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INDO-WEST PACIFIC PYCNOGONIDA COLLECTED BY SOME MAJOR OCEANOGRAPHIC EXPEDITIONS

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ABSTRACT

Seventy-six species of Pycnogonida, and some unidentifiable forms, belonging to 25 genera in all 8 families, of which 13 species are new to science, are recorded from the Indo-West Pacific region. New species are described in the genera *Ascorhynchus*, *Ammothella*, *Achelia*, *Pantopipetta*, *Nymphon*, *Callipallene*, *Phoxichilidium*, *Anoplodactylus*, and *Pycnogonum*. A phylogenetic hierarchy of the families of extant Pycnogonida is presented.

INTRODUCTION

In the course of the years, large collections of Pycnogonida from the Indo-West Pacific region have been accumulated, originating from several large oceanographic expeditions: the International Indian Ocean Expedition (Research Vessels "Anton Bruun" and "Te Vega"), the "Alpha Helix" cruises in the Indo-Australian region, the Indonesian-Dutch "Snellius II" expedition to Indonesia, and the cruise "Karubar" of the R.V. "Baruna Jaya I" to the Kai Islands. In addition a small amount of material was brought together by private collectors.

The collections treated in the present report contain 76 identifiable species (plus 8 species represented by juvenile or damaged specimens, identified to genus level only). Of these, 13 are new to science. The new species form a relatively small fraction, although this is understandable in the light of the great progress in the knowledge of littoral and shallow-water Indo-West Pacific pycnogonids made in recent years through numerous papers by Child and Müller. Not less than 17 species recorded in the present paper have been described after 1980!

New data on morphology, variability, and especially distribution are recorded for many species.

The following taxa are treated in the sequel:

- Family Ammonoidea Dohrn, 1881
Genus *Eurycyde* Schiödte, 1857
E. setosa Child, 1988
Genus *Bathyzetes* Stock, 1955
B. setiger (Loman, 1908)
B. virago (Loman, 1908)
Genus *Cilunculus* Loman, 1908
C. sewelli Calman, 1938
Genus *Ascorhynchus* Sars, 1877
A. levissimus Loman, 1908
A. somaliensis n. sp.
Genus *Ammothella* Verrill, 1900
A. alcalai Child, 1988
A. appendiculata (Dohrn, 1881)
A. indica Stock, 1954
A. ovalis n. sp.
A. stauromata Child, 1982
A. tippula Child, 1983
A. vanninii Stock, 1982
A. spec.
Genus *Boehmia* Hoek, 1881
B. chelata (Böhm, 1879)
Genus *Achelia* Hodge, 1864
A. assimilis (Haswell, 1885)
A. boschi Stock, 1992
A. deodata Müller, 1990
A. mixta n. sp.
A. nana (Loman, 1908)
A. sawayai Marcus, 1940
Genus *Tanystylum* Miers, 1877? (1879)
T. bredini Child, 1970
T. haswelli Child, 1990
T. isabellae Marcus, 1940
T. oculospinosum Hilton, 1942
T. rehderi Child, 1970
- Family Colossendeidae Hoek, 1881
Genus *Rhopalorhynchus* Wood-Mason, 1873
Rh. filipes Stock, 1991
Rh. spec.
Genus *Colossendeis* Jarzynsky, 1870
C. angusta Sars, 1877
C. macerrima Wilson, 1881
C. cf. minuta Hoek, 1881
- Family Rhynchothoracidae d'Arcy Thompson, 1909
Genus *Rhynchothorax* Costa, 1861
Rh. mediterraneus Costa, 1861
- Family Austrodecidae Stock, 1954
Genus *Pantopipetta* Stock, 1963
P. clavata n. sp.
Genus *Austrodecus* Hodgson, 1907
A. goughense Stock, 1957
A. stocki Child, 1988
A. tubiferum Stock, 1957
- Family Nymphonidae Wilson, 1878
Genus *Nymphon* J.C. Fabricius, 1794
N. biformidens Stock, 1974
N. nakamurai n. sp.
N. spec. (aequidigitatum-group)
- Family Callipallenidae Flynn, 1929
Genus *Propallene* Schimkewitsch, 1909
P. curtipalpus Child, 1988
Genus *Callipallene* Flynn, 1929
C. dubiosa Hedgpeth, 1949
C. fallax n. sp.
C. novaezealandiae (Thomson, 1884)
Genus *Parapallene* Carpenter, 1892
P. haddoni Carpenter, 1892
P. nierstraszi Loman, 1908
Genus *Pseudopallene* Wilson, 1878
Ps. spec.
Genus *Pigrogromitus* Calman, 1927
P. timsanus Calman, 1927
Genus *Queubus* Barnard, 1946
Q. jamesanus Barnard, 1946
- Family Phoxichilidiidae Sars, 1891
Genus *Pallenopsis* Wilson, 1881, subgenus
Pallenopsis s. str.
P. (P.) angusta Stock, 1991
P. (P.) spinipes Carpenter, 1907
P. (P.) spec.
Genus *Pallenopsis* Wilson, 1881, subgenus
Bathypallenopsis Stock, 1975
P. (B.) californica Schimkewitsch, 1893
P. (B.) paramollis Stock, 1975
P. (B.) scoparia Fage, 1956
P. (B.) tydemani tydemani Loman, 1908
Genus *Phoxichilidium* Milne Edwards, 1840

Ph. ponderosum n. sp.

Genus *Anoplodactylus* Wilson, 1878

A. batangensis (Helfer, 1938)

A. calliopus Staples, 1982

A. chamorrus Child, 1983

A. cryptus n. sp.

A. digitatus (Böhm, 1879)

A. exaggeratus n. sp.

A. glandulifer Stock, 1954

A. laminatus n. sp.

A. longiceps Stock, 1951

A. maritimus Hodgson, 1914

A. muelleri n. sp.

A. pectinus Hedgpeth, 1948

A. pseudotarsalis Müller, 1992

A. pycnosoma (Helfer, 1938)

A. squalidus Clark, 1973

A. tenuicorpus Child, 1991

A. tubiferus (Haswell, 1884)

A. spec.

Genus *Endeis* Philippi, 1843

E. holthuisi Stock, 1961

E. mollis (Carpenter, 1904)

E. spec.

Family Pycnogonidae Wilson, 1878

Genus *Pycnogonum* Brünnich, 1764

P. (s.l.) tuberculatum Clark, 1963

P. spec.

Genus *Pycnogonum*, subgenus *Retroviger* Stock, 1968

P. (R.) asiaticum Müller, 1992

P. (R.) musaicum n. sp.

P. (R.) pustulatum n. sp.

Genus *Pycnogonum*, subgenus *Nulloviger* Stock, 1968

P. (N.) africanum Calman, 1938

P. (N.?) nodulosum Dohrn, 1881

ON THE PHYLOGENETIC HIERARCHY OF THE TAXA RECORDED IN THIS REPORT

The sequence of the families and genera in this report is based on my personal philosophy about the phylogenetic relationships of these taxa. My ideas are based on comparison of the Recent

Pycnogonida with their sistergroup, the fossil Palaeopantopoda, and on the assumption that the basic number of segments of palp, oviger and legs is ten. From comparison with the sistergroup it becomes clear that in the plesiomorphic state, proboscis and abdomen consist of more than one segment. Most Recent pycnogonids show the apomorphic condition, in which the proboscis shows no external traces of segmentation. But in the genus *Eurycyde*, the plesiomorphic state is present: the proboscis consists of a narrow basal stalk that is well-articulated with the inflated distal portion; this distal portion shows in turn vestiges of partition, demonstrated by sclerotized lines marking a constriction. In *Ascorhynchus* no articulated basal stalk is present, but tripartition marks are still visible in many species.

All Recent pycnogonids have a one-segmented abdomen, but in the plesiomorphic state, an articulation line separates the abdomen from trunk segment 4 (fused with segment 4 in the apomorphic state). Vestiges of a two-segmented abdomen can be found in *Eurycyde*, where the distal part of the abdomen is set off at an angle from the proximal part, with strong armature at the place of the bend.

The basic number of ten segments is present in the palps of several genera, such as *Ascorhynchus*, *Eurycyde*, *Colossendeis*, and *Rhopalorhynchus*. Reduction of the number of palp segments is an apomorphy, finally leading to the absence of palps in the female sex (e.g. *Propallene*) or in both sexes (e.g. *Phoxichilidium*, *Endeis*, *Pycnogonum*).

The basic number of ten oviger segments occurs in many genera; it should be stressed that I do not consider the oviger claw a segment, but an, eventually transformed, terminal spine. Apomorphic reduction in the number of oviger segments usually starts in the female sex (e.g. *Pallenopsis*), leading to total absence of ovigers in the female (e.g. *Anoplodactylus*, *Phoxichilidium*, *Pycnogonum* s. str.), and in the most advanced taxa in both sexes (*Nulloviger*).

In more primitive genera, segments 7 to 10 of the oviger carry special spines, also called compound spines or strigilis, of a leaf-like shape with denticulate margins (e.g. most Ammotheidae,

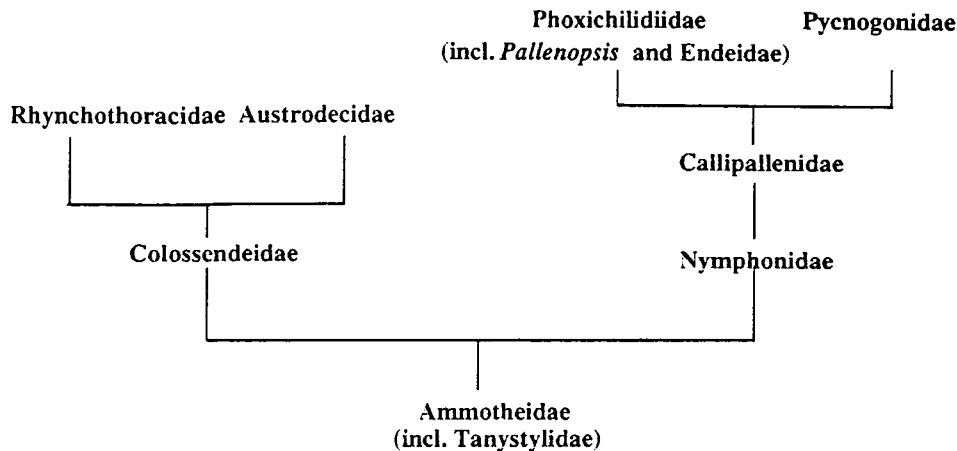


Fig. 1. Phylogenetic relationships between the extant families of Pycnogonida.

Nymphonidae, Callipallenidae, Colossendeidae, *Pantopipetta*). In the more advanced taxa, such spines are absent (no doubt a reversal) (e.g. Phoxichilidiidae, Pycnogonidae). In the most primitive taxa, the special spines are arranged in more than one row (e.g. *Ascorhynchus*, *Colossendeis*); it is tempting to call this the plesiomorphic state.

Almost all pycnogonids possess 8 "normal" leg segments (viz., coxae 1 to 3, femur, tibiae 1 and 2, tarsus, and propodus), but the leg terminates in a claw, on which the auxiliary claws are inserted. By comparison with the 10-segmented oviger, which no doubt is homologous to a normal leg, I assume that claw and auxiliaries are homologous with oviger segments 9 and 10. Frequently the auxiliary claws are lost, but this is a homoplastic event that occurred in almost all pycnogonid families. Exceptionally, the claw itself is reduced (some *Ammothella*) or absent (some *Ascorhynchus*). In one case, *Nymphonella*, the number of segments in leg 1 increased, no doubt an autapomorphy caused by adaptation to the very special life cycle of members of this genus.

The chelifores in the Recent pycnogonids underwent strong modifications. The highest number of segments in the scape is two (primitive Ammotheidae, juveniles of *Colossendeis*). Adults of *Colossendeis* lose their chelifores, except for some rare cases of neotenic retention. The

number of scape segments in most pycnogonids is apomorphically reduced to one, and in the most advanced families the chelifores are lost completely (e.g. *Pycnogonum*).

In the plesiomorphic state the chelae are well-developed, with curved, gaping fingers (e.g. certain Ammotheidae). In a more evolved state, the fingers are more or less straight, and leave no gap between them when closed (e.g. *Nymphon*, *Callipallene*). Apomorphic reduction (juveniles still perfectly chelate, one or both fingers reduced in adults) is found in several genera (*Hemichela*, *Achelia*, *Ammothella*). *Tanystylum* usually loses the chelae completely in adults, leaving only a one-segmented rudiment of the scape. In *Endeis* the so-called collar is sometimes seen as a chelifore rudiment, but some adults in this genus retain neotenic chelifores (Munilla, 1988, fig. 12, illustrates such a case, under the name of *Anplodactylus* sp.) and still possess a collar, consequently the collar is not homologous with the chelifore. The most apomorphic condition is total loss of the chelifore (e.g. *Pycnogonum*).

These phylogenetic considerations have led me to the hierarchy of the pycnogonid families shown in Fig. 1.

Within each family, the genera are arranged in accordance to the same criteria, thus from members with the highest number of segments in pro-

boscis, abdomen, chelifores, palps, and ovigers (plesiomorphs) to those with the lowest number (apomorphs).

Within each genus, the phylogenetic relationships of the species are not so clear in many instances. Therefore, I prudently have arranged the species treated in this report in alphabetical order.

The material on which this paper is based, has been deposited as follows:

National Museum of Natural History, Leiden (RMNH) — the Snellius II material;
Muséum national d'Histoire naturelle, Paris (MNHN) — part of the Karubar material;
Puslitbang Oseanologi-LIPI, Indonesia (POLIPI) — the remaining Karubar material;
Zoölogisch Museum Amsterdam (ZMA) — the remaining material.

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TAXONOMIC PART

Family Ammotheidae

Eurycyde setosa Child, 1988

Child, 1988b: 8-10, Fig. 3; Child, 1990: 316-317; Müller, 1992: 156, Figs. 1-5.

1 ♀ (fragm.). "Alpha Helix" Stn. M-6, Australia (Northern Territories), Melville Island, 12°05'S 131°06'E, hand-collected at 3 m, 31 May 1979 (ZMA Pa. 200.936).

2 ♂. "Alpha Helix" Stn. M-26, Papua New Guinea, 09°29'45"S 147°06'40"E, hand-collect-

ed at 1 m, 10 June 1979 (ZMA Pa. 200.866).

Remarks.- A recently described, characteristic species. Previous records are from Batan Island (Philippines), the Tioman Archipelago (Malaysia), and Lizard Island (Great Barrier Reef), all in very shallow waters (0-4 m)

Morphologically, this species is somewhat variable. The spiniform processes on coxa 1 may be pubescent or naked; usually, the posterior process is the largest, but in one of "Alpha Helix" males, the anterior process on leg 4 is larger than the posterior process. In the male holotype, all coxal processes are devoid of long spines, but both in the Malaysian male, and in the present Papuan males, the posterior process of coxa 1 of leg 4 bears a long spine or seta. The tubercles on the crurigers are less conspicuous in the Papuan males than in the holotype.

Eurycyde longioculata Müller, 1990, from the Society Islands, is very close to *E. setosa*, but has the first chelifore scape segment longer than the second, whereas in *E. setosa* the second is longer than the first.

Bathyzetes setiger (Loman, 1808). Fig. 2a-b.

Eurycyde setigera Loman, 1908: 29-30, Pl. IV Figs. 52-58.

Bathyzetes setiger; Stock, 1955: 261, Fig. 24a-c; Nakamura & Child, 1990: 305-306, Fig. 1 E-G.

1 ♀. "Baruna Jaya I", KARUBAR, Stn. CP 20, Indonesia, Kai Islands, 05°15'S 132°59'E, beam trawl, 769-809 m, 25 Oct. 1991 (POLIPI).

3 spms. "Baruna Jaya I", KARUBAR, Stn. CC 21, Indonesia, Kai Islands, 05°14'S 133°00'E, 688-694 m, 25 Oct. 1991 (MNHN Py. 856).

1 chelate juv. "Baruna Jaya I", KARUBAR, Stn. CP 38, Tanimbar Island, 07°40'S 132°27'E, beam trawl, 620-666 m, 28 Oct. 1991 (MNHN Py. 857).

Remarks.- The adult female from Stn. CP 20 has large genital pores on the ventral surface of coxa 2 of all legs. The juvenile from Stn. CP 38, though having all essential characters of the species, is still perfectly chelate.

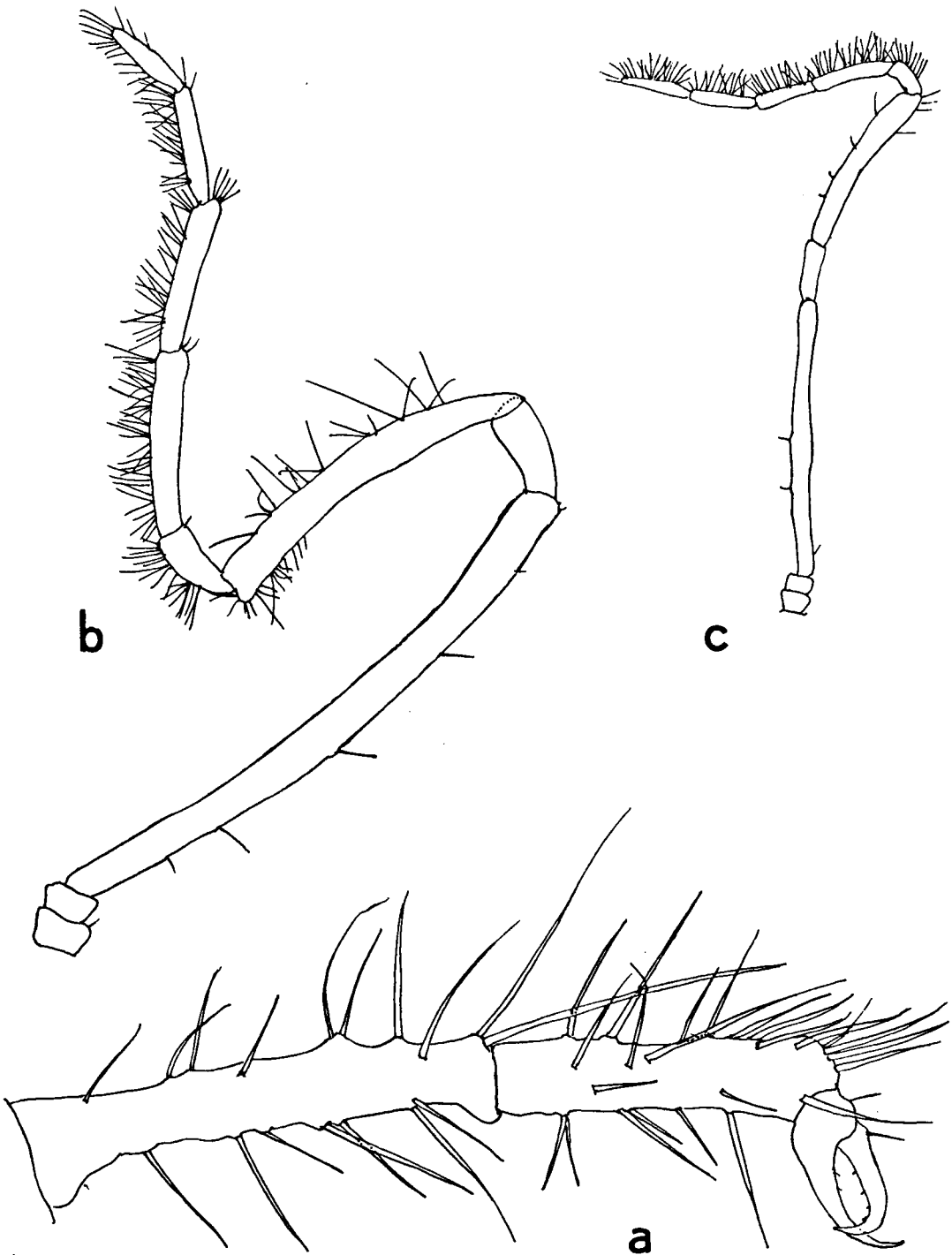


Fig. 2. *Bathyzetes*. a-b, *B. setiger* (Loman, 1908): a, chela of juvenile from "Karubar" Stn. CP 38; b, palp of ♂, from "Karubar" Stn. CP 20. c, *B. virago* (Loman, 1908: palp of ♂ from "Karubar" Stn. CP 20 (to same scale as Fig. 2b).

This species has been recorded only twice before. All records are from Indonesia (off NE Sulawesi and Flores Sea) in depths from 558 to 1260 m.

Bathyzetes virago (Loman, 1908). Fig. 2c

Eurycyde virago Loman, 1908: 30-31, Pl. V Figs. 59-65.

Bathyzetes virago; Stock, 1955: 261, Fig. 24d-f; Nakamura & Child, 1990: 307.

1 ♂ ovig. "Baruna Jaya I", KARUBAR, Stn. CP 20, Indonesia, Kai Islands, 05°15'S 132°59'E, beam trawl, 769-809 m, in a sponge, 25 Oct. 1991 (MNHN Py. 855).

Remarks.- By its small size, very widely separated crurigers, rather slender proboscis, and structure of the distal part of the oviger, this specimen approaches closely Loman's type-material. Nakamura & Child (1990) mention as an additional distinctive feature that palp segment 7 is shorter than segment 8; in my opinion this statement should read "segment 8 slightly shorter than segment 9".

Note that this specimen was found at the same station as the previous species, *B. setiger*.

This is only the second record for this species. The type specimens were collected likewise in Indonesia, E. of Ceram, in 567 m.

Cilunculus sewelli Calman, 1938. Fig. 3.

Cilunculus sewelli Calman, 1938: 161-163, Figs. 8-9; Clark, 1963: 75; Stock, 1968b: 13 (syn.); Arnaud & Child, 1988: 129-130; Müller, 1990d: 106; Turpaeva, 1990b: 21-23, Fig. 3; Nakamura & Child, 1991: 21.

1 ♀. International Indian Ocean Expedition, "Anton Bruun" Cruise 7, Stn. 390-C, Natal, 29°45'S 31°40'E, Agassiz trawl, 440 m, 8 Sep. 1964 (ZMA Pa. 200.862).

Remarks.- As already noted by Nakamura & Child (1991), this species shows some variation in the development of the trunk tubercles and in length and number of the long setae on the legs.

Unnoticed before passed the fact that not all legs have the same morphology: the first three pairs of legs are similar, but leg 4 has a different setation, a more curved propodus and shorter auxiliary claws (see Fig. 3a and 3b). In all previous publications only the anterior legs have been described. This is another prank played by the sea-spiders to embitter taxonomists' life: they tend to loose easily some legs and retain others with different morphology.

C. sewelli is known from eastern Africa (Kenya, Zanzibar, Natal, and the Moçambique Channel), Japan (off Honshu), and New Zealand, in depths ranging from 183 to 1789 m.

The present record adds nothing new to the distributional data, since another specimen of the same species was reported from the same "Anton Bruun" station (Stock, 1968b).

Ascorhynchus levissimus Loman, 1908

Loman, 1908: 33-34, pl. IV Figs. 46-51; Stock, 1953b: 304 (in key); Stock, 1975b: 130 (text); Nakamura & Child, 1990: 305, Fig. 1 A-D.

1 ♂, 1 ♀. "Snellius II", Stn. 4.276, Indonesia, N of Sumbawa, off Tambora volcano, 08°12'S 118°12'E, 750 m, sandy volcanic mud, 31 Oct. 1984 (RMNH 93659 & ZMA Pa. 200.672).

Remarks.- These specimens agree perfectly with the material recorded by Nakamura & Child (1990) from the Flores Sea. The male in the present collection bears 57 cement gland pores on the third leg (the number of pores was never observed before).

This is only the third record for this species; all records are from the Flores Sea, and all from a relatively narrow bathymetrical range (630-794 m).

Ascorhynchus somaliensis n. sp. Figs. 4-5.

1 ♂ ovig. (holotype), 1 ♂ (paratype). International Indian Ocean Expedition, "Anton Bruun" Cruise 9, Stn. 456, Somalia, 11°14'N 51°08'E,

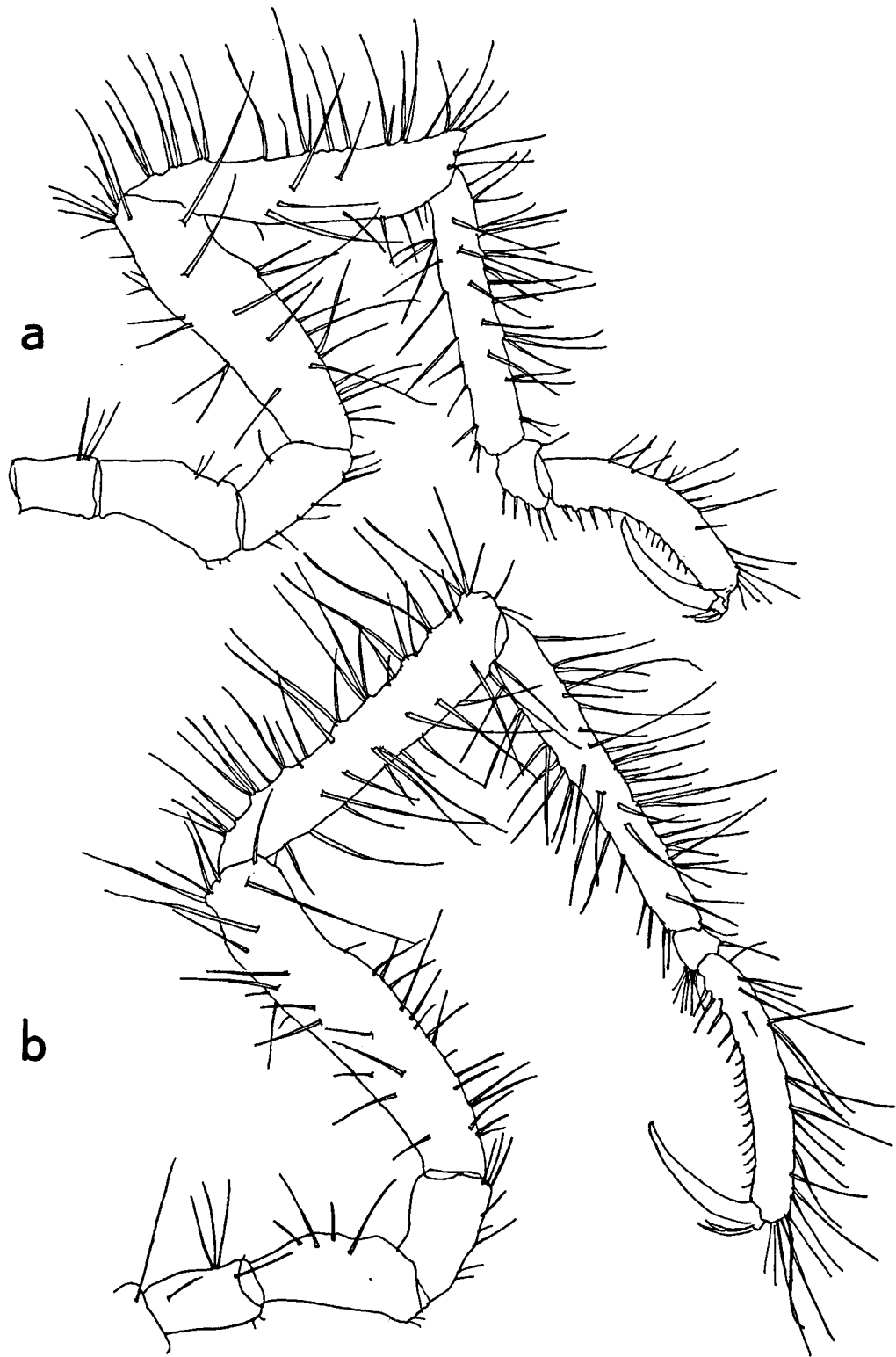


Fig. 3. *Cilunculus sewelli* Calman, 1938, ♀, from "Anton Bruun" Cruise 7, Stn. 390-C. a, leg 3; b, leg 4 (to same scale).

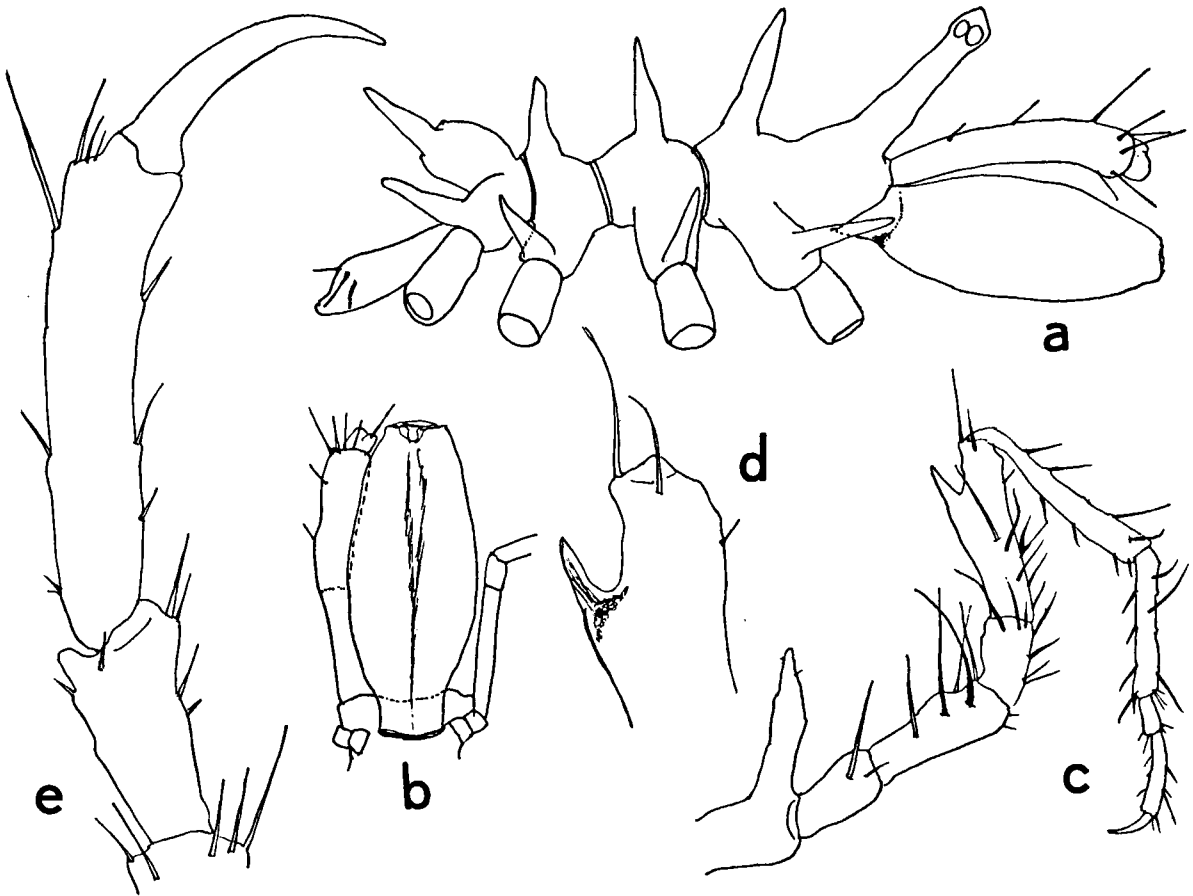


Fig. 4. *Ascorhynchus somaliensis* n. sp., ♂, from "Anton Bruun" Cruise 9, Stn. 456. a, trunk, from the right; b, proboscis, ventral; c, cruriger and leg 3; d, cement gland of leg 3; e, distal segments of leg 3 (a, b, and c to same scale).

27-31 m, 17 Dec. 1964 (ZMA Pa. 200.949).

Description.- Very similar to *A. ornatus* (Helfer, 1938) and in particular to *A. meteor* Müller, 1989.

Trunk: length of crurigers as in *A. ornatus*. Abdomen with articulation line at base. Length of mid-dorsal and cruriger spurs as in *A. meteor*. Ocular tubercle tall, with (in dorsal view) a much wider basal portion than in either of the two other species. Proboscis shape as in *A. meteor*.

Chelifere scape long, almost reaching distal end of proboscis; scape with hint of articulation at mid-length, armed with long setae.

Palps without peculiarities.

Oviger with short, smooth terminal claw; segment 6 less elongate than in *A. ornatus* or *A. meteor*. Compound spines in 2 rows on segments

7 to 10, according to formula $4+2 : 3+3 : 2+2 : 3+1$; each spine with 3 or 4 marginal teeth. Eggs small.

Legs with long setae on coxae 1, 2 and 3, and femur; shorter, still conspicuous, setae on remaining leg segments. Femoral cement gland tube *not* terminal, but placed at about 75% of dorsal margin of segment; pointed. Tarsus more like that of *A. ornatus* than that of *A. meteor*, more than twice as long as wide and almost half as long as propodus. Propodal sole very feebly concave, armed with 3 spinules only. Claw long, curved; no auxiliary claws.

Measurements of ♂ holotype (mm).- Length trunk (frontal margin cephalic segment to base abdomen) 1.20; width across 2nd crurigers 1.45; length abdomen 0.53; length proboscis (ventral)

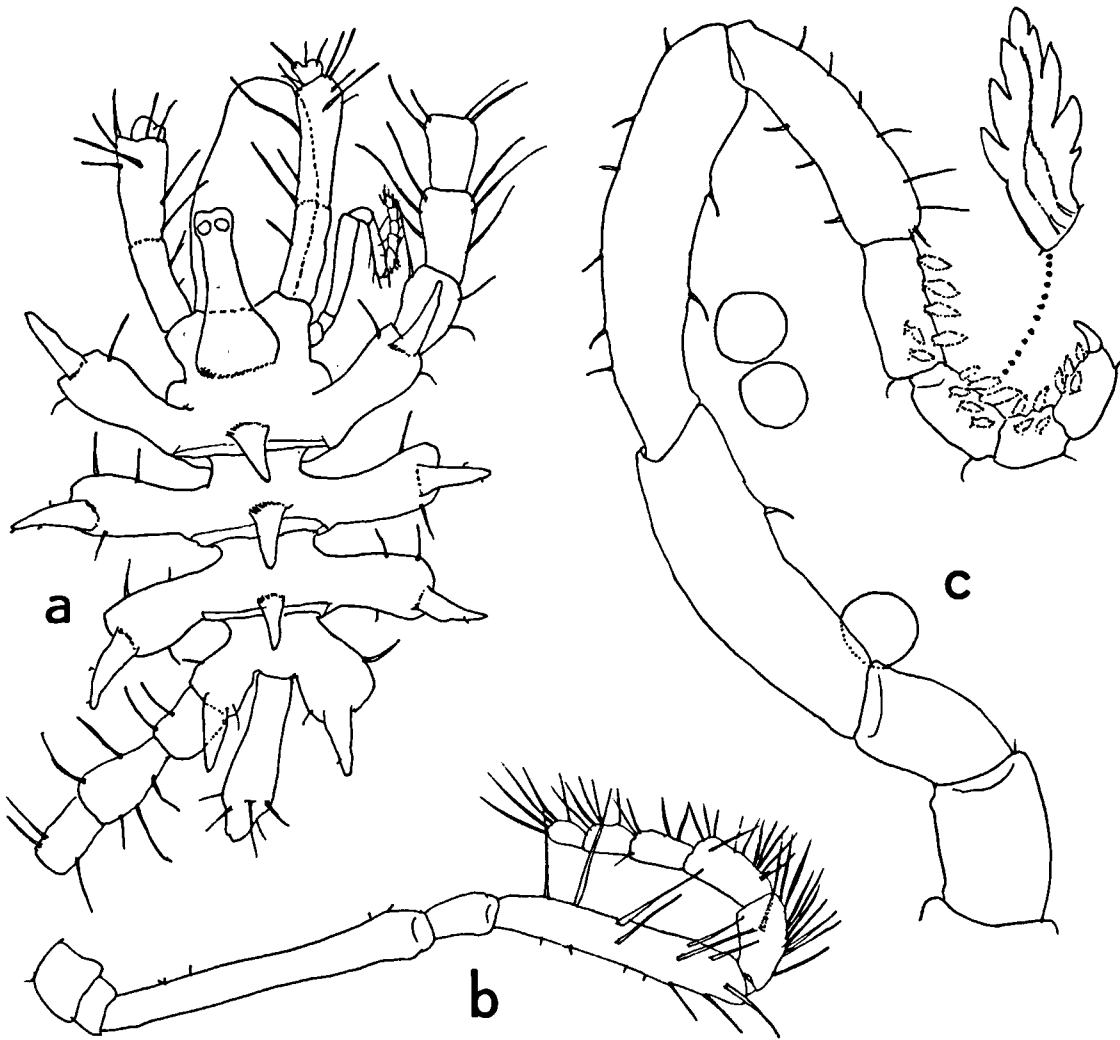


Fig. 5. *Ascorhynchus somaliensis* n. sp., ♂, from "Anton Bruun" Cruise 9, Stn. 456. a, trunk, dorsal; b, palp; c, oviger.

0.93; greatest diameter proboscis 0.42. Third leg: 1st coxa 0.26; 2nd coxa 0.43; 3rd coxa 0.22; femur 0.55; 1st tibia 0.53; 2nd tibia 0.45; tarsus 0.09; propodus 0.24; claw 0.15

Etymology.- The specific name is derived from the terra typica, Somalia.

Remarks.- There are several small differences that separate *A. somaliensis* from its two look-alikes. The most outstanding difference is found in the position of the cement gland tube: termi-

nal on the femur in *A. ornatus* and *A. meteor*, at some $\frac{3}{4}$ of the femur in *A. somaliensis* (see Stock, 1953a, Fig. 6; and Müller, 1989b, Figs. 1-14).

***Ammothella alcalai* Child, 1988**

Child, 1988b: 2-4, Fig. 1.

1 ♂, 1 chelate juvenile. "Alpha Helix" Stn. M-86, Indonesia, Misoöl island, 02°03.8'S 130°08.3'E, hand-collected at 0.5 m, 3 July 1979 (ZMA Pa. 200.889).

Remarks.- This species was only known from a couple of localities in the Philippines, consequently it is new to Indonesia. Our material agrees very well with the types, perhaps with the only exception that all crurigers bear only one dorsal tubercle, against some crurigers with two, others with one in the holotype.

Ammothella appendiculata (Dohrn, 1881)

Stock, 1955: 250-257, Fig. 18 (refs.); Müller, 1991: 25-28, Fig. 6 (refs.); Child, 1992a: 12 (refs.); Stock, 1992b: 83.

3 ♀, 5 chelate juvs. "Alpha Helix" Stn. M-86, Indonesia, Misoöl island, 02°03.8'S 130°08.3'E, hand-collected at 0.5 m, 3 July 1979 (ZMA Pa. 200.890).

Remarks.- These specimens all resemble the short-eyed (or Mediterranean) form of *A. appendiculata* (see Stock, 1955: 251, Fig. 18a-c; or Child, 1992a, Fig. 4), and not the long-eyed (or West Indian) form (see Stock, 1955: 251, Fig. 18d-f; or Müller, 1991, Fig. 6).

Apart from numerous records from the Mediterranean and the warm-water region of the western and eastern Atlantic, this species has been recorded infrequently from the Pacific (Panamá; Child, 1979), the Red Sea area (Stock, 1957a, 1958a, 1964) and Oman in the Indian Ocean (Stock, 1992b). It is new to Indonesia.

Ammothella indica Stock, 1954

Stock, 1954b: 113-119, Figs. 54, 55, 56c, 57a-c; Stock, 1959: 551; Utinomi, 1959: 203, Figs. 2-3; Stock, 1968b: 11; Child, 1970: 292; Stock, 1974b: 13; Nakamura & Child, 1983: 18-19; Kim & Hong, 1986: 48; Kim, 1986: 5; Hong & Kim, 1987: 143-144; Nakamura, 1987: 26-27, Pls. 22-23; Child, 1988a: 51; Child, 1988b: 5; Müller, 1989a: 124-125; Müller, 1990a: 66; Müller, 1990b: 188; Müller, 1992: 156. 2 spms. (fragm.). "Alpha Helix" Stn. M-26, Papua New Guinea, 09°29'45"S 147°06'40"E, hand-collected at 1 m, 10 June 1979 (ZMA Pa. 200.891).

1 ♀. "Alpha Helix" Stn. M-48, NE New Guinea, 06°41.7'S 147°53.1'E, hand-collected between 0 and 8 m, 18 June 1979 (ZMA Pa. 200.886).

2 ♂, 1 ♀. "Alpha Helix" Stn. M-56, N of New Guinea, 03°23.0'S 143°40.2'E, hand-collected between 1 and 5 m, 21 June 1979 (ZMA Pa. 200.884).

1 ♂. "Alpha Helix" Stn. M-88, Indonesia, Misoöl island, 02°03.8'S 130°08.3'E, hand-collected at 6 m, 3 July 1979 (ZMA Pa. 200.846).

1 ♀. "Alpha Helix" Stn. M-128, Indonesia, Minahassa peninsula (Sulawesi), 01°51.2'N 125°05.7'E, hand-collected between 2 and 11 m, 16 July 1979 (ZMA Pa. 200.880).

Remarks.- A frequently recorded shallow-water species, ranging from Japan in the north, the Society Islands in the east, through Indonesia and Korea, to South Africa in the south-west.

Ammothella ovalis n. sp. Figs. 6-7.

1 ♂ ovig. (holotype), 1 ♂ ovig. & 2 ♀ (paratypes). "Alpha Helix" Stn. M-16, Australia, Gulf of Carpentaria, 12°35.4'S 141°36.2'E, hand-collected at 1 m, 4 June 1979 (ZMA Pa. 200.847).

1 ♀. "Alpha Helix" Stn. M-59, N of New Guinea, 03°23.8'S 143°40.7'E, hand-collected between 1 and 6 m, 21 June 1979 (ZMA Pa. 200.882).

Description.- Male: Small, compact, rotund, completely segmented trunk. Crurigers separated by narrow intervals; each with long, backward pointing seta. Frontal margin of cephalic segment with inconspicuous, rounded projection on either side. Ocular tubercle cylindrical with rounded tip; eyes well-pigmented. Abdomen: proximal part almost vertically standing up, with sharp bend into almost horizontal distal part; 6 hollow, club-shaped spines at bend, 2 such spines near tip. Proboscis inflated, oval, distal margin truncate.

Chelifore scape 2-segmented; basal part of left and right first segments connected. Segment 1 < segment 2. One hollow spine of segment 1, 3 on segment 2. Chela globular, fingers reduced. Total chelifore reaching to only $2/3$ of length of proboscis.

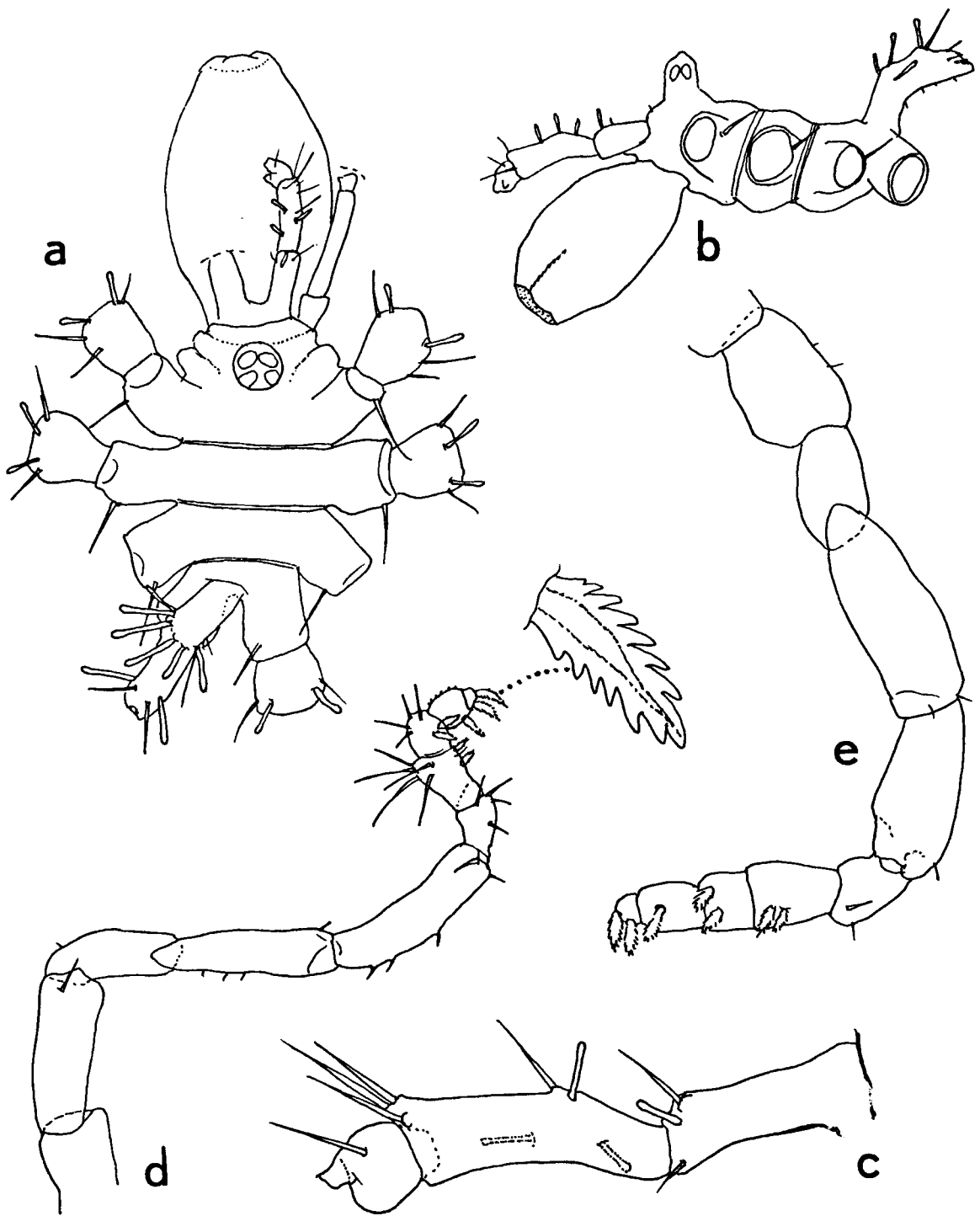


Fig. 6. *Ammothella ovalis* n. sp., from "Alpha Helix" Stn. M-16. a, trunk, ♂, dorsal; b, trunk, ♀, from the left; c, chelifore, ♂; d, oviger, ♂; e, oviger, ♀.

Palp 9-segmented; segment 2 < 4; segments 1,3, and 5 short; remaining segments slender, much longer than wide.

Oviger 10-segmented; segments 2 and 3 rather elongate, 2 > 3; segments 4 and 5 subequal, each longer than segment 2; segments 7 and 8 with long ectal setae; segment 8 with feeble distal bulge; segment 10 minute; compound spine formula 2:2:1:2. Each compound spine with 5 to 7 marginal teeth.

Legs: Some hollow spines on coxae 1 and 2, femur, and both tibiae; all setae on legs smooth. Femur with subdistal, bent, long cement gland tube. Tibia 2 longest segment. Propodus feebly curved; 4 heel spines; sole with row of some 6 small spinules. Claw thin; auxiliary claws about $\frac{3}{4}$ of main claw.

Measurements of ovigerous male (mm).- Length trunk (frontal margin cephalic segment to tip 4th cruriger) 1.06; width across 2nd crurigers 0.66; length proboscis (ventral) 0.60; greatest diameter proboscis 0.34. Leg 3: 1st coxa 0.18; 2nd coxa 0.34; 3rd coxa 0.22; femur 0.56; 1st tibia 0.59; 2nd tibia 0.63; tarsus 0.06; propodus 0.39; claw 0.16; auxiliary claws 0.13.

Female: Fewer hollow spines on abdomen. Oviger feebler than in ♂; segment 4 longest. Legs with swollen coxae 2 and 3, and femur. The female from "Alpha Helix" Stn. M-59 lacks the abdomen, but otherwise conforms the type-specimens closely, with the exception of a higher number of hollow spines on scape segments 1 and 2.

Etymology.- The specific name *ovalis* refers to the shape of the trunk and especially of the proboscis.

Remarks.- Usually, the members of the genus *Ammothella* have gracile bodies, but the present species with closely-packed crurigers, a rotund trunk, low ocular tubercle, short abdomen, and massive, inflated, oval proboscis forms one of the few exceptions. More or less resembling the new species are:

- *A. rotundata* Child, 1988b, only known from a juvenile specimen, which can be distinguished

from the present species by the possession of feathered spines (instead of naked) on the chelifore scape and proximal leg segments, and short (not longer than wide) palp segments 5 to 9.

- *A. schmitti* Child, 1970, and *A. hedgpethi* Fage, 1958 likewise with plumose spines on all leg segments but for tarsus and propodus, and with pointed tubercles at the anterior margin of the cephalic segment.

- *A. vanninii* Stock, 1982 and *A. omanensis* Stock, 1992b, which do not have such a rotund trunk, possess a more slender abdomen and longer chelifores.

- *A. symbia* Child, 1979, which has a less inflated, more pointed proboscis, a longer abdomen, and a cement gland tube located at the distal end of the femur (subdistally in the present species).

- *A. heterosetosa* Hilton, 1942, again a species with plumose spines, having a very short abdomen, hardly projecting beyond the 4th crurigers.

***Ammothella stauromata* Child, 1982**

Child, 1982b: 271-273, Fig. 1; Nakamura & Child, 1988: 809-810; Child, 1988b: 5-7; Müller, 1989a: 125; Müller, 1990a: 66; Müller, 1990d: 106; Child, 1990: 316.

1 ♂ ovig. "Alpha Helix" Stn. M-34, Papua New Guinea, 10°45'10"S 150°20'20"E, hand-collected at 6 m, 14 June 1979 (ZMA Pa. 200.843).

1 chelate juvenile. "Alpha Helix" Stn. M-78, Indonesia, Irian Barat, N of Tjendrawasih (= Vogelkop peninsula), 00°41.5'S 133°19.5'E, hand-collected, intertidal to subtidal (2 m), 1 July 1979 (ZMA Pa. 200.887).

Remarks.- Though described only a dozen years ago, this species appears to be widely distributed in shallow waters (0-6 m) of the entire Indo-West Pacific. Up to now it has been recorded from Enewetak Island, Samoa, the Society Islands, Fiji Islands, Lizard Island (Great Barrier Reef), the Philippines, and Kenya. The present records fill nicely the gap between the Philippines and Lizard Island.

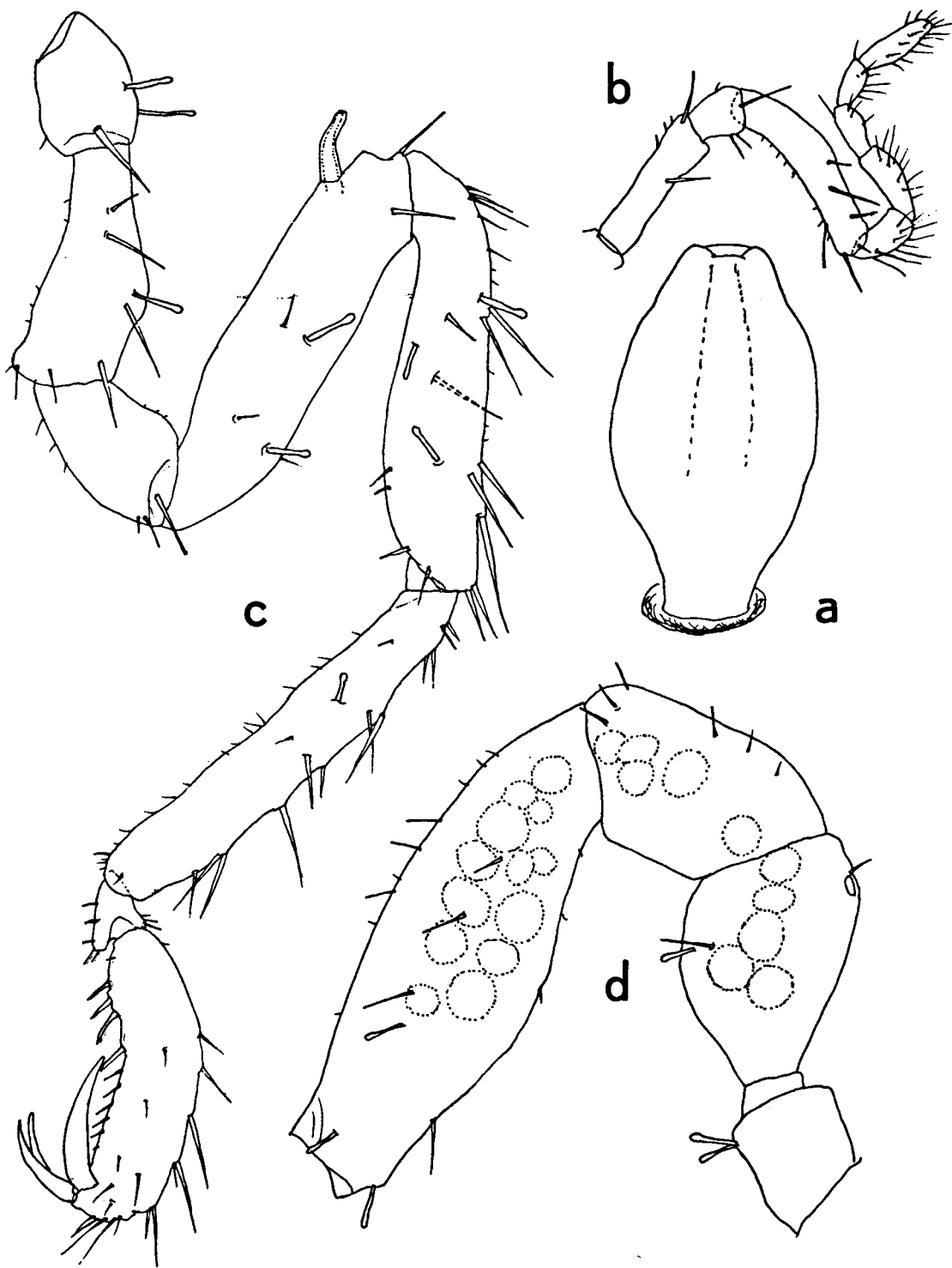


Fig. 7. *Ammothella ovalis* n. sp., from "Alpha Helix" Stn. M-16. a, proboscis, ♀, ventral; b, palp, ♂; c, leg 3, ♂; d, proximal segments of leg 2, ♀.

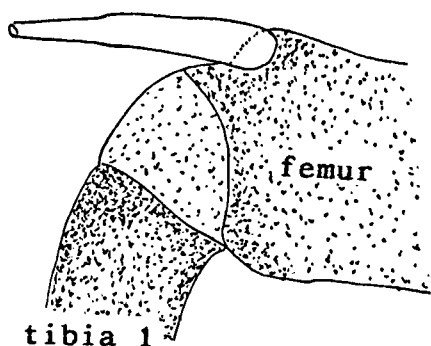


Fig. 8. *Ammothella vanninii* Stock, 1982, ♂ from "Alpha Helix" Stn. M-34. Cement gland of leg 4.

***Ammothella tippula* Child, 1983**

Child, 1983: 701-705, Fig. 2; Child, 1988a: 51; Child, 1988b: 7; Müller, 1990a: 67; Müller, 1990c: 97; Müller, 1990d: 106; Child, 1991: 138-139.

1 chelate juvenile. Guam, NCS Beach (Tanguisson Beach), 13°32.9'N 144°48.4'E, hand-collected, intertidal, 18 Oct. 1983, leg. R.F. Bolland (ZMA Pa. 200.845).

1 juv. Guam, 1 km ENE of Anae Island (Nimitz Beach), 13°21.6'N 144°38.7'E, hand-collected, intertidal, 28 Aug. 1983, leg. R.F. Bolland (ZMA Pa. 200.844).

1 ♀. Indonesia, Halmahera islands, Ternate, Kampong Tafure, ca. 5 m offshore, depth ca. 1 m, from coral, 11 Feb. 1979 (ZMA Pa. 200.883).

Remarks.- This species has Guam for type-locality, but has recently been recorded also from the Philippines, Fiji, Sri Lanka, Réunion island, and Aldabra atoll. It has been found in the intertidal zone and in very shallow waters, up to a depth of only 11 m.

***Ammothella vanninii* Stock, 1982. Fig. 8.**

Stock, 1982: 183-187, Figs. 1-7.

1 ♂. "Alpha Helix" Stn. M-34, Papua New Guinea, 10°45'10"S 150°20'20"E, hand-collected at 6 m, 14 June 1979 (ZMA Pa. 200.881).

1 chelate juvenile, probably this species. "Alpha Helix" Stn. M-52, NE New Guinea, 05°48.2'S 146°11.4'E, hand-collected between 1 and 10 m, 19 June 1979 (ZMA Pa. 200.888).

Remarks.- This characteristic species, with long spines on the frontal margin of the cephalic segment, on the first scape segment, and on the first coxae, was hitherto only known from the holotype, a female, collected in shallow waters (2 to 5 m) near Gesira (Somalia). Notwithstanding the rather damaged condition of the adult male in the present collection, and notwithstanding the large distance between New Guinea and Somalia, I cannot discern any important differences between them.

The male is new to science; it possesses a long cement gland tube at the dorsodistal end of the femur (see Fig. 8).

***Ammothella* spec.**

1 chelate juvenile. "Alpha Helix" Stn. M-25, Papua New Guinea, 09°29'45"S 147°06'40"E, hand-collected at 1 m, 11 June 1979 (ZMA Pa. 200.885).

Remark.- Belongs to the *appendiculata*-group.

***Boehmia chelata* (Böhm, 1879)**

Gordon, 1944: 61-62, Fig. 23; Barnard, 1954: 133-136, Fig. 22 (older refs.); Stock, 1956: 89, Fig. 11; Stock, 1957b: 96, Fig. 14; Stock, 1962: 277-278; Arnaud & Child, 1988: 128, 129 (text, key).

1 ♂. International Indian Ocean Expedition, "Anton Bruun" Cruise 7, Stn. 391-F, Natal, 29°26'S 31°46'E, 77 m, 9 Sep. 1964 (ZMA Pa. 200.946).

Remarks.- In the length of the abdomen and general body shape, this specimen looks like *B. chelata*; the subdivision of the distal palp segments, supposed to be characteristic of *B. chelata*, is obscure, however.

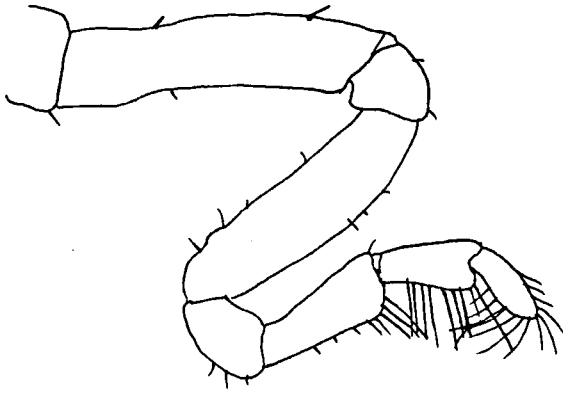


Fig. 9. *Achelia assimilis* (Haswell, 1885), ♀ from "Alpha Helix" Stn. M-16. Palp.

The distal part of the proboscis is coloured black, even through the specimen has been preserved in alcohol for 30 years.

B. chelata is only known from the littoral zone and shelf of the east coast of Southern Africa. Feeds on octocorals.

Achelia assimilis (Haswell, 1885). Fig. 9.

Achelia assimilis; Hedgpeth, 1961: 7-11, Figs 3-7; Clark, 1963: 89 (refs.); Poore, 1968: 585; Fry & Hedgpeth, 1969: 106 (refs.); Hedgpeth, 1979, folio page 28; Stock, 1973b: 92; Child, 1975: 24; Child, 1977: 440-441; Clark, 1983: 61; Bastida et al., 1980: 317; Minnaard & Zamponi, 1984: 267-269, Fig. 7; Bremec et al., 1986: 42-44, Figs. 16-22; Child, 1988b: 2; Müller, 1989a: 124, Figs. 1-10; González & Edding, 1990: 151-155, Fig. 2; Child, 1990: 312-313; Child, 1991: 138; Müller, 1992: 155.

Ammonothea wilsoni Schimkewitsch, 1887: 271; Schimkewitsch, 1890: 336-339, Figs. 16-23; Hodgson, 1907: 10-13, 19, Fig. 3.

Achelia wilsoni; Stock, 1957b: 100, Fig. 16.

10 spms. "Alpha Helix" Stn. M-14, Australia (Northern Territories), 11°33.5'S 135°52.5'E, dredge, 22 m, 2 June 1979 (ZMA Pa. 200.824).

1♀, 1 juv. "Alpha Helix" Stn. M-25, Papua New Guinea, 09°29'45"S 147°06'40"E, hand-collected at 1 m, 11 June 1979 (ZMA Pa. 200.931).

10 spms. "Alpha Helix" Stn. M-26, Papua New Guinea, same data as Stn. M-25, but 10 June 1979 (ZMA Pa. 200.926).

1 ♂. "Alpha Helix" Stn. M-31, Papua New Guinea, 10°10.6'S 148°07'E, hand-collected at 6 m, 13 June 1979 (ZMA Pa. 200.822).

2 ♂. "Alpha Helix" Stn. M-34, Papua New Guinea, 10°45'10"S 150°20'20"E, hand-collected at 6 m, 14 June 1979 (ZMA Pa. 200.930).

7 spms. "Alpha Helix" Stn. M-48, NE New Guinea, 06°41.7'S 147°53.1'E, hand-collected between 0 and 8 m, 18 June 1979 (ZMA Pa. 200.820).

1 ♀. "Alpha Helix" Stn. M-50, NE New Guinea, 05°48.2'S 146°11.4'E, hand-collected at 2 m, 19 June 1979 (ZMA Pa. 200.924).

1 ♂. "Alpha Helix" Stn. M-51, same data as Stn. M-50, but depth 12 m (ZMA Pa. 200.833).

21 spms. "Alpha Helix" Stn. M-56, N of New Guinea, 03°23.0'S 143°48.2'E, hand-collected between 1 and 5 m, 21 June 1979 (ZMA Pa. 200.836).

1 ♂, 1 chelate juv. International Indian Ocean Expedition, "Anton Bruun" Cruise 7, Stn. 372-D, Moçambique, 24°46'S 34°49'E, rock dredge, 19 m, 19 Aug. 1964 (ZMA Pa. 200.829).

Remarks.- Several authors have wondered if this species is extremely variable, or that it is just a dumping ground for several sibling species. For the moment, I have followed Hedgpeth's (1961) opinion, and considered all these forms synonymous. The present specimens do not solve the question: in body shape, trunk tuberculation and general spinosity they agree well with the "small form" described by Stock (1954b) from New Zealand. However in the structure of the palp (Fig. 9), with its elongate 6th segment, they resemble more closely certain Chilean forms illustrated by Hedgpeth (1961, Fig. 6). The auxiliary claws are half as long as the main claw, likewise in agreement with some Chilean specimens, and unlike the New Zealand material in which they are longer.

The female from "Alpha Helix" Stn. M-25 has exceptionally long chelifores. The male from "Anton Bruun" Stn. 372-D has more strongly spinose coxae than the other specimens.

None of the specimens examined during the present study carries mid-dorsal trunk tubercles.

Achelia assimilis differs from the partially sympatric *A. nana* (Loman) in a stronger scape, a lower male genital process, strong size difference between the propodal heel and sole spines, and a more elongate terminal palp segment.

This species has frequently been recorded from shallow, cooler waters (New Zealand, Chile, Argentina), but also from tropical areas (Victoria, Australia; French Oceania; Philippines; Society Islands; Malaysia; Guam). The "Anton Bruun" record (Stn. 372-D) extends the range of this complex species to the Moçambique Channel.

Achelia boschi Stock, 1992

Stock, 1992b: 86-89, Figs. 4-5.

1 ♂, 1 ♀, 1 juv. International Indian Ocean Expedition, "Anton Bruun" Cruise 9, Stn. 445, Somalia, 09°41'N 51°03'E, trawl, 60-70 m, 16 Dec. 1964 (ZMA Pa. 200.828).

Remarks.- These specimens agree with the types from the littoral zone of Oman, except for two features: the eye tubercle is less pointed, almost truncate, at the tip, and the chelifores are somewhat shorter.

Achelia deodata Müller, 1990

Müller, 1990d: 103-105, Figs. 1-6.

1 ♂. International Indian Ocean Expedition, "Anton Bruun" Cruise 9, Stn. RU 265, Grand Comoro Island, near village of Moroni, hand-collected, probably intertidal, November 1964, leg. R.U. Gooding (ZMA Pa. 200.825).

1 juv., probably this species. Indian Ocean Expedition, Oceanic Reefs of the Seychelles Stn. 711, S coast of Aride Island, 04°13'S 55°40'E, in coral rubble and calcareous algae, depth 4-8 m, 18-19 Dec. 1992, leg. H.A. ten Hove (ZMA Pa. 200.993).

Remarks.- The adult specimen agrees closely

with the male holotype, and only known specimen, from the Kenyan littoral.

Achelia mixta n. sp. Figs. 10-11.

1 ♂ (holotype), 2 ♀ (paratypes). "Alpha Helix" Stn. M-56, N of New Guinea, 03°23.0'S 143°40.2'E, hand-collected between 1 and 5 m, 21 June 1979 (ZMA Pa. 200.826).

1 ♂ ovig. (paratype). "Alpha Helix" Stn. M-52, NE New Guinea, 05°48.2'S 146°11.4'E, hand-collected between 1 and 10 m, 19 June 1979 (ZMA Pa. 200.917).

1 ♂ (paratype). "Alpha Helix" Stn. M-58, same data as Stn. M-56 (ZMA Pa. 200.834).

1 ♀ (paratype). "Alpha Helix" Stn. M-109, Indonesia, Halmahera islands, 00°01.5'S 127°10.7'E, diving, ca. 6 m, 12 July 1979 (ZMA Pa. 200.837).

1 ♂ (paratype). "Alpha Helix" Stn. M-132, Indonesia, Sangihe islands, 03°44.1'N 125°34.9'E, hand-collected between 1 and 18 m, 18 July 1979 (ZMA Pa. 200.920).

Description.- Male: Trunk with 2 articulation lines; cruriger 1 with 1 posterodistal tubercle, crurigers 2 and 3 with 1 anterodistal and 1 posterodistal tubercle; cruriger 4 unadorned. Anterolateral corner of cephalic segment with 1 or 2 tubercles on either side. All tubercles spiniferous.

Proboscis less pointed than that of *Achelia assimilis* and *A. nana*, less slender than that of *A. sawayai*. Abdomen almost reaching to distal end of coxa 1 of leg 4, with inconspicuous swelling at base.

Chelifore scapes short, their bases fused; bearing 1 to 3 short spines, not spurred.

Palp segment 2 much shorter than segment 4; segments 5 through 8 slightly clavate, 5 to 7 short, segment 8 a little longer.

Oviger with reversed spine on segment 6. Compound spine formula 1:1:1:2. Compound spines lanceolate, with 5 pairs of marginal teeth.

Legs: Coxa 1 of legs 1 and 2 with 2 anterodistal and 2 posterodistal rounded spurs; of legs 3 and 4 with 1 anterodistal and 2 posterodistal

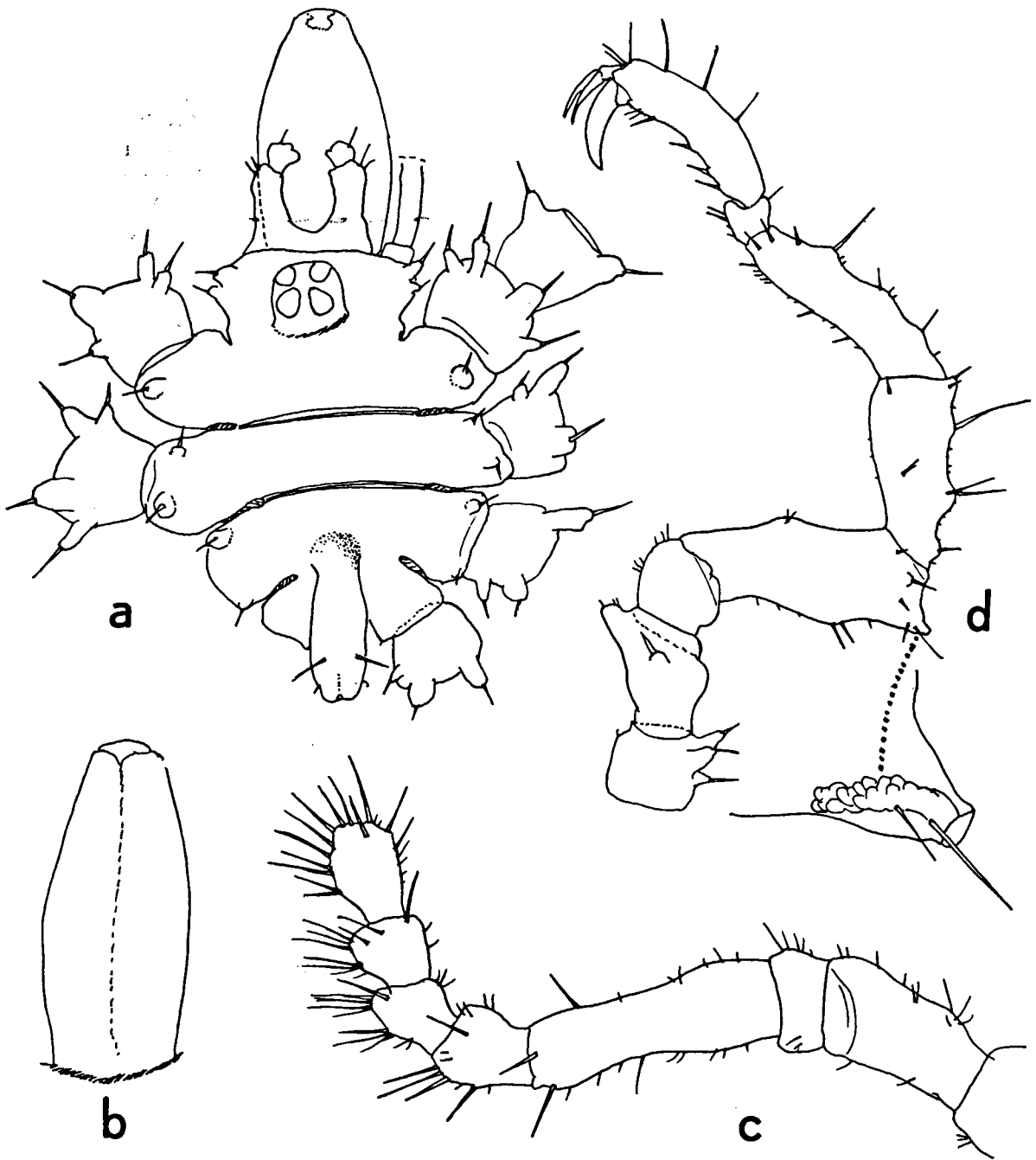


Fig. 10. *Achelia mixta* n. sp., from "Alpha Helix" Stn. M-56. a, trunk, ♂, dorsal; b, proboscis, ♂, ventral; c, palp, ♀; d, leg 4, ♂ (to same scale as Fig. 10a).

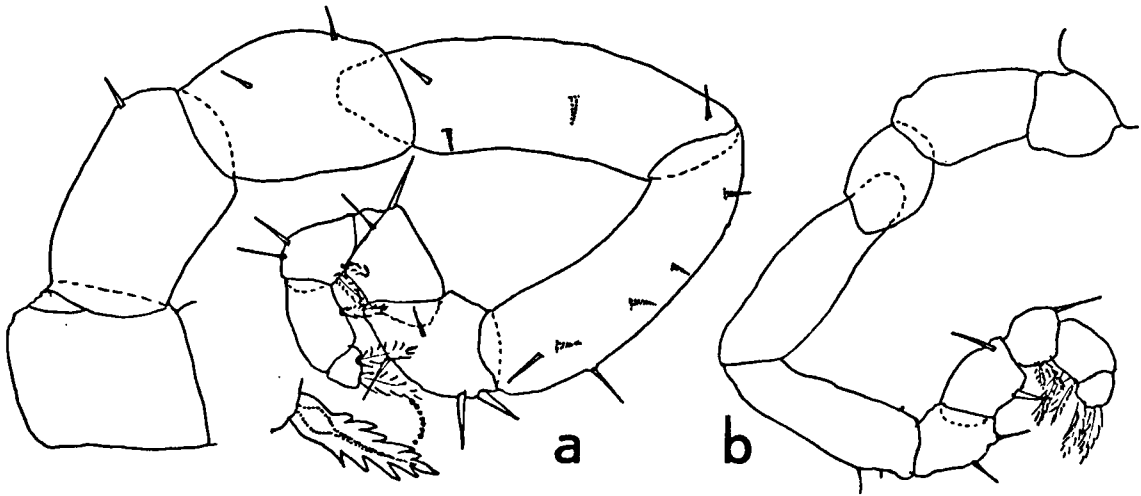


Fig. 11. *Achelia mixta* n. sp., from "Alpha Helix" Stn. M-56. a, oviger, ♂; b, oviger, ♀.

rounded spurs. Coxa 2 short, with rounded spur on antero- and posterodistal angles. Genital spur on ventrodistal side of coxa 2 of legs 3 and 4, low. Coxa 3 without spurs. Femur and tibiae about equal in length, not very spinous, without tall tubercles or spurs. Propodus feebly curved; 3 heel spines occupying entire proximal half of propodus; no real sole spines, but group of 4 irregular, distal, stiff setae. Claw less than half as long as propodus, auxiliary claws more than half as long as claw. Cement gland discharging at dorsodistal end of femur, at top of conical prominence.

Female: Tuberculation of trunk less pronounced than in male. Spurs on coxae lower than in male. Femur swollen for conception of eggs. Oviger much smaller; no reversed spine on segment 6 and one of the spines on segment 7 obviously lacking teeth.

Measurements of ♂ from Stn. M-56 (mm).- Length trunk 0.60; width across 2nd crurigers 0.47; length abdomen 0.20; length proboscis (ventral) 0.49; greatest diameter proboscis 0.21. Leg 4: 1st coxa 0.13; 2nd coxa 0.17; 3rd coxa 0.10; femur 0.30; 1st tibia 0.29; 2nd tibia 0.30; tarsus 0.05; propodus 0.29; claw 0.12; auxiliary claws 0.075.

Etymology.- The Latin name *mixta* alludes to the mixed feelings I have in describing another new species in this large and allegedly variable genus.

Remarks.- Obviously, this species is most closely related to *A. deodata* Müller, 1990 from Kenya and the Comores. With that species, it shares the ovoid, rather than pointed, proboscis shape, the configuration of the palp (segment 2 \ll 4, short distal four segments), the oviger structure, the low genital spur of the male, the rounded, rather than pointed, coxal spurs, the poorly spinous long leg segments, and the distribution of the spines on the propodus.

Several or all of these characters separate *A. mixta* from sympatric species like *A. assimilis*, *A. nana*, and *A. sawayai*. Males of *A. mixta* differ from those of *A. deodata* in the presence of two spiniferous tubercles on crurigers 2 and 3 (instead of none); in a longer abdomen reaching to the end of coxa 1 of leg 4 (instead of to the end of cruriger 4), and in particular by the fused chelifore bases in both sexes (instead of separate chelifore scapes). The latter character is reminiscent of some species in the related genus *Tanystylum*.

***Achelia nana* (Loman, 1908)**

Ammonothea nana Loman, 1908: 60-61, Pl. I Figs. 1-11.

Achelia nana; Stock, 1991a: 161 (refs.); Stock, 1992b: Fig. 6c.

3 ♂. "Snellius II" Stn. 4.070, Indonesia, E of Komodo Island, Slawi Bay, N cape of entrance, 08°36'S 119°31.2'E, rocky shore and sandy beach, 17 Sep. 1984 (RMNH 93664).

1 ♀. "Alpha Helix" Stn. M-53, Schouten Islands (N. of New Guinea), 03°48'S 144°30'E, otter trawl, 22 m, 20 June 1979 (ZMA Pa. 200.831).

1 ♀. Australia, Queensland, Great Barrier Reef, Heron Island, intertidal reef flat, 12-13 March 1986, leg. H.A. ten Hove (ZMA Pa. 200.927)

1 ♀. Japan, Okinawa, 1 km WNW of Onna Village, Horseshoe Cliffs, 26°30.0'N 127°50.9'E, collected by divers in 67 m, leg. R.F. Bolland, 15 Aug. 1981 (ZMA Pa. 200.821).

1 ♀. International Indian Ocean Expedition, "Anton Bruun" Cruise 7, Stn. 391-J, Natal, off Durban, 29°21'S 31°35'E, Agassiz trawl, 57 m, 9 Sep. 1964 (ZMA Pa. 200.823).

Remarks.- Widely distributed in practically the entire Indo-West Pacific, with the exception of the NW Indian Ocean, from 0 to 435 m.

***Achelia sawayai* Marcus, 1940**

Müller, 1991: 19-24, Figs. 4-5 (older refs.); Child, 1992a: 11-12 (refs.).

1 ♂ ovig. "Alpha Helix" Stn. M-31, Papua New Guinea, 10°10.6'S 148°07'E, hand-collected at 6 m, 13 June 1979 (ZMA Pa. 200.928).

1 ♀. "Alpha Helix" Stn. M-32, same data as Stn. M-31, but depth 3 m (ZMA Pa. 200.929).

1 ♂. "Alpha Helix" Stn. M-39, Louisiade Archipelago, 10°46'18"S 152°22'45"E, hand-collected between 0 and 6 m, 5 June 1979 (ZMA Pa. 200.827).

3 ♂, 3 ♀. "Alpha Helix" Stn. M-48, NE New Guinea, 06°41.7'S 147°53.1'E, hand-collected between 0 and 8 m, 18 June 1979 (ZMA Pa. 200.819).

1 ♂ ovig., 2 ♀. "Alpha Helix" Stn. M-51, NE New Guinea, 05°48.2'S 146°11.4'E, hand-collected at 12 m, 19 June 1979 (ZMA Pa.

200.832).

1 ♂ ovig., 1 ♂, 1 ♀. "Alpha Helix" Stn. M-52, same data as Stn. M-51, but depth 1-10 m (ZMA Pa. 200.922).

4 ♂, 2 ♀. "Alpha Helix" Stn. M-56, N of New Guinea, 03°23.0'S 143°40.2'E, hand-collected between 1 and 5 m, 21 June 1979 (ZMA Pa. 200.923).

8 spms. "Alpha Helix" Stn. M-58, same data as Stn. M-56 (ZMA Pa. 200.919).

1 ♀. "Alpha Helix" Stn. M-64, N of New Guinea, 03°31.5'S 143°36.0'E, hand-collected between 0 and 4 m, 23 June 1979 (ZMA Pa. 200.835).

1 ♀, 1 juv. "Alpha Helix" Stns. M-132 and M-135, Indonesia, Sangihe islands, 03°44.1'N 125°34.9'E, hand-collected between 1 and 18 m, 18 July 1979 (ZMA Pa. 200.918 & 200.921).

1 ♀. "Snellius II" Stn. 4-012, Indonesia, Pulau Pulau Maisel, reef flat N of Mai, 05°28'S 127°31'E, hand-collected between 0 and 1.5 m, 7 Sep. 1984 (RMNH 93663).

Remarks.- Müller (1990b) discusses the possible synonymy of *A. sawayai* with *A. besnardi* Sawaya, 1951 and *A. adelpha* Child, 1970.

This species has predominantly been recorded from the warm-water region of the western Atlantic (from southern Brazil to the northern Caribbean and the Gulf of Mexico). Isolated records exist from West Africa (Fage, 1949), Madagascar (Stock, 1974), the Society Islands (Müller, 1989a, 1990b), and the Fiji Islands (Müller, 1990d). This is an intertidal or very shallow water species.

***Tanystylum bredini* Child, 1970**

Child, 1970: 296-299, Fig. 3; Child, 1977: 441; Child, 1988: 52; Müller, 1989a: 125, Figs. 11-21; Müller, 1990a: 67, Figs. 7-15; Müller, 1992: 152-159, Figs. 6-11; Stock, 1992b: 92-93.

1 ♂, 1 ♀. "Alpha Helix" Stn. M-126, Indonesia, Minahassa peninsula (Sulawesi), 01°53.3'N 125°06.0'E, hand-collected between 0 and 6 m, 16 July 1979 (ZMA Pa. 200.841).

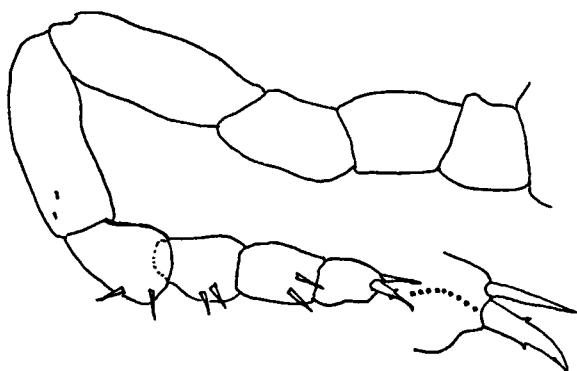


Fig. 12. *Tanystylum haswelli* Child, 1990, ♀ from "Alpha Helix" Stn. M-78: oviger.

1 ♂. "Alpha Helix" Stn. M-130, Indonesia, Sangihe islands, 03°47.5'N 125°35.3'E, hand-collected between 1 and 7 m, 18 July 1979 (ZMA Pa. 200.840).

Remarks.- It is with considerable doubt that I classify these specimens with *T. bredini*. They agree with this species in having longish, spiny chelifore stumps, a 4-segmented palp, no apophysis on oviger segment 7 of the male, a 9- (not 10-) segmented female oviger, low tubercles on the crurigers, and an auxiliary claw that is about half as long as the main claw.

They differ from *T. bredini*, but agree with *T. haswelli* Child, 1990 in having an elongate 4th palp segment, and in proboscis shape (at least in female). The single female at my disposal differs moreover from both *T. bredini* and *T. haswelli* in the length of the abdomen, reaching almost to the distal end of coxa 1 of leg 4 (as in the holotype of *T. orbiculare* Wilson, 1978, re-illustrated by Child, 1990, Fig. 3). Müller (1989a, 1990a, 1992) has recorded similar "variations" in his material of *T. bredini*.

It is hard to see some light in this mixture of morphological characters, especially since of some of the "forms" only a very limited material is available. The only reason that I did not identify the present Indonesian specimens with *T. orbiculare* is its 9-segmented female oviger (according to Wilson, 1878, 10-segmented in *T. orbiculare*; see also Krapp, 1973). However, Krapp's

figure of the abdomen in lateral view is so very different from that by Child (1990) of the holotype, that it is hard to imagine that the same species is involved. Clark (1977: 332), on the basis of fresh material from the type area, New England, comes to the same conclusion, which he ably worded as follows: "I am convinced the species needs further study". For the Indo-Pacific, *T. haswelli* may fall within the range of variation of *T. bredini*, the older name. Whether these two in turn are junior synonyms of *T. orbiculare* remains to be seen. We first need a study on the variability of *T. orbiculare* from New England, before any conclusion on the correct identity of the Indo-West Pacific and Mediterranean taxa can be reached. For the purpose of this report, I have kept the species apart as good as I could.

T. bredini is widely distributed in shallow waters of the western Pacific and Indian Oceans.

Tanystylum haswelli Child, 1990. Fig. 12.

Child, 1990: 317-319, Fig. 2.

1 juv. "Alpha Helix" Stn. M-28, Papua New Guinea, 09°33'30"S 147°10'E, hand-collected at 5 m, 12 June 1979 (ZMA Pa. 200.838).

1 ♂. "Alpha Helix" Stn. M-34, Papua New Guinea, 10°45'10"S 150°20'20"E, hand-collected at 6 m, 14 June 1979 (ZMA Pa. 200.913).

1 ♂. "Alpha Helix" Stn. M-58, N of New Guinea, 03°23.0'S 143°40.2'E, hand-collected between 1 and 5 m, 21 June 1979 (ZMA Pa. 200.914).

1 ♂. ovig., 1 ♂, 2 ♀. "Alpha Helix" Stn. M-78, Irian Barat, N of Tjendrawasih (= Vogelkop peninsula), 00°41.5'S 133°19.5'E, hand-collected, intertidal to 2 m subtidal, 1 July 1979 (ZMA Pa. 200.830).

Remarks.- The affinities of this species are discussed above, under *T. bredini*. *T. haswelli* was only known from the male holotype, taken at Lizard Island (Great Barrier Reef) in a depth of 2 m.

The female is new; it has a 9-segmented oviger, a rather rare character in this genus, shared by

T. bredini, *T. conirostrum* (Dohrn, 1881) (see Krapp, 1973, Fig. 3f) and *T. geminum* Stock, 1954a. There are 4, instead of 5, short distal oviger segments, each armed with 2 simple spines, but for one of spines on segment 9, which is slightly larger than the others and bears one minute denticle on either margin (Fig. 12).

Tanystylum isabellae Marcus, 1940

Müller, 1991: 69-72. Fig. 29 (refs.); Stock, 1992a: 119-121, Figs. 22-26.

1 ♀. "Alpha Helix" Stn. M-56, N of New Guinea, 03°23.0'S 143°40.2'E, hand-collected between 1 and 5 m, 21 June 1979 (ZMA Pa. 200.915).

Remarks.- It is with some doubt that I refer the solitary female from New Guinea to this species, previously recorded from the western Atlantic (from southern Brazil to the Virgin Islands) and Zaire. However, this is not the first instance of a member of the family Ammotheidae showing a similar distribution (e.g., see *Tanystylum oculospinosum* and *Achelia sawayai*).

The New Guinean specimen resembles the Atlantic material in practically every detail, except perhaps in a trifle more clearly demarcated distal tubular part of the proboscis, and the slightly longer chelifore rudiment. In good agreement are the strong, medially directed spine on palp segment 3, the tuberculation of the crurigers and coxae, the length of the abdomen, the pointed ocular tubercle, the 10-segmented female oviger of which the last segment is small and armed with 2 poorly denticulate spines.

Tanystylum oculospinosum Hilton, 1942

T. oculospinosum Hilton, 1942e: 70 (diagnosis only); Child & Hedgpeth, 1971: 619; Child, 1980: 324; Austin, 1985: 429; Child, 1992a: 35-37, Fig. 16; Child, 1992b: 23-24 (refs., syn.).

T. tubirostre Stock, 1954a: 117-120, Figs. 24-25; Bourdillon, 1955: 600, Pl. III Figs. 2-4.

T. tubirostrum; Stock, 1975a: 984; Child, 1979: 34-35; Child,

1980: 324; Child, 1982a: 363; Zambrana et al., 1985: 31; Müller, 1990a: 67-70, Figs. 16-20; Müller, 1991: 79-80, Fig. 33.

T. mexicanum Child, 1979: 32-34, Fig. 11.

1 ♂ ovig., 2 ♀. "Alpha Helix" Stn. M-16, Australia, Gulf of Carpentaria, 12°35.4'S 141°36.2'E, hand-collected at 1 m, 4 June 1979 (ZMA Pa. 200.842).

1 ♂ ovig. "Snellius II" Stn. 4-012, Pulau Pulau Maisel, reef flat N of Mai, 05°28'S 127°31'E, hand-collected between 0 and 1.5 m, 7 Sep. 1984 (RMNH 93662).

Remarks.- The species is most frequently found in the West Indies and in the warm-water area along the American Pacific coast, but there is an isolated record from Kenya as well. The present records fill the gap between two previously mentioned localities, the Galapagos and Kenya. It becomes more and more clear that *T. oculospinosum* is a circumtropical species.

Tanystylum rehderi Child, 1970

Child, 1970: 302-306, Fig. 5; Child, 1983: 705; Child, 1988: 53-54; Müller, 1989a: 126; Child, 1991: 142.

1 ♂. "Alpha Helix" Stn. M-126, Indonesia, Minahassa peninsula (Sulawesi), 01°53.3'N 125°06'E, hand-collected between 0 and 6 m, 16 July 1979 (ZMA Pa. 200.916).

1 ♀. "Alpha Helix" Stn. M-135, Indonesia, Sangihe islands, 03°44.1'N 125°34.9'E, hand-collected between 1 and 18 m, 18 July 1979 (ZMA Pa. 200.912).

1 ♀. Guam, Tweed's Cave Dive area, 0.5 km N. of Haputo Point, 13°34.9'N 144°49.8'E, hand-collected between 3 and 6 m, 26 March 1983, leg. R.F. Bolland (ZMA Pa. 200.839).

Remarks.- This shallow-water species (0-18 m) has been recorded from the Society Islands, Palau, Guam, and Aldabra atoll. It is new to Indonesia and Guam. *T. rehderi* is very similar to *T. acuminatum* Stock, 1954a (western tropical Atlantic), but differs mainly in a more tapering

proboscis and somewhat more robust cheliform stumps.

Family Colossendeidae

Rhopalorhynchus filipes Stock, 1991

Stock, 1991a: 161-163, Fig. 27.

1 ♀. "Snellius II", Stn. 4.227, Indonesia, N.E. of Taka Bone Rate (Tiger Islands), W of Pulau Tinanjan, 06°32.8'S 121°09.4'E, dredge, sandy bottom, calcareous stones, soft corals, sponges, 60 m, 15 Oct. 1984 (RMNH 93660).

Remarks.- This species was known from the Chesterfield Islands, Loyalty Islands, and New Caledonia (roughly between 21° to 25°S and 159° to 167°E). It is new to Indonesian waters. Previous records came from depths between 200 and 320 m, the present record is only from 60 m.

The single specimen resembles closely the types, except for the claw of the legs, which is slightly longer (clearly over half as long as the propodus).

Rhopalorhynchus spec.

1 spm., without legs. International Indian Ocean Expedition, "Anton Bruun" Cruise 7, Stn. 372-B, Moçambique, 24°48'S 34°59'E, rock dredge, 42 m, 19 Aug. 1964 (ZMA Pa. 200.854).

Colossendeis angusta Sars, 1877

C. angusta Sars, 1877: 268-269; Sars, 1891: 140-143, Pl. X Fig. 2a-f; Hedgpeth, 1948: 269-271, Fig. 50a (refs.); Fage, 1956: 175; Hedgpeth, 1963: 1322; Losina-Losinsky, 1964: 336; Hedgpeth, 1969: 27, 28; Turpaeva, 1971: 287; Daniel & Sen, 1980: 165; Bamber, 1983: 70-71; Austin, 1985: 429 (distr.); Stock, 1988: 507; Turpaeva, 1989: 128-131, Figs. 4-5; Nakamura & Child, 1991: 62; Child, 1992b: 41.

C. gracilis Hoek, 1891: 69-70, Pl. IX Figs. 6-8, Pl. X Figs. 6-7; Stock, 1963: 330, Fig. 6a; Stock, 1968b: 17; Turpaeva, 1974: 298, Fig. 11 (3-4); Stock, 1975a: 990, Fig. 11 g-h; Minnaert & Zamponi, 1984: 275-276, Fig. 12; Stock, 1990:

220, Fig. 6; Turpaeva, 1990a: 114-115, Fig. 4 (5-7).

1 spm. International Indian Ocean Expedition, "Anton Bruun" Cruise 8, Stn. 399-C, Moçambique, 21°18'S 36°18'E, shrimp trawl, 1510-1600 m, 10 Feb. 1964 (ZMA Pa. 200.945).

Remarks.- Examination of Arctic and Boreal specimens of *C. angusta* has convinced me that *C. gracilis* is a junior synonym of *C. angusta*. Contrary to Sars' illustrations (1891), the three distal palp segments of *C. angusta* are invariably shorter than segment 7, and the abdomen reaches at most to the distal end of coxa 1 of leg 4.

This species is widely distributed in deep waters of all major oceans.

Colossendeis macerrima Wilson, 1881

Stock, 1978: 400-401, Figs. 400-401 (syn.); Stock, 1986: 417 (refs.)

9 spms. International Indian Ocean Expedition, "Anton Bruun" Cruise 8, Stn. 399-C, Moçambique, 21°18'S 36°18'E, shrimp trawl, 1510-1600 m, 10 Feb. 1964 (ZMA Pa. 200.942).

1 spm. (fragm.). International Indian Ocean Expedition, "Anton Bruun" Cruise 8, Stn. 400-C, Moçambique, near Ponta da Barra Ralsa, 20°30'S 35°43'E, 62 m, 3 Oct. 1964 (ZMA Pa. 200.860).

1 spm. "Alis", Campaign BATHUS 2, Stn. CP 771, New Caledonia, 22°09.5'S 166°01.7'E, beam trawl, 610-800 m, 18 May 1993 (MNHN Py. 853).

Remarks.- World-wide in deeper water. The Moçambique specimen ("Anton Bruun" Stn. 400-C) comes from waters too shallow to be true (was possibly still clinging to the net used at Stn. 399).

Colossendeis cf. **minuta** Hoek, 1881

Stock, 1963: 326-328, Fig. 4 (older refs., syn.); Fry & Hedgpeth, 1969: 26, 28 (key), 38; Turpaeva, 1975: 241-242, Figs. 7, 8 (5-6); Stock, 1990: 221.

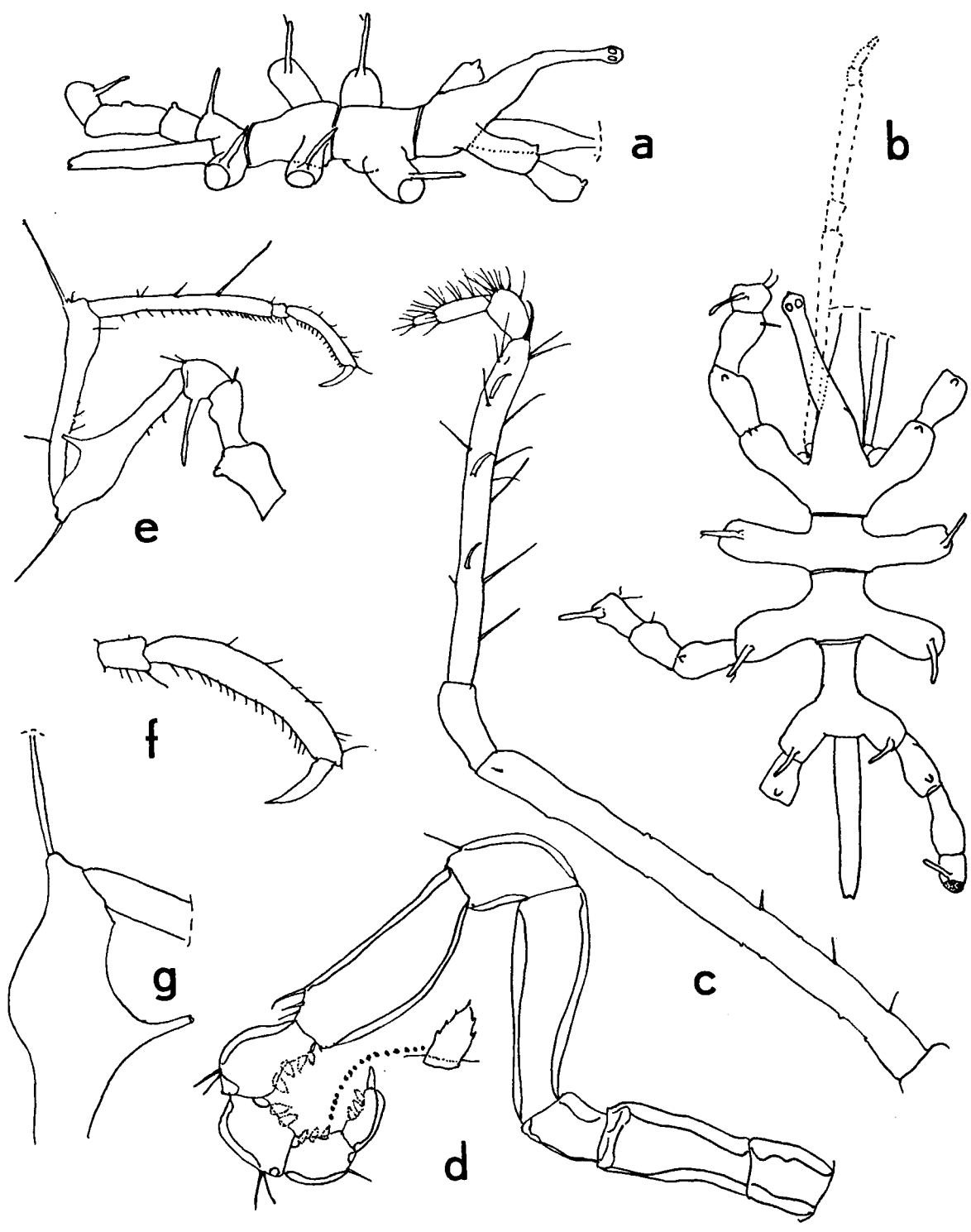


Fig. 13. *Pantopipetta clavata* n. sp., ♀ holotype, from "Anton Bruun" Cruise 8, Stn. 420-A. a, trunk, from the right; b, trunk, dorsal; c, palp; d, oviger; e, legs (to same scale as Fig. 13a-b); f, distal segments of leg 2; g, cement gland area of leg 2.

1 juv. "Baruna Jaya I", KARUBAR, Stn. CP 53, Indonesia, Tanimbar Island, 08°18'S 131°41'E, 1026-1053 m, 30 Oct. 1991 (MNHN Py. 854).

Remarks.- It is hard to identify juvenile specimens in this difficult genus, but this specimen shows all characteristics of *C. minuta*, except in the 7th palp segment which is definitely shorter than in adult specimens.

Most localities of *C. minuta* are in the deep-sea of the Atlantic Ocean (NW Atlantic basin to southern Africa), but Turpaeva (1975) found it in the Pacific off the Chilean coast, and Hoek (1898) records it (as *C. japonica*) from S. of Honshu (Japan).

Family Rhynchothoracidae

Rhynchothorax mediterraneus

Costa, 1861

Child, 1988a: 56 (older refs.); Stock, 1992a: 135-136 (refs.)

5 spms. International Indian Ocean Expedition, "Anton Bruun" Cruise 8, Stn. 400-C, Moçambique, near Ponta da Barra Ralsa, 20°30'S 35°43'E, 62 m, 3 Oct. 1964 (ZMA Pa. 200.858).

1 spm. "Alpha Helix" Stn. M-24, Papua New Guinea, 09°31'40"S 147°15'24"E, hand-collected between 1 and 4 m, 9 June 1979 (ZMA Pa. 200.861).

1 spm. "Alpha Helix" Stn. M-26, Papua New Guinea, 09°29'45"S 147°06'40"E, hand-collected at 1 m, 10 June 1979 (ZMA Pa. 200.879).

1 ♀. "Alpha Helix" Stn. M-97, Indonesia, Aru Islands, 05°27.0'S 134°25.5'E, hand-collected between 0 and 0.9 m, reef, 6 July 1979 (ZMA Pa. 200.857).

Remarks.- Though most records are from the Mediterranean and Brazil, there are also two records in the western Indian Ocean: Aldabra atoll (Child, 1988a) and Madagascar (Stock, 1974). Almost all previous collections were made on the continental shelf (1-200 m), but for one in 1100 m off southern Brazil (Stock, 1992a).

The specimen from "Alpha Helix" Stn. M-24

has indistinct tubercles on the dorsal surface of crurigers 2 to 4, but distinct ones on cruriger 1.

The Indonesian and Coral Sea records form a very considerable range extension.

Family Austrodecidae

Pantopipetta clavata n. sp. Fig. 13.

1 ♂ (holotype). International Indian Ocean Expedition, "Anton Bruun" Cruise 8, Stn. 420-A, Kenya, 02°42'S 40°53'E, 140 m, shrimp trawl, 6 Nov. 1964 (ZMA Pa. 200.868).

Description.- Male: Trunk completely segmented, with articulation line at base of abdomen. Crurigers longer than trunk diameter, separated by intervals larger than their own diameter; first pair of crurigers with dorsal tubercle; crurigers 2 to 4 with tall dorsal spur. No mediadorsal trunk tubercles. Ocular tubercle very tall, curved forward, with 4 small distal eyes. Abdomen slightly less long than trunk segments 3 and 4 combined, reaching to tip of coxa 3 of leg 4. Distal part of proboscis lacking in holotype.

Palp 7-segmented. Segment 2 almost as long as segments 3 to 7 combined. Segment 4 elongate, armed with 4 curved spines and several setae. Segment 5 < 6; segment 7 small, longer than wide.

Oviger 10-segmented, as typical for the genus. Segment 4 longest, segment 6 next-longest. Segment 10 slightly shorter than segment 9. Wedge-shaped compound spines on segments 7 to 10, according to formula 4:2:2:3; each compound spine with 2 to 5 marginal teeth. Terminal claw smooth, obtuse.

Legs 1 to 4 mutually similar. Coxa 1 with dorsal tubercle; coxa 2 dorsally naked; coxa 3 with long dorsal spur. Femur strongly clavate, because entire dorsodistal half inflated by cement gland; distal end with long seta placed on socle; cement gland discharging through ventral funnel-shaped opening. Tibiae 1 and 2 subequal, slender, longer than femur. Tarsus short. Propodus curved, sole evenly armed with some 16 small spinules. Claw distinctly shorter than half the

length of propodus; no auxiliary claws.

Female unknown.

Measurements of holotype (mm).- Length trunk (frontal margin ocular tubercle to tip abdomen) 2.2; width across 2nd crurigers 0.83; length abdomen 0.61. Second leg: 1st coxa 0.27; 2nd coxa 0.22; 3rd coxa 0.13; femur 0.65; 1st tibia 0.70; 2nd tibia 0.71; tarsus 0.15; propodus 0.69; claw 0.28.

Etymology.- The specific name, *clavata*, alludes evidently to the clavate shape of the femur.

Remarks.- In the key to the species of the genus (Arnaud & Child, 1988), this species can be followed to couplet 8, where it keys out with *P. bilobata* Arnaud & Child, 1988 from the South African east coast. It is indeed morphologically very close to that species, but differs at first sight by the clavate aspect of the femur. The swelling caused by the cement gland occupies the entire distal half of the femur, and is not restricted to a "large broad based tubercle" as in *bilobata*. Additional differences, though of minor importance, are the more widely spaced crurigers, the longer distal palp segment (just a knob in *bilobata*), and the shorter distal oviger segment.

***Austrodecus goughense* Stock, 1957.**

Fig. 14a.

Stock, 1957c: 63-65, Fig. 34; Arnaud, 1974: 781; Arnaud & Branch, 1991: 69, unnumbered Figs.

2 ♂. International Indian Ocean Expedition, "Anton Bruun" Cruise 7, Stn. 381-A, S Madagascar Ridge, 33°13'S 43°51'E, Campbell grab, 46 m, 30 Aug. 1964 (ZMA Pa. 200.848).

Remarks.- These specimens agree closely with the published illustrations and descriptions of *A. goughense*. The palp, never figured in great detail, is illustrated in the present paper (Fig. 14e).

First discovered at Gough Island in the southern Atlantic, the species was later found in the Indian Ocean at Amsterdam Island (37°52'S), St. Paul (38°44'S), and the Prince Edward

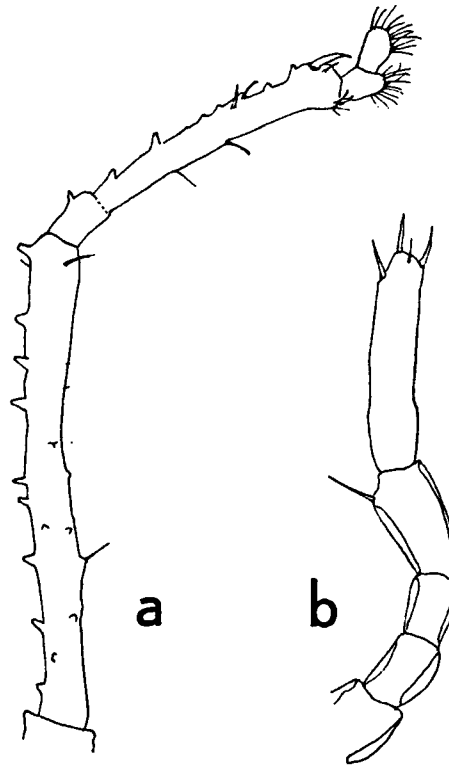


Fig. 14. *Austrodecus*. a, *A. goughense* Stock, 1957, ♂, from "Anton Bruun" Cruise 7, Stn. 381-A: palp. b, *A. tubiferum* Stock, 1957, ♀, from "Anton Bruun" Cruise 6, Stn. 346-B: oviger.

archipelago (ca. 46°40'S). The present record forms a northward extension of more than 4° of the known range. The bathymetrical range extends from 0 to 141 m.

***Austrodecus stocki* Child, 1988. Fig. 15.**

Child, 1988: 54-55, Fig. 1.

2 ♀. International Indian Ocean Expedition, "Anton Bruun" Cruise 8, Stn. 409-E, Moçambique Channel, 16°11'S 43°42'E, rock dredge, 62 m, 18 Oct. 1964 (ZMA Pa 200.878).

Remarks.- The present specimens agree well with the holotype, and only known specimen, likewise of the female sex, originating from

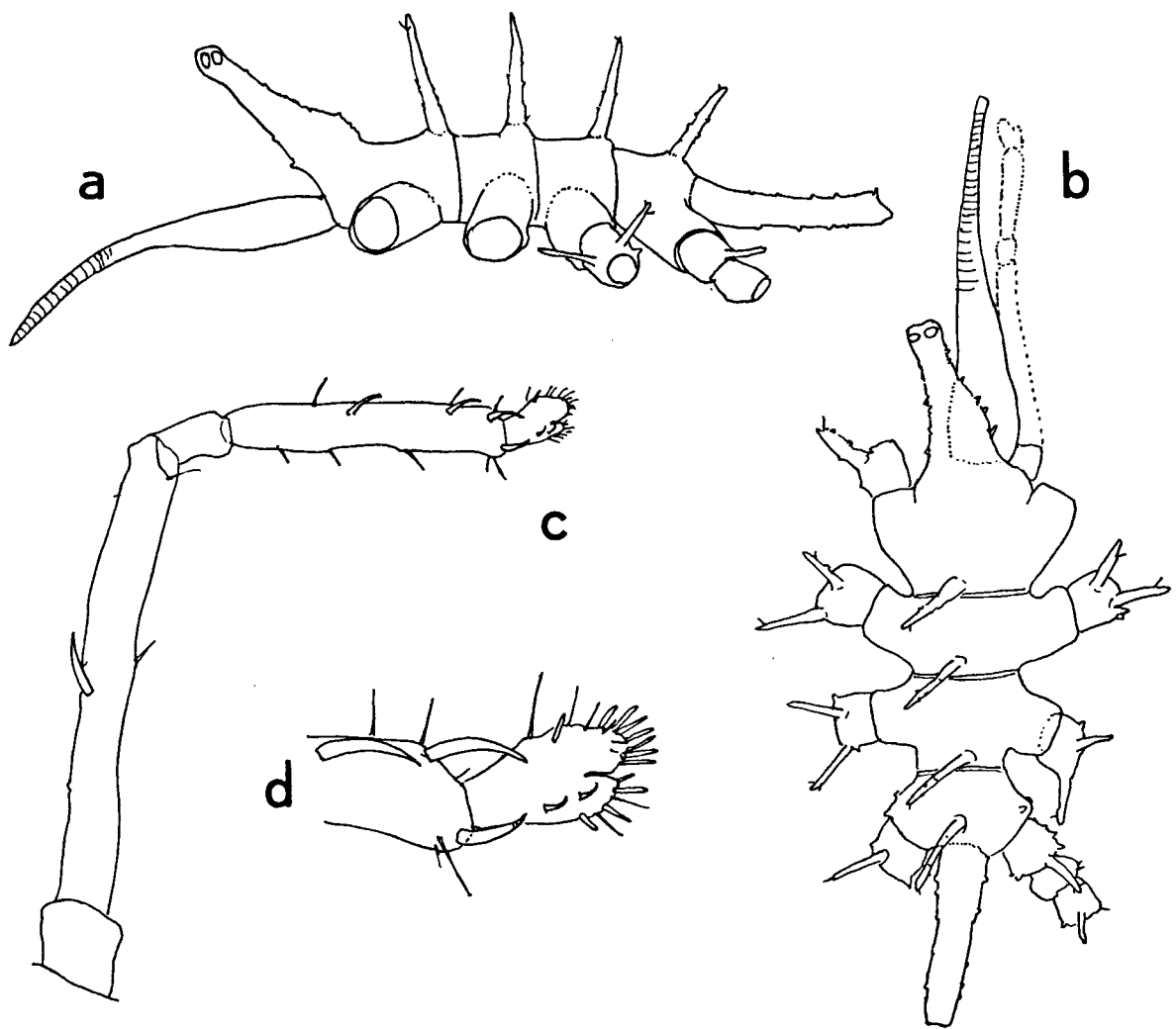


Fig. 15. *Austrodecus stocki* Child, 1988, —, from “Anton Bruun” Cruise 8, Stn. 409-E. a, trunk, from the left; b, trunk, dorsal; c, palp; d, distal palp segments.

Aldabra atoll, depth 20 m, except for some minor details in the distal palp segments. The curved spines in the distal part of palp segment 4 are stronger and more numerous than in Child’s figure, and 2 smaller, curved spines are present on segment 5 (none figured by Child).

***Austrodecus tubiferum* Stock, 1957.**
Fig. 14b.

A. tubiferum Stock, 1957c: 75-77, Fig. 43; Nakamura & Child, 1988: 669; Child, 1988a: 55; Nakamura & Child,

1991: 35.

A. gordonae (part.); Stock, 1954b: 153, Fig. 76e.

2 ♂. International Indian Ocean Expedition, “Anton Bruun” Cruise 2, Stn. 124-E, N of Mauritius, 19°54’S 57°36’E, dredge, depth not recorded, 14 June 1963 (ZMA Pa. 200.851).

3 ♂, 2 ♀. International Indian Ocean Expedition, “Anton Bruun” Cruise 6, Stn. 346-A, E of Rodriguez Island, 19°24’S 65°30’E, dredge, 91 m, 9 June 1964 (ZMA Pa. 200.852).

2 ♂, 1 ♀. International Indian Ocean Expedition, “Anton Bruun” Cruise 6, Stn. 346-B, same

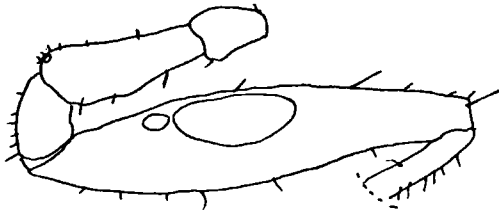


Fig. 16. *Nymphon biformidens* Stock, 1974, ♀, from "Alpha Helix" Stn. M-25. Proximal segments of leg 1.

data as Stn. 346-A, but depth 91-2743 m (ZMA Pa. 200.853).

Remarks.- The present Indian Ocean material agrees very well with the holotype from Sagami Bay, Japan, but for some minor details: the mid-dorsal trunk tubercles often bear a small spine (easily broken-off), in one of the specimens the interval between the crurigers is a trifle wider, and both spines at the penultimate palp segment are curved (in the holotype 1 curved and 1 straight).

The female oviger, never described before, is illustrated here (Fig. 14b); it has a very slender distal segment, just as in male.

The distribution of this species is kind of remarkable. Usually it occurs in more temperate waters of Japan, but recently Nakamura & Child (1988) recorded it from Okinawa in the warmer waters of the Ryukyu Islands. The present records extend the range to the centre of the Indian Ocean and Mauritius. Apparently, "Anton Bruun" dredge haul 346-B in which 3 specimens were taken, reached from the shelf area, across the slope into very deep waters. Previous records were located between 37 and 184 m.

Family Nymphonidae

Nymphon biformidens Stock, 1974. Fig. 16.

Stock, 1974b: 15-16, Fig. 4; Child, 1988a: 68 (key).

1 ♀, 1 juv. "Alpha Helix" Stn. M-25, Papua New

Guinea, 09°29'45"S 147°06'48"E, hand-collected at 1m, 11 June 1979 (ZMA Pa. 200.865).

Remarks.- The female has retained only its first pair of legs. It agrees very closely with the holotype, likewise a female, from Madagascar (inter-tidal). No other specimens are actually known. Consequently, the range is considerably extended to the Coral Sea. The adult female has a swollen femur (Fig. 16), containing one, elongate egg and one much smaller egg.

Nymphon nakamurai n. sp. Fig. 17.

1 young ♀ (holotype). "Alpha Helix" Stn. M-135, Indonesia, Sangei Islands (= NE of Sulawesi), 03°44.1'N 125°34.9'E, hand-collected between 1 and 18 m, 18 July 1979 (ZMA Pa. 200.870).

Description.- Closely resembling *N. biformidens* Stock, 1974 (see above). Neck, however, shorter and wider, and length of chelifore scape greater in proportion to length of neck.

Chela with fingers shorter than palm; immovable finger with proximal two teeth simple, distal six teeth bifid; movable finger with 1 simple proximal tooth and 7 bifid distal teeth (in *N. biformidens* more teeth are simple and fewer teeth are bifid).

Palp segment 3 distinctly shorter than segment 2; segment 5 shaped like elongate egg.

Oviger: Compound spine formula 4:4:6:6. Terminal claw long, thin, inner margin almost imperceptibly hirsute.

Legs: Femur slightly shorter than tibia 1; tibia 2 much longer than tibia 1. Tarsus slightly over one-third of length of propodus (in *N. biformidens* almost half as long). Claw shorter than auxiliary claws; inner margin of claw with extremely minute setules; inner margin of auxiliaries with numerous fine, but distinct, teeth.

Measurements of holotype (mm).- Length trunk (frontal margin cephalic segment to tip 4th cruriger) 0.80; width across 2nd crurigers 0.40; length scape 0.33; length chela 0.30. Second leg: 1st coxa 0.13; 2nd coxa 0.24; 3rd coxa 0.11; femur 0.65; 1st tibia 0.75; 2nd tibia 1.15; tarsus

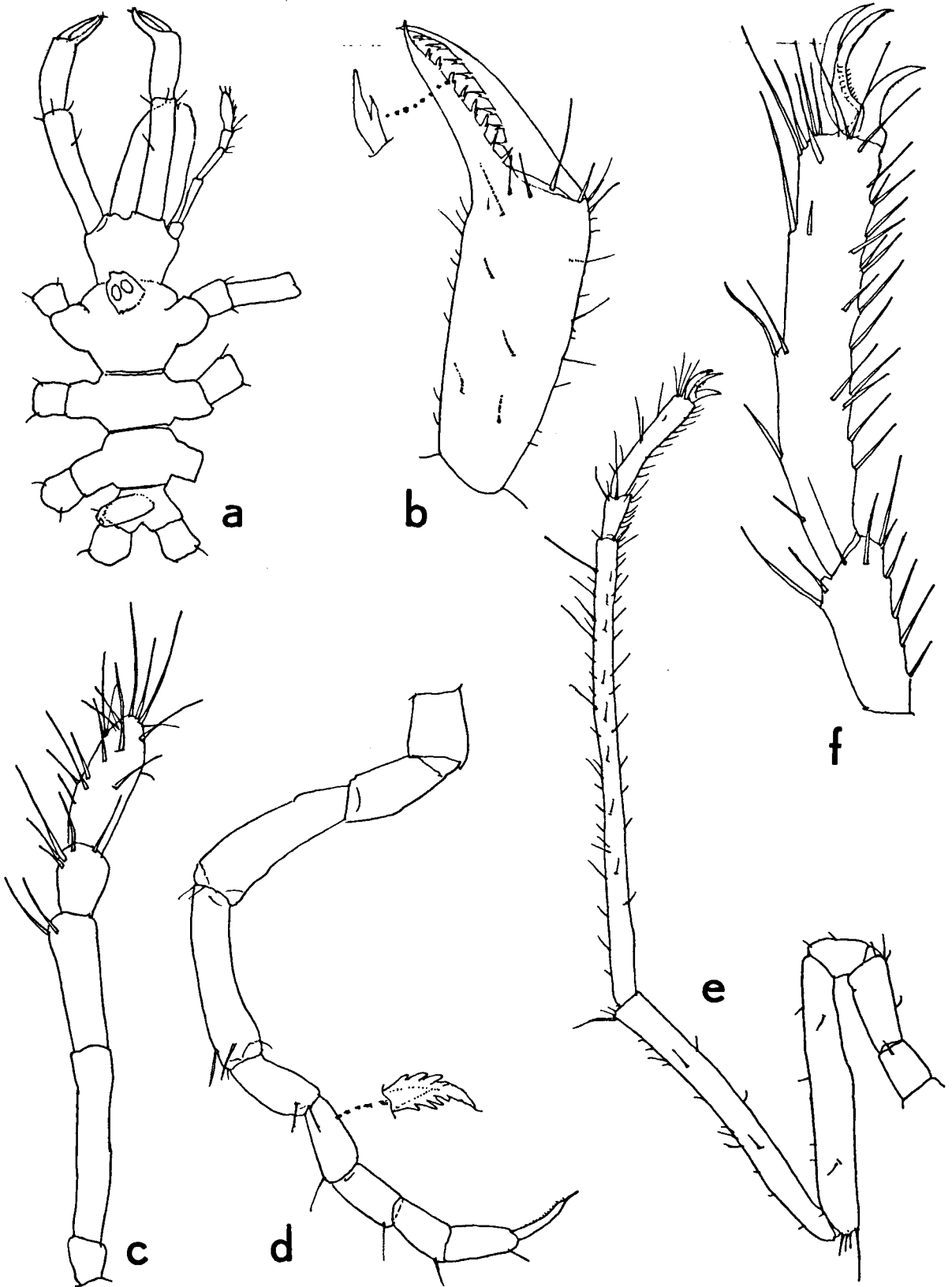


Fig. 17. *Nymphon nakamurai* n. sp., ♀ holotype, from "Alpha Helix" Stn. M-135. a, trunk, dorsal; b, chela; c, palp; d, oviger; e, leg 2; f, distal segments of leg 2.

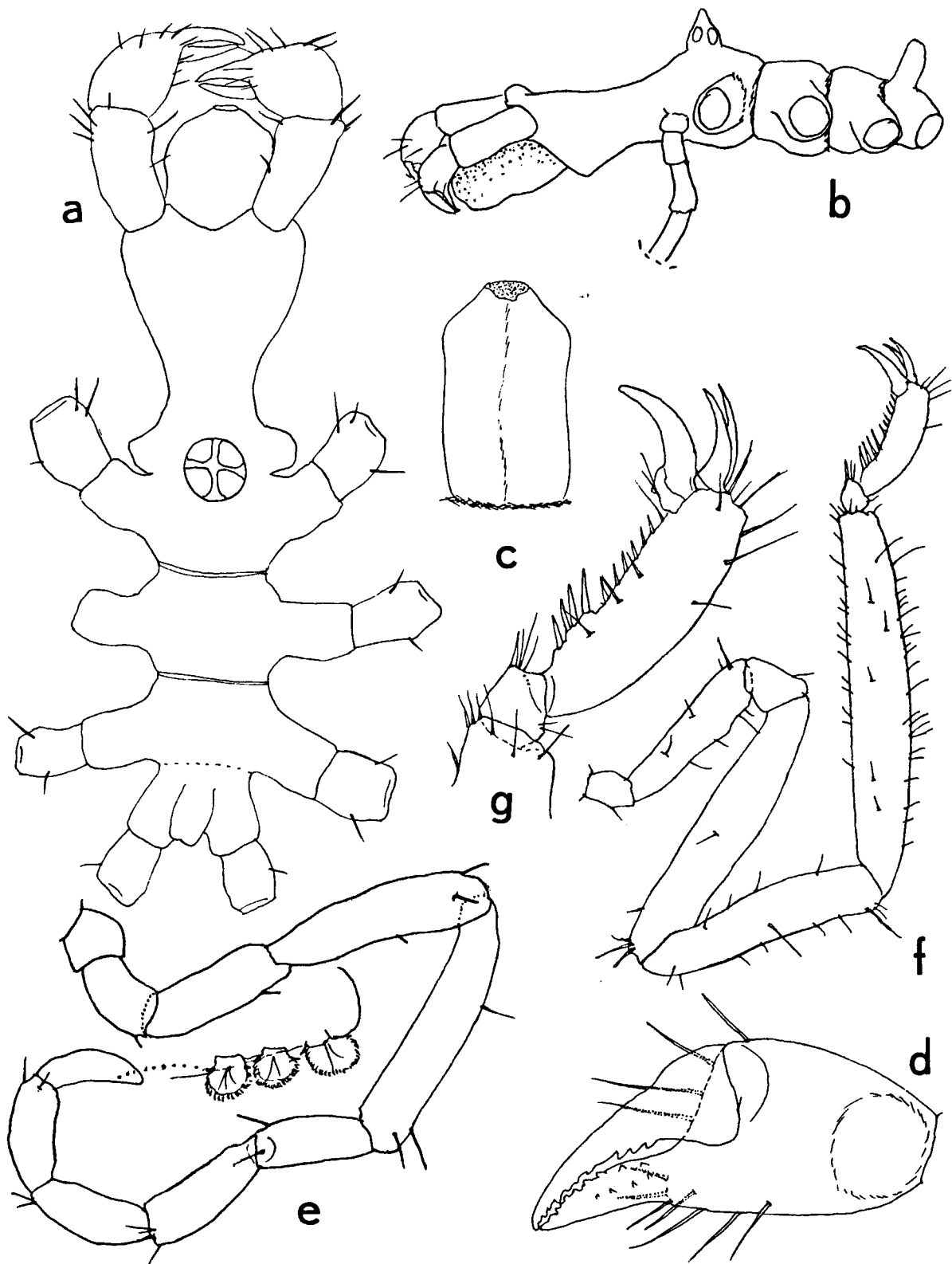


Fig. 18. *Callipallene fallax* n. sp., ♀ holotype, from "Alpha Helix" Stn. M-88. a, trunk, dorsal; b, trunk, from the left; c, proboscis, ventral; d, chela; e, oviger; f, leg 3; g, distal segments of leg 3.

0.11; propodus 0.30; claw 0.055; auxiliary claws 0.091.

Etymology.- Named after Professor Koichiro Nakamura, of Tokyo, in recognition of his fine contributions to pycnogonid taxonomy.

Remarks.- This species belongs to the *Nymphon aequidigitatum*-group (for discussion and key to the species, see Child, 1988a). After Child's publication, one more species has been added to the group, viz. *N. macabou* Müller, 1990e.

As mentioned in the description, the new species is very similar to *N. biformidens*; both species are known from females only. For the moment, and awaiting the discovery of males, *N. nakamurai* can be distinguished by its smaller size, shorter propodus, longer scape, shorter neck, lower number of compound oviger spines, lower number of simple teeth on the fingers of the chela, a more swollen distal palp segment, and a shorter third palp segment.

Nymphon spec. (*aequidigitatum*-group)

1 fragmentary spm. "Alpha Helix" Stn. M-26, Papua New Guinea, 09°29'45"S 147°06'40"E, hand-collected at 1m, 10 June 1979 (ZMA Pa. 200.934).

Family Callipallenidae

Genus **Propallene** Schimkewitsch, 1909

I agree with Staples (1982: 457) that *Metapallene* Schimkewitsch, 1909 is based on a subadult *Propallene*. Subadults of the species recorded below still have unsegmented, stub-like palps just as in the type-species of the genus *Metapallene*, *M. languida* (Hoek, 1881).

Propallene curtipalpus Child, 1988

Child, 1988: 21-23, Fig. 9; Nakamura & Child, 1988: 667-668.

3 ♂ ovig., 4 ♂, 4 juvs. "Alpha Helix" Stn. M-86, Indonesia, Misoöl island, 02°03.8'S 130°08.3'E, hand-collected at 0.5 m, 3 July 1979 (ZMA Pa. 200.952).

Remarks.- These specimens are in good agreement with the type series from the Philippines. Later, Nakamura & Child (1988) recorded it also from the Ryukyu Islands. The known depth range is 0 to 20 m.

There is some variation in the number of cement gland tubes on the femur, tibia 1 and tibia 2. In previously recorded males these numbers are 1 (femur), and 1 to 2 (each tibia). In some males in the present collection, there are slightly more tubes, viz, 3:3:2.

Callipallene dubiosa Hedgpeth, 1949

Hedgpeth, 1949: 275-277, Fig. 35; Stock, 1954b: 41-43, Fig. 17; Sandô, 1964: 30; Utinomi, 1971: 322 (older refs.); Honma & Tikami, 1978: 37; Müller, 1990a: 71; Nakamura & Child, 1991: 38 (refs.); Müller, 1992: 159.

1 ♀. International Indian Ocean Expedition, "Te Vega" Cruise 2, Stn. 65 LH 3, Singapore, Pulau Mantu, 01°10'N 103°45'E, hand-collected between 0 and 1 m, 18 Oct. 1963 (ZMA Pa. 200.859).

Remarks.- This species was originally described from Hakodate (Japan). Later records are from various Japanese localities, Amoy, Singapore, Malaysia, India, Kenya and Zanzibar. All records are from shallow waters (0-46 m).

Callipallene fallax n. sp. Fig. 18.

1 ♀ (holotype). "Alpha Helix" Stn. M-88, Indonesia, Misoöl island, 02°03.8'S 130°08.3'E, hand-collected at 6 m, 3 July 1979 (ZMA Pa. 200.877).

1 ♀ (paratype). "Alpha Helix" Stn. M-132, Indonesia, Sangihe islands, 03°44.1'N 125°34.9'E, hand-collected between 1 and 18 m, 18 July 1979 (ZMA Pa. 200.874).

Description.- Female: Trunk completely segmented in paratype, trunk segments 3 and 4 fused in holotype. Crurigers unarmed, shorter than width of trunk, separated by intervals wider than own diameter. Neck with wide, rounded anterior "crop"; lateral margins convex in distal part, concave in proximal part, no part of margin straight. Oviger implantation just free of anterior border of first cruriger. Proboscis cylindrical in basal two-thirds, shaped like truncate cone in distal third. Ocular tubercle lowly conical, eyes pigmented. Abdomen short, erect, truncate at tip.

Chelifore scape robust. Palm and fingers of equal length; both fingers slightly curved, with ca. 8 small, rounded, triangular teeth; immovable finger moreover with auxiliary row of 4 minute teeth.

No palps. Oviger segment 3 rather elongate; segment 5 longer than 4. Compound spines mostly rounded (terminal spine of segments 7, 8, and 9 more elongate), finely denticulate; compound spine formula 6:7:6:6.

Legs: Coxa 2 more than half as long as femur. Tibia 1 < femur, tibia 2 > femur. Propodus short, only $\frac{1}{4}$ of tibia 2, with 4 straight heel spines; sole very straight, with 6 spinules. Claw slightly over one-third of propodus; auxiliary claws $\frac{3}{4}$ of main claw, not pectinate.

Male unknown.

Measurements of ♀ (mm).- Length 1st trunk segment 0.58; length of 2nd trunk segment 0.16; length 3rd + 4th trunk segments (to tip 4th cruriger) 0.28; width across 2nd crurigers 0.42; length scape 0.20; length chela 0.23; anterior diameter "crop" 0.29. Third leg: 1st coxa 0.15; 2nd coxa 0.44; 3rd coxa 0.11; femur 0.76; 1st tibia 0.66; 2nd tibia 0.96; tarsus 0.055; propodus 0.28; claw 0.12; auxiliary claws 0.10.

Etymology.- The name *fallax* (Latin = tricky) alludes to the confusing resemblance to other species of the genus.

Remarks.- This species is mainly characterized by its short, very straight propodus, and long 2nd coxa. Of the two species of *Callipallene* from the same geographic area, *C. dubiosa* Hedgpeth,

1949 has narrower intervals between the crurigers and a curved propodus, whereas *C. novaezealandiae* (Thomson, 1884) has a slender and more curved propodus.

Callipallene novaezealandiae (Thomson, 1884)

Callipallene brevirostris novaezealandiae; Stock, 1954: 48-50 (older refs.); Child, 1975: 10 (refs.); Stock, 1975b: 127-132; Child, 1982b: 277; Nakamura & Child, 1983: 58-59; Child, 1983: 708-709; Child, 1988b: 21; Nakamura & Child, 1988: 664; Müller, 1990d: 106; Child, 1991: 145; Nakamura & Child, 1991: 38.

1 ♂. "Alpha Helix" Stn. M-4, Australia (Northern Territories), S. shore of East Vernon Is., 12°05.0'S 131°06.0'E, from algae washings, 0-3 m, 31 May 1979 (ZMA Pa. 200.932).

Remarks.- Widely distributed from New Zealand, South Australia, various islands in the western Pacific, including the Philippines, to Japan. Bathymetrical range 0-82 m.

Parapallene haddoni Carpenter, 1892

Carpenter, 1892: 553-555, Pl. XXII Figs. 1-6; Loman, 1908: 44; Clark, 1963: 26-28, Fig. 13; Child, 1975: 12-15, Fig. 6a-c.

1 immature spm. International Indian Ocean Expedition, "Anton Bruun" Cruise 7, Stn. 372-C, Moçambique, 24°46'S 34°50'E, rock dredge, 22 m, 19 Aug. 1964 (ZMA Pa 200.864).

Remarks.- It is risky to identify immature material (oviger still incompletely developed). There seems, however, nothing to prevent an identification as *P. haddoni*, especially since Clark (1963), after re-examination of the cotypes, and Child (1975a) noticed considerable intraspecific morphological variation.

All previous records are from the Australian shelf, ranging from tropical waters (Torres Strait) in the north to cooler waters as far south as 32° (Rottneest Island). This is the first record outside Australia.

Parapallene nierstraszi Loman, 1908

Child, 1975: 15, Fig. 7 (older refs.); Nakamura & Child, 1991: 41; Stock, 1991a: 193 (in key); Stock, 1991b: 223.

1 ♂ ovig., 2 ♀. International Indian Ocean Expedition, "Anton Bruun" Cruise 9, Stn. 456, Somalia, 11°14'N 51°08'E, 27-31 m, 17 Dec. 1964 (ZMA Pa. 200.948).

Remarks.- A wide-ranging species, recorded from Western Australia, through Indonesia and the Philippines to Japan, and in the west to South Africa. It is new to the north-western Indian Ocean.

Pseudopallene spec.

1 larva. International Indian Ocean Expedition, "Anton Bruun" Cruise 8, Stn. 420-A, Kenya, 02°42'S 40°53'E, shrimp trawl, 140 m, 6 Nov. 1964 (ZMA Pa. 200.933).

Remarks.- It is possible that this is the larva of *Ps. gilchristi* Flynn, 1928, a species known from off Port Natal (Flynn, 1928), the Transkei area (Arnaud & Child, 1988), and Lorenzo Marques (Stock, 1968b), although it disagrees from the adults in having small pectinations on the propodal heel spines.

Pigrogromitus timsanus Calman, 1927

Stock, 1991a: 194-195 (refs.).

3 spms. "Alpha Helix" Stn. M-16, Australia (Queensland), Cape York Peninsula, 12°35.4'S 141°36.2'E, hand-collected at 1 m, 4 June 1979 (ZMA Pa. 200.863).

1 spm. "Alpha Helix" Stn. M-126, Indonesia, Minahassa Peninsula (Sulawesi), 01°53.3'N 125°06.0'E, hand-collected between 0 and 6 m, 16 July 1979 (ZMA Pa. 200.939).

Remark.- A pan-tropical shallow-water species.

Queubus jamesanus Barnard, 1946

Barnard, 1946: 63; Barnard, 1954: 157-158, Fig. 34; Barnard, 1955: 107; Stock, 1959: 562-563, Fig. 7; Day, 1969: 121, 1 Fig.

1 juv. International Indian Ocean Expedition, "Anton Bruun" Cruise 8, Stn. 394-B, Natal, 29°27'S 31°31'E, shrimp trawl, 68-70 m, 25 Sep. 1964 (ZMA Pa. 200.871).

Remarks.- The oviger of this juvenile is still imperfectly developed. This curious species is known from a limited part of the South African east coast only; previous records were all from the intertidal zone or very shallow waters.

Family Phoxichilidiidae

Pallenopsis (Pallenopsis) angusta

Stock, 1991

Stock, 1991a: 195-197, Figs. 47-48.

1 ♀. "Baruna Jaya 1", KARUBAR Stn. CP 25, Indonesia, Kai Islands, 05°30'S 132°52'E, beam trawl, 336-346 m, 26 Oct. 1991 (MNHN Py. 858).

Remarks.- This species was recorded before from New Caledonia and the Loyalty Islands. It is new to Indonesia.

Pallenopsis (Pallenopsis) spinipes Carpenter, 1907. Fig. 19.

Stock, 1957b: 88-91, Figs. 5-7 (redescr. types, older refs.); Nakamura, 1987: 11-12, Pl. 9; Child, 1988: 66.

1 ♂. International Indian Ocean Expedition, "Anton Bruun" Cruise 8, Stn. 408-D, Moçambique Channel, 16°42'S 43°19'E, rock dredge, 150-300 m, 15 Oct. 1964 (ZMA Pa. 200.941).

Remarks.- This is a somewhat variable species, characterized by the following combination of morphological features: crurigers 1 and 2 sepa-

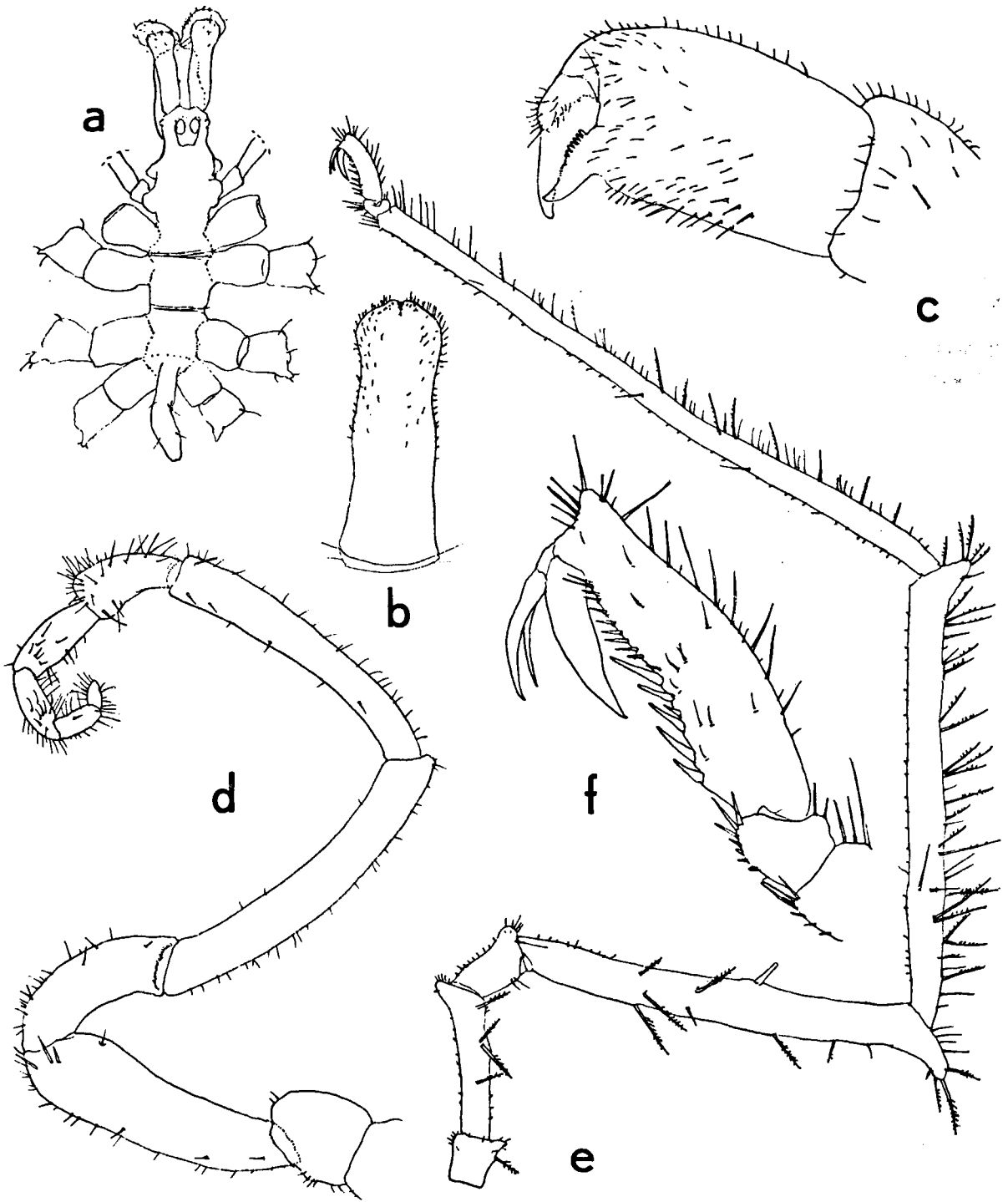


Fig. 19. *Pallenopsis (P.) spinipes* Carpenter, 1907, ♂, from "Anton Bruun" Cruise 8, Stn. 408-D. a, trunk, dorsal; b, proboscis, ventral; c, chela; d, oviger; e, leg 3; f, distal segments of leg 3.

rated by much smaller interval than crurigers 2 and 3; coxa 1 with 1 dorsal tubercle; immovable finger of chela with row of strong teeth in proximal part; legs with distal spur on femur and tibia 1; long barbed spines present in fluctuating numbers on coxae 1 and 2, femur, and both tibiae.

The present specimen bears out these characters very clearly, but differs from previously recorded samples in having slightly more slender legs, bearing more numerous barbed spines.

The species was previously found in the Fiji Islands, Sagami Bay (Japan), the Maldive and Amirante Islands, and Aldabra atoll, between 0 and 80 m. The present record extends both the geographical range to the Moçambique Channel, and the bathymetrical range to 300 m.

Pallenopsis (Pallenopsis) spec.

1 juv. International Indian Ocean Expedition, "Anton Bruun" Cruise 8, Stn. 403-E Moçambique, 19°09'S 36°55'E, shrimp trawl, 88 m, 9 Oct. 1964 (ZMA Pa. 200.849).

Remark.- This juvenile, still without well-developed ovigers, cannot properly be identified.

Pallenopsis (Bathypallenopsis) californica
Schimkewitsch, 1893. Fig. 20.

Pallenopsis californica Schimkewitsch, 1893: 39-41, Pl. I Fig. 11, Pl. II Figs. 18-23; Hilton, 1942c: 40 (no new material); Turpaeva, 1969: 63 (text only).

Pallenopsis (Bathypallenopsis) californica; Stock, 1975a: 1036, Figs. 33-34 (redescr. types); Turpaeva, 1991: 39.

Pallenopsis oscitans; Barnard, 1954: 122, Fig. 17 (non Hoek, 1881).

1 ♂. International Indian Ocean Expedition, "Anton Bruun" Cruise 8, Stn. 399-C, Moçambique Channel, 21°18'S 36°18'E, shrimp trawl, 1510-1600 m, 10 Feb. 1964 (ZMA Pa. 200.944).

Remarks.- Rarely recorded but widely distributed in the Indian and Pacific Oceans: Gulf of California (type-locality), off Cape Point, South

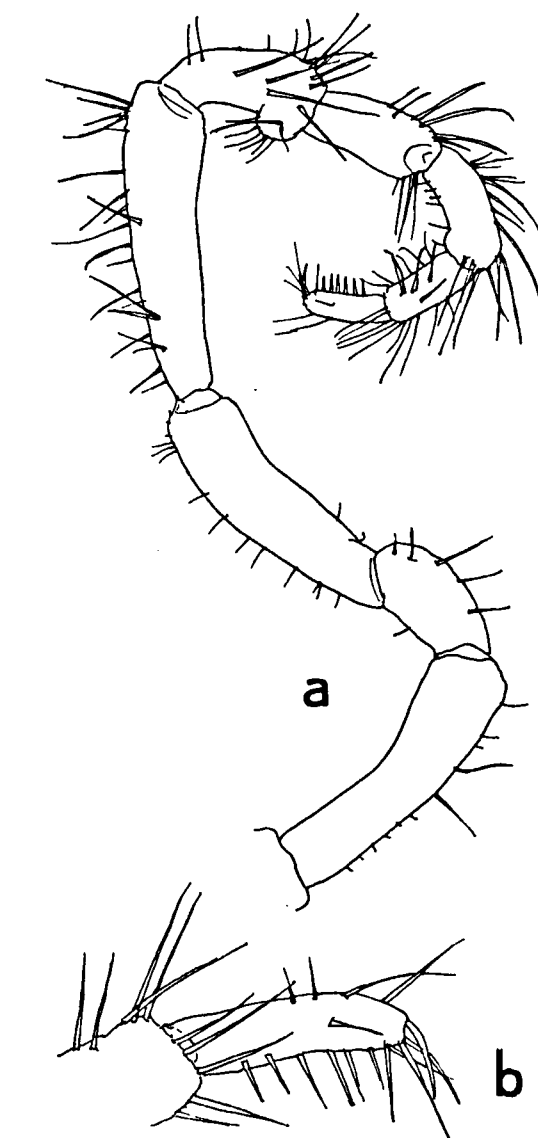


Fig. 20. *Pallenopsis (Bathypallenopsis) californica* Schimkewitsch, 1893, ♂, from "Anton Bruun" Cruise 8, Stn. 399-C. a, oviger; b, distal oviger segment.

Africa (Barnard, 1954), and Moçambique Channel (Turpaeva, 1991, and present record). Bathymetrical range 1510-3000 m.

I agree with Turpaeva that the South African specimen recorded by Barnard (1954) under the name of *P. oscitans*, belongs in reality to *P. californica*.

The male oviger is illustrated in the present

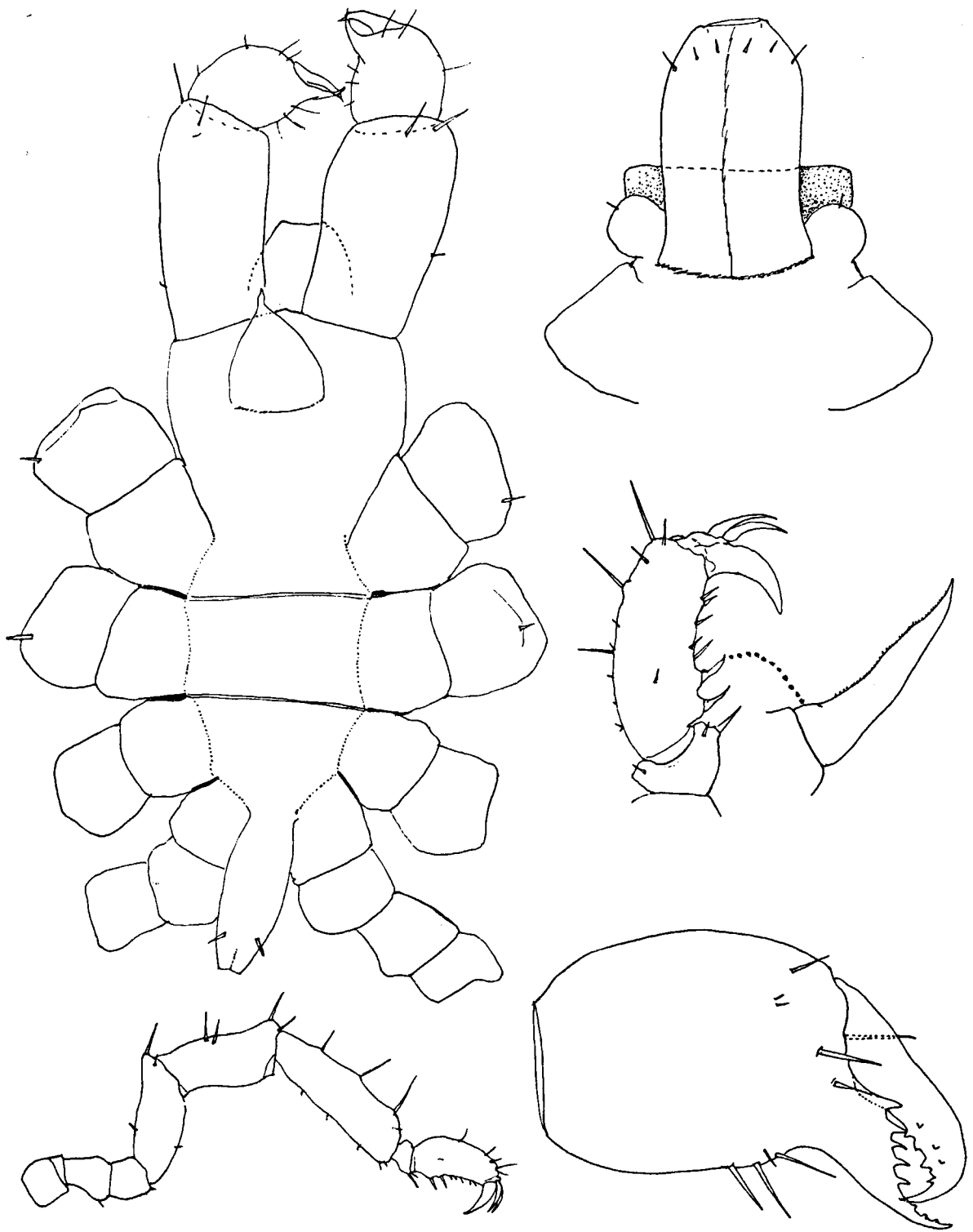


Fig. 21. *Phoxichilidium ponderosum* n. sp., ♀ holotype, from "Alpha Helix" Stn. M-135. a, trunk, dorsal; b, proboscis and neck, ventral; c, chela; d, leg 3; e, distal segments of leg 3.

paper, showing the details of the ornamentation in more detail than Schimkewitsch' figure.

Pallenopsis (Bathypallenopsis) paramolis Stock, 1975

Stock, 1975a: 1045-1048, Figs. 38-39.

1 ♂. "Baruna Jaya I", KARUBAR Stn. CP 72, Indonesia, Tanimbar Island, 08°36'S 131°33'E, beam trawl, 699-676 m, 2 Nov. 1991 (MNHN Py. 858).

2 ♂, 2 ♀. International Indian Ocean Expedition, "Anton Bruun" Cruise 8, Stn. 399-C, Moçambique Channel, 21°18'S 36°18'E, shrimp trawl, 1510-1600 m, 10 Feb. 1964 (ZMA Pa. 200.940).

Remarks.- The type-specimens were collected at two "Albatross" stations S. of Honshu (Japan). The species was never recorded again, consequently it is new to Indonesia and Moçambique. Also the bathymetrical is extended, from 676-1600 m.

Pallenopsis (Bathypallenopsis) scoparia Fage, 1956

Nakamura & Child, 1991: 40 (refs.); Stock, 1991a: 198 (refs.); Child, 1992a: 67-69, Fig. 31.

2 ♀. "Baruna Jaya I", KARUBAR Stn. CP 38, Indonesia, Tanimbar Island, 07°40'S 132°27'E, beam trawl, 620-666 m, 28 Oct. 1991 (1 ♀ POLIPI, 1 ♀ ZMA Pa. 200.652).

1 juv. International Indian Ocean Expedition, "Anton Bruun" Cruise 5, Stn. 2718, Maldive Islands, 06°20'N 74°75'E, 500-1000 m, 30 Apr. 1964 (ZMA Pa. 200.850).

Remarks.- This species has been recorded from all major oceans, in deeper waters (312-1520 m). The station number on the label for the "Anton Bruun" station in the Maldives is probably erroneous (the expedition did not reach numbers far in the two-thousand).

Pallenopsis (Bathypallenopsis) tydemani tydemani Loman, 1908

Nakamura & Child, 1990: 308 (refs.); Nakamura & Child, 1991: 40-41 (refs.); Stock, 1991b: 224 (refs.). See also Bamber & Thurston, 1993 851-852, Fig. 9.

1 ♂. "Baruna Jaya I", KARUBAR Stn. CP 54, Indonesia, Tanimbar Island, 08°21'S 131°43'E, beam trawl, 836-869 m, 30 Oct. 1991 (POLIPI).

Remarks.- Known from deeper waters (100-1709 m) from Indonesia to Japan.

Phoxichilidium ponderosum n. sp. Fig. 21.

1 ♀ (holotype). "Alpha Helix" Stn. M-135, Indonesia, Sangihe islands, 03°44.1'N 125°34.9'E, hand-collected between 1 and 18 m, 18 July 1979 (ZMA Pa. 200.873).

Description.- Female: Trunk with segmentation lines between segments 1 and 2, and 2 and 3. Crurigers shorter than trunk diameter, touching, unarmed. Neck reaching to middle of proboscis, massive, wide, unadorned. Ocular tubercle conical, with sharply pointed tip; eyes (in preserved specimen) indistinct. Abdomen carried horizontally, reaching beyond tip of coxa 1 of leg 4. Proboscis more or less cylindrical, with row of stiff setules subterminally.

Chelifore scape massive, with few setae, without tubercles. Chela with oval hand; movable finger strongly curved in distal part, with 4 triangular teeth and auxiliary row of 3 minute teeth; immovable finger with 5 tall proximal teeth and 3 minute distal teeth.

Palps present in shape of globular swellings, left and right of insertion of proboscis. No ovigers.

Legs short. Coxa 1 of anterior two pairs of legs with 1 dorsal spinule, on remaining legs naked. Tibia 2 longest segment. Propodus short and heavy; 2 heel spines, each spine fringed with microscopical setules along one margin; sole with 5 slender spines. Claw curved, less than half as long as propodus. Auxiliary claws long, over

half as long as claw. Genital apertures on ventral surface of coxa 2 of all legs.

Male unknown.

Measurements of ♀ holotype (mm).- Length of 1st trunk segment 0.40; length 2nd trunk segment 0.12; length 3rd + 4th trunk segments (to tip 4th cruriger) 0.29; width across 2nd crurigers 0.51; length proboscis (ventral) 0.38; greatest (= distal) diameter proboscis 0.21; anterior diameter neck 0.34; length scape 0.35; length chela 0.28. Third leg: 1st coxa 0.11; 2nd coxa 0.19; 3rd coxa 0.14; femur 0.38; 1st tibia 0.39; 2nd tibia 0.57; tarsus 0.07; propodus 0.32; claw 0.11; auxiliary claws 0.08.

Etymology.- The specific name, *ponderosum* (Latin = heavy, massive) alludes to the very compact habit of the new species.

Remarks.- Only 7 species of the *Phoxichilidium* /*Anoplodactylus*-complex possess dorsally implanted, well-developed auxiliary claws (Stock, 1991a: 202). All these species have well-separated crurigers and none resembles the new species in having touching crurigers (the so-called *Halosoma* type). Moreover, in most species the auxiliary claws are much shorter than in *P. ponderosum*.

The holotype does not look quite full-grown, but the female genital apertures are clearly visible, so the specimen is apparently mature.

Anoplodactylus batangensis (Helfer, 1938)

Stock, 1968b: 54 (older refs., syn.); Zambrana et al., 1985: 32 (refs.); Müller, 1991: 106-109, Fig. 47 (refs.); Child, 1992a: 41-42, Fig. 18; Müller, 1993: 47.

1 ♂, 1 ♀, 1 juv. "Alpha Helix" Stn. M-39, Louisiade Archipelago, 10°46'18"S 152°22'45"E, hand-collected between 0 and 6 m, 15 June 1979 (ZMA Pa. 200.893).

1 larva, "Alpha Helix" Stn. M-134, Indonesia, Sangihe islands, 03°46.0'N 125°35.0'E, hand-collected at ca. 6 m, 18 July 1979 (ZMA Pa. 200.904).

Remarks.- An easily recognizable species, with a

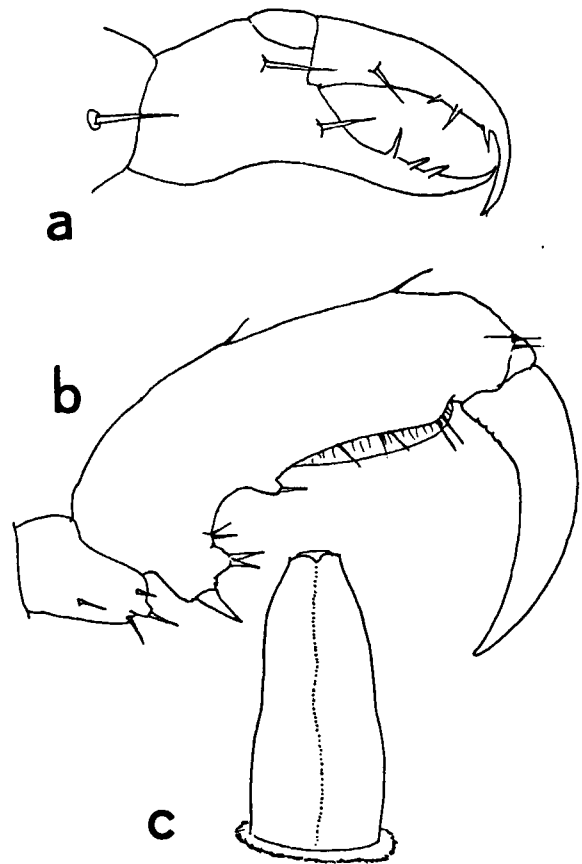


Fig. 22. *Anoplodactylus*. a-b, *A. calliopus* Staples, 1982, ♀, from "Alpha Helix" Stn. M-5: a, chela; b, distal segments of leg 2. c, *A. chamorrus* Child, 1983, ♂, from Guam, proboscis, ventral.

very slim proboscis. Distribution circum-tropical, in shallow waters. In the Indo-West Pacific it has been recorded from Madagascar, Tanzania, the Philippines, the Great Barrier Reef, and New Caledonia.

Anoplodactylus calliopus Staples, 1982. Fig. 22a-b.

Staples, 1982: 459-461, Fig. 3.

1 ♀. "Alpha Helix" Stn. M-5, Australia (Northern Territories), shore East Vernon Is., 12°05'S 131°06'E, reef flat platform, depth 0 m, 31 May 1979 (ZMA Pa. 200.807).

1 ♀. "Alpha Helix" Stn. M-86, Indonesia, Misoöl island, 02°03.8'S 130°08.3'E, hand-collected at 0.5 m, 3 July 1979 (ZMA Pa. 200.910).

Remarks.- While the female from Stn. M-86 agrees fully with *A. calliopus* as described by Staples from Queensland, the female from Stn. M-5 does not quite.

In good agreement are the armature of the propodal heel and sole, the absence of auxiliary claws, and the presence of teeth of the fingers of the chela. Not in agreement are the slope of the propodal lamina (oblique in *A. calliopus*, vertical in the Stn. M-5 specimen), and the number of teeth on the chela (7-8 teeth in *A. calliopus*, 3 teeth in Stn. M-5 specimen). These differences are shown in Fig. 22a-b. In absence of males, it seems best to treat this specimen as *A. calliopus*.

Anoplodactylus chamorrus Child, 1983. Fig. 22c.

Child, 1983: 705-707, Fig. 3; Child, 1988b: 16; Child, 1990: 330-331; Child, 1991: 143; Müller, 1992: 164.

1 ♂ ovig., 2 ♂, 4 ♀, 1 juv. Guam, NCS Beach (Tanguisson Beach), 13°32.9'N 144°48.4'E, hand-collected, intertidal, 18 Oct. 1983, leg. R.F. Bolland (ZMA Pa. 200.799).

4 ♂, 3 ♀, 2 juv. Guam, 1 km ENE of Anae Island (Nimitz Beach), 13°21.6'N 144°38.7'E, hand-collected, intertidal, 20 Aug. 1983, leg. R.F. Bolland (ZMA Pa. 200.806).

1 ♂ juv., "Alpha Helix" Stn. M-28, Papua New Guinea, 09°33'30"S 147°10'E, hand-collected at 5 m, 12 June 1979 (ZMA Pa. 200.902).

1 ♂, 1 juv.. "Alpha Helix" Stn. M-32, Papua New Guinea, 10°10.6'S 148°07'E, hand-collected at 3 m, 13 June 1979 (ZMA Pa. 200.798).

Remarks.- In dorsal or ventral view, the proboscis of this species is slightly tapering (Fig. 22c), a feature not clearly borne out by Child's (1983) figure. As Child (1991) puts it, it would seem as though the longstanding home of this species is Guam. Other localities are in the Philippines, Malaysia, and on the Australian

Great Barrier reef, all in very shallow waters.

Anoplodactylus cryptus n. sp. Fig. 23.

? *Anoplodactylus* species; Child, 1975: 20-22, Fig. 9a-e.

1 ♂ (holotype). "Alpha Helix" Stn. M-4, Australia (Northern Territories), S. shore of East Vernon Is., 12°05.0'S 131°06.0'E, from algae washings, 0-3 m, 31 May 1979 (ZMA Pa. 200.804).

Description.- Male (holotype): Trunk robust, compact; segmentation lines present between segments 1 and 2, and 2 and 3. Crurigers as long as wide, separated by less than their diameter; distodorsally with 1 spinule. Proboscis barrel-shaped, short, truncate at tip; ventrodorsal surface with some spinules. Ocular tubercle low, rounded; eyes pigmented. Abdomen short, thick.

Chelifore scape thin, armed with some small spinules. Chela with almost naked palm and strongly curved fingers without teeth; immovable finger longer than movable one.

Palp rudiments present as small knobs at expanded base of neck.

Oviger 6-segmented, segment 3 longest; few minute spinules on segments 2 through 4; segment 5 with 1 strong, endal, crooked spine in proximal third and 4 smaller reversed spines on ectal and medial surfaces; segment 6 rounded, with 3 crooked, reversed spines.

Legs rather glabrous. Coxa 2 not elongate; genital spur on legs 3 and 4 not very prominent. Cement gland in proximal half of dorsal side of femur, elongate in shape, discharging through 1 small, simple pore. Propodal heel not very pronounced, armed with 2 strong spines; sole with 7 sigmoid spines and row of simple spines; propodal lamina almost vestigial. Claw robust. Auxiliary claws present, lateral.

Female unknown.

Measurements of male holotype (mm).- Length trunk (anterior margin neck to tip 4th cruriger) 0.72; width across 2nd crurigers 0.39; length proboscis (ventral) 0.24; greatest diameter proboscis 0.15. First leg: 1st coxa 0.13; 2nd coxa

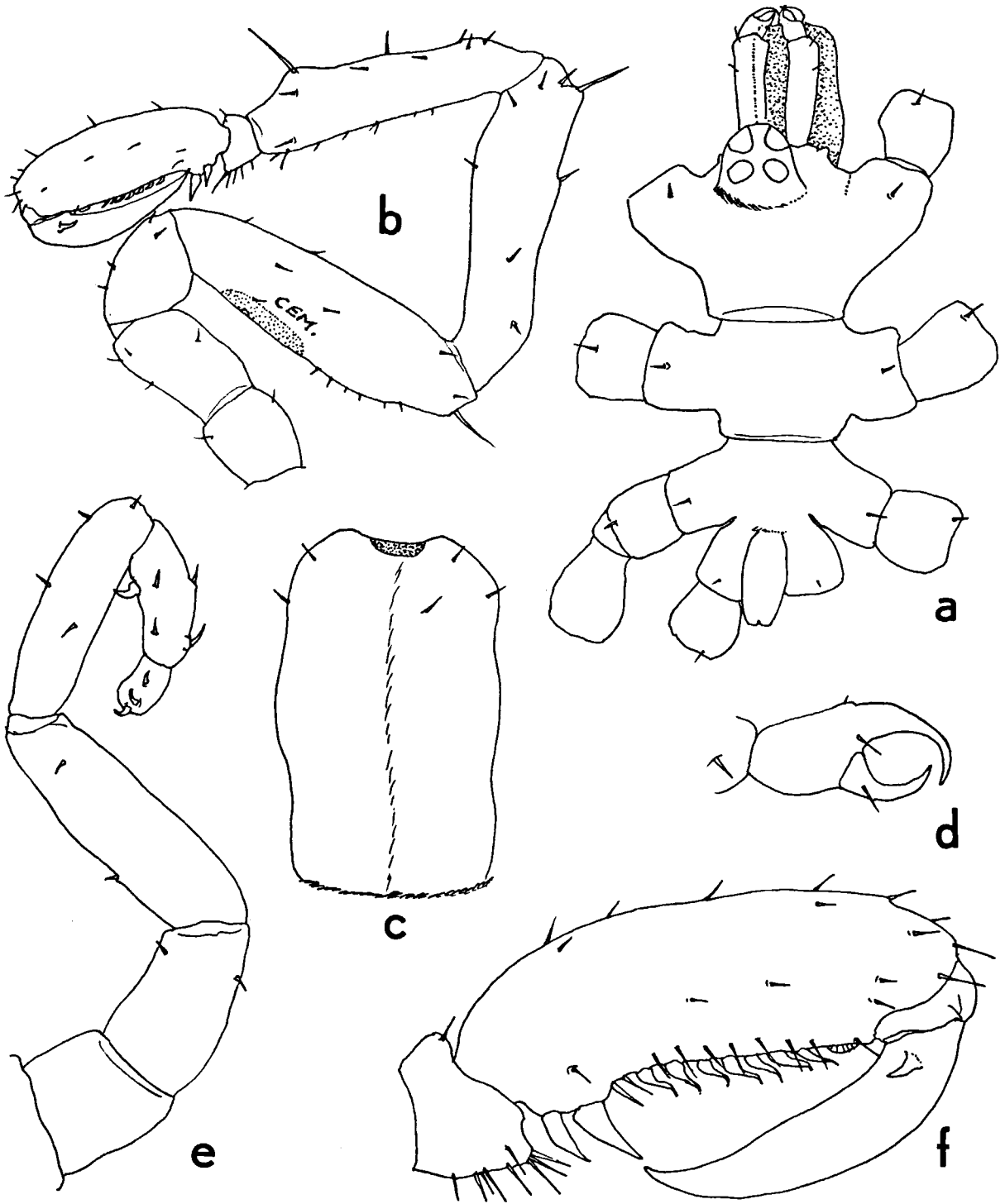


Fig. 23. *Anoplodactylus cryptus* n. sp., ♂ holotype, from "Alpha Helix" Stn. M-4. a, trunk, dorsal; b, leg 1 (to same scale as trunk); c, proboscis, ventral; d, chela; e, oviger; f, distal segments of leg 2. [CEM. = cement gland.]

0.19; 3rd coxa 0.13; femur 0.47; 1st tibia 0.44; 2nd tibia 0.41; tarsus 0.05; propodus 0.34; claw 0.25.

Etymology.- The name *cryptus* (from the Greek κρυπτός, meaning concealed) alludes to the fact that this species has several look-alikes in Australia.

Remarks.- At first sight, the new species looks like *A. spirostrum* Stock, 1973a from south-eastern Australia, and *A. evansi* Clark, 1963 from New South Wales and Tasmania. However, in these two species the cement gland opens through a short duct instead of a pore. *A. evansi* has moreover a more robust chela, a longer second coxa with a projecting genital spur, and a more elongate oviger, especially clear at the level of segments 2 and 3. *A. spirostrum* resembles *A. cryptus* more closely, but has a long propodal lamina.

Perhaps *A. cryptus* is the male sex belonging to a female from the northern coast of New South Wales, recorded by Child (1975a) as *Anoplodactylus* species. Unfortunately, Child did not provide any measurements of his material, so we do not know if a tiny species, like *A. cryptus*, or a bigger one is concerned.

Anoplodactylus digitatus (Böhm, 1879)

Stock, 1965: 28-29 (syn., older refs.); Müller, 1992: 164-166, Figs. 18-26; Stock, 1992b: 94 (refs.)

1 ♀ juv. "Snellius II" Stn. 4.163, Indonesia, off SW Salayer, 06°21.8'S 120°26.5'E, dredge, 65-75 m, sandy bottom with sponges and soft corals, 29 Sep. 1984 (RMNH 93661).

Remark.- An almost pantropical and -subtropical species.

Anoplodactylus exaggeratus n. sp. Figs. 24-25.

1 ♂ (holotype), "Alpha Helix" Stn. M-102,

Indonesia, Banda Islands, 04°32.6'S 129°40.6'E, hand-collected at 15 m, 8 July 1979 (ZMA Pa. 200.793).

1 juv. International Indian Ocean Expedition, "Te Vega" Stn. 65 LH 3, Singapore, Pulau Mantu, 01°10'N 103°45'E, hand-collected between 0 and 1 m, 18 Oct. 1963 (ZMA Pa. 200.894).

Description.- Male: An extremely attenuated and slender species, similar only to *A. tenuicarpus* Child, 1991 (*A. t.*), from which it differs in the following characters:

Crurigers with 1 distal seta (none in *A. t.*). Chela very slender almost half as long as filiform scape (one-third of scape in *A. t.*); palm narrower, 3 times as long as largest diameter (twice as long in *A. t.*); fingers also more slender, strongly curved, armed with 3 (movable finger) to 5 (immovable finger) fine, needle-like teeth (teeth triangular in *A. t.*).

Oviger very elongate; 2nd and 4th segment at least 10 times longer than basal diameter (in *A. t.* 6 to 8 times); 5th segment half as long as 4th (two-third of 4th in *A. t.*)

Legs lankier than those of *A. t.* Femur with only one, low, broad cement gland cusp, situated distad of middle of dorsal surface of segment (2 cusps in *A. t.*). Tibia 1 slightly longer than tibia 2 (slightly shorter in *A. t.*). Tibia 2 $3\frac{1}{4}$ times longer than propodus ($2\frac{2}{3}$ times in *A. t.*). Propodus with 2 heel spines; second heel spine with 12 slender teeth (7 or 8 less tall teeth in *A. t.*).

Remaining characters as in *A. t.*

Female unknown.

Measurements of ♂ holotype (mm).- Length 1st trunk segment 0.31; length 2nd trunk segment 0.49; length 3rd trunk segment 0.52; length 4th trunk segment (to tip 4th cruriger) 0.37; width across 2nd crurigers 0.77; length proboscis (ventral) 0.43; greatest diameter proboscis 0.13. Second leg: 1st coxa 0.19; 2nd coxa 0.61; 3rd coxa 0.16; femur 1.11; 1st tibia 1.26; 2nd tibia 1.20; tarsus 0.05; propodus 0.37; claw 0.23.

Etymology.- The specific name is Latin and

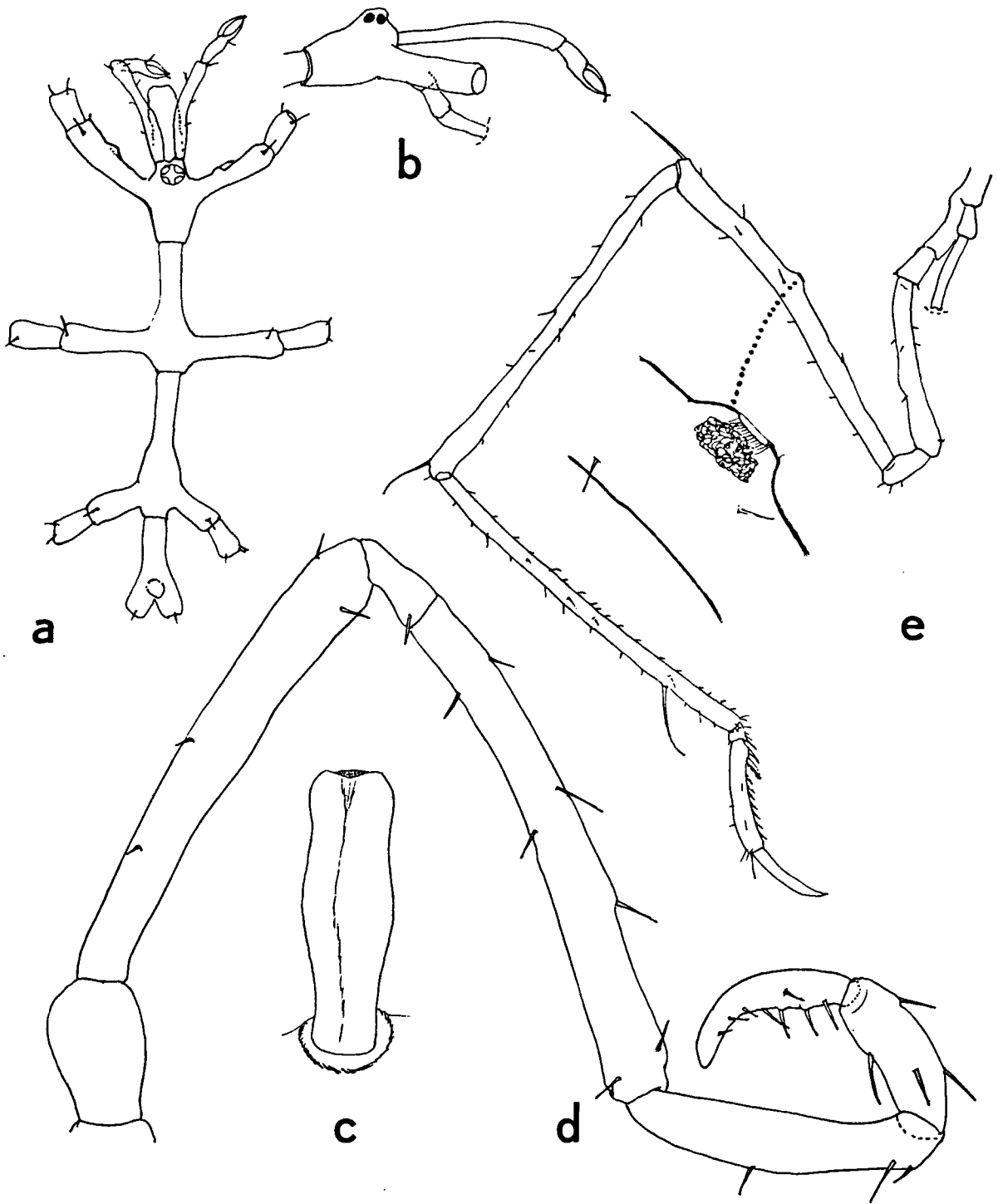


Fig. 24. *Anoplodactylus exaggeratus* n.sp., ♂ Holotype, from "Alpha helix Stn. M-102. a, trunk; b, cephalic segment from the right; c, proboscis, ventral; d, oviger; e, leg 1, with cement gland more strongly enlarged

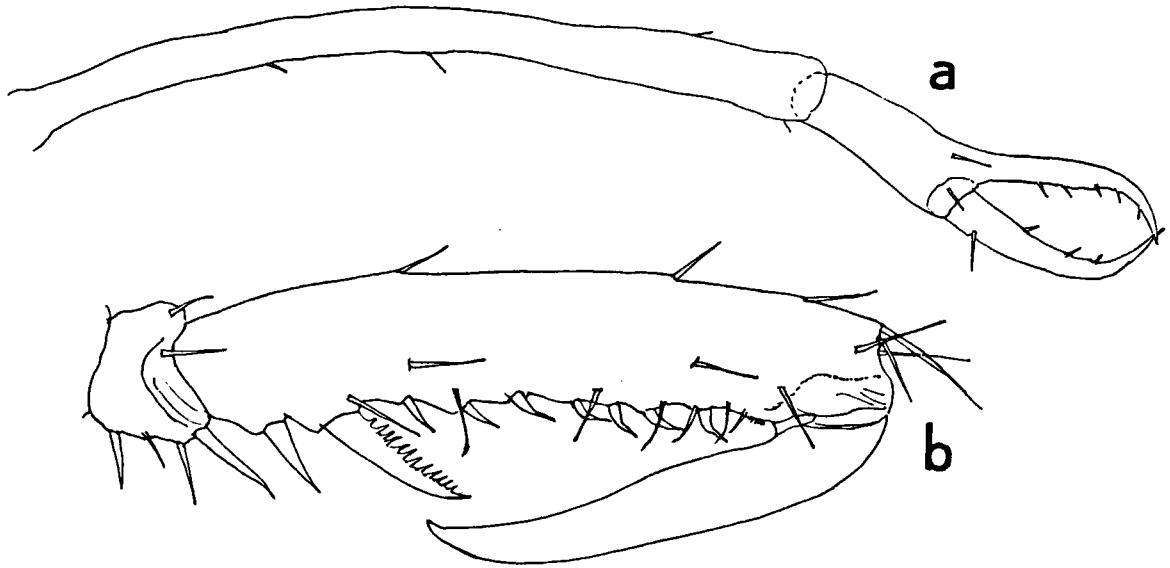


Fig. 25. *Anoplodactylus exaggeratus* n. sp., ♂ holotype. a, chelifore; b, distal segments of leg 1.

means exaggerated, alluding to the extremely spindle-shanked appearance of the new species.

Remarks.- The differences between *A. exaggeratus* and *A. tenuicarpus* are indicated in the above description. The juvenile from "Te Vega" Stn 65 LH 3 agrees with the holotype in the very long chelae, the setiferous crurigers, and the number of pectinations of the propodal heel spine of leg 1.

***Anoplodactylus glandulifer* Stock, 1954**

Stock, 1954b: 80-84, Fig. 36; Stock, 1992b: 94-95 (refs.); Müller, 1992: 166, Figs. 27-30.

1 ♀. "Alpha Helix" Stn. M-4, Australia (Northern Territories), S. shore of East Vernon Is., 12°05.0S 131°06.0'E, from algae washings, 0-3 m, 31 May 1979 (ZMA Pa. 200.897).

Remarks.- Wide-spread in the intertidal zone and very shallow waters of the Indo-West Pacific, from Polynesia in the east to the African coast in the west.

***Anoplodactylus laminatus* n. sp. Fig. 26.**

1 ♂ (holotype). "Alpha Helix" Stn. M-128, Indonesia, Minahassa Peninsula (Sulawesi), 01° 51.2'N 125°05.7'E, hand-collected between 2 and 11 m, 16 July 1979 (ZMA Pa. 200.817).

1 ♀ juv. "Alpha Helix" Stn. M-28, Papua New Guinea, 09°33'30"S 147°10'E, hand-collected at 5 m, 12 June 1979 (ZMA Pa. 200.911).

1 ♀ juv. "Alpha Helix" Stn. M-108, Indonesia, Molucca Sea, 00°06.3'S 126°27.0'E, hand-collected between 0 and 8 m, 12 July 1979 (ZMA Pa. 200.808).

1 ♀ juv. "Alpha Helix" Stn. M-124, Indonesia, Halmahera islands, 01°40.9'N 127°32.2'E, hand-collected between 0 and 0.5m, 15 July 1979 (ZMA Pa. 200.810).

Description. Male: Clear articulation lines between trunk segments 1 and 2, and 2 and 3; no articulation line between segments 3 and 4. Neck narrow. Ocular tubercle low, tip bluntly pointed; eyes well-pigmented. Crurigers unadorned, but for some minute setules; separated by narrow intervals. Abdomen short, directed obliquely upward at an angle of some 45°.

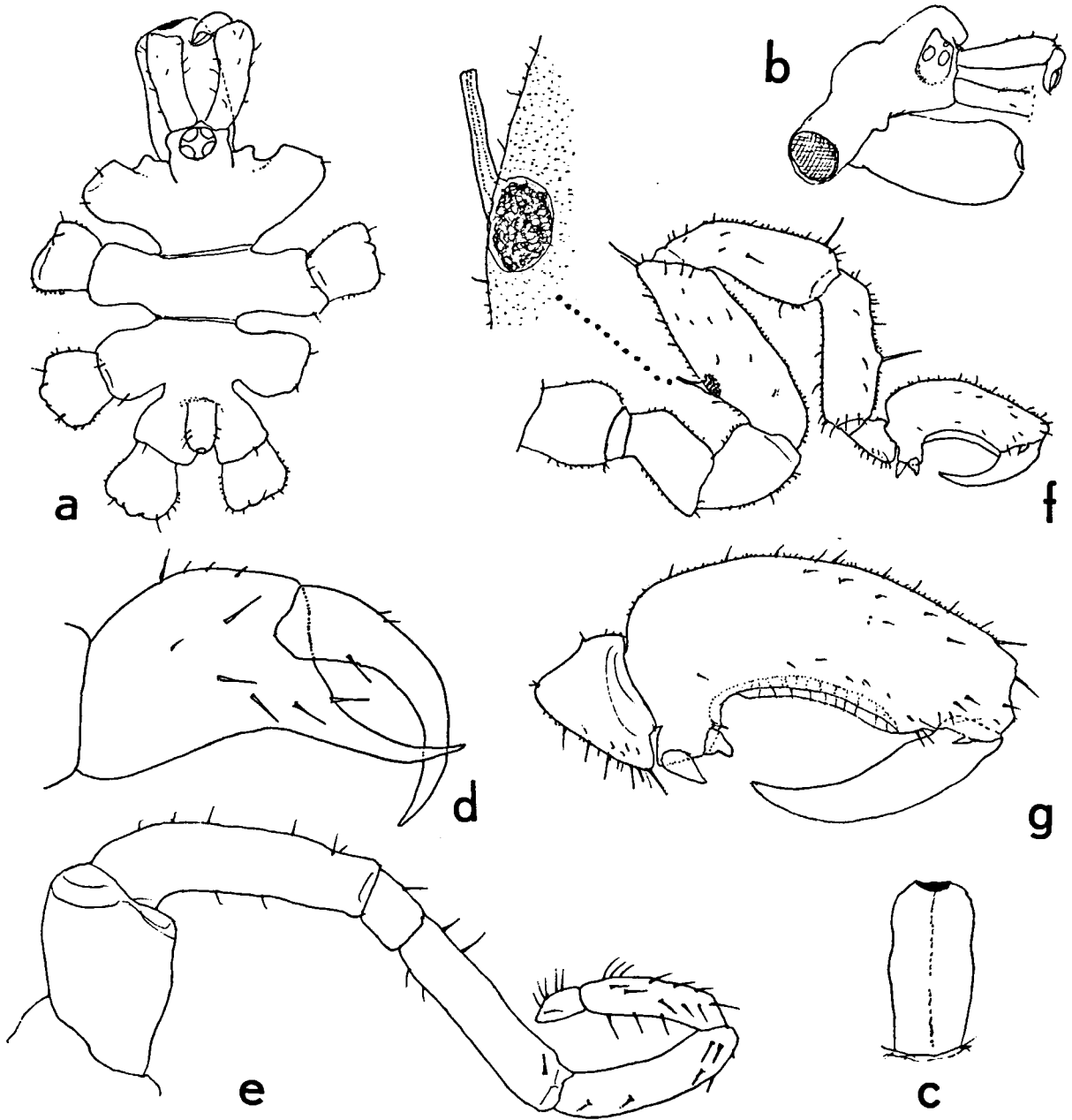


Fig. 26. *Anoplodactylus laminatus* n. sp., ♂ holotype, from "Alpha Helix" Stn. M-128. a, trunk, dorsal; b, cephalic segment, from the right; c, proboscis, ventral; d, chela; e, oviger; f, leg 3; g, distal segments of leg 3.

Proboscis somewhat barrel-shaped, wider near tip than at base; in lateral view slightly upcurved.

Chelifere scapes diverging, slightly curved, armed with some small spinules only. Chela not very spinous either, with long, curved fingers, each finger with an inner seta but no teeth.

Palps represented by pronounced swelling or

tubercle.

Oviger 7-segmented (!), because suture between segments 3 and 4 distinct (vestigial or absent in most other species of the genus). Segments 5 to 7 with several so-called reversed spines.

Legs short and robust, all segments finely

pubescent. Coxa 2 *ca.* 1¹/₂ times as long as coxa 1. Femur > tibia 1, tibiae 1 and 2 subequal. Femoral cement gland oval; tube narrow, somewhat less than half as long as femoral diameter, inserted before middle of dorsal margin of segment. Tarsus with weakly projecting ventrodiscal corner, without strong spines. Propodus characteristic: strongly pronounced heel bearing only 2, roughly triangular, shark-tooth-shaped spines; sole concave and covered over its entire length with propodal lamina; lamina not membranaceous (as in most species of the genus) but callos; prelaminal spine absent. Claw strong, curved, with minute, lateral auxiliary claw.

Female.- Specimens at hand not adult. Proboscis without ventral outgrowths. Armature of propodal heel on one of the legs with 1 big spine only, in another leg with 1 big spine and 2 smaller spines; one of the legs of another specimen with 1 prelaminal spine; remaining legs as in holotype.

Measurements of ♂ holotype (mm).- Length trunk (frontal margin cephalic segment to tip 4th cruriger) 1.14; width across 2nd crurigers 0.73; length proboscis (ventral) 0.56; greatest diameter proboscis 0.29. Third leg: 1st coxa 0.27; 2nd coxa 0.41; 3rd coxa 0.30; femur 0.74; 1st tibia 0.53; 2nd tibia 0.53; tarsus 0.11; propodus 0.58; claw 0.33.

Etymology.- The specific name, *laminatus* (Latin) refers to the very long and strong propodal lamina.

Remarks.- The combination of narrowly separated crurigers, a longish and slender cement gland tube, and the propodal ornamentation (very long lamina, heel armature restricted to 2 spines) distinguish the new species from almost all other taxa in this large genus. In these respects, only 3 species, all from the Indo-Pacific, show resemblance to *A. laminatus*: *A. krappi* Müller, 1990a (from Kenya), *A. calliopus* Staples, 1982 (first described from Queensland), and *A. arescus* du Bois-Reymond Marcus, 1959 (first described from the Red Sea).

In *A. arescus* the tarsus bears a strong ventrodiscal projection, the propodal sole is convex (not

concave), and the crurigers are touching.

A. calliopus has toothed fingers of the chela, and the propodal sole bears one pair of prelaminal spines.

Closest is no doubt *A. krappi*; this species has, however, undivided oviger segments 3 and 4; the combined segments 3+4 are longer in *A. laminatus* than in *A. krappi*; the propodal sole of *A. krappi* bears 1 pronounced prelaminal spine; and *A. krappi* lacks auxiliary claws.

Anoplodactylus longiceps Stock, 1951

A. longiceps Stock, 1951: 16 (footnote) (pro *A. longicollis* Williams, 1941: 36-38, Figs. 2-5, preocc.); Stock, 1956: 97-98, Fig. 14c-d; Clark, 1963: 4 (listed), 55 (text); Child, 1975: 20, Fig. 9f; Child, 1990: 331; Child, 1991: 144.

1 ♀ (fragm.). "Alpha Helix" Stn. M-37, Louisiade Archipelago, 10°46'18"S 152°22'45"E, hand-collected at 6 m, 15 June 1979 (ZMA Pa. 200.809).

1 ♀ juv. "Alpha Helix" Stn. M-52, NE New Guinea, 05°48.2'S 146°11.4'E, hand-collected between 1 and 10 m, 19 June 1979 (ZMA Pa. 200.907).

Remarks.- Identification of females in this difficult genus has to be done under reservation. However, the long neck, widely spaced crurigers, tall and pointed ocular tubercle, and spurred femur are in perfect agreement with Williams' figures.

Previously known from Lindeman and Lizard Islands (Queensland, Australia), the Kai Islands (Indonesia), off Point Cloates (Western Australia), and Guam, in depths between 2 and 134 m.

Anoplodactylus maritimus Hodgson, 1914

Stock, 1975a: 1069-1074, Fig. 54 (distinction, syn.).

500+ spms. "Anton Bruun" Cruise 9, Stn. 479, Mid-Atlantic, 24°55'N 44°00'W, 19 Jan. 1965; 25°02'N 48°35'W, 20 Jan. 1965; 24°46'N 53°12'W, 21 Jan. 1965; dip net, surface (ZMA Pa. 200.947).

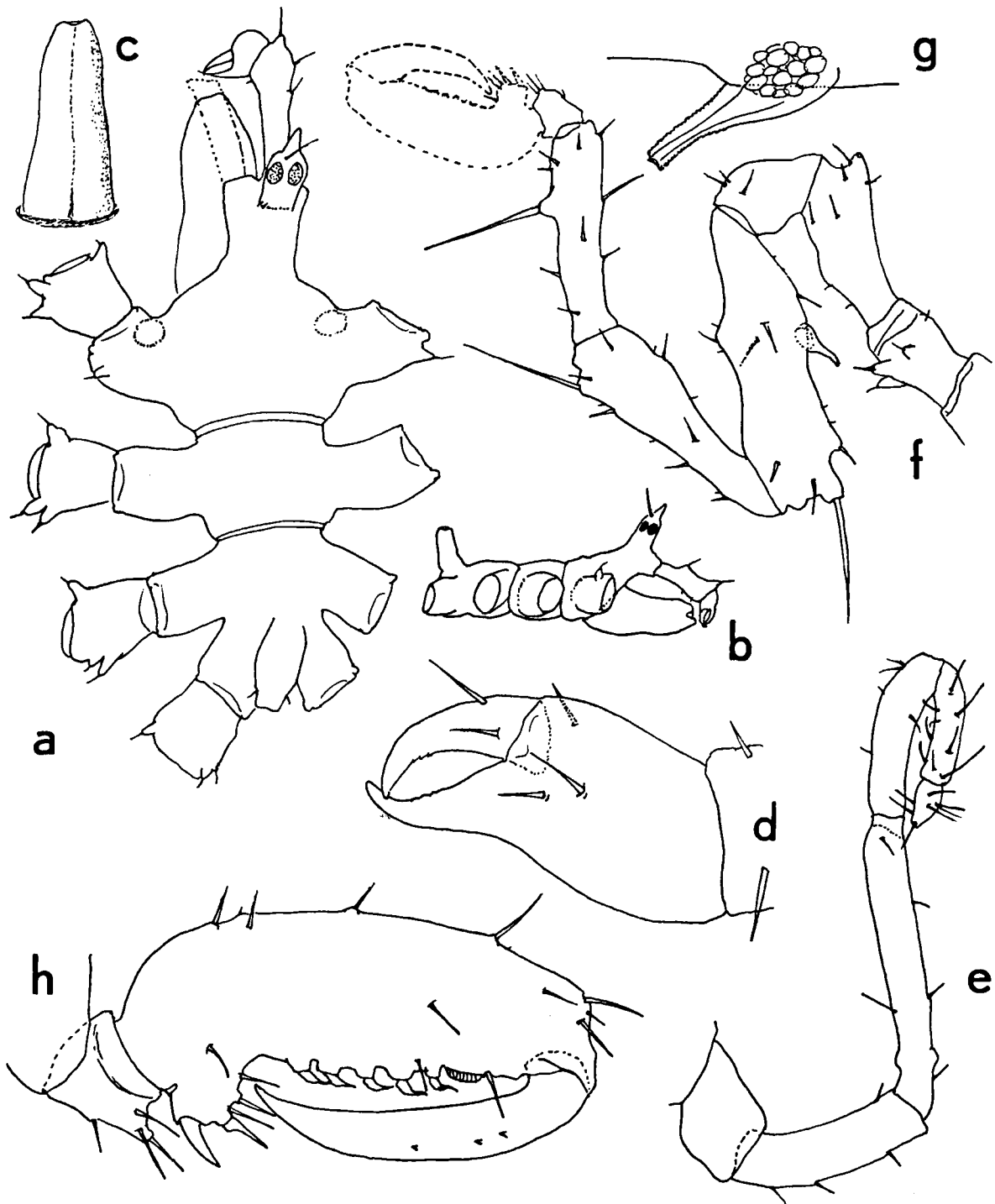


Fig. 27. *Anoplodactylus muelleri* n. sp., ♂ holotype, from "Alpha Helix" Stn. M-24. a, trunk, dorsal; b, trunk, from the right; c, proboscis, ventral; d, chela; e, oviger; f, leg 3; g, cement gland of leg 3; h, distal segments of leg 3.

Remarks.- This Atlantic species actually does not belong in this report, but because it was collected during the homeward bound leg of the "Anton Bruun" it is included here. According to the "Anton Bruun" labels, the species was associated with floating hydroids. The large samples contain ovigerous males and ripe females, but predominantly juveniles.

Anoplodactylus muelleri n. sp. Fig. 27.

1 ♂ (holotype). "Alpha Helix" Stn. M-24, Papua New Guinea, 09°31'48"S 147°15'24"E, hand-collected between 1 and 4 m, 9 June 1979 (ZMA Pa. 200.811).

Description.- Male: Trunk segments 1 and 2, and 2 and 3 articulated. Neck slender, narrow. Crurigers separated by approximately their own diameter; cruriger 1 with 1 posterodistal, spiniferous tubercle; distal margin of all crurigers with 2 hardly perceivable swellings. Ocular tubercle tall, sharply pointed, armed with 1 long seta; eyes present. Proboscis tapering but not really tubiform, somewhat upcurved in lateral view. Abdomen erect, not much longer than 4th cruriger.

Chelifere scape with 2 spiniferous swellings and some spines. Palm of chela longer than curved fingers; inner margin of both fingers with some minute crenulations.

Palp absent.

Oviger implanted way out on cruriger 1, 6-segmented; segment 3 longest.

Legs: coxa 1 with 1 anterodistal, 1 posterodistal and 1 posterior, pointed tubercle, each spine-tipped. Coxa 2 about twice as long as coxa 1; genital spur ventrodistal, on legs 3 and 4. Femur sort of distorted by swellings and bulges, like in some species of *Endeis*; cement gland globular, discharging through flask-shaped duct, with ribbed margins, located before middle of dorsal side of segment. Femur longer than either tibia 1 or 2. Propodal heel strong, armed with 2 stronger and 3 weaker spines; sole with row of 5 sig-

moid spines, each placed on low socle; lamina very short. Claw with 3 minute denticles on lateral surface; no auxiliary claws.

Female unknown.

Measurements of ♂ holotype (mm).- Length trunk (frontal margin cephalic segment to tip 4th cruriger) 0.79; width across 2nd crurigers 0.47; length proboscis (ventral) 0.44; greatest diameter proboscis (basal) 0.17; greatest diameter proboscis (distal) 0.13. Third leg: 1st coxa 0.13; 2nd coxa 0.25; 3rd coxa 0.13; femur 0.41; 1st tibia 0.35; 2nd tibia 0.34; tarsus 0.05; propodus 0.28; claw 0.20.

Etymology.- Named in honour of Dr. Hans-Georg Müller, who recently contributed to our knowledge by several ably illustrated papers on tropical, littoral Pycnogonida.

Remarks.- There are very few species in this prolific genus that have a tapering proboscis, the proboscis usually being barrel-shaped or cylindrical. Three species in the area under consideration show a tapering proboscis, i.e., *A. batangensis* (Helfer, 1938), *A. squalidus* Clark, 1973, and *A. chamorrus* Child, 1983. The proboscis of *A. batangensis* is rather different though, being very narrow, pipette-like; the species shares the presence of lateral denticles on the claw of the legs with the new species. *A. squalidus* differs above all by the transverse fingers of the chela. *A. chamorrus* has touching crurigers and lacks tubercles on coxa 1.

There is a strong general resemblance of the new species to *A. marshallensis* Child, 1982b, but that species lacks trunk segmentation, lacks a spiniferous process on cruriger 1, has 2 (instead of 3) tubercles on coxa 1, possesses a shorter femoral gland duct, the ocular tubercle is devoid of a posteriorly directed seta, and its proboscis is described as "a cylinder".

Other look-alikes show differences in one or more of the following characters: a lower ocular tubercle, a different proboscis, a longer propodal lamina, a different cement gland, absence of coxal tubercles, less "distorted" femora, presence of auxiliary claws.

Anoplodactylus pectinus Hedgpeth, 1948

Child, 1979: 58; Child, 1982b: 372-373 (older refs.); Stock, 1979: 15; Zambrana et al., 1985: 33 (refs.); Child, 1988b: 20; Nakamura & Child, 1988: 662-663; Müller, 1991: 131-134, Fig. 57.

2 ♂, 1 ♀. "Alpha Helix" Stn. M-28, Papua New Guinea, 09°33'30"S 147°10'E, hand-collected at 5 m, 12 June 1979 (ZMA Pa. 200.909).

1 ♀. "Alpha Helix" Stn. M-42, Trobriand Islands, 08°30.7'S 150°59.2'E, hand-collected between 0 and 3 m, 16 June 1979 (ZMA Pa. 200.895).

1 ♂, 3 ♂, 1 ♀. "Alpha Helix" Stn. M-52, NE New Guinea, 05°48.2'S 146°11.4'E, hand-collected between 1 and 10 m, 19 June 1979 (ZMA Pa. 200.796).

3 ♂, 3 ♀, 1 larva. "Alpha Helix" Stn. M-56, N. of New Guinea, 03°23.0'S 143°40.2'E, hand-collected between 1 and 5 m, 21 June 1979 (ZMA Pa. 200.797).

1 ♂, 1 ♀. "Alpha Helix" Stn. M-58, same data as Stn. M-56 (ZMA Pa. 200.908).

1 ♀. "Alpha Helix" Stn. M-135, Indonesia, Singihe Islands, 03°44.1'N 125°34.9'E, hand-collected between 1 and 18 m, 18 July 1979 (ZMA Pa. 200.900).

1 ♀ juv. Indonesia, Halmahera islands, Ternate, Kampong Tafure, ca. 5 m offshore, depth ca. 1 m, on coral, 11 Feb. 1979 (ZMA Pa. 200.905).

Remarks.- This species is predominantly found in the Caribbean, but is also known from isolated records in Madagascar (Arnaud, 1973; Stock, 1974b), the Ryukyu Islands (Nakamura & Child, 1988), and the Philippines (Child, 1988b). These are the first records for the Indo-Australian archipelago. The species occurs always in shallow waters, between 0 and 27 m.

Anoplodactylus pseudotarsalis Müller, 1992. Fig. 28c-d.

Müller, 1992: 167-170, Figs. 31-36.

1 ♂. International Indian Ocean Expedition, "Te Vega" Cruise 2, Stn. 68 LH 5, Malaysia,

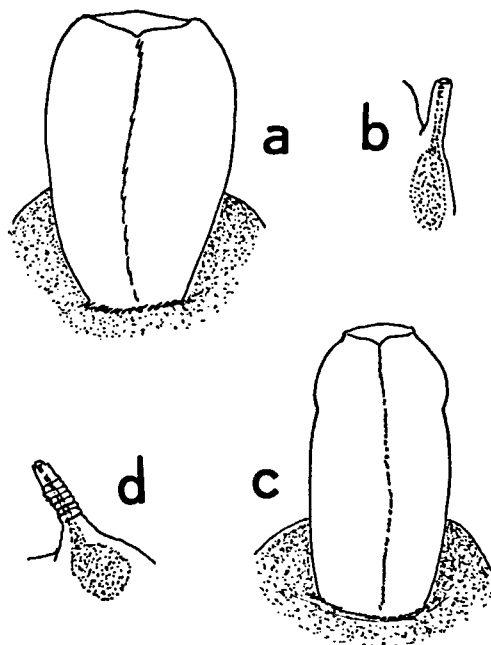


Fig. 28. *Anoplodactylus*. a-b, *A. tarsalis* Stock, 1968, ♂ holotype: a, proboscis, ventral; b, cement gland of leg 3. c-d, *A. pseudotarsalis* Müller, 1992, ♂, from "Alpha Helix" Stn. M-52: c, proboscis, ventral; d, cement gland of leg 3.

Straits of Malacca, Pulau Besar Malaya, 02°06'N 102°20'E, 0-3 m, 26 Oct. 1963 (ZMA Pa. 200.805).

1 ♀. "Alpha Helix" Stn. M-50, NE New Guinea, 05°48.2'S 146°11.4'E, hand-collected at 2 m, 19 June 1979 (ZMA Pa. 200.812).

1 ♂, 2 ♀, 2 larvae. "Alpha Helix" Stn. M-52, same data as Stn. M-50, but depth 1 to 10 m, 19 June 1979 (ZMA Pa. 200.801).

1 ♂ ovig. "Alpha Helix" Stn. M-105, Indonesia, Obi Islands, 01°32.5'S 127°23.8'E, hand-collected at 6 m, 11 July 1979 (ZMA Pa. 200.892).

Remarks.- Dr. Müller has keenly recognized in a recent paper (1992) that two sibling species hide under the name of *Anoplodactylus tarsalis* Stock, 1968b. The differences between the two are slight, but persistent and pertain to (1) the presence of two poriferous tubercles located on the cephalic segment between the ocular tubercle and the articulation of trunk segments 1 and 2 of

A. pseudotarsalis (in *A. tarsalis* such tubercles are lacking); (2) the shape of the proboscis, which is somewhat more slender, with a constriction at about $\frac{2}{3}$ of its length in *A. pseudotarsalis*, and robust, with regularly convex lateral margins in *A. tarsalis*; (3) the cement gland tube which is a trifle longer and annulate (not granulate, as Müller describes it) in *A. pseudotarsalis*, and somewhat shorter with a smooth surface in *A. tarsalis*; (4) the margin demarcating the narrow neck from the widened anterior part of the cephalic segment reaches to *ca.* $\frac{1}{3}$ of the proboscis in *A. pseudotarsalis*, to middle of the proboscis in *A. tarsalis*. Some of these differences are illustrated again in the present paper (Fig. 28), based on re-examination of the holotype of *A. tarsalis*.

Müller also mentions differences in the slenderness of chelifores and legs, but the present material does not confirm these observations. The 2nd coxa in all our specimens of *A. pseudotarsalis* is short, just as in *A. tarsalis*, but since this character appears to be age-dependant it is quite possible that older specimens have a longer 2nd coxa.

The larvae from "Alpha Helix" Stn. M-52 already show the characteristic wedge-shaped tarsus and possess the poriferous post-ocular tubercles. The female from "Te Vega" Stn. 68 LH 5 deviates from most specimens of *A. pseudotarsalis* in showing a well-developed articulation line between trunk segments 3 and 4.

Up to now, *A. pseudotarsalis* was only known from the Tioman archipelago, Malaysia, and like the present material from very shallow waters.

Anoplodactylus pycnosoma (Helfer, 1938)

Peritrachia pycnosoma Helfer, 1938: 176-177, Fig. 7.

Halosoma pycnosoma; Marcus, 1940: 45-46.

Anoplodactylus pycnosoma; Stock, 1953a: 41, Fig. 5; Stock, 1954b: 75-77, Fig. 33; Utinomi, 1971: 326; Stock, 1974b: 16, Child, 1975: 20; Stock, 1975b: 127, 132; Nakamura & Child, 1983: 50; Child, 1983: 708; Kim, 1984: 536, Fig. 5d-h; Kim & Hong, 1986: 44; Hong & Kim, 1987: 161; Child, 1988a: 59; Child, 1988b: 20; Müller, 1990a: 77; Müller, 1990c: 100, Figs. 7-13; Child, 1991: 144; Nakamura & Child, 1991: 30; Müller, 1992: 173.

? *Anoplodactylus pycnosoma*; Saldanha, 1974: 332.

1 ♀. International Indian Ocean Expedition, "Te Vega" Cruise 2, Stn. D-20, Mauritius, Flicq-en-Flacq, Arsenal Bay, probably intertidal, 15 June 1963 (ZMA Pa. 200.802).

1 larva, probably this species. International Indian Ocean Expedition, "Te Vega" Cruise 2, Stn. D-21, same locality as Stn. D-20, but from algae washings, 16 June 1963 (ZMA Pa. 200.800).

1 ♂. International Indian Ocean Expedition, "Te Vega" Cruise 2, Stn. 65 LH 3, Singapore, Pulau Mantu, 01°10'N 103°45'E, hand-collected between 0 and 1 m, 18 Oct. 1963 (ZMA Pa. 200.815).

1 ♂, 3 juvs. International Indian Ocean Expedition, "Te Vega" Cruise 2, Stn. 72 LH 4, Singapore, Tanjong Berlayer (Labrador Beach), Keppel Harbour, 01°16'N 103°48'E, intertidal, 19 Oct. 1963 (ZMA Pa. 200.813).

1 ♀. Guam, 1 km ENE of Anae Island (Nimitz Beach), 13°21.6'N 144°38.7'E, hand-collected, intertidal, 28 Aug. 1983, leg. R.F. Bolland (ZMA Pa. 200.818).

1 ♀. Guam, 2.6 km NE of Taguan Point (near Marbo Cave area), 13°29.2'N 144°52.1'E, hand-collected, intertidal, 23 Aug. 1983, leg. R.F. Bolland (ZMA Pa. 200.816).

1 ♂ ovig., 6 ♂, 4 ♀. "Alpha Helix" Stn. M-26, Papua New Guinea, 09°29'45"S 147°06'40"E, hand-collected at 1 m, 10 June 1979 (ZMA 200.896).

1 ♂. "Alpha Helix" Stn. M-31, Papua New Guinea, 10°10.6'S 148°07'E, hand-collected at 6 m, 13 June 1979 (ZMA Pa. 200.906).

1 ♀. "Alpha Helix" Stn. M-52, NE New Guinea, 05°48.2'S 146°11.4'E, hand-collected between 1 and 10 m, 19 June 1979 (ZMA Pa. 200.795).

Remarks.- This is a relatively common species, widely distributed in the intertidal zone or in very shallow waters of the Indo-West Pacific. It has been recorded from Japan, Korea, Malaysia, the Philippines, Guam, Western Australia, Palau, Réunion island, Aldabra atoll, the Seychelles, Tanzania, and Madagascar. The range is extended on the basis of the present material to Singapore, New Guinea, and Mauritius.

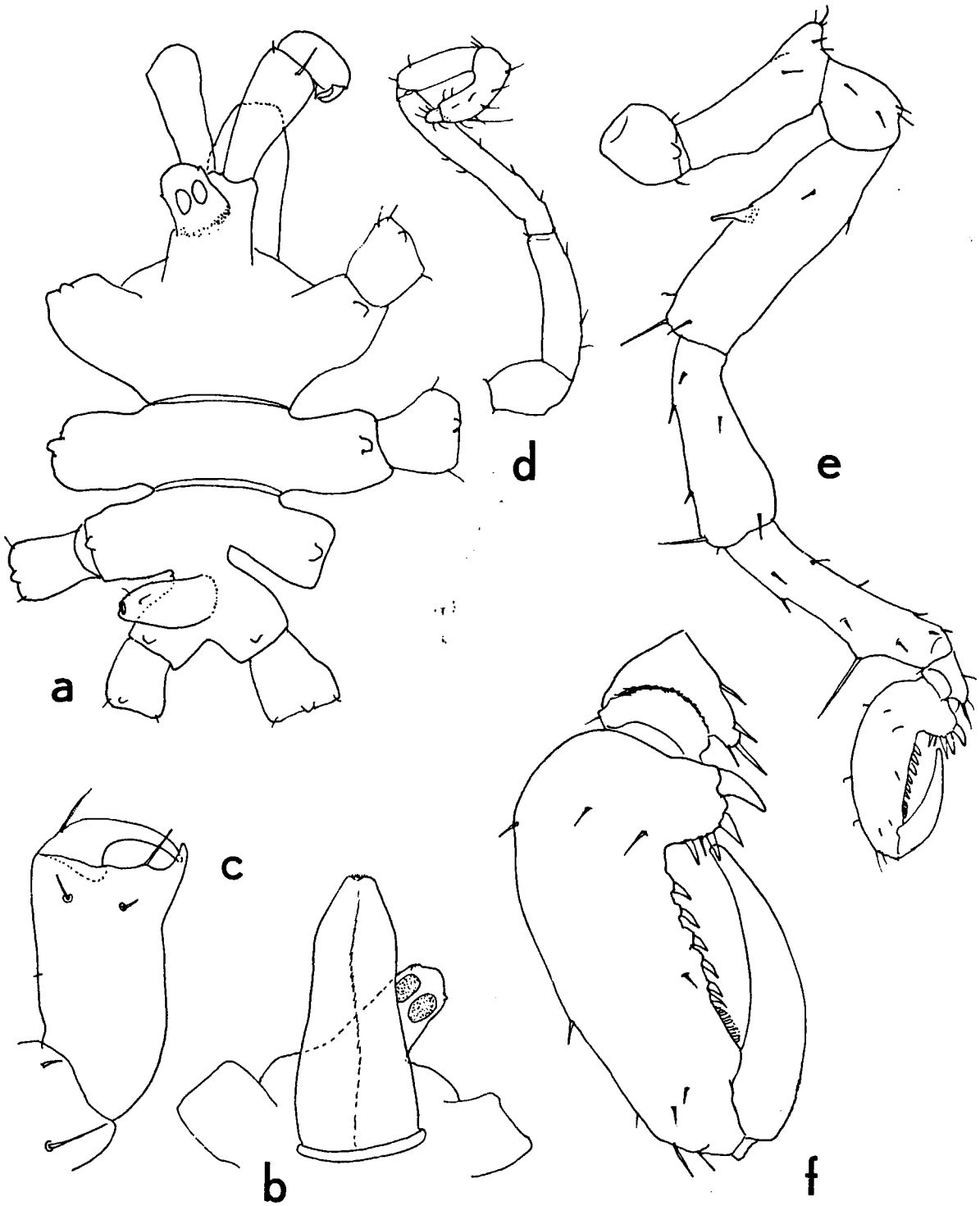


Fig. 29. *Anoplodactylus squalidus* Clark, 1973, ♂, from "Alpha Helix" Stn. M-134. a, trunk, dorsal; b, anterior part of body, ventral; c, chela; d, oviger; e, leg 4; f, distal segments of leg 4.

Saldanha's record (1974) from Portugal must be strongly doubted; I presume that either *A. robustus* (Dohrn, 1881) or *A. angulatus* (Dohrn, 1881) is concerned.

Anoplodactylus squalidus Clark, 1973. Fig. 29.

A. squalida Clark, 1973: 30-33, Fig. 2.

A. squalidus; Müller, 1989a: 126-127, Figs. 45-46 (syn., redescr. type).

A. rimulus Child, 1988a: 59-61, Fig. 3; Nakamura & Child, 1988: 815, Fig. 2 G-I.

1 ♂ ovig., 1 ♀. "Alpha Helix" Stn. M-4, Australia (Northern Territories), S. shore of East Vernon Is., 12°05.0'S 131°06.0'E, from algae, 0-3 m, 31 May 1979 (ZMA Pa. 200.803).

1 ♀. "Alpha Helix" Stn. M-6, Australia (Northern Territories), same locality and date as Stn. M-4, depth 3 m (ZMA Pa. 200.898).

1 ♀. "Alpha Helix" Stn. M-25, Papua New Guinea, 09°29'45"S 147°06'48"E, hand-collected at 1 m, 11 June 1979 (ZMA Pa. 200.814).

1 ♀. "Alpha Helix" Stn. M-86, Indonesia, Misoöl island, 02°03.8'S 130°08.3'E, hand-collected at 0.5 m, 3 July 1979 (ZMA Pa. 200.903).

1 ♂, 2 juvs. "Alpha Helix" Stn. M-134, Indonesia, Sangihe islands, 03°46.0'N 125° 35.0'E, hand-collected at ca. 6 m, 18 July 1979 (ZMA Pa. 200.794).

Remarks.- A somewhat variable species: proboscis with (in ♀?) or without (in ♂?) ventral cleft; cement gland tube sometimes widened at its base; trunk with or without segmentation lines. Nevertheless, the slightly tapering proboscis and the shape of the chela are absolutely distinctive for the species. I have included some new Figures of the male from "Alpha Helix" Stn. M-134, in order to document the variability.

Previously recorded from New Britain, the Society Islands, American Samoa, Sulawesi, and Aldabra atoll, all in very shallow waters (0-6 m).

Anoplodactylus tenuicarpus Child, 1991

A. tenuicarpus Child, 1991: 142-143.

A. attenuatus Child, 1988b (preocc.): 12-14, Fig. 5; Child, 1988a: 56.

1 ♂ juv. "Alpha Helix" Stn. M-28, Papua New Guinea, 09°33'30"S 147°10'E, hand-collected at 5 m, 12 June 1979 (ZMA Pa. 200.899).

1 ♀. "Alpha Helix" Stn. M-128, Indonesia, Minahassa peninsula (Sulawesi), 01°51.2'N 125° 05.7'E, hand-collected between 2 and 11 m, 16 July 1979 (ZMA Pa. 200.901).

Remarks.- A very delicate species, previously recorded from the Philippines, Guam, and the Seychelles, in very shallow waters (1-11 m). It is closely related to a species treated above, *A. exaggeratus* n. sp.

Anoplodactylus tubiferus (Haswell, 1884)

Phoxichilidium tubiferum Haswell, 1884: 1032, Pl. 57 Figs. 1-5. *Anoplodactylus tubiferus*; Cole, 1904a: 288; Loman, 1908: 72; Flynn, 1919: 79-81, Pl. XX Figs. 12-14, Pl. XXI Fig. 15; Williams, 1941: 35; Clark, 1963: 49; Stock, 1979: 158; Staples, 1982: 457-459, Fig. 2 C-F (refs., syn.); Child, 1988: 61; Müller, 1989b: 281-282, Figs. 15-20; Miyazaki & Makioka, 1990: 1; Nakamura & Child, 1991: 32; Stock, 1991b: 224; Miyazaki & Makioka, 1993: 2.

Anoplodactylus pulcher Carpenter, 1907: 97-98, Pl. 12 Figs. 13-19; Stock, 1954b: 84; Stock, 1965: 29, Fig. 45; Stock, 1968b: 49; Arnaud, 1973: 957; Stock, 1973b: 92, 97; Miyazaki & Makioka, 1988: 15; Miyazaki, 1989: 6.

Anoplodactylus stylops Loman, 1908: 71, Pl. II Figs. 20-24.

1 ♀. International Indian Ocean Expedition, "Anton Bruun" Cruise 7, Stn. 364-A, Moçambique Channel, 23°20'S 43°36'E, Campbell grab, 51 m, 12 Aug. 1964 (ZMA Pa. 200.951).

Remarks.- Widely distributed in the Indian and western Pacific oceans, mostly on the continental shelf. There is a previous record from the Moçambique Channel (Stock, 1968b).

Anoplodactylus spec.

1 adult ♀. "Alpha Helix" Stn. M-15, Australia (Northern Territories), 11°31.5'S 135°48.8'E, dredge, 23.8 m, 2 June 1979 (ZMA Pa. 200.953).

1 ♀. "Alpha Helix" Stn. M-49, NE New Guinea, 06°41.9'S 147°53.1'E, hand-collected at 1 m, 18 June 1979 (ZMA Pa. 954).

Remarks.- The specimen from Stn. M-15 can be described as follows: Shape and tuberculation of body and legs resembling those of *A. squalidus* Clark, but the chela is "normal", instead of with transverse fingers. The most noteworthy character of this specimen is the presence of 2 ventral swelling on the proximal part of the proboscis, as in *A. evansi* Clark, 1963, but in its remaining characters it is rather different.

In absence of males, I refrain from naming these two solitary females.

Endeis holthuisi Stock, 1961

Stock, 1961: 28-29, Figs. 1-6.

1 ♀, 1 juv. "Alpha Helix" Stn. M-89, Irian Barat, near Fakfak, 03°07.9'S 132°30.5'E, hand-collected between 1 and 7 m, from massive coral heads, 4 July 1979 (ZMA Pa. 200.867).

Remarks.- This species was only known from the male holotype, collected by hand at Biak, an island north of Irian Barat.

Endeis mollis (Carpenter, 1904)

Phoxichilus mollis Carpenter, 1904: 182-183, Figs. 1-7.
Endeis mollis; Utinomi, 1971: 327 (older refs.); Child, 1977: 441; Child, 1979: 66; Daniel & Sen, 1980: 165; Zambrana et al., 1985: 32 (refs.); Child, 1991: 144-145 (refs.).

1 ♂ ovig. International Indian Ocean Expedition, "Anton Bruun" Cruise 9, Stn. 456, Somalia, 11°14'N 51°08'E, 27-31 m, 17 Dec. 1964 (ZMA Pa. 200.950).

Remarks.- A circum-tropical species. The present male possesses 23 cement gland pores on the femur of the third leg.

Endeis spec.

2 juv. International Indian Ocean Expedition,

"Te Vega" Cruise 2, Stn. 63 LH 1, NE Singapore Is., Pu Sekudu, Strait of Johore, 01° 24'N 103°59'E, 0-1 m, 16 Oct. 1963 (ZMA Pa. 200.872).

1 spm. (legs lacking). "Alpha Helix" Stn. M-134, Indonesia, 03°46.0'N 125°35.0'E, hand-collected at ca. 6 m, 18 July 1979 (ZMA Pa. 200.937).

Remark.- The two juveniles from the "Te Vega" cruise still retain chelate chelifores.

Pycnogonum (s.l.) **tuberculatum** Clark, 1963

Clark, 1973: 77-79, Fig. 38.

1 ♀. "Alpha Helix" Stn. M-56, N of New Guinea, 03°23.0'S 143°40.2'E, hand-collected between 1 and 5 m, 21 June 1979 (ZMA Pa. 200.855).

1 ♀. "Alpha Helix" Stn. M-58, same data as Stn. M-56 (ZMA Pa. 200.938).

Remarks.- The only previous records of this species are those of Clark (1963) from New South Wales and Bass Strait, 90-148 m. The present locality is much further north and is in much shallower waters.

The shape of the proboscis, shape and armature of the propodus, and the low tubercles on the two tibiae agree better with *P. tuberculatum* than with the closely related *P. moolenbeeki* Stock, 1992b.

Pycnogonum (s.l.) spec.

1 larva. "Alpha Helix" Stn. M-6, Australia (Northern Territories), Melville Island, 12°05'S 131°06'E, hand-collected at 3 m, 31 May 1979 (ZMA Pa. 200.876).

Pycnogonum (**Retroviger**) **asiaticum**

Müller, 1992

Müller, 1992: 173-177, Figs. 49-55.

1 ♂. "Alpha Helix" Stn. M-126, Indonesia,

Minahassa Peninsula (Sulawesi), 01°53.3'N 125°06.0'E, hand-collected between 0 and 6 m, 16 July 1979 (ZMA Pa. 200.935).

Remarks.- The present male is in some respects intermediate between the drawings of *P. benokianum* Ohshima, 1935, as reproduced by Hedgpeth, 1949 on the basis of Ohshima's notes, and Müller's (1992) *P. asiaticum*. The shape of the proboscis and the size of the mid-dorsal trunk tubercles agree with the latter, but the tubercles on the crurigers (distinct on cruriger 4, vestigial on the remaining crurigers, as in Hedgpeth's Fig. 49a) are in agreement with *P. benokianum*.

Nevertheless, I have little doubt that the present material belongs to *P. asiaticum*, since it agrees with it in having the proximal seven oviger segments of subequal length, and the terminal oviger claw as long as segments 6 and 7 combined (in *P. benokianum* segments 4 to 7 are elongate, much longer than segments 1 to 3, and the terminal claw is shorter than segment 7). Moreover the anterior part of the cephalic segment, the so-called "neck", is distinctly longer in *P. asiaticum* than in *P. benokianum*.

The male genital pores of *P. asiaticum* are situated on the ventral surface of coxa 2.

This recently described species was only known from the type-locality, in the Tioman Archipelago (Malaysia), where it came from very shallow waters (1-2 m).

***Pycnogonum (Retroviger) musaicum* n. sp.**
Fig. 30.

1 ♂ (holotype). "Alpha Helix" Stn. M-48, NE New Guinea, 06°41.7'S 147°53.1'E, hand-collected between 0 and 8 m, 18 June 1979 (ZMA Pa. 200.869).

Description.- Male: Trunk, proboscis and legs distinctly reticulate. Trunk completely segmented; trunk segments 1, 2, and 3 with strong, simple or bifid, mid-dorsal prominence. Ocular tubercle rounded, lower than mid-dorsal prominences; eyes distinct. Crurigers touching in basal part, unadorned. Cephalic segment forming anterior hood over base of proboscis. Proboscis

slightly down-curved, tapering, truncate cone. Abdomen reaching to end of coxa 1 of leg 4.

Oviger very small, 7-segmented, ending in long, strongly curved claw.

Coxa 1 of leg 1 unadorned; coxa 1 of remaining legs with tall dorsal spur. Femur and tibia 1 with dorsal humps, in particular at distal end. Propodus curved, sole densely armed with numerous spinules of a size. Claw curved, less than half as long as propodus; no auxiliary claws.

Female unknown.

Measurements of male holotype (mm).- Length trunk (frontal margin cephalic segment to tip 4th lateral process) 2.82; width across 2nd crurigers 1.65; length abdomen 0.62; length proboscis (ventral) 1.76; basal diameter proboscis 0.86; distal diameter proboscis 0.40. Third leg: 1st coxa 0.41; 2nd coxa 0.27; 3rd coxa 0.39; femur 0.88; 1st tibia 0.81; 2nd tibia 0.89; tarsus 0.15; propodus 0.89; claw 0.34.

Etymology.- From the Greek word *μουσαϊκος* (= mosaic), alluding to the reticulation of the integument.

Remarks.- Amongst the species of *Pycnogonum* having a strongly tapering proboscis, the present species stands out by one or more of the following characters: (1) absence of tubercles or spurs on the crurigers; (2) presence of dorsal spur on coxa 1 of legs 2 to 4; (3) presence of an oviger in the male sex; (4) reticulation of the integument.

In general habit, *P. torresi* Clark, 1963 from Torres Strait comes closest, but this species lacks coxal spurs, has very few spinules on the propodal sole, lacks humps on femur and tibia 1, and shows signs of incipient reticulation only.

Another look-alike is *P. madagascariensis* Bouvier, 1911 (see re-description in Arnaud, 1971), but this species has a less tapering proboscis, lacks a dorsal spur on coxa 1, and has non-touching crurigers.

Pycnogonum (Retroviger) pustulatum
n.sp. Fig. 31.

1 ♂ (holotype), 1 ♂ & 3 ♀ (paratypes). "Alpha

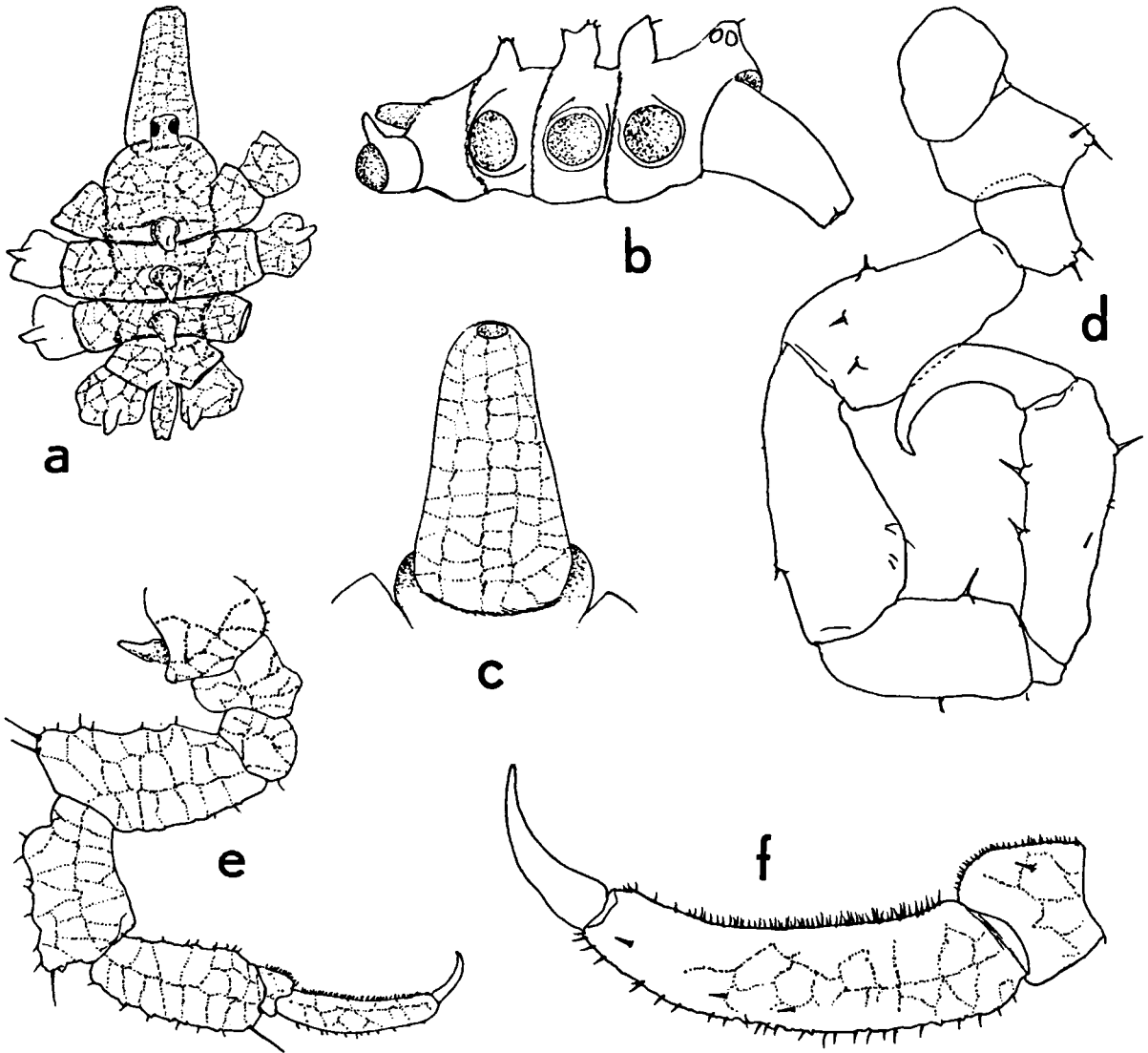


Fig. 30. *Pycnogonum (Retroviger) musaicum* n. sp., ♂ holotype, from "Alpha Helix" Stn. M-48. a, trunk, dorsal; b, trunk, from the right; c, proboscis, ventral; d, oviger; e, leg 3; f, propodus of leg 3.

Helix" Stn. M-56, N of New Guinea, 03°23.0'S 143°40.2'E, hand-collected between 1 and 5 m, 21 June 1979 (ZMA Pa. 200.856).

Description.- Male: Outline of trunk elongate. Neck short. Crurigers separated by narrow intervals. Each cruriger with mid-dorsal tubercle, and feebly developed posterodistal swelling; crurigers 2 to 4 moreover with distinct anterodistal spur. Ocular tubercle low, eyes present. Postocular tubercle slightly lower than ocular tubercle.

Trunk segments 1 to 4 each with 1 mediodorsal tubercle at posterior margin. Abdomen linear, tip rounded. Entire integument of proboscis, trunk and legs covered by rugose pimples. Proboscis shaped like truncate egg.

Oviger 7-segmented. Segments 1 to 3 short, segments 4 to 7 elongate; distal claw feebly curved, shorter than segment 7.

Legs: Coxa 1 with strong anterodistal spur and inconspicuous posterodistal swelling. Femur with huge proximoventral bump; distodorsal end

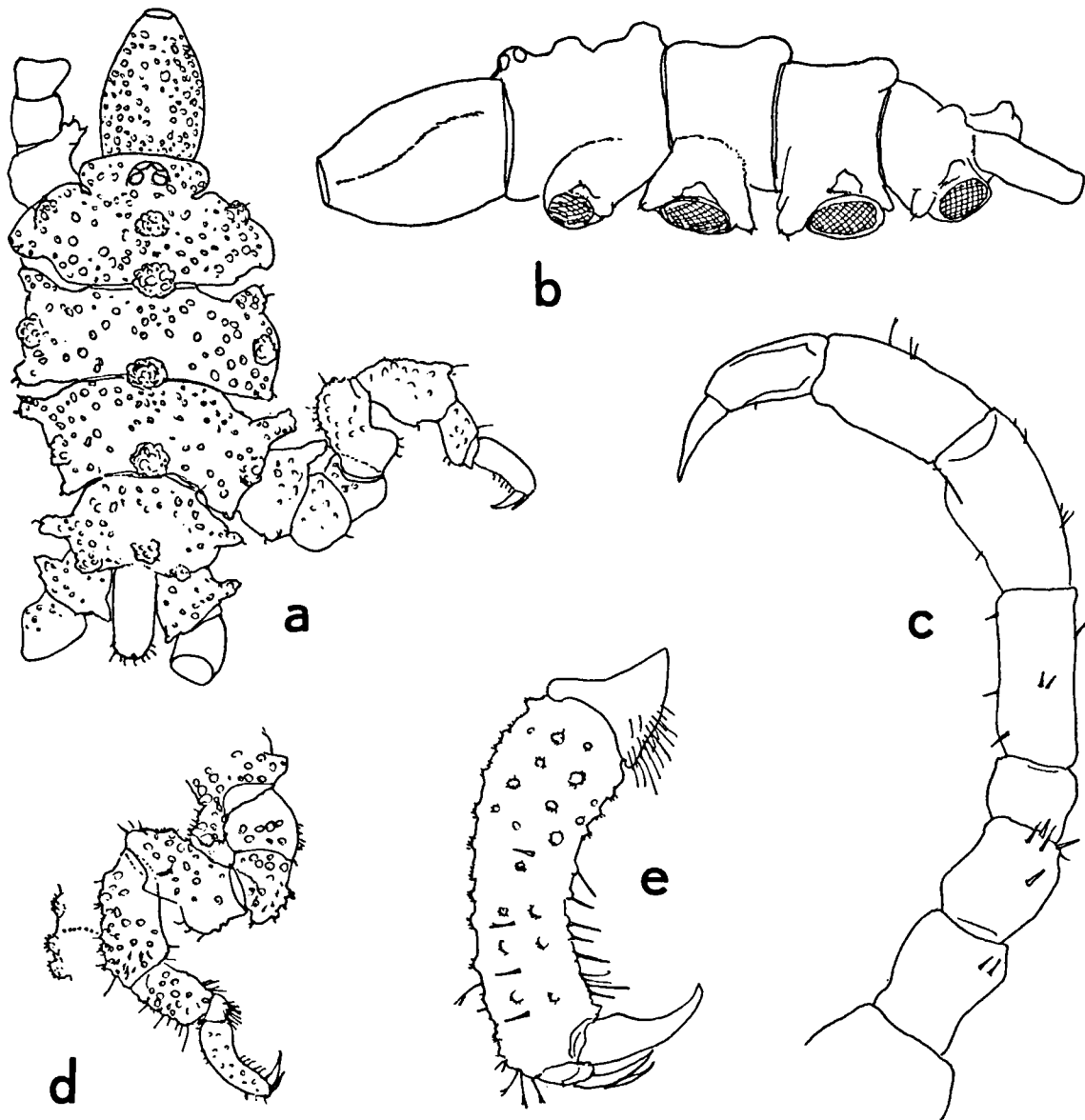


Fig. 31. *Pycnogonum (Retroviger) pustulatum* n. sp., from "Alpha Helix" Stn. M-56. a, trunk, ♂, dorsal; b, trunk, ♀, from the left; c, oviger, ♂; d, leg 2, ♂ (to same scale as Fig. 31a and b); e, propodus leg 2, ♂.

feebly produced. Tibia 2 much shorter than tibia 1. Tarsus with dense field of spines on ventral surface. Propodus curved, rather massive; no propodal heel spines; distal part of sole with limited number of bifid setae; some dorsodistal setae also bifid. Claw curved; auxiliary claws at least half as long as main claw.

Female: Similar to male. No ovigers. Genital pores on dorsal surface of leg 4 only.

Measurements of male (mm).- Length trunk (frontal margin cephalic segment to tip 4th cruri-

ger) 1.85; width across 2nd crurigers 1.31; length abdomen 0.43; length proboscis (ventral) 0.83; length proboscis (dorsal) 0.62; greatest diameter proboscis 0.51. Third leg: 1st coxa 0.29; 2nd coxa 0.24; 3rd coxa 0.20; femur 0.52; 1st tibia 0.44; 2nd tibia 0.35; tarsus 0.06; propodus 0.42; claw 0.16; auxiliary claws 0.10.

Etymology.- The Latin name, *pustulatum*, refers to the numerous rugose pimples on the integument.

Remarks.- Most species of *Pycnogonum* are devoid of auxiliary claws, but such claws are present in *P. benokianum* Ohshima, 1935, *P. asiaticum* Müller, 1992, *P. plumipes* Stock, 1955, *P. pusillum* Dohrn, 1881, *P. planum* Stock, 1954, *P. cessaci* Bouvier, 1911, *P. ungelatum* Loman, 1911, *P. sivertseni* Stock, 1955, *P. uedai* Nakamura & Child, 1983, and *P. koreanum* Kim & Stock, 1984. Of these, *P. koreanum* is probably a junior synonym of *P. uedai*.

In most of these species, the auxiliary claws are small ($\leq 1/4$ of the claw), but in *P. koreanum* and *P. asiaticum* they are longer, like in the present species ($\geq 1/2$ of the claw). It is to these two taxa that the new species is most closely allied. *P. pustulatum* differs from both in the presence of anterodorsal spurs on the crurigers 2 to 4, and a similar spur on coxa 1 of all legs, as well as in showing a strong ventroproximal hump on the femur. The small oviger of *P. asiaticum* consists of 7 shortish, subequal segments and a long distal claw, whereas that of *P. pustulatum* has elongate segments 4 to 7, and a short distal claw. The male oviger of *P. benokianum* resembles of *P. pustulatum* more closely. However, the female genital pores of *P. benokianum* are said to be located on the ventral surface of coxa 2 of legs 3 and 4, whereas those of *P. pustulatum* are on the dorsal surface of coxa 2 of leg 4.

Pycnogonum* (*Nulloviger*) *africanum

Calman, 1938. Fig. 32 a-b.

Calman, 1938: 163-165, Fig. 10; Stock, 1968b: 61, Fig. 22a-b; Turpaeva, 1991: 42.

2 ♂, 1 ♀. International Indian Ocean Expedition, "Anton Bruun" Cruise 7, Stn. 370-G, Moçambique, 24°40'S 35°28'E, 347 m, 18 Aug. 1964 (ZMA Pa. 200.943).

Remarks.- The specimens listed above came from the same station as the two specimens recorded by Stock (1968b). Turpaeva's specimens were collected at the nearby "Vitjaz" station 2626 (24°42'S 35°31'E), but the two type-specimens described by Calman (1938) were from much further north, viz. off Zanzibar. The

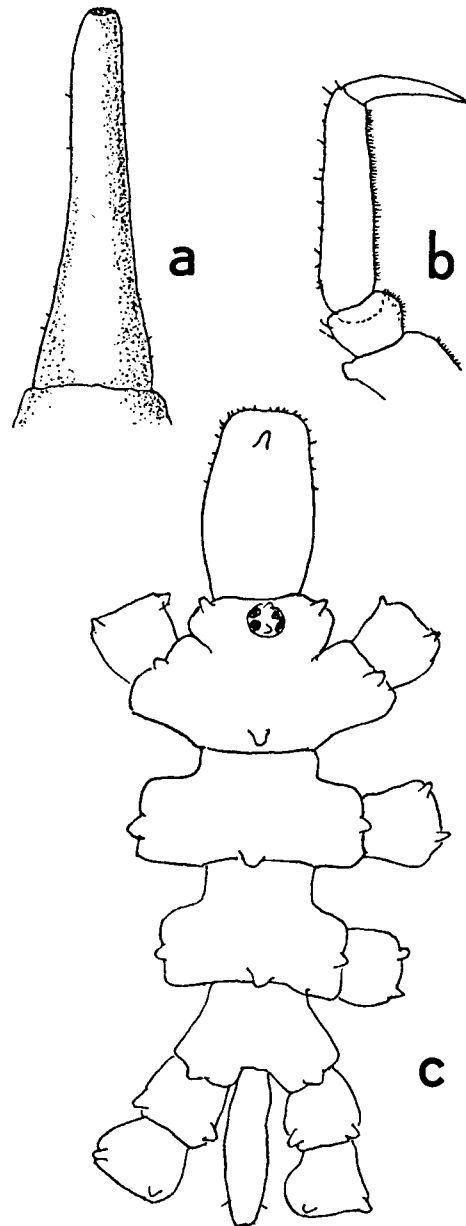


Fig. 32. *Pycnogonum*. a-b, *P. (Nulloviger) africanum* Calman, 1938, from "Anton Bruun" Cruise 7, Stn. 370-G: a, pro-boscis, ♂, dorsal; b, distal segments of leg 4, ♀. c, *P. (N. ?) nodulosum* Dohrn, 1991, ♀ from "Anton Bruun" Cruise 8, Stn. 400-C: trunk, dorsal.

known depth range of this species is 183-1228 m.

The present specimens resemble the types in incipient reticulation of the integument, the arrangement and size of the mid-dorsal tubercles

and of the tubercles on the crurigers, the presence of two distodorsal tubercles on tibia 1, the down-curved proboscis, etc. However, the lateral margins of the proboscis are straight in Calman's figure, slightly concave in the present material (Fig. 31a). The propodal sole of one of the "Anton Bruun" males resembles that illustrated by Calman, but in the other two specimens, the distal part of the ventral margin of tibia, tarsus, and propodus bear densely packed small spinules (Fig. 31b).

The only noteworthy sexual difference is found in the location of the genital pores (Stock, 1968b). The male is devoid of ovigers.

Pycnogonum (Nulloviger) ? nodulosum

Dohrn, 1881. Fig. 32c.

P. nodulosum Dohrn, 1881: 203-207, Pl. XVI Figs. 1-3; d'Arcy Thompson, 1909: 540; Bouvier, 1922: 116; Calman, 1928: 62; Fage, 1953: 381; Bourdillon, 1954: 155; Barnard, 1955: 106; Stock, 1958: 5; Gottlieb, 1959: 115; de Haro, 1965: 142; de Haro, 1966: 663; Stock, 1966: 401 (in key); de Haro, 1967a: 121; de Haro, 1967b: 301; Stock, 1968a: 34, Fig. 28; Munilla, 1978: 8; Chimenz-Gusso et al., 1978: 100; Munilla, 1981: 78; Munilla & de Haro, 1981: 191-197, Figs. (electrophoresis); Munilla & de Haro, 1984: 532; Arnaud, 1988: 50; Arnaud & Child, 1988: 152-153
P. rhinoceros Dohrn, 1881: 38, 66 (nomen nudum).

2 ♀. International Indian Ocean Expedition, "Anton Bruun" Cruise 8, Stn. 400-C, Moçambique, vicinity of Ponta da Barra Ralsa, 20°30'S 35°43'E, 62 m, 3 Oct. 1964 (ZMA Pa. 200.875).

Remarks.- These specimens differ from Dohrn's (1881) illustrations in a few, probably not important, respects: (1) the anterior margin of the cephalic segment bears left and right a small but distinct tubercle, and (2) the crurigers are more widely separated (Fig. 31c).

The species ranges from the Mediterranean, via Morocco, to South Africa (Algoa Bay, Zululand, Transkei). It has usually been found in the upper part of the shelf, but occasionally in depths up to 550 m.

Although not infrequently recorded, it seems that all records are quoted as females. This makes me believe that the male of this species is

devoid of ovigers, thus looking like a female. If my suspicion is correct, *P. nodulosum* would classify with the subgenus *Nulloviger*, Stock, 1968b.

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