

Pycnogonida from Carrie Bow Cay, Belize

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ABSTRACT

This is a systematic account of pycnogonids found in the area of Carrie Bow Cay, Belize. Thirty one identified species in 14 genera are discussed of which four are described as new species: *Hedgpethius mamillatus*, *Callipallene belizae*, *Anoplodactylus imswe*, and *Rhynchothorax crenatus*. Most species discussed were found within their previously known range of geographical distribution. Three species are reported for only the second time: *Hedgpethius tridentatus*, previously known from Florida, *Parapallene bermudensis*, from Bermuda, and *Anoplodactylus bahamensis*, from the Bahamas. At Carrie Bow Cay most pycnogonids occur within the littoral depth zone, some extend their range into the sublittoral to a depth of 33 m. Habitats include mangrove roots, algae, and seagrasses, as well as coral and coral rubble.

Introduction

This is the first report of pycnogonids from the Belizean barrier reef. Only a small collection from the northern portion of this barrier reef in the Territorio de Quintana Roo, Mexico, has been treated in a previous publication (Child, 1979). Previous to that report, the nearest occurrence of pycnogonids reported in the literature were deep water captures of *Anoplodactylus lentus* Wilson and *Ascorhynchus serratus* Hedgpeth off Yucatan (Hedgpeth, 1948:226, 259). *Anoplodactylus lentus* is also listed from deep water in the Yucatan Channel (Stock, 1975:1055). Other nearby captures are recorded from Cuba to the northeast and from the Caribbean coast of Panama to the south.

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Most published work on pycnogonids centers on descriptive systematics. The small size, cryptic coloration, and very slow movement of these predators make it difficult to record their habits and habitats in the field. Therefore, our knowledge of the ecology of this group is rather poor. Although no attempt was made in this study to observe pycnogonids alive, ecologically relevant information on substrates and associations was obtained and is presented.

All specimens are deposited in the pycnogonid collections of the National Museum of Natural History, Smithsonian Institution, and bear the catalog numbers of the United States National Museum collection (USNM).

ACKNOWLEDGMENTS.—My appreciation is extended to the various collectors listed under "material examined" and to P. M. Kier for supporting my 1976 field work in Belize. I am grateful to T. E. Bowman for his critical reading of the manuscript.

Methods

Pycnogonids were found in a wide variety of microhabitats such as bryozoans, hydroids, and encrusting sponges, algae, or seagrass, and rock rubble covered with one or more of these. Most samples were collected in a depth of less than one meter, some to a maximum depth of 33 m. The gross samples were either examined live under a low-power microscope or preserved before study. Plants and broken-up rock and rubble were agitated in a bucket with dilute formalin in seawater to separate and preserve the microfauna. Floating organisms were then skimmed off and the remainder of the liquid poured through a net to

concentrate the sample. Other suitable substrates such as dock pilings, coral heads, mangrove roots, and rock faces were scraped or chipped into plastic bags for preservation and later examination.

All specimens illustrated in this report were drawn by the author with the aid of a compound microscope and a camera lucida.

Species List

Family AMMOTHEIDAE

Achelia Hodge

Achelia sawayai Marcus

Ammothella Verrill

Ammothella appendiculata (Dohrn)

A. exornata Stock

A. marcusi Hedgpeth

A. rugulosa (Verrill)

Ascorhynchus Sars

Ascorhynchus latipes (Cole)

Ascorhynchus sp. cf. *serratus* Hedgpeth

Eurycyde Schiödt

Eurycyde raphiaster Loman

Hedgpethius Child

Hedgpethius mamillatus, new species

H. tridentatus Child

Nymphopsis Haswell

Nymphopsis duodorsospinosa Hilton

Tanystylum Miers

Tanystylum birkelandi Child

T. tubirostrum Stock

Family CALLIPALLENIDAE

Callipallene Flynn

Callipallene belizae, new species

C. emaciata (Dohrn)

Parapallene Carpenter

Parapallene bermudensis Lebour

Pigrogromitus Calman

Pigrogromitus timsanus Calman

Family PHOXICHILIDIIDAE

Anoplodactylus Wilson

Anoplodactylus bahamensis Child

A. batangensis (Helfer)

A. evelinae Marcus

A. imswae, new species

A. jonesi Child

A. maritimus Hodgson

A. monotrema Stock

A. multiclavus Child

A. pectinus Hedgpeth

A. portus Calman

Anoplodactylus sp.

Family ENDEIDAE

Endeis Philippi

Endeis spinosa (Montagu)

Family NYMPHONIDAE

Nymphon Fabricius

Nymphon floridanum Hedgpeth

Family RHYNCHOTHORACIDAE

Rhynchothorax Costa

Rhynchothorax architectus Child

R. crenatus, new species

Family AMMOTHEIDAE

Achelia Hodge, 1864

Achelia sawayai Marcus, 1940

Achelia sawayai.—Krapp and Kraeuter, 1976:342–343 [literature].—Child, 1979:7–8.

MATERIAL EXAMINED.—Carrie Bow Cay: On corals, 9.1 to 30.5 m, by hand with SCUBA, 7 Apr 1973; 1♂ with eggs. Tidal flats in 0.5 m, coll. K. Rützler, 2 May 1974; 1♀. Tidal flats in 0.5 m, coll. K. Rützler, 4 May 1974; 1♂. Tidal flats in 0–1 m, coll. K. Rützler, 7 May 1974; 1♂. Windward side, reef crest and flat in 0.5 m, 12 Jan 1976; 1 juvenile. Broken rock and rubble at tide line, coll. J. Clark, 17 Jan 1976; 6♂, 1♀, 2 juveniles. Tidal flats, coll. M. Jones, 8 Apr 1976; 1♂. Coral rubble on inner side of reef crest in 0.2–0.4 m, coll. A. Cohen, 15 Jan 1978; 1♀. Rubble at tide line, coll. C. A. Child, 27 Jan 1978; 3 specimens. Rubble at tide line, ocean side, coll. C. A. Child, 28 Jan 1978; 7 specimens. Rocks with algae on reef crest, coll. C. A. Child, 29 Jan 1978; 8 specimens. Algae of the genera *Halimeda* and *Caulerpa* from outer reef crest, coll. C. A. Child, 30 Jan 1978; 9 specimens. From the seagrass *Syringodium* on lagoon flats in 1.3 m, coll. B. Kensley, 1 Feb 1978; 1♀. Ocean side flats, plankton net on bottom in 0.4 m, coll. R. Larson, 30 Jan 1978; 1 juvenile. *Syringodium* bed at S end of lagoon in 1.3 m, coll. B. Kensley, 3 Feb 1978; 6♂, 1 juvenile. Rubble from tide line in 0.3 m, coll. C. A. Child, 4 Feb 1978; 3 specimens. Rubble in front of reef crest in 0.6 m, coll. B. Kensley, 5 Feb 1978; 2♂, 1♀. Carpet of coralline and fine red algae at shore, coll. B. Kensley, 5 Feb 1978; 3♀. From *Halimeda*

in same place; 7 specimens. *Halimeda* and sparse rubble from top of reef ridge, in 18 m, coll. C. A. Child, 7 Feb 1978; 1♀. From other *Halimeda* and rubble nearby, coll. B. Kensley, 7 Feb 1978; 2 specimens.

Tobacco Reef: About 500 m N of South Water Cay, debris at low tide, coll. M. Carpenter and R. Larson, 23 Mar 1977; 2♂.

Twin Cays: N end of dividing channel, on *Halimeda* in 1 m, coll. C. A. Child, 31 Jan 1978; 1♀. NW coast, mat of *Caulerpa verticillata* J. Agardh and mangrove rootlets beneath mangroves, intertidal, coll. C. A. Child, 31 Jan 1978; 3 specimens. NW coast, another *Caulerpa* mat under mangroves, coll. C. A. Child, 2 Feb 1978; 4 specimens. NW coast, mat of *Halimeda* under mangroves, intertidal, coll. C. A. Child, 2 Feb 1978; 4 specimens.

REMARKS.—This species is by far the most common pycnogonid in the Carrie Bow area and occurs from the tide line to a depth of 18 meters. It is also common elsewhere in the tropical North and South Atlantic to depths of 65 meters. It has also been found in Madagascar.

ECOLOGY.—Several general collections of algae made in the shallow waters of various cays indicate that *Achelia sawayai* lives on associated rubble and other substrates rather than on the algae itself. This species and others were generally not found on clean algae at Carrie Bow Cay, but were common where the algae and rubble were associated with adherent detritus and sessile fauna. Therefore, it is concluded that algae do not provide food for *A. sawayai*, but only a substrate for food attachment.

***Ammothella* Verrill, 1900**

***Ammothella appendiculata* (Dohrn, 1881)**

Ammothella appendiculata.—Stock, 1955:250–252, fig. 18 [literature]; 1975:973–975.—Child, 1974:497; 1979:9.

MATERIAL EXAMINED.—Carrie Bow Cay: Sand trough behind outer reef ridge in 27 m, in coral sand and rubble, coll. C. A. Child, 7 Feb 1978; 2 juveniles. Rubble with *Halimeda* from top of outer

reef ridge in 18 m, coll. B. Kensley, 7 Feb 1978; 1♂ juvenile.

Blue Ground Range (Cays): At S end of northernmost cay, on mangrove roots in 0–1 m, coll. C. A. Child, 30 Apr 1976; 1 juvenile.

Twin Cays: NW coast, from *Rhizophora* roots with algae, sponges, ascidians, and hydroids in 0.5 m, coll. C. A. Child, 31 Jan 1978; 3♂ with eggs, 1♀, 3 juveniles. From *Halimeda* mats along N channel wall in 1 m, coll. C. A. Child, 2 Feb 1978; 3♂ with eggs, 1♂, 7♀, 15 juveniles. From red sponge along wall of N channel in 1.0–1.5 m, coll. M. Carpenter, 2 Feb 1978; 2♂ with eggs.

REMARKS.—There is some controversy over the status of this species and *Ammothella rugulosa* (page 358). The wide morphological variation displayed by *A. appendiculata* almost bridges the gap between the two species. Stock (1955:250–252, fig. 18) described two forms of *A. appendiculata*: one with the relatively short appendages of European specimens, and another form with very long appendages from the Caribbean. Stock considered that his two forms reflected differences between the ultimate and penultimate molt in adults, the ultimate molt producing the “long form.” The above material is in agreement with the “long form” but includes several chelate juveniles, thus invalidating the use of adult morphology as an explanation for the range of variation. Raising even more questions than these littoral specimens are the juveniles from depths of 18 and 27 meters with both abdomen and ocular tubercle more than twice as long as the “short form.”

As Stock pointed out, apparently no single visible character can be used to separate *Ammothella appendiculata* from *A. rugulosa* taxonomically, if indeed they are separate species. It is somewhat easier to separate them on the basis of chelifore scape segment lengths (subequal for *A. rugulosa*) and ocular tubercle and abdomen length (measurably shorter for *A. rugulosa*). Stock (1975:973) noted that these differences are probably insufficient to separate the two species. I have no stronger criteria for keeping the species separate, but with the inadequate material currently available, I will regard them as separate until a larger

collection can be measured and diagnosed with more certainty.

ECOLOGY.—This species has been found in a wide variety of littoral habitats throughout the Caribbean and on the Pacific side of Panama besides Europe and the Middle East. It has been collected in association with *Rhizophora*, several species of algae, *Thalassia*, sand, rubble, corals, sponges, and ascidians. This distribution indicates a wide food preference, probably including hydroids and other coelenterates, sponges, and possibly ascidians.

***Ammothella exornata* Stock, 1975**

Ammothella exornata Stock, 1975:975–978, figs. 7c–d, 8.—Child, 1979:9, fig. 3a–c.

MATERIAL EXAMINED.—Twin Cays: NW coast, mat of *Caulerpa verticillata* and mangrove rootlets under *Rhizophora* in intertidal, coll. C. A. Child, 2 Feb 1978; 3♀, 2 juveniles.

REMARKS.—The male characters were described and figured by Child (1979:9, fig. 3a–c). This is the third record of this species. *Ammothella exornata* is so distinctive that it is easily recognized, even as a juvenile. It is the only known species from the Caribbean littoral having median trunk tubercles.

ECOLOGY.—In Belize, this species is known only in association with *Rhizophora mangle* Linnaeus and *Caulerpa* sp. I collected several juveniles associated with algae (not *Caulerpa*) on the prop roots of *R. mangle* in the U.S. Virgin Islands. The type-specimens, from St. Martin, were also collected on and near this mangrove. The only other capture record is Stock's (1975) two specimens collected on algae at Bonaire. The species, however, is not common in this mangrove habitat. At least six algae samples were taken from mangrove roots at about the time of the above capture but no other specimens of *Ammothella exornata* were found. The preferred sessile fauna used for food probably was not with the algae on and around the roots where the six samples were taken. No bryozoans, sponges, or hydroids were found in the *Caulerpa* sample. Therefore, the primary food of

this species, as with most pycnogonid species, remains unknown.

***Ammothella marcusii* Hedgpeth, 1948**

Ammothella marcusii Hedgpeth, 1948:247–249, fig. 39b–g; 1954:427.—Stock, 1975:975, fig. 7a–b.—Child, 1979:9, 11.

MATERIAL EXAMINED.—Carrie Bow Cay: tide flats in 0.5 m, coll. K. Rützler, 4 May 1974; 1♂.

Twin Cays: NW Coast, mat of *Caulerpa verticillata* and mangrove rootlets under *Rhizophora* in intertidal, coll. C. A. Child, 2 Feb 1978; 1♂.

REMARKS.—These specimens agree well with Hedgpeth's figures of the type, also a male, and Stock's clarifying figures of the palp and terminal leg segments. Superficially, *Ammothella marcusii* is much more setose than the other species of *Ammothella* in this report. There are many more clubbed, plain, and feathered setae on these specimens than have been figured before.

The species is much less common than its nearest Caribbean relation, *Ammothella appendiculata*, which is known to have an extremely wide range of habitats in its amphi-Atlantic distribution. The above records extend the known range of *A. marcusii* to Belize from Florida, Panama, the eastern Caribbean islands, and the Mexican Pacific coast.

ECOLOGY.—This species has been found in shallow water on debris, a sandy reef, *Lithothamnion* flats, rubble, algae, and on tide flats. This distribution shows no pattern except that the principal food of the species is not restricted to particular substrates.

***Ammothella rugulosa* (Verrill, 1900)**

Ammothella rugulosa.—Stock, 1975:972 [literature].—Child, 1979:11.

MATERIAL EXAMINED.—Carrie Bow Cay: Rubble along tide line on ocean side, coll. J. Clark, 17 Jan 1976; 1♂. Large *Halimeda* clump from SE shore, coll. B. Kensley, 5 Feb 1978; 9♂, 2♀.

South Water Cay: SW end, scrapings from dock pilings in 0.5 m, coll. C. A. Child, 30 Jan 1978; 1 juvenile.

Twin Cays: N channel, sponge with ectoprocts in 0.5 m, coll. R. Larson, 31 Jan 1978; 2 juveniles. NW coast, mat of *Caulerpa verticillata* and mangrove rootlets under *Rhizophora* in intertidal, coll. C. A. Child, 31 Jan 1978; 7♂ with eggs, 1♀, 3 juveniles. Another mat from nearby, coll. C. A. Child, 2 Feb 1978; 5♂ with eggs, 2♂, 3♀, 2 juveniles. *Halimeda* mat from nearby, coll. B. Kensley, 2 Feb 1978; 1♀, 1 juvenile. N channel, red sponge from wall of channel in 1.0–1.5 m, coll. M. Carpenter, 2 Feb 1978; 1♂ with eggs.

REMARKS.—All specimens of *Ammothella* with short ocular tubercle, short abdomen, and first chelifore segment approximately equal to the second are tentatively placed under *A. rugulosa*. Those without these qualifications are placed with *A. appendiculata* (see remarks under that species).

The female from the *Halimeda* mat of 2 Feb 1978, has an extra eye situated below the normal left anterior eye. It is round, half the size of the one above, and is darkly pigmented, matching the four eyes above.

Scattered records indicate that *Ammothella rugulosa* is distributed from Bermuda to Florida and through the Caribbean to Brazil.

ECOLOGY.—This species lives among fouling organisms on ships and piers and has been taken in association with *Sargassum*, in addition to the habitats listed above.

Ascorhynchus Sars, 1877

Ascorhynchus latipes (Cole, 1906)

Ascorhynchus latipes.—Hedgpeth, 1948:256 [literature]; 1954:427.—Fage, 1952:530.—Stock, 1953:304 [key]; 1954:116; 1975:969.—Child, 1979:15–16.

MATERIAL EXAMINED.—Carrie Bow Cay: Tide line on ocean side among rocks and rubble, coll. J. Clark, 17 Jan 1976; 1♀, 1 juvenile. Tidal flats on ocean side, from plankton net resting on bottom in 0.5 m at night, coll. R. Larson, 30 Jan 1978; 1♀.

REMARKS.—This is another species for which

the range is extended to the western Caribbean. Its occurrence from Florida and the Bahamas to Bonaire, and also at Dakar, Senegal, gives it an ampho-Atlantic distribution.

ECOLOGY.—This littoral species appears to have some preference for sand and rock habitats, but the collecting records are too scarce to be certain.

Ascorhynchus sp. cf. *serratum* Hedgpeth, 1948

Ascorhynchus serratum Hedgpeth, 1948:259–260, fig. 44a–f.
Ascorhynchus serratus.—Stock, 1975:969.

MATERIAL EXAMINED.—Carrie Bow Cay: In coral and algae on outer vertical reef face in 27–30 m, coll. C. A. Child, 29 Apr 1976; 1 juvenile.

REMARKS.—This specimen probably represents a new species, but is sufficiently immature that a description should be postponed until an adult can be collected. It shows several similarities to *Ascorhynchus serratum*, in having 3-segmented chelifores, tall ocular and median trunk tubercles, and a long curved oviger claw. The differences exhibited by this juvenile are that it (1) is without lateral process tubercles; (2) has *Ammothella*-like terminal leg segments, but without auxiliary claws; (3) has very short legs and oviger segments in comparison with *A. serratum*; (4) has very short first tibiae; and (5) has very long dorsodistal leg setae. Some or most of these characters may be the result of growth stage, but tubercles are usually well developed by this stage. The absence of lateral process tubercles possibly places this specimen in a separate species.

The depths at which *Ascorhynchus serratum* has been captured, roughly from 400 to 700 meters off Florida and in the Yucatan Channel, would remove this specimen from consideration as the same species except that we know nothing of vertical migration during growth in pycnogonids. We do know that some pycnogonids have a narrow range of temperature tolerances, and perhaps vertical migration is limited by this factor. Certainly, the temperatures from 30 meters to 700 meters cover a wide thermal spectrum.

Eurycyde* Schiödte, 1857**Eurycyde raphiaster* Loman, 1912**

Eurycyde raphiaster.—Stock, 1975:979 [literature].—Child, 1979:21, fig. 5i-j.

MATERIAL EXAMINED.—Carrie Bow Cay: Tidal flats in 0.5 m, coll. K. Rützler, 4 May 1974; 1♂. Rock and algae from both sides of reef crest at low tide, coll. M. Carpenter, 20 Mar 1977; 1♀. Rocks and algae from just in front of reef crest in 0.4 m, coll. B. Kensley, 29 Jan 1978; 1♀. From sandy rubble with *Halimeda* behind outer reef ridge in 27 m, coll. C. A. Child, 7 Feb 1978; 1 juvenile. From *Halimeda* clump behind outer reef ridge in 27 m, coll. B. Kensley, 7 Feb 1978; 1 juvenile.

REMARKS.—Females of this species usually have lateral process and first coxa tubercles that are much smaller than those of the male, and the lateral processes are sometimes placed closer together, imparting a dimorphic appearance to the species. Otherwise, *Eurycyde raphiaster* is easily distinguished from others of the genus in the western Atlantic.

The juveniles collected from 27 meters appear to mark the deepest limit at which this species has been taken in the western Atlantic. Loman (1912:13) lists the capture depth as 91 meters for his type from the Cape Verde Islands.

ECOLOGY.—Three of the above records show this species to be associated with *Halimeda*. It has many other habitats throughout its amphi-Atlantic range. It was one of the few pycnogonids found in the high energy wave action area of the reef crest, but it was also taken in the calm water of the sand trough behind the outer reef ridge.

***Hedgpethius* Child, 1974**

EMENDED DIAGNOSIS.—Ammonotheidae. *Ascorhynchus*-like with minutely papillose body surface, without trunk or lateral process tubercles. Anterior trunk segment longer than combined length of posterior 3 segments; first lateral processes at extreme posterior of first segment, imparting

“long necked” appearance. Proboscis with 3 anterior-pointing tubercles arranged laterally and ventrally around its largest circumference. Scape 2-segmented, very short, chela vestigial. Palp 7- or 8-segmented, third segment with swelling. Female oviger rudimentary, 3-segmented. Male oviger 9-segmented, *Ammonothea*-like, without denticulate spines. Propodus with much reduced or missing main claw, auxiliaries large, very curved.

***Hedgpethius mamillatus*, new species**

FIGURE 163a-f.

MATERIAL EXAMINED.—Carrie Bow Cay: Broken rock and rubble at tide line, coll. J. Clark, 17 Jan 1976; 1 ovigerous female, holotype (USNM 170997).

DESCRIPTION.—First body segment 0.5 longer than combined length of posterior 3 segments. Lateral processes short, less than half trunk diameter, separated by greater than their own diameter, without setae or tubercles. Ocular tubercle a rounded cone as tall as neck diameter, situated at midlength of first trunk segment. Eyes lightly pigmented. Abdomen cylindrical, carried half erect, not extending beyond posterior lateral processes, armed with 2 distal setae.

Proboscis large, ovoid, without marked constrictions, with 2 dorsolateral and 1 ventral anterior-pointing tubercles at widest diameter of proboscis and at one-third its length. Anterior to each tubercle is a slight bulge in same longitudinal axis. Mouth with 3 lateral and ventral slits with flat distinct lips.

Scape 2-segmented, short, carried in cowl around anterior of first trunk segment. First scape segment longest, with single dorsodistal seta. Second segment minute. Chela tiny, with anterior crease and no fingers.

Palp 7-segmented, thin. First 2 segments small, no longer than wide. Third segment about 5 times as long as wide, with a distinct posterior bulge. Fourth and sixth segments tiny, only slightly longer than wide. Fifth segment longest, extremely slender, with 3-4 endal setae. Terminal segment thin, 4 times as long as wide, armed with

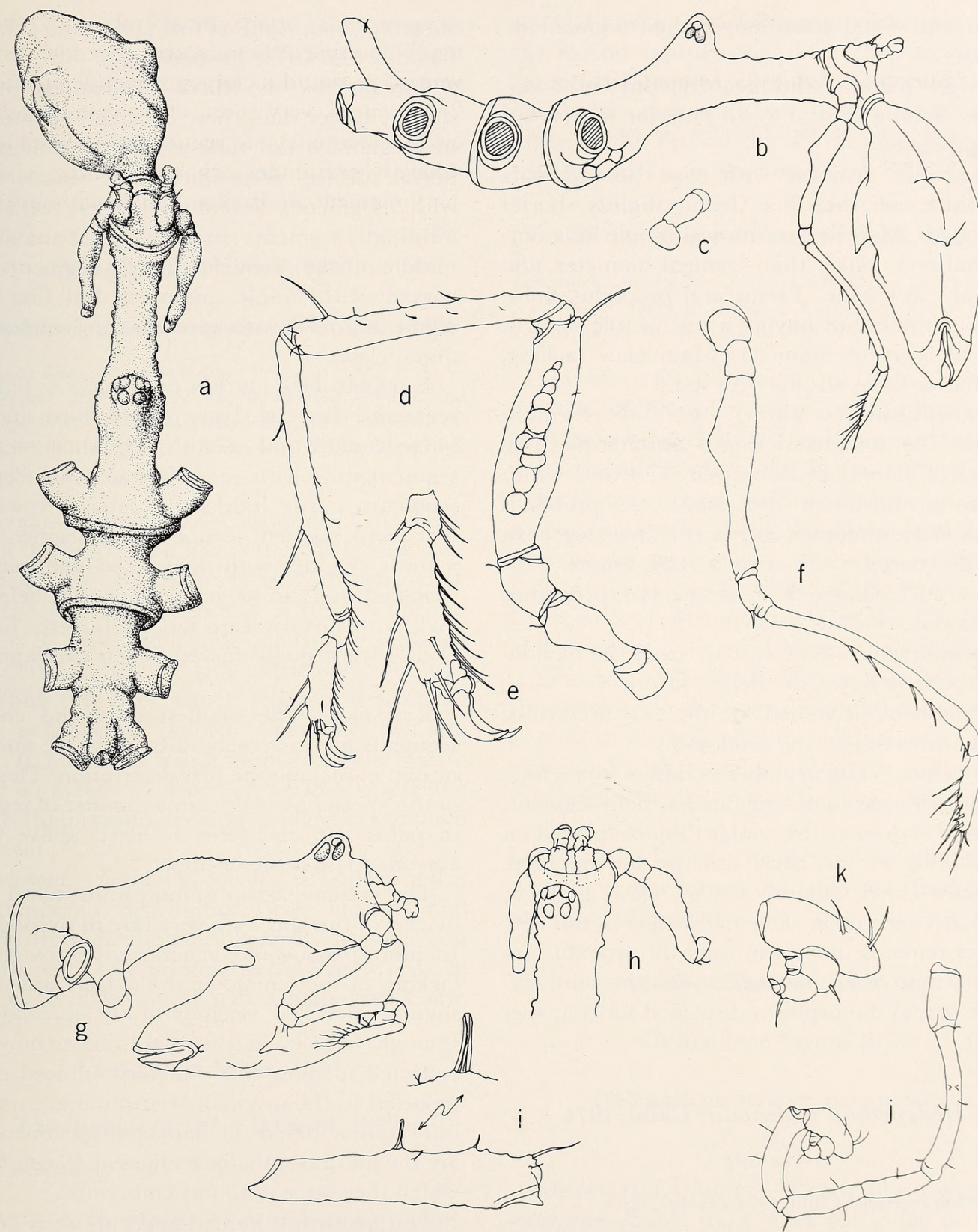


FIGURE 163.—*Hedgpethius mamillatus*, new species (holotype): *a*, trunk; *b*, trunk, lateral; *c*, oviger; *d*, third leg; *e*, terminal segments of third leg; *f*, palp. *Hedgpethius tridentatus* Child, male: *g*, anterior trunk segments, lateral; *h*, anterior of trunk, dorsal; *i*, femur with enlargement of femoral cement gland; *j*, oviger; *k*, oviger terminal segments.

endal and distal setae longer than segment diameter.

Oviger (female) rudimentary, tiny, of 3 segments, arising ventrally just anterior to first lateral processes.

Legs thin, femorae with eggs. Second tibia slightly longer than first, femur slightly shorter than both. Major segments with single long dorsodistal seta, longer than segment diameter, and several short setae. Tarsus and propodus short, without spines but having a row of sole setae as long as segment diameter. Main claw lacking, auxiliaries large, strongly curved.

MEASUREMENTS (mm).—Ocular segment length, 0.44; total trunk length (anterior tip to tip of fourth lateral processes), 0.74; trunk width (across second lateral processes), 0.23; proboscis length, 0.37; abdomen length, 0.1; third leg, coxa 1, 0.09, coxa 2, 0.15, coxa 3, 0.09, femur, 0.34, tibia 1, 0.37, tibia 2, 0.38, tarsus, 0.04, propodus, 0.13, auxiliary claw, 0.05.

DISTRIBUTION.—Known only from the type-locality, Carrie Bow Cay, Belize, littoral.

ETYMOLOGY.—Named for the two breast-like lateral tubercles on the proboscis.

REMARKS.—The new species differs from *Hedgpethius tridentatus* in having one less palp segment, a longer abdomen, the ocular tubercle placed on the middle of the neck, and by having large auxiliary claws without a main claw, however small, between them. The male oviger of this new species remains unknown, but will probably resemble that of *H. tridentatus*, with the same extreme sexual dimorphism displayed for that species.

Hedgpethius tridentatus Child, 1974

FIGURE 163g-k.

Hedgpethius tridentatus Child, 1974:494-497, fig. 1.

MATERIAL EXAMINED.—Twin Cays: NW coast, mat of *Caulerpa verticillata* and mangrove rootlets beneath *Rhizophora* in intertidal, coll. C. A. Child, 31 Jan 1978; 1♂, 1♀. Another mat of the same

substrate from just S of first collection, coll. C. A. Child, 2 Feb 1978; 13 specimens.

DESCRIPTION OF MALE.—Proboscis tubercles slightly larger than those of female. Femoral cement gland a tall tube placed at midlength of dorsal surface, perpendicular to femur. Oviger with 9 segments: second the longest; sixth ovoid; terminal 3 segments (strigilis) placed anaxially on middle of sixth segment; strigilis segments short, curved, with simple spines; all but first oviger segment armed with several setae; without terminal claw.

EMENDED DESCRIPTION OF FEMALE.—Palp of 8 segments: first two very short; third and fifth longest; sixth and seventh very short; terminal segment thin, with ventral setae. Chelifores of 3 segments, partly hidden by anterior cowl of first trunk segment. Scape with 2 segments, first a short cylinder with dorsodistal seta, second a wrinkled bud, no longer than wide. Chela vestigial, with distal crease but no fingers. Juvenile chela with strongly curved fingers overlapping at tips.

REMARKS.—The smallest palp and chelifore segments are extremely difficult to see and were missed in making the first description. The males of this species have the same number of segments in palps and chelifores as listed above in the emended female description.

The extreme sexual dimorphism found in the ovigers of this species is very rare in pycnogonids. In most pycnogonid genera, either ovigers are lacking in the female or the ovigers are smaller slightly modified versions of the male ovigers. Enough females of this genus have now been collected to show that the very reduced ovigers reported in the original description are not misinformation based on damaged specimens, but are the natural state for females of *Hedgpethius*, in which they appear almost embryonic.

This genus was named and published before I received the paper by Turpaeva (1973), in which she assigns a number of species of *Rhopalorhynchus* (Colossendeidae) to a new genus, *Hedgpethia*. According to the International Code of Zoological

Nomenclature, Article 56a, both names must be retained. The two genera are sufficiently different in most characters that they will never become synonymous.

The known distribution for *Hedgpethius tridentatus* is extended from Florida to the Belizean barrier reef islands; all records are littoral.

Nymphopsis Haswell, 1885

Nymphopsis duodorsospinosum Hilton, 1942a

Nymphopsis duodorsospinosum Hilton, 1942a:303–305, pl. 45.—Hedgpeth, 1948:250–252, fig. 40; 1954:427.—Child and Hedgpeth, 1971:609 [list].—Kraeuter, 1973:496.—Stock, 1975:978.—Krapp and Kraeuter, 1976:342.—Child, 1979:21.

MATERIAL EXAMINED.—Carrie Bow Cay: Tidal flats in 0.5 m, coll. K. Rützler, 7 May 1974; 1♀.

REMARKS.—This species is easily recognized by its large size in comparison with tiny littoral species, its legs and trunk, which are crowded with dorsal tubercles, and particularly the two tall trunk tubercles, which separate it from all other pycnogonids known from the Belizean coast. It has been found from the tide line to about 60 meters of depth on various substrates, but its habits and feeding preferences remain unknown.

Nymphopsis duodorsospinosa has a wide tropical and temperate distribution, from Georgia and Florida through the Caribbean to Panama and from the Gulf of California to the Pacific coast of Panama. It is also found in the Galapagos Islands.

Tanystylum Miers, 1879

Tanystylum birkelandi Child, 1979

Tanystylum birkelandi Child, 1979:23, fig. 7.

MATERIAL EXAMINED.—Carrie Bow Cay: Flats on ocean side, rubble and calcareous algae from tide line, coll. C. A. Child, 27 Jan 1978; 2♀.

REMARKS.—These two females agree exactly with the female paratype from Galeta Island, on

the Caribbean side of Panama. Since this is only the second capture record for the species, little can be said concerning its habitats, except that it has been taken with coralline and calcareous algae in the littoral. Its distribution is here extended north from Panama to the Belizean coast.

Tanystylum tubirostrum Stock, 1954

Tanystylum tubirostre Stock, 1954:117–120, figs. 24–25.—Bourdillon, 1955:600, pl. 3: figs. 2–4.—Child, 1979:34–35.
Tanystylum tubirostrum.—Stock, 1975:984.

MATERIAL EXAMINED.—Twin Cays: NW coast, on roots of *Rhizophora mangle* with adherent red and green sponges, algae, ascidians and hydroids in 0.5 m, coll. C. A. Child, 31 Jan 1978; 2♂, 1♀.

REMARKS.—These specimens agree in all respects with Stock's (1954) description and figures. The present capture extends the known distribution of this species from Bermuda, Puerto Rico, Curaçao and Bonaire, the western Caribbean, and the Pacific shores of Mexico and Panama.

ECOLOGY.—There are few capture records for this species, but these are fairly well documented. It lives in littoral habitats and has been found associated with *Sargassum*, hydroids, and, in this case, with a wealth of potential food. Pycnogonids are known to feed on hydroids and ascidians and because they have been taken in association with sponges, it is assumed that they also feed on the soft parts of sponges.

Family CALLIPALLENIDAE

Callipallene Flynn, 1929

Callipallene belizae, new species

FIGURE 164.

MATERIAL EXAMINED.—Carrie Bow Cay: *Halimeda* and rubble from outer reef ridge in 18 m, coll. B. Kensley, 7 Feb 1978; 1♂ with eggs, holotype (USNM 171035), 2 juvenile paratypes (USNM 171036). Large clump of *Halimeda* from same area, coll. C. A. Child, 7 Feb 1978; 1♀

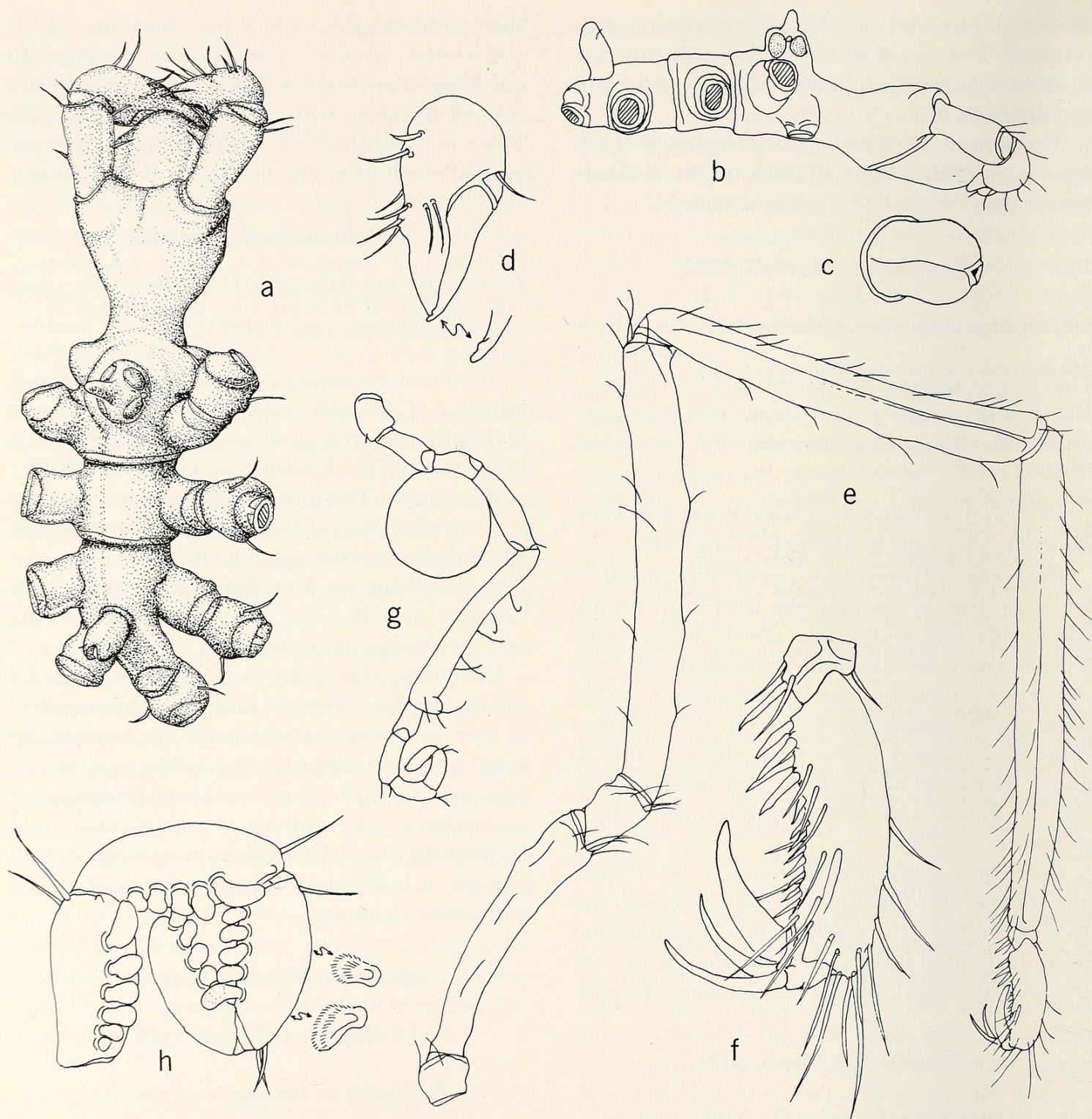


FIGURE 164.—*Callipallene belizae*, new species (holotype): *a*, trunk; *b*, trunk, lateral; *c*, proboscis, ventral; *d*, chela with enlargement of tip of movable finger; *e*, third leg; *f*, terminal segments of third leg; *g*, oviger with single egg; *h*, terminal segments of oviger with enlargement of two spines.

paratype (USNM 171037).

DESCRIPTION.—First 2 trunk segment lines present, third lacking. Neck short, unadorned. Lateral processes short, only as long as their diame-

ters, separated by less than their diameters, glabrous. Ocular tubercle a broad truncated cone capped with a thin tubercle as tall as ocular cone. Eyes large, lightly pigmented. Abdomen an in-

flated cylinder slightly longer than twice its maximum diameter, armed with 2 distal setae.

Proboscis short, inflated distally and with rounded ventrodistal bulges.

Chelifore scape equal in length to proboscis, armed with lateral and dorsodistal setae. Chela with slightly inflated palm, armed with 7–8 dorsal and 1 ventral setae. Fingers overlap at tips, without setae. Movable finger with single tiny distal tooth, broader than long.

First 3 segments of oviger moderately short, fourth longer, fifth more than twice length of fourth, armed with several setae longer than fifth segment diameter. Distal apophysis of male fifth segment armed with 2 setae. Terminal 4 segments (strigilis) armed with denticulate spines in the formula 6:5:5:5. Denticulate spines dimorphic: proximal spines oval with fine denticulations; distal spine larger, with fan-like projection of denticulations pointing distally on segment.

Legs long, slender, very setose distally. First and third coxae short, little longer than their diameters. Second coxa long, curved, over 5 times longer than its maximum diameter. Femur slightly longer than tibia 1, tibia 2 slightly longer than femur. Cement glands not found. Tarsus short, armed with 2 smooth ventral spines, 1 ventral and 1 dorsal setae. Propodus short, only slightly curved, armed distally and laterally with many long setae. Sole with 4 smooth heel spines and 7 distal spines. Main claw half as long as propodus, auxiliaries about 0.9 times length of main claw, without endal setae or teeth.

MEASUREMENTS (mm).—Trunk length (chelifore insertion to tip of fourth lateral processes), 0.89; trunk width (across second lateral processes), 0.37; abdomen length, 0.12; proboscis length, 0.28; third leg, coxa 1, 0.12, coxa 2, 0.65, coxa 3, 0.19, femur, 0.96, tibia 1, 0.77, tibia 2, 1.1, tarsus, 0.06, propodus, 0.28, claw, 0.14.

DISTRIBUTION.—Known only from the type-locality, Carrie Bow Cay, Belize, in depths of 18 meters.

ETYMOLOGY.—Named for the country where it was discovered, Belize.

REMARKS.—This new species resembles Amer-

ican specimens of *Callipallene brevirostris* (Johnston), but has a shorter neck; it is also similar to Caribbean specimens of *C. emaciata*. It differs from both of these species in the following respects: the new species has a tall thin tubercle on top of its truncated ocular cone; it has smooth tarsus and propodus spines whereas the other two have variously crenulated spines; its chela fingers are without teeth except for a single tiny distal tooth on the movable finger; the auxiliary claws are longer than for most American specimens, although those of *C. brevirostris* are sometimes as long; and the posterior trunk segmentation line is lacking, although this is not a reliable taxonomic character with this genus.

Taxonomic distinction among *Callipallene* species is often very difficult to make, not only because several species are very similar, but also because apparently they have more than one adult molt stage with resulting changes in setae, teeth, denticulate spine number and shape, and mensural characters and their ratios. These molt changes add vastly to the difficulty in deciding where variation ends and species begin, a dividing line that will undoubtedly remain uncertain for most *Callipallene* species until large numbers can be compared interspecifically and intraspecifically.

The propodus of *Callipallene belizae* is shorter, less curved, and has many more setae than either *C. brevirostris* or *C. emaciata*. Neither of these species has the very marked dimorphism shown in the denticulate oviger spines of *C. belizae*. The terminal spine on each of the four distal segments is splayed out and canted forward so as to resemble a fan.

ECOLOGY.—Since this species has been found only in rubble and *Halimeda* at depths of 18 meters, and the bottom samples from which the species was taken were not preserved for possible food preference organisms, its habits are unknown.

Callipallene emaciata (Dohrn, 1881)

Callipallene emaciata emaciata.—Stock, 1952a:8 [literature].

Callipallene emaciata.—Stock, 1975:1011.—Child, 1979:41–42.

MATERIAL EXAMINED.—Carrie Bow Cay: From *Thalassia* bed in 0.5 m, coll. R. Larson, 31 Mar 1977; 1♂ with eggs, 1♂, 2♀, 2 juveniles. From *Dictyota* on reef flat in 0.5 m, coll. R. Larson, 16 Mar 1977; 1 juvenile. Rubble and calcareous algae at wall on ocean side at tide line, coll. C. A. Child, 28 Jan 1978; 1♀. *Syringodium* and sediment from lagoon in 1.5 m, coll. B. Kensley, 1 Feb 1978; 1♀. Plankton sampler on bottom on ocean side flats in 0.5 m, coll. R. Larson, 30 Jan 1978; 1 larva (probably this species).

South Water Cay: Piling scrapings from dock at S end on lagoon side, coll. C. A. Child, 30 Jan 1978; 1 juvenile.

REMARKS.—These are the first records of *Calipallene emaciata* from the western Caribbean. This species has been found in the Mediterranean, Portugal, the Azores, and from Florida and the Caribbean archipelago to the Guianas, primarily in littoral and shallow depths.

ECOLOGY.—This species and two others from the Caribbean coasts, *Callipallene brevirostris* and *C. phantoma* (Dohrn) are generally found associated with fouling organisms on bridge and dock pilings.

Parapallene Carpenter, 1892

Parapallene bermudensis Lebour, 1949

FIGURE 165.

Parapallene bermudensis Lebour, 1949:930–932, figs. 2–3.

MATERIAL EXAMINED.—Carrie Bow Cay: Coral, sand and rubble from sand trough behind outer reef ridge at 27 m, coll. C. A. Child, 6 Feb 1978; 1♀ subadult. Sand and rubble from slightly S of above sample in 27 m, coll. C. A. Child, 7 Feb 1978; 1♂ juvenile.

REMARKS.—Although neither of these specimens is fully mature, they agree with Lebour's (1949) description and represent only the second record of this species; the type-locality is Bermuda. An unreported female from about the same depth in the Bahama Islands is in the collections of the National Museum of Natural History.

Since Lebour's (1949) figures are somewhat stylized and several details are omitted from her drawings and description, I have prepared a set of figures of the male for clarification. Lebour stated that the chela fingers lack denticulations, but both the Bahama specimen and the above two have very small denticulations or teeth on one or both fingers of the chela.

The species has raised lips and an oral fringe of tiny setae. The propodus has two major heel spines unlike the figure and description of Lebour's (1949:931–932, figs. 3–7) specimen. The ventrodistal second tibia spine, major tarsal spine, and the sole spines all show a slight serration on their inner surfaces. The auxiliary claws are slightly shorter than those figured by Lebour.

The ovigers of the Carrie Bow female are shorter than those of the type-specimen, but the female was about to molt and the next (adult) stage oviger can be seen clearly within the outer chitinous layer. The oviger of the Carrie Bow male is still the unsegmented curled appendage of a juvenile.

A distinctive character of this species is its spination. There are short broad spines on the first coxae and a series of these spines around the insertion of the chelifores and proboscis. The spines have an annulated hollow interior without the annulations being carried through to the outer surface (Figure 165f). Elsewhere on the animal, where other typical spines and setae are present, these annulated spines are absent.

The Carrie Bow specimens represent a range extension to the western Caribbean for this species.

ECOLOGY.—The four available records for this species indicate that it has a very restricted depth preference. All four specimens reportedly have been taken in depths of 27 to 33 meters (90 to 100 ft). Lebour's (1949) type was taken "with fragments of hydroids and weeds." The Carrie Bow specimens were taken from rubble with some algae and probably a number of hydroids, although none of the latter were saved. No habitat data are available on the Bahamas specimen.

The Carrie Bow specimens were light brownish green. Pigmentation and feeding preference have

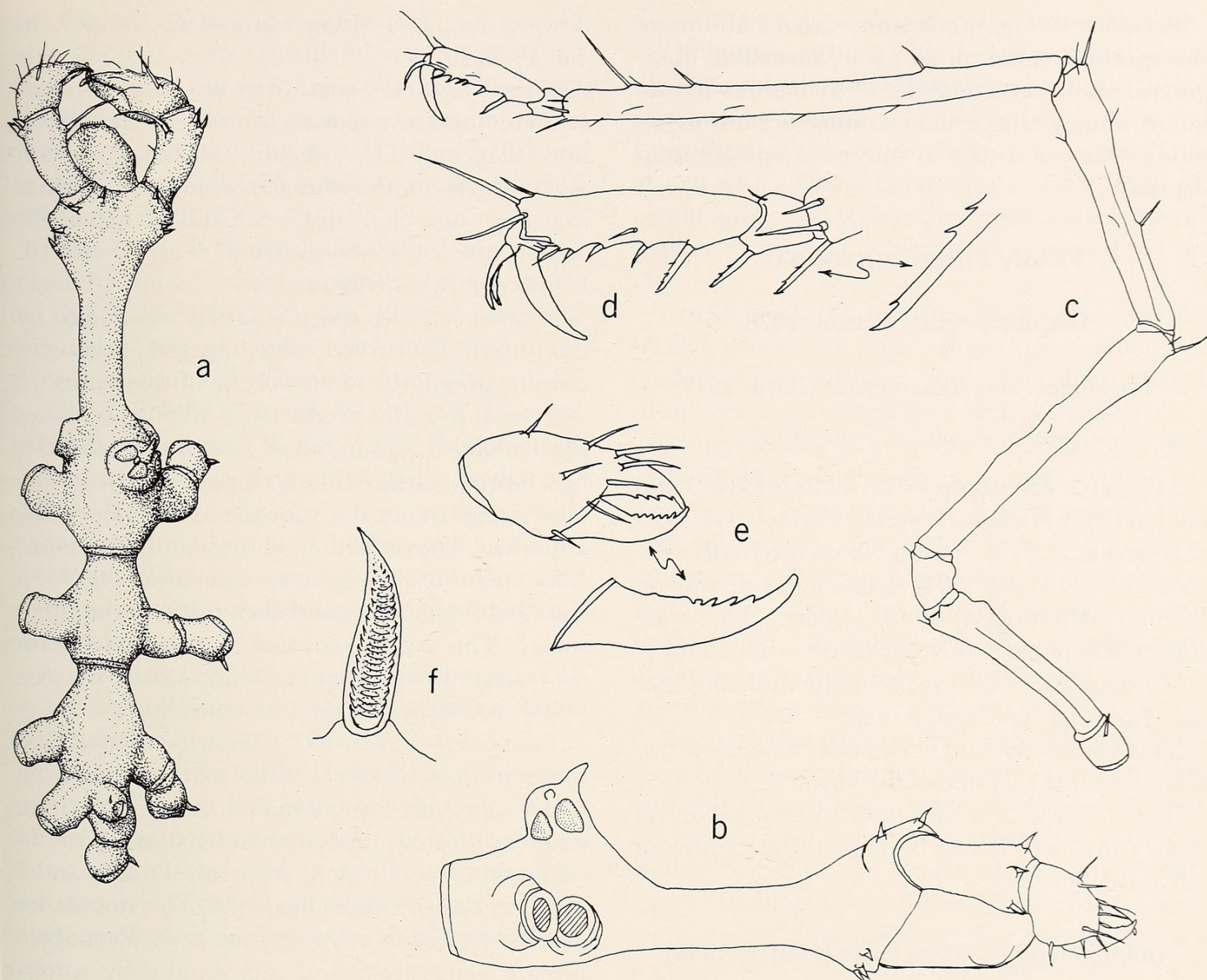


FIGURE 165.—*Parapallene bermudensis* Lebour, juvenile male: *a*, trunk; *b*, anterior trunk segments, lateral; *c*, third leg; *d*, terminal segments of third leg with enlargement of spine; *e*, chela with enlargement of movable finger; *f*, annulated spine.

not been correlated, but most literature references concerning live pycnogonids state that generally they are colored the same as the substrate making them difficult to see. Their color probably represents some of the algal substrate on which many pycnogonids find their food source.

Pigrogromitus Calman, 1927

Pigrogromitus timsanus Calman, 1927

Pigrogromitus timsanus Calman, 1927:408–410, fig. 104a–f.—Hedgpeth, 1947:7 [text]; 1948:214–216, fig. 23.—Stock,

1968a:46; 1975:1015–1016.—Lipkin and Safriel, 1971:9.—Arnaud, 1972:159–160.—Child, 1979:46, 47.

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

MATERIAL EXAMINED.—Carrie Bow Cay: Among rocks and rubble on ocean side at tide line, coll. J. Clark, 17 Jan 1976; 2 juveniles.

Twin Cays: Among *Rhizophora* roots along N edge of dividing channel at S end of Cays in 0.6 m, coll. C. A. Child, 25 Apr 1976; 1♂ with eggs.

REMARKS.—This species has a pantropical distribution. This is the second record of capture in the western and southwestern Caribbean, the first being from the Caribbean coast of Panama.

ECOLOGY.—The many and varied habitats of this species include corals, algae, zoanthids, mangroves, rubble, and molluscan cavities. It was also found among unspecified fouling organisms on pilings, almost always at intertidal and subtidal depths.

Family PHOXICHILIDIIDAE

Anoplodactylus Wilson, 1878

Anoplodactylus bahamensis Child, 1977

Anoplodactylus bahamensis Child, 1977:587–589, fig. 2.

MATERIAL EXAMINED.—Carrie Bow Cay: Tidal flats in 0.5 m, coll. K. Rützler, 2 May 1974; 1♂.

REMARKS.—This species was originally described (Child, 1977:587) as having teeth only on the movable fingers of the chelae. The male collected here has 3 tiny low teeth on the immovable finger also, but it is otherwise indistinguishable from the type, also a male.

This Carrie Bow male extends the known distribution to the western Caribbean.

The habitats or associations of this species remain unknown. It has been found at depths of 0.5 and 12 meters.

Anoplodactylus batangensis (Helfer, 1938)

Pycnosoma batangense Helfer, 1938:174–176, fig. 6a–c.

Anoplodactylus batangensis.—Stock, 1968a:54 [literature]; 1975:1082–1083, fig. 43c–d.—Arnaud, 1973:957, figs. 3–4.—Child, 1979:50.

MATERIAL EXAMINED.—Carrie Bow Cay: Tidal flats at tide line, coll. K. Rützler, 23 Apr 1974; 1♂ with eggs, 1♀. Tidal flats at 0.5 m, coll. K. Rützler, 2 May 1974; 1♂. From *Dictyota* on reef flat in 0.5 m, coll. R. Larson, 16 Mar 1977; 1♂ juvenile. From *Thalassia* bed in 0.5 m, coll. R. Larson, 31 Mar 1977; 1 juvenile. Rubble and *Halimeda* from outer reef crest in 0.5 m, coll. B. Kensley, 30 Jan 1978; 1♂ with eggs. Mixed carpet of red algae and compact corallines at SE end shore, coll. B. Kensley, 5 Apr 1978; 1♂.

South Water Cay: *Thalassia* and red sponge

beyond dock at S end in 1 m, coll. B. Kensley, 30 Jan 1978; 3♀.

Twin Cays: NW coast, mat of *Caulerpa verticillata* and mangrove rootlets from under *Rhizophora*, intertidal, coll. C. A. Child, 31 Jan 1978; 1♂, several juveniles. Another *C. verticillata* and rootlet mat from nearby, coll. C. A. Child, 2 Feb 1978; 3♂. A mat of *Halimeda* from nearby, coll. B. Kensley, 2 Feb 1978; 1♀.

REMARKS.—This species is easily recognized by its anteriorly curved and tapered proboscis, unique among the many species of this genus.

Several live and even freshly killed specimens, particularly the 3♂ found on *Caulerpa*, 2 Feb 1978, had a broad chalk-white stripe running from the posterior of the ocular tubercle to the base of the abdomen. The remainder of these animals ranged from cream to slightly straw colored, except for a chalk-white band around each distal leg segment suture. This white color was not associated with the intestinal diverticula, which could be seen below and separate from the color line.

ECOLOGY.—Stock (1975:1083) mentioned that males seem to be rare, but both in this collection and in another from Panama, males appear in equal or greater numbers than females. Of the 14 adults in this collection, there are 9 males and 5 females; 2 of the males bear eggs. This imbalance may be related to collecting methods. Pycnogonids are generally found incidentally by sorters who are looking for other organisms and therefore many are missed.

The habitats of this species are quite varied, and include algae, *Thalassia*, sponges, rubble, and *Rhizophora*. All specimens were taken in littoral depths and most records in the literature are also from shallow water.

Anoplodactylus evelinae Marcus, 1940

Anoplodactylus evelinae Marcus, 1940:55–58, pl. 4.—Hedgpeth, 1948:232, fig. 31.—Child, 1979: 53.

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

MATERIAL EXAMINED.—Carrie Bow Cay: Tidal flats at tide line, coll. K. Rützler, 23 Apr 1974;

1♂. *Thalassia* bed in 0.5 m, coll. R. Larson, 31 Mar 1977; 1♂ with eggs. Rubble and calcareous algae on ocean side in 0.3 m, coll. C. A. Child, 27 Jan 1978; 1♀. *Halimeda*, *Caulerpa*, and rubble from outer reef crest in 0.5 m, coll. B. Kensley, 30 Jan 1978; 1♀. Clump of *Halimeda* at shore, SE end, coll. B. Kensley, 5 Feb 1978; 1♀.

Twin Cays: NW coast, *Rhizophora* roots with algae, hydroids, ascidians, and bryozoans in 0.5 m, coll. C. A. Child, 31 Jan 1978; 2 juveniles. NW coast, mat of *Caulerpa verticillata* and mangrove rootlets under *Rhizophora*, intertidal, coll. C. A. Child, 2 Feb 1978; 4♂, 2♀. Mat of *Halimeda* from same area, coll. B. Kensley, 2 Feb 1978; 1♀.

REMARKS.—This is another easily recognized species. It is very "stumpy" in appearance, with a short and broad ocular tubercle, abdomen, and proboscis. The legs are robust and the very pointed heel with its short spine makes a reliable recognition character.

It is common in the western Caribbean. The above collections produced 14 specimens from the littoral.

ECOLOGY.—The habits of *Anoplodactylus evelinae* are unknown, but it is found together with other species of pycnogonids in algae, *Thalassia*, *Rhizophora*, rubble, and among sessile animals. The Belizean collections do not support Stock's (1975: 1083) suggestion that this species is a sand burrower.

Anoplodactylus imswe, new species

FIGURE 166

MATERIAL EXAMINED.—Tobacco Reef: Reef top about 500 m N of South Water Cay, intertidal, coll. M. Carpenter and R. Larson, 23 Mar 1977; 1♂ holotype (USNM 171122).

Carrie Bow Cay: Tidal flats in 0.5 m, coll. K. Rützler, 4 May 1974; 1♀ paratype (USNM 171123). Tidal flats in 0.5 m, coll. K. Rützler, 7 May 1974; 1♀ paratype (USNM 171124).

DESCRIPTION.—Trunk with first two intersegmental lines well marked, third incomplete, marked only by slight depression dorsally. Lateral processes separated by slightly less than their

diameters, each as long as trunk diameter, without tubercles, armed with 1–3 dorsodistal setae. Ocular tubercle a moderately tall cylinder twice as tall as its diameter, capped by triangular cone. Eyes distally on cylinder, darkly pigmented. Neck armed with single seta lateral to, and in front of, ocular tubercle. Abdomen almost 3 times its diameter, bent erect, armed with several distal setae.

Chelifores thin, scape armed with several distal setae. Chela ovoid, fingers shorter than palm, well curved at tips, without teeth. Palm with several distal setae; movable finger with 3 ectal setae.

Oviger with robust curved basal segment. Second segment only slightly longer, cylindrical, armed with ectal row of 6–7 short setae. Third segment longest, slightly less than half again as long as second segment, armed with several ectal and endal setae. Terminal 3 segments each shorter than last, moderately setose distally with distal setae longer than segment diameter. Terminal segment thin, pointed at tip.

Leg with first coxae armed with 2–4 dorsodistal setae, without tubercles. Second coxae of third and fourth legs with ventrodiscal genital spur almost as long as segment diameter, carrying genital orifice at tip. Coxae of first and second legs without spurs or orifices. Third coxae armed with several distal setae. Femur the longest leg segment with first tibia longer than second, each armed with several short setae and a single long dorsodistal seta, as long or longer than segment diameter. Seta of femur mounted on short tubercle. Femoral cement gland a long, thin, flask-shaped tube, canted distally, situated at less than one-third length of femur. Tarsus roughly triangular, with several ventral setae. Propodus stout; heel perpendicular, armed with single large spine and 5 smaller spines. Sole armed with 6–7 curved spines and several lateral setae; distal lamina one-fifth sole length. Claw robust, strongly curved. Auxiliary claws lacking.

MEASUREMENTS (mm).—Trunk length (chelifore insertion to tip of fourth lateral processes), 0.93; trunk width (across first lateral processes), 0.63; proboscis length, 0.52; abdomen length,

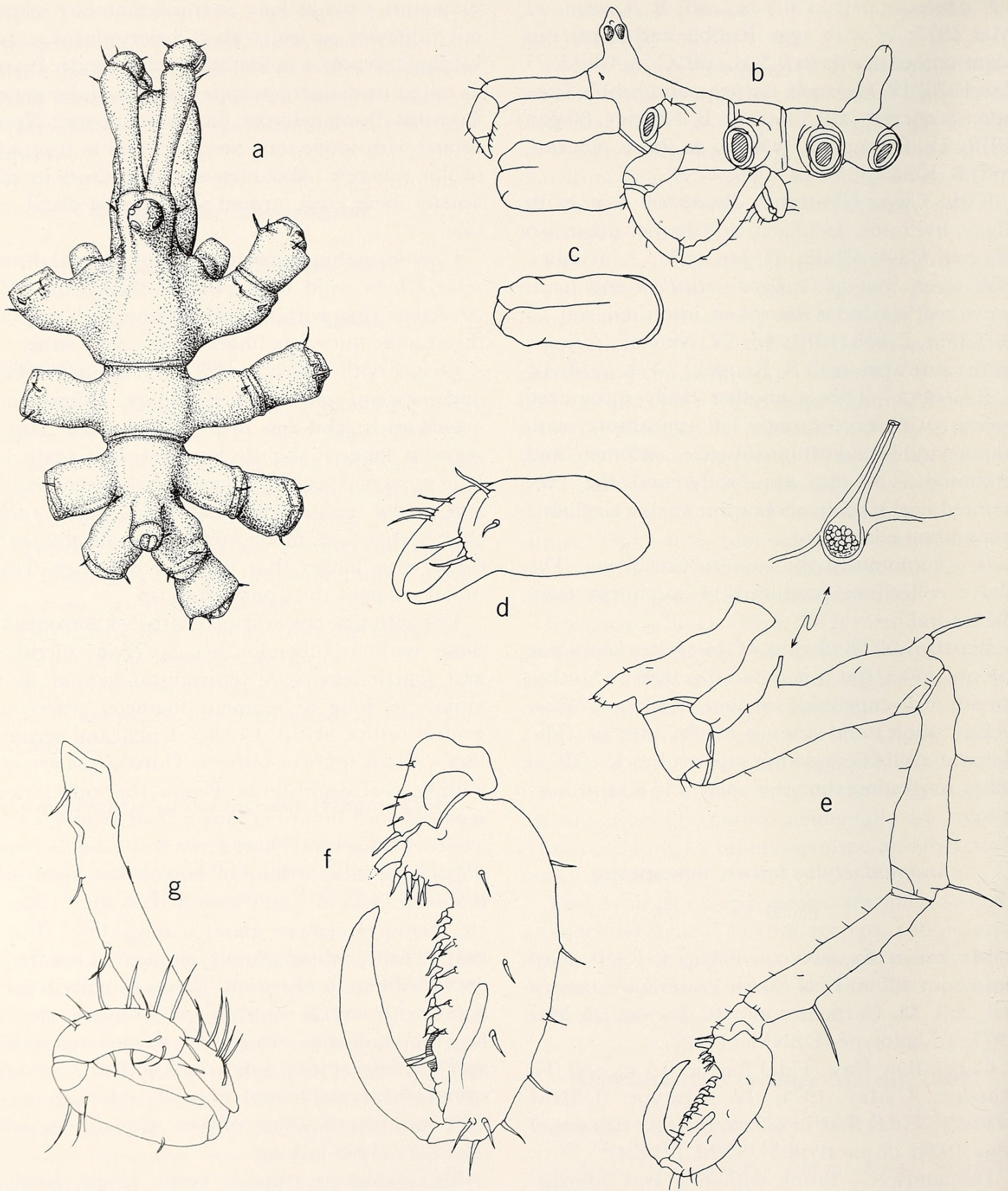


FIGURE 166—*Anoplodactylus imswae*, new species (holotype): *a*, trunk; *b*, trunk, lateral; *c*, proboscis, ventral; *d*, chela; *e*, third leg with enlargement of femoral cement gland; *f*, terminal segments of third leg; *g*, oviger terminal segments.

0.24; third leg, coxa 1, 0.21, coxa 2, 0.42, coxa 3, 0.2, femur, 0.55, tibia 1, 0.52, tibia 2, 0.47, tarsus, 0.09, propodus, 0.34, claw, 0.23.

DISTRIBUTION.—Known only from the type-locality, the Belizean barrier reef at Tobacco Reef and Carrie Bow Cay at a depth of 0.5 meters.

ETYMOLOGY.—This species is named for the Smithsonian Institution Investigations of Marine Shallow-Water Ecosystems (IMSWE) Project.

REMARKS.—The femoral cement glands of this species are not unique among species of *Anoplodactylus*. They are almost exactly like the glands of *A. batangensis*, but they are placed slightly farther back toward the proximal end of the segment in the new species. Other differences in *A. imswae* remove it from consideration as *A. batangensis*. Most notably, the proboscis in the new species is cylindrical whereas in *A. batangensis* it is constricted distally to a thin tube. The new species also has longer first oviger segments, longer and less setose leg segments, longer ocular tubercle and abdomen, and lacks low lateral process tubercles. The propodus, however, with its heel and heel spine, sole spines, and lack of auxiliaries, is strikingly similar in both species.

This species is similar to *Anoplodactylus erectus* Cole in the shape of the trunk, ocular tubercle, oviger, and abdomen, but the propodus characters and the cement glands are very different. It is also similar to *A. maritimus*. In comparison with Giltay's male type specimen of *A. parvus* (= *A. maritimus*, fide Stock, 1975:1069–1074), the ovigers, chelifores, trunk, and propodus shape of *A. imswae* are very close to those of the type of *A. parvus*. The differences are (1) the propodus of *A. parvus* has two heel spines and auxiliary claws, (2) the abdomen and ocular tubercle are shorter, (3) there are no discernible trunk segmentation lines, and (4) the cement glands are tiny short tubes where they emerge from the femorae.

ECOLOGY.—The three specimens from Belize, although collected in separate locations, all share a distinct color pattern. When freshly killed, the Tobacco Reef specimen had a bright purple gut. After storage in alcohol for a year or more, all three specimens have deep blue intestinal tracts.

This blue pigment appears to be a reliable recognition character for this species, at least on the Belizean barrier reef. The purple or blue gut color is shared by *Anoplodactylus lentus*, a much larger pycnogonid which has not yet been found in Belize. The coloration of *A. imswae* indicates that it might feed on organisms containing blue-green algae, but since collecting data for this species do not contain information on habitat associates, its feeding preference remains unknown.

Anoplodactylus jonesi Child, 1974

Anoplodactylus jonesi Child, 1974:497–500, fig. 2; 1979:56, fig. 19a–b.

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

MATERIAL EXAMINED.—Carrie Bow Cay: Tidal flats in 0.5 m, coll. K. Rützler, 2 May 1974; 2♂.

REMARKS.—Both of these specimens are normal males with full ovigers and a tall tubular cement gland on each femur. Several questionable females have been found in the past that bear male ovigers, ova in the legs, and that lack cement glands. This seemingly abnormal situation has led to speculation on the status of this species in a genus in which the females are entirely without ovigers. Further discussion and figures of this species appear in Child (1979:56, fig. 19a–b).

ECOLOGY.—Habits and habitats are lacking for the Belizean specimen, but in Panama the species has been found most often among algae.

Anoplodactylus maritimus Hodgson, 1914

Anoplodactylus maritimus Hodgson, 1914:164; 1915:148; 1927:357.—Marcus, 1940:60.—Stock, 1975:1069–1074, fig. 54.

Not *Anoplodactylus maritimus*.—Hedgpeth, 1948:230, fig. 29d–e [= *A. iuleus* Stock, 1975:1069].

Anoplodactylus parvus Giltay, 1934:1–3, figs. 1–5.—Hedgpeth, 1948:223–224, fig. 27e–f.—Stock, 1951:13, figs. 14–16; 1954:127; 1955:235; 1957:85; 1975:1069–1074, fig. 54.—Bourdillon, 1955:590–591, fig. 1, pl. 1: fig. 2.—Fage and Stock, 1966:326.—Kraeuter, 1973:494–495.

MATERIAL EXAMINED.—Carrie Bow Cay: Tidal flats, coll. M. L. Jones, 6 Apr 1976; 1♀.

South Water Cay: Rubble from edge of chan-

nel in 6 m, coll. C. A. Child, 1 Feb 1978; 2♂ with eggs, 2 juveniles.

Twin Cays: NW coast, *Halimeda* mat from under mangroves in 0.3 m, coll. B. Kensley, 2 Feb 1978; 1♀.

REMARKS.—In agreement with Stock (1975:1072), I have combined the two species under Hodgson's (1914) earlier designation. There is ample cause for confusion here as Hodgson's type was never figured. Giltay's (1934) *Anoplodactylus parvus* has been figured by several authors, including Giltay, but was never compared with Hodgson's type (which appears to have been lost). As presently designated, the species can also be easily confused with *A. petiolatus* (Kroyer), which itself is sufficiently variable to suggest the possibility of two species (Stock, 1975:1075). Stock (1975, figs. 53, 54) attempted to sort out and figure the differences between the present species and *A. petiolatus*.

Association with floating substrates has given this species an extremely wide distribution in the Atlantic. It has been found from Chesapeake Bay in Virginia, south to Bermuda and through the West Indies to Brazil. Hodgson (1914) originally described it from south of the Azores and it is known also from the Cape Verde Islands.

ECOLOGY.—This species is common over vast areas of the mid-Atlantic as one of the many inhabitants of the seaweed *Sargassum* (Bourdillon, 1955, fig 1). The type of *Anoplodactylus maritimus* was collected in *Sargassum*, and many other records confirm this association. I have also seen specimens feeding on hydroids attached to *Sargassum* dipped from Florida waters. The present collection, however, shows that this species occupies other habitats as well.

Anoplodactylus monotrema Stock, 1979

Anoplodactylus robustus.—Child and Hedgpeth, 1971:612–613 [literature].—Stock, 1975:1080.

Anoplodactylus monotrema Stock, 1979:15–18, figs. 4–5.—Child, 1979:56, 58, fig. 19c.

MATERIAL EXAMINED.—Carrie Bow Cay: Tidal flats in 0–1 m, coll. 7 Apr 1973; 1♂ with eggs.

REMARKS.—This species has a "fat" appear-

ance with a short blunt proboscis, abdomen, and ocular tubercle.

All specimens previously assigned to *Anoplodactylus robustus*, whether from European collections or from western hemisphere collections, were thought to agree. It recently became evident that the European specimens have more than one (usually 3) cement gland per femur whereas the American specimens have only one gland per femur. Other slight differences, when taken in combination, caused American specimens to be recognized as a separate species, *A. monotrema*. Therefore, the known distribution of the American species is confined to the east and west coasts of southern North America and northern South America, including the Galapagos Islands.

ECOLOGY.—The color of this littoral and sublittoral species is usually straw or lighter. Its feeding habits are not yet identified. It has been taken on a wide variety of substrates.

Anoplodactylus multiclavus Child, 1977

Anoplodactylus multiclavus Child, 1977:593–596, fig. 4; 1979:58, fig. 19d.

MATERIAL EXAMINED.—South Water Cay: SE side, in shallow grass bed with sand patches near *Rhizophora* stumps in 0.5 m, coll. J. Clark, 15 Jan 1976; 1♂ with eggs.

REMARKS.—This specimen agrees with the type, also a male, in all respects including the multiple cement glands, except that it appears slightly more robust.

ECOLOGY.—Both the type and this specimen have been found in association with or near mangroves.

Anoplodactylus pectinus Hedgpeth, 1948

Anoplodactylus pectinus Hedgpeth, 1948:234–236, fig. 34; 1954:427.—Stock, 1955:235; 1974:17.—Arnaud, 1973:955–957.—Child, 1974:500; 1979:58.

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

MATERIAL EXAMINED.—Carrie Bow Cay: Tidal flats at tide line, coll. K. Rützler, 23 Apr 1974; 1♂. From *Dictyota* on reef flat in 0.5 m, coll. R. Larson, 16 Mar 1977; 1♂ with eggs, 1♂. Rubble

from sand trough behind outer reef ridge in 27 m, coll. C. A. Child, 6 Feb 1978; 3♂, 2♀. Rubble from just S of 6 Feb collection, in 27 m, coll. C. A. Child, 7 Feb 1978; 3♂.

Twin Cays: NW coast, mat of *Caulerpa verticillata* and mangrove rootlets beneath *Rhizophora*, intertidal, coll. C. A. Child, 2 Feb 1978; 1♀. Mat of *Halimeda* from nearby, intertidal, coll. B. Kensley, 2 Feb 1978; 1♀.

REMARKS.—This species, including its females, is easily recognized by the pectinate major heel spine that can be seen under high magnification.

This marks the second time *Anoplodactylus pectinus* has been collected in the western Caribbean. Previously, it has been collected on the Caribbean coast of Panama, in Florida, the Caribbean Leeward Islands, and in Madagascar.

ECOLOGY.—Freshly killed specimens had light green intestinal diverticula. This color may be a character useable to distinguish fresh specimens of this species, at least on the Belizean barrier reef. *Anoplodactylus portus* shares this green color, but retains coloration even after long storage, unlike *A. pectinus*. The color is undoubtedly a function of diet, although the particular green food matter is unknown.

Anoplodactylus portus Calman, 1927

Anoplodactylus portus.—Stock, 1975:1052–1053, fig. 41b–e [literature].—Child, 1978:133–144, figs. 1–4; 1979:58–59.

MATERIAL EXAMINED.—Carrie Bow Cay: Rubble and *Halimeda* from reef crest in 0.5 m, coll. C. A. Child, 29 Jan 1978; 1♂ with eggs. Lagoon flats, with *Syringodium* and sediment in 1.2 m, coll. B. Kensley, 1 Feb 1978; 1♂ juvenile, 1 larva. Mixed algae and compact corallines at shore, coll. B. Kensley, 5 Feb 1978; 1♀ juvenile. *Halimeda* and rubble from outer reef ridge in 18 m, coll. B. Kensley, 7 Feb 1978; 1♀ juvenile.

South Water Cay: Rubble from edge of channel in 6 m, coll. C. A. Child, 1 Feb 1978; 1♂, 2♀.

Twin Cays: NW coast, mat of *Caulerpa verticillata* and mangrove rootlets under *Rhizophora*, intertidal, coll. C. A. Child, 2 Feb 1978; 1♀.

REMARKS.—This is a pantropical species with

a robust appearance which aids in distinguishing it from the many other tropical species of this genus. As with all species of *Anoplodactylus*, the configuration of the male femoral cement gland(s) is a key character. In conjunction with oviger, chela, and propodus characters, it facilitates recognition among these otherwise difficult species. This observation does not hold for females, which remain difficult if not impossible to identify if they are not taken in the same sample or area with recognizable males.

ECOLOGY.—This species is often collected with gut diverticula in the legs showing green chloroplasts or at least chlorophyllous coloration ingested from the algal habitat in which it is often found. Whether or not it picks this up directly as food or as a biproduct of eating algal-grazing fauna has never been demonstrated.

Anoplodactylus sp.

MATERIAL EXAMINED.—Carrie Bow Cay: Tidal flats, coll. K. Rützler, 4 May 1974; 1♀ juvenile. Lagoon surface among *Thalassia* and *Sargassum*, coll. R. Larson with plankton net, 25 Jan 1978; 1 larva. Tidal flat, plankton net resting on bottom in 0.5 m, coll. R. Larson, 30 Jan 1978; 1 larva. With *Syringodium* in 1.0–1.5 m, coll. B. Kensley, 3 Feb 1978; 2♀ juveniles.

REMARKS.—None of these specimens is mature enough to identify.

Family ENDEIDAE

Endeis Philippi, 1843

Endeis spinosa (Montagu, 1808)

Endeis spinosa.—Hedgpeth, 1948:238–240 [early literature].—Stock, 1952b:185–186; 1954:128; 1957:85; 1962:218; 1968a:59 [key]; 1968b:32, fig. 25.—Soyer, 1966:3.—de Haro, 1966:9; 1967:109, 112–113, fig. 5.—Krapp, 1973:72.—Child, 1979:66.

MATERIAL EXAMINED.—Carrie Bow Cay: *Thalassia* beds in lagoon, 1.5 m, coll. J. D. Ferraris, 11 May 1975; 1♂ with eggs.

Stann Creek: Surface plankton tow off Pelican

Beach, 0.5 mi out, coll. R. Larson, 13 Apr 1978; 1♀.

REMARKS.—This species has been found from Norway to Argentina, including the Mediterranean Sea, at mainly littoral and sublittoral depths.

ECOLOGY.—*Endeis spinosa* is a frequent inhabitant of floating *Sargassum* in the Caribbean and elsewhere. It is also common in *Thalassia* grass that is supporting colonies of hydroids, bryozoans, and ascidians.

Family NYMPHONIDAE

Nymphon Fabricius, 1794

Nymphon floridanum Hedgpeth, 1948

Nymphon floridanum Hedgpeth, 1948:196–199, fig. 17 [long-necked form only].—Stock, 1955:215, fig. 1a [long-necked form only]; 1975:994–998, figs. 14–15.—Kraeuter, 1973:494.—Krapp and Kraeuter, 1976:336–337.—Child, 1979:37.

MATERIAL EXAMINED.—Carrie Bow Cay: Tidal flats at low water, coll. K. Rützler, 23 Apr 1974; 1♂. Tidal flats, coll. M. L. Jones, 5 Apr 1976; 1♀. *Halimeda* and rubble from outer reef ridge in 18 m, coll. B. Kensley, 7 Feb 1978; 1 juvenile.

REMARKS.—These specimens are all the long-necked form of *N. floridanum* (sensu strictu) as defined by Stock (1975:994–998). In this extensive genus, this species (along with its look-alike, *N. aemulum*) is one of the few tropical members that is both littoral and sublittoral. It is known from Georgia through the Caribbean to as far south as French Guiana. It has been found in association with coral, algae, and sandy habitats.

Family RHYNCHOTHORACIDAE

Rhynchothorax Costa, 1861

Rhynchothorax architectus Child, 1979

Rhynchothorax architectus Child, 1979:68–72, figs. 23, 24a–g, 25a–e.

MATERIAL EXAMINED.—Carrie Bow Cay: Broken rock and rubble at tide line on ocean side, coll. J. Clark, 17 Jan 1976; 1♂.

REMARKS.—This is the third capture locality for this variable species, the first two being the Caribbean and Pacific sides of the Isthmus of Panama. This specimen agrees well with male paratype specimens from Panama. It has low middorsal tubercles instead of the taller ones of the holotype. The species is known only from the intertidal.

ECOLOGY.—This species probably came from the coral sand around or under rock rubble. The most common habitats of this genus, as reported in the literature, are interstitial, with the animals living between sand grains around or under rocks. The above capture probably substantiates this mode of living and suggests that coralline and coral sand are the primary substrates.

Rhynchothorax crenatus, new species

FIGURE 167

MATERIAL EXAMINED.—Carrie Bow Cay: Coral sand and rubble in sand trough behind outer reef ridge in 27 m, coll. C. A. Child, 6 Feb 1978; 1 subadult specimen, holotype (USNM 170996).

DESCRIPTION.—Trunk compact, first 2 segment lines complete, third lacking. First 3 trunk segments with tall conical median dorsal tubercles almost as tall as ocular tubercle. Surface of entire animal except proboscis with minute scattered papillae. Dorsal and ventral trunk surfaces with pattern of lightly pigmented molt sutures similar to reticulations. Ocular tubercle tall, pointing about 30 degrees anteriorly, with 2 tiny lateral tubercles flanking a conical cap, a posterior triangular median tubercle and 2 thin short tubercles lateral and posterior to triangular tubercle. Conical cap with single posterior seta. Eyes large with medium dark pigment. Abdomen extending to tip of second coxae of fourth legs, cylindrical, and with proximal and distal constrictions, armed with 3 dorsodistal setae.

Proboscis cylindrical-conical, with 2 dorsolateral bulges flanking a tall spike-like tubercle in median line halfway along proboscis. Mouth with 2 laterally flattened antimeres confining it to a vertical slit.

Palps 4-segmented, arising from rather long

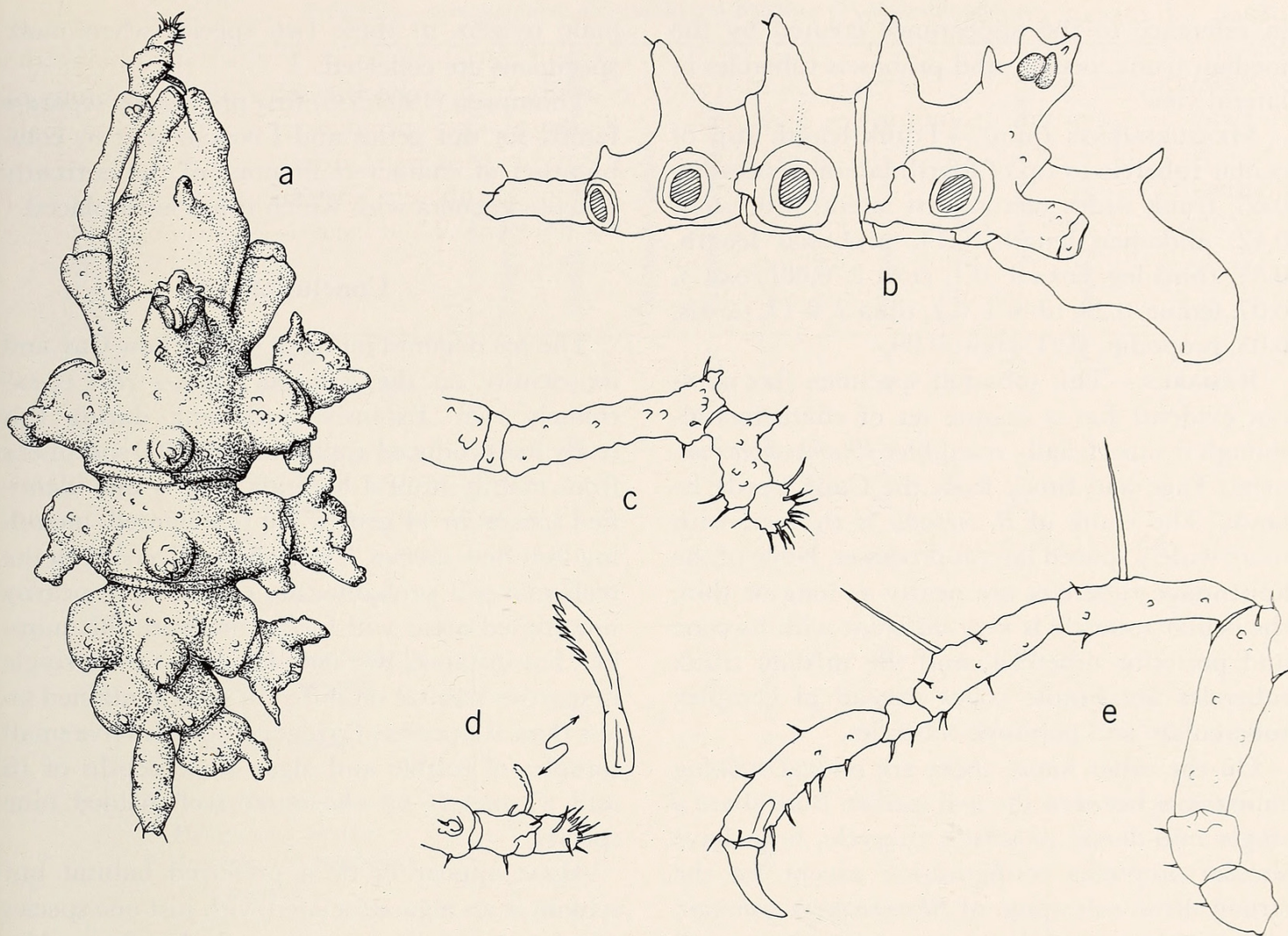


FIGURE 167—*Rhynchothorax crenatus*, new species (holotype): *a*, trunk; *b*, trunk, lateral; *c*, palp; *d*, terminal segments of palp, dorsally, with enlargement of endal spine; *e*, third leg.

trunk tubercle bases lateral to and closely set against proboscis. First segment very short, half as long as its diameter. Second segment longest, with small triangular dorsodistal tubercle armed with 2–3 setae and tiny ventrodistal tubercle armed with single seta. Third segment slightly less than half as long as second, with narrow median dorsal tubercle armed with seta, and small ventrodistal bulge armed with 2–3 setae. Terminal segment round in lateral aspect, armed with many setae dorsally, distally, and ventrally. Third palp segment armed on endal surface with single large spine bearing denticulations on posterior surface only. Spine slightly longer than diameter of segment.

Chelifores entirely lacking.

Oviger incomplete (?) or vestigial (?) in holo-

type, only small unsegmented bud present.

Legs moderately thin, armed with a few short setae and a very long single seta on first and second tibiae. Femorae lacking long setae. Femur the longest segment; first and second tibiae each shorter than preceding segment. Major leg segments of anterior 4 legs slightly longer than posterior four. Tarsus with single ventral spine and seta. Propodus without heel, moderately curved, armed with 5–6 sole spines. Terminal segments of anterior 4 legs armed with 4–6 tarsus setae and up to 12 sole spines. Claw robust, less than half propodus length. Auxiliary claws lacking.

DISTRIBUTION.—Known only from the type-locality, Carrie Bow Cay, Belize, in a depth of 27 meters.

ETYMOLOGY.—From Latin, meaning notched,

in reference to the appearance created by the median trunk, ocular, and proboscis tubercles in lateral view.

MEASUREMENTS (mm).—Trunk length (tip of ocular tubercle to tip of fourth lateral processes), 0.65; trunk width (across first lateral processes), 0.42; abdomen length, 0.14; proboscis length, 0.35; third leg, coxa 1, 0.1, coxa 2, 0.08, coxa 3, 0.07, femur, 0.23, tibia 1, 0.2, tibia 2, 0.17, tarsus, 0.05, propodus, 0.21, claw, 0.09.

REMARKS.—This subadult specimen (sex pores not evident) has a unique set of characters although it superficially resembles *Rhynchothorax unicornis* Fage and Stock from the Cape Verde Islands. The trunk of *R. crenatus* is thinner, with more widely spaced lateral processes. None of the appendage tubercles are nearly as long or thin, the ocular tubercle is very different with its cone and posterior tubercles, and the median trunk tubercles are simple cones instead of complex tuberculate and papillose tubercles.

On the other hand, there are several striking similarities between the two species. Both share a single mid-dorsal proboscis tubercle, both have similar propodus configuration except for the strong distal sole spine of *Rhynchothorax unicornis*, and both have similar palps although the tall tubercle of the second segment and the tiny terminal segment are not present on *R. crenatus*. Both species lack auxiliary claws and have lateral process and coxa 1 tubercles in the same places although their sizes are very different. Finally, both species have small lateral tubercles placed behind the ocular tubercle and rudimentary ovigers (signifying that both are females?) of a button-like appearance.

The two species are similar enough perhaps to form a geminate pair, separated by the Atlantic Ocean and Caribbean Sea. Probably, each is a valid species, but the discovery of a specimen intermediate between the two, if such exists, would invalidate any suggestion that these examples represent speciation by geographic isolation due to plate tectonics. Although the male ovigers in *Rhynchothorax* species are much alike, it might be worthwhile to study the character of

male ovigers in these two species when more specimens are collected.

Thompson (1909:535) first proposed a separate family for this genus and I concur that its combination of characters fit none of the currently accepted genera with which it has been placed.

Conclusions

The pycnogonid fauna of Carrie Bow Cay and its vicinity on the Belizean barrier reef is extremely rich. Extensive collecting during this study has produced approximately 300 specimens from mainly littoral habitats. Thirty-one identified species in 14 genera are represented, including four new species. The habitat diversity on the reefs makes it probable that collecting in nearby unsampled areas will further increase this number. For instance, two samples taken from a single mangrove habitat on different days contained no less than 10 species of pycnogonids, and five small samples of rubble and algae from depths of 18 and 27 meters on the outer reef yielded nine species.

Algae appear to be a preferred habitat but seldom is an alga associated with just one species of pycnogonid. *Sargassum* is regularly colonized by *Anoplodactylus maritimus*, *Endeis spinosa*, *Tanystylum tubirostrum*, *Numphopsis duodorsospinosum*, and occasionally other species. All these species, however, are also found in other habitats, such as rubble, other algae, sea grass, coral, and mangrove roots. Without an analysis of gut content there is no proof that pycnogonids ingest algae. More likely, they eat the soft parts of animals living on the algae or on rubble having associated algal growth. Specimens of *Achelia sawayai*, for example, were captured on rubble with algae supporting sessile organisms and were not found on "clean" algae collected at the same time. Pycnogonids with green intestinal diverticula (*Anoplodactylus pectinus* and *A. portus*) possibly form the second step in the food chain by ingesting the tissues of animals that feed primarily on green algae. Pycnogonids move very slowly so that it is almost impossible for them to feed on mobile fauna. A stand of foliose

TABLE 27.—Geographical distribution of Belizean pycnogonid species

Species	Pantropical	Middle America (Pacific)	Galapagos Islands	Panama (Caribbean)	Belize	Other Caribbean	Western N Atlantic	Guianas and Brazil	W Africa and Europe	Indian Ocean
<i>Achelia sawayai</i>				X	X	X	X	X	X	X
<i>Ammothella appendiculata</i>		X		X	X	X	X	X	X	X
<i>A. exornata</i>				X	X	X				
<i>A. marcusii</i>		X	X	X	X	X	X			
<i>A. rugulosa</i>				X	X	X	X	X		
<i>Ascorhynchus latipes</i>				X	X	X	X		X	
<i>A. serratus</i>					X?	X				
<i>Eurycyde raphiaster</i>				X	X	X	X	X	X	
<i>Hedgpethius mamillatus</i>					X					
<i>H. tridentatus</i>					X		X			
<i>Nymphopsis duodorsospinosa</i>		X		X	X	X	X			
<i>Tanystylum birkelandi</i>				X	X					
<i>T. tubirostrum</i>		X			X	X	X			
<i>Callipallene belizae</i>					X					
<i>C. emaciata</i>				X	X	X	X	X	X	
<i>Parapallene bermudensis</i>					X		X			
<i>Pigrogromitus timsanus</i>	X									
<i>Anoplodactylus bahamensis</i>					X		X			
<i>A. batangensis</i>	X									
<i>A. evelinae</i>		X		X	X	X	X	X	X	
<i>A. imswi</i>					X					
<i>A. jonesi</i>				X	X	X	X			
<i>A. maritimus</i>					X	X	X	X	X	
<i>A. monotrema</i>			X	X	X	X	X	X		
<i>A. multiclavus</i>				X	X	X				
<i>A. pectinus</i>				X	X	X	X			X
<i>A. portus</i>	X									
<i>Endeis spinosa</i>				X	X	X	X	X	X	
<i>Nymphon floridanum</i>				X	X	X	X	X		
<i>Rhynchothorax architectus</i>		X		X	X					
<i>R. crenatus</i>					X					

green algae can support an enormous number of attached organisms, many of which are known to be food for pycnogonids. Among these organisms are hydroids—long a classic example of pycnogonid food—sponges, tube worms, ascidians, and anemones. Since Pycnogonids have been captured on living corals, they probably also feed on these cnidarians.

Most of the Belizean species have a littoral depth distribution with the exception of *Parapallene bermudensis* which has only been captured within the narrow limits of 27 to 33 meters. This rarely collected species may have escaped owing to inefficient collecting techniques. More sampling on reefs at this depth range may provide many other species previously thought to be rare.

The geographical distribution of pycnogonids from Belize is summarized in Table 27. Most of the species also occur in the eastern Caribbean and some are present along the Caribbean shores of Panama. Three species were found in the Caribbean for the first time: *Hedgpethius tridentatus*, previously known from Florida; *Anoplodactylus bahamensis*, Bahamas; and *Parapallene bermudensis*, Bermuda. The four new species presented here are known only from Belize. Nineteen species are known from the western North Atlantic beyond the Caribbean, and at least 10 range to the

Guianas and Brazil. There are eight known amph-Atlantic species, two of which are also known from the Indian Ocean. The Pacific distribution of Belize species is much more restricted, as is to be expected. The isthmian barrier has permitted colonization of only six species on the Pacific shores of Central America. Two species are also known from the Galapagos Islands and one of these has been captured in other areas of the Eastern Pacific. Three additional species are pan-tropical in distribution and are known from most of the above localities.

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