. Seventh segment anaxial to 6th, armed with 4 very long ectal setae and 1 endal seta. Eighth segment armed with 1 endal denticulate spine and 2 ectal setae slightly longer than segment diameter. Ninth segment armed with 1 endal denticulate spine and no ectal setae. Tenth segment a mere bud, armed with 2 large denticulate spines. Denticulate spines with from 8 to 12 serrations per side.

Legs moderately long, not heavily spinose. First coxae armed with 2 anterior and 2 posterior long spines, 1 long dorsodistal tubular spine and 1 short dorsomedian tubular spine (sometimes missing on 4th pair of 1st coxae). Second coxae armed with 1 long dorsomedian tubular spine and several lateral long pointed spines. Third coxae with thin fringe of ventrodistal setae. Femur almost glabrous, armed proximoventrally with 2 or 3 short setae and 5 or 6 longer dorsodistal spines. Femoral cement gland a tube only as long as segment diameter, arising dorsodistally from low tubercle. Tibia 1 armed with 3 long tubular spines and 2 long pointed spines at three-tenths of the dorsal length, 2 lateral pointed spines distally and laterally to the tubular spines, a very long dorsodistal spine and several shorter laterodistal spines. Tibia 2 without tubular spines, but several dorsal long pointed spines and 3 or 4 ventral short setae. Propodus robust, without heel, sole hardly curved. Heel area armed with 3 broad spines, sole with 5 or 6 short spines. Claw moderately curved, half as long as propodus. Auxiliaries thin, seven-tenths as long as main claw.

MEASUREMENTS OF HOLOTYPE (mm).—Trunk length (anterior rim to tip of 4th lateral processes), 0.81; trunk width (across 2nd lateral processes), 0.61; proboscis length, 0.72; abdomen length, 0.48; third leg, coxa 1, 0.17; coxa 2, 0.35; coxa 3, 0.25; femur, 0.63; tibia 1, 0.69; tibia 2, 0.71; tarsus, 0.09; propodus, 0.39; claw, 0.2.

DISTRIBUTION.—The proposed species is known from its type-locality, Cocos Island, Costa Rica, and from Sinaloa State, Mexico, to the Gulf of Panama in shallow to littoral depths.

ETYMOLOGY.—The proposed name *symbius* (companion or partner) is from the Greek. This species is often found in the same localities as *A. spinifera*.

REMARKS.—This species has several immediately recognizable differences from *A. spinifera* and the other Panamanian species. The first is the length of the chelifores. In almost all Panamanian specimens of *A. spinifera* examined, the scape segments measure seven-tenths or more of the proboscis length while with the new species, the scape segments measure one-half of the proboscis length. There are also no median dorsal trunk tubes on *A. symbius* as there are on *A. spinifera*, and the

lateral tubercles over the palp insertion are very different from any of the thin single or double tubes or tubercles met on other Panamanian members of the genus. These lateral tubes or tubercles and the length of the scape segments are very different for *A. rugulosa* and *A. appendiculata,* including their spination. There are more tubular and pointed spines on the scape segments of the 3 species above than are found on *A. symbius.* The propodus is more robust and less curved on the new species than on the other 3 species.

In *A. spinifera,* palp segments 6 and 7 have a combined length of less than the 4th segment, while their combined length equals the 4th segment in *A. symbius.* Finally, the ocular tubercle of *A. symbius* is almost universally shorter than that of *A. spinifera.* This new species has no plumose setae.

Genus *Ascorhynchus* Sars, 1877

Key to the Middle American Species of *Ascorhynchus*

Lateral processes almost touching; ocular tubercle a constricted cone pointing anteriorly; chelifores small, straight, 2-segmented; legs very setose; trunk length about 3.8–4.0 mm ....***A. latipes***

Lateral processes separated by slightly less than their diameter; ocular tubercle a simple cone; chelifores small, 2-segmented, with a distinct downcurved bend; legs with scattered setae, mostly dorsal; trunk length about 2.5 mm .....***A. castellioides***

Ascorhynchus castellioides Stock

Ascorhynchus castellioides Stock, 1957:82–84, fig. 2.—Bayer, et al., 1970:A48, A117.—Stock, 1975a:968.—Birkeland, et al., 1976:133.

MATERIAL EXAMINED.—Panama Caribbean: Canal Zone, Misc. Sta., LGA69–43 (2♀, 1y); NMNH Sta. 14–2 (1y). Bahía Portobelo, Misc. STRI Sta., 26 Aug 1973 (1y), 5 Jul 1975, plate 133 (3y, 2 larvae). Galeta Island reef, STRI settling plate, 8 Jan 1971 (13y), 24 Jun 1971 (12y), 27 Jul 1971 (87y and larvae), 21 Dec 1971 (1y), 10 Feb 1972 (2y), 14 Apr 1972 (18y and larvae), 12 Jun 1972 (12y and larvae), 9 Aug 1972 (2y), 11 Sep 1972 (8y), 9 Nov 1972 (1y), 12 Jan 1973 (3y), 9 Apr 1973 (2y), 8 Jun 1973 (1y), 27 Aug 1973 (2y, 1 larva), 13 Feb 1974 (1y), 20 Dec 1974 (1y, 1 larva).

REMARKS.—There are only 2 adults in this large number (178) of specimens. These were scraped from a pier piling at Coco Solo, near Stock's paratype-locality. These records appear to indicate that the young live at a deeper depth (4 to 5 m) than adults in the Panamanian area and will recruit quickly along with hydroids to clean surfaces. Most of what first appeared on the settling plates, put down at all times of the year, were new growths of hydroids and barnacles. There was apparently little or no sponge recruitment on the plates, which does not support Stock's (1975a:968) contention that this species feeds on sponges. On the other hand, it does not refute the idea for adults in other situations.

Ascorhynchus latipes (Cole)

Barana latipes Cole, 1906:217–222, pls. 1, 2.

Ascorhynchus latipes (Cole).—Marcus, 1940:93.—Hedgpeth, 1948:256–257, fig. 42b.—Fage, 1952:530.—Stock, 1953:304 [key].—Hedgpeth, 1954:427.—Stock, 1954a:116; 1975a:969.—Birkeland, et al., 1976:133.—Child, in prep.—Stock, in press.

MATERIAL EXAMINED.—Mexico Caribbean: Quintana Roo, Smithsonian-Bredin Sta. 85–60 (1♀).

Panama Caribbean: Golfo de San Blas, Misc. STRI Sta., 7 Nov 1974, 37.5 m (1♂, 1♀), 7 Nov 1974, 11.5 m (1♂ with eggs, 1♂, 1♀). Gatun Locks, NMNH Sta. 81–1 (1♂, 1y). Galeta Island reef, Barnard PAN–15 (1♂); STRI *Acanthophora* 1 (1♀), 4 (1♀), 6 (2♀), 7 (1♂ with eggs), 9 (1♂, 2♀), 11 (1♂ with eggs, 1♂, 1♀), 16 (3♂, 3♀, 5y), 17 (1♂, 3♀), 18 (2♀, 1y), 19 (1♀), 20 (1♂, 1y); STRI *Laurencia* 7 (1♂), 9 (1♀), 10 (1♀), 11 (1♂ with eggs, 1♂, 1♀), 13–A (1♂), 14–A (1♂ with eggs), 15–A (1♀), 15–B (1♂ with eggs, 1♂, 1♀); STRI *Laurencia* oil spill, 21 Mar 1972 (1y), 17 Apr 1972 (1♂ with eggs); STRI *Laurencia* 20 (1♂), 21 (2♂), 23 (4♂, 1♀); STRI *Zoanthus* 6 (3♂ with eggs, 2♂, 1♀), 9 (4♂, 1♀), 11 (1♀), 12 (1♂, 3♀, 2y), 16 (2♂, 1♀, 1y), 18 (1♂, 1♀, 1y), 19 (1♂, 5♀), 20 (2♂, 1♀, 1y); STRI Coralline 7 (1♂ with eggs, 1♂), 9 (1♀), 10 (1♀), 11 (2♀), 13 (2♀), 19–A (1♂), 21 (2♂, 1♀), 23 (1♀), 25 (1♂, 3♀); STRI *Thalassia* 18 (1♂, 2♀), 19 (1♀); STRI settling plates, 11 Oct 1971 (4y).

REMARKS.—A few specimens of this littoral species have been found from time to time in many places from the Bahamas and Florida to Curaçao and Dakar, Africa. This is the first time it has been

recorded from the western Caribbean. It was thought to be rare or at least scarce throughout its range, but along the Panama coast it is among the most commonly collected littoral species, as the above collecting records for 122 specimens attest. The 2 records from the San Blas islands reveal that *A. latipes* has a greater depth range than was previously suspected. The collecting records also show that there is probably no single breeding season for this species as males with eggs were taken in all months except August, September, and October. Further collecting could possibly have found them in these months and also in December and January when no collections were made.

It is worthwhile noting that along this Panama coast *A. latipes* seems to prefer the intertidal reef top habitat, while *A. castellioides* was found mostly subtidally on settling plates and never on the reef top.

Genus *Eurycyde* Schiödte, 1857

Key to the Middle American Species of *Eurycyde*

1. Ocular tubercle and abdomen with many long spines 2
   Ocular tubercle with 2 small spines or glabrous 3
2(1). Robust species; anterior lateral processes touching; 1st coxae with small posterior tubercle or none; chelifores robust ..... ***E. gorda***, new species
   Thinner species; all lateral processes separated by half their diameter or more; 1st coxae with large anterior and posterior tubercles; chelifores very thin ..... ***E. raphiaster***
3(1). Lateral processes and 1st coxae with 2 long dorsodistal spines; ocular tubercle with short setae ..... ***E. clitellaria***
   Lateral processes with 1 long dorsodistal spine and 1 curved posterior tubercle; 1st coxae with from 3 to 5 spines; ocular tubercle glabrous ..... ***E. curvata***, new species

Eurycyde clitellaria Stock

Eurycyde clitellaria Stock, 1955:263–266, figs. 25–26.—McCloskey, 1967:128–131, figs. 18–24.

MATERIAL EXAMINED.—Mexico Pacific: Jalisco, *Velero III* 275–34, (2 ♀, 2y).

REMARKS.—These specimens are extremely close to *E. clitellaria* and differ mainly in spination from Stock's type male and McCloskey's female. The paired spines on the anterior 4 lateral processes are very large, swollen, and have a few tiny microsetae. There are no spines on the posterior 4 lateral processes. The dorsodistal spine on the 1st coxa of all legs is again very large and swollen, as are the spines of the abdomen and chelifores. The abdomen has the crooked shape typical of the species, but has 2 sets of 4 dorsal large spines. The 2nd row is posterior to the middorsal row and the lateral spines are shorter than the dorsal 2. The chelifores agree in the large dorsodistal spine of the 1st segment, but in addition, have 2 or 3 lateral spines shorter than the distal spine. The 2nd segment has 4 stout spines instead of 2 as shown for the type-specimen.

The ovigers agree with McCloskey's female, but have the double row of denticulate spines in the formula 5:4:3:5, with the distal spine on the terminal segment unpaired and larger than the rest. These 2 females are slightly larger in all proportions than the specimens previously recorded.

The distribution of this species is now extended to the Pacific. Although this is the first record of this species in the Pacific, other genera almost parallel this distribution, such as, *Nymphopsis duodorsospinosa* and *Pycnogonum cessaci*. It must be noted that this was the only Pacific collection at which the genus *Eurycyde* was found, although other species occur to the north and south of the Middle American coast. None were found on the Pacific side of Panama.

Eurycyde curvata, new species

FIGURE 5*a–h*

MATERIAL EXAMINED.—Colombia Caribbean: Cabo de la Vela, *Velero III* A13–39 (1 ♂, holotype, USNM 168613).

DESCRIPTION.—Trunk fully segmented. Lateral processes separated by one-fourth to half their

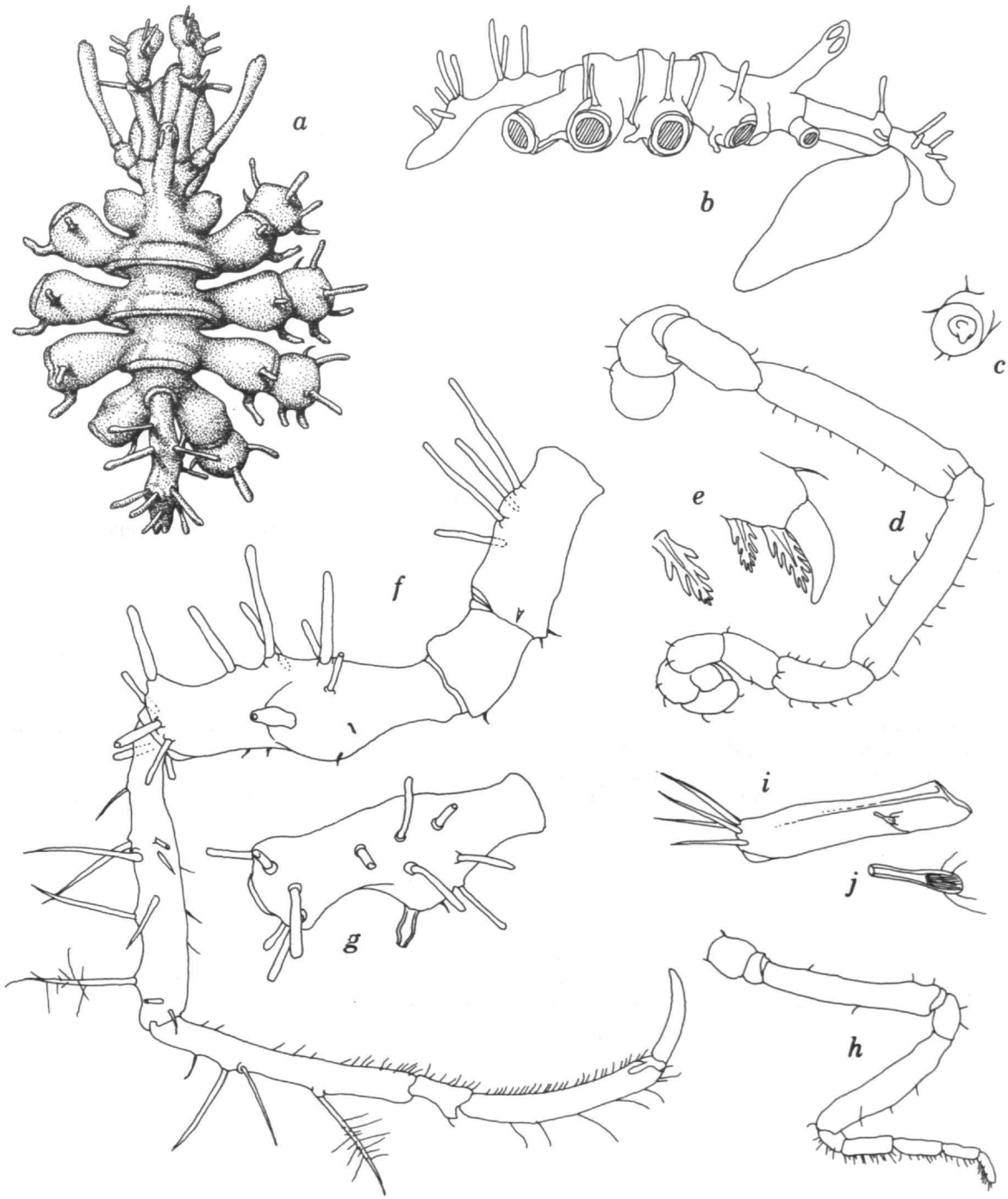

FIGURE 5.—*Eurycyde curvata*, new species, holotype, male: *a*, trunk, dorsal view; *b*, trunk, lateral view; *c*, chelifore tip from anterior; *d*, oviger; *e*, oviger tip, enlarged, with a typical denticulate spine; *f*, third leg; *g*, femur, dorsal view showing cement gland bulge *h*, palp. *Eurycyde raphiaster*, male: *i*, femur, showing cement gland habitus; *j*, cement gland, enlarged.

diameter, armed dorsodistally with single straight clubbed spine longer than segment diameter and 1 posterodistal curved tubercle slightly shorter than segment diameter. Fourth lateral processes without dorsodistal spine. Ocular tubercle approximately 4 times as long as its diameter, directed anteriorly at 30° angle, unarmed, with small rounded tubercle at apex. Eyes at extreme distal end, lightly pigmented. Neck behind ocular tubercle and insertion of palps very thin. Abdomen carried horizontally, curving ventrally, distinctly articulated to trunk, armed with 2 groups of long clubbed spines, 4 proximal and 5 in distal cluster.

Proboscis basal segment cylindrical, as long as chelifore 1st segment. Proboscis distal segment thin, pyriform, constricted distally.

Chelifore 1st segment armed with long clubbed spine dorsodistally and shorter clubbed spine laterodistally. Second segment armed with 4 clubbed spines and 2 or 3 short setae dorsally. Chelifores moderately slender. Chela reduced to rounded rudiment with 2 tiny buds representing fingers, carried in distal concavity.

Palps with 3rd and 5th segments long and slender, 6th to 10th segments slender, thickly armed with ventral setae.

Oviger typical of genus. Fourth and 5th segments longest; 4th with endal row of setae, 5th and 6th each with an endal and ectal row of setae. Terminal 4 segments with double row of denticulate spines in the formula 6:5:5:6, with spines grading from smallest proximally to largest distally. Largest denticulate spine on distal end of terminal segment, unpaired, almost as long as terminal claw.

Coxae and femur robust, other leg segments slender. First coxa of anterior 3 legs armed with tall dorsodistal clubbed spine, 2 dorsolateral clubbed spines, a small pointed spine on anterior margin, and a long curved tubercle on posterior margin. Coxa 1 of 4th legs with only dorsodistal clubbed spine, 1 anterior clubbed spine and a small pointed and curved posterior spine. Coxa 2 armed with 4 dorsal long clubbed spines and several small distal setae. Coxa 3 unarmed except for 1 or 2 small ventral setae. Femur robust, armed with field of 6 middorsal and lateral long clubbed spines and distal field of long clubbed spines. Femoral cement gland in large bulbous tubercle on midposterior surface of segment, topped by large swollen tube. Tibia 1 armed with 1 short and 4 very long pointed spines dorsally, the distal spine with very long thin microsetae; a few long sharp and clubbed spines laterally, and a few short setae ventrally. Tibia 2 armed with 3 long pointed spines dorsally, the distal spine with microsetae; and a row of ventral setae increasing in numbers distally. Tarsus fairly long, armed with 1 dorsodistal seta and row of ventral setae. Propodus long, moderately curved, armed with 5 long setae dorsally and a row of 26–28 spines ventrally. Claw moderately slender, long, almost half length of propodus.

MEASUREMENTS OF HOLOTYPE (mm).—Trunk length (chelifore insertion to tip of 4th lateral processes), 1.62; trunk width (across 2nd lateral processes), 1.43; ocular tubercle length, 0.48; proboscis length (both segments laterally), 1.58; abdomen length, 0.94; third leg, coxa 1, 0.33; coxa 2, 0.57; coxa 3, 0.27; femur, 0.9; tibia 1, 0.9; tibia 2, 0.77; tarsus, 0.18; propodus, 0.6; claw, 0.26.

DISTRIBUTION.—Known only from the type-locality, off Cabo de la Vela, Colombia, in 24-meters depth.

ETYMOLOGY.—Latin, pertaining to the curved tubercle on the posterior of each lateral process and first coxa.

REMARKS.—There is no other species of this genus known that bears curved posterior tubercles on the lateral processes and first coxae. This character plus the lack of any setae or spines on the tall ocular tubercle serve to set this species off from any of the previously described *Eurycyde* species. This new species has the majority of its large spines club-shaped, that is, not tapered to a point, but rounded off at the tips and almost the same diameter throughout. The large spines of other species are mostly tapered to a point and are often of a broader diameter in the middle. The oviger, palps, and propodus of all known *Eurycyde* species are very similar and perhaps will not serve as good diagnostic characters for any species.

The femoral cement gland of the new species is the largest known among the various *Eurycyde* species for which this organ has been described. Comparative figures of the cement gland of *Eurycyde raphiaster* are included (Figure 5*i*, *j*) since this gland has never been figured, to my knowledge, for Loman's species. It is seen to be quite a bit smaller. It appears to be a valid character of this genus for males to have the single cement gland on the posterior face of the femur rather than on

the dorsal or ventral side as with other members of this family.

Eurycyde gorda, new species

FIGURE 6

MATERIAL EXAMINED.—Panama Caribbean: Galeta Island reef, STRI Coralline 5 (1 ♀, holotype, USNM 168611), 6 (1 ♀, paratype, USNM 168612).

DESCRIPTION.—Trunk fully segmented. Lateral processes crowded; first and second touching, second and third barely separated, third and fourth separated by one-fourth to one-third of their diameter, all glabrous. Ocular tubercle short, only twice as long as minimum diameter, erect, club-shaped with diameter increasing distally, apex flap, armed with circle of large pointed spines varying in number from 12 to 14 in 2 specimens. Eyes at midlength of tubercle, large, lightly pigmented. Neck behind ocular tubercle broad. Abdomen short, broad, curved posteriorly at distal end, armed with circle of 10 large pointed spines halfway along segment length and several small setae distally. Abdomen with distinct suture line around base.

Proboscis with robust basal segment, shorter than 1st scape segment. Remainder of proboscis of typical shape for the genus, but more robust and without distal constriction.

Chelifores robust, moderately short, only 4 or 5 times longer than their median diameter. First scape segment armed with single long pointed dorsodistal spine. Second segment armed with 8 long pointed spines on dorsal and lateral surfaces. Chela a rudimentary knob with 2 short finger buds, carried extended rather than within concave scape tip.

Palp typical of the genus. Terminal segments short, their lengths either equal to or no more than twice their diameter, armed with field of ventral setae.

Oviger segments 4 and 5 relatively short, not much more than 3 times longer than their diameter. All segments armed with very few setae or none. Terminal 4 segments armed with denticulate spines having 7 to 8 dentations per side and all much the same size, in 2 rows with formula 7:6:6:5. Distal spine on terminal segment unpaired, slightly larger than others, almost length of terminal claw.

Legs robust, segments shorter in relation to their diameter than for other known species. First coxa unarmed except for hint of low tubercle distally on 1st and 2nd legs. Second coxae with 1 long pointed dorsomedian spine bearing microsetae and 2 small ventrodistal setae on segment. Third coxae with single ventrodistal seta each. Femur cylindrical, armed with dorsodistal fringe of long pointed spines bearing microsetae. Cement gland unknown. First tibia armed dorsally with 5 long pointed spines, each with microsetae and 2 long spines without microsetae and 2 short setae laterodistally. Second tibia armed with 4 long pointed spines dorsally, each with microsetae, and a row of short ventral setae increasing in numbers distally. Tarsus moderately short, armed with row of ventral setae. Propodus robust, curved, armed with 3 dorsal setae and a row of from 15 to 17 short sole setae. Claw robust, two-fifths as long as propodus.

MEASUREMENTS OF HOLOTYPE (mm).—Trunk length (chelifore insertion of tip of 4th lateral processes), 0.95; trunk width (across 2nd lateral processes), 0.8; ocular tubercle length, 0.16; proboscis length (both segments, laterally), 0.82; abdomen length, 0.26; third leg, coxa 1, 0.16; coxa 2, 0.22; coxa 3, 0.17; femur, 0.44; tibia 1, 0.49; tibia 2, 0.48; tarsus, 0.09; propodus, 0.35; claw, 0.15.

DISTRIBUTION.—Known only from the type-locality, Galeta Island reef flats, Panama, in the intertidal zone.

ETYMOLOGY.—From the Spanish for fat, pertaining to the "pleasingly plump" appearance of the whole animal.

REMARKS.—This new species bears a closer relationship to the common Caribbean species, *E. raphiaster*, than the preceeding new species, *E. curvata*. It is one of the few, at least in the female, which lack any form of lateral process adornment, such as with *E. spinosa*, *E. longisetosa*, and *E. encantada*. The other known species all have some form of tubercles, spines, or setae on their lateral processes.

All other species of *Eurycyde* have a thinner appearance and lateral processes that are separated by at least half their diameter from each other. All of the long spines on *E. gorda* are pointed as with *E. raphiaster*, and the crown-like circle of spines on the ocular tubercle and abdomen are similar to that species. None of the long spines are clubbed or blunt-tipped. The differences are in the shape and length of the ocular tubercle and abdomen, the short stout chelifores, the lack of large tubercles

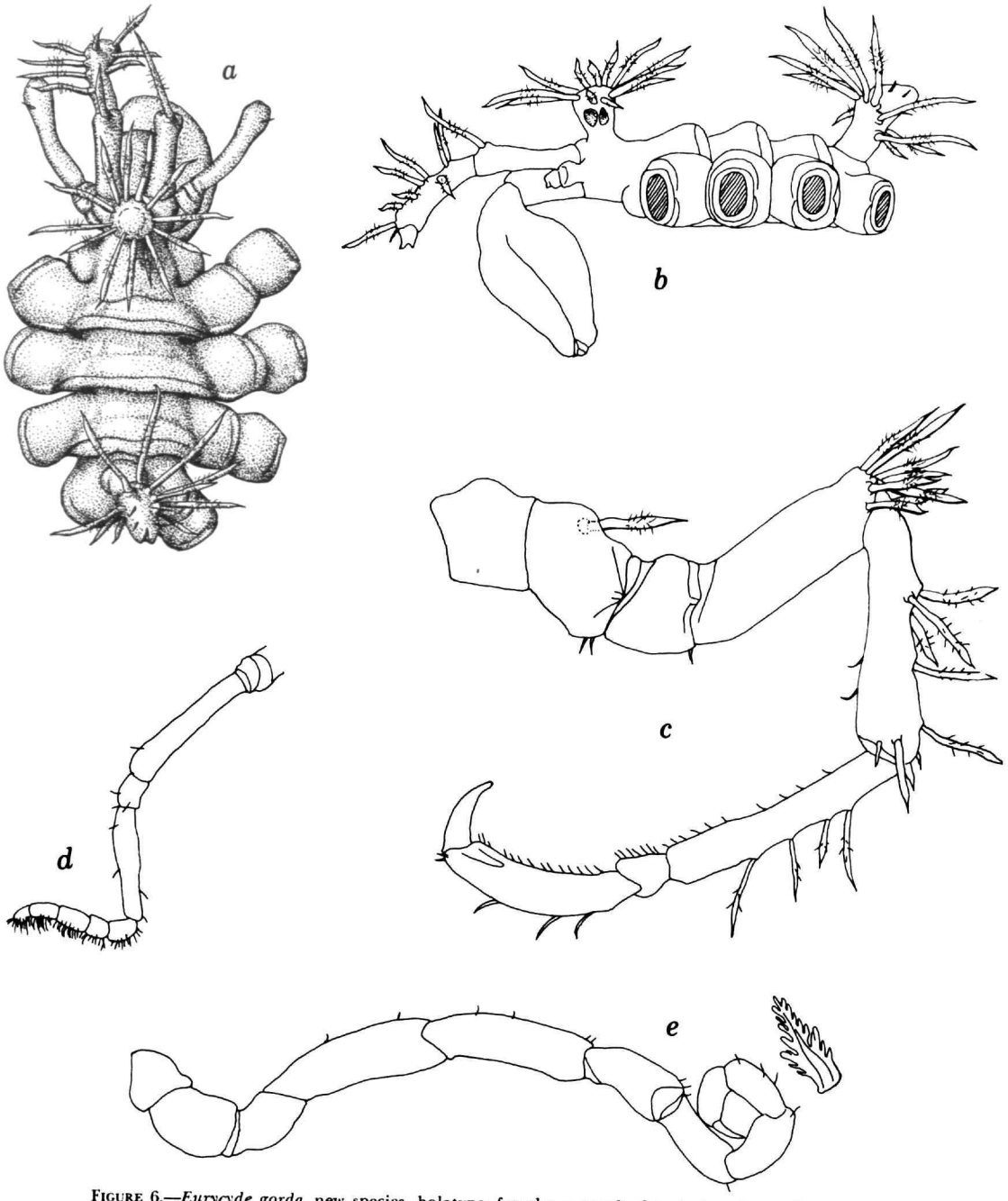

FIGURE 6.—*Eurycyde gorda*, new species, holotype, female: *a*, trunk, dorsal view; *b*, trunk, lateral view; *c*, third leg; *d*, palp; *e*, oviger, with enlargement of typical spine.

on the 1st coxae, and the lack of lateral process adornment, all of which remove this new species from consideration as *Eurycyde raphiaster,* or any of the other known species.

Eurycyde raphiaster Loman

FIGURE 5*i, j*

Eurycyde raphiaster Loman, 1912:13.—Stock, 1975a:979 [literature].—Stock, in press.—Birkeland, et al., 1976:133.—Child, in prep.

MATERIAL EXAMINED.—Panama Caribbean: Golfo de San Blas, Misc. STRI Sta., 1 Nov 1971 (1 ♀, 1y). Galeta Island reef, STRI Coralline 9 (2 ♂ y, 1 ♀), 10 (1 ♂ with eggs, 4 ♂), 11 (1 ♂, 1 ♀, 1y), 15 (2 ♂, 2 ♀), 17 (1 ♂), 19-A (1 ♂), 21 (1 ♂ with eggs), 23 (1 ♀), 24 (1 ♂); STRI *Laurencia* 11 (1 ♂ with eggs), 13-B (1y), 16-B (1 ♂), 23 (1 ♂), 24 (1 ♂); STRI *Laurencia* oil spill, 17 Apr 1972 (1 ♂); STRI *Zoanthus* 5 (1 ♂ with eggs), 6 (2 ♂), 7 (1 ♂), 9 (1 ♀), 10 (1 ♂ with eggs), 12 (1 ♂ with eggs, 2 ♂, 3 ♀), 19 (1 ♂ with eggs), 20 (2 ♂); STRI *Acanthophora* 6 (1 ♂), 9 (1 ♂), 10 (1 ♂), 12 (2 ♂), 17 (1 ♀), 18 (1 ♂ with eggs, 1 ♂), 20 (2 ♂); STRI *Thallasia* 17 (1 ♂); STRI settling plate, 10 Feb 1972 (1y); NMNH Sta. 15 (1 ♂).

REMARKS.—The femoral cement gland of this species has never been adequately illustrated. A dorsal and lateral view are included here.

This species has tropical amphi-Atlantic distribution, being found in many locations in Florida and the Caribbean and also the Cape Verde Islands. It is apparently confined to the Atlantic as it has not been found on the Pacific side of Panama.

Genus *Nymphopsis* Haswell, 1885

Nymphopsis duodorsospinosa Hilton

Nymphopsis duodorsospinosa Hilton, 1942b:303–305, pl. 45.—Hedgpeth, 1948:250–252, fig. 40; 1954:427.—Child and Hedgpeth, 1971:609 [list].—Kraeuter, 1973:496.—Stock, 1975a:978.—Krapp and Kraeuter, 1976:342.—Birkeland, 1976:134, 157.—Child, in prep.

MATERIAL EXAMINED.—Mexico Pacific: Baja California, *Velero III* 532-36 (1 ♀), [Hilton's paratype, USNM 79436]; Misc. Sta., coll. Hilton, 18 Apr 1927 (1 ♂, 1 ♀). Gulf of California, Misc. Sta., coll. Abbott, 16 Apr 1967 (1 ♂ with eggs, 1 ♂, 2 ♀, 2y), coll. Brusca, 13 Jun 1972 (1 ♂ with eggs), coll. Brusca, 11 Jun 1975 (1 ♀), coll. Brusca, 3 Jul 1975 (1 ♂ with eggs), coll. Flanagan, 23 Jul 1974 (1 ♀). Jalisco, *Velero III* 275-34 (1 ♂ with eggs, 1 ♀, 1y, 1 larva).

Panama Pacific: Canal Zone, Barnard, PAN-10 (3y); NMNH Sta. 28-2 (2 ♂, 2 ♀). Panama City, STRI *Abietinaria* 2 (1 ♀, 1y), 3 (1 ♀, 3y), 4 (2 ♂ with eggs, 3 ♂, 4 ♀, 5y), 5 (2 ♂ with eggs), 6 (1 ♂ with eggs, 3 ♀, 2y); NMNH Sta. 23-2 (1 ♂, 1 ♀), 25-1 (1 ♂), 58-2 (1 ♀); Misc. Sta., coll. Glynn, May 1969 (1 ♀), LGA 69-68 (1 ♀).

Panama Caribbean: Galeta Island reef, STRI *Laurencia* 7 (1 ♀); STRI *Laurencia* oil spill, 21 Mar 1972 (1 ♂ with eggs); Misc. STRI Sta., 22 Mar 1973 (1 ♀); NMNH Sta. 15 (1 ♂). Punta Guanche near Portobelo, Misc. STRI Sta., 29 Apr 1972 (1 ♂ y).

REMARKS.—The northern boundary for distribution of this species seems to coincide with the southern boundary for *N. spinosissima.* I can find no records of either species from the west coast of Baja California, although Hilton (1942b:302) recorded *N. spinosissima* from Bahía Rosario, Baja California. I have not seen this specimen. Collections are few and far between from this harsh desert coast, but it seems to be the terminus of distribution for many species. One specimen identified by Hilton (1942b:302) as N. *spinosissima* from Baja California, turned out to be *N. duodorsospinosa,* and perhaps his specimen listed above is the same. *Nymphopsis duodorsospinosa* is, thus far, the most common species found in the Gulf of California. Its distribution is from Mexico to Panama and the Galapagos Islands to Belize and South Carolina, Georgia, and Florida in the United States.

Genus *Tanystylum* Miers, 1879

To the seven species of *Tanystylum* found thus far in the Caribbean, this report adds another known species, *T. isthmiacum difficile,* and one new species, *T. birkelandi.* It is surprising that, over this vast expanse of sea with its many island shores where a wealth of other pycnogonid genera and species are found (including endemics), so few specimens of *Tanystylum* have come to light. Only 9 specimens of the genus are reported herein from the Caribbean shores of Panama. Nowhere in the Caribbean do they form a significant part of the pycnogonid fauna, in terms of numbers, although a few specimens appear in most reports on Caribbean species. Stock (1955), in his treatise on the Mortensen collections, listed only 6 specimens (of 5 species) of the genus, 2 from the Caribbean and 4 from the Pacific coast of North America. He (Stock, 1975a) listed 36 specimens of 4 species from the Caribbean from the Miami Deep-sea Expeditions.

The Pacific shores of Middle America, on the other hand, previously thought rather depauperate in pycnogonids, host great numbers of *Tanystylum* specimens, particularly *T. intermedium* and *T. isthmiacum,* such that their numbers in some collecting areas from the dominant pycnogonid fauna. There are 8 species of the genus now known from these Pacific shores (including the new species from Malpelo Island, Colombia) with 3 represented as new species in this report: *T. dowi, T. malpelensis,* and *T. mexicanum.*

From the above facts, it appears as though *Tanystylum* proliferates in more temperate waters and, although there are a fair number of species to be found in tropical waters, the genus begins to form a significant percentage of the faunal count only in cooler waters. This conjecture apparently holds true for the East Indies and western Indian Ocean, from which only a few records of *Tanystylum* appear. The Caribbean fauna is better known than those of these other areas, but intensive collecting by a few expeditions in the western tropical Pacific and western Indian Ocean has produced few specimens or species of *Tanystylum.*

Key to the Middle American Species of *Tanystylum*

1. Chelifores with 2 segments, chela vestigial; proboscis pyriform; propodus without heel and large spines, *Achelia*-like; palps with 6 or 7 segments ..... ***T. intermedium***
   Chelifores with 1 segment, chela lacking; proboscis cylindrical, oval, tubular or conical; propodus with heel and 2 or 3 large spines; palps with from 4 to 6 segments 2
2(1). Proboscis egg-shaped, of 2 segments with proximal "collar" extension; abdomen short, not extending to tip of 4th lateral processes; palps 4-segmented; male oviger without 7th segment apophysis ..... ***T. malpelensis,*** new species
   Proboscis of single segment 3
3(2). Male 7th oviger segment with perpendicular setose apophysis 4
   Male 7th oviger segment without apophysis, or only females known 8
4(3). Proboscis distally tubular; chelifore stumps tiny or of medium length; palps 5-segmented....5
   Proboscis a truncated cone, inflated proximally; chelifore stumps long; palps 5- or 6-segmented 7
5(4). Chelifores tiny, hardly showing beneath ocular segment overhang; abdomen extending to midlength of 1st coxae of 4th leg; oviger spines fully denticulate ..... ***T. tubirostrum***
   Chelifores of medium length; abdomen extending slightly beyond 4th lateral processes....6
6(5). Proboscis a long tube with concave sides; oviger spines fully denticulate; ocular tubercle a tall truncated cone with 1 small tubercle ..... ***T. dowi,*** new species
   Proboscis distally tubular, proximal part swollen, convex; oviger spines denticulate at tips only; ocular tubercle low, rounded, with 2 tiny tip tubercles. .... ***T. oculospinosum***
7(4). Palps of 5 segments, 3rd and 4th coalesced; abdomen short, reaching just beyond 4th lateral processes; lateral processes usually with 1 bulbous tubercle ..... ***T. isthmiacum isthmiacum***
   Palps of 6 segments, 3rd and 4th fully articulated; abdomen longer, reaching distal end of coxal 1 of 4th legs; lateral processes with 2 bulbous tubercles .... ***T. isthmiacum difficile***
8(3). Chelifore stumps tiny, hardly showing beneath ocular segment overhang; proboscis tubular; palps 5-segmented (only ♀ known) 9
   Chelifore stumps long; proboscis a cylinder or truncated cone; palps 4-segmented (♂, ♀ known) 10
9(8). Ocular tubercle low, rounded, without tubercle; lateral processes with single tiny tubercle, without setae; oviger spines denticulate only at tips ..... ***T. calicirostrum***
   Ocular tubercle extended into tall pointed cone; lateral processes with 1 or 2 bulbous tubercles with setae; oviger spines fully denticulate ..... ***T. mexicanum,*** new species
10(8). Abdomen almost erect, not extending to tip of 4th lateral processes; palp 2nd segment inflated, 4th segment ovoid, little over twice as long as wide; proboscis a cylinder, consricted distally ..... ***T. birkelandi,*** new species
   Abdomen low, extending slightly beyond 4th lateral processes; palp 2nd segment tapering distally, 4th segment thin, over 3 times longer than wide; proboscis a tapering truncated cone ..... ***T. geminum***

Tanystylum birkelandi, new species

FIGURE 7

MATERIAL EXAMINED.—Panama Caribbean: Galeta Island reef, STRI Coralline 21 (1 ♂, holotype, USNM 170494) 25 (1 ♀, paratype, USNM 170495).

DESCRIPTION OF MALE.—Trunk circular, unsegmented, with fold posterior to ocular segment. Lateral processes closely crowded, without tubercles or setae. Ocular segment glabrous, extending well anterior to circle formed by lateral processes. Ocular tubercle cylindrical, as tall as wide, capped by forward-pointing tubercle. Eyes large, pigmented dark brown. Abdomen moderately long, almost erect, cylindrical, armed with 7 or 8 dorsal setae. All longer setae have microsetae except some at extremes of appendage terminal segments.

Proboscis almost cylindrical, small, with constriction just proximal to lips, imparting a fat bottle shape.

Chelifore stumps long, almost half length of proboscis, cylindrical, with constrictions at proximal ends. Both armed with 2 distal setae longer than segment diameter.

Palps with 4 segments. Second segment longest, an inflated oval armed with 2 lateral setae. Terminal segments cylindrical, smaller in diameter than 2nd segment. Third segment armed with single ventral seta with microsetae and terminal segment armed with 5 or 6 distal setae with microsetae, longer than twice segment diameter. Palps shorter than proboscis.

Oviger proximal segments with several short setae. Sixth segment with 3 stout recurved spines and 1 seta, 7th with 3 setae as long as segment diameter, without lateral apophysis. Eighth and 9th segments with 4 and 1 long setae respectively, each bearing microsetae. Terminal segment with 2 long denticulate spines twice length of segment, denticulations tridentate.

Legs robust, armed with clumps of dorsal setae bearing microsetae and a few simple setae ventrally. Coxa 1 without large tubercles, but with setae bearing microsetae on tiny raised cylindrical tubercles: 3 anterior, 1 dorsal, and 2 posterior. Coxae 2 and 3 with a few dorsal and ventral setae. Femoral cement gland a tapering tube on dorsodistal tubercle, tube longer than usual for genus. Tarsus with single ventral spine and 2 lateral setae. Propodus robust, with 2 heel spines, 3 smaller sole spines, and several lateral and distal setae. Claw slightly over half propodal length, auxiliaries half main claw length.

FEMALE PARATYPE.—Trunk slightly smaller than male, but legs larger and longer. Chelifore stumps with 3 long setae. Palps slightly shorter than those of male. Oviger smaller than usual for genus, 9-segmented, with single simple spine on 5th through 8th segments, 2 simple spines on terminal segment.

MEASUREMENTS OF HOLOTYPE (mm).—Trunk length (chelifore insertion to tip of 4th lateral processes), 0.46; trunk width (across 2nd lateral processes), 0.45; abdomen length, 0.21; proboscis length, 0.25; third leg, coxa 1, 0.13; coxa 2, 0.12; coxa 3, 0.15; femur, 0.3; tibia 1, 0.29; tibia 2, 0.3; tarsus, 0.07; propodus, 0.25; claw, 0.13.

DISTRIBUTION.—Known only from the type-locality, Galeta Island, Panama, in the intertidal zone.

ETYMOLOGY.—Named for Dr. Charles Birkeland, coordinator of the STRI Panama Survey and collector of many of the specimens reported here.

REMARKS.—Among the characters that separate this species from all other known members of the genus are the very short 4-segmented palps, which are shorter than the small cylindrical proboscis, long chelifore stumps constricted at their bases, tall erect abdomen, male oviger without 7th segment apophysis, 2 heel spines instead of the usual 3, lack of tubercles on the lateral processes and first coxae, and setae bearing microsetae on most segments. This species is also one of the smallest of the genus known, even though most species have a trunk length of less than 1 mm.

The very long chelifore stumps are reminiscent of *T. styligerum* and *T. isthmiacum* (in both of its subspecies), but the similarities end there, due to great differences in the abdomen, lateral process tubercles, proboscis, and palp segments between the species. Setae bearing microsetae are also found on *T. bigibbosum*, but there is no other similarity between the 2 species. None of the other characters of *T. birkelandi* is unique, but taken in combination, all are sufficient to characterize this new species.

Tanystylum calicirostrum Schimkewitsch

FIGURE 8

Tanystylum calicirostre Schimkewitsch, 1889:331–333, figs. 5–7.—Marcus, 1940:97 [key].—Hedgpeth, 1948:268, fig. 49b–d.

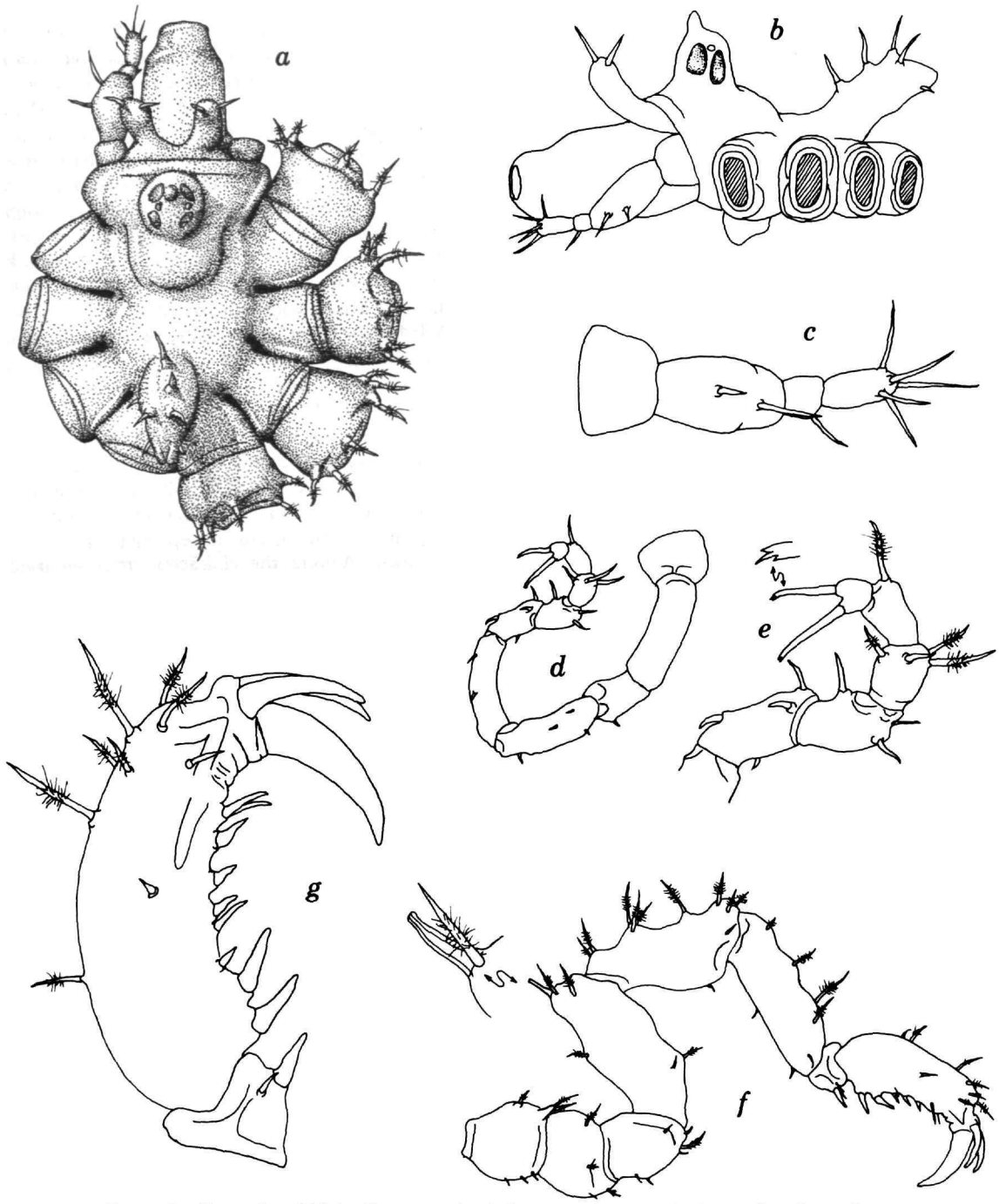

FIGURE 7.—*Tanystylum birkelandi*, new species, holotype, male: *a*, trunk, dorsal view; *b*, trunk, lateral view; *c*, palp; *d*, oviger; *e*, terminal segments of oviger, enlarged, with further enlargement of oviger spine tip; *f*, third leg, with enlargement of cement gland tube; *g*, terminal segments of third leg, enlarged.

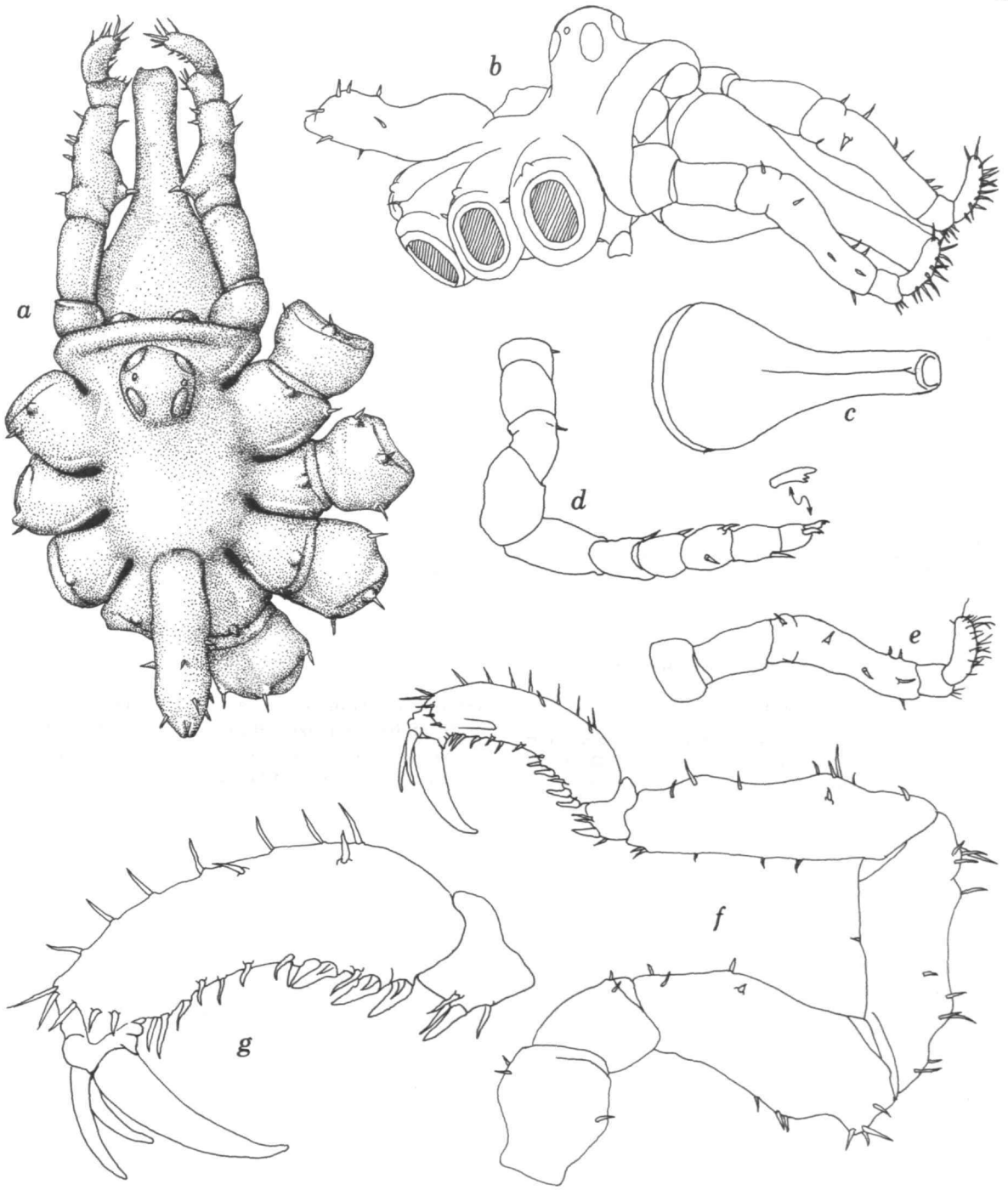

FIGURE 8.—*Tanystylum calicirostrum*, Bermuda specimen, female: *a*, trunk, dorsal view; *b*, trunk, lateral oblique view; *c*, proboscis, ventral view; *d*, oviger, with enlarged terminal spine; *e*, palp; *f*, third leg; *g*, terminal segments of third leg.

Not *Tanystylum calcirostre* [sic].—Kraeuter, 1973:496 [= *Achelia sawayai* Marcus, fide Krapp and Kraeuter, 1976: 342].

MATERIAL EXAMINED.—Bermuda: coll. A. E. Verrill, 1901 (1 ♀).

REMARKS.—This Yale Museum specimen (above) is 1 of only 2 known specimens, both females. The whereabouts of Schimkewitsch's type-specimen is unknown to me. Hedgpeth (1948:268) reported on this same specimen, but made an error in the number of palp segments. There are only 5, as the accompanying figure here shows. The species was not found in the many samples recorded here from Bahía de Panama, the type-locality.

The species looks very much like *T. tubirostrum* and *T. dowi*, except that *T. calicirostrum* has very tiny lateral process tubercles while those of the other 2 species are very much larger. The 1st coxae of these 2 species are also heavily tuberculate and spinose, whereas those of *T. calicirostrum* are smooth and bear only 3 or 4 spines. These characters appear sufficient to keep this species separate from *T. tubirostrum* and *T. dowi*.

Tanystylum dowi, new species

FIGURE 9*a–g*

MATERIAL EXAMINED.—Panama Pacific: Panama City, NMNH Sta. 58–4 (1 ♂ with eggs, holotype, USNM 170496, 1 ♂, 3 ♀, 1y, paratypes, USNM 170497); STRI *Abietinaria* 3 (1 ♂, paratype, USNM 170498).

DESCRIPTION.—Trunk circular, unsegmented, integument granular. Lateral corners of cephalic segment extend slightly beyond circle formed by lateral processes, corners armed with a tiny tubercle with seta. Lateral processes touching, armed with low tubercles slightly posterior to dorsal and all but 1st processes armed with small anterolateral tubercles. All tubercles with small seta each. Ocular tubercle a truncated cone slightly taller than wide, capped with a small truncated tubercle. Eyes large, slightly pigmented. Abdomen with slight bulge anteriorly, carried at 45° angle, extending well beyond 4th lateral processes, armed with 5 dorsodistal setae.

Proboscis broad at base, tapering with concave sides to tubular, slightly downcurved tip.

Chelifore stumps moderately long, bulbous, armed with 3 dorsodistal setae.

Palps 5-segmented. Third segment longest, with slight proximal invagination marking coalesced segments. Second and 3rd segments armed with dorsal and lateral setae. Terminal segment articulated anaxially to 4th segment, which extends ventrally, slightly beyond terminal suture. Both segments armed distally and ventrally with setae as long as or longer than segment diameter.

Oviger of characteristic shape; male 7th segment with large lateral apophysis bearing 4 long setae and a thin endal tubercle with 2 short setae. Eighth and 9th segments armed with single plain spine. Terminal segment much reduced, armed with single seta and 2 large denticulate spines with both side and tip serrations.

Legs robust, moderately setose. Coxa 1 with anterior, dorsal, and posterior distal tubercles bearing 1 or 2 setae each. Coxae 2 and 3 with ventral fringe of setae. Femoral cement gland a constricted tube on dorsodistal bulge. Tibiae with 2 low dorsal bulges. Tarsus with ventral stout spine and 4 setae. Propodus with 3 stout heel spines, sole with several distal setae, not continuous along its length. Claw long, almost one-half propodal length, auxiliary claws half main claw length.

MEASUREMENTS OF HOLOTYPE (mm).—Trunk length (chelifore insertion to tip of 4th lateral processes), 0.67; trunk width (across 1st lateral processes), 0.66; abdomen length, 0.25; proboscis length, 0.49; third leg, coxa 1, 0.16; coxa 2, 0.24; coxa 3, 0.15; femur, 0.48; tibia 1, 0.44; tibia 2, 0.47; tarsus, 0.1; propodus, 0.38; claw, 0.18.

DISTRIBUTION.—Known from the type-locality, Panama City (off old French Fort) and from Punta Paitilla beach in intertidal depths.

ETYMOLOGY.—Named for Captain J. M. Dow, who commanded the old Panama Railway Company's steamer *Guatemala* on the Chagres River during the 1850s, and who appears to have been the first serious amateur collector of aquatic fauna in Panama and Central America to have had his collections reported in scientific literature of the time. Captain Dow collected at least one pycnogonid specimen, *Pycnogonum reticulatum*, from El Salvador (Hedgpeth, 1948:279).

REMARKS.—This new species shows similarities to *T. calicirostrum*, *T. oculospinosum*, *T. rehderi*, and *T. tubirostrum*. Each has a more or less tubular distal proboscis, but the following differences occur in

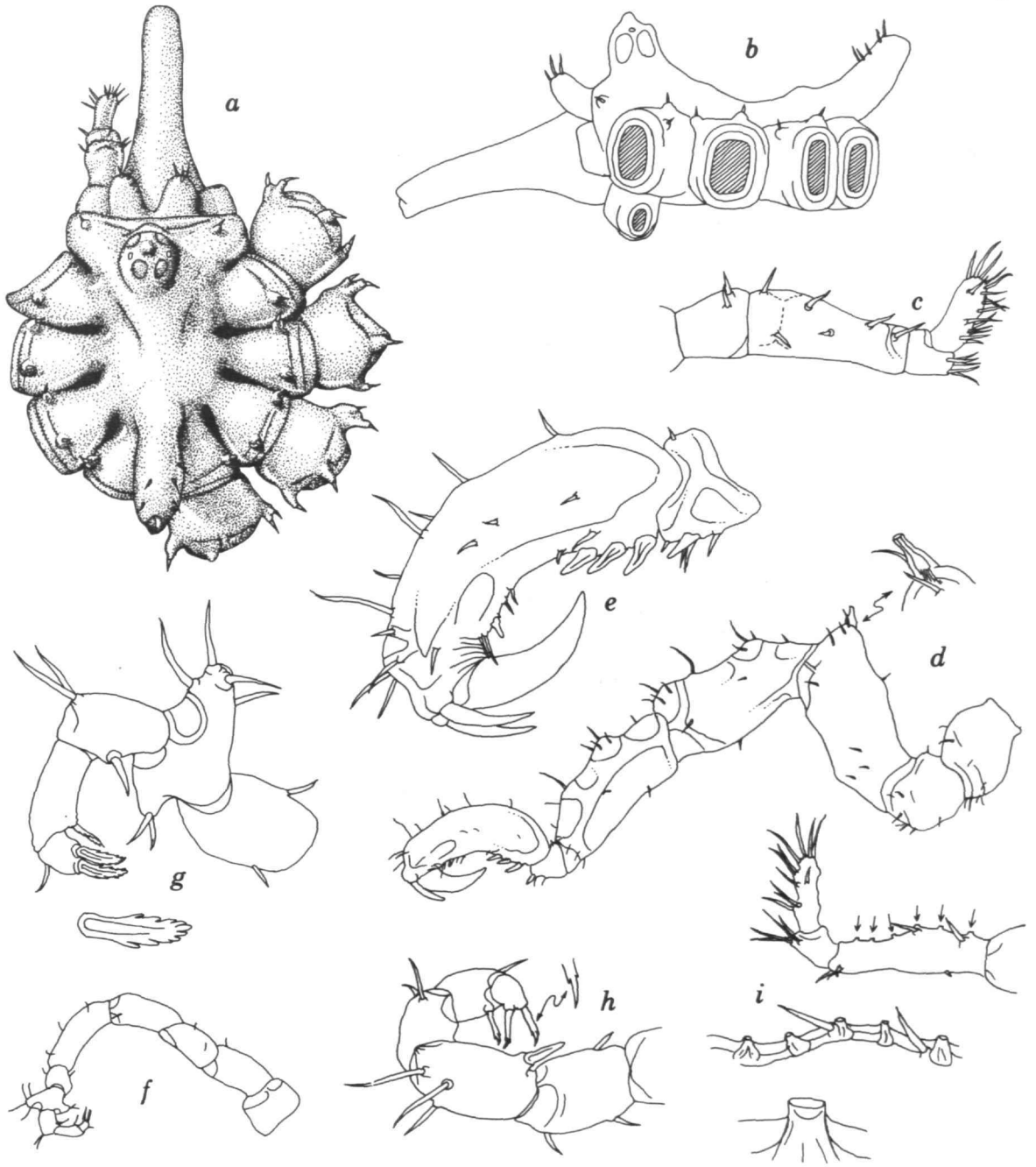

FIGURE 9.—*Tanystylum dowi*, new species, holotype, male: *a*, trunk, dorsal view; b, trunk, lateral view; *c*, palp; *d*, third leg, with enlargement of cement gland; *e*, terminal segments of third leg; *f*, oviger; *g*, terminal segments of oviger, with enlargement of one terminal spine. *Tanystylum geminum*, male: *h*, terminal segments of oviger, with enlargement of terminal spine tip; *i*, palp, with enlargement of dorsal row of glands (?) and a single pore.

palps, ovigers, and lateral process tubercles. The new species is superficially closest to *T. rehderi,* but its oviger has a median rectangular apophysis on the 7th segment while *T. rehderi* has a distal triangular apophysis on this oviger segment. The distal lateral process tubercles are larger and differently arranged on *T. rehderi.* It also has the 3rd palp segment, unlike the other species mentioned above, differentiated into a short proximal segment and the usual longer distal segment. All other species concerned here have the long 3rd segment with only a hint of its segmentation into 2 parts.

Males of the other 3 species all have a large rectangular apophysis on the oviger 7th segment, but the tubular proboscis is slightly different for each species. The proboscis of *T. tubirostrum* is narrower at its tip and has more of a ventral curve; that of *T. oculospinosum* is more robust at its base and is shorter than that of *T. dowi.* Those of *T. rehderi* and *T. calicirostrum* are much more concave on the sides and have a narrower tip. The ocular tubercle of *T. dowi* is taller and the eyes are larger than the other species except for perhaps *T. rehderi,* but the chelifore stump length and spination on the new species are different from any of the other species mentioned. *Tanystylum dowi* and *T. tubirostrum* share the uncommon character in this genus of having fully denticulate terminal segment oviger spines. In most species, the spines are plain or only denticulate at their tips.

Tanystylum geminum Stock

FIGURE 9*h, i*

Tanystylum geminum Stock, 1954a:120–122, fig. 26.— Bourdillon, 1955:600–601, pl. 3, figs. 5–7.—Stock, 1975a:983–984, fig. 10.—Stock, in press.

MATERIAL EXAMINED.—Mexico Caribbean: Quintana Roo, Smithsonian-Bredin Sta. 100–60 (1 ♀ ovig.).

Panama Caribbean: Galeta Island reef, Barnard, PAN–18 (2 ♂); NMNH Sta. 15 (1 ♂); STRI settling plate, 27 Aug 1973 (1 ♀ ovig.).

REMARKS.—These specimens agree in most respects with the type figures of Stock (1954a, fig. 26), except that the female abdomen of the specimen above is slightly longer than that of the type. The male abdomen, on the other hand, is shorter than that figured by Stock and does not reach the tips of the 1st coxae of the 4th lateral processes. The chelifore stumps of the Panamanian specimens are all somewhat longer than those of the type and the proboscis is more inflated proximally than shown.

The oviger denticulate spines have a single denticle on each side well back from the tip. A figure of the terminal segments of the male oviger is given here, along with an enlargement of one of the terminal spines.

In examining the palps of the male specimens, a series of tiny dorsal pores was discovered which have, beneath the integument, associated "glands" or bulbous roots (Figure 9*i*). These may be examples of the "palp glands" that are mentioned in some of the older literature on pycnogonids. Their function remains unknown.

Distribution of this species is extended from the eastern Antilles to the western end of the Caribbean in Panama.

Tanystylum intermedium Cole

Tanystylum intermedium Cole, 1904:278–280, pl. 21: figs. 7–9, pl. 22: figs. 1–7, pl. 23: figs. 1–3.—Stock, 1955:249 [literature]; 1975b:71–74, figs. 10–15.—Birkeland, et al., 1976:157.

Tanystylum panamum Hilton, 1942e:69–70.

Tanystylum intermedioides Hedgpeth, 1961:14–16, fig. 10.

Not *Tanystylum intermedium.*—Hedgpeth, 1940:86–87 [= *T. californicum*].

MATERIAL EXAMINED.—Mexico Pacific: Gulf of California, Misc. Sta., coll. Abbott, 21 May 1966 (1 ♂ with eggs). Gulf of Tehuantepec, *Velero III* Sta. 260–34 (1 ♂). Jalisco, *Velero III* Sta. 275–34 (9 ♂ with eggs, 1 ♀ ovig., 3 ♀, 5y, 1 larva).

Panama Pacific: Panama City, STRI *Abietinaria* 1 (1 ♀), 2 (4 ♂, 3 ♀), 3 (6 ♂, 4 ♀, 1y), 4 (1 ♂, 3 ♀), 6 (8 ♂, 1 ♀); NMNH Sta. 52–1 (1 ♂), 58–4 (1 ♂, 2 ♀, 7y), 92–1 (2 ♀, 1y), 92–4 (1 ♀); Misc. Sta., 28 Dec 1936 (1 ♂, 1 ♀; Hilton's types of *T. panamum*). Pacora Island, *Velero III* 245–34 (1 ♀ with eggs). Archipiélago de las Perlas, NMNH 41–1 (1 ♀ y).

REMARKS.—Hilton's types turned out to be this species with slightly larger lateral process tubercles. Cole (1904: pl. 22: fig. 4) figured palps with 7 segments, but Hilton's specimens and a number of others above have the 2 terminal segments coalesced, making a long 6th terminal segment. Palp segment counts are known to be variable with some *Tanystylum* species, so this is of no systematic value.

This species has had a southern California distribution in most earlier records, but there are un-

published specimens in the USNM collections from Humboldt County, northern California, to as far south as middle Peru. Stock's (1975b:71) record extends its distribution to northern Chile. The present records reveal *T. intermedium* to be rather common at the Pacific terminus of the Canal. It has not been found on the Caribbean side of the isthmus where the genus seems to be rather rare.

Tanystylum isthmiacum isthmiacum Stock

Tanystylum isthmiacum Stock, 1955:247–249, fig. 17.
Tanystylum isthmiacum isthmiacum.—Stock, 1966:390 [text]. fig. 2i, j; 1975b:74, figs. 16–21.

MATERIAL EXAMINED.—Mexico Pacific: Baja California, *Velero III* Sta. 283–34 (1 ♂, 2 ♀), 287–34 (1y).

Costa Rica Pacific: Guanacaste, Misc. Sta. 1566 (1 ♂, 4 ♀). Golfo de Nicoya, Misc. Sta. 1567 (1 ♂ with eggs, 3 ♀). Isla Cocos, Misc. Sta. 1634 (1 ♂).

Panama Pacific: Panama City, Barnard PAN–5 (1 ♂), PAN–16 (1y); NMNH Sta. 25–1 (4 ♂, 3 ♀, 6y), 25–4 (1y), 58–4 (9 ♂, 5 ♀, 10y), 92–1 (1 ♀); STRI *Abietinaria* 1 (10 ♂, 8 ♀), 2 (9 ♂, 8 ♀, 2y), 3 (18 ♂, 14 ♀), 4 (7 ♂, 12 ♀), 5 (1 ♀), 6 (11 ♂, 9 ♀, 3y, 1 larva), 8 (5 ♂, 3 ♀). Canal Zone, Barnard PAN–8 (2 ♂, 2 ♀, 5y, 2 larvae), PAN–10 (1 ♂, 1 ♀), PAN–17 (2 ♀, 7y, 5 larvae); NMNH Sta. 91 (2 ♀, 3y), 133–1 (1y), 166–1 (1 ♂); Glynn coll., Mar 1976 (♂ with eggs, 22 ♂, 17 ♀, 16y). Islas Perlas, NMNH Sta. 34 (4y). Isla Taboguilla, STRI settling plate, 2 Feb 1971 (1y), 21 Mar 1971 (7 ♂ with eggs, 3 ♂, 9 ♀, 1y, 7 larvae), 11 May 1971 (3 ♀, 2y), 24 Aug 1971 (1 ♂, 2 larvae), 8 Oct 1971 (1 ♀, 1y), 1 Dec 1971 (5 ♂, 3 ♀, 7y), 1 Feb 1972 (2 ♂, 3 ♀), 4 Apr 1972 (1 larva), 2 Jun 1972 (30 specimens), 8 Aug 1972 (25 specimens), 8 Sep 1972 (1 ♂, 1 ♀, 3y), 8 Nov 1972 (3 ♀, 1 larva), 10 Jan 1973 (1 ♂ with eggs, 4 ♀, 2y), 12 Apr 1973 (3 ♂, 2 ♀, 2y), 11 Jun 1973 (75 specimens), 15 Jan 1974 (1 ♂, 1 ♀, 2 larvae), 12 Feb 1974 (1 ♂ with eggs, 3y), 11 Mar 1974 (4 ♂ with eggs, 1 ♂, 7 ♀, 4y), 19 Apr 1974 (58 specimens), 21 May 1974 (1 ♂ with eggs, 1 ♂, 1 ♀, 3 larvae), 13 Jun 1974 (4 ♂, 4 ♀, 7y), STRI settling plate 23, 13 Jun 1974 (26 specimens), plate 78, 30 Aug 1974 (1 ♂ with eggs, 3 ♂, 5 ♀, 3y), plate 101, 30 Aug 1974 (2 ♂ with eggs, 3 ♀), plate 110, 1 Oct 1974 (3 ♂, 4 ♀), plate 63, 13 Nov 1974 (1 ♂ with eggs, 1 ♀, 1 larva), plate 79, 19 Dec 1974 (3y), plate 36, 19 Dec 1974 (1 ♀, 1 larva), 19 Feb 1975 (1 ♀), plate 57, 15 May 1975 (1y).

REMARKS.—Although this species might be divided into more than 2 subspecies, the wide variations among the specimens were not quite enough to warrant a split. There are several characters which do not vary in *T. isthmiacum isthmiacum*: the male 7th oviger segment with its lateral apophysis, although the 4th and 5th segments vary in length; the tarsus with a large spine matching the 3 propodal heel spines; the 5 strong palp segments, although several of these specimens have a weakly segmented extra segment placed between the 2nd and 3rd; a dorsodistal femoral cement gland in the male, which shows no variation; and denticulate oviger spines having 3 or 4 serrations per side.

The variations are most conspicuous in the tuberculation of laterial processes and 1st coxae, the size and shape of chelifore stumps, tuberculation of the ocular tubercle apex, and the length versus diameter of the proboscis. These variations could be used to form other subspecies except that there appears to be some small gradation between specimens in these characters. There is never enough variation, on the other hand, to close the separation between this subspecies and *T. i. difficile*. None of these specimens has as broad a proboscis as *difficile* nor does any have the gap between the 2 proximal heel spines and the 3rd or distal spine. The 6 palp segments are never as clearly defined in the above material as they are in the subspecies *difficile*.

This subspecies is quite close to Hilton's (1939: 33) *Tanystylum duospinum*, inadequately described from a juvenile having only ovigerous buds. The lateral processes and coxae tubercles fall well within the range of variation in *T. i. isthmiacum*, but the palp of Hilton's specimen has 6 distinct segments. Two propodal heel spines occur on all legs of *T. duospinum* examined (some missing), but there is a smaller 3rd spine distal to the 2 larger spines in his juvenile. The tarsus has a large spine as in *T. i. isthmiacum*.

The above records extend the Pacific distribution of this species from Salinas, Ecuador, to as far north as Isla Cedros, Mexico, and from the intertidal to at least 6 meters in depth. Isla Taboguilla, Panama is the type-locality.

Tanystylum isthmiacum difficile Stock

Tanystylum isthmiacum difficile Stock, 1966:389–391, fig. 2a–h.
Tanystylum isthmiacum ssp. *difficile.*—Fage and Stock, 1966: 318.—Stock, 1975a:984–985.—Stock, in press.

MATERIAL EXAMINED.—Panama Caribbean: Galeta Island. Misc. STRI Sta., 1 Dec 1972 (1 ♀).

REMARKS.—This single female specimen is only tentatively assigned to the above subspecies, primarily because of the differences in the proboscis configuration between this specimen and the other

described specimens. Stock (1975a:985) mentions the proboscis shape as being variable. In this specimen, the proboscis is broader at the tip and shorter than the type, although the bulbous proximal part agrees well with the type-specimen. The 6-segmented palp with a long curved terminal segment agrees very well with the type, and all propodi of this specimen have the peculiar separation between distal and middle heel spines not mentioned in the literature, but figured by Stock (1966, fig. 2h).

This Panamanian specimen has other slight differences worth enumerating: the ocular tubercle has 2 small tubercles in lateral view; the lateral process tubercles are larger than on the type; and there is a small setose tubercle on each anterior corner of the ocular segment.

This specimen also differs from its Pacific Panamanian neighbor, *T. i. isthmiacum* in the ways listed by Stock (1966:390) in creating the subspecies.

This record adds another distant habitat to the widely scattered distribution of this species. It has been found in the Cape Verde Islands off West Africa, in at least 3 places on the Brazilian coast, and now on the Caribbean coast of Panama. It lives from the subtidal down to at least 93 meters. It has not been found in intertidal habitats.

Tanystylum malpelensis, new species

FIGURE 10

MATERIAL EXAMINED.—Colombia Pacific: Isla Malpelo, Misc. STRI Sta., 2 Mar 1972 (1 ♂ with eggs, holotype, USNM 170499; 1 ♀, paratype, USNM 170500), 29 Feb 1972 (1 ♂, paratype, USNM 170501), 29 Feb–2 Mar 1972 (1y, paratype, USNM 170502).

DESCRIPTION.—Trunk circular, unsegmented, smooth. Lateral processes closely crowded, without tubercles or setae. Anterior of cephalic segment without lateral tubercles or setae. Ocular tubercle a low truncate cone with small apical knob. Eyes lightly pigmented. Abdomen short, oval, armed with 6 dorsal setae. Abdomen not extending as far as tips of fourth lateral processes. Proboscis barrel-shaped, constricted at both ends, arising from a truncated conical collar-like extension of the cephalic segment.

Chelifore stumps short, slightly spatule, extending to suture between proboscis and cephalic segment extension, armed with 2 or 3 dorsodistal setae.

Palps 4-segmented. Second segment inflated, equal in length to terminal segments, armed with single short dorsal seta and 2 short ventrodistal setae. Terminal segment thin, twice length of 3rd segment, both armed with ventral and distal setae longer than segment diameter.

Oviger 10-segmented. Male 7th segment without lateral apophysis. Each segment armed with several short setae and terminal 2 segments armed with 1 and 2 long spines respectively, spines slightly denticulate at tips. Female oviger reduced, terminal segments armed with single long spine each, denticulate at tips.

Legs short, typical of genus, setose dorsally. Tibiae with 3 dorsal swellings. Femoral cement gland a tiny short dorsodistal tube almost hidden among several long setae. Tarsus very short, armed with ventral spine and 4 setae. Propodus very robust, armed dorsally and laterally with many short setae. Heel with 3 large spines, sole with continuous field of short thick setae. Claw short, only two-fifths propodal length. Auxiliaries about three-fourths main claw length.

Coxa 1 of male with rectangular anterodistal tubercle armed with 2 setae, coxa with single dorsal and posterior setae. Female coxa 1 without anterior tubercle, but with single distal setae on anterior, dorsal, and posterior surfaces.

MEASUREMENTS OF HOLOTYPE (mm).—Trunk length (chelifore insertion to tip of the 4th lateral processes), 0.5; trunk width (across 2nd lateral processes), 0.49; abdomen length, 0.14; proboscis length, 0.33; third leg, coxa 1, 0.12; coxa 2, 0.17; coxa 3, 0.14; femur, 0.36; tibia 1, 0.35; tibia 2, 0.35; tarsus, 0.08; propodus, 0.29; claw, 0.12.

DISTRIBUTION.—Known only from Isla Malpelo, Colombia, in three locations, subtidally to 36 m.

ETYMOLOGY.—Named for its collecting locality.

REMARKS.—The anterior extension of the cephalic segment of this tiny new species is unique among the known species of *Tanystylum*. It effectively extends the proboscis by an additional quarter length, perhaps rendering it more effective in probing for food. It may be sufficiently flexible to evert and retract. The barrel shape of the proboscis is not unique among *Tanystylum* species, but the proximal constriction of the barrel is different from any known species.

This new species has several similarities to a group of closely related eastern Pacific species: *T.*

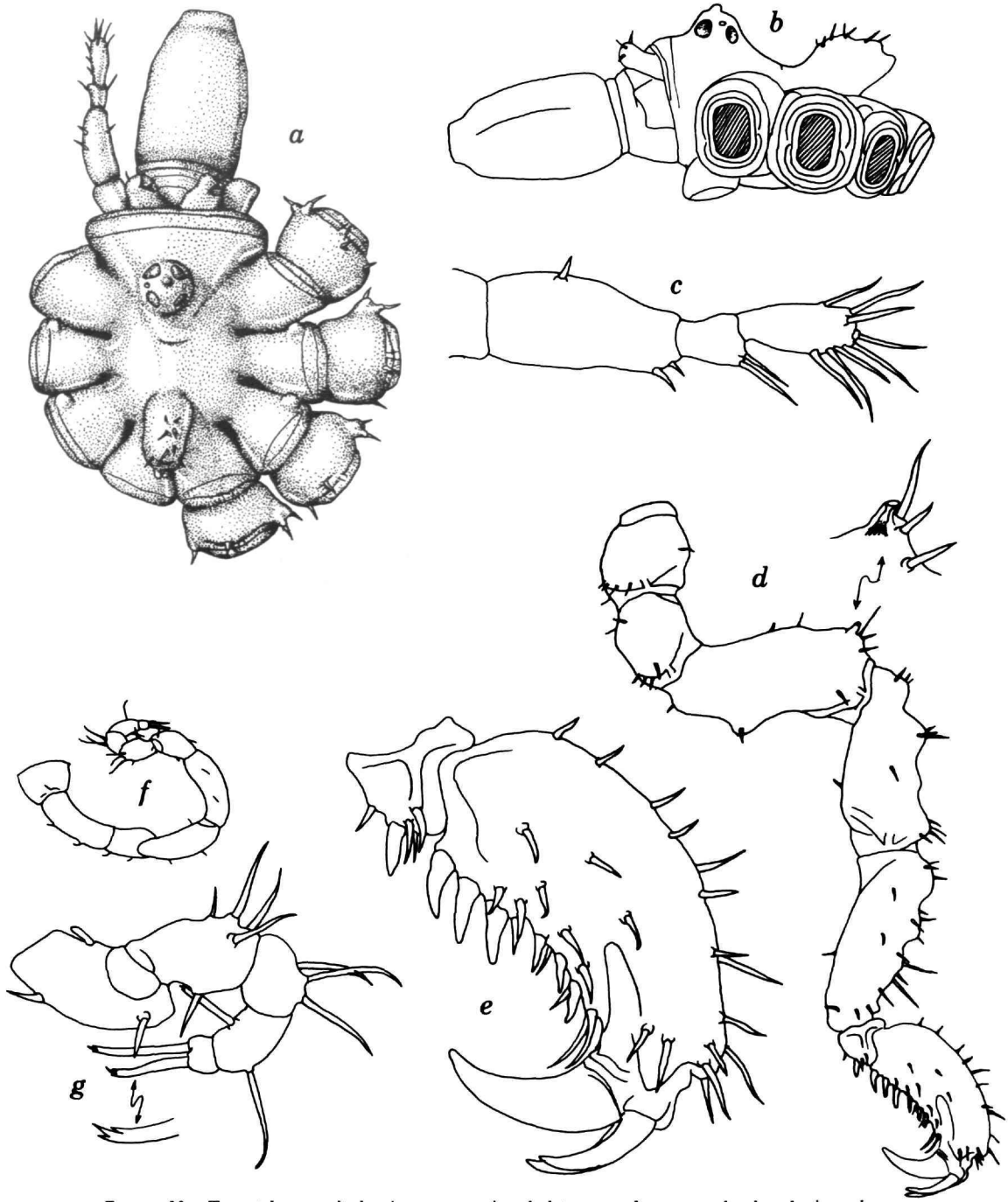

FIGURE 10.—*Tanystylum malpelensis*, new species, holotype, male: *a*, trunk, dorsal view; *b*, trunk, lateral view; *c*, palp; *d*, third leg, with enlargement of cement gland; *e*, terminal segments of third leg, enlarged; *f*, oviger; *g*, terminal segments of oviger, enlarged, with further enlargement of terminal spine tip.

nesiotes, T. distinctum, and *T. occidentalis.* All have a 4-segmented palp with a slightly inflated second segment, and abbreviated abdomen placed further toward the anterior of the trunk than usual, and a male oviger without a lateral apophysis on the seventh segment. Both *T. nesiotes* and *T. distinctum* have tubercles and setae distally on their lateral processes, while *T. malpelensis* and *T. occidentalis* share glabrous lateral processes without setae or tubercles. The proboscis of *T. occidentalis* is cylindrical with a bluntly rounded tip, while the barrel shape of *T. malpelensis* is unique.

The new species is apparently endemic to this tiny islet of volcanic rocks. It has not appeared in several collections of pycnogonids taken along the Pacific coast of Colombia. It is included in this report because it was collected by the STRI Panama Survey team, even though the type-locality lies outside Middle America. It was collected with *Anoplodactylus erectus,* a widely distributed species but the only other pycnogonid known from Isla Malpelo.

Tanystylum mexicanum, new species

FIGURE 11*a-h*

MATERIAL EXAMINED.—Mexico Pacific: Gulf of California, coll. Dawson, 18 Feb 1946 (1 ♀, holotype, USNM 170650). Baja California, *Velero III* Sta. 279-34 (1 ♀, paratype, USNM 170651). Guerrero, *Velero III* Sta. 264-34 (1y, paratype, USNM 170652).

DESCRIPTION.—Trunk circular, robust, unsegmented. Ocular segment extending beyond circular outline of trunk, armed with dorsolateral setae. Lateral processes crowded, armed with low dorsodistal tubercles with setae on anterior and posterior corners except for 1st lateral processes which have them only on posterior corners. Ocular tubercle a tall cone with a small tubercle about halfway along its posterior surface. Eyes moderately large, unpigmented, near base of ocular tubercle. Abdomen long, reaching distal end of 1st coxa of 4th legs, carried almost horizontally except for upcurved distal 3rd, armed with many short setae. Proboscis broadly egg-shaped in proximal two-thirds, tapering abruptly to tubular tip in distal 3rd. Tip curves ventrally.

Chelifore stumps extremely short, mostly hidden by anterior overhang of cephalic segment, armed with 2 or 3 short setae.

Palps 5-segmented. Third segment longest, armed with several proximal setae and distal fringe of lateral and ventral setae. Fourth segment shortest, with a small ventrodistal elongation bearing a fringe of setae. Terminal segment oval, armed with many ventral and distal setae, none longer than segment diameter.

Oviger (female) typical of genus. Fourth and 5th segments longest, 5th slightly longer than 4th. Terminal 3 segments each armed with 2 large fully denticulate spines having 5 or 6 serrations per side.

Legs robust, armed with groups of short setae on bosses and laterally. First coxa with bulbous dorsodistal tubercle bearing 3 short setae and small anterior and posterior tubercles with setae. Second and 3rd coxae inflated, without tubercles. Femur with a low boss dorsally and ventrally and a bulbous dorsodistal tubercle armed with 6 or 7 distal setae. Femur and tibia 1 equal in length, tibia 2 very slightly longer. Tarsus with single ventral spine surrounded by field of short setae. Propodus well curved, armed with 3 robust heel spines and a field of many short sole setae. Claw well curved, half as long as propodus. Auxiliary claws less than half main claw length.

MEASUREMENTS OF HOLOTYPE (mm).—Trunk length (chelifores to tip of 4th lateral processes), 1.2; trunk width (across 2nd lateral processes), 1.07; proboscis length, 0.89; abdomen length, 0.5; third leg, coxa 1, 0.25; coxa 2, 0.39; coxa 3, 0.39; femur, 1.03; tibia 1, 1.03; tibia 2, 1.07; tarsus, 0.17; propodus, 0.71; claw, 0.36.

DISTRIBUTION.—Known from the type-locality, Isla Patos, Sonora, in the Gulf of California, and from Bahía Santa Maria, Baja California, and Bahía Petatlán, Guerrero, Mexico. The holotype's collecting depth is unknown, but probably subtidal. The other recorded depths are 18 and 46 meters, respectively.

ETYMOLOGY.—The species is named for its country of origin.

REMARKS.—There are 4 closely related species of *Tanystylum* along this coast from Panama to California. They are, besides the new species, *T. tubirostrum, T. californicum,* and *T. calicirostrum.* This new species shares a distally tubular proboscis with the other 3 species and very reduced chelifore stumps as with the latter 2 species. The chelifore

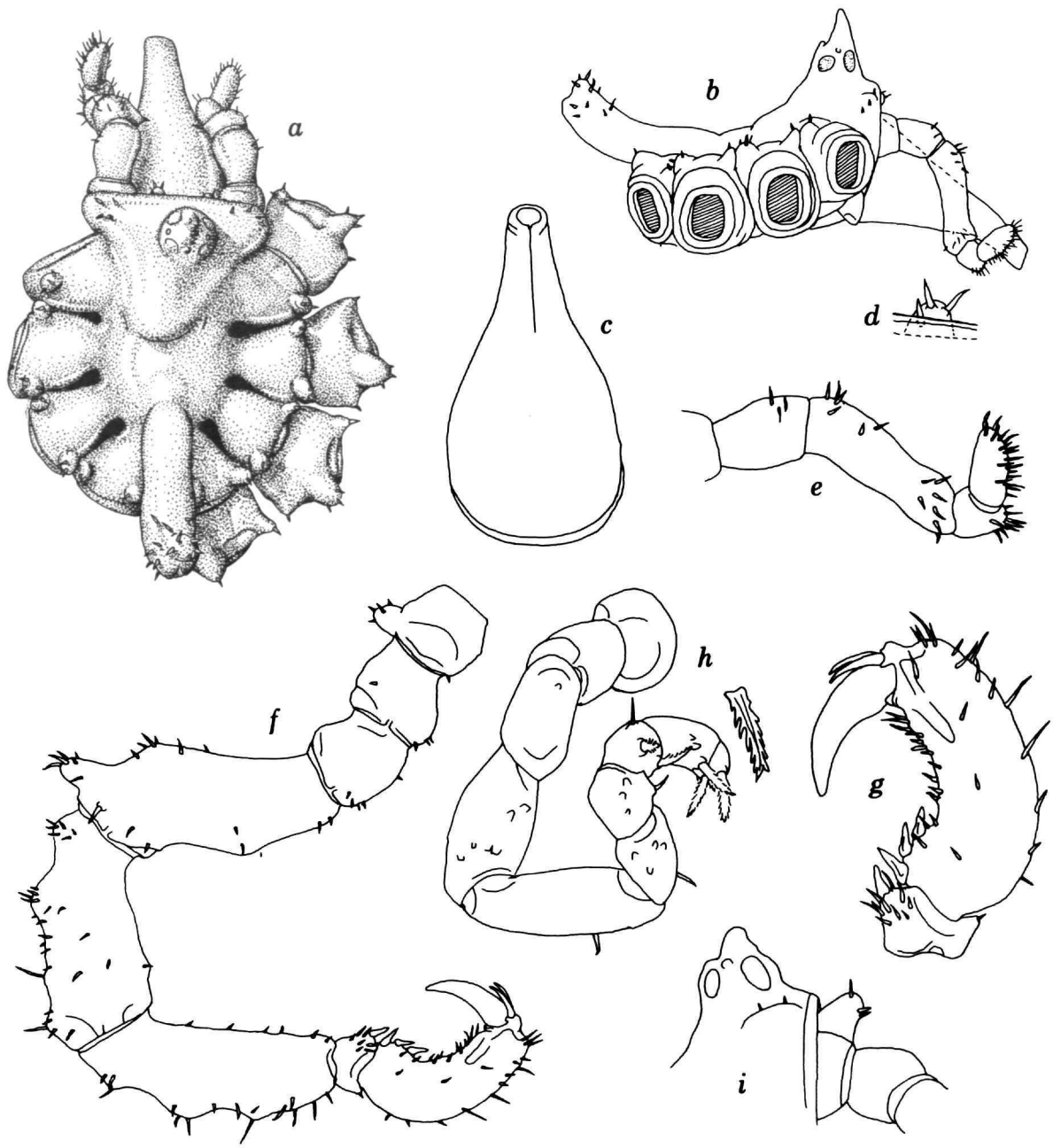

FIGURE 11.—*Tanystylum mexicanum,* new species, holotype, female: *a,* trunk, dorsal view; *b,* trunk, lateral view; *c,* proboscis, ventral view; *d,* enlargement of chelifore stump, dorsal view; *e,* palp; *f,* third leg; *g,* terminal segments of third leg; *h,* oviger, with enlargement of terminal spine. *Tanystylum californicum: i,* lateral view of trunk anterior showing chelifore stumps.

stumps of *T. californicum* are longer and extend slightly beyond the 1st palp segment (Figure 11*i*).

The differences in size among these species is the most notable trait under superficial examination. Although nearly the same size, *T. tubirostrum* and *T. calicirostrum* average 30 percent (from 20 to 40 percent) smaller than *T. mexicanum*; and *T. californicum* is approximately 10 to 20 percent larger than *T. mexicanum*.

None of these species have the tall conical ocular tubercle or the long distally upturned and heavily setose abdomen of *T. mexicanum*. The abdomen of *T. californicum* also has a distinctive basal hump, which is not found on any of the other 3 species. The proboscis of the new species has a more gradual taper distally than any of the other 3 species. A combination of the long abdomen, tall ocular cone, tapering proboscis, low lateral process tubercles, and large size of this species should serve to distinguish it from others along the Pacific coast of Middle America.

This new species has a widely scattered distribution on the Mexican coast, from outer Baja California and far north in the Gulf of California to as far south as Guerrero State, near Acapulco. This disparity in collecting localities is undoubtedly due to sporadic collecting along this geologically inhospitable coast rather than to any scarcity of the species. The fact that the species lives in the subtidal rather than intertidally would also contribute to its scarcity in collections.

Tanystylum oculospinosum Hilton

Tanystylum oculospinosum Hilton, 1942e:70.—Child and Hedgpeth, 1971:619–623, fig. 5

Tanystylum oculospinum [sic].—Stock, 1954a:122 [text]; 1955:248–249 [text]; 1966:390 [text].

MATERIAL EXAMINED.—Mexico Pacific: Baja California, Misc. Sta., 2 Sep 1938 (1 ♂, Hilton's holotype, USNM 81518); Barnard PAZ–18 (1 ♂, 1 ♀), PAZ–21 (1 ♀), PAZ–22 (1 ♀, 1y).

REMARKS.—Child and Hedgpeth (1971, fig. 5) illustrate a lower ocular tubercle than these specimens possess. Reexamination of the squashed type-specimen reveals that it has a taller ocular tubercle with appointed cone at its apex, in agreement with the La Paz specimens. These specimens agree with the type in most other characters, including the spination of the 5 palp segments. One of the La Paz female specimens has a taller hump at the abdomen base and the abdomen is carried more toward the horizontal than any of the others. There are also fewer sole spines on the La Paz specimens than on Galapagan specimens, but variation between insular and mainland specimens could account for these small differences. The proboscis of La Paz specimens is more inflated toward the tip than that of Galapagan specimens.

The distribution of *T. oculospinosum*, besides the Galapagos Islands, is extended from the northern coast of Baja California to its southern tip, and it continues to be known from the intertidal and subtidal.

Tanystylum tubirostrum Stock

Tanystylum tubirostre Stock, 1954a:117–120, figs. 24, 25.—Bourdillon, 1955:600, pl. 3: figs. 2–4.

Tanystylum tubirostrum.—Stock, 1975a:984.—Child, in prep.

MATERIAL EXAMINED.—Mexico Pacific: Gulf of Tehuantepec, *Velero III* 260–34 (1 ♂ with eggs, 1y).

Panama Pacific: Archipiélago de las Perlas, NMNH Sta. 38–1 (1 ♂ with eggs). Panama City, NMNH Sta. 25–1 (1 ♀, 3y); STRI *Abiëtinaria* 1 (1 ♀ ovig., 1 ♀), 3 (1 ♂, 4 ♀, 1y), 4 (1 ♂ with eggs), 8 (1 ♂ with eggs).

REMARKS.—These specimens differ from the type figures in the following respects: the proboscis is usually not as curved in its distal half; few of the palps show the hint of segmentation in the long 3rd segment; the dorsal lateral process tubercles are much smaller or missing, although the anterior lateral process tubercles are as shown; the oviger denticulate spines show fewer serrations; and the legs are slightly less robust. These specimens agree with the type in all other characters, including the large apophysis on the male 7th oviger segment.

This species is very closely related to *T. calicirostrum*, but there are no specimens showing a gradation of variation between the 2. In *T. calicirostrum*, the lateral processes and 1st coxae have tiny dorsodistal tubercles, unlike the large tubercles on the 1st coxae of *T. tubirostrum*. The palps of the 2 species are almost alike except that the 2nd segment of *T. calicirostrum* is a little longer. The long 3rd segment has an unarticulated and incomplete suture in both species, although it is not found in the above Pacific specimens. These differences are best seen by comparison of Figure 8 with Stock's figures 24 and 25 (Stock, 1954a).

The previous distribution records for *T. tubirostrum* were from the Caribbean and Bermuda. This is the first time it has been found on the Pacific side of Middle America, but as the distribution records in this report show, *T. tubirostrum* shares its Pacific habitats with at least 16 other pycnogonids found on both coasts of America.

Tanystylum species indeterminate

MATERIAL EXAMINED.—Panama Pacific: Canal Zone, NMNH Sta. 28–2 (1larva). Archipiélago de las Perlas, NMNH Sta. 32 (1 larva).

Panama Caribbean: Galeta Island, Barnard PAN–18 (1y).

REMARKS.—None of these specimens show sufficient characters for their determination.

Family NYMPHONIDAE

Genus *Nymphon* Fabricius, 1794

Key to the Middle American Species of *Nymphon*

1. Tarsus much longer than propodus; all appendages long, thin; chela fingers with many simple teeth; palp segments 2 and 3 equal, segments 4 and 5 equal (deep water species) ..... ***N. pixellae***
   Tarsus much shorter than propodus 2
2(1). Tarsus only about one-fourth length of propodus; neck and appendages short; chela fingers with 9 simple teeth; palp segments 2 and 3 equal, segment 5 longer than segment 4 ..... ***N. apheles,*** new species
   Tarsus about one-third to two-fifths length of propodus; neck and appendages long 3
3(2). Chela fingers with 28–32 simple teeth; without tubercles; 3rd palp segment longer than 4th and 5th which are subsequal in length; propodal claw and auxiliaries without rugosities ..... ***N. lituus,*** new species
   Chela fingers with 15–19 bifid teeth; small tubercles above chelifore insertion; 3rd and 5th palp segments subequal, 4th very short; propodol claws with tiny endal rugosities .... ***N. floridanum***

Nymphon apheles, new species

FIGURE 12

MATERIAL EXAMINED.—Panama Pacific: Panama City, Barnard PAN–16 (1 ♀, holotype, USNM 169204).

DESCRIPTION.—A small robust species with short appendages. Trunk fully segmented. Lateral processes little longer than their diameters, separated by distance equal to their diameters or less, unadorned. Neck short, broad, with ocular tubercle at neck base. Ovigers implanted directly beneath ocular tubercle and touching anterior of 1st lateral processes. Ocular tubercle a truncated cone no taller than basal diameter, capped by a pair of small lateral tubercles. Eyes large, unpigmented. Abdomen cylindrical, tapering at tip, carried at 45° angle, slightly longer than 4th lateral processes, armed with 1 or 2 short setae.

Proboscis cylindrical, short, rounded distally to small mouth.

Chelifores short, robust. Scape less than 3 times longer than its minimum diameter, armed distally with several setae. Chela palm short, armed dorsally with 4 setae. Fingers slightly longer than palm, both armed with 9 fairly long thin teeth. Finger tips cross when fingers closed.

Palps short. Second segment longest, only slightly longer than 3rd. Fourth segment three-fifths length of 3rd, terminal segment three-fourths length of 3rd. Second, 3rd, and 4th armed ventrodistally with 2 short setae, 5th armed with small distal fringe of setae.

Oviger segments short, possibly not fully developed in type-specimen. Fourth segment slightly shorter than 5th, the longest, which is only little more than 4 times longer than its diameter. Terminal segments armed with denticulate spines having either 2 or 3 denticulations per side, in the formula 5:5:2:3. Terminal segment with claw as long as segment, armed with 3 endal serrations.

Legs short. Sexual pores not evident on 2nd coxae. Second tibia the longest segment, 1st tibia little longer than femur. Femur and tibiae armed

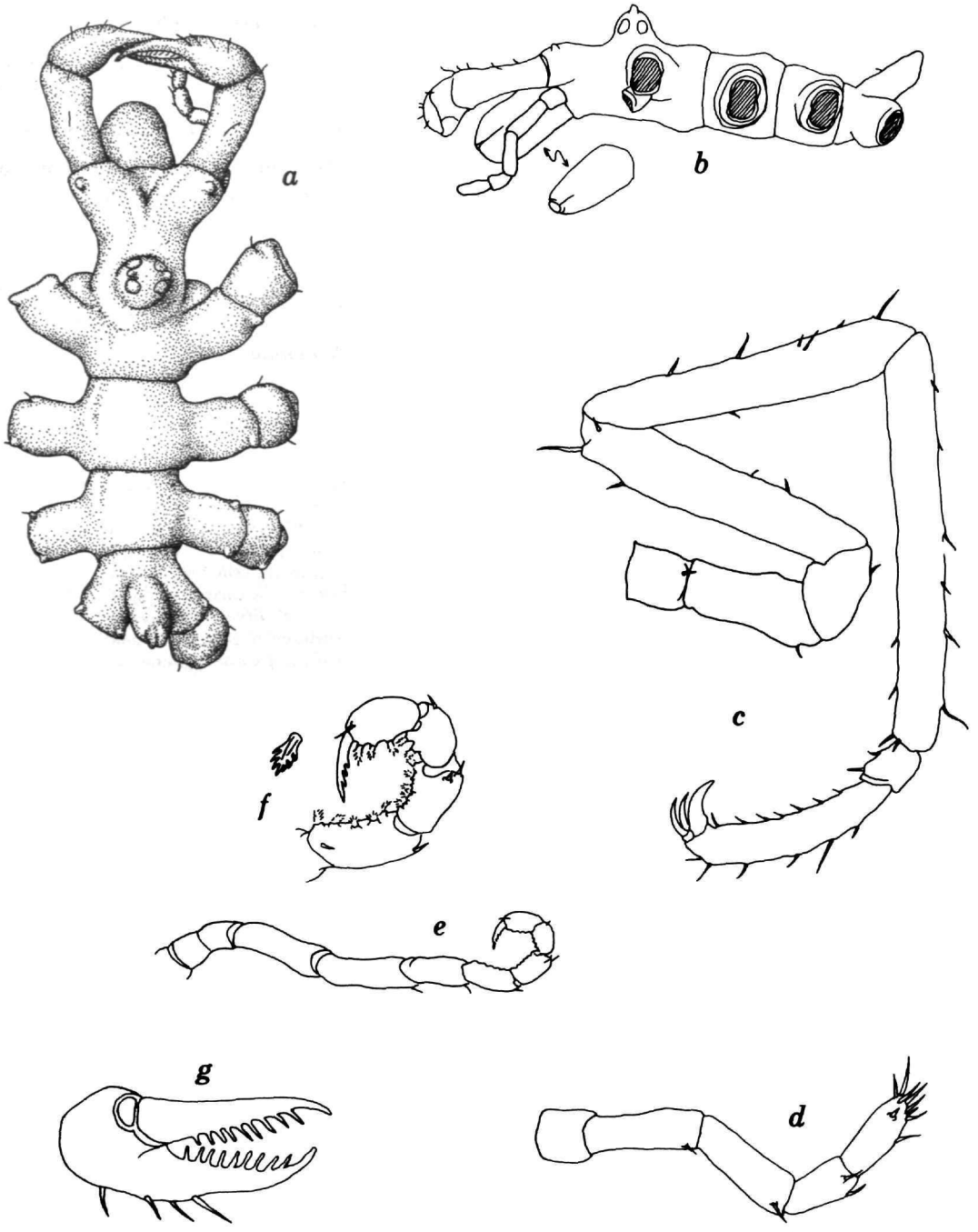

FIGURE 12.—*Nymphon apheles*, new species, holotype, female: *a*, trunk, dorsal view; *b*, trunk, lateral view, with inset of proboscis in ventral view; *c*, third leg; *d*, palp; *e*, oviger; *f*, terminal segments of oviger, with detail of one spine; *g*, chela.

with a dorsodistal seta slightly shorter than segment diameter, and several short setae. Tarsus short, slightly less than one-fourth propodal length. Propodus slightly curved, without heel or larger heel spines, armed with from 4 to 7 short sole setae and several longer dorsal setae. Claw short, robust, strongly curved. Auxiliary claws three-fifths main claw length.

MEASUREMENTS OF HOLOTYPE (mm).—Trunk length (chelifore insertion to tip of 4th lateral processes), 0.98; trunk width (across 2nd lateral processes), 0.52; proboscis length, 0.26; abdomen length, 0.18; third leg, coxa 1, 0.12; coxa 2, 0.31; coxa 3, 0.2; femur, 0.64; tibia 1, 0.69; tibia 2, 0.86; tarsus, 0.13; propodus, 0.44; claw, 0.13.

DISTRIBUTION.—Known only from the type-locality, Punta Paitilla, Panama City, from the intertidal zone.

ETYMOLOGY.—From Greek, meaning "smooth" or "simple." This refers to the lack of any obvious distinguishing characters of this species.

REMARKS.—Within this giant *Nymphon* genus of about 180 species, relatively few are found in tropical littoral habitats. Most are from deeper or cooler waters. This new species is the first small robust *Nymphon* to be found on the tropical American Pacific coast. *Nymphon lituus* (p. 38) is another tropical Pacific coast species, but it is larger and quite tenuous in comparison with *N. apheles*.

Along the tropical Atlantic shores of North America, there are 2 species, *N. aemulum* (littoral) and *N. floridanum* (sublittoral) that show some similarities to this new species. Assuming that this single specimen is a subadult female, which would undergo at least one more molt to become a breeding adult, the body and appendages would undoubtedly become somewhat larger and probably have slightly different length ratios among the segments. It would then be quite comparable in certain characters to *N. aemulum,* a species from Florida and the Antilles. Of the 2 related species *N. apheles* is closer to *N. aemulum* than to *N. floridanum*. The first 2 species have a short neck, robust chelifores, similar chelae and finger teeth shape and numbers, and similar ovigers. The differences are found in the oviger spines, which have many more serrations in *N. aemulum,* and in the oviger claw, which has a field of minute rugosities instead of the few large teeth found in *N. apheles*. The legs of the 2 species are quite different, not only in length ratios of the major segments, but in the very setose appearance of *N. aemulum* in comparison with the very few setae on the legs of *N. apheles*.

The palp of *N. aemulum* has a much longer second segment and much shorter fourth segment, and all three claws on the propodus bear a field of rugosities of the same nature as those on the oviger claw. The propodal claws of *N. apheles* are without adornment.

Any other similarities or differences between *N. apheles* and other tropical shallow-water species will have to await the future collection of fully adult males and females from this faunistically very rich little Paitilla area in Panama City.

Nymphon floridanum Hedgpeth

Nymphon floridanum Hedgpeth, 1948:196–199, fig. 17 [long-necked form only].—Stock, 1955:215, fig. 1a [long-necked form only].—Kraeuter, 1973:494.—Stock, 1975a:994—998, figs. 14–15.—Krapp and Kraeuter, 1976:336–337.—Child, in prep.

MATERIAL EXAMINED.—Panama Caribbean: Galeta Island reef, STR settling plate, 24 Jun 1971 (ly); Misc. STRI Sta., 16 Apr 1971 (1 ♂, 2 ♀).

REMARKS.—The above adults are the typical long-necked form and agree in all respects with the reevaluation of this species given by Stock (1975a:994–998). None of the above material was collected in the intertidal, which serves to confirm the many capture records in placing this species below the low tide line and in the sublittoral. Its known depth range is from as little as 1 m to almost 60 m. Most depth records are in the sublittoral.

Its distribution pattern, as understood now, is from Georgia and Florida in the United States, the Gulf of Mexico, from Panama to the Antilles in the Caribbean, and as far south as French Guiana.

The 3 adult specimens listed above were kept alive by me in the STRI laboratory at Galetta Island for several days. All 3 had light to medium brown coloration with dark green rings distally on the 1st and 2nd tibiae. During periods of extended observation, the specimens all vigorously and continually cleaned their legs for periods of from 15 to 20 minutes with the strigili of both ovigers. The strigilis was clasped around the proximal coxae and stroked out along the leg to the propodus. When not cleaning themselves, the specimens both walked and swam with slow undulating leg motions.

Nymphon lituus, new species

FIGURE 13

MATERIAL EXAMINED.—Mexico Pacific: Gulf of California, Misc. Sta., Brusca and Joerger coll., 28 Jun 1972 (1 ♀, holotype, USNM 169205, 1 ♀, paratype, USNM 169206). Baja California, coll. Brusca, 18 Mar 1974 (1 ♀, 1 ♂, paratypes, USNM 169208); Misc. Sta., UA72-12 (2 ♀, paratypes, USNM 169207).

Panama Pacific: Panama City, NMNH Sta. 25-1 (1 ♀, paratype, USNM 169209).

DESCRIPTION.—Trunk slender, completely segmented. Lateral processes separated by one and one-half to 2 times their diameters, unarmed. Neck moderately long, about 3 times its diameter, cylindrical, with anteriorly curved low tubercle over insertion of chelifores. Ocular tubercle at anterior of 1st lateral processes, cylindrical, capped with a small cone having 2 small lateral papillae. Eyes large, well pigmented. Abdomen as long as posterior lateral processes, carried at about 30° angle.

Proboscis cylindrical, lips rather flat.

Chelifores long, slender. Scape cylindrical, slightly flaring distally. Chela fingers slender, longer than inflated rectangular palm. Immovable finger with tuft of several setae over base, armed with 28 or 29 thin teeth. Movable finger without setae, armed with about 33 thin teeth. Fingertips moderately curved, overlap when closed.

Palps with 2nd segment slightly longer than 3rd and 4th together. Third and 5th segments subequal, 4th slightly shorter. Each of terminal 3 segments armed with ventral and distal setae.

Oviger (female) insertion touching anterior of 1st lateral processes. Fourth and 5th segments subequal, 6th slightly club-shaped. Terminal 4 segments armed with denticulate spines arranged in the formula 15:10:10:11. Denticulate spines with 5 or 6 lateral serrations. Terminal claw long, with 7 thin endal serrations.

Legs long, slender, armed with very few setae. Femur and tibia 1 nearly equal in length, tibia 2 about three-tenths longer. Genital pores on coxae 2 of all legs on ventrodistal swelling. Propodus two and one-half times length of tarsus. Tarsus with few dorsal setae, a row of 12 short ventral spines and 1 robust ventrodistal spine. Propodus moderately curved with several short and long setae dorsally. Sole armed with 20 to 22 short spines. Main claw short, less than one-fourth propodus length. Auxiliary claws four-fifths main claw length.

MEASUREMENTS OF HOLOTYPE (mm).—Trunk length (chelifore insertion to tip of 4th lateral processes), 1.26; trunk width (across 2nd lateral processes), 0.55; proboscis length, 0.29; abdomen length, 0.16; third leg, coxa 1, 0.16; coxa 2, 0.45; coxa 3, 0.26; femur, 1.19; tibia 1, 1.28; tibia 2, 1.62; tarsus, 0.18; propodus, 0.41; claw, 0.09.

DISTRIBUTION.—Known from the type-locality, Puerto Peñasco, Sonora, Mexico, with other material from the Gulf of California and Punta Paitilla, Panama City. The depths range from intertidal to 9 m.

ETYMOLOGY.—The proposed name is from the Latin and refers to a curved staff, in reference to the small curved tubercles over the insertion of each chelifore.

REMARKS.—There are 2 Pacific coast *Nymphon*'s known that show similarities to *N. lituus: N. pixellae* and *N. heterodenticulatum*. The few similarities to *N. pixellae* concern the chelifores, proboscis, and the general shape of the trunk, all of which resemble superficially those of the new species. The differences are that *N. pixellae* is twice the size of *N. lituus*, the lateral processes are much longer, the tarsus is longer than the propodus, and length ratios of most leg, palp, and oviger segments are different.

Nymphon lituus is much closer to *N. heterodenticulatum*, a southern California species. Again, the latter species belongs to the longitarsal group of species with auxiliary claws rather than the brevitarsal group, to which *N. lituus* belongs. The trunk, proboscis, chelifores, oviger, and palp segment ratios are very similar to *N. lituus*. The principle differences are that *N. lituus* has a low rounded conical ocular tubercle rather than one with a high peaked shape, a shorter palp in total length, shorter lateral processes, very different denticulations of the oviger spines, and a much shorter tarsus and main claw.

There are variations among the several females available. The male remains unknown. The adult female from Panama has only tiny tubercles over the chelifore insertion rather than the larger curved tubercles on the specimens taken farther north. The palp segments are also slightly longer in this specimen, but the other segments, including the tarsus, propodus, and claws are almost identical

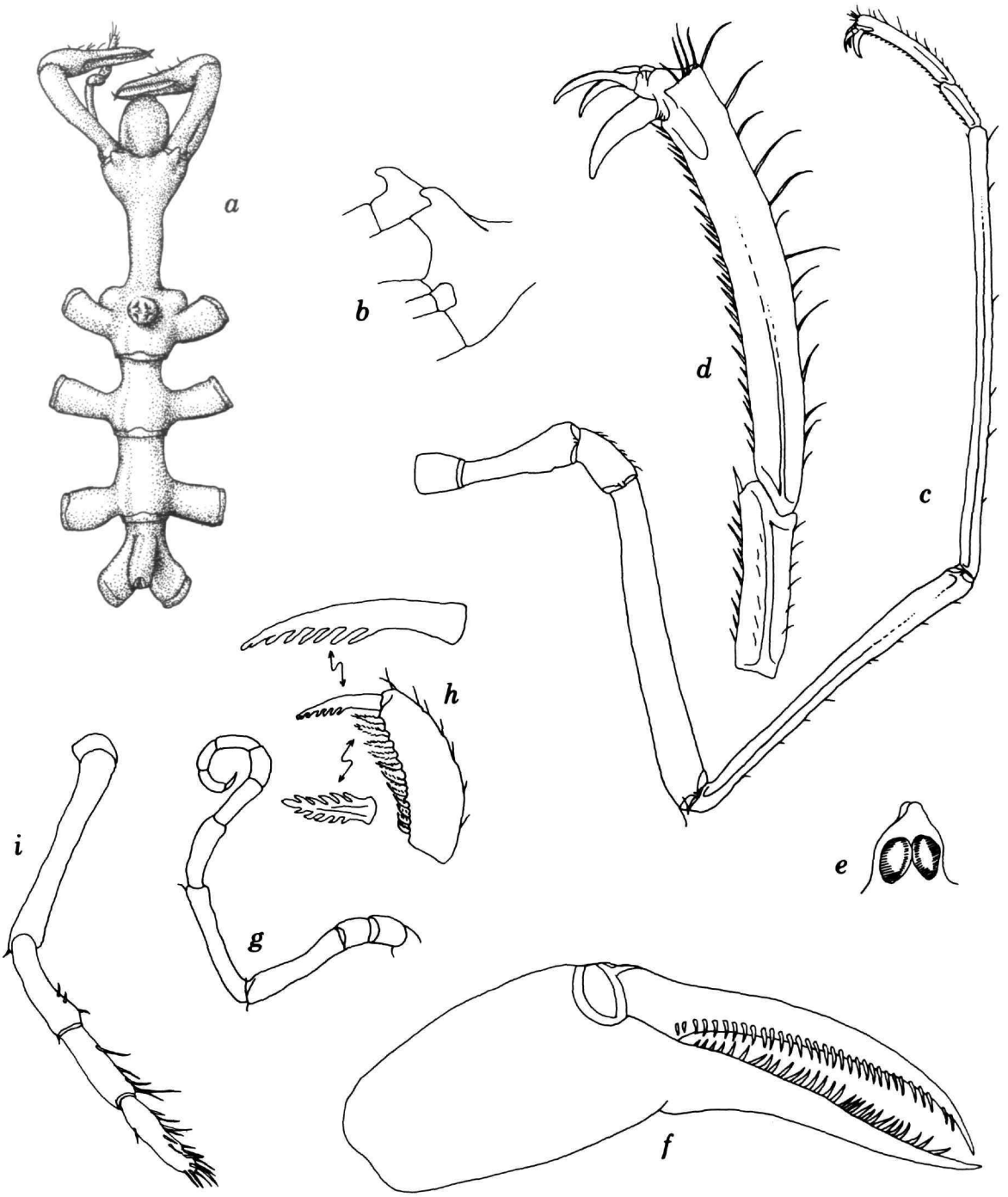

FIGURE 13.—*Nymphon lituus*, new species, holotype, female: *a*, trunk, dorsal view; *b*, anterior of cephalic segment showing curved tubercles over chelifore insertion; *c*, third leg; *d*, terminal segments of third leg; *e*, ocular tubercle, lateral view; *f*, chela; *g*, oviger; *h*, terminal segments of oviger, showing enlargement of spine and terminal claw; *i*, palp.

with the Gulf of California specimens. There is variation among all of the specimens in denticulated spine counts on the ovigers. The proximal segment count varies from 15 to 17 spines and the other terminal segments vary from 10 to 13, 10 to 12, and 10 to 12, respectively. The oviger terminal claw has either 7 or 8 thin teeth.

This new species is associated with floating *Sargassum* in its northern range, but it was taken among hydroids and bryozoans on rocks in Panama. It was not found at other collecting sites between the Gulf of California and Panama City.

Nymphon pixellae Scott

Nymphon pixellae Scott, 1912:206–209, pl. 7: figs. 1–11.—Hedgpeth, 1941:255 [key], pls. 9, 10.—Hilton, 1942a:4; 1942b:279–280, pl. 35.—Hedgpeth, 1949:246 [key].—Henry, 1953:17–18, figs. 1–5.—Stock, 1955:216–217, fig. 1b–d.—Turpaeva, 1973:178–179.

Nymphon solitarium Exline, 1936:414–416, fig. 33a–d.—Hedgpeth, 1939:458–459.

Nymphon variatum Hilton, 1942a:4.—Hedgpeth, 1949:271, fig. 34b.

MATERIAL EXAMINED.—Mexico Pacific: Gulf of California, Misc. Sta. 83–H3 (10 specimens); 1011 (2 ♂ with eggs, 1 ♀).

REMARKS.—I am not convinced that this species is found in the Gulf of California or in any Mexican waters. The data for both collections above is questionable. Other information with the Scripps specimens seems to place their origin at about 90 km out in the Sonora desert rather than in the vastly cooler Gulf waters. Hilton (1942a:4) stated that it is a "common species . . . into the Gulf of California," but his species identifications are found to be slightly less than half correct. I have seen none of his identified specimens of this species. I concur with Hedgpeth (1949:271) that Hilton's *N. variatum* is probably this species.

These 13 specimens all agree very well with the various descriptions of *N. pixellae*, but with the doubtful locations it would be best to await further Gulf collections with fully acceptable data before declaring this species a bona fide Gulf resident.

Family CALLIPALLENIDAE

Key to the Middle American Genera

1. Palps lacking or represented by low unsegmented knobs 2
   Palps of 4 segments, small, in ♂ only; ovigers 9-segmented with denticulate spines on strong strigilis; without auxiliary claws ..... ***Anoropallene***
2(1). Palps represented by low knobs; chela fingers small, at right angles to palm; ovigers 10-segmented, with feeble strigilis having many simple spines; auxiliary claws present (size of animal large) ..... ***Pallenopsis***
   Palps entirely lacking 3
3(2). Chelifores 3-segmented, not as long as proboscis; body and legs robust, *Pycnogonum*-like, with low dorsal trunk tubercles; oviger 8-segmented, without strigilis, with small terminal claw; propodus without auxiliary claws ..... ***Pigrogromitus***
   Chelifores 2-segmented, chela crossed in front of short proboscis; body and legs slender, well separated; oviger 10-segmented, with denticulate spines on well-formed strigilis, without terminal claw; propodus with auxiliaries ..... ***Callipallene***

Genus *Anoropallene* Stock, 1956

Anoropallene palpida (Hilton)

FIGURE 3*d*, *e*

Palene [sic] *palpida* Hilton, 1939:30.

Oropallene palpida.—Hilton, 1942c:38.

Oropallene heterodenta Hilton, 1942c:38.

Oropallene (?) spec.—Stock, 1954b:29–31, fig. 11.

Anoropallene palpida.—Stock, 1956:46.

Anoropallene heterodenta.—Stock, 1956:46.

Anoropallene crenispina Stock, 1956:46–48, fig. 7.

MATERIAL EXAMINED.—California Pacific: Santa Monica, Misc. Sta. 826–38, (1 ♂, holotype of *P. palpida* Hilton, USNM 79430).

Mexico Pacific: Baja California, *Velero III*, 126–33 (1 ♂, holotype of *O. heterodenta* Hilton, USNM 79429); coll. Brusca, 14 Mar 1974 (1 ♀ ovig.). Gulf of California, coll. Walker, 9 Feb 1952 (1 ♀); coll. de la Cruz, 12 Oct 1969 (1 ♂ with eggs, 1 ♀). Oaxaca State, coll. Dawson, 6 Apr 1959 (1 ♀, in A. Hancock Foundation collections).

Panama Pacific: Panama City, NMNH Sta. 52–2 (5 ♂ with eggs and larvae), 84–C (3 ♂ with eggs, 5 ♀, 19y), 162–3 (1 ♂ with eggs), 180–1 to 5 (3 ♂ with eggs, 4 ♂, 16 ♀, 27y, plus 59

specimens many ♂ with eggs), 181–2 to 5 (4 ♂ with eggs, 1 ♂, 8 ♀, 10y). Canal Zone, NMNH Sta. 182–1 (2y), 183–2 (1 larva).

REMARKS.—Hilton's types agree in most respects with Stock's (1956) figure 7 of *A. crenispina,* even to the crenulated propodal heel spines and the chela denticulation. The Panama specimens show some insignificant variation, particularly in the denticulate oviger spine count and the number of setae on the appendages. This would be expected among a large suite of specimens.

The B. W. Walker specimen has an abnormality which is illustrated in Figure 3*d*. The chelifores appear to have been lost and regenerated near their proximal ends and have grown back with constrictions which must have rendered ineffective the longitudinal musculature.

The femoral cement glands have not been illustrated previously. Examination of males in the above collection reveals the number of cement gland tubes to be variable. There are usually from 8 to 11 small tubes in a single row along most of the ventral surface of the femur (Figure 3*e*). They could be confused easily with spines as they look like a row of broken off spines or setae, but examination under high magnification shows each to be a hollow tube. The specimen from NMNH station 84-C has many more cement gland tubes than normal. It has from 27 to 31 tubes on each femur, and the legs are more setose than usual.

Hilton's type-locality of *P. palpida* appears to mark the northern limits of its distribution along the Pacific coast. Stock's description (1956:46–48) was for a specimen from the Guatemala coast. From the other localities in this collection, it appears to occur rather commonly in the shallows as far south as Panama, and seems to prefer mud bottoms. The collection from NMNH station 180–1 presents an enigma. All 109 specimens were taken on a smooth intertidal mud bottom lacking in any other visible epifauna. The substrate contained polychaetes and a few isopods, but none of the usual sessile fauna previously considered as food for pycnogonids. From this scant evidence, this species would appear to be an organic detritus feeder rather than the more usual carnivorous feeder.

Genus *Callipallene* Flynn, 1929

Key to the Middle American Species of *Callipallene*

1. Propodal heel spines crenulated; auxiliaries and main claw less than half propodal length; strigilis denticulate spines similar in shape 2
   Propodal heel spines (3) smooth; auxiliaries and main claw half propodal length, auxiliaries with 2–4 proximal teeth; strigilis denticulate spines dimorphic ..... ***C. panamensis,*** new species

2(1). Chela fingers with about 15 unevenly spaced teeth; propodal heel with 4 spines; distal leg segments only lightly setose; neck as long as or longer than its width ..... ***C. emaciata***
   Chela fingers with up to 9 evenly spaced teeth; propodal heel with 5 spines; distal leg segments very setose; neck shorter than its width ..... ***C. solicitatus,*** new species

Callipallene emaciata (Dohrn)

Pallene emaciata Dohrn, 1881:193–196, pl. 14: fig. 10–21.
Callipallene emaciata emaciata.—Stock, 1952a:8 [literature]; 1958:137.
Callipallene emaciata.—Arnaud, 1974:175, table 2.—Stock, 1975a:1011.—Arnaud, 1976:70, 71, table 1.—Child, in prep.

MATERIAL EXAMINED.—Mexico Caribbean: Quintana Roo, Smithsonian-Bredin 83–60 (2 ♀ ovig.).

Panama Caribbean: Galeta Island reef, Barnard PAN–7 (1 ♀ ovig.); STRI *Acanthophora* 12 (1 ♂ with eggs, 1 ♀ ovig.); NMNH Sta. 1–5 (1 ♀ ovig.). Golfo de San Blas, NMNH Sta. 116–1 (1 ♂), 119–5 (1y).

REMARKS.—These specimens all have the characteristic short neck, low ocular tubercle and abdomen, and completely segmented trunk of *C. emaciata*. They also have characters rarely mentioned in the extensive literature on this species. The tips of the major heel and tarsus spines are all markedly crenulated on these Panamanian specimens, as well as other specimens examined from Europe, Florida, and Belize. This character is not unique to *C. emaciata,* but is shared by some *C. brevirostris* specimens from New England. The 6 New England specimens examined for this character have very slightly crenulated spines, but some lack any crenulations. Heel spines of 3 specimens examined from Europe show no crenulations.

Another character rarely mentioned is the pres-

ence of a field of rugosities or serrations ventrally on the auxiliary claws, such as are found on some other *Callipallene* species. Dohrn (1881, pl. 14: fig. 3) figures large serrate teeth on the auxiliaries of *C. phantoma,* as does Stock (1952a, fig. 24). The serrations on the claws of Panamanian specimens of *C. emaciata* are very tiny, many in number, and form 2 rows, which converge to a point about three-fifths of the distance toward the tip of the claw. The main claw of this species as well as that of all other species examined never bears serrations. Examination of a few European and Florida specimens of *C. emaciata* shows this character to be consistent. The auxiliary claws of *C. brevirostris* specimens from New England reveal that some, but not all, have these serrations and they extend for only half the claw length or less.

The European specimens of *C. brevirostris* examined for comparison show all smooth claws with no serrations. The variation among both crenulations and serrations with these 3 species may have scant taxonomic importance, but it may be of some value when used in conjunction with the more commonly accepted characters of neck length, propodus shape, claw length ratios, and lateral process size and separation in differentiating these difficult species.

These records extend the known range of *C. emaciata* to the southwestern Caribbean from its previously known distribution from Belize, Florida, and the eastern Caribbean to Guyana. It is also found commonly in many European locations.

Callipallene panamensis, new species

FIGURE 14

MATERIAL EXAMINED.—Panama Pacific: Canal Zone, NMNH Sta. 183–1 (1 ♂ with eggs, holotype, USNM 169369; 1 ♀, paratype, USNM 169370); 183–2 (1 ♀ ovig., paratype, USNM 169371), 161–3 (1y, 1 larvae, paratypes, USNM 169372), 255 (7 ♂ with eggs and larvae, 1 ♀ ovig., paratypes, USNM 171223).

DESCRIPTION.—Trunk completely segmented. Lateral process molt sutures well delineated, lightly pigmented. Lateral processes glabrous, separated by slightly less than their diameters, length of each subequal to trunk diameter. Neck slightly longer than its diameter. Ocular tubercle broad and short, without tubercle at apex. Eyes very large, slightly pigmented. Abdomen a short truncated cone little longer than ocular tubercle.

Proboscis short, with ventrodistal bulges.

Chelifore scape short, armed with few distal setae. Chelae (of female paratype—those of male holotype damaged) as long or longer than scape, fingers little longer than palm, which is distally ringed with setae. Immovable finger straight, armed with 7 sharp triangular teeth. Movable finger slightly curved, armed with 11 or 12 low blunt triangular teeth smaller than those on immovable finger.

Oviger of typical shape with large distal apophysis on fifth segment. Compound spines of terminal 4 segments dimorphic; proximal spines of usual oval shape with fringe of tiny denticulations, distal spine on each segment having large denticulations distally and a proximal fringe of tiny denticulations. Denticulate spines arranged in the formula 7:7:7:7.

Legs moderately long, armed with few setae proximally and increasing numbers of short setae toward distal ends. Femur the longest segment. Femoral cement glands not found. Tarsus extremely short, without ventral spine. Propodus slender, curved, heel armed with 3 strong spines (4 in ♀) and sole with 10 to 12 shorter curved spines. Main claw strongly curved, over half propodal length. Auxiliary claws little shorter than main claw, armed with 2 or 3 spine-like teeth on inner margin at base. Spines as long or longer than claw diameter.

MEASUREMENTS OF HOLOTYPE (mm).—Trunk length (chelifore insertion to tip of 4th lateral processes), 1.28; trunk width (across 2nd lateral processes), 0.67; proboscis length, 0.33; ocular tubercle length, 0.1; abdomen length, 0.12; fourth leg, coxa 1, 0.22; coxa 2, 0.63; coxa 3, 0.31; femur, 1.09; tibia 1, 0.89; tibia 2, 1.01; tarsus, 0.08; propodus, 0.42; claw, 0.26.

DISTRIBUTION.—The type-locality is Culebra Island at Fort Amador, Pacific side of the Canal Zone. The other localities are all nearby in the Canal Zone and the depths are all low intertidal.

ETYMOLOGY.—The new species is named for the country of origin.

REMARKS.—*Callipallene panamensis* appears to be a much less attenuated sibling of *C. phantoma.* The oviger spines are dimorphic, as illustrated by Dohrn (1881, pl. 14: figs. 8–9). The auxiliaries, although longer in the new species, have the same spine-like teeth at their bases. Almost all segments

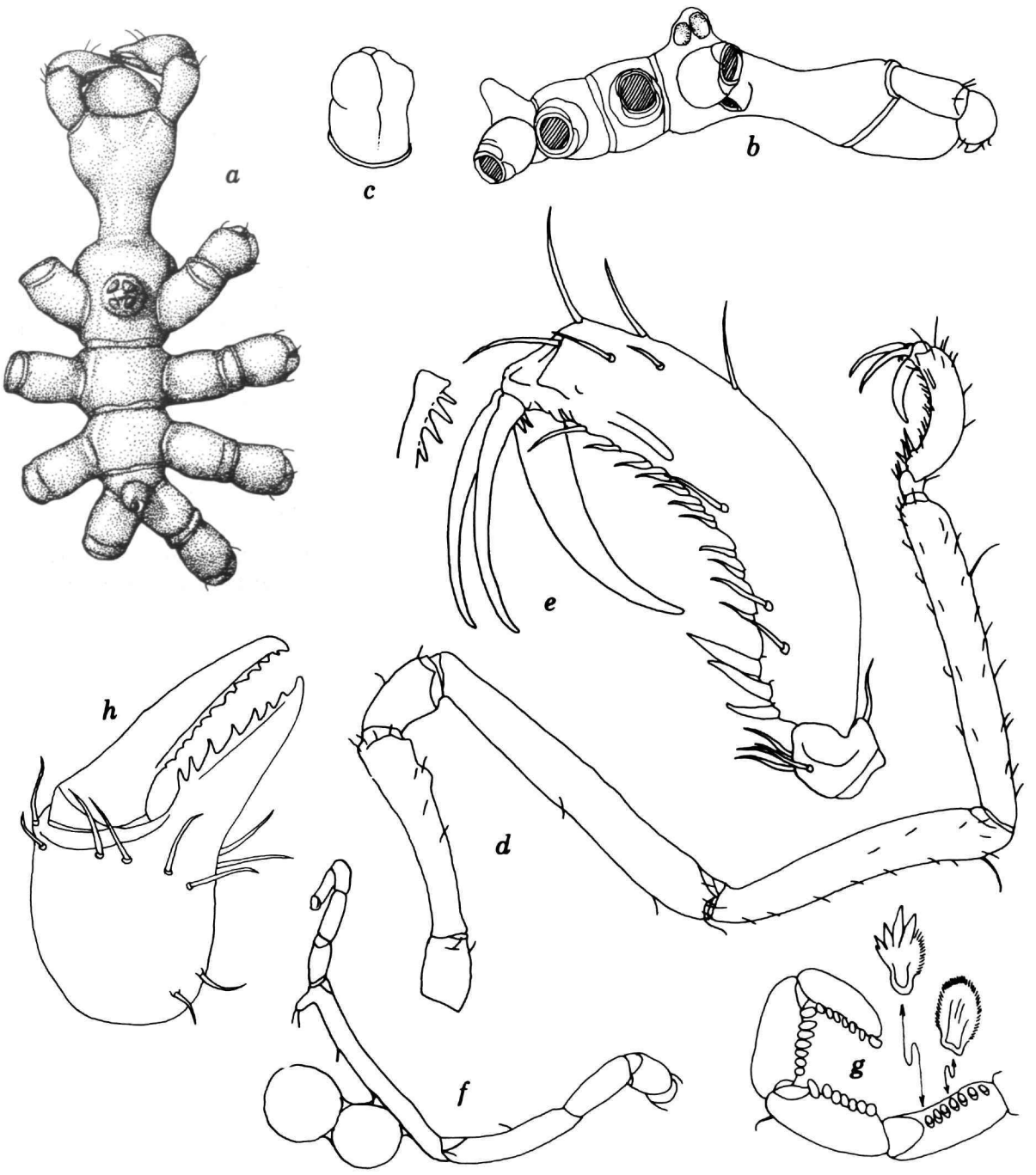

FIGURE 14.—*Callipallene panamensis*, new species, holotype, male: *a*, trunk, dorsal view; *b*, trunk, lateral view; *c*, proboscis, ventral view; *d*, third leg; *e*, terminal segments of third leg, with enlargement of auxiliary claw base; *f*, oviger; *g* terminal segments of oviger, showing enlargements of a median and a distal spine of seventh segment; *h*, chela.

of *C. panamensis* are shorter than those of *C. phantoma*, with the short neck being the most obvious difference. The new species also resembles *C. pectinata*, an Indian Ocean species having auxiliary claw teeth, but, here again, the differences are most notable in the neck length and the various length ratios of the legs between the 2 species. The 3rd legs of the male holotype specimen of *C. panamensis* are missing and measurements were therefore made of the 4th leg.

The 2 other known species of *Callipallene* from the Pacific coast of North America, *C. pacifica* and *C. californiensis* are quite different from *C. panamensis*. Hedgpeth's *C. pacifica* has a longer neck and much longer leg segments than this species, although the propodus and claws are similar. Hall's *C. californiensis* is a much more compact species with the lateral processes almost touching and the neck merely a constriction of the ocular segment. It also has shorter, more robust legs and a propodus with 5 heel spines. The auxiliaries measure a little over half the main claw while they are almost as long as the main claw in *C. panamensis*.

Callipallene solicitatus, new species

FIGURE 15

MATERIAL EXAMINED.—Mexico Pacific: Baja California, Barnard PAZ–5 (1 ♀, paratype), PAZ–10 (1 ♂, holotype, USNM 169419; 3y paratypes), PAZ–24 (1 ♀ ovig., 11y, paratypes); *Velero III* 287–34 (1 ♀ ovig., 4y, paratypes).

Panama Pacific (paratypes): Isla Taboguilla, STRI settling plate, 21 Mar 1971 (1y ♀), 1 Feb 1972 (1 larva), 8 Nov 1972 (1 ♀ ovig), 12 Apr 1973 (1 ♀ ovig., 1y), 11 Mar 1974 (1y), 19 Apr 1974 (1y ♀); STRI *Balanus* 28 (1 ♀ ovig., 5 larvae); STRI *Balanus* 55, 15 Apr 1975 (1 ♀ ovig.).

DESCRIPTION.—*Velero III Female Paratype*: First 2 trunk segmentation lines complete, 3rd incomplete dorsally. Lateral processes glabrous, separated by their diameters or little less. Length of lateral processes slightly less than trunk diameter. Neck as long as its diameter. Ocular turbercle broad and short, rounded at apex, without tubercle. Eyes large, unpigmented. Abdomen a truncated cone subequal in length to ocular tubercle, armed with 2 lateral setae.

Proboscis short, rounded, with slight ventrodistal bulges. Lips slightly inflated.

Chelifore scape short, distally inflated, armed with several dorsal and dorsodistal setae almost as long as segment diameter. Chela as long as scape, palm inflated, armed with fringe of setae around finger insertion. Fingers without setae, moderately curved, armed with 9 or 10 blunt teeth on movable finger, 7 or 8 blunt teeth on immovable finger. Finger tips overlap when closed.

Oviger shape common to genus, armed with single distal seta on terminal segments and finely serrate denticulate spines of like form with the formula 8:7:7:7.

Legs moderately long, armed with a few ventral setae on proximal segments and many setae dorsally, laterally, and ventrally on tibiae. Second tibia longest segment. Tarsus extremely short, armed with several setae and single long ventral spine crenulate distally. Propodus slightly over 3 times longer than wide, slightly curved, heel armed with 5 thin spines, all distally crenulated. Sole armed with 10 to 12 thin spines and 8 or 9 setae on either side of sole. Propodus armed distally with tuft of long setae. Claw less than half propodal length. Auxiliary claws three-fourths main claw length, armed ventrally near their bases with small field of microsetae.

Male Holotype: Slightly smaller than female, but habitus almost the same in all length ratios and shape, including propodus. Ocular tubercle slightly taller than female's. Oviger with typical longer fifth segment having distal apophysis as long as segment diameter, armed with several ectal setae. Terminal segments as in female, but with denticulate spine formula 6:7:6:7. Femoral cement glands very difficult to discern, forming 2 definite rows and perhaps a 3rd row ventrally on coxa 3 and proximal half or 3rd of femur. Each gland a tiny flat pore without raised rim.

MEASUREMENTS OF FEMALE PARATYPE (mm).—Trunk length (chelifore insertion to tip of 4th lateral processes), 1.07; trunk width (across 2nd lateral processes), 0.51; proboscis length, 0.36; abdomen length, 0.1; third leg, coxa 1, 0.18; coxa 2, 0.51; coxa 3, 0.26; femur, 1.02; tibia 1, 0.86; tibia 2, 1.03; tarsus, 0.06; propodus, 0.36; claw, 0.17.

DISTRIBUTION.—Known from the type-locality, Isla San Francisco, Baja California, and from other localities in Baja California and the Pacific coast of Panama. Depths range from intertidal to 27 meters.

ETYMOLOGY.—The species name is Latin and means "to vex" or "to trouble," pertaining to the

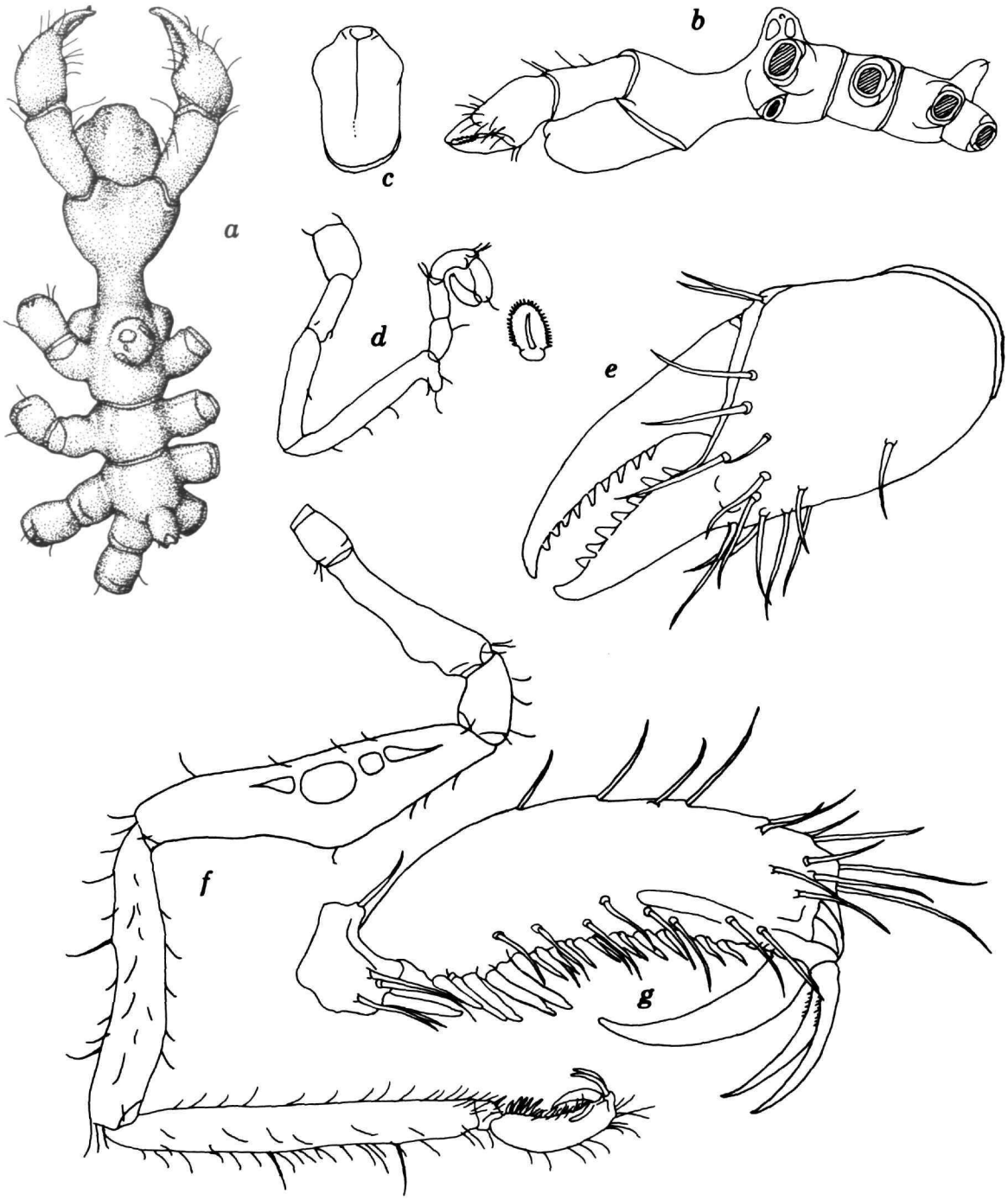

FIGURE 15.—*Callipallene solocitatus*, new species, holotype, male: *a*, trunk, dorsal view; *b*, trunk, lateral view; *c*, proboscis, ventral view; *d*, oviger, with enlargement of a terminal spine; *e*, chela; *f*, third leg; *g*, terminal segments of third leg.

vexing similarities between this species and the others presented in this report.

REMARKS.—This species superficially looks very much like both *C. emaciata* and *C. panamensis,* thus the species name. The differences between this new species and *C. panamensis* are a shorter neck and lateral processes, the 2nd tibia is longest of the leg segments while the femur is longest in *C. panamensis*, and the new species has blunt peg-like chela finger teeth while *C. panamensis* has sharply pointed saw-like teeth. The principal difference between the 2, though, is in the propodus. That of *C. panamensis* is more slender and strongly curved, has 3 heel spines (4 in the ♀), and auxiliary claws almost equal to main claw length. The propodus of *C. solicitatus* is more robust and not nearly as curved, has 5 heel spines crenulated at their tips, and has much shorter auxiliary claws that have a basal field of tiny setae rather than several basal teeth. The oviger spines of this species are all alike except for graded sizes from proximal to distal ends, but the denticulate spines of *C. panamensis* are dimorphic with different forms of serration.

Comparisons of the new species with specimens of *C. emaciata* from both Panama and the coast of Florida, show a number of significant differences. The neck of *C. emaciata* is shorter with little or no distance between the flaring base of the "crop" and the oviger implantation tubercles. The legs of *C. emaciata* are almost glabrous, particularly the tibiae, in contrast with the setose legs of the new species. The propodus of both species is similar, but that of the new species is a little longer in relation to width and is much more setose distally. The heel and tarsus spines are alike in both species, but the auxiliaries of *C. emaciata* do not have tiny basal setae. Finally, there are more teeth on the chela fingers of *C. emaciata* than on the new species.

Comparison of specimens from both Isla Taboguilla and the Isthmus shows that there is some variation present in *C. solicitatus*. The trunk segmentation lines are complete on some specimens from Taboguilla, but the posterior line is incomplete on all specimens examined from the Isthmus. There are slight variations in neck length between Taboguilla and mainland specimens, with the neck slightly shorter in some specimens from Taboguilla. These small variations contribute more to the already vexing position of this new species among its sympatric relatives.

Genus *Pallenopsis* Wilson, 1881

Pallenopsis schmitti Hedgpeth

Pallenopsis schmitti Hedgpeth, 1943:44; 1948:212–214, fig. 22; 1954:427.—Stock, 1955:233–234, fig. 10.—Bayer, et al., 1970:A48.

Pallenopsis (Pallenopsis) schmitti.—Stock, 1975a:1028–1030, fig. 30c–d.

MATERIAL EXAMINED.—Panama Caribbean: Galeta Island reef, Misc. STRI Sta., 27 Sep 1972 (1 ♀), 28 Jul 1975 (1 ♀, 1y).

REMARKS.—This species has been collected throughout the Caribbean and from Florida and the Bahamas to northern Brazil. Within the bounds of this report, Stock (1975a) reported this species from the coast of Honduras. These specimens appear to be among the shallowest captures on record while the greatest depth so far recorded is 586 m.

Genus *Pigrogromitus* Calman, 1927

Pigrogromitus timsanus Calman

Pigrogromitus timsanus Calman, 1927:408–410, fig. 104a–f.—Hedgpeth, 1947:7 [text]; 1948:214–216, fig. 23.—Stock, 1968a:46.—Lipkin and Safriel, 1971:9.—Arnaud, 1972a: 159–160.—Reimer, 1976:229.—Birkeland, et al., 1976:134, 158.—Child, in prep.

Clotenopsa prima Hilton, 1942d:52–53, fig. 8.

MATERIAL EXAMINED.—Mexico Pacific: Baja California, Barnard PAZ–5 (2 larvae).

Panama Pacific: Isla Taboguilla, STRI *Tetraclita* 5 (1y); NMNH Sta. 59–1 (1 ♂).

Panama Caribbean: Galeta Island reef, STRI *Laurencia* 6 (1 ♂ with eggs), 7 (1 ♀, 1y, 2 other specimens), 9 (1y); STRI *Zoanthus* 6 (2 ♂), 11 (1 ♂); Misc. STRI Sta., 24 Apr 1971 (1y). Canal Zone, NMNH Sta. 10–9 (1 ♀), 81–1, –2, –4 (3 ♀, 3y), 125–1 (1y), 174–C (1y).

REMARKS.—From the number of juveniles in this series, a hitherto unrecorded fact comes to light. The ovigers of this species become fully developed at the same time that the last legs reach full development. This is not the case with most pycnogonids where ovigers develop later, just before adulthood and relatively long after the legs are fully formed. The sex glands develop normally at adulthood as with other genera. The ovigers are large in both sexes and it would be relatively difficult to tell the sexes apart were it not for the

slightly raised sex pores on all second coxae of the female.

The distribution of this species, on both sides of the Isthmus and in Mexico, contributes little to its known circumtropical range. This "canal" species is one of only 3 species of pycnogonids found within the lower or seaward Gatun Lock system of the Panama Canal.

Family PHOXICHILIDIIDAE

Genus *Anoplodactylus* Wilson, 1878

Key to the Middle American Species of *Anoplodactylus*

1. Proboscis styliform, upturned; propodus with 1 heel spine, small propodal lamina, no auxiliary claws ..... ***A. batangensis***
   Proboscis cylindrical or modified cylinder 2
2(1). Female proboscis with ventral paired processes or tubercles; distinct palp buds flanking proboscis ..... ***A. portus***
   Female proboscis without adornment 3
3(2). Oviger with 5 segments only; lateral processes touching for part of length; cement gland a flat cribriform oval; propodus without lamina, with auxiliary claws .... ***A. monotrema***
   Oviger with 6 segments 4
4(3). Multiple cement glands, 4 or 5 low cups; propodus with long lamina, 2 heel spines, auxiliary claws; lateral processes separated by less than their diameters .. ***A. multiclavus***
   Single cement gland per leg 5
5(4). Lateral processes widely separated 6
   Lateral processes separated by their own diameters or less 9
6(5). Lateral processes separated by twice their diameters; cement gland a raised cup 7
   Lateral processes separted by slightly more than their diameters; cement glands various 8
7(6). Lateral processes slightly longer than their diameters; dorsodistal leg tubercles shorter than or equal to segment diameter; chela palm ovoid, fingers curved, without teeth .... ***A. insigniformis***
   Lateral processes not longer than their diameters; dorsodistal leg tubercles longer than segment diameters; chela palm rectangular; only movable finger very curved, with endal setae ..... ***A. massiliformis***
8(6). Lateral processes progressively shorter toward posterior, with tubercles; proboscis slightly styliform or tapered distally; cement gland a raised cup; heel spines smooth; large dorsodistal leg tubercles present ..... ***A. galetensis,*** new species
   Lateral processes of almost equal length, without tubercles; proboscis an inflated cylinder; cement gland a depressed cribriform slit; distal heel spine largest, with pectinate anterior surface; no leg tubercles ..... ***A. pectinus***
9(5). Lateral processes touching for at least part of their length 10
   Lateral processes not touching 11
10(9). Propodus with single heel spine on raised tubercle, without lamina or auxiliary claws; tibia 2 less than half length of tibia 1; cement gland a flat cribriform plate .... ***A. evelinae***
   Propodus with 2 heel spines, long lamina and auxiliary claws; tibiae subequal; cement gland a tiny tube ..... ***A. viridintestinalis***
11(9). Cement gland a low cup or cone 12
   Cement gland a tube or cone 13
12(11). Lateral processes separated by half their diameter or less, with low tubercles; cement gland a low truncated cone; propodus with 2 heel spines, tiny lamina, auxiliary claws; pad of setae on movable finger, without teeth ..... ***A. bova,*** new species
   Lateral processes almost touching, without tubercles; cement gland a low cup; propodus with 1 heel spine, long lamina, minute auxiliaries; fingers with teeth .... ***A. stri,*** new species
13(11). Lateral processes separated by their own diameter or less 14
   Lateral processes separated by three-fourths of their diameter or less, without tubercles; chela fingers without teeth; propodus with short lamina, 2 heel spines, auxiliaries 16

14(13). Lateral processes only as long as their diameters, without tubercles; cement gland a conical tube; propodus with 2 heel spines, auxiliaries, very long lamina; oviger 2nd segment shorter than 4th (ovigers sometimes on ♀) ..... ***A. jonesi***

Lateral processes longer than their diameters, with tubercles 15

15(14). Propodus with long lamina, 2 heel spines, auxiliaries; cement gland a tube; fingers thin, without teeth; oviger 2nd segment half as long as 3rd ..... ***A. trispinosus***

Propodus with short lamina, 2 heel spines, auxiliaries; cement gland a tube; fingers thin, with teeth; oviger 3rd segment two and one-half times longer than 2nd ..... ***A. allotrius,*** new species

16(13). Palp bud tubercles distinct; ocular tubercle a tall cone; oviger 2nd segment almost length of 3rd; cement gland a conical tube; legs with small dorsodistal tubercles ..... ***A. reimerae,*** new species

No palp bud tubercles; ocular tubercle cylindrical; oviger 2nd segment only two-fifths as long as 3rd; cement gland a long visible tube beneath chitin, exterior tube short; small dorsodistal tubercle only on femur ..... ***A. erectus***

Anoplodactylus allotrius, new species

FIGURE 16

MATERIAL EXAMINED.—Panama Caribbean: Galeta Island reef, STRI *Acanthophora* 16 (1 ♂, holotype, USNM 169410). Canal Zone, NMNH Sta. 10–9 (1 ♀ ovig., 1y, paratypes, USNM 169411).

DESCRIPTION.—Trunk with 1st intersegmental line well marked, 2nd and 3rd lacking. Lateral processes separated by distances equal to or slightly less than their diameters, each as long as trunk diameter, armed with low rounded dorsodistal tubercle. Second lateral processes each with a posterodistal seta, other lateral processes without setae. Ocular tubercle large, one and one-half times longer than its diameter, cylindrical with truncate cone at apex. Eyes very large, darkly pigmented. Neck with 1 small seta on either side below ocular tubercle. Abdomen moderately long, slightly swollen, armed with 3 or 4 distal setae.

Proboscis cylindrical, with dorsal curve and slight constriction halfway along its length.

Palps represented by small bulges halfway along anterior surface of 1st lateral processes.

Chelifore scape slender, cylindrical, swollen slightly toward tip, armed with 3 dorsal and distal setae. Chela palm ovoid, fingers little longer than palm. Immovable finger slightly curved, armed with single lateral seta, without teeth. Movable finger longer, more curved, armed with 2 ectal setae and 5 tiny papilla-like teeth.

Oviger segments slender, 3rd segment two and one-half times length of 2nd. Fourth little longer than 2 terminal segments combined. Terminal 2 segments armed with recurved setae. Terminal segment ovoid, little longer than wide.

First coxae of legs without tubercles, with lateral and ventral setae. Coxal spur of 3rd and 4th legs very small, hardly extending beyond distal segmentation line. Femur the longest segment, only slightly longer than 2nd tibia. Femoral cement gland on median dorsal surface forming a long subcuticular tube as long as segment diameter and emerging as a thin tube slightly less than half as long as segment diameter. Major leg segments armed with several short dorsal, lateral and ventral setae, and a single long dorsodistal seta. Propodus moderately slender, with large heel armed with 2 curved spines and 5 robust setae. Sole armed with 7 strongly curved spines, several lateral setae, and a short lamina measuring less than one-fourth sole length. Claw moderately curved, auxiliaries very short, robust.

Female slightly larger. Chela fingers armed with 3 or 4 teeth larger than those of male, on both fingers. Propodus armed with 5 or 6 sole spines and a slightly longer lamina.

MEASUREMENTS OF HOLOTYPE (mm).—Trunk length (chelifore insertion to tip of 4th lateral processes), 0.83; trunk width (across 1st lateral processes), 0.51; proboscis length, 0.37; abdomen length, 0.19; third leg, coxa 1, 0.15; coxa 2, 0.35; coxa 3, 0.23; femur, 0.58; tibia 1, 0.47; tibia 2, 0.53; tarsus, 0.07; propodus, 0.3; claw, 0.21.

DISTRIBUTION.—Known from the type-locality, Galeta Island, and from nearby Limon Bay in the intertidal.

ETYMOLOGY.—From the Greek, meaning "one who belongs to a different group," signifying the close similarities, but marking the differences between this new species and its closely related species, *A. maritimus* and *A. petiolatus.*

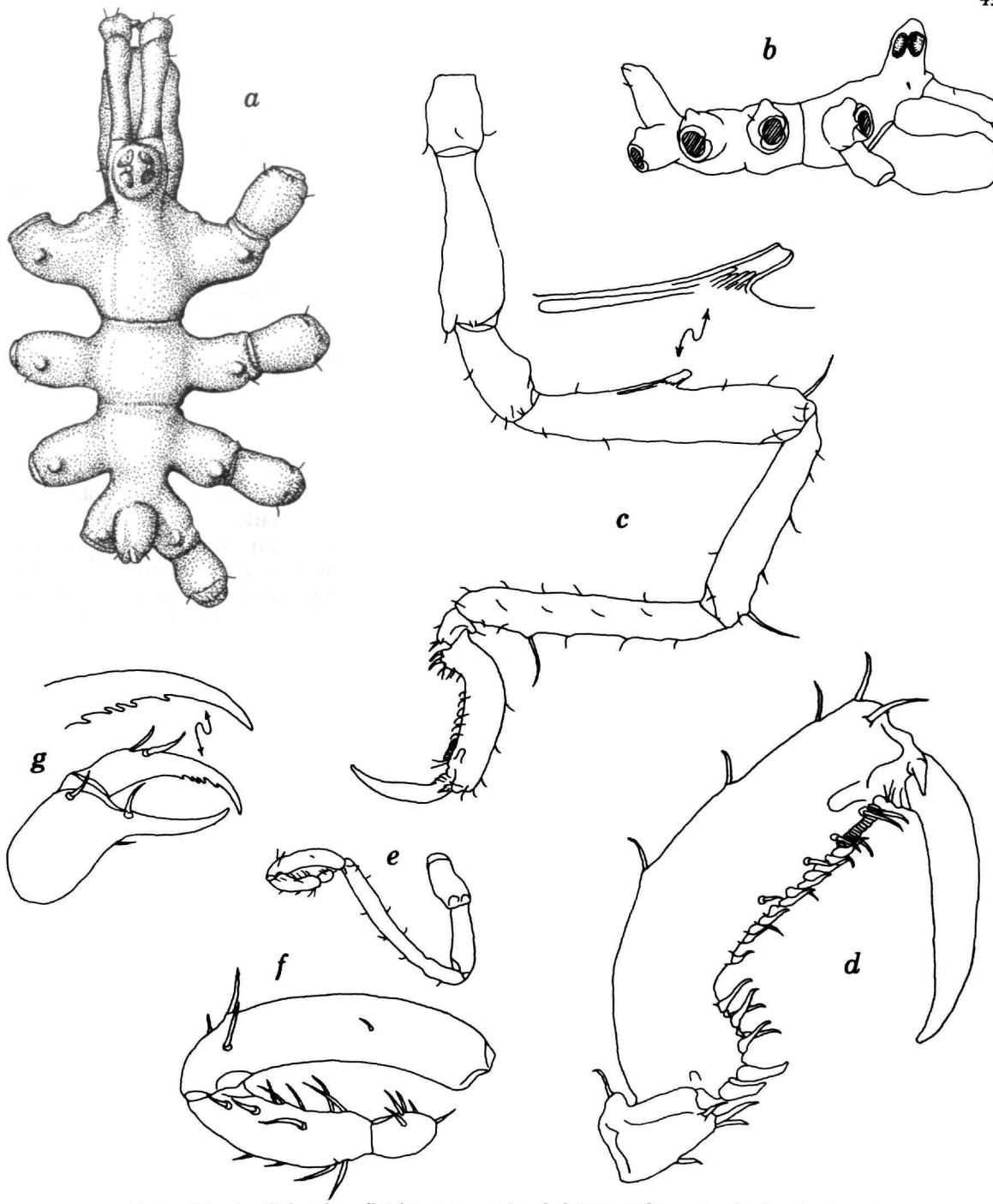

FIGURE 16.—*Anoplodactylus allotrius*, new species, holotype, male: *a*, trunk, dorsal view; *b*, trunk, lateral view; *c*, third leg, with enlargement of cement gland; *d*, terminal segments of third leg; *e*, oviger; *f*, terminal segments of oviger; *g*, chela, with enlargement of tip of movable finger.

REMARKS.—This new species lacks any notable distinguishing characters except for the chela finger teeth shape and these, as described above, are not unique to this species. I have found at least 5 other species of *Anoplodactylus* having teeth on only 1 of the 2 fingers, as in the above holotype, and the presence of chela finger teeth remains unknown for many species described 30 or more years before this diagnostic character was recognized.

The nearest Atlantic relations of this species are *A. maritimus* and *A. petiolatus,* neither of which have chela finger teeth. Of the 2, *A. allotrius* is closer to *A. maritimus.* Examination of Giltay's (1934) holotype of *A. parvus* (= *A. maritimus,* in agreement with Stock, 1975a:1072–1075) shows the trunk, oviger, propodus, and femoral cement glands very much like the new species. I have called this a new species belonging to a "different group" than *A. maritimus,* because it has longer chela with teeth on one or both fingers, a longer cement gland tube outside the cuticle, and a short lamina. The auxiliary claws are robust while they are tiny or lacking on *A. maritimus,* and the ocular tubercle is both taller and broader and has much larger eyes than *A. maritimus.*

The characters mentioned above for *A. allotrius* are almost intermediate between those of *A. petiolatus* and *A. maritimus.* The new species has shorter and more oval chelae than *A. petiolatus,* along with shorter ovigers, shorter cement gland tubes, a propodus and lamina that are also shorter, and a slightly more compact trunk. Neither *A. petiolatus* nor *A. maritimus* were collected during these Panama surveys, although the Caribbean shores here are well provided with *Sargassum* weed. Floating weed was often picked from Galeta Island and Limon Bay during the course of the surveys. Perhaps the currents do not push *Sargassum* containing these pycnogonids this far west. Both species are frequent inhabitants of mid-Atlantic *Sargassum* weed.

Anoplodactylus batangensis (Helfer)

Pycnosoma batangense Helfer, 1938:174–176, fig. 6a–c.
Anoplodactylus batangensis.—Stock, 1968a:54 [literature].—Arnaud, 1973:957, figs. 3, 4.—Stock, 1974:17; 1975a:1082–1083, fig. 43c–d.—Birkeland, et al., 1976:133.—Stock, in press.—Child, in prep.

MATERIAL EXAMINED.—Panama Pacific: Canal Zone, Barnard PAN-3 (2 ♂ with eggs, 1 larva); NMNH Sta. 255 (1 ♂). Panama City, NMNH Sta. 58–4 (1 ♀, 6y).

Mexico Caribbean: Quintana Roo, Smithsonian-Bredin 100–60 (1 ♀ ovig.).

Panama Caribbean: Galeta Island reef, Barnard PAN–1 (1 ♀ ovig.), PAN–7 (1 larva); NMNH Sta. 15 (1 ♂, 1 ♀, 2y); STRI *Acanthophora* 16 (2 ♂); STRI *Laurencia* 13–B (1 ♀), 14–A (1 ♂), 14–B (2 ♀), 15–A (1 ♂ with eggs, 1 ♀), 16–B (1 ♀); STRI *Laurencia* oil spill, 17 Mar 1972 (3 ♂ with eggs, 1 ♀, 1 larva), 21 Mar 1972 (2 ♀), 17 Apr 1972 (1 ♂ with eggs, 1 ♀); STRI settling plate, 10 Feb 1972 (1y).

REMARK.—A circumtropical shallow-water species.

Anoplodactylus bova, new species

FIGURE 17

MATERIAL EXAMINED.—Panama Pacific: Panama City, STRI *Abietinaria* 3 (1 ♂, holotype, USNM 169409).

DESCRIPTION.—Trunk robust, 1st and 2nd segmentation lines complete, 3rd entirely lacking. Lateral processes separated by half their diameters or less, each armed with a triangular dorsodistal tubercle flanked by 2 or 3 setae. Anterior and posterior molt suture lines strong on all but last pair of lateral processes. Ocular tubercle large, conical, slightly constricted. Eyes situated at half the length of cone, darkly pigmented. Abdomen moderately long, swollen in distal half, armed with 4 or 5 distal setae.

Proboscis cylindrical, constricted at two-thirds its length, with rounded oral surface.

Palp buds lacking.

Chelifore scape cylindrical, slightly overreaching proboscis, armed with few dorsal setae. Chela palm quadrangular, armed distally with few setae. Immovable finger less curved than movable finger. Movable finger with proximal pad of many setae. Fingers without teeth.

Oviger segments short, robust. Second segment three-fifths length of 3rd. Terminal 3 segments increasingly inflated with terminal segment broader than its length, terminal 2 segments armed with many lateral setae.

First coxae of legs with 2 dorsolateral small tubercles each bearing a seta. Second coxa of 3rd leg with coxal spur shorter than diameter of segment, slightly longer on 4th leg. Major leg segments armed with several dorsal, lateral, and ventral short setae and single dorsodistal seta shorter than segment diameter. Femur with dorsodistal

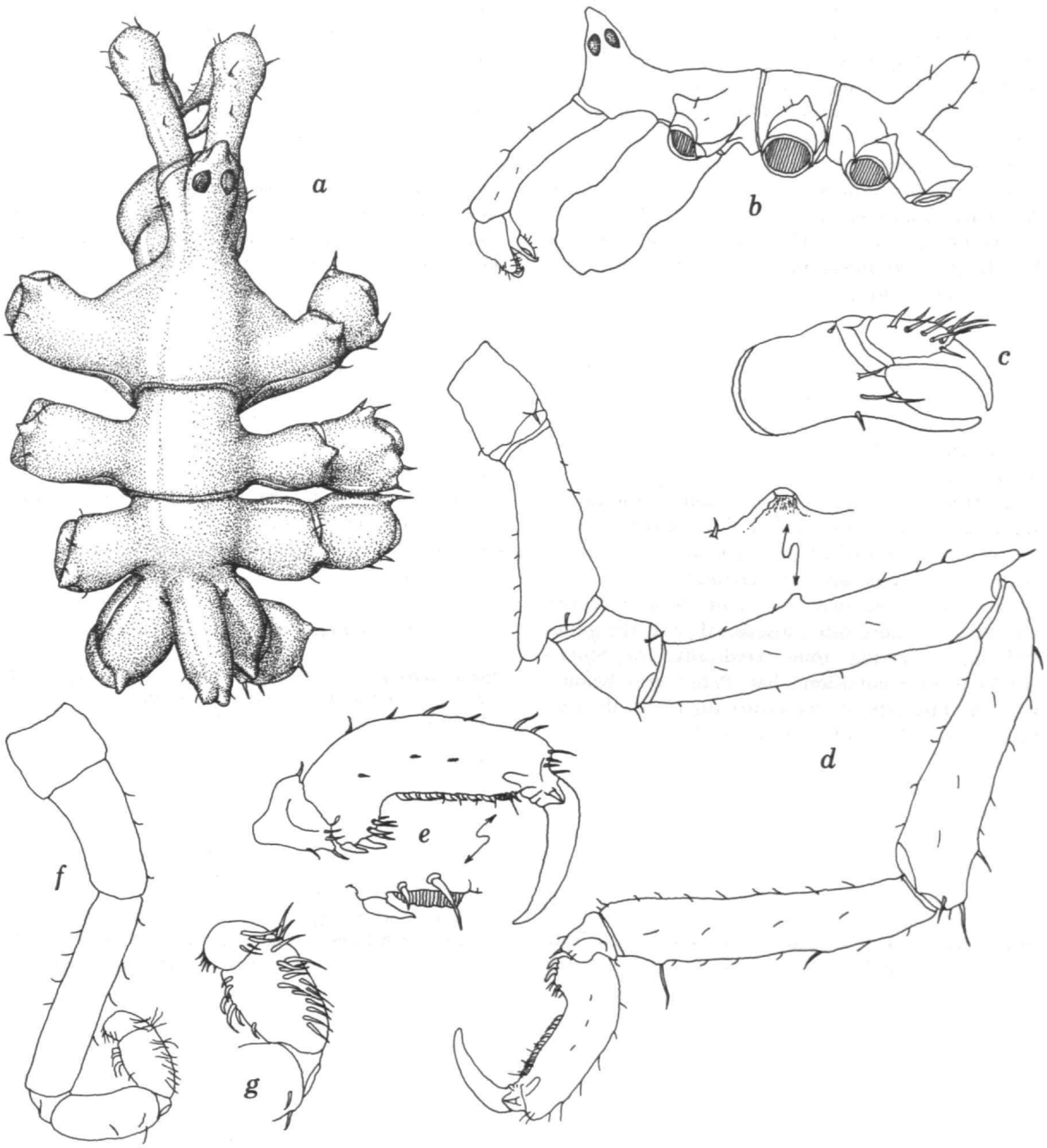

FIGURE 17.—*Anoplodactylus bova*, new species, holotype, male: *a*, trunk, dorsal view; *b*, trunk, lateral view; *c*, chela; *d*, third leg, with enlargement of cement gland; *e*, terminal segments of third leg, with enlargement of lamina; *f*, oviger; *g*, terminal segments of oviger, enlarged.

tubercle. Femoral cement gland a low truncate cone pointing distally, capped with large pore, situated slightly proximal to midpoint of femur dorsal surface. Tarsus almost triangular, armed with several distal setae. Propodus robust, with strong heel armed with 2 curved spines and 5 smaller spines. Sole armed with 8 or 9 broad and curved spines, the tips of which touch next anterior spines, and several flanking setae. Propodal lamina very tiny, at extreme distal end of sole. Claw moderately curved. Auxiliaries small, slender, sharply pointed.

MEASUREMENTS OF HOLOTYPE (mm).—Trunk length (chelifore insertion to tip of 4th lateral processes), 1.71; trunk width (across 2nd lateral processes), 1.07; proboscis length, 0.79; abdomen length, 0.42; third leg, coxa 1, 0.26; coxa 2, 0.75; coxa 3, 0.37; femur, 1.19; tibia 1, 1.09; tibia 2, 1.15; tarsus, 0.16; propodus, 0.59; claw, 0.36.

DISTRIBUTION.—Known only from the type-locality, Punta Paitilla, Panama City, at a low intertidal depth.

ETYMOLOGY.—From the Latin noun *bova,* meaning a "swelling of the legs." This is in reference to the swollen terminal oviger segments, which many years ago were regarded as specialized legs.

REMARKS.—This new species has several characters that are more often associated with the genus *Pallenopsis,* giving some credibility to Stock's (1975a:1016) contention that *Pallenopsis* belongs with the Phoxichilidiidae rather than with the Callipallenidae. The *Pallenopsis*-like characters are an ectal pad with many setae on the movable finger, the strong lateral molt suture lines quite often found on *Pallenopsis,* and the extremely setose terminal oviger segments. This last comparison between the genera is more tenuous because of the reduced number of oviger segments (5 or 6) in *Anoplodactylus* (*Pallenopsis* has from 8 to 10), but the terminal oviger segments in this genus far more often have very few setae and some are glabrous, while just the opposite holds true for *Pallenopsis.* Both genera lack an effective strigilis.

Familial affinities in *Pallenopsis* remain difficult to assess because the genus has several characters that fall equally well within the diagnosis of either of the above families. Family designation, particularly in the pycnogonids, are grossly artificial, to say the least, and are as full of man's conjectural shortcomings as any group can be that lacks a universally recognized fossil record. The few Devonian fossils that some regard as pycnogonid ancestors hardly provide a suitable family tree on which to hang the many and diverse genera recognized today. It is not likely either that we will ever have a fossil record of such small soft-bodied animals.

This new species shows some similarities to *A. portus,* particularly in the leg segments, propodus, cement glands, and distal femur tubercle. This species lacks the short palp buds of *A. portus,* has shorter coxal spurs, shorter lateral processes in relation to their diameter, and has shorter oviger segments, particularly the second. The oviger terminal setae, as mentioned before, are more numerous. Lateral process tubercles are notably larger on *A. bova.* I do not believe that the variability found in *A. portus* is broad enough to encompass all of the differences outlined above. Whether or not the female of *A. bova,* which remains unknown, has ventral alar processes on the proboscis and palp buds of any shape, must await future collections.

The 2nd right lateral process and leg of this unique specimen are slightly reduced but perfectly formed. This is possibly the result of early loss and regeneration of these parts.

Anoplodactylus erectus Cole

Anoplodactylus erectus Cole, 1904:289–291, pl. 14: fig. 12, pl. 26: figs. 1–9.—Child, 1970:288–289 [literature].—Stock, 1975b:74–76, figs. 22, 23.—Birkeland, et al., 1976:158.

MATERIAL EXAMINED.—Mexico Pacific: Gulf of California, Misc. Sta. 3024 (1 ♀).

Panama Pacific: Panama City, STRI *Abietinaria* 1 (1 ♂, 2 ♀), 2 (1 ♂), 3 (1 ♂ with eggs, 1 ♂, 1 ♀), 4 (1 ♂ with eggs). Isla Taboguilla, STRI settling plate, 21 Mar 1971 (1 ♂), 1 Dec 1971 (1 ♂), 4 Apr 1972 (1 ♂ with eggs, 1 ♂, 1y), 2 Jun 1972 (1y ♂), 8 Aug 1972 (72 specimens, mostly y), 8 Sep 1972 (2 ♂ with eggs, 2 ♀, 2y), 8 Nov 1972 (1y), 10 Jan 1973 (1y), 13 Feb 1973 (2 ♀, 3y), 12 Apr 1973 (1 ♂), 12 Feb 1974 (1 ♀, 2y), 11 Mar 1974 (5 ♂ with eggs, 8 ♀, 13y), 19 Apr 1974 (32 specimens, mostly y), 21 May 1974 (1 ♀, 26y & larvae), 13 June 1974 (1y), No. 23, 13 Jun 1974 (1 ♂), No. 78, 30 Aug 1974 (1y ♂), No. 101, 30 Aug 1974 (3 ♂, 1 ♀, 6y), No. 110, 1 Oct 1974 (2 ♂ with eggs, 4 ♀, 4y, 1 larva), No. 63, 13 Nov 1974 (1 ♀), No. 75, 13 Nov 1974 (1 ♂), No. 36, 19 Dec 1974 (6 ♂ with eggs, 10 ♀, 2y), No. 79, 19 Dec 1974 (1y ♂); STRI *Balanus* 28, (1y ♂), STRI *Balanus* 57, 15 May 1975 (1 ♂ with eggs), STRI *Balanus* 57, 11 Jul 1975 (1 ♂ with eggs, 1 ♀).

Colombia Pacific: Isla Malpelo, Misc. STRI Sta., subtidal dive, 3 Mar 1972 (1 ♂ with eggs); STRI, dive 9, 3 Mar 1972 (1y ♂).

REMARKS.—Almost all of these specimens (the Taboguilla material) are what might be called a "short form" of *A. erectus*. Most segment measurements are shorter in relation to the segment diameter, making the animal appear more robust than those specimens illustrated in the literature. On the other hand, virtually all diagnostic characters agree with *A. erectus*: short propodal lamina, strong heel with 2 heel spines, short chela with moderately curved fingers having no teeth, length relationships of leg segments and coxal spur, femoral cement glands, lack of complete trunk segmentation, oviger segment length ratios. The most notable missing character is the tubercle on each lateral process. These are either much smaller or lacking on the Taboguilla specimens, but are taller and more obvious on the Malpelo specimens. This large collection affords a sufficient series to show that the lateral process tubercles are actually a variable character, at least in this species, and should not be used as a reliable diagnostic feature. The much more reliable femoral cement gland, along with 2 heel spines, lamina, and the segment length ratios will serve to differentiate this species from most others.

Anoplodactylus erectus has been recorded previously from Taboguilla in the Mortensen collection (Stock, 1955:239), and is known from Costa Rica and Mexico (Hilton, 1942a, 1942f), to include the distribution within the scope of this paper. It has one of the widest latitudinal distributions of any pycnogonid known to me: from the cold waters of British Columbia, the tropical waters of Middle America, Hawaii, and the Tuamotus, to the subantarctic waters of Punta Arenas, Chile. *Anoplodactylus* is predominantly a tropical and temperate water genus, although there is one species known from the high Antarctic, *A. australis*. The thermal tolerance of *A. erectus*, provided all specimens recorded in the literature are this species, presents another enigma to the specialist in this class of marine invertebrates.

Anoplodactylus evelinae Marcus

Anoplodactylus evelinae Marcus, 1940:55–58, fig. 4.—Hedgpeth, 1948:232, fig. 31.—Fage, 1949:27–28, fig. 3.–Birkeland, et. al., 1976:133.—Child, in prep.—Stock, in press.

Anoplodactylus (Labidodactylus) evelinae.—Stock, 1954a:128; 1975a:1083.

MATERIAL EXAMINED.—Mexico Caribbean: Quintana Roo, Smithsonian-Bredin 85–60 (1y ♀).

Panama Caribbean: Galeta Island reef, STRI *Laurencia* oil spill, 17 Apr 1972 (1y ♂). Golfo de San Blas, NMNH Sta. 116–1 (1 ♀).

Panama Pacific: Canal Zone, Barnard PAN–3 (1 ♀, PAN–10 (2 ♂ with eggs, 1 ♂); NMNH Sta. 23–1 (1 ♀). Panama City, STRI *Abietinaria* 1 (1 ♂ with eggs, 1 ♂, 2 ♀), 2 (1 ♂, 1 ♀), 3 (1 ♂ with eggs, 2 ♂, 3 ♀), 4 (1 ♂, 5 ♀), 6 (14 ♂, 5 ♀, 12y); NMNH Sta. 25–1 (1 ♂ with eggs, 8 ♂, 16 ♀, 4y), 25–6 (1 ♂, 1 ♀), 58–4 (3 ♂, 3 ♀, 16y), 84–B (1 ♂, 3y, 1 larva), 92–1 (2 ♂, 1 ♀, 1y), 92–4 (1 ♀). Isla Taboguilla, STRI settling plate, 24 Aug 1971 (1 larva).

REMARKS.—This species has not appeared as common in any collection until this time. Fage (1949: 27) listed 18 specimens from the former Belgian Congo, and none of the Florida or Caribbean collections list more than a few. It is therefore enlightening to find it one of the more common pycnogonids collected in the Golfo de Panamá in intertidal and subtidal habitats. The above collections number 121 specimens. In more than half of the above captures, the species was found associated with the hydroid *Abietinaria*. Most of these habitats are very rocky with sparse algae and some sand between the rocks. I made the collection of NMNH Sta. 25–1, which consisted of rock scrapings in which *Abietinaria* was the predominant fauna. One of the sandy collections (NMNH Sta. 25–6) contained 2 specimens in sand sievings, but direct evidence for *A. evelinae* living in a psammophilous habitat, as stated by Stock (1975a:1083), is lacking for most of the above collections.

It is probably a good idea to subdivide this crowded genus into subgenera, and, if a review is undertaken with this object in mind, it would be well to include at least one other species under the subgenus *Labidodactylus*. The Philippine species *A. tarsalis* shares the generic curiosities of elongated tarsus, huge heel and no auxiliaries on the propodus, and a very shortened tibia 2. Possibly *A. arescus* deserves this subgeneric designation also, because of its similar tarsus-propodus shape. Neither of these species has dorsal trunk tubercles as with *A. evelinae*, nor do they have its cribellate femoral cement gland openings. Subdividing the huge genus *Nymphon* has been attempted over the years with varying success. Most of the criteria at the generic level, such as those above, have not stood the test of time with *Nymphon*.

Anoplodactylus galetensis, new species

FIGURE 18

MATERIAL EXAMINED.—Panama Caribbean: Galeta Island reef, Misc. STRI Sta., 30 Jun 1971 (1 ♂, holotype, USNM 168765), 20 Jul 1972 (2y ♂, paratypes), 12 Oct 1972 (1 ♀, paratype), 19 May 1974 (1 ♀, paratype).

DESCRIPTION.—Trunk with 1st and 2nd intersegmental lines well marked, posterior 2 segmentation lines lacking. Lateral processes separated by slightly more than their diameters, each armed with triangular dorsodistal tubercle, diminishing in size from anterior to posterior, without setae. Lateral processes longer than their diameter anteriorly, decreasing to shorter than their diameter posteriorly. Ocular tubercle cylindrical, capped with conical tubercle equal in length to cylinder. Eyes large, with dark brown-black pigment. Abdomen slightly longer than ocular tubercle, tapering to rounded point, glabrous.

Proboscis slightly styliform, tapering distally and swollen at three-fifths its length. Lips blunted on flat oral surface.

Chelifores large; scape cylindrical, moderately setose dorsally, with anterior-pointing triangular tubercle dorsodistally. Chela rectangular, setose along ectal surface. Fingers moderately curved, overlapping distally, without teeth.

Ovigers 6-segmented; 3rd segment almost twice the length of 2nd, moderately setose; 5th and 6th segments heavily setose endally; 6th segment tapering to point distally.

Third leg: 1st coxa no longer than its diameter, 2nd coxa twice length of 3rd, armed with ventral setae and long coxal spur equal to three-fifths of segment length. Female spur equal only to segment diameter. Femur armed with scattered short setae and long dorsal and lateral tubercles distally. Cement gland at femur midlength, as a large raised oval cup. Tibiae armed with scattered short setae. First tibia with long dorsal and lateral tubercles distally, none on 2nd tibia. Tarsus very short, setose. Propodus robust, setose, large heel armed with single heel spine and group of 6 smaller spines. Sole armed with 9 knife-edged spines curving distally, but lacking propodal lamina. Claw large, robust, without auxiliaries.

MEASUREMENTS OF HOLOTYPE (mm).—Trunk length (chelifore insertion to tip of 4th lateral processes), 3.49; trunk width (across 1st lateral processes), 2.05; proboscis length, 1.58; abdomen length, 0.48; third leg, coxa 1, 0.39; coxa 2, 1.25; coxa 3, 0.6; femur, 2.67; tibia 1, 2.17; tibia 2, 2.8; tarsus, 0.24; propodus, 1.12; claw, 0.73.

DISTRIBUTION.—Known only from the type-locality, Galeta Island, from subtidal to 6 meters.

ETYMOLOGY.—Named for its type-locality, Galeta Island.

REMARKS.—This large species, with a leg span of about 2.5 cm, has the appearance of being assembled by a committee out of parts gleaned from other *Anoplodactylus* species nearby. It has the distal appendage tubercles of *A. insignis*, the femoral cement gland of *A. insigniformis* or *A. massiliformis*, the lateral process tubercles of *A. simulator*, but it has the propodus and thin tapering proboscis of none of these. It is the proboscis that sets this species apart from any other of the large-sized *Anoplodactylus* species. It tapers to a blunt end only half the diameter of the swollen section and, although the proboscis is somewhat styliform, it does not reach the extreme taper or curvature of *A. batangensis*.

This species does not inhabit the intertidal, as will be seen by the collecting records. The collecting depths were all from 3 to 6 meters and the species was never collected during the intensive reef-top surveys at Galeta. Comparison with *A. insigniformis*, also taken subtidally at Galeta (on settling plates), shows a resemblance in the 2 species except for the wider 1st lateral processes and different proboscis in *A. galetensis*. The other similar species mentioned above, *A. insignis* and *A. massiliformis*, were not found in the collections reported on here, although the allotype specimen of *A. massiliformis* was collected at Colón, Panama, only about 6.4 km away.

Anoplodactylus insigniformis Stock

Anoplodactylus insigniformis Stock, 1975a:1058–1063, figs. 45–47.—Stock, in press.

MATERIAL EXAMINED.—Panama Caribbean: Galeta Island reef, STRI settling plate, 27 Aug 1973 (1y ♂). Canal Zone, NMNH Sta. 81–4 (1 ♀).

REMARKS.—Both specimens were collected within a short distance of the type-locality, Cristobal. The known distribution of *A. insigniformis* is from

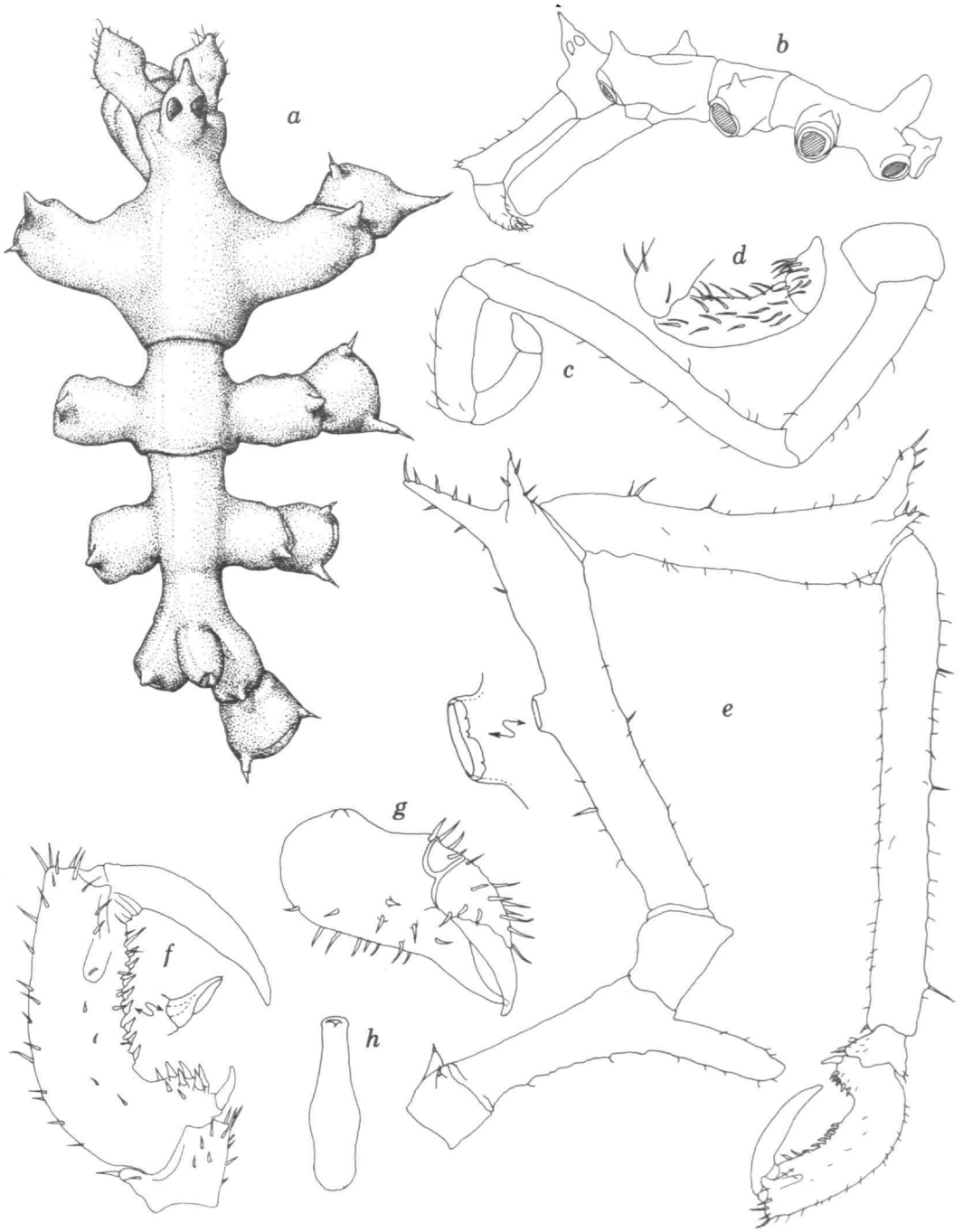

FIGURE 18.—*Anoplodactylus galetensis*, new species, holotype, male: *a*, trunk, dorsal view; *b*, trunk, lateral view; *c*, oviger; *d*, terminal segments of oviger, enlarged; *e*, third leg, with enlargement of cement gland; *f*, terminal segments of third leg, with enlargement of sole spine; *g*, chela; *h*, proboscis, ventral view.

Panama and Jamaica to the southern Netherlands Antilles, all in the Caribbean.

The juvenile leg tubercles are not as long or fully formed as those of the adult, as would be expected, nor are the coxal spurs on the posterior legs fully formed. The femoral cement glands of the juvenile male are oval discs, but had not yet raised to form the broad tube typical of this species. It would be difficult to confuse this species with *A. insignis,* because of the much shorter proboscis, lack of any extension or dorsodistal tubercle on the scape, and lack of the distal propodal extension beyond the insertion of the main claw, as with *A. insigniformis.* Before this species was recognized in 1975, there were probably many sublittoral specimens from the Caribbean deposited in collections as *A. insignis,* although, as stated above, the differences are now easily recognized.

Anoplodactylus jonesi Child

FIGURE 19a, b

Anoplodactylus jonesi Child, 1974:497–500, fig. 2.—Child, in prep.

Anoplodactylus (?) *antillianus* Stock, 1975a:1081–1082, fig. 57.

MATERIAL EXAMINED.—Panama Caribbean: Galeta Island reef, STRI Coralline 7 (1 ♂), 9 (2 ♂, 2 ♀), 11 (2 ♂, 1 ♀), 13 (1 ♀ with ovigers), 15 (2 ♀ ovig.), 17 (1 ♀), 19–A (1 ♂, 1 ♀), 20–A (1 ♂ with eggs, 1 ♀ with ovigers), 24 (1 ♀), 25 (1 ♂, 2 ♀); STRI *Laurencia* 11 (2 ♂, 1 ♀), 14–A (1 ♂ with eggs, 1 ♀ ovig.), 15–B (1 ♂), 18 (1 ♂, 1 ♀); STRI *Laurencia* oil spill, 21 Mar 1972 (1 ♀); STRI *Zoanthus* 10 (1 ♀), 12 (1 ♀ ovig.), 15 (1 ♀), 18 (1 ♂).

REMARKS.—Thirty of the 32 specimens above are normal-appearing males and females (by definition of the genus), while only 2 (about 6 percent) are females with ovigers. This is 10 percent of all females. A figure of the normal male propodus and leg with the cement gland is included here. The oviger of normal males is almost exactly like that of an abnormal female in the original description, except that the terminal segment is sometimes shorter. The segment is more often equal to that of the type. Out of 34 specimens on record, 4 (about 12 percent) are abnormal females with ovigers. This is too large a number to be a casual error, especially when the specimens from the 3 locations are separated by over 1600 km. If this phenomenon were embryonic misdetermination, then the same thing should occur in samples of several hundred specimens of other *Anoplodactylus* species. So far, a female with ovigers has not been recorded with other species. The single exception is with male-female gynandromorphs (see p. 58). There must be, therefore, something peculiar only to *A. jonesi* that causes a small percentage of females to grow atypical organs while the majority do not. It could be easily explained by misdetermination if the female ovigers were misshapen or not a normal matched pair, but they are normal in relation to those of the male for all four known specimens with this attribute.

Stock's (1975a:1081, footnote) reference to the genus *Phoxiphilyra* (pro *Philyra,* preocc.) of Losina-Losinsky (1961:82) could provide just the answer needed. Losina-Losinsky erected her genus and described 2 new species based only on 3 specimens. Her genus has all the characters of *Anoplodactylus,* except that both male and female have ovigers, if reduced. One species, *P. quadriarticulata,* has long auxiliary claws, but this character is sometimes of questionable diagnostic value. It is possible that Losina-Losinsky's 2 females are abnormal females out of a larger group of normal females, the same as for *A. jonesi.* The odds against this are great, but *A. jonesi* was described twice, each from a single abnormal individual and the odds for this are remote also.

Anoplodactylus massiliformis Stock

Anoplodactylus massiliformis Stock, 1975a:1063–1066, figs. 48–49.

REMARKS.—No specimens of this species were found in the collections examined here, but the allotype was taken in 60–63 meters off Colón, Panama. This depth is almost beyond the scope of the shallow water forms reported in this paper, although 2 or 3 species here are recorded at both shallower and deeper depths. The known distribution of *A. massiliformis* is from Panama and the southern West Indies to the mouth of the Amazon River, Brazil.

Anoplodactylus monotrema Stock

FIGURE 19c

Anoplodactylus robustus.—Child and Hedgpeth, 1971:612–613 [literature].

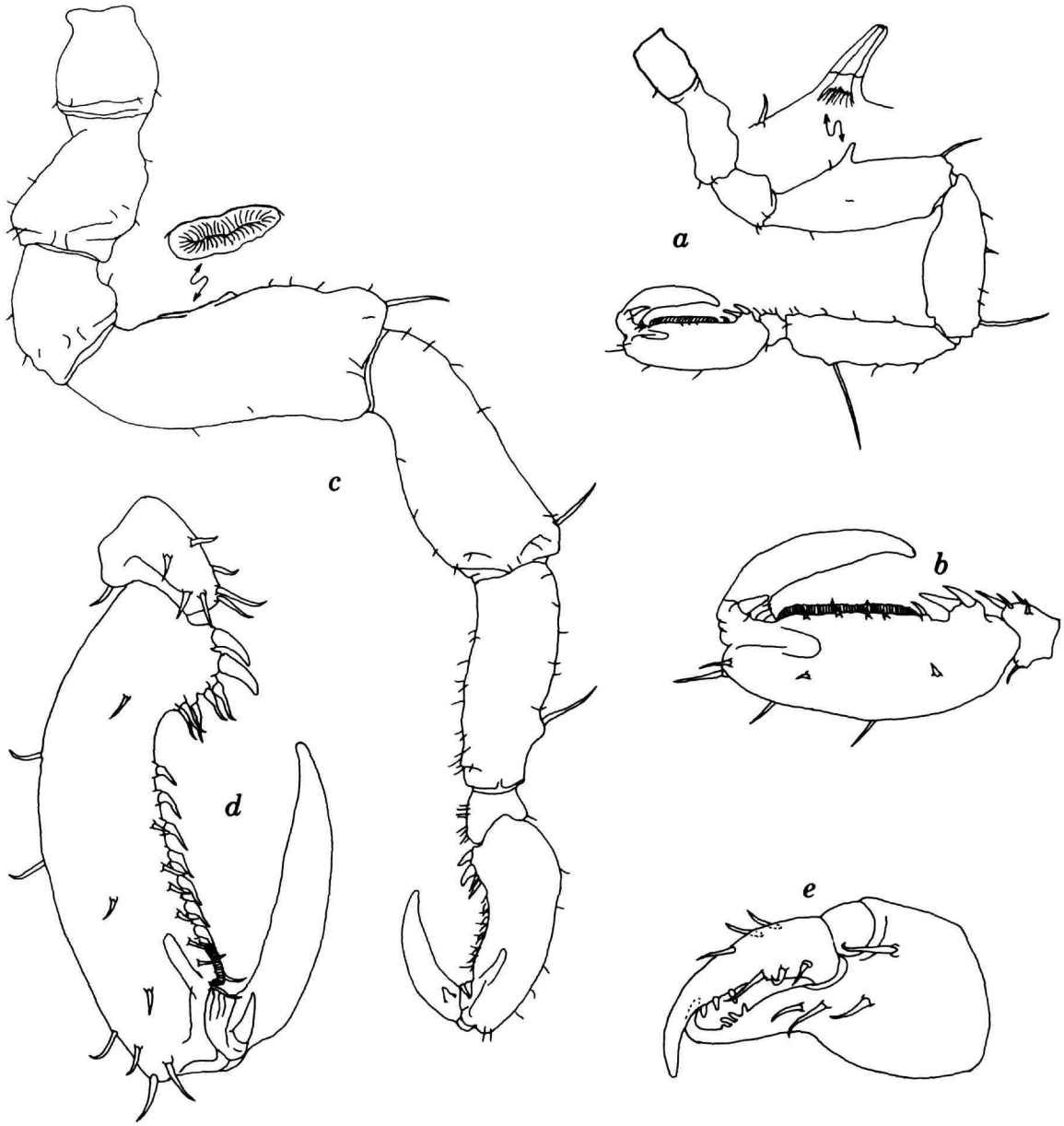

FIGURE 19.—*Anoplodactylus jonesi*, male: *a*, third leg, with enlargement of cement gland; *b*, terminal segments of third leg, enlarged. *Anoplodactylus monotrema*, male: *c*, third leg, with dorsal view of cement gland. *Anoplodactylus multiclavus*, female: *d*, terminal segments of third leg. *Anoplodactylus compactus*: *e*, chela.

Anoplodactylus monotrema Stock, in press, figs. 4–5.

MATERIAL EXAMINED.—Mexico Caribbean: Quintana Roo, Smithsonian-Bredin 11–60 (1 ♂), 72–60 (1 ♀).

Panama Caribbean: Galeta Island reef, STRI *Laurencia* 12 (1 ♂), 13–B (1 ♀), 15–A (1 ♀), 15–B (1 ♀ with eggs, 2 ♀), 24 (1 ♀); STRI *Laurencia* oil spill, 17 Mar 1972 (3 ♂, 1 ♀, 1y), 21 Mar 1972 (1 ♂ with eggs), 27 Mar 1972 (1 ♂ with eggs, 4 ♂, 11 ♀), 17 Apr 1972 (6 ♂ with eggs, 1 ♂, 3 ♀); STRI *Zoanthus* 15 (1 ♂), 18 (1 ♂); STRI Coralline 24 (1 ♀); NMNH Sta. 15 (1 ♀). Caledonia Bay, *Velero III* A9–39 (1 ♀).

REMARKS.—Stock (in press) recently separated the Western Hemisphere specimens out of Dohrn's *A. robustus,* based on the male of the new species having only 1 oval cribriform cement gland while Dohrn's species has 3 raised pores. The specimens of *A. robustus* figured by Marcus (1940, pl. 8, *Halosoma robustum*) has several faintly drawn cement glands, which would place them in *A. robustus.*

The species as it is now known, has a distribution from North America and the Caribbean to Hawaii and the Galapagos Islands. None were found here from the Pacific coast of Panama or other localities in Middle America (Pacific).

Anoplodactylus multiclavus Child

FIGURE 19*d*

Anoplodactylus multiclavus Child, 1977:593–596, fig. 4.–Child, in prep.

MATERIAL EXAMINED.—Mexico Caribbean: Quintana Roo, Smithsonian-Bredin 72–60 (1 ♂ with eggs).

Panama Caribbean: Near Portobelo, NMNH Sta. 5–1 (1 ♂ with eggs). Golfo de San Blas, NMNH Sta. 116–1 (1 ♀, 1y), NMNH Sta. 116–4 (1 ♂, 1 ♀). Canal Zone, NMNH Sta. 81–4 (1 ♀). Galeta Island reef, STRI *Acanthophora* 9 (1 ♀), 17 (1 ♂), 19 (1 ♂, 1 ♀); STRI *Laurencia* 14–B (1 ♀), 15–A (1 ♀), 16–A (1 ♀), 16–B (1 ♂ with eggs, 1 ♀, 1y); STRI *Laurencia* oil spill, 17 Mar 1972 (1 ♂, 4 ♀), 21 Mar 1972 (1 ♂ with eggs, 2 ♂, 4 ♀, 1y), 27 Mar 1972 (10 ♂, 16 ♀), 17 Apr 1972 (4 ♂ with eggs, 8 ♂, 3 ♀).

REMARKS.—This distinctive species was described from a single male specimen. The above females add little to the original description except for the usual slightly larger size of the female and differences in the terminal leg segments which are figured here.

The female propodus has a very short lamina while the male lamina is three-fifths as long as the sole. The male propodal sole has 2 or 3 sole spines and a few small setae flanking the lamina, while the female sole has 7 or 8 large sole spines and the same flanking setae. Female heel spines are slightly longer and less curved and the auxiliary claws are stouter and a little longer than in the male. The reduction of propodal lamina in females seems to be more or less usual among those species of *Anoplodactylus* provided with a lamina. In many species described years ago, this character was not recognized and therefore remains unknown.

Anoplodactylus multiclavus is now known from the intertidal of the U.S. Virgin Islands and the Caribbean coast of Panama and Belize.

Anoplodactylus pectinus Hedgpeth

Anoplodactylus pectinus Hedgpeth, 1948:234–236, fig. 34; 1954:427.—Stock, 1955:235, fig. 11.—Arnaud, 1973:955–957. —Child, 1974:500.—Stock, 1974:17.—Stock, in press.—Child, in prep.

Anoplodactylus pectinis [sic].—Stock, 1975a:1050–1052, fig. 41a.

MATERIAL EXAMINED.—Mexico Caribbean: Quintana Roo, Smithsonian-Bredin 53–60 (1 ♂ with eggs), 83–60 (1 ♀).

Panama Caribbean: Golfo de San Blas, NMNH Sta. 116–4 (1 ♂ with eggs). Galeta Island reef, Misc. STRI Sta., 30 Jun 1971 (1 ♀).

REMARKS.—The obvious disparity between the 2 collecting areas for this species, the Caribbean and Madagascar, would lead one to believe that a geminate pair is involved. On the other hand, there is a sufficient number of distribution disparities among the pycnogonids that this species may turn out to have a pantropical distribution, as has been found for several other species long after they were originally described.

Anoplodactylus portus Calman

Anoplodactylus portus Calman, 1927:405–408, fig. 103.—Child, 1975:201 [literature].—Birkeland, et al., 1976:158.—Child, 1978:133–144.—Child, in prep.—Stock, in press.

MATERIAL EXAMINED.—Costa Rica Pacific: Bahía Salinas, *Velero III* 478–35 (1 ♂ with eggs).

Panama Pacific: Panama City, STRI *Abietinaria* 1 (2 ♂, 1 ♀, 2y), 2 (1 ♂, 1y), 3 (2 ♂ with eggs, 3 ♀, 3 abnormal ♀, 1y), 6 (1 ♀, 1y), 8 (4 ♂, 1 ♀, 2 abnormal ♀, 2y); NMNH Sta. 25–1 (1 ♂), 58–4 (1y), 84–C, –D (1y ♂, 1 ♀), 91 (166 ♂, ♀, y–19 adults are gynandromorphs). Canal Zone, Barnard PAN–10 (2 ♀); NMNH Sta. 23–1 (1 ♀), 56–5 (1 ♀), 133–1 (1 ♂, 3y, 2 larvae); Misc. Sta. LGA 69–65 (1 abnormal ♂), coll. Glynn, Mar 1976 (350 specimens—10 adults are gynandromorphs).

REMARKS.—The gynandromorphs and abnormalities in these collections are treated by Child (1978), and represent the first instance of this phenomenon found among the pycnogonids.

The species is common along the Pacific coast of California to at least as far south as Peru. Within the scope of this paper, it has also been reported from the Pacific coast of Nicaragua (Stock, 1955: 238–239). Hilton (1942f) recorded this species as *A. robustus* from the Gulf of California.

I consider Hedgpeth's (1961:5–7) variety *chilensis* from Chile to be a further variation of this species, which has shown a remarkable ability to produce abnormalities.

Anoplodactylus reimerae, new species

FIGURE 20

MATERIAL EXAMINED.—Panama Pacific: Isla Taboguilla, STRI settling plate, 1 Dec 1971 (1 ♂, holotype, USNM 169412), 8 Nov 1972 (1 ♂, 2 ♀, paratypes), 10 Jan 1973 (1 ♂ with eggs, paratype), 12 Apr 1973 (1 ♂ with eggs, paratype), 19 Apr 1974 (1 ♂, 1y ♂, paratypes); STRI *Balanus,* 19 Feb 1975 (1 ♀, paratype). Panama City, NMNH Sta. 92–4 (2 ♀, 2y, paratypes).

DESCRIPTION.—Animal entirely covered with tiny evenly spaced papillae. First 2 trunk segmentation lines complete, each with a posterior curve at median dorsal point, 3rd segmentation line entirely lacking. Lateral processes one and one-half times as long as wide, separated by distances equal to or slightly less than their diameters, armed dorsodistally with small pointed tubercles flanked by 2 or 3 setae. Ocular tubercle a perfect cone, blunt at tip, almost one and one-half times taller than diameter at base. Eyes large, darkly pigmented, situated toward base of cone. Abdomen long, cylindrical, curved anteriorly from base, armed with 2 laterodistal setae.

Proboscis cylindrical, inflated toward tip, lips slightly inflated.

Palps represented by small pointed buds, longer than wide, located at anterior midpoint of cephalic segment. Buds slightly shorter on male paratypes. Female palp buds point laterally, situated ventrally below curving collar, not to be seen dorsally.

Chelifore scape cylindrical, inflated distally with ventral curve, armed with lateral and distal short setae. Chela ovoid, armed with 3 endal and 7 or 8 ectal setae. Fingers moderately and equally curved, of equal length, without teeth. Movable finger with ectal fringe of setae.

Oviger moderately long, slender, third segment one and one-fourth times length of 2nd, both armed with few lateral setae. Terminal 2 segments slightly clubbed, both armed with endal fringe of short setae.

Legs moderately long, slender, armed with few setae. Third leg with coxal spur as long as segment diameter. Coxal spur of 4th leg slightly longer. Femoral cement gland a swollen cone pointing distally, capped by small pore, situated slightly proximal to middorsal point. Femur and tibia 1 with small dorsodistal tubercles and tiny laterodistal tubercles, each armed with 1 seta shorter than segment diameter. Tibia 2 without tubercles, armed with single dorsodistal seta. Propodus with wide heel armed with 2 curved spines and 7 lesser spines. Sole armed with from 6 to 8 strong curved spines, few lateral spines, and propodal lamina equal to three-tenths sole length. Claw robust, slightly curved. Auxiliaries robust, strongly pointed.

MEASUREMENTS OF HOLOTYPE (mm).—Trunk length (scape insertion to tip of 4th lateral processes), 1.4; trunk width (across 1st lateral processes), 0.94; proboscis length, 0.62; abdomen length, 0.43; third leg, coxa 1, 0.29; coxa 2, 0.65; coxa 3, 0.36; femur, 1.21; tibia 1, 1.01; tibia 2, 1.08; tarsus, 0.14; propodus, 0.56; claw, 0.37.

DISTRIBUTION.—Known from the type-locality, Isla Taboguilla, and the adjacent mainland in Panama City, from the intertidal to 9 meters.

ETYMOLOGY.—Named for Dr. Amada A. Reimer, whose delightful correspondence introduced me to the STRI survey collections and who patiently supplied me with further collections and station data as they were sorted from STRI survey samples.

REMARKS.—This graceful species shows some affinities to several Panamanian and Pacific coast species. It has the distinct palp buds and smooth chela fingers of *A. trispinosus,* and the conical ocular tubercle and similar legs of *A. californicus.* Hall's (1913) California species, apparently rare in collections, if one disregards half of Hilton's determinations, has not been collected on the Central American coast and none are available to me. Hall's species may, in fact, be *A. virdintestinalis,* according to some of his figures (Hall, 1913, pl. 4). His tiny figure (pl. 4: fig. 15) of the cement gland, though, suggests that it is very like that of *A.*

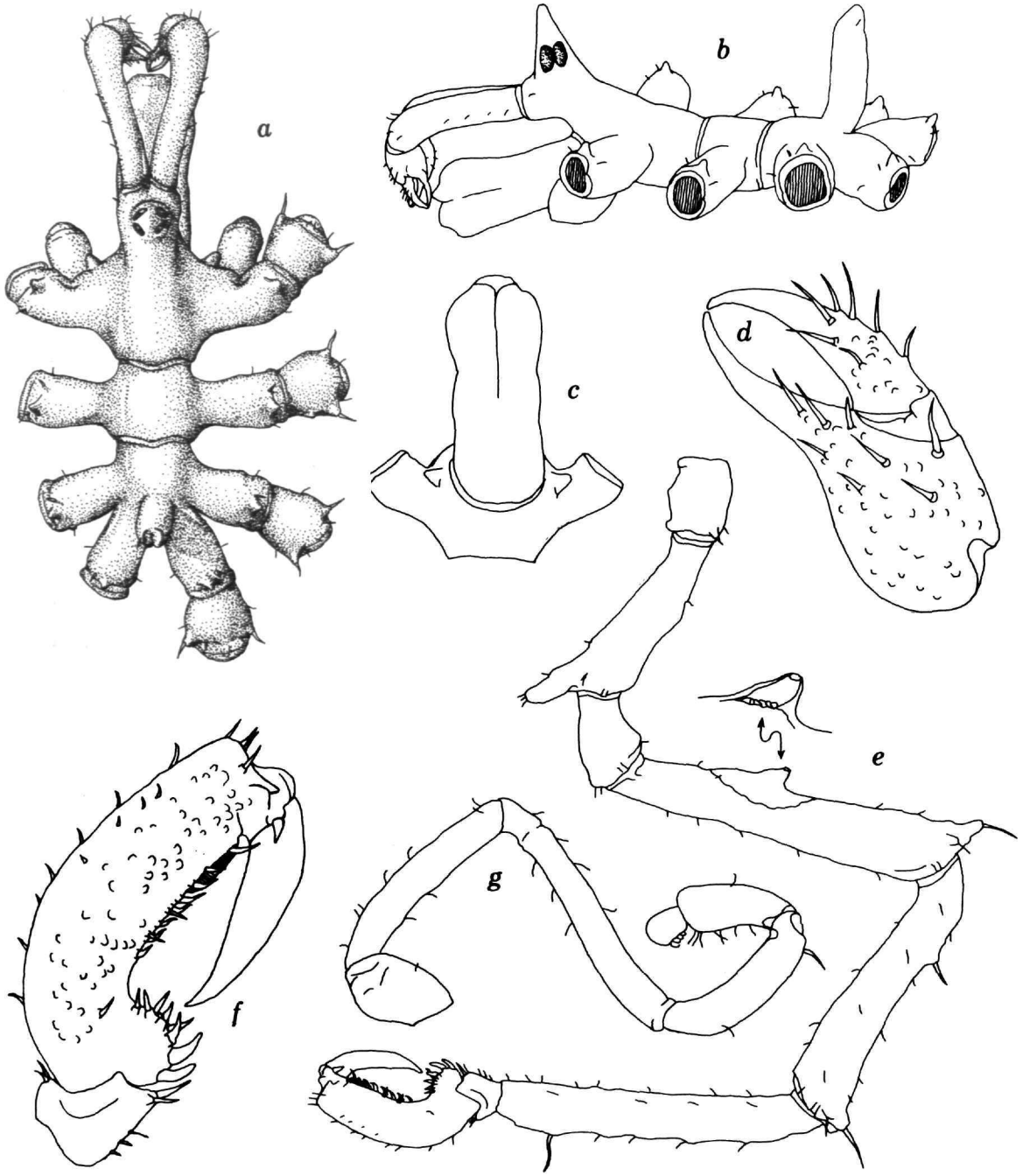

FIGURE 20.—*Anoplodactylus reimerae*, new species, holotype, male: *a*, trunk, dorsal view; *b*, trunk, lateral view; *c*, cephalic segment and proboscis, ventral view, showing palp buds; *d*, chela; *e*, third leg, with enlargement of cement gland; *f*, terminal segments of third leg; *g*, oviger.

reimerae. The terminal leg segments of the two species are also very similar, but the wide proboscis, closely positioned lateral processes, and very setose oviger are sufficiently different from *A. reimerae* to separate the 2 species. See further discussion of Hall's species under *A. viridintestinalis* (p. 63). There are no other similarities of the new species with *A. trispinosus* than those mentioned above.

The new species is perhaps closest to *A. stictus*, a species known only from Brazil. The legs are, again, very similar, including the coxal spurs, the dorsodistal tubercles, the propodus, and particularly the cement glands, which are exactly alike in both species. Other similarities are found in the ocular tubercle, well separated trunk segments, chelifore shape, and the proboscis. The differences are that *A. stictus* has alar processes on the female proboscis ventral surface, complete trunk segmentation, lack of lateral process tubercles, and different oviger segment lengths and terminal segment setation.

The new species also shares several similarities with *A. portus*, including ovigers, femoral cement gland, chelifores, and ocular tubercle. The females of *A. reimerae*, though, never have the peculiar alar proceses found on females of *A. portus*.

Anoplodactylus stri, new species

FIGURE 21

MATERIAL EXAMINED.—Panama Caribbean: Galeta Island, Misc. STRI Sta., 21 Apr 1971 (1 ♂, holotype, USNM 169376).

DESCRIPTION.—Trunk compact, without segmentation. Lateral processes little longer than their diameters, almost touching proximally, with greater separation distally, without tubercles, armed with single dorsodistal setae. Ocular tubercle a truncated cone as wide as tall, capped by a low knob. Eyes large, darkly pigmented. Abdomen inflated, little taller than ocular tubercle, armed with several distal setae.

Proboscis cylindrical, as long as scape. Mouth flat, without raised lips.

Palp buds represented by low bulges on anterior of 1st lateral processes.

Chelifore scape cylindrical, armed with 1 lateral and 2 distal seate. Chela ovoid, armed with 2 or 3 distal setae. Movable finger strongly curved, armed with 2 ectal setae and 3 or 4 small serrate teeth. Fixed finger almost straight, armed with 2 small serrate teeth, without setae.

Ovigers 6-segmented, the 2nd almost as long as 3rd. Fifth segment with 10 setae as long as segment diameter. Terminal segment pointed, little longer than its diameter, armed with 4 or 5 setae equal to its length.

Legs moderately short. Second coxa of 4th legs with very short coxal spur armed with 2 setae. Other legs without coxal spurs. Femoral cement gland a large slightly raised disc with wide pore situated at midpoint on dorsal surface of femur. Femur longest of main leg segments, which are all armed with a few short setae and 1 long dorsodistal seta. Propodus with a strong heel armed with 1 curved spine and 4 smaller spines. Sole armed with 2 curved spines and a lamina three-fifths of the sole length, flanked by several small setae. Claw with strongly curved tip. Auxiliary claws very small to minute.

MEASUREMENTS (mm).—Trunk length (chelifore insertion to tip of 4th lateral processes), 0.73; trunk width (across 2nd lateral processes), 0.52; proboscis length, 0.41; abdomen length, 0.17; third leg, coxa 1, 0.18; coxa 2, 0.34; coxa 3, 0.19; femur, 0.52; tibia 1, 0.4; tibia 2, 0.45; tarsus, 0.07; propodus, 0.34; claw, 0.22.

DISTRIBUTION.—Known only from the type-locality, Galeta Island, in the intertidal.

ETYMOLOGY.—Named for the personnel of the Smithsonian Tropical Research Institute (STRI), whose surveys contributed the majority of specimens reported in this paper.

REMARKS.—This tiny species belongs to a group of small compact species called the *Anoplodactylus pygmaeus*-complex by Stock (1975a:1075–1076). It comes closest in number of like characters to *A. arescus*, a species from the Red Sea. Both have a single heel spine, but the propodus of *A. arescus* is inflated and has a lamina along the entire sole surface.

The new species differs from all species of the *A. pygmaeus*-complex in having the following combination of charactetrs: a single heel spine, lateral processes almost touching, long propodal lamina, chela fingers without teeth, a low cup-shaped cement gland, and lack of lateral process tubercles. The new species in some ways resembles *A. pygmaeus* (specimens from the southeastern United States), but *A. pygmaeus* has small lateral process tubercles,

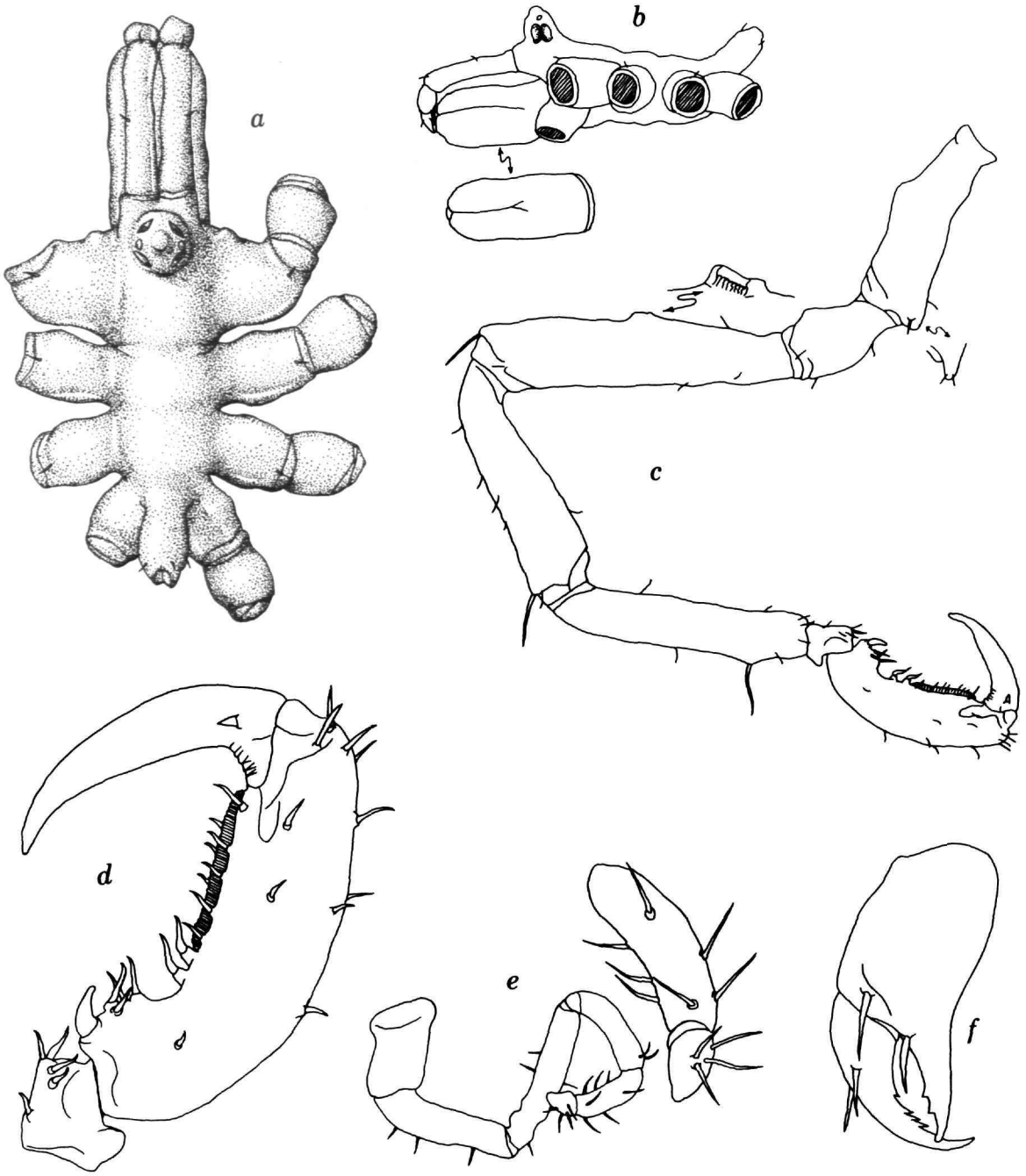

FIGURE 21.—*Anoplodactylus stri*, new species, holotype, male: *a*, trunk, dorsal view; *b*, trunk, lateral view, with proboscis in ventral view; *c*, third leg, with enlargement of cement gland and inset of genital spur of fourth leg; *d*, terminal segments of third leg; *e*, oviger, with enlargement of two terminal segments; *f*, chela.

more crowded lateral processes, a very different cowl-shaped cement gland, and 2 heel spines. A single heel spine is relatively rare in this genus. One of the few species that shares this character is *A. batangensis* (p. 50).

Other species of this complex all have 2 heel spines, lateral processes separated by greater intervals, teeth on the chela fingers, or different cement glands and other combinations of characters differing from the new species.

On the Pacific side of the Isthmus, there is another compact species, *Anoplodactylus* species 1 (p. 64), which has some similarity to *A. stri.* The Culebra Island species, though, is even more compact (Figure 22) and has 2 heel spines, tiny lateral process tubercles, and chela finger teeth, all of which are lacking in *A. stri.*

Hilton's (1939:27–28) *A. compactus* of southern California is another similar compact species that has cement glands very like those of *A. stri.* Unlike the new species, *A. compactus* has large lateral process tubercles, 2 heel spines, and a full length propodal lamina. Figure 19*e* of the chela (not previously illustrated) is included here for *A. compactus.*

Anoplodactylus trispinosus Stock

Anoplodactylus trispinosus Stock, 1951:14–16, figs. 17–22; 1954a:127; 1954b, fig. 35; 1964:31, figs. 8–9 (Curaçao record only); 1975a:1076–1079, figs. 55, 56a, table 1.

Not *Anoplodactylus trispinosus* Stock, 1964:31, figs. 5–7 [Red Sea record = *A. turbidus* Stock].

MATERIAL EXAMINED.—Panama Caribbean: Canal Zone, NMNH Sta. 14–2 (1 ♂).

REMARKS.—This tiny specimen was first thought to be a new species. There are several differences between this specimen and Stock's (1975a, fig. 55) figures of his Curaçao specimen. The proboscis is longer in the Panamanian specimen, extending slightly beyond the segmentation line between the scape and chela. The ocular tubercle is shorter by about three-tenths, although it has the same lateral tubercules and general shape. The general habitus of both species are similar, including the oviger segmentation and setae, the chela finger shape and lack of teeth, the inflated abdomen, and the slight lateral process tubercles. The vestigial palp buds are not so evident in the Panamanian specimen. The proximal heel spine is larger than its mate and the auxiliaries are larger than in Stock's figures. I regard these small differences as insufficient in their sum to warrant erecting a new species, particularly when the previously known distribution of this eastern Caribbean species (Curaçao and Tobago) would place it also as a likely inhabitant of the western Caribbean.

Anoplodactylus viridintestinalis (Cole)

Halosoma viridintestinalis Cole, 1904:286–288, pl. 14: fig. 11, pl. 24: figs. 6–8, pl. 25, figs. 1–4.

Anoplodactylus viridintestinalis.—Stock, 1955:239 [literature]. —Ziegler, 1960:19.—Krapp and Kraeuter, 1976:340.—Reimer, 1976:299.—Birkeland, et al., 1976:158.

Phoxichilus compactus Hilton, 1939:35 [misidentification, see Child, 1975].

?*Anoplodactylus californicus* Hall, 1912:91–93, figs. 49, 52c, f, i, j; 1913:129–130, pl. 4: figs. 14–16.

MATERIAL EXAMINED.—Mexico Pacific: Gulf of California, Barnard SCO–5 (1y). Gulf of Tehuantepec, *Velero III* 260–34 (1y ♂).

Panama Pacific: Canal Zone, Barnard PAN–10 (1 ♂ with eggs). Panama City, Barnard PAN–5 (1 ♂ with eggs), PAN–16 (1 ♀ ovig.); STRI *Abietinaria* 1 (1 ♀), 2 (3 ♂ with eggs, 6 ♂, 1 ♀), 3 (5 ♂ with eggs, 10 ♂, 10 ♀, 1y), 4 (3 ♂ with eggs, 1 ♂, 1 ♀, 1y), 6 (6 ♂ with eggs, 8 ♂, 6 ♀, 1y); STRI *Tetraclita* 1 (1 ♂ with eggs, 2 ♂, 2 ♀); NMNH Sta. 25–1 (2 ♂, 2y, 1 larva).

REMARKS.—In my opinion, without having seen Hall's type or any other specimen designated as *A. californicus,* Hall's species should tentatively be put under *A. viridintestinalis.* Hall's original figure (1912, fig. 49) shows a juvenile with one oviger segment. Hall's additional figures (1913, pl. 4: figs. 14–16) show an oviger very much like that of *A. viridintestinalis,* except for a slightly different arrangement of setae, which may be due to viewing angle. This is compared with Hedgpeth's (1948:217, fig. 25) figure of the oviger for *A. viridintestinalis.*

There is much similarity in the femoral cement glands and genital processes of the last two pairs of legs for each species. Cole (1904:286–288) described this species from a female specimen. Comparison of *A. viridintestinalis* specimens in hand tend to support this contention when compared with Hedgpeth's and Hall's figures (see p. 61).

This is another species for which these records indicate a southern extension in distribution. It is known now from the San Francisco area of Cali-

fornia, south to Panama, but not beyond. Specimens are very common along the Pacific shores of the Canal Zone and Panama City, but have not been found on the Caribbean side of the Isthmus.

The specimen recorded by Krapp and Kraeuter (1976:340) from Georgia, United States, is probably not of this species. It is a female and missing most leg distal segments. Isolated females in this genus are difficult or impossible to identify, but I would state, after examining the specimen, that it is probably *A. pygmaeus*, a species common to the Georgia coast.

Anoplodactylus species 1

FIGURE 22

MATERIAL EXAMINED.—Panama Pacific: Canal Zone, Barnard PAN–17 (1 ♀ ovig.). Panama City, NMNH Sta. 58–4 (1 ♀).

REMARKS.—This will be a new species when a male is collected to reveal all of the diagnostic characters. Until then, this species can only be designated by a number.

This is another tiny compact species belonging to the *A. pygmaeus*-complex of Stock (1975a:1075–1076). Its two closest relations are *A. compactus* of southern California, and *A. haswelli* of Australia. It differs from *A. compactus* in having a more broad and lower ocular tubercle, a longer abdomen, a second tibia shorter than the first (those of *A. compactus* are subequal), and in lacking large lateral process tubercles. Both species share the crowded lateral processes, small size, similar propodus, and chela finger teeth. The propodal lamina of this species measures only about one-fourth of the sole length while that of *A. compactus* covers the entire sole. It is often the case among species of this genus that the lamina of the male is longer than that of the female and since only the females of this species are known, a shorter lamina is to be expected.

This species has a similar affinity to *A. haswelli* Flynn in the large inflated proboscis, crowded lateral processes, and similarities in leg and propodus characters and chela finger teeth. This latter character is a point of dispute among later authors and Flynn's (1918:3–5) original description, but it will suffice to say here that this species and the unnamed Panama specimens have fingers with multiple teeth. The male femoral cement gland, a prime diagnostic character, has not been figured for *A. haswelli*.

Anoplodactylus species 2

Anoplodactylus spec. 2.—Stock, 1955:243–244, fig. 15.

MATERIAL EXAMINED.—Panama Pacific: Canal Zone, Barnard PAN–17 (3 ♀, 1y ♂, 17y); NMNH Sta. 85–7 (1 ♀). Panama City, NMNH Sta. 25–1 (1 ♀, 1y); NMNH Sta. 58–4 (1 ♀, 1y).

REMARKS.—This rather distinctive species enters the record a second time with only females and juveniles collected. I believe that the specimen Stock listed and figured as a female is actually an immature male. None of the three females above, collected in and around Panama City, have the obvious oviger buds. These buds would grow into full ovigers along with femoral cement glands after the next one or two molts. The male juveniles above have the same distinct palp buds, produced laterally anterior to the oviger implantation. The ovigers of each are only half formed, in the same location as the oviger buds figured by Stock, and none of the specimens have begun to form femoral cement glands on the legs.

The above females share a single heel spine, conical ocular tubercle, tiny palp buds, trunk with two segmentation lines, and most other characters shown in Stock's figures. The eyes, however, are missing from the dorsal aspect of Stock's Perlas Islands specimen. They may not have been as distinguishable as the eyes of these three females. The eyes are small, well pigmented, and situated almost at the base of the ocular tubercle cone. This unnamed species shares the single heel spine character with *A. stri, A. batangensis,* and others listed in this report. So far as is known, the distribution of this species is confined to the littoral of the Gulf of Panama.

Anoplodactylus species indeterminate

MATERIAL EXAMINED.—Mexico Pacific: Jalisco, *Velero III* 275–34 (1 damaged ♀).

Costa Rica Pacific: Puerto Culebra, *Velero III* Sta. 257–34 (1y ♀).

Panama Pacific: Canal Zone, NMNH Sta. 131–1 (1 larva); Barnard PAN–8 (6y and larvae). Panama City, NMNH Sta. 25–6 (1y ♀); NMNH Sta. 84–E (1y); STRI *Abietinaria* 2 (1 ♀), 5 (1 damaged ♀ ovig.). Taboguilla Island, STRI settling plate, 2 Feb 1971 (1 damaged ♂), 21 Mar 1971 (1y ♀), 24 Aug 1971 (1 ♀, 1 larva). Archipiélago de las Perlas, NMNH Sta. 32 (1y ♀).

Panama Caribbean: Galeta Island reef, STRI *Laurencia* 23 (1 ♀); STRI *Acanthophora* 20 (1 ♀).

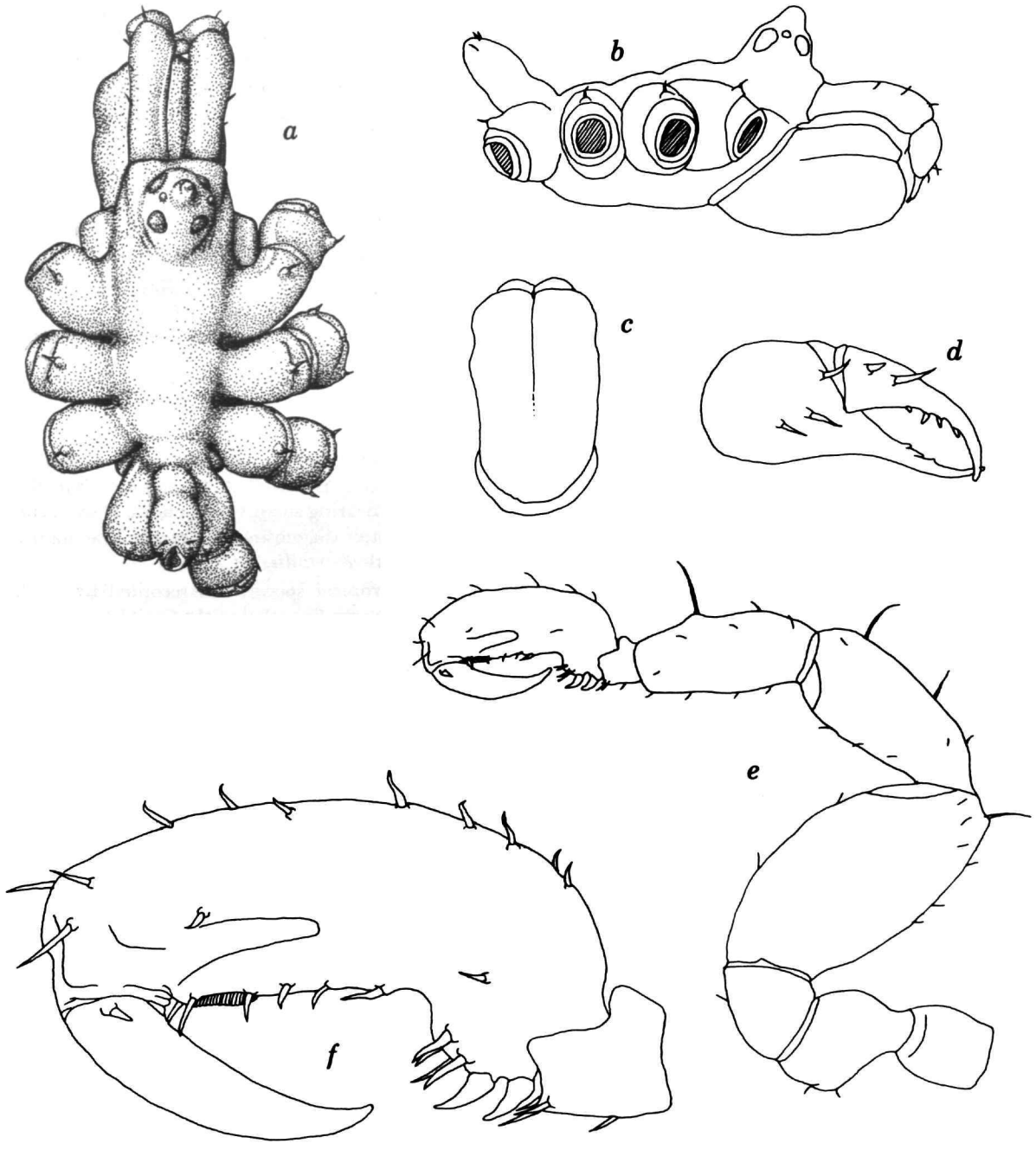

FIGURE 22.—*Anoplodactylus* species 1, female, Barnard PAN–17 specimen: *a*, trunk, dorsal view; *b*, trunk, lateral view; *c*, proboscis, ventral view; *d*, chela; *e*, third leg; *f*, terminal segments of third leg.

Mexico Caribbean: Quintana Roo, Smithsonian-Bredin Sta. 95–60 (1y ♂).

REMARKS.—Adult species of *Anoplodactylus* are sufficiently difficult to separate, particularly from stations having multiple species, that I make no attempt to assign names to these females, damaged specimens, and juveniles. Where recognizable *Anoplodactylus* species were found to occur at the same station, the above specimens appeared to differ in one or more respects from these species and were separated. Most of the adults are either damaged or not sufficiently developed to show sexual characters.

Family ENDEIDAE

Genus *Endeis* Philippi, 1843

Key to the Middle American Species of *Endeis*

1. Intestinal tract, particularly in legs, with many branched and unbranched diverticula; cement gland pores in irregular band along length of femur ..... ***E. flaccida***
   Intestinal tract without diverticula; cement glands in single row 2
2(1). Femur straight, without swellings; legs with isolated spines or setae ..... ***E. mollis***
   Femur distorted with swellings bearing large spines; less than 20 cement gland pores ..... ***E. spinosa***

Endeis flaccida Calman

Endeis flaccidus Calman, 1923:295, fig. 17.

Phoxichilus sp.?.—Loman, 1908:79, pl. 13: fig. 189 [from *Siboga* Sta. 310].

Endeis flaccida.—Stock, 1953:300; 1968a:56, 59 [key]; 1970:3–4; 1975a:1085, fig. 58a–b.

MATERIAL EXAMINED.—Panama Pacific: Isla Taboguilla, STRI *Pocillopora* 57 (1y ♂).

Panamá Caribbean: Canal Zone, NMNH Sta. 81–4 (1 ♀ ovig.).

REMARKS.—This species is easily recognized by its gut diverticula, particularly in the tibiae, and the straight femur without projections. The rather peculiar distribution of this species, previously known from several places in the Indo-Pacific and southern Florida, is now extended to both sides of the Isthmus of Panama. It has been found in the littoral and sublittoral.

Endeis mollis (Carpenter)

Phoxichilus mollis Carpenter, 1904:182, figs. 1–7.

Endeis mollis.—Stock, 1965:31 [literature]; 1968a:59 [key].—Utinomi, 1971:327.—Stock, 1975a:1083–1085; 1975b:76.

MATERIAL EXAMINED.—Panama Caribbean: Drake (near Portobelo?) Misc. STRI Sta., plate 48, 5 Jul 1975 (1 ♂ with eggs, 1 ♀, 1y), plate 21, 5 Jul 1975 (2y).

REMARKS.—The femoral cement glands on the posterior side of the femorae number from 14 to 16, less than has been encountered in other males of this species. This number would be more in keeping with the gland number of *E. spinosa*, but the straight legs bearing small spines on the above male serve as a better diagnostic character in placing the specimen with *E. mollis*.

This pantropical species was recorded by Stock (1975a:1083) from Cristobal at the Caribbean mouth of the Canal, and it has been previously collected on the Colombian coast. The present records are from further east along the same Panama coast as Cristobal.

Endeis spinosa (Montagu)

Phallangium spinosum Montagu, 1808:100, pl. 5: fig. 7.

Endeis spinosa.—Hedgpeth, 1948:238–240 [literature].—Stock, 1952b:185–186; 1954a:128; 1957:85; 1962:218.—Soyer, 1966: 3.—Haro, 1966:9; 1967:109, 112–113, fig. 5.—Stock, 1968a:59 [key]; 1968b:32, fig. 25.—Bayer, et al., 1970:A48.—Krapp, 1973a:72.—Child, in prep.

MATERIAL EXAMINED.—Panama Caribbean: Galeta Island, NMNH Sta. 1–2 (1 ♀ ovig.).

REMARKS.—It seems peculiar that this frequent inhabitant of drifting *Sargassum* would only be found once along the Caribbean coast of Middle America. This female was taken in *Thalassia* grass in about 20 cm depth. It is a common species along the Florida and eastern Caribbean coasts, but from the repeated collecting efforts of the Panama Survey, it would appear to be an infrequent visitor to the western Caribbean.

Family COLOSSENDEIDAE

Genus *Rhynchothorax* Costa, 1861

This genus presents several controversial characters or points of contention, not the least of which are palp segment number, chelifores, and familial affiliation. Many authors, including the writer, have described species with a certain number of palp segments, making the first segment the one extending out laterally from the cephalic segment. While examining five different species in the U.S. National Museum collections for purposes of comparison with the new species described below, I found that what has been called a first palp segment is in actuality a lateral extension of the cephalic segment and is without even a hint of a segmentation line. This necessitates revising most descriptions to reduce the number of palp segments by one article.

Hedgpeth (1951:111–115) described *R. philopsammum,* for instance, as having 5 palp segments and figured a distinct suture line at the base of the lateral cephalic extension. Reexamination of the holotype reveals no such suture, so that the actual number of palp segments are 4.

Reexamination of a specimen of *R. anophthalmus* shows the same error and reduces the palp segments again from 5 to 4. Two other species, to be described by the author in a future publication, show the same lateral cephalic extension without suture lines. The original description of *R. barnardi* Child and Hedgpeth (1971:626–628) is also in error in describing an extra palp suture against the cephalic segment, and the correct number is 5 instead of 6 for *A. barnardi.* Without examining all type-specimens, it is impossible to say that this error has occurred in all species, but it is probable that this lateral extension has been regarded as a distinct segment in several other species descriptions.

Chelifores have been described in at least three adult species of *Rhynchothorax.* The type-specimen of *R. alcicornis,* has unfortunately been destroyed, but the other two of *R. philopsammum* and *R. anophthalmus,* respectively, are found to lack any form of chelifore as described. In both of these very closely related species what were thought to be chelifores are actually anteriodorsal extensions of the cephalic segment (Figure 24*h, i*). Based on the original descriptions, all other species now known lack chelifores in the adult. It would be reasonable then to assert that no adult *Rhynchothorax* has chelifores and that they only exist in the juvenile stages.

One of the undescribed species mentioned above has a juvenile specimen with fully chelate chelifores, and more than one juvenile of *R. australis* in the U.S. National Museum collections (to be cataloged) has small chelifores. This fact, if true for all *Rhynchothorax* species, would remove the genus from the Ammotheidae; where it often has been placed in the past. The genus has also been included in the Colossendeidae; a total lack of chelifores in adults would tend to reinforce this placement. The lack of chelifores in adults cannot be the only character used to place them in the Colossendeidae; therefore, the family contains those genera with fully developed palps and ovigers in both sexes, but which lack chelifores in the adults.

Superficial comparison of morphological characters in the genus *Colossendeis* with those of the genus *Rhynchothorax* immediately reveals a great gulf of differences in size, tuberculation, and general shape between the two, such that placing them in the same family would seem, on the surface, to be foolhardy. We know nothing, unfortunately, of the life habits of *Colossendeis* and our knowledge of the habits and habitations of *Rhynchothorax* is so fragmentary as to forbid comparison or speculation. It is my opinion that the genus *Rhynchothorax* should be placed in its own family when we know more about its peculiar infaunal mode of living as described for several of the species. It does not seem appropriate at this time, however, to propose a family for *Rhynchothorax* based only on the morphological characters of the genus, when life habits may provide a better basis.

Key to the Middle American Species of *Rhynchothorax*

Dorsum of trunk and proboscis with cube-shaped tubercles with many bosses; ocular tubercle of 4 horns with bosses, eyes lacking; abdomen rectangular ..... ***R. architectus,*** new species

Dorsum of trunk smooth, without tubercles; ocular tubercle of 2 horns without bosses; eyes lacking; abdomen a truncate cone ..... ***R. philopsammum***

Rhynchothorax architectus, new species

FIGURE 23, 24*a–g*, 25*a–e*

MATERIAL EXAMINED.—Panama Pacific: Canal Zone, Barnard PAN–8 (1 ♀ ovig., 1y, paratypes), PAN–17 (1 ♂, 1y, paratypes).

Panama Caribbean: Galeta Island reef, STRI Coralline 9 (1 ♂, holotype, USNM 168769, 1y, paratype), 10 (1 ♂), 19–A (1 ♂), 21 (2 ♂); STRI *Zoanthus* 9 (1 ♂), 12 (1 ♂), 14 (2 ♂), 16 (1 ♂), 19 (1 ♂, 2 ♀); STRI *Laurencia* 10 (1 ♀), 14–B (1 ♀), 18 (1 ♂ with eggs); STRI *Laurencia* oil spill, 21 Mar 1972 (1 ♂), 17 Apr 1972 (1 ♀).

DESCRIPTION.—Entire surface of animal moderately papillose. Trunk completely segmented. Middorsal tubercles extending from anterior proboscis to posterior of abdomen, those of trunk with many bosses without setae. Lateral processes separated by less than their diameters, with 2 or 3 dorsodistal small tubercles and with larger posterior multiple-pointed tubercles on 1st and 2nd processes. Ocular tubercle low, extending forward over base of proboscis with 2 sets of 2 tubercles adorned with several low bosses. Eyes entirely lacking. Abdomen moderately short, cylindrical, with blunt tip, armed with row of small dorsal tubercles without setae.

Proboscis a tapered cylinder, swollen dorsally, armed with simple tubercles middorsally and row of small bosses laterally and midventrally. Dorsal antimere well developed.

Chelifores entirely lacking.

Palps 4-segmented. First segment as long as terminal 3, arising from lateral extension of cephalic segment. Second segment twice as long as its diameter, armed with 2 setae. Third segment over 3 times its diameter, with long dorsal tubercle almost as long as segment length, armed with few setae. Fourth segment strongly curved dorsally to same height of 3rd segment tubercle, armed ventrally and distally with many setae. Palp without large endal spine.

Oviger 10-segmented; 4th and 6th longest, club-shaped, armed distally with 1 or 2 setae. Terminal 4 segments armed with trilobed or unilobed spines in the formula 3:3:2:3. Terminal claw typical of the genus, forming subchela distally.

Third leg moderately slender, tuberculate. Coxa 1 with dorsolateral tubercles. Coxa 2 with large posterior tubercle on 3rd leg only, carrying sexual pore. Coxa 3 with low ventral bulge. Femur with short ventral spine and very long dorsodistal spine. Femoral cement gland a low bulge ventrally, placed at three-tenths of the segment length, with a simple pore at highest point. Tibiae subequal, with several short setae and 1 long dorsodistal spine each. Femur little longer than tibiae. Propodus moderately curved, armed with 6 or 7 sole spines on anterior legs and 2 sole spines on posterior legs. Claw robust. Auxiliaries three-fifths of main claw.

VARIATIONS.—Female larger than male. Male with 2 median trunk tubercles per segment, sometimes with only 1, females with 1 or none. Anterior lateral process tubercle sometimes lacking in either sex. Female without coxa 2 spur on 3rd leg. Palp shape either long or more oval in each segment, regardless of sex.

MEASUREMENTS OF HOLOTYPE (mm).—Trunk length (tip of ocular tubercles to tip of 4th lateral processes), 0.69; trunk width (across 2nd lateral processes), 0.43; proboscis length, 0.38; abdomen length, 0.16; third leg, coxa 1, 0.07; coxa 2, 0.1; coxa 3, 0.09; femur, 0.24; tibia 1, 0.22; tibia 2, 0.22; tarsus, 0.04; propodus, 0.19; claw, 0.08.

DISTRIBUTION.—Known from the type-locality, Galeta Island, and from both the Pacific and Caribbean sides of the Canal Zone, in the intertidal.

ETYMOLOGY.—The proposed name is from Greek, meaning an "architect" or "master builder," referring to the middorsal trunk architecture and its great variations.

REMARKS.—This new species is one of a group (Group "D" of Krapp, 1973b:123) having a low ocular tubercle projecting anteriorly, no eyes, and a palp tubercle on the penultimate segment forming a pseudochela with the terminal segment. The species of this group are, besides *R. architectus*, *R. philopsammum*, *R. anophthalmus*, and *R. alcicornis*. This species differs from all of these by having median and dorsolateral proboscis tubercles and multilobed median trunk tubercles. *Rhynchothorax architectus* differs from all other known members of the genus, except the three above, in lacking eyes, and shares the character of a fully segmented trunk only with *R. philopsammum* and *R. articulatus*. The extreme dorsal tuberculation of the new species is sufficient to separate it from all other known species.

The ventral femoral cement gland of the new species is slightly larger on the 4 anterior legs than on the posterior legs and was found coated with exuvia on all legs of the holotype. The one male

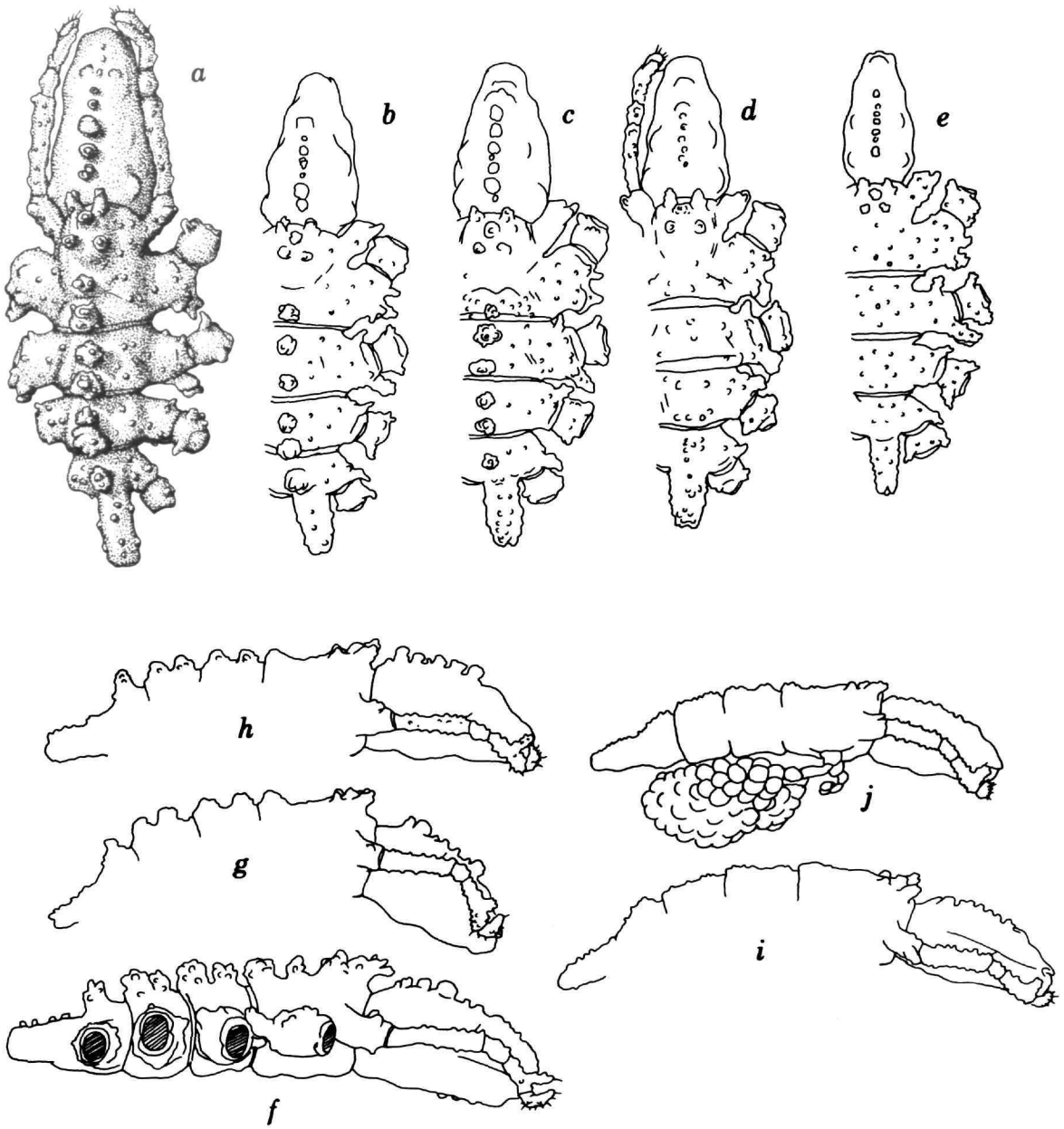

FIGURE 23.—*Rhynchothorax architectus*, new species, males. Dorsal views: *a*, holotype; *b*, *Zoanthus* 19 specimen; *c*, Coralline 19–A specimen; *d*, Barnard PAN–8 specimen; *e*, *Laurencia* 18 specimen with eggs. Lateral views: *f*, holotype: *g*, *Zoanthus* 19 specimen; *h*, Coralline 19–A specimen; *i*, Barnard PAN–8 specimen; *j*, Laurencia 18 specimen with eggs. (All to same scale.)

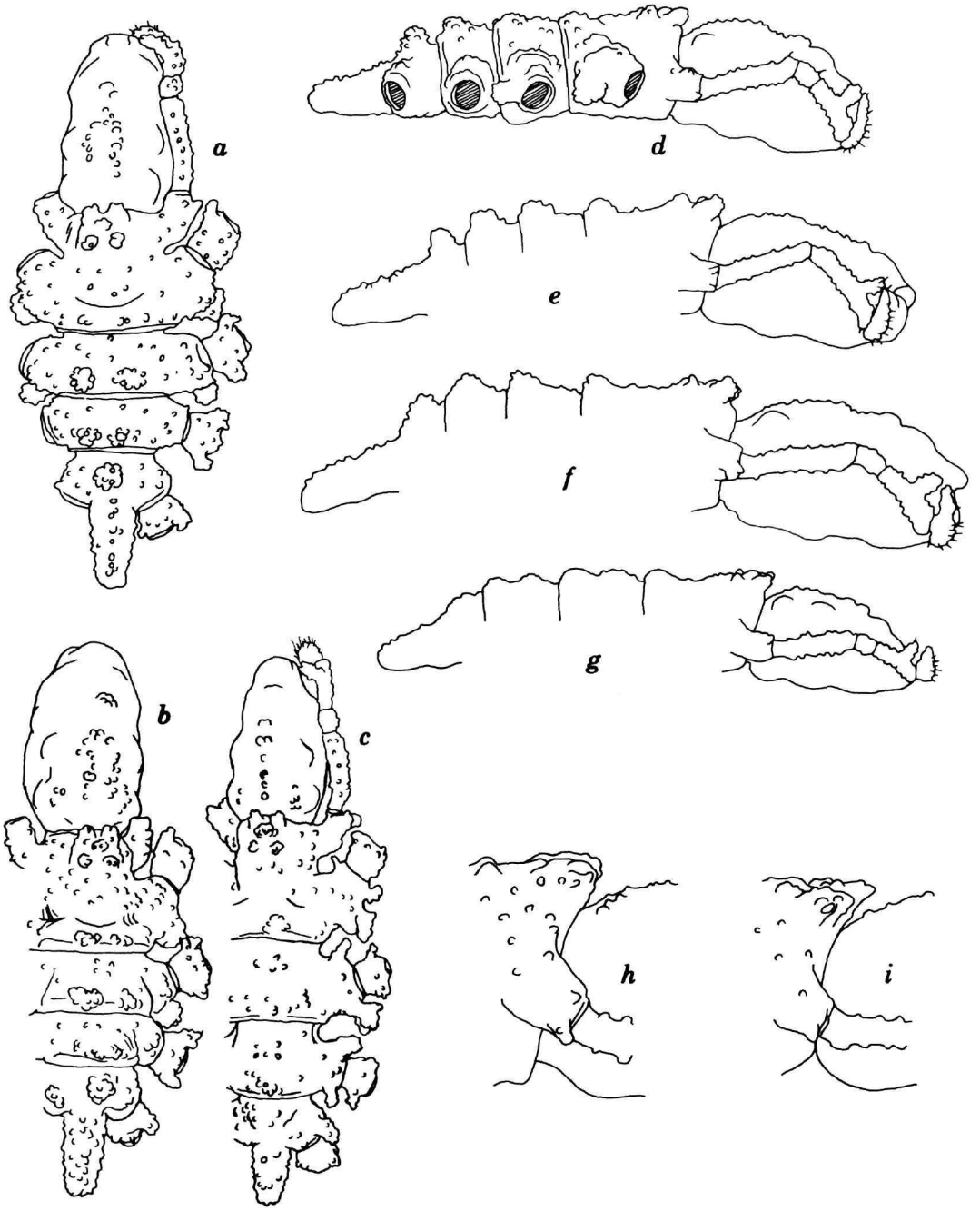

FIGURE 24.—*Rhynchothorax architectus*, new species, females, dorsal views: *a*, *Laurencia*, 21 Mar 1972 specimen; *b*, *Zoanthus* 19 specimen; *c*, *Zoanthus* 9 specimen. Lateral views: *d*, *Laurencia*, 21 Mar 1972 specimen; *e*, *Zoanthus* 12 specimen; *f*, *Zoanthus* 19 specimen; *g*, *Zoanthus* 9 specimen. *Rhynchothorax philopsammum*, female: *h*, anterior of ocular segment at junction of proboscis. *Rhynchothorax anophthalmus*, paratype: *i*, anterior of ocular segment at junction of proboscis. (*a–g* same scale; *h*, *i*, same scale.)

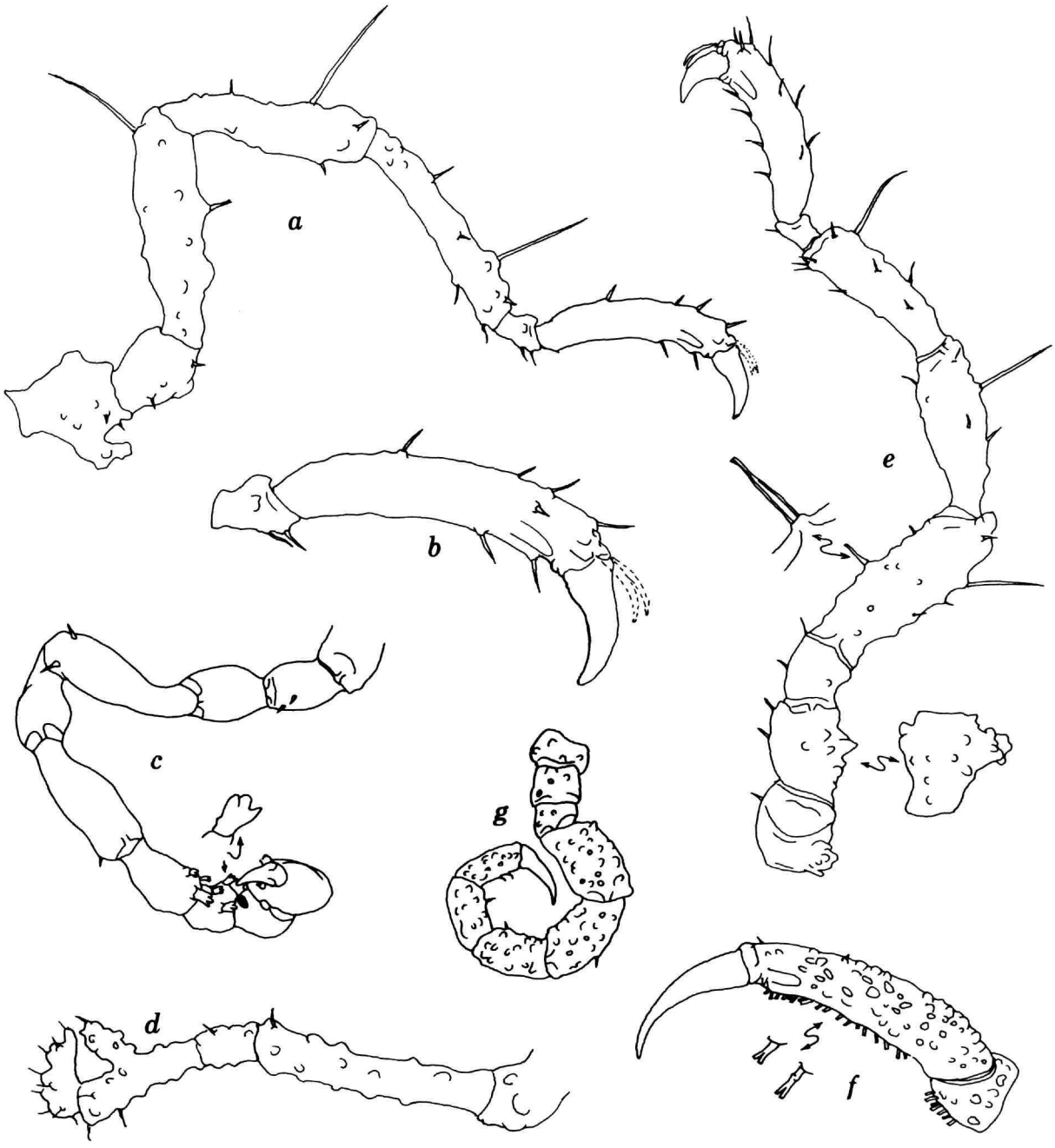

FIGURE 25.—*Rhynchothorax architectus*, new species, male, holotype: *a*, third leg; *b*, terminal segments of third leg; *c*, oviger, with enlargement of typical spine; *d*, palp; *e*, third leg of male from Barnard PAN–8, second coxa in dorsal view and enlargement of cement gland. *Pycnogonum panamum*, male: *f*, terminal segments of third leg with enlargement of two sole spines; *g*, oviger.

specimen with eggs has a single flat mass covering the entire trunk ventrally.

Rhynchothorax philopsammum Hedgpeth

FIGURE 24*h*

Rhynchothorax philopsammum Hedgpeth, 1951:111–115, pl. 3.—Stock, 1966:415 [key].—Zago, 1970:3 [key].—Arnaud, 1972b:408 [key].—Krapp, 1973b: 120–121 [key].—Clark, 1976:295 [key].

MATERIAL EXAMINED.—Mexico Pacific: Gulf of Tehuantepec, *Velero III* 260–34 (2y), 261–34 (1 ♀).

REMARKS.—This is the first time since Hedgpeth's original records that new specimens of this species have been reported. There are other uncatalogued specimens in the U.S. National Museum collections from southern California, but these are the southernmost records for this species. It evidently does not occur as far south as Panama.

This single female specimen is indistinguishable from the figures of the type given by Hedgpeth (1951, pl. 3). This species is slightly larger than the usual minute forms that make up this genus. Hedgpeth was in error in describing the chelifores as short, thimble-shaped processes. There are 2 anterior projections of the cephalic segment that form part of the low ocular tubercle and that were mistaken for chelifores. There is not a trace of chelifores on any adult specimen I have seen.

Family PYCNOGONIDAE

Genus *Pycnogonum* Brünnich, 1764

Key to the Middle American Species of *Pycnogonum*

1. Integument reticulated; without lateral process tubercles; without auxiliary claws 2
   Integument not reticulated, but with tiny rugosities; with lateral process tubercles; with or without auxiliary claws 3
2(1). Oviger of 8 segments; lateral processes separated slightly; propodal sole spines bifid ..... ***P. panamum***
   Oviger of 7 segments; lateral processes touching; sole spines simple ..... ***P. reticulatum***
3(1). Oviger of 7 segments; lateral processes well separated; propodal sole spines bifid; auxiliary claws present ..... ***P. cessaci***
   Oviger of 9 segments; lateral processes touching; sole spines simple; no auxiliary claws ..... ***P. stearnsi***

Pycnogonum cessaci Bouvier

Pycnogonum cessaci Bouvier, 1911:493.—Fage, 1952:531–533, fig. 1.—Stock, 1954a:129; 1966:400 [key].—McCloskey, 1967: 131–133, figs. 25–27.—Stock, 1975a:1085–1086, fig. 58d.—Birkeland, et al., 1976:158.
Pycnogonum pamphorum Marcus, 1940:115–117, pl. 16.
Pycnogonum leticiae Mello-Leitão, 1945:1–4, figs. 1–5.

MATERIAL EXAMINED.—Panama Pacific: Panama City, STRI *Abietinaria* 1 (1 ♂ with eggs, 1 ♀), 2 (1 ♂, 1 ♀, 2 larvae), 3 (2y ♂, 1y ♀, 1 larva), 6 (5y); NMNH Sta. 25–1 (1 ♂ with eggs, 1 ♂, 1 ♀, 1y, 3 larvae).

REMARKS.—This tropical Amphi-Atlantic species is recorded here from the Pacific coast for the first time. These specimens are smaller than Atlantic specimens examined for comparison, but are otherwise indistinguishable. Auxiliary claws apparently arise and grow larger the further west specimens are found from the West African habitat. Fage (1952:533) found no auxiliaries on his Dakar specimens. Stock (1954a:129, 1975a:1086, fig. 58d) found vestigial auxiliaries on Venezuelan specimens. These Panamanian specimens have larger auxiliaries, fully one-fourth as long as the main claw.

Pycnogonum panamum Hilton

FIGURE 25*f*, *g*

Pycnogonum panamum Hilton, 1942b:310–311, pl. 47.—Hedgpeth, 1961:17, fig. 11.—Stock, 1966:402 [key].
?*Pycnogonum littorale*.—Nicolet, 1849:308; 1854, pl. 4: fig. 8.

MATERIAL EXAMINED.—Panama Pacific: Gulf of Chiriqui, *Velero III* 249–34 (1 ♂, holotype, USNM 79433).
Ecuador Pacific: Cabo San Francisco, *Velero III* 214–34, (1 ♂).

REMARKS.—Hilton listed one other specimen, a male, from the Islas Secas, a group of islands west

of Bahía Honda in the Gulf of Chiriqui, Panama. Distribution of this species appears to be confined to the west coast of Middle and South America, south to Chile (?), and in depths to 38 meters.

It resembles superficially *P. elephas,* from southern Brazil and Uruguay, but males of *P. panamum* have 8-segmented ovigers. The female lacks ovigers, but the male ovigers with terminal claw place this species in Stock's (1968a:60) subgeneric classification of *Pycnogonum*. The male proboscis is longer and more cylindrical than that of the female figured by Hedgpeth (1961, fig. 11a–b), but it agrees otherwise with his specimen. The tarsus and propodus are very like those of *P. elephas,* and have the same bifid endal setae extending proximally on tibia 2 to the distal end of the propodus, as figured here (Figure 25*f*). The terminal claw, without auxiliaries, is almost half the length of the propodus.

Pycnogonum reticulatum Hedgpeth

Pycnogonum reticulatum Hedgpeth, 1948:279–281, fig. 52c-f; 1954:427.—Stock, 1954a:129; 1966:402 [key]; 1968a, fig. 22j; 1975a:1085.

Pycnogonum sp.—Hedgpeth, 1947:13, fig. 5c.

MATERIAL EXAMINED.—Mexico Caribbean: Quintana Roo, Misc. Sta., coll. Downey, 13 Aug 1970 (1 ♀).

Panama Caribbean: Bocas del Toro, Misc. STRI Sta., 22 Jul 1971 (1 ♀), Aug 1971 (1 ♀).

El Salvador Pacific: coast, Misc. Sta. coll. J. M. Dow, 1850's (1 ♂).

REMARKS.—It is regrettable that no other specimen of this species has been found on the Pacific coast to reinforce Dow's single record (Hedgpeth, 1948:279) and above. Dow collected on both coasts of Middle America.

The distribution of *P. reticulatum* is now known to range from Florida, the Caribbean coast of Mexico and western Panama, the eastern Caribbean to Venezuela, and the single Pacific record.

Pycnogonum stearnsi Ives

Pycnogonum stearnsi Ives, 1892:142–144, pl. 10.—Hall, 1913: 133 [key].—Cole, 1904:251 [table], 259 [key], 292–294, pl. 14: figs. 13–15, pl. 26: fig. 10.—Hilton, 1915a:69; 1915b:202–203, 205–206; 1920:93.—Ohshima, 1933:147–149, fig. 2.—Schmitt, 1934:69.—Hilton, 1939:34.—Hedgpeth, 1940:86–87; 1941:254 [key], pl. 10 [part].—Hilton, 1943:19.—Hedgpeth, 1949:307 [text].—Ziegler, 1960:21.—Hedgpeth, 1964: 209 [key], fig. 92a.—Stock, 1966:402 [key].

MATERIAL EXAMINED.—Mexico Pacific: Gulf of California, Barnard SCO-7 (1 ♀); Misc. Sta., coll. Abbott, 22 May 1966 (1 ♀), coll. Brusca, 20 Mar 1972 (1 ♀), 24 Jan 1971 (1 ♀). Gulf of Tehuantepec, *Velero III* 260–34 (1 ♂ with eggs, 2 ♂, 2y).

REMARKS.—This species is quite common on the California coast, but has yet to be recorded in places between there and the Kurile Islands, where it was reported by Ohshima. The above records represent a range extension to the south, to the head of the Gulf of California, and to the Gulf of Tehuantepec. It has not been found in Panama and evidently does not extend south of Mexico as do *P. cessaci* and *P. reticulatum.*

This species can be distinguished from the other nonreticulated species, *P. cessaci,* by its lack of any trace of auxiliary claws and mostly simple propodal sole spines. *Pycnogonum cessaci* has bifurcated sole spines whereas *P. stearnsi* has only one or a few distally on each propodus.

Appendix

Station List

Smithsonian Tropical Research Institute, Environmental Protection Agency oil spill survey stations at which pycnogonids were collected and the species taken at each station.

Panama Caribbean

STRI Stations, Galeta Island

Laurencia: Reeftop zone where 73 percent or more of the area is covered by the alga *Laurencia papillosa;* all biota removed from a 0.25 m² grid area, intertidal.

Laurencia 5, 17 Feb 1971: *Ammothella rugulosa.*

Laurencia 6, 1 Mar 1971: *Ammothella rugulosa, Pigrogromitus timsanus.*

Laurencia 7, 2 Mar 1971: *Achelia sawayai, Ammothella marcusi, Ascorhynchus latipes, Nymphopsis duodorsospinosa, Pigrogromitus timsanus.*

Laurencia 9, 1 Jun 1971: *Ascorhynchus latipes, Pigrogromitus timsanus.*

Laurencia 10, 8 Jun 1971: *Ammothella marcusi, Ascorhynchus latipes, Rhynchothorax architectus.*

Laurencia 11, 15 Jun 1971: *Achelia sawayai, Ammothella marcusi, Ascorhynchus latipes, Anoplodactylus jonesi, Eurycyde raphiaster.*

Laurencia 12, 22 Jun 1971: *Anoplodactylus monotrema.*

Laurencia 13–A, 8 Feb 1972: *Achelia sawayai, Ascorhynchus latipes.*

Laurencia 13–B, 8 Feb 1972: *Achelia sawayai, Anoplodactylus batangensis, A. monotrema, Eurycyde raphiaster.*

Laurencia 14–A, 14 Feb 1972: *Achelia sawayai, Ammothella rugulosa, Anoplodactylus batangensis, A. jonesi, Ascorhynchus latipes.*

Laurencia 14–B, 14 Feb 1972: *Ammothella marcusi, A. rugulosa, A. spinifera, Anoplodactylus batangensis, A. multiclavus, Rhynchothorax architectus.*

Laurencia 15–A, 16 Feb 1972: *Achelia sawayai, Anoplodactylus batangensis, A. monotrema, A. multiclavus, Ascorhychus latipes.*

Laurencia 15–B, 16 Feb 1972: *Achelia sawayai, Ammothella rugulosa, Anoplodactylus jonesi, A. monotrema, Ascorhynchus latipes.*

Laurencia 16–A, 8 Mar 1972: *Achelia sawayai, Ammothella marcusi, Anoplodactylus multiclavus.*

Laurencia 16–B, 8 March 1972: *Ammothella marcusi, A. rugulosa, A. spinifera, Anoplodactylus batangensis, A. multiclavus, Eurycyde raphiaster.*

Laurencia 17, 17 Mar 1972: *Ammothella marcusi, A. rugulosa.*

Laurencia 18, 20 Jun 1972: *Achelia sawayai, Ammothella rugulosa, Anoplodactylus jonesi, Rhynchothorax architectus.*

Laurencia 19–A, 30 Aug 1972: *Ammothella rugulosa.*

Laurencia 20, 1 Sep 1972: *Ammothella rugulosa, Ascorhynchus latipes.*

Laurencia 21, 26 Mar 1973: *Ascorhynchus latipes.*

Laurencia 22, 28 Mar 1973: *Ammothella marcusi.*

Laurencia 23, 8 Apr 1973: *Ammothella marcusi, A. rugulosa, Anplodactylus* species indeterminate, *Ascorhynchus latipes, Eurycyde raphiaster.*

Laurencia 24, 22 Apr 1973: *Achelia sawayai, Ammothella rugulosa, Anoplodactylus monotrema, Eurycyde raphiaster.*

Laurencia oil spill, 17 Mar 1972: *Achelia sawayai, Ammothella marcusi, A. rugulosa, A. spinifera, Anoplodactylus batangensis, A. monotrema, A. multiclavus.*

Laurencia oil spill, 20 Mar 1972: *Ammothella marcusi, A. spinifera.*

Laurencia oil spill, 21 Mar 1972: *Achelia sawayai, Ammothella marcusi, Anoplodactylus batangensis, A. jonesi, A. monotrema, A. multiclavus, Ascorhynchus latipes, Nymphopsis duodorsospinosa, Rhynchothorax architectus.*

Laurencia oil spill, 27 Mar 1972: *Ammothella marcusi, A. rugulosa, Anoplodactylus monotrema, A. multiclavus.*

Laurencia oil spill, 17 Apr 1972: *Ammothella marcusi, A. rugulosa, Anoplodactylus batangensis, A. evelinae, A. monotrema, A. multiclavus, Ascorhynchus latipes, Eurycyde raphiaster, Rhynchothorax architectus.*

Acanthophora: Reeftop zone where two species of this algae form the dominant substrate; all biota removed from a 0.25 m² grid area, intertidal.

Acanthophora 1, 29 Sep 1970: *Ascorhynchus latipes.*

Acanthophora 4, 22 Oct 1970: *Ascorhynchus latipes.*

Acanthophora 6, 29 Apr 1971: *Ascorhynchus latipes, Eurycyde raphiaster.*
Acanthophora 7, 3 May 1971: *Ascorhynchus latipes.*
Acanthophora 9, 24 Jun 1971: *Achelia sawayai, Anoplodactylus multiclavus, Ascorhynchus latipes, Eurycyde raphiaster.*
Acanthophora 10, 30 Jun 1971: *Eurycyde raphiaster.*
Acanthophora 11, 2 Jul 1971: *Achelia sawayai, Ascorhynchus latipes.*
Acanthophora 12, 7 Jul 1971: *Achelia sawayai, Ammothella marcusi, Callipallene emaciata, Eurycyde raphiaster.*
Acanthophora 16, 8 Aug 1972: *Achelia sawayai, Ammothella rugulosa, Anoplodactylus allotrius, A. batangensis, Ascorhynchus latipes.*
Acanthophora 17, 3 May 1973: *Achelia sawayai, Ammothella spinifera, Anoplodactylus multiclavus, Ascorhynchus latipes, Eurycyde raphiaster.*
Acanthophora 18, 4 May 1973: *Ascorhynchus latipes, Eurycyde raphiaster.*
Acanthophora 19, 7 May 1973: *Achelia sawayai, Anoplodactylus multiclavus, Ascorhynchus latipes.*
Acanthophora 20, 7 May 1973: *Achelia sawayai, Anoplodactylus* species indeterminate, *Ascorhynchus latipes, Eurycyde raphiaster.*

Zoanthus: Reeftop zone where 73 percent or more of the substrate is occupied by *Zoanthus sociatus;* all biota removed from a 0.25 m² grid area, intertidal.

Zoanthus 5, 15 Mar 1971: *Eurycyde raphiaster.*
Zoanthus 6, 16 Mar 1971: *Ammothella marcusi, Ascorhynchus latipes, Eurycyde raphiaster, Pigrogromitus timsanus.*
Zoanthus 7, 27 Mar 1971: *Eurycyde raphiaster.*
Zoanthus 9, 15 Jul 1971: *Ascorhynchus latipes, Eurycyde raphiaster, Rhynchothorax architectus.*
Zoanthus 10, 19 Jul 1971: *Anoplodactylus jonesi, Eurycyde raphiaster.*
Zoanthus 11, 30 Jul 1971: *Ascorhynchus latipes, Pigrogromitus timsanus.*
Zoanthus 12, 2 Aug 1971: *Achelia sawayai, Ammothella marcusi, Anoplodactylus jonesi, Ascorhynchus latipes, Eurycyde raphiaster, Rhynchothorax architectus.*
Zoanthus 14, 10 Aug 1972: *Achelia sawayai, Rhynchothorax architectus.*
Zoanthus 15, 17 Aug 1972: *Ammothella marcusi, Anoplodactylus jonesi, A. monotrema.*
Zoanthus 16, 23 Aug 1972: *Ascorhynchus latipes, Rhynchothorax architectus.*
Zoanthus 18, 26 Apr 1973: *Ascorhynchus latipes, Anoplodactylus jonesi, A. monotrema.*
Zoanthus 19, 9 May 1973: *Ascorhynchus latipes, Eurycyde raphiaster, Rhynchothorax architectus.*
Zoanthus 20, 10 May 1973: *Achelia sawayai, Ascorhynchus latipes, Eurycyde raphiaster.*

Thalassia: Reeftop zone where the predominant substrate is *Thalassia testudinum;* all biota removed from a 0.12 m² grid area, intertidal.

Thalassia 8, 8 Apr 1971: *Achelia sawayai.*
Thalassia 10, 21 Jul 1971: *Achelia sawayai.*
Thalassia 15–A, 19 Jun 1972: *Achelia sawayai.*
Thalassia 16–A, 20 Jul 1972: *Achelia sawayai.*
Thalassia 17, 4 Apr 1973: *Eurycyde raphiaster.*
Thalassia 18, 16 May 1973: *Ascorhynchus latipes.*
Thalassia 19, 17 May 1973: *Ascorhynchus latipes.*

Coralline: Reeftop zone in which 65 percent or more of the substrate is occupied by crustose coralline algae; all biota removed from 0.12 m² grid area, intertidal.

Coralline 5, 3 Mar 1971: *Ammothella marcusi, Eurycyde gorda*
Coralline 6, 3 Mar 1971: *Eurycyde gorda*
Coralline 7, 27 Mar 1971: *Achelia sawayai, Ammothella marcusi, Anoplodactylus jonesi, Ascorhynchus latipes.*
Coralline 9, 8 Aug 1971: *Ammothella marcusi, Anoplodactylus jonesi, Ascorhynchus latipes, Eurycyde raphiaster, Rhynchothorax architectus.*
Coralline 10, 17 Aug 1971: *Ascorhynchus latipes, Eurycyde raphiaster, Rhynchothorax architectus.*
Coralline 11, 14 Aug 1971: *Ammothella marcusi, Anoplodactylus jonesi, Ascorhynchus latipes, Eurycyde raphiaster.*
Coralline 12, 19 Aug 1971: *Ammothella marcusi.*
Coralline 13, 1 Nov 1971: *Achelia sawayai, Ammothella marcusi, Anoplodactylus jonesi, Ascorhynchus latipes.*
Coralline 15, 23 Nov 1971: *Achelia sawayai, Ammothella marcusi, Anoplodactylus jonesi, Eurycyde raphiaster.*
Coralline 17, 22 May 1972: *Ammothella marcusi, Anoplodactylus jonesi, Eurycyde raphiaster.*
Coralline 19–A, 12 Jun 1972: *Anoplodactylus jonesi, Ascorhynchus latipes, Eurycyde raphiaster, Rhynchothorax architectus.*
Coralline 20–A, 13 Jun 1972: *Ammothella marcusi, Anoplodactylus jonesi.*
Coralline 21, 20 Aug 1972: *Ammothella marcusi, Ascorhynchus latipes, Eurycyde raphiaster, Rhynchothorax architectus, Tanystylum birkelandi.*
Coralline 23, 12 Mar 1973: *Ascorhynchus latipes, Eurycyde raphiaster.*
Coralline 24, 13 Mar 1973: *Achelia sawayai, Ammothella marcusi, Anoplodactylus jonesi, A. monotrema, Eurycyde raphiaster.*
Coralline 25, 14 Mar 1973: *Achelia sawayai, Ammothella marcusi, Anoplodactylus jonesi, Ascorhynchus latipes, Tanystylum birkelandi.*

STRI settling plates: Plexiglass rectangles (5 × 15 cm) placed subtidally in 8 to 10 meters below the reeftop and left in place for approximately 2 months for benthic recruitment.

8 Jan 1971: *Ammothella spinifera, Ascorhynchus castellioides.*
29 Jan 1971: *Ammothella spinifera.*
16 Apr 1971: *Ammothella rugulosa.*
24 Jun 1971: *Ammothella rugulosa, Ascorhynchus castellioides, Nymphon floridanum.*
27 Jul 1971: *Ammothella spinifera, Ascorhynchus castellioides.*
11 Oct 1971: *Ascorhynchus latipes*
21 Dec 1971: *Ammothella spinifera, Ascorhynchus castellioides.*
10 Feb 1972: *Ammothella appendiculata, Anoplodactylus batangensis, Ascorhynchus castellioides, Eurycyde raphiaster.*
14 Apr 1972: *Ascorhynchus castellioides.*
12 Jun 1972: *Ammothella spinifera, Ascorhynchus castellioides.*
9 Aug 1972: *Ascorhynchus castellioides.*
11 Sep 1972: *Ammothella exornata, A. spinifera, Ascorhynchus castellioides.*
9 Nov 1972: *Ascorhynchus castellioides.*
12 Jan 1973: *Ascorhynchus castellioides.*
15 Feb 1973: *Ammothella rugulosa.*
9 Apr 1973: *Ascorhynchus castellioides.*
8 Jun 1973: *Ammothella spinifera, Ascorhynchus castellioides.*
27 Aug 1973: *Anoplodactylus insigniformis, Ascorhynchus castellioides, Tanystylum geminum.*
13 Feb 1974: *Ammothella spinifera, Ascorhynchus castellioides.*
14 Nov 1974: *Ammothella spinifera.*
20 Dec 1974: *Ascorhynchus castellioides.*

Panama Pacific

STRI Stations, Panama City

Abietinaria: Predominant substrate organism is the hydroid *Abietinaria* sp.; all biota removed from a 0.12 m² grid area, lower intertidal.

Abietinaria 1, 29 Oct 1970: *Ammothella symbius, Anoplodactylus erectus, A. evelinae, A. portus, A. viridintestinalis, Pycnogonum cessaci, Tanystylum intermedium, T. i. isthmiacum, T. tubirostrum.*
Abietinaria 2, 29 Oct 1970: *Ammothella symbius, Anoplodactylus erectus, A. evelinae, A. portus, Anoplodactylus* species indeterminate, *A. viridintestinalis, Nymphosis duodorsospinosa, Pycnogonum cessaci, Tanystylum intermedium, T. i. isthmiacum.*
Abietinaria 3, 29 Oct 1970: *Ammothella symbius, Anoplodactylus bova, A. erectus, A. evelinae, A. portus, A. viridintestinalis, Nymphopsis duodorsospinosa, Pycnogonum cessaci, Tanystylum dowi, T. intermedium, T. i. isthmiacum, T. tubirostrum.*
Abietinaria 4, 29 Oct 1970: *Ammothella symbius, Anoplodactylus erectus, A. evelinae, A. viridintestinalis, Nymphopsis duodorsospinosa, Tanystylum intermedium, T. i. isthmiacum, T. tubirostrum.*
Abietinaria 5, 26 Apr 1971: *Anoplodactylus* species indeterminate, *Nymphopsis duodorsospinosa, Tanystylum i. isthmiacum.*
Abietinaria 6, 26 Apr 1971: *Ammothella symbius, Anoplodactylus evelinae, A. portus, A. viridintestinalis, Nymphopsis duodorsospinosa, Pycnogonum cessaci, Tanystylum intermedium, T. i. isthmiacum.*
Abietinaria 8, 26 Apr 1971: *Anoplodactylus portus, Tanystylum i. isthmiacum, T. tubirostrum.*

STRI Stations, Isla Taboguilla

STRI settling plates: Plexiglass plates (5 × 15 cm) placed in 8 m depth (tidal range, 6 m) for approximately 2 months for recruitment purposes.

2 Feb 1971: *Anoplodactylus* species indeterminate, *Tanystylum i. isthmiacum.*
21 Mar 1971: *Anoplodactylus* species indeterminate, *A. erectus, Callipallene solicitatus, Tanystylum i. isthmiacum.*
11 May 1971: *Tanystylum i. isthmiacum.*
24 Aug 1971: *Anoplodactylus* species indeterminate, *A. evelinae, Tanystylum i. isthmiacum.*
8 Oct 1971: *Tanystylum i. isthmiacum.*
1 Dec 1971: *Anoplodactylus erectus, A. reimerae, Tanystylum i. isthmiacum.*
1 Feb 1972: *Callipallene solicitatus, Tanystylum i. isthmiacum.*
4 Apr 1972: *Anoplodactylus erectus, Tanystylum i. isthmiacum.*
2 Jun 1972: *Anoplodactylus erectus, Tanystylum i. isthmiacum.*
8 Aug 1972: *Anoplodactylus erectus, Tanystylum i. isthmiacum.*
8 Sep 1972: *Anoplodactylus erectus, Tanystylum i. isthmiacum.*
8 Nov 1972: *Anoplodactylus erectus, A. reimerae, Callipallene solicitatus, Tanystylum i. isthmiacum.*
10 Jan 1973: *Anoplodactylus erectus, A. reimerae, Tanystylum i. isthmiacum.*
13 Feb 1973: *Anoplodactylus erectus.*
12 Apr 1973: *Anoplodactylus erectus, A. reimerae, Callipallene solicitatus, Tanystylum i. isthmiacum.*
11 Jun 1973: *Tanystylum i. isthmiacum.*
15 Jan 1974: *Tanystylum i. isthmiacum.*
12 Feb 1974: *Anoplodactylus erectus, Tanystylum i. isthmiacum.*
11 Mar 1974: *Anoplodactylus erectus, Callipallene solicitatus, Tanystylum i. isthmiacum.*
19 Apr 1974: *Anoplodactylus erectus, A. reimerae, Callipallene solicitatus, Tanystylum i. isthmiacum.*
21 May 1974: *Anoplodactylus erectus, Tanystylum i. isthmiacum.*
13 Jun 1974, no number and number 23: *Anoplodactylus erectus, Tanystylum i. isthmiacum.*
30 Aug 1974, numbers 78 and 101: *Anoplodactylus erectus, Tanystylum i. isthmiacum.*

1 Oct 1974, number 110: *Anoplodactylus erectus, Tanystylum i. isthmiacum.*
13 Nov 1974, numbers 63 and 75: *Anoplodactylus erectus, Tanystylum i. isthmiacum.*
19 Dec 1974, number 36 and 79: *Anoplodactylus erectus, Tanystylum i. isthmiacum.*
19 Feb 1975: *Tanystylum i. isthmiacum.*
15 May 1975, number 57: *Tanystylum i. isthmiacum.*

Miscellaneous STRI Stations

Galeta Island

16 Apr 1971, on coral slab from 2–2.5 m: *Nymphon floridanum.*
21 Apr 1971, Mangrove 5: *Anoplodactylus stri.*
24 Apr 1971, on opisthobranch in 3–5 meters, coll. D. Meyer: *Pigrogromitus timsanus.*
30 Jun 1971, on stem of *Porites furcata* in 3 m: *Anoplodactylus galetensis.*
30 Jun 1971, on algae in 4–5 m: *Ammothella exornata, Anoplodactylus pectinus.*
5 Mar 1972, on crinoid in 6–9 m, coll. D. Meyer: *Achelia sawayai.*
20 Jul 1972, on subtidal reef in 3–6 m: *Anoplodactylus galetensis.*
27 Sep 1972, on dead coral in 5–6 m, coll. D. Meyer and J. Stames: *Pallenopsis schmitti.*
12 Oct 1972, on ascidian in 6 m: *Anoplodactylus galetensis.*
1 Dec 1972, on algae 6.3–9 meters below reef crest: *Tanystylum isthmiacum difficile.*
22 Mar 1973, on *Spyridia filamentosa* on reef: *Ammothella rugulosa, Nymphopsis duodorsospinosa.*
19 May 1974, on subtidal reef in 6 meters: *Anoplodactylus galetensis.*
28 Jul 1975, on bryozoans (*Gemelliporidra* sp.), coll. J. Dudley: *Pallenopsis schmitti.*

Panama Caribbean

22 Jul 1971, Bocas del Toro, between Isla Bastimentos and Isla Popa, S of Cayo Crawl reef, 09°14'N, 82°08'W, from dead coral on reef in 6 m, coll. D. Meyer: *Pycnogonum reticulatum.*
Aug 1971, Bocas del Toro, 09°22'N, 82°14' W, on *Agaricia* sp., coll. D. Meyer: *Pycnogonum reticulatum.*
1 Nov 1971, Golfo de San Blas, Salar Island Group, Ucubsui Island, on *Porites furcata,* 09°30'30"N, 78°48'28"W, *Eurycyde raphiaster.*
29 Apr 1972, Punta Guanche. near Portobelo: *Ammothella spinifera, Nymphopsis duodorsospinosa.*
26 Aug 1973, Bahía Portobelo, settling plate in 8–9 m: *Achelia sawayai, Ammothella spinifera, Ascorhynchus castellioides.*
7 Nov 1974, Golfo de San Blas, Salar Island Group, Ucubsui Island, under cement block at 37.5 m, coll. C. Birkeland: *Ascorhynchus latipes.*
7 Nov 1974, Golfo de San Blas, Salar Island Group, Ucubsui Island under cement block on coral reef, 11.5 m, coll. C. Birkeland: *Ascorhynchus latipes.*
5 Jul 1975, Drake (near Portobelo?), settling plate 21, open substrate: *Endeis mollis.*
5 Jul 1975, Drake (near Portobelo?), settling plate 48, on overgrown substrate, coll. C. Birkeland: *Endeis mollis.*
5 Jul 1975, Drake (near Portobelo?), settling plate 133: *Ascorhynchus castellioides.*

Isla Taboguilla

Balanus, 19 Feb 1975: *Anoplodactylus reimerae.*
Balanus 28, 19 Mar 1975: *Anoplodactylus erectus, Callipallene solicitatus.*
Balanus 55, 15 Apr 1975: *Callipallene solicitatus.*
Balanus 57, 15 May 1975: *Anoplodactylus erectus.*
Balanus 57, 11 Jul 1975: *Anoplodactyus erectus.*
Tetraclita 1, 31 Dec 1970: *Anoplodactylus viridintestinalis.*
Tetraclita 5, 31 Dec 1970: *Pigrogromitius timsanus.*
Pocillopora 57, 15 May 1975: *Ammothella symbius, Endeis flaccida.*

Colombia Pacific

29 Feb 1972, Isla Malpelo, at head of western fjord, number 2, label 175. 03°51'07"N, 81°35'40"W, intertidal, coll. J. R. Young: *Tanystylum malpelensis.*
2 Mar 1972, Isla Malpelo, near intertidal, dive 5, coll. J. R. Young and C. Birkeland: *Tanystylum malpelensis.*
3 Mar 1972, Isla Malpelo, fjord, number 2, dive 9, subtidal: *Anoplodactylus erectus.*
3 Mar 1972, Isla Malpelo, subtidal dive: *Anoplodactylus erectus.*
29 Feb–2 Mar 1972, Isla Malpelo, subtidal dive, on barnacle: *Tanystylum malpelensis.*

NMNH Stations, Panama Survey

(National Museum of Natural History, Smithsonian Institution)

1–2 Panama Caribbean; Galeta Island, extreme E end, *Thalassia* flats among mangroves, pushnet in 0–0.5 m, 16 Apr 1971: *Endeis spinosa.*
1–5 Panama Caribbean; Galeta Island, extreme E end, plankton tow in and over *Thalasia,* 0–0.3 m, 16 Apr 1971: *Ammothella exornata, Callipallene emaciata.*
5–1 Panama Caribbean; first cove SW of Buenaventura Cove, W of Portobelo, 09°31'40"N, 79°41'15"W, cobbles on sand beach, poison, intertidal, 18 Apr 1971: *Anoplodactylus multiclavus.*
10–9 Panama Caribbean; Canal Zone, Limon Bay, W jetty,

inside near Toro Point, pushnet on *Thalassia* flat, 0.3–0.6 m, 20 Apr 1971: *Anoplodactylus allotrius, Pigrogromitus timsanus.*

14–2 Panama Caribbean; Canal Zone, Limon Bay, Fort Sherman, Shimmey Beach, on steel shark fence with algae and ascidians, 1.2–2.6 m, 21 Apr 1971: *Anoplodactylus trispinosus, Ascorhynchus castellioides.*

15 Panama Caribbean; Galeta Island, algal and rock wash on flats in front of Laboratory, intertidal, 21 Apr 1971: *Achelia sawayai, Ammothella spinifera, Anoplodactylus batangensis, A. monotrema, Eurycyde raphiaster, Nymphopsis duodorsospinosa, Tanystylum geminum.*

15–3 Panama Caribbean; Galeta Island, intertidal *Zoanthus*, 21 Apr 1971: *Ammothella marcusi.*

22–1 Panama Pacific; Canal Zone, Fort Amador, Culebra Island, intertidal rock wash, 24 Apr 1971: *Ammothella symbius.*

23–1 Panama Pacific; Canal Zone, Venado Beach, W of island, poison in intertidal rock pool, 25 Apr 1971: *Anoplodactylus evelinae, A. portus.*

23–2 Panama Pacific; Canal Zone, Venado Beach, intertidal rock washings, 25 Apr 1971: *Nymphopsis duodorsospinosa.*

25–1 Panama Pacific; Panama City, Punta Paitilla, E side of point off Union Club, 08°58′15″N, 79°31′W., bryozoans and hydroids from rocks in lowest intertidal, 26 Apr 1971: *Ammothella symbius, Anoplodactylus evelinae, A. portus, A. viridintestinalis, Anoplodactylus* species 2, *Nymphon lituus, Nymphopsis duodorsospinosa, Pycnogonum cessaci, Tanystylum i. isthmiacum, T. tubirostrum.*

25–4 Panama Pacific; Panama City, Punta Paitilla, in tide pool with *Caulerpa* sp., 26 Apr 1971: *Tanystylum i. isthmiacum.*

25–6 Panama Pacific; Panama City, Punta Paitilla, from rocks and sand in natural gutter, 26 Apr 1971: *Anoplodactylus evelinae.*

28–1 Panama Pacific; Canal Zone, Fort Amador, Culebra Island, NW end, intertidal rock wash, 28 Apr 1971: *Ammothella spinifera.*

28–2 Panama Pacific; Canal Zone, Fort Amador, Culebra Island, NW end, intertidal rock wash, 28 Apr 1971: *Ammothella spinifera, Nymphopsis duodorsospinosa, Tanystylum* species indeterminate.

32 Panama Pacific; Archipiélago de las Perlas, Isla Pedro Gonzales, W side near SW tip, 08°22′42″N, 79°06′12″W, rocks and sand in 5 m, 30 Apr 1971: *Anoplodactylus* juveniles and *Tanystylum* larvae.

33–3 Panama Pacific; Archipiélago de las Perlas, Isla Pedro Gonzales, cove just N of SW point, rocky sand intertidal, 30 Apr 1971: *Ammothella symbius.*

34 Panama Pacific; Archipiélago de las Perlas, Isla Pedro Gonzales, cove N of E point, rocky sand with algae in 1.5–6 m, 30 Apr 1971: *Tanystylum i. isthmiacum.*

38–1 Panama Pacific; Archipiélago de las Perlas, Isla Chapera, small cove N of E point, 08°35′36″N, 79°01′24″W, shore rocks, 1 May 1971: *Tanystylum tubirostrum.*

41–1 Panama Pacific; Archipiélago de las Perlas, Isla Pajaros, NE cove behind E point, poison in intertidal rocks, 08°34′36″N, 79°01′18″W, 1 May 1971: *Tanystylum intermedium.*

52–1 Panama Pacific; Panama City, Punta Paitilla, just E of point, cobbles and shells in mud, low intertidal, 3 Nov 1971: *Tanystylum intermedium.*

52–2 Panama Pacific; Panama City, Punta Paitilla, just E of point, cobbles and shells in mud, low intertidal, 3 Nov 1971: *Anoropallene palpida.*

56–1 Panama Pacific; Canal Zone, off Farfan Point, mud and rocks, 5 Nov 1971: *Ammothella symbius.*

56–5 Panama Pacific; Canal Zone, off Farfan Point, mud and rocks, 5 Nov 1971: *Anoplodactylus portus.*

58–2 Panama Pacific; Panama City, reef off old French Fort, sand and mud patch in 0–1 m, 6 Nov 1971: *Nymphopsis duodorsospinosa.*

58–4 Panama Pacific; Panama City, reef off old French Fort, around rocks, 0–1 m, 6 Nov 1971: *Ammothella symbius, Anoplodactylus batangensis, A. evelinae, A. portus, Anoplodactylus* species 1 and 2, *Tanystylum dowi, T. intermedium, T. i. isthmiacum.*

59–1 Panama Pacific; Isla Taboguilla, E beach, N shoal, in rocks, 08°48′45″N, 79°30′30″W, 7 Nov 1971: *Pigrogromitus timsanus.*

81–1 Panama Caribbean; Canal Zone, Limon Bay, Gatun Locks, lower W chamber, outer platform sill, 20 Mar 1972: *Ascorhynchus latipes, Pigrogromitus timsanus.*

81–2 Panama Caribbean; Canal Zone, Limon Bay, Gatun Locks, floor of outer platform, lower W chamber, 20 Mar 1972: *Pigrogromitus timsanus.*

81–4 Panama Caribbean; Canal Zone, Limon Bay, Gatun Locks, lower W chamber, outer part of sill, 20 Mar 1972: *Anoplodactylus insigniformis, A. multiclavus, Endeis flaccida, Pigrogromitus timsanus.*

84–B-E Panama Pacific; Panama City, Punta Paitilla, embayment E of Point, in mud, sand, and rocks at progressively higher tides, 13 Apr 1972: *Ammothella symbius* (B), *Anoplodactylus evelinae* (B), *A. portus* (C, D), *Anoplodactylus* species indeterminate (E), *Anoropallene palpida* (C).

85–7 Panama Pacific; Canal Zone, Punta Farfan flats, poison in 1–1.5 m, 14 Apr 1972; *Anoplodactylus* species 2.

86–2 Panama Pacific; Canal Zone, Isla Venado, SE side, intertidal rocks, 15 Apr 1972: *Ammothella symbius.*

91 Panama Pacific; Canal Zone, Fort Amador, Canal pilot pier at end of causeway, beneath floats, 18 Apr 1972: *Ammothella symbius, Anoplodactylus portus, Tanystylum i. isthmiacum.*

92–1 Panama Pacific; Panama City, Recife de Casa de Putas off old French Fort, intertidal rocks, 18 Apr 1972: *Anoplodactylus evelinae, Tanystylum intermedium, T. i. isthmiacum.*

92–4 Panama Pacific; Panama City, Recife de Casa de Putas, under rocks 0.7 m above low water, 18 Apr 1972: *Anoplodactylus evelinae, A. reimerae, Tanystylum intermedium.*

104–2 Panama Caribbean; Galeta Island, in *Halimeda* on

reef front N of Lab, 29 Apr 1972: *Ammothella marcusi.*

106 Panama Pacific; Canal Zone, Fort Amador, between Canal pilot pier and Naos Island, rocks, poison, 1 Nov 1972: *Ammothella symbius.*

116–1 Panama Caribbean; Golfo de San Blas, Isla Mira, 09°32′37″N, 78°54′23″W, wood piling near shore, 9 Nov 1972: *Achelia sawayai, Ammothella rugulosa, Anoplodactylus evelinae, A. multiclavus, Callipallene emaciata.*

116–4 Panama Caribbean; Golfo de San Blas, Isla Mira, wash of *Halimeda,* shore, 9 Nov 1972: *Achelia sawayai, Ammothella exornata, A. spinifera, Anoplodactylus multiclavus, A. pectinus.*

119–5 Panama Caribbean; Golfo de San Blas, Corgetupo, 09°33′20″N, 78°53′45″W, rocks and coral 60–120 m off shore, 10 Nov 1972: *Callipallene emaciata.*

125–1 Panama Caribbean; Canal Zone, Fort Sherman, Toro Point, intertidal rocks and coral, 15 Nov 1972: *Pigrogromitus timsanus.*

129–2a Panama Pacific; Panama City, Punta Paitilla, *Tetraclita* zone in rocky low intertidal, 1 Apr 1973: *Ammothella symbius.*

131–1 Panama Pacific; Canal Zone, Fort Amador, Naos Island, tide pool, 3 Apr 1973: *Anoplodactylus* species indeterminate.

133–1 Panama Pacific; Panama City, Whorehouse Reef, 08°56′53″N, 79°31′20″W, 1.3 m above low water, 5 Apr 1973: *Anoplodactylus portus, Tanystylum i. isthmiacum.*

161–3 Panama Pacific; Canal Zone, halfway between Isla Venado and Punta Bruja, 08°53′02″N, 79°35′18″W, poison on shore, C. E. Dawson coll., 9 Nov 1973: *Callipallene panamensis.*

162–3 Panama Pacific; Panama City, buoy no. 1 off Whorehouse Reef, shallows, 9 Nov 1973: *Anoropallene palpida.*

166–1 Panama Pacific; Panama City, Whorehouse Reef, lowest intertidal, 13 Nov 1973: *Tanystylum i. isthmiacum.*

174–C Panama Caribbean; Canal Zone, Fort Sherman, Devil's Beach, in *Thalassia* on reef flat, 6 Mar 1974: *Pigrogromitus timsanus.*

180–1 to 5 Panama Pacific; Panama City, Punta Paitilla, mud and cobbles, 5 samples taken at 0.5 m below low water, 8 Mar 1974: *Anoropallene palpida* (all samples).

181–2 to 5 Panama Pacific; Panama City, Punta Paitilla, about 45 m W of sta. 180, mud, shell, cobbles, 8 Mar 1974: *Anoropallene palpida* (all samples).

182–1 Panama Pacific; Canal Zone, Fort Amador, Pilot House beach, transect at low water, 9 Mar 1974: *Anoropallene palpida.*

183–1 Panama Pacific; Canal Zone, Fort Amador, Culebra Island, Scout Beach, low water, 10 Mar 1974: *Callipallene panamensis.*

183–2 Panama Pacific; Canal Zone, Fort Amador, Culebra Island, Scout Beach, low water, 10 Mar 1974: *Anoropallene palpida, Callipallene panamensis.*

255 Panama Pacific; Canal Zone, Fort Amador, Naos Island, intertidal, 7 Apr 1978: *Anoplodactylus batangensis, Callipallene panamensis.*

J. Laurens Barnard Collections

COCOS–3 Costa Rica Pacific; Isla Cocos, 05°33′N, 87°04′W, 1955: *Ammothella symbius.*

PAN–1 Panama Caribbean; Galeta Island, *Avrainvillea* wash above low tide, 27 Apr 1955: *Ammothella marcusi, A. spinifera, Anoplodactylus bantangensis.*

PAN–3 Panama Pacific; Canal Zone, Venado Island, tidal rock wash, 24 Apr 1955: *Ammothella spinifera, A. symbius, Anoplodactylus batangensis, A. evelinae.*

PAN–5 Panama Pacific; Panama City, Punta Paitilla, tidal rock wash, 22 Apr 1955: *Ammothella symbius, Anoplodactylus viridintestinalis, Tanystylum i. isthmiacum.*

PAN–7 Panama Caribbean; Galeta Island, algae and rock wash from reef edge, 26 Apr 1955: *Ammothella marcusi, Anoplodactylus batangensis, Callipallene emaciata.*

PAN–8 Panama Pacific; Canal Zone, Fort Amador, Culebra Island, below or near marine railway, rocks, 23 Apr 1955: *Ammothella symbius, Anoplodactylus* species indeterminate, *Rhynchothorax architectus, Tanystylum i. isthmiacum.*

PAN–10 Panama Pacific; Canal Zone, W of Punta Bruja, rock wash along shore, 21 Apr 1955: *Ammothella symbius, Anoplodactylus evelinae, A. portus, A. viridintestinalis, Nymphopsis duodorsospinosa, Tanystylum i. isthmiacum.*

PAN–11 Panama Caribbean; Galeta Island, *Porites* zone, intertidal, 27 Apr 1955: *Achelia sawayai, Ammothella marcusi.*

PAN–15 Panama Caribbean; Galeta Island, reef top mud puddle, 27 Apr 1955: *Achelia sawayai, Ammothella marcusi, Ascorhynchus latipes.*

PAN–16 Panama Pacific; Panama City, Punta Paitilla, rock wash from tide pool, 22 Apr 1955: *Ammothella symbius, Anoplodactylus viridintestinalis, Nymphon apheles, Tanystylum i. isthmiacum.*

PAN–17 Panama Pacific; Canal Zone, Fort Amador, Culebra Island, tidal rock wash, 23 Apr 1955: *Ammothella symbius, Anoplodactylus* species 1 and 2, *Rhynchothorax architectus, Tanystylum i. isthmiacum.*

PAN–18 Panama Caribbean: Galeta Island, intertidal coral and rock wash, 26 Apr 1955: *Tanystylum geminum, Tanystylum* species indeterminate.

PAZ–5 Mexico Pacific: Baja California (Gulf side), Isla del Espiritu Santo, Bahía Ballenas, 24°27′40″N, 110°22′30″W, rock and algal wash, intertidal, 28 Nov 1971: *Callipallene solicitatus, Pigrogromitus timsanus.*

PAZ–10 Mexico Pacific; Baja California (Gulf side), Isla San Francisco, E bay, 24°49′30″N, 110°34′30″W, wash of cobbles and green aglae, intertidal, 30

Nov 1971: *Ammothella spinifera, Callipallene solicitatus.*

PAZ-18 Mexico Pacific; Baja California (Gulf side), 11 km E of Cabo San Lucas, Bajo Colorado Hotel, 22°57'10"N, 109°47'45"W, *Pelvetiopsis* algal wash, 4 Dec 1971: *Tanystylum oculospinosum.*

PAZ-21 Mexico Pacific; Baja California (Gulf side), 11 km E of Cabo San Lucas, Bajo Colorado Hotel, wash of green subcalcareous algae, 4 Dec 1971: *Tanystylum oculospinosum.*

PAZ-22 Mexico Pacific; Baja California (Gulf side), 11 km E of Cabo San Lucas, Bajo Colorado Hotel, wash of closely packed green algae, 0.3 m, 4 Dec 1971: *Tanystylum oculospinosum.*

PAZ-24 Mexico Pacific; Baja California (Gulf side), Bahia Concepción 24 km from mouth on E side, 26°39'N, 111°46'20"W, interidal rock wash, 6 Dec 1971: *Ammothella spinifera, Callipallene solicitatus.*

SCO-5 Mexico Pacific; Gulf of California. Sonora, Puerto Peñasco, near Marine Station, 31°11'45"N, 113°33'30"W, mixed intertidal algae, 18 Oct 1970: *Anoplodactylus viridintestinalis.*

SCO-7 Mexico Pacific; Gulf of California, Sonora, Puerto Peñasco, near Marine Station, algae in pool, intertidal, 18 Oct 1970: *Pycnogonum stearnsi.*

Smithsonian-Bredin Expedition Stations, 1960

Quintana Roo, Mexico Caribbean

11-60 Isla Mujeres, 0.8 km S of village, outer ocean shore to 0.5 m, rocks and coral sand, 29 Mar 1960: *Anoplodactylus monotrema.*

44-60 Bahía de la Ascensión, small inlet behind Punta Allen, on mangrove roots, 7 Apr 1960: *Achelia sawayai.*

53-60 Bahía de la Ascensión, cave across S side of peninsula with "light," algae from mangrove roots, sponges, 10 Apr 1960: *Anoplodactylus pectinus.*

72-60 Bahía de la Ascensión, Arrecife Nicchehabin, coral from central part in 1.3-2 m, 14 Apr 1960: *Anoplodactylus montrema, A. multiclavus.*

77-60 Bahía de la Ascensión, N end, just E of Halfway Point, *Thalassia*, mangrove roots, and sandy beach area, 15 Apr 1960: *Achelia sawayai.*

83-60 Bahía de la Ascensión, mangrove inlet behind Punta Allen light, 16 Apr 1960: *Anoplodactylus pectinus, Callipallene emacita.*

85-60 Bahía de la Ascensión, along shore near Punta Suliman, tide pools and rocks, 17 Apr 1960: *Ammothella rugulosa, Anoplodactylus evelinae, Ascorhynchus latipes.*

95-60 Bahía de la Ascensión, Punta Suliman to 300 m SW, shore and reef flats to 1.6 m, 19 Apr 1960: *Anoplodactylus* species indeterminate.

100-60 Isla de Cozumel, N of Punta Santa Maria, shore and *Thalassia* flats, 21 Apr 1960: *Ammothella rugulosa, Anoplodactylus batangensis, Tanystylum geminum.*

Velero III Stations

(University of Southern California, Allan Hancock Foundation)

A9-39 Panama Caribbean; Darien Province, Bahía Caledonia, 08°53'40"N, 70°40'50"W, shore near freshwater stream, 4 Apr 1939: *Anoplodactylus monotrema.*

A13-39 Colombia Caribbean; S of Cabo de La Vela, 12°12'35"N, 72°10'45"W, dredged in 24 m, 8 Apr 1939: *Eurycyde curvata.*

126-33 Mexico Pacific; Baja California, Bahía Santa Maria, 24°44'N, 112°13'W, dredge in 3-5 m, 21 Mar 1933: *Anoropallene palpida.*

214-34 Ecuador Pacific; Cabo San Francisco, 00°40'N, 80°05'W, dredged near rocks in 4 m, 11 Feb 1934: *Pycnogonum panamum.*

245-34 Panama Pacific; Pacora Island, Bahía Honda, off NW point of island, 07°45'15"N, 81°32'00"W, dredge in 27 to 46 m, 21 Feb 1934: *Tanystylum intermedium.*

249-34 Panama Pacific; Gulf of Chiriqui, Bahía Honda, outside island S of Bay, 07°43'10"N, 81°32'30"W, dredged in 29 to 38 m, 22 Feb 1934: *Pycnogonum panamum.*

257-34 Costa Rica Pacific; Puerto Culebra, 10°37'N, 85°40'W, dredged around isles in bay, 25 Feb 1934: *Anoplodactylus* species indeterminate.

260-34 Mexico Pacific; Oaxaca, western Gulf of Tehuantepec, Bahía Tangola-Tangola, Isla Tangola, 15°46'N, 96°06'W, shore collecting, 1 Mar 1934: *Ammothella marcusi, Anoplodactylus viridintestinalis, Pycnogonum stearnsi, Rhynchothorax philopsammum, Tanystylum intermedium, T. tubirostrum.*

261-34 Mexico Pacific; Oaxaca, western Gulf of Tehuantepec, Bahía Tangola-Tangola, Isla Tangola, from coral along shore, 1 Mar 1934: *Ammothella marcusi, Rhynchothorax philopsammum.*

264-34 Mexico Pacific; Guerrero, Bahía Petatlán, S and W of Islas Blancas, 17°34'N, 101°30'W, dredge, 46 m, 2 Mar 1934: *Ammothella spinifera, Tanystylum mexicanum.*

275-34 Mexico Pacific; Jalisco, Bahía Tenacatita, off Cabeza de Navidad, 19°15'N, 104°49'W, dredge, 46 to 64 m, 4 Mar 1934: *Anoplodactylus* species indeterminate, *Eurycyde clitellaria, Nymphopsis duodorsospinosa, Tanystylum intermedium.*

279-34 Mexico Pacific; Baja California, Bahía Santa Maria, off Punta Hugues, 24°44'30"N, 112°16'W, dredge, 18 m, 7 Mar 1934: *Tanystylum maxicanum.*

283-34 Mexico Pacific; Baja California, Bahía Thurloe, off Punta Thurloe, 27°38'N, 114°50'W, dredge, 15 to 18 m, 9 Mar 1934: *Ammothea hilgendorfi, Tanystylum i. isthmiacum.*

287-34 Mexico Pacific; Baja California, Isla Cedros (Cerros), off South Bay, 28°12'N, 115°15'W, dredge, 18 to 27

m, 10 Mar 1934: *Callipallene solicitatus, Tanystylum i. isthmiacum.*

478–35 Costa Rica Pacific; Bahía Salinas, 11°03'N, 85°43'W, dredge, coarse sand, 3 m, 11 Feb 1935: *Anoplodactylus portus.*

532–36 Mexico Pacific; Baja California, Bahía San Francisquito, 36.5 m, 2 Mar 1936: *Nymphopsis duodorsospinosa.*

Miscellaneous Stations

Mexico Pacific

UA72–12 Baja California (Gulf side), Isla Angel de La Guardia, Puerto Refugio, 29°32'N, 113°33'W, in *Sargassum* and *Padina,* coll. L. T. Findley; 2 Apr 1972: *Nymphon lituus.*

83–H3 Gulf of California, coll. University of California: *Nymphon pixellae.*

1011 Gulf of California, coll. Scripps Institution, in 330 m, 2 Jul 1916: *Nymphon pixellae.*

1555 Sinaloa, Mazatlán, Isla Venado, SE side, 23°14'N, 106°29'15"W, sand and shell beach, 0–1 m, coll. C. E. Dawson and C. A. Child, 18 Jul 1972: *Ammothella spinifera, A. symbius.*

3024 Gulf of California, Sonora, off Puerto Peñasco, 31°21'N, 113°49'W, trawl 20 m, coll. *Albatross,* 25 Mar 1889: *Anoplodactylus erectus.*

18 Apr 1927 Baja California (Gulf side), Isla del Espiritu Santo, 24°22'N, 110°11'W, dredged with corallines in 20 m, coll. W. A. Hilton: *Nymphopsis duodorsospinosa.*

2 Sep 1938 Baja California, Bahía de Todos Santos, 36 m or beach, coll. W. A. Hilton, no. 3827: *Tanystylum oculospinosum.*

18 Feb 1946 Gulf of California, Sonora, Isla Patos, N of Isla Tiburon 29°17'N, 112°29'W, coll. E. Y. Dawson: *Tanystylum mexicanum.*

9 Feb 1952 Gulf of California, Sonora, Estero, 3 km W of Yavarros, coll. B. Walker: *Anoropallene palpida.*

6 Apr 1959 Oaxaca, Bahía Chacahua, in 5–8 m, coll. E. Y. Dawson: *Anoropallene palpida.*

21 May 1966 Gulf of California, Sonora, Norse Beach, 10 km N of Puerto Peñasco, on ascidians under rocks, low intertidal, coll. D. P. Abbott: *Ammothella spinifera, Tanystylum intermedium.*

22 May 1966 Gulf of California, Sonora, Puerto Peñasco, Trailer Beach, among ascidians on rocks, low intertidal, coll. D. P. Abbott: *Pycnogonum stearnsi.*

16 Apr 1967 Gulf of California, Sonora, Puerto Peñasco, tide pool in basalt, 500 m S of Rocky Point, 31°20'N, 113°40'W, coll. D. P. Abbott: *Nymphopsis duodorsospinosa.*

12 Oct 1969 Gulf of California, Sonora, Bahía de Guasimas, near Guaymas, 27°50'N, 110°35'W, mud bottom, coll. fishermen for Laboratorio Concepción R. de La Cruz, shrimp net: *Anoropallene palpida.*

24 Jan 1971 Gulf of California, Sonora, Bahía San Carlos, 24 km N of Guaymas, 27°56'N, 111°04'W, rocky intertidal, coll. R. Brusca: *Pycnogonum stearnsi.*

20 Mar 1972 Gulf of California, Sonora, Puerto Lobos, 30°17'N, 112°53'W, under rock in lower intertidal, coll. R. Brusca: *Pycnogonum stearnsi.*

Jun 1972 Gulf of California, Sonora, Puerto Peñaso, on anemone off marine station, coll. M. Joerger: *Ammothella spinifera.*

13 Jun 1972 Gulf of California, Sonora, Puerto Peñasco, *Sargassum* on shore near marine station, coll. R. Brusca: *Nymphopsis duodorsospinosa.*

28 Jun 1972 Gulf of California, Sonora, Puerto Peñasco, under stone and intertidal *Sargassum at* marine station, coll. R. Brusca and M. Joerger: *Nymphon lituus.*

14 Mar 1974 Baja California (Gulf side), Bahía Pichilinque, near La Paz, 24°15'N, 110°19'W, on shore in *Caulerpa,* coll. R. Brusca: *Anoropallene palpida.*

18 Mar 1974 Baja California (Gulf side), Bahía Concepción, on *Sargassum* in 9 m, coll. R. Brusca: *Nymphon lituus.*

23 Jul 1974 Gulf of California, Sonora, near Bahía San Carlos, about 24 km N of Guaymas, coll. C. Flanagan: *Nymphopsis duodorsospinosa.*

11 Jun 1975 Gulf of California, Sonora, Puerto Peñasco, on *Sargasum* in tide pool at marine station coll. R. Brusca: *Nymphopsis duodorsospinosa.*

3 July 1975 Gulf of California, Sonora, Bahía Venetia about 48 km N of Guaymas 28°11'N, 111°22"W, with *Saragassum* and *Padina* in 5 m, coll. R. Brusca; *Nymphopsis duodorsospinosa.*

Mexico Caribbean

13 Aug 1970 Quintana Roo, Isla Mujeres, from sponge in shallows, coll. M. Downey: *Pycnogonum reticulatum.*

Costa Rica Pacific

1566 Guanacaste, Playa del Coco, S end of beach toward island, 10°33'30"N, 85°43'15"W, rocks and sand, 0–0.8 m, coll. C. E. Dawson and C. A. Child, 11 Aug 1972: *Ammothella symbius, Tanystylum i. isthmiacum.*

1567 Golfo de Nicoya, Isla Tolinga, NE side, 09°46'30"N, 84°54'40"W, rocks and sand, 0–0.3 m, coll. C. E. Dawson and C. A. Child, 12 Aug 1972: *Ammothella spinifera, Tanystylum i. isthmiacum.*

1634 Isla Cocos, Wafer Bay, E of beach 05°32'48"N, 87°03'38"W, rocks, sand, tide pools to 0.5 m,

coll. Millard, et al., 14 Jul 1973: *Tanystylum i. isthmiacum.*

El Salvador Pacific

1850s Coast, coll: J. M. Dow: *Pycnogonum reticulatum.*

Panama Pacific

LGA69–65 Canal Zone, Venado Beach, intertidal mud and rocks, coll. L. G. Abele and J. Graham, 1 Jul 1969: *Anoplodactylus portus.*

LGA69–68 Panama City, Punta Paitilla, beyond sand beach, intertidal, coll. L. G. Abele, 7 Jul 1969: *Nymphopsis duodorsospinosa.*

28 Dec 1936 Panama City, Bella Vista District, shore, coll. Mrs. E. E. Robson: *Tanystylum intermedium.*

May 1969 Panama City, Punta Paitilla, coll. P. Glynn: *Nymphopsis duodorsospinosa.*

Mar 1976 Canal Zone, Fort Amador, Pilot Pier float fouling material with algae, coll. P. Glynn: *Ammothella symbius, Anoplodactylus portus, Tanystylum i. isthmiacum.*

Panama Caribbean

LGA69–43 Canal Zone, Coco Solo, U.S. Army dock pilings opposite Pier II, coll. L. G. Abele and N. Powell, 22 Apr 1969: *Ascorhynchus castellioides.*

California Pacific

826–38 Los Angeles County, Santa Monica, coll. J. Burch, 1938: *Anoropallene palpida.*

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