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# PYCNOGONIDA OF THE CALLIOPE RIVER & AUCKLAND CREEK, QUEENSLAND

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ABSTRACT

Nine identifiable species of pycnogonid are recorded from the lower reaches of the Calliope River and Auckland Creek. The collection includes two new species *(Hemichela longiunguis* and *Anoplodactylus calliopus),* and the ranges of three species are extended, including one new record for Australian waters. *Anoplodactylus pulcher* is synonomized with *Anoplodactylus tubiferus* and *Endeis picta* is synonomized with *Endeis straughani.* The genus *Metapallene* is synonomized with the genus *Propallene.* Cement glands are recorded for the first time in *Endeis straughani* and *Anoplodactylus simplex.* The holotype of *Anoplodactylus haswelli* has been re-examined in an attempt to clarify uncertain morphological characters.

## INTRODUCTION

This paper is based on collections made by the Queensland Electricity Generating Board during an environmental study carried out before and after The Gladstone Power Station was commissioned in September 1976. All specimens represented were collected by Van Veen grab in very shallow water (depth 0·8 m. – 9·0 m).

The following species are represented:

FAMILY CALLIPALLENIDAE: *Parapallene australiensis* (Hoek 1881); *Propallene saengeri* Staples, 1979; *Pigrogromitus timsanus* Calman, 1927 (new record for Australia).

FAMILY PHOXICHILIDIIDAE: *Anoplodactylus tubiferus* (Haswell 1884) range extension; synonymized with *A. pulcher* Carpenter, 1907; *Anoplodactylus calliopus* sp. nov.; *Anoplodactylus simplex* Clark, 1963 (range extension); *Anoplodactylus* sp. (juveniles).

FAMILY ENDEIDAE: *Endeis straughani* Clark, 1970.

FAMILY AMMOTHEIDAE: *Hemichela longiunguis* sp. nov.

FAMILY COLOSSENDEIDAE: *Rhopalorhynchus tenuissimum* (Haswell, 1884).

The present collection has increased the number of pycnogonid species recorded in Queensland from twenty-two to twenty-eight. This includes *Propallene saengeri* Staples, 1979 described earlier from the same collection.

Sampling stations were located in the cooling water outfall canal and at each of eleven transects selected along the River and Creeks. These transects extended to a distance of 15·1 km upstream. The location of the transects (1–11) and the cooling water outfall canal (cw) are shown in Fig. 1. Primary data relating to each individual transect is provided by Saenger et al., 1980. The second number in each River and Creek station code identifies the particular transect. Cooling water outfall canal stations are designated cw.

Institutions in which material has been lodged are referred to by the following abbreviations: National Museum of Victoria (NMV); Queensland Museum (QM); Institute of Taxonomic Zoology (Zoologisch Museum, Amsterdam) (ZMA); Zoological Museum, University of Copenhagen (ZMUC); National Museum of Natural History, Washington, D.C. (USNM); National Museum, Wellington (NMW). Comparative material has also been lodged with the Queensland Electricity Board (QEGB).

### Family CALLIPALLENIADAE Hilton 1942
### Genus *Parapallene* Carpenter, 1892
### *Parapallene australiensis* (Hoek, 1881)

SYNONOMY:

*Pallene australiensis* Hoek, 1881, pp 76–78, pl. X1, figs 1–7 (in part). Haswell, 1884, p. 1022.

*Parapallene australiensis* Carpenter, 1892, p. 553. Loman, 1908, p. 48. Calman 1937, pp. 530–532 (redescr. of types). Stock, 1954, p. 50, fig. 24 d–e; 1973a, p. 119. Clark, 1963 pp. 25–26. Child 1975, p. 12.

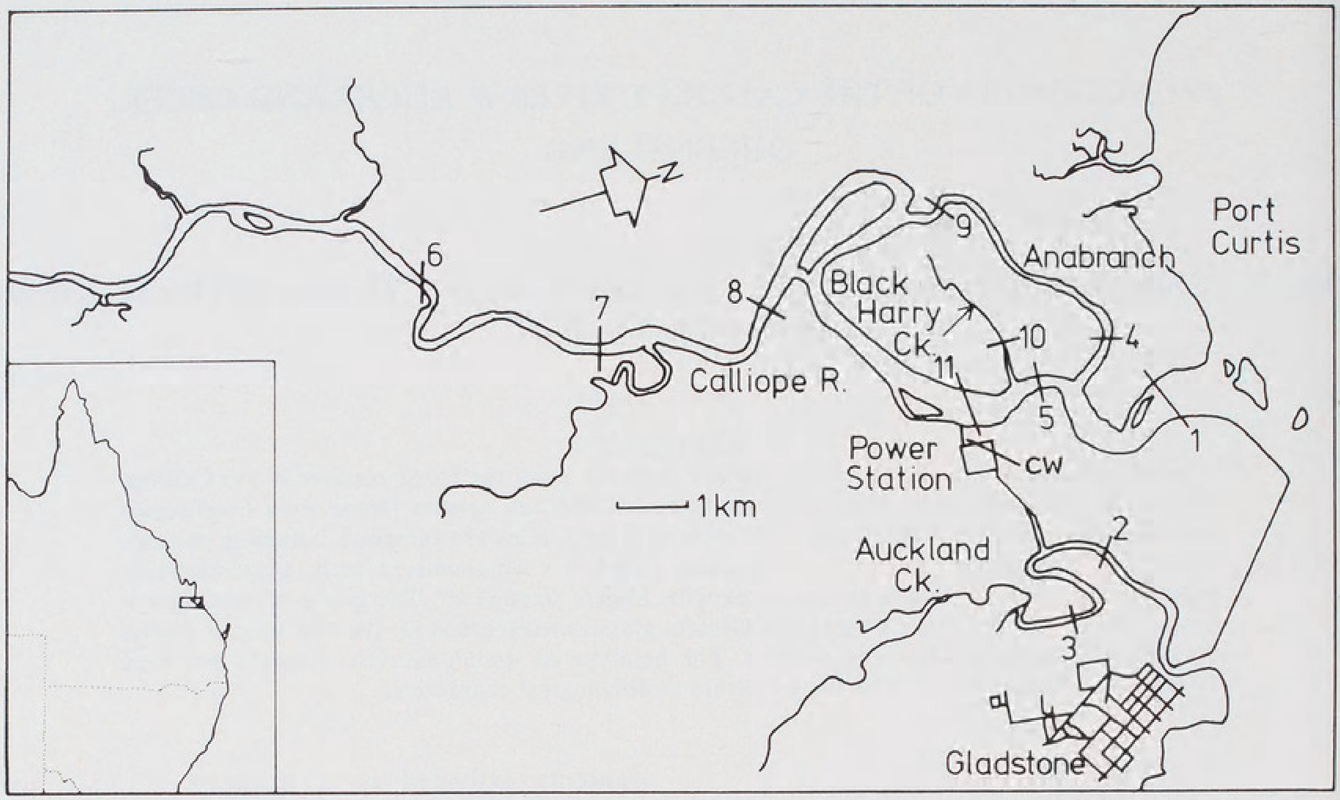


FIG. 1. Map of study area showing locations of transects 1–11 and cooling water outfall (cw) (after Saenger et al., 1980).

MATERIAL EXAMINED: Calliope R., cooling water screens 21.viii.1977, 1 ♂ QM S895.

DISTRIBUTION: Eastern and southern coasts of Australia.

DISCUSSION:

This solitary specimen is subadult. I have little doubt that the 'true articulation' or 'transverse fold of cuticle' in front of the ocular tubercle as noted by Hoek (1881, p. 76) and Calman (1937, p. 531) respectively, has resulted from the crimping of the cuticle due to flattening of the arched body under a glass slide. I am also of the opinion that the cuticular fold described in several other members of the genus, notably *P. nierstraszi* Loman, 1908, *P. longipes* Calman, 1938 and *P. challengeri* Calman, 1937b has resulted in a similar manner. The eye tubercle in the present specimen has a bifurcated apex. Examination of several specimens from Westernport Bay Victoria, indicates that the shape of the eye tubercle is a variable character ranging from acutely conical to distinctly bifurcate at the apex.

Genus *Propallene* Schimkewitch, 1909

*Propallene saengeri* Staples, 1979

SYNONOMY:

*Propallene saengeri* Staples, 1979, pp. 90–93 fig. 2D, fig. 4A–L.

MATERIAL EXAMINED: Calliope R., Stns. 22/10/3, 13/5/5, 1 ♂ (ovig.) 1 ♀ (gav.) ZMA Pa. 2889; 15/1/5, 17/5/1, 1 ♂ 1 ♀ (grav.) ZMUC; 21/11/1, 3 ♂ (2 ovig.) 2 ♀ (grav.) NMNZ Pyc 50; 8/11/5, 15/4/1, 18/11/1, 22/7/5, 22/1/1, 22/10/3, 22/9/5, 8/9/5, 19/9/5, 5 ♂ (4 ovig.) 12 ♀ (11 grav.) NMV K71 Auckland Ck, Stns. 18/3/3, 18/2/2, 15/2/1, 1 ♂ (ovig.) 2 ♀ (grav.) NMV K72; 8/2/2, 1 ♂ (ovig.) 1 ♀ (grav.) QEGB.

DISTRIBUTION: Central Queensland.

DISCUSSION:

The genera *Metapallene* Schimkewitsch, 1909 and *Propallene* have been distinguished principally by the presence of one or two palp segments in the male. Recently it has been demonstrated that in subadult forms the palps of *Propallene* are one-segmented and not until maturity do the second segments become evident. (Staples, 1979, fig. 1F; Nakamura 1981, p. 57, fig. 17). *Pallene longiceps* Bohm, 1879 was correctly assigned to the genus *Propallene* by Schimkewitsch (1909).

Schimkewitsch (1909) also erected the genus *Metapallene* and named *Pallene languida* Hoek, 1881 as the type species. Re-examination of Hoek's specimen now shows that *Metapallene* was founded on a subadult *Propallene*. Accordingly I propose that *Metapallene* be synonomized with *Propallene*. Another genus, *Pallenoides* Stock, 1951 may also have been based on a subadult male or more likely, a female *Propallene*. The structure of the oviger spines and variation in their shape (proximal and distal spines dissimilar) distinguishes the type species *P. magnicollis* from other members of the genus and places it in agreement with the diagnosis of the genus *Propallene*. The sex of the type specimen is in doubt (Stock, 1955 pp. 226-227). The absence of a distal apophysis on the fifth oviger segment combined with the absence of palps would suggest it to be female.

Genus *Pigrogromitus* Calman, 1927
*Pigrogromitus timsanus* Calman, 1927
Fig. 2 G–J

SYNONOMY:

*Pigrogromitus timsanus* Calman, 1927, pp. 408–410 fig. 104 A–F. Hedgpeth, 1948, pp. 214–216, fig. 23. Stock, 1968a, p. 46; 1975 pp. 1015–1016. Lipkin and Safriel, 1971, p.9. Arnaud, 1972, pp. 159–160.

*Clotenopsa prima* Hilton, 1942, pp. 52–58, fig. 8.

MATERIAL EXAMINED: Calliope R., Stns. 11/11/1, cw/4, 1 ♂ 1 ♀, QM S897; 12/1/1, 33/cw/3, 1 ♂ 1 ♀ (grav.) USNM 184170; Oct. 1976, cw/3, 2 ♂ (1 ovig.), 2 ♀ (1 grav.), ZMUC; 27/cw/1, 1 ♂ 1 ♀, ZMA Pa. 2888; 25/cw/2, 1 ♂ 1 ♀ 1 juv., NMNZ Pyc51; 18/4/5, 45/cw/1, 1 ♂ (ovig.) 1 ♀ (grav), QEGB; 21/11/1, 18/5/1, 18/11/1, 21/8/3, 26/cw/2, 28/cw/2, 32/cw/2, 33/cw/2, 10/cw/3, 14/cw/3; 24/cw/3, 30/cw/3, 31/cw/3, 30/cw/4, 43/cw/4, 15/cw/5, 13/cw/4, 25/cw/5, 27/cw/5, 33/cw/5, 42/cw/5, 46/cw/5, cw/11/1, cw/11/2, cw/12/2, cw/23/5, 26/cw/1, cw/12/5, 31/cw/4, 26/cw/5, 13 ♂ (1 ovig.) 29 ♀ (7 grav.) 22 juv. NMV K73. Other material: Panama, Caribbean. Galeta I., intertidal, Laurencia Sample 6 Col. STRI Survey Group. 1 ♂ (ovig.) 1.iii.1971 (USNM 154460); Panama, Caribbean: Galeta I., Intertidal, Laurencia Sample 7 Coll. STRI survey group. 1 ♀ 1 juv., 2.iii.1971 (USNM 154461).

DISTRIBUTION: Circumtropical.

DISCUSSION:

The present material represents the first record of this species from Australian waters. In comparison with Calman's (1927, fig. 104A) illustration of the male holotype the Queensland specimens have reduced median trunk tubercles and are more compact with lateral processes touching or almost touching (rarely diverging) throughout their length. The sixth segment of the male oviger bears a strong spine on its outer margin, which although illustrated by Calman (fig. 104 E), is not mentioned in the text. The specimens from Queensland and from Galeta I. are very similar. Several juveniles were firmly attached to sea anemones with their proboscides inserted into the host tissue.

Family PHOXICHILIDIIDAE Sars, 1891
Genus *Anopodactylus* Wilson, 1878
*Anoplodactylus tubiferus* (Haswell, 1884)
Fig. 2 C–F

SYNONOMY:

*Phoxichilidium tubiferum* Haswell, 1884, p. 1032, pl. 57, figs 1–5. Whitelegge, 1889, p. 223.

*Anoplodactylus tubiferus* Cole, 1904a, p. 288. Loman, 1908, p. 72. Flynn, 1919b, pp. 79–81, pl. XX, figs. 12–14, pl. XXI, fig. 15. Williams, 1941, p. 35. Clark, 1963, p. 49; Stock, 1979, p. 158.

*Anoplodactylus pulcher* Carpenter, 1907, p. 97–98, pl. 12, figs. 13–19 (**new synonomy**); Stock, 1954b, p. 84; 1965a: 29, fig. 45; 1968b: 49; 1973b: 92; 1979, p. 158. Arnaud, 1973a, p. 957.

*Anoplodactylus stylops* Loman, 1908, p. 71, pl. 11, figs. 20–24.

MATERIAL EXAMINED: Calliope R., Stns. 15/9/3, 15/1/5, 1 ♂ (ovig.) 1 ♀ (grav.) QEGB; 22/7/5, 11/11/1, 1 ♂ 1 ♀ ZMA Pa. 2890; 8/9/5, 16/1/2, 1 ♂ (ovig.) 1 ♀ ZMUC; 4/9/4, 19/6/2, 1 ♂ 1 ♀ (grav.) USNM 184893; 22/7/5, 1 ♂ (ovig.) NMNZ Pyc45; 14/1/2, 1 ♀ (grav.) NMNZ Pyc46; 11/4/4, 8/4/1, 1 ♂ 1 ♀ QM896; 11/11/2, 8/5/1, 8/1/2, 12/1/5, 22/7/5, 23/1/2, 18/10/2, 22/10/2, 8/9/2, 22/4/2, 19/9/2, cw/5/4, cw/5/1, cw/4/3, 5 ♂ (1 juv.) 15 ♀ (1 grav. 1 juv.) NMV K74 Auckland Ck, 17/2/2, 18/3/3, 15/2/2, 12/2/3, 8/2/2, 16/2/3, 22/3/1, 11/3/4, 19/3/2, 17/2/3, 11 ♂ (1 ovig.) 4 ♀ (2 grav.) NMV K75. Other material: Reef at Carnac I., Western Australia, in red algae, 21.iii.1972, 1 ♂, coll. N. Coleman ZMA Pa. 2028; Persian Gulf; 25° 55'N, 50° 16'E, trawl, bottom, marl and shell, 13 m. 6.ix.1956, 1 ♀ coll. C. E. Dawson, St. 4 ZMA Pa. 1718; Anton Bruun, Cruise 7, St. 363W, Mozambique Channel, 23° 19'S, 43° 36'E, trawl. 91–73 m. 6.viii.1964, 2 ♂ ZMA Pa. 1751; Madagascar: region of Fort Dauphin, 2½ miles W. of Pointe Itaperina, trawled in 50 m. bottom shelly sand, 19.x.1958, 1 ♂ Coll. Dr. A. Crosnier, nr. ch–2. ZMA Pa. 1600. Syntype: *A. stylops* Loman, 1908, Banda Sea Indonesia 1 ♀ USNM 128212.

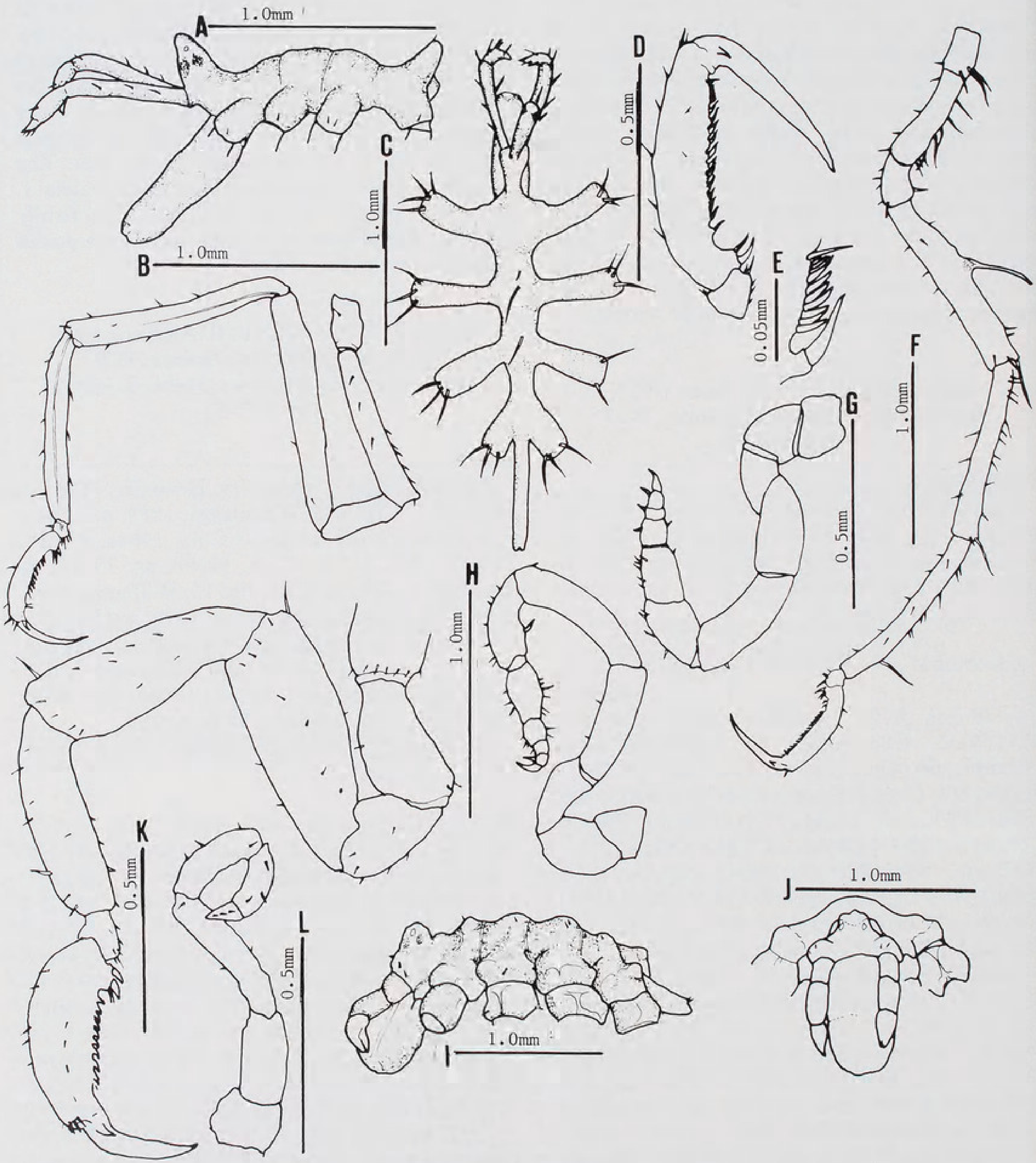


FIG. 2. *Anoplodactylus simplex* A, Trunk, lateral view, female; B, Leg 3, male. *Anoplodactylus tubiferus* C, Trunk of male, dorsal; D, Distal leg segments, male; E, Distal spines propodal sole, male; F, Leg 3, male. *Pigrogromitus timsanus* G, Oviger, female; H, Oviger, male I, Trunk, lateral view, male; J, Cephalic region, anterior view, male. *Anoplodactylus haswelli*, K, Leg 3, male, holotype; L Oviger male, holotype.

DISTRIBUTION: Madagascar, Mozambique Channel, Persian Gulf, Paumben (India), Maldive Is. (Indian Ocean) Carnac I. (W. Australia), Banda Sea (Indonesia) and the east coast of Australia.

DISCUSSION:

The Queensland specimens are smaller and the distal processes on the femora and first tibiae are not as well developed as those from elsewhere, otherwise there is little to distinguish the specimens. The present material is closest to the specimens from the Mozambique Channel, particularly in the shape of the propodus. The number of propodal sole spines is age dependent and in the Queensland material ranges from five in subadults to 22 in adults. The propodal sole bears a distal group of approximately 12 closely set spinules which may be spiniform or peg-shaped. As far as I am aware only two other species, *A. eroticus* Stock, 1968b and *A. coxalis* Stock, 1968b possess a similar group of spinules. The number of setae on the lateral processes and legs varies considerably, the Carnac I. specimen is exceptional in possessing 10–20 long setae on each lateral process. This specimen also differs from the others in having the second coxa of each leg distinctly less than twice the length of coxa three (approximately equal — distinctly longer in other material). Palps are represented by two low bulges situated proximally on the anterior margin of the first lateral process. Trunk segmentation is variable, often entirely lacking. *A. tubiferus* is such a distinctive species that I have little hesitation in synonomizing *A. pulcher* with it.

### *Anoplodactylus calliopus* sp. nov.
(Fig. 3 A–K)

HOLOTYPE: Calliope River, Stn. 21/11/1, 4·4 m, June 1980 1 ♂ QM S898.
ALLOTYPE: Auckland Creek, Stn. 18/2/2, 2 m, July 1979 1 ♀ (grav.) QM S899.
PARATYPES: Calliope R., Stn. 21/11/1, 4·4 m, June 1980 1 ♂ 6 ♀ NMV K77, 1 ♀ NMNZ Pyc 47, 1 ♂ ZMA Pa. 2891; Stn. 21/11/2, 3·9 m June 1980 1 ♂ USNM 184894; Stn. 21/1/5, 5·6 m, June 1980, 1 ♀ (grav.) ZMA Pa. 2892. Black Harry Ck., Stn. 20/10/3, 2·7 m, March 1980 1 ♀ USNM 184895. Auckland Ck., Stn. 22/2/1, 1·3 m, Oct. 1980 1 ♂ (ovig.); Stn. 18/2/5, 1 m, July 1979, 1 ♀ (grav.) NMV K78.

DIAGNOSIS:

*Anoplodoctylus* with single femoral cement gland emerging through long duct; propodus with strong heel, bearing single stout spine; lamina 2/3 length of sole, preceded by conical process and recurved spine; auxiliary claws lacking. Ventral outgrowths lacking on ♀ proboscis, chela fingers denticulate.

DESCRIPTION:

TRUNK: Intersegmental lines indistinct or lacking; lateral processes touching or close together at their origins, longer in male, fourth process shorter than remainder; processes 1, 2 and 3 with low tubercle distally, tipped with a single spinule. Abdomen well developed, inclined upward at an angle of about 45°; bears small spines distally. Ocular tubercle with two lateral and one posterior apical processes; eyes four, distinctly pigmented; lateral sense organs not evident.

PROBOSCIS: stout, inserted anteroventrally on cephalon, few minute setae distally, slight swellings subterminally; mouth opening large; ventral outgrowths lacking.

PALPS: vestigial organs not evident.

CHELIFORES: scape one-segmented, not touching at base, armed with few dorsal setae; both fingers curved, dactylus with seven–eight denticles, immovable finger with five denticles, three setae at base of dactylus, a few strong setae on palm.

OVIGER: in male only, six-segmented, segment three longest, segments five and six armed with numerous recurved setae. Measurements of oviger segments ♂ holotype (mm): 1, 0·11; 2, 0·21; 3, 0·32; 4, 0·15; 5, 0·12; 6, 0·04.

THIRD LEG: Femur the longest segment, male with cement gland on median dorsal surface, duct equal to or slightly longer than width of femur. PROPODUS: heel strong, armed with single stout spine proximally and a pair of more slender spines distally; lamina about 2/3 length of sole, preceded by obtuse conical process with recurved spine. Auxiliary claws absent. Genital pores (female) on low mound on 2nd coxae of all legs, in males pores on legs three and four only.

Measurements (mm) of ♂ holotype (those of ♀ allotype in brackets). Length of trunk (anterior margin of cephalon to tip 4th lateral process) 0·76 (0·63); length cephalon 0·31 (0·27); width across 2nd lateral processes 0·60 (0·48); length proboscis (ventral) 0·43 (0·43) greatest width proboscis 0·23 (0·22); length chelifore scape 0·30 (0·31); length abdomen 0·20 (0·19). Third leg: 1st coxa 0·14 (0·13); 2nd coxa 0·26 (0·23); 3rd coxa 0·19 (0·16); femur 0·46 (0·47); 1st tibia 0·42 (0·37); 2nd tibia 0·35 (0·34); tarsus 0·05 (0·05); propodus 0·24 (0·20); claw 0·14 (0·12); length of cement gland duct 0·11.

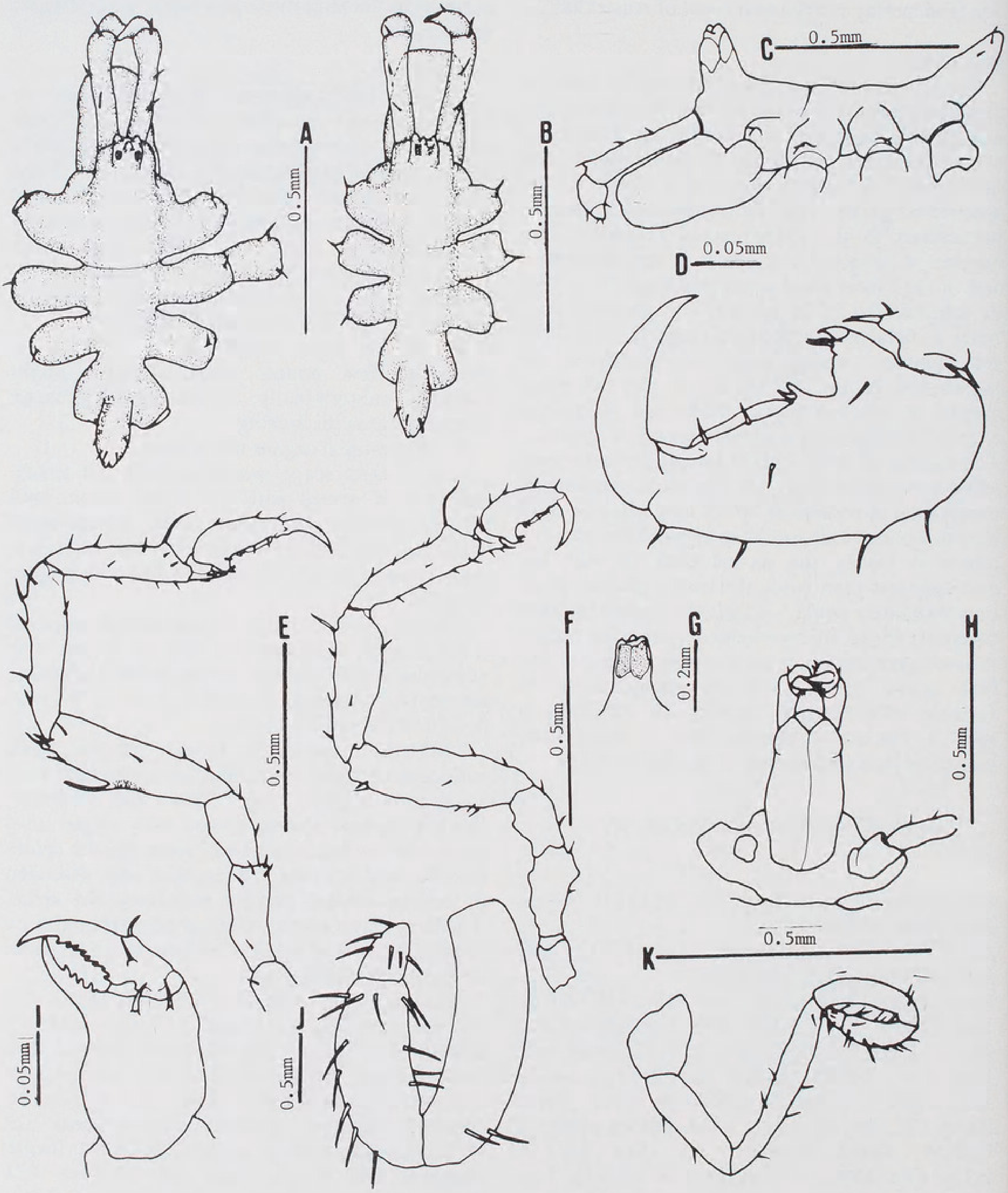


FIG. 3. *Anoplodactylus calliopus* sp. nov. A, Trunk, dorsal view, male; B, Trunk, dorsal view, female; C, Trunk, lateral view, female; D, Leg 3, distal segments, female; E, Leg 3, male; F, Leg 3, female; G, Eye tubercle, anterior view, female; H, Cephalic region, ventral view, male; I, Chela, male; J, Oviger, distal segments, male; K, Oviger, male.

DISCUSSION:

Only *A. arescus* Marcus, 1959 shares the following combination of characters with *A. calliopus:* lateral processes close together; a strong propodal lamina; auxiliary claws absent and a femoral cement gland duct about as long as femur is wide. *A. calliopus* is distinguished from *A. arescus* by the presence of low spiniform tubercles on lateral processes 1–3 (absent in *A. arescus)* and by the shape of the propodus. In *A. calliopus* the heel is more pronounced and lacks the swelling or 'cushion' evident at the base of the heel in *A. arescus.* The lamina occupies 2/3 the length of the propodal sole and is preceded by a conical process. In *A. arescus* the lamina occupies the entire length of the sole. *A. calliopus* is another member of the *A. pygmaeus* complex of Stock (1975, p. 1075–6), a group of small compact species. Only two other members of this complex are found in Australian waters which possess a propodal lamina and lack auxiliary claws. These species are *A. minusculus* Clark, 1970 and *A. spinirostrum* Stock, 1973a. From both these species the present material differs principally in the length of the cement gland duct, the shape of the propodal heel and possession of a single stout heel spine (two in *A. minusculus, A. spinirostrum).*

I have named this species for the Calliope River, its type locality.

*Anoplodactylus haswelli* (Flynn, 1918)
Fig. 2 K–L

SYNONOMY:

*Halosoma haswelli* Flynn, 1918 pp. 3–5 Pl. 1, figs 1–6.

*Anoplodactylus haswelli* Williams, 1941 p. 33–35. Clark 1963 pp. 48–49, figs 24 A–D.

HOLOTYPE: Shark I., Port Jackson; low tide amongst mussels. 1 ♂, (7 slides) AM. P4156–P4162.

DISCUSSION.

In the absence of a description of the male cement gland aperture(s) — a prime diagnostic character — it is not possible to adequately compare this species with others in the genus. Although not represented in the present collection I have re-examined the holotype in the hope of clarifying this aspect. Due to the manner in which the holotype specimen has been mounted the cement gland openings cannot be seen. However it is evident that the glands do not open through a duct. The third leg is re-illustrated in greater detail and a complete figure of the male oviger is provided.

*Anoplodactylus simplex* Clark, 1963
Fig. 2 K–L, Plate 1, Figs C–D

SYNONOMY:

*Anoplodactylus simplex* Clark 1963 pp. 50–51, fig. 25 A–F. Stock, 1979, p. 158.

MATERIAL EXAMINED: Calliope R., Stns. 8/11/1, 1 ♂ QEGB; 18/8/1, 1 ♀ NMNZ Pyc48; 18/7/5 1 ♀ (grav.) QM S909; 8/1/5, 1 ♂ 1 ♀ USNM 184896; 8/4/1, 1 ♀ ZMUC; 17/1/2, 8/11/5, 1 ♂ 1 ♀ NMV K79. Auckland Ck., 18/2/2, 1 ♂ 1 ♀, ZMA Pa. 2893; 8/3/4, 1 ♂ QM S909; 8/2/2, 1 ♀ QEGB. Other material: Holotype, Shallow Bay, just south of Kurnell, Botany Bay, NSW. Dredged 15 ft. sand and weed. 1 ♂ (ovig.) Coll. F. McNeill and party AM P28423. Allotype, 1 ♀ AM P28422 same locality details.

DISTRIBUTION. East coast, Australia.

DISCUSSION:

Re-examination of the holotype together with the additional material now at hand reveals the presence of some 22–30 inconspicuous femoral cement glands in the male. These glands open through minute pores only evident when viewed under high magnification (Pl. 1, C–D). Distally each lateral process bears one (or two) small dorsal spines. The eye tubercle bears lateral sense organs situated above the eyes. Propodal lamina lacking.

*Anoplodactylus* sp.

MATERIAL EXAMINED: Calliope R., Stns. 38/cw/4, 41/cw/5, 1 ♂ (juv.) 1, protonymphon QM S902.

DISCUSSION.

I am unable to determine these species with any certainty.

Family ENDEIDAE Norman, 1908
Genus *Endeis* Philippi, 1843
*Endeis straughani* Clark, 1970
Fig. 5 K–M. Plate 1, Figs A–B

SYNONOMY:

*Phoxichilus charybdaeus(?)* Haswell, 1884.

*Endeis straughani* Clark, 1970: 13–15 fig. 1–5.
*Endeis picta* Bamber, 1979: 251–254 fig. 1 A–I.

MATERIAL EXAMINED: Calliope R., Stns. screens 8/2/80, 1 ♂ (ovig.) QM S903; 45/cw/2, 1 ♀ NMNZ Pyc52; 30/cw/2; R.B. 29.xi.1979, 4 ♂ (1 ovig., 2 juv.) 2 ♀ NMV K76. Other material: Paratypes, Northern Electrical Authority Powerhouse, Ross Ck., Townsville, Queensland 1 ♀ 2 ♂ 3 juv. coll. I.M. Straughan, 31.i.1967 QM S19. *Endeis picta* Bamber, Gold Coast fouling community 12.xii.1975 1 ♂ holotype. BM 1977:81:1; 2 ♀ paratypes same locality BM 1977:82:3.

DISTRIBUTION: Queensland (Australia); Ghana (W. Africa).

DISCUSSION.

Re-examination of the paratype specimens of *E. straughani* together with the additional material now at hand permits amplification of the existing description. Approximately 25–30 minute cement glands arranged mainly in a single row are situated dorsolaterally on the posterior surface of each femur in the male; toward the middle of the femur a second irregular row of approximately eight glands occurs (Pl. 1, A–B). Sixth oviger segment with inflated external surface, sometimes lobe-like, bearing three–five spinules. A smiliar swelling or lobe has previously been noted in *E. mollis* (Carpenter, 1904) by Calman (1938, p. 160) and Barnard (1954, p. 131) and also on the internal surface of the sixth oviger segment in *E. flaccida* Calman, 1923 by Stock (1975, p. 1085). On its inner margin the sixth oviger segment bears two strong recurved spines. Clark (1970 p. 15) stated that genital pores in the male are situated on the third and fourth legs. I have been unable to locate the male holotype, however, in the two male paratypes before me genital pores are present on legs 2, 3 and 4. In a single instance a small pore is also present on leg 1. This pore is not situated on a low tubercle as in legs 2, 3 and 4. The number of heel spines in adults varies from three–five, and is not always constant in one specimen. Eye tubercle more acute in some specimens than in others and bears small lateral sense organs. In adults the length of the proboscis (measured ventrally) varies from 64%–83% (mean 74%) of the length of the trunk (measured from the tip of the cephalon to the tip of the 4th lateral process). A small inconspicuous tubercle which may bear a small apical spine is situated on the neck at the base of each collar lobe. Collar lobes rounded, not meeting mid-dorsally. A few minute setae may be present mid-dorsally on trunk segments 1, 2 and 3. Eggs small, carried in a single mass wrapped around both ovigers. Sub-adults in the present material are characterised by having tibia 2 longer than the femur (femur longer in adults) and by having well developed spines on the neck, lateral processes and coxa 1 which in adults are either reduced or replaced by a blunt tubercle. After comparing the holotype and paratypes of *E. picta* Bamber, 1979 with *E. straughani* I consider them to be conspecific. The Ghana specimens are more compact and possess genital pores on all legs. In view of the variability found in the Queensland specimens and the limited material available for comparison I have not placed much reliance on these characters. I am of the opinion that several distinguishing features cited by Bamber (relatively unhirsuite propodus, porportionately smaller tarsus and more obvious cement glands) are not significant. Using Stock's key (1968b, p. 59) *E straughani* can be followed down to couplet 7a where it keys out with *E. biseriata* Stock 1968b, p. 57.

The differences between *E. straughani* and the short-spined form of *E. biseriata* are slight. Stock described the holotype of *E. biseriata* as having widely spaced lateral processes (space between 2nd and 3rd processes 0·82 mm each provided with a single spiniform projection (dorsal eminences lacking) and in having tibia 2 longer than the femur. Oviger segment 4 is longer than segment 5, a character upon which Stock (1979 p. 30) has placed some reliance. The specimens of *E. straughani* in the present collection are compact (space between 2nd and 3rd processes 0·33 mm–0·48 mm) with one or two low dorsal eminences on each process (spines absent in adults). The femur is consistently longer than tibia 2 in adult specimens and oviger segment 5 is longer than segment 4. In isolation these differences may not be particularly significant however when taken in combination I believe that the retention of *E. straughani* as an independent species may be justified.

Critical examination of all available material is required to ellucidate the relationship between these species.

Family AMMOTHEIDAE Dohrn, 1881
Genus *Hemichela* Stock, 1954
*Hemichela longiunguis* sp. nov.
Fig. 4 A–L

HOLOTYPE: Calliope River, Stn 18/10/2, 1·3m, July 1979, 1 ♂ (QM S900).

ALLOTYPE: Anabranch of Calliope River, Stn 8/4/2, 5·2m, Nov. 1976, 1 ♀ (grav.) QM S901.

PARATYPES: Calliope R., Stn. 22/8/5, 2m, Nov 1976, 1 ♀ (grav.) (ZMUC); Stn. 21/7/5, 2·2m, Aug. 1976, 1 ♂ (ovig). ZMA Pa. 2895; Stn. 7/1/1, 1·6m, Aug. 1976, 1 ♀ (grav.) ZMA Pa.

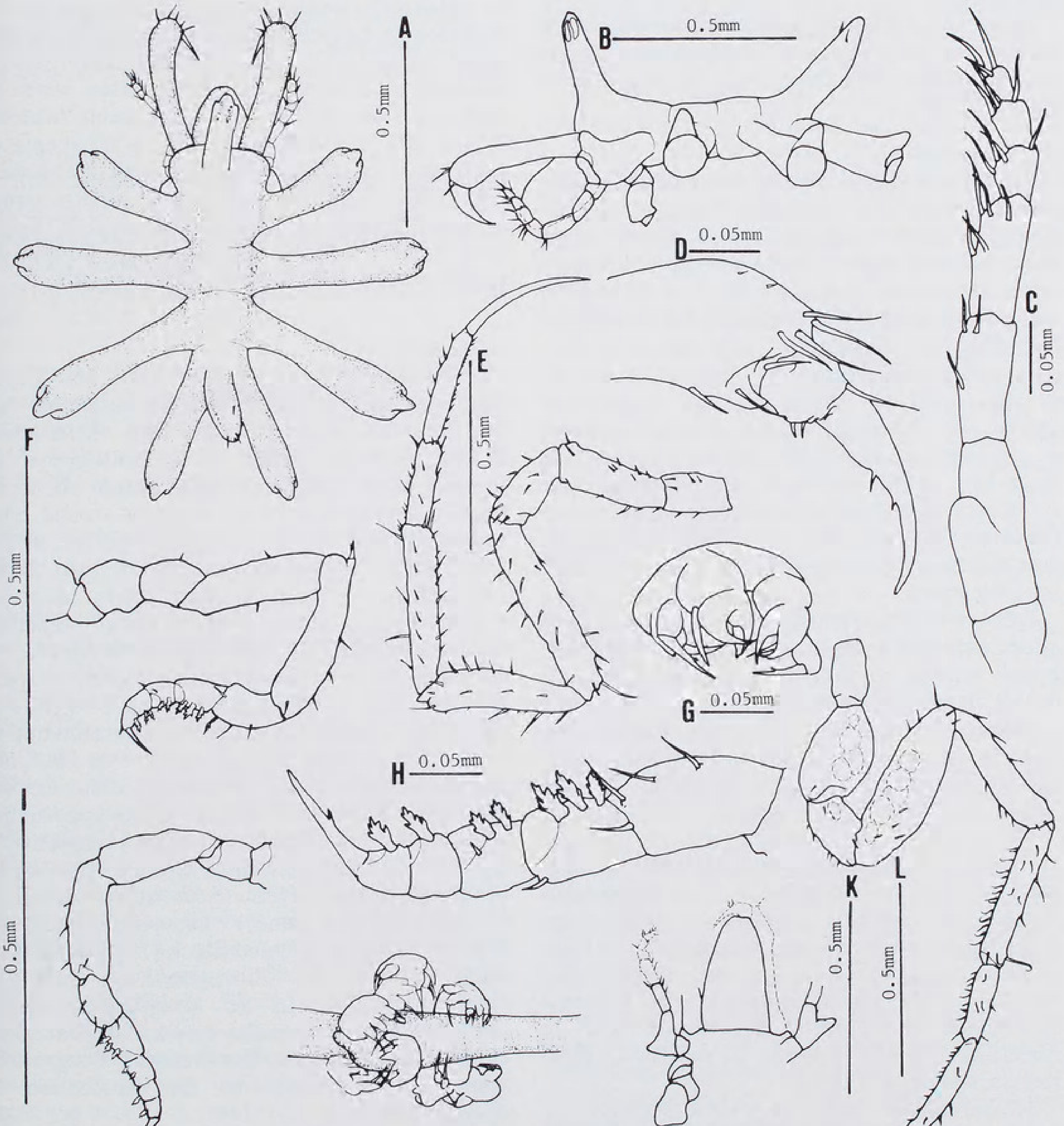


FIG. 4. *Hemichela longiunguis* sp. nov. A, Trunk, dorsal view, male; B, Trunk, lateral view, male; C, Palp, female; D, Chela, female; E, Leg 3, male; F, Oviger, male; G, Protonymphon; H, Oviger, distal segments, female; I, Oviger, female; J, Protonymphon on lateral process; K, Cephalic region, ventral, female; L, Leg 3, female.

2896; Stn. 8/8/4, 4·6 m, Nov. 1976, 1 ♀ (grav.) USNM 184897 19/11/1, 3·2m, Nov. 1979 1 ♂ (ZMUC). Anabranch of Calliope R., Stn. 22/9/3, 5·8m, Oct. 1980, 1 ♂ USNM 184898; Stn. 15/4/2, 5·2m, Oct. 1978, 1 ♀ (grav.) NMNZ Pyc 49; Stn. 22/9/5, 1·2m, Oct 1980, 1 ♂ (ovig.) 2 ♀ (grav.) NMV K81; Auckland Ck, Stn. 22/2/1, 1·3m, Oct. 1980, 1 ♂ NMV K82.

DIAGNOSIS:

*Hemichela* with a pronounced lateral process on each second palp segment. Terminal claw longer than propodus; chela finger with two denticles on inner margin.

DESCRIPTION:

Trunk intersegmental lines variably developed, generally indistinct or absent. Lateral processes diverging; slightly dilated, armed with a single distal tubercle, each tubercle with several minute setae. Eye tubercle slender, situated at anterior margin of cephalon, height approx. 2·5 times basal diameter, two dorsolateral papillae; eyes four, indistinct. Proboscis tapering, slightly constricted at about half its length, directed ventrally at approx. 45°. Abdomen slender, directed upwards at an angle of about 45°, armed distally with three–four small spines. Chelifore scape one-segmented, armed distally with several long setae. Chela with dactylus only, curved and bearing two denticulations on inner margin. Palm short, with few long setae.

Palps seven-segmented, segments three–seven armed with long setae, segment 2 with pronounced lateral process on the outer surface, process in female larger than male.

Measurements (mm) of palp segments ♂ holotype (those of ♀ allotype in brackets): 1, 0·05 (0·05); 2, 0·12 (0·12); 3, 0·10 (0·09); 4, 0·08 (0·07); 5, 0·04 (0·04); 6, 0·03 (0·04); 7, 0·03 (0·04).

Ovigers ten-segmented; segment 5 longest; in ♂ bears reversed spine proximally. Compound spine formula on segments seven–ten variable, may differ between left and right oviger, spine formula segments seven–ten, 2–4; 2: 1 or 2: 1; each spine bears two or three lateral denticulations. Terminal claw equal in length to segments 9 and 10 combined; 1–2 denticles may be present on inner margin, sometimes absent.

Measurements (mm) of oviger segments ♂ holotype (those of ♀ allotype in brackets). 1, 0·08 (0·04); 2, 0·09 (0·06); 3, 0·08 (0·11); 4, 0·23 (0·18); 5, 0·25 (0·20); 6, 0·11 (0·10); 7, 0·08 (0·07); 8, 0·04 (0·05); 9, 0·03 (0·03); 10, 0·04 (0·03); claw 0·07 (0·07).

LEGS: Femur the longest segment, cement glands not evident; tibia 2 longer than tibia 1; in female coxae 1, 2 and femur dilated. Propodal heel absent, sole bearing about 12 spines. Terminal claw slender, longer than propodus. Auxiliary claws absent. Genital pores present on ventral surface of second coxae of all legs in both sexes, those of ♂ smaller than ♀.

Measurements (mm) of ♂ holotype (♀ allotype in brackets): length trunk (frontal margin of cephalon to tip 4th lateral process) 0·84 (0·80); width across 2nd lateral process 1·03 (0·87); diameter of trunk 0·16 (0·15); greatest width of cephalon 0·26 (0·30); height of ocular tubercle 0·25 (0·20); length of scape 0·36 (0·35); length of proboscis (ventral) 0·32 (0·32); length of abdomen 0·28 (0·25). Third leg: coxa 1 0·18 (0·18); coxa 2 0·28 (0·22); coxa 3 0·18 (0·15); femur 0·48 (0·45); tibia 1 0·40 (0·38); tibia 2 0·43 (0·40); tarsus 0·21 (0·20); propodus 0·32 (0·30); claw 0·34 (0·35).

DISCUSSION.

The occurrence of ovigerous males and gravid females dispels Fry's (1978 p.44) suspicion that the only other species, *Hemichela micrasterias* Stock, 1954 was based on a teratological or juvenile form. Ovigerous males carry about 70 eggs in a gelatinous mass wrapped around both ovigers. Protonymphon larvae are carried on the trunk surface of the male mainly confined to the ventro-distal surface of each lateral process. Protonymphons possess a small, distally tapering proboscis flanked by fully chelate chelifores. At the base of each chela there is a long hollow spine through which a cement gland opens. Two pairs of lateral appendages are present each terminating in a long claw bearing a single denticle on the inner margin. Okuda (1940) demonstrated in *Achelia alaskensis* (Cole, 1904) that these appendages metamorphose into palps and ovigers respectively. Eyes not evident. Coinciding with the distribution of protonymphons are 'stellate' outgrowths which I believe are the same as those referred to by Norman (1908, p. 22) and Stock (1978, p. 204) as being present on *Paranymphon spinosum* Caullery, 1876. In *H. longiunguis* these outgrowths occur on males only and appear to be composed of a cement-like material. Outgrowths appear to be related to the distribution of protonymphon.

*H. longiunguis* is distinguished from *H. micrasterias* by the possession of pronounced lateral processes on the second palp segment (absent in *H. micrasterias);* in the great length of the terminal claw (longer than propodus in *H.*

*longiunguis*, less than half as long in *H. micrasterias*); only two denticles on the dactylus (six in *H. micrasterias*) and in the oviger spine formula (*H. longiunguis* segments 7–10 with one–four compound spines, *H. micrasterias* with one or two).

The specific name, *longiunguis* (long claw) alludes to the great length of the terminal claw.

### Family COLOSSENDEIDAE Hoek, 1881
### Genus *Rhopalorhynchus* Wood-Mason, 1873
### *Rhopalorhynchus tenuissimum* (Haswell, 1884)
Fig. 5 A–J

SYNONOMY:

*Colossendeis tenuissima* Haswell, 1884, pp. 1029–30, pl. LVI figs 5–8.

*Rhopalorhynchus tenuissimus* Flynn, 1919 pp. 71–2, pl. XVIII figs 1–3.

*Rhopalorhynchus tenuissimum Stock,* 1958, p. 125.

MATERIAL EXAMINED: Holotype: Port Denison Queensland 1 ♂ AM G5193. Other material: Calliope R., 3 ♂ 1 ♀ (grav.) 4 juv. Stns. 12/1/1 QM S910; 12/8/3, 12/1/1, 8/5/1, 21/5/5, 19/11/1, 15/4/1, 19/9/2, 15/9/5, NMV K80.

DISTRIBUTION: Only known from the Queensland coast.

DISCUSSION.

I have re-examined the holotype and confirm Flynn's (1919, p. 70) opinion that the specimen has suffered as a result of being mounted on a glass slide. The proboscis has been considerably distorted and owing to the amount of detritus adhering to the ovigers it is not possible to determine accurately the features of the distal segments. The chelate nature of the terminal oviger segment as portrayed by Haswell (1884 fig. 7) is not at all clear. An object resembling a spine similar to that figured by Haswell can be distinguished. I am uncertain as to whether this is a partly obscured spine similar to that found in the Gladstone specimens (Fig. 5 I), an imperfection in the mounting medium, or some foreign material. The legs have been mounted independently of the trunk without any indication of their correct sequence and as a result of a broken cover slip only four legs have their terminal segments intact.

Stock (1958) proposed six standard measurements with which the shape of a proboscis can be described with reasonable precision. In *Rh. tenuissimum* however, the stalk expands distally to merge with the inflated part. Because of this it is not possible to determine accurately the junction of the two parts. The problem is especially difficult in juveniles where the basal stalk tapers for most of its length. In the absence of a clearly defined point from which the length of the inflated part may be measured, the position of the tooth when expressed as a percentage of the inflated part becomes somewhat arbitrary. The reference point from which my measurements have been taken are indicated with an arrow in Figure 5 G–H.

In the holotype the lateral processes are separated by about five times their basal diameter. A strong proboscis denticle is present at 44% of the inflated part. The basal 'stalk' is short, (36% of the total proboscis length). The sixth-seventh palp segment ratio is 82%. The tarsal ratio of the four legs is 86–98%; the tarsus is equal to, or shorter than the propodus and the terminal claw varies in length from 57–62% of the propodus.

Examination of the new material suggests that the relative lengths of the leg and trunk segment are largely age dependent. (Measurements of juveniles in brackets.) In males, lateral processes are separated by about eight times their own basal diameter (juveniles four–six times). The sixth-seventh palp segment ratio is 65–70% (65–83%). The tarsal ratio is 97–114% (118–135%). The tarsus is equal to or longer than the propodus (shorter in juveniles) and the terminal claw-propodus ratio is 69–83% (55–61%). The strong proboscis denticle is present at 44–50% of the inflated part. In the solitary female, lateral processes are separated by approximately six times their own basal diameter and the basal 'stalk' is 38% of the total proboscis length (46–48% in males). The fact that the female and juvenile forms resemble the holotype more closely than do the adults is puzzling. The presence of what appears to be a small genital pore on the ventrodistal surface of one leg in the holotype suggests that the specimen is an adult male, but in view of the above anomalies and the presence of only one pore, this may not be the case.

In view of the close geographic proximity to the type locality and the close morphological agreement, in particular the size and position of the proboscis denticle, I have assigned the present material to *Rh. tenuissimum*.

Measurements (mm) of proboscis ♂ 12/1/1, ♀ 19/11/1, NMV K80: $\alpha$ 3·18, 3·45 $\beta$ 1·02, 1·23: $\gamma$ 2·15, 3·04: $\delta$ 1·90, 1·83: $\varepsilon$ 0·65, 0·90: $\zeta$ 0·27, 0·32.

*Rh. tenuissimum* falls into the closely related longitarsal group within the *kroeyeri* section (proboscis with dorsal denticle) of the genus (Stock, 1958). The other species in this group are *Rh. kroeyeri* Wood-Mason, 1873, *Rh. lomani* Stock, 1958 and *Rh. sibogae* Stock, 1958. Of these species *Rh. lomani* is the most distinctive, having an eye tubercle with a strong apical point and a narrowly produced proboscis with the denticle distinctly before the middle of the inflated

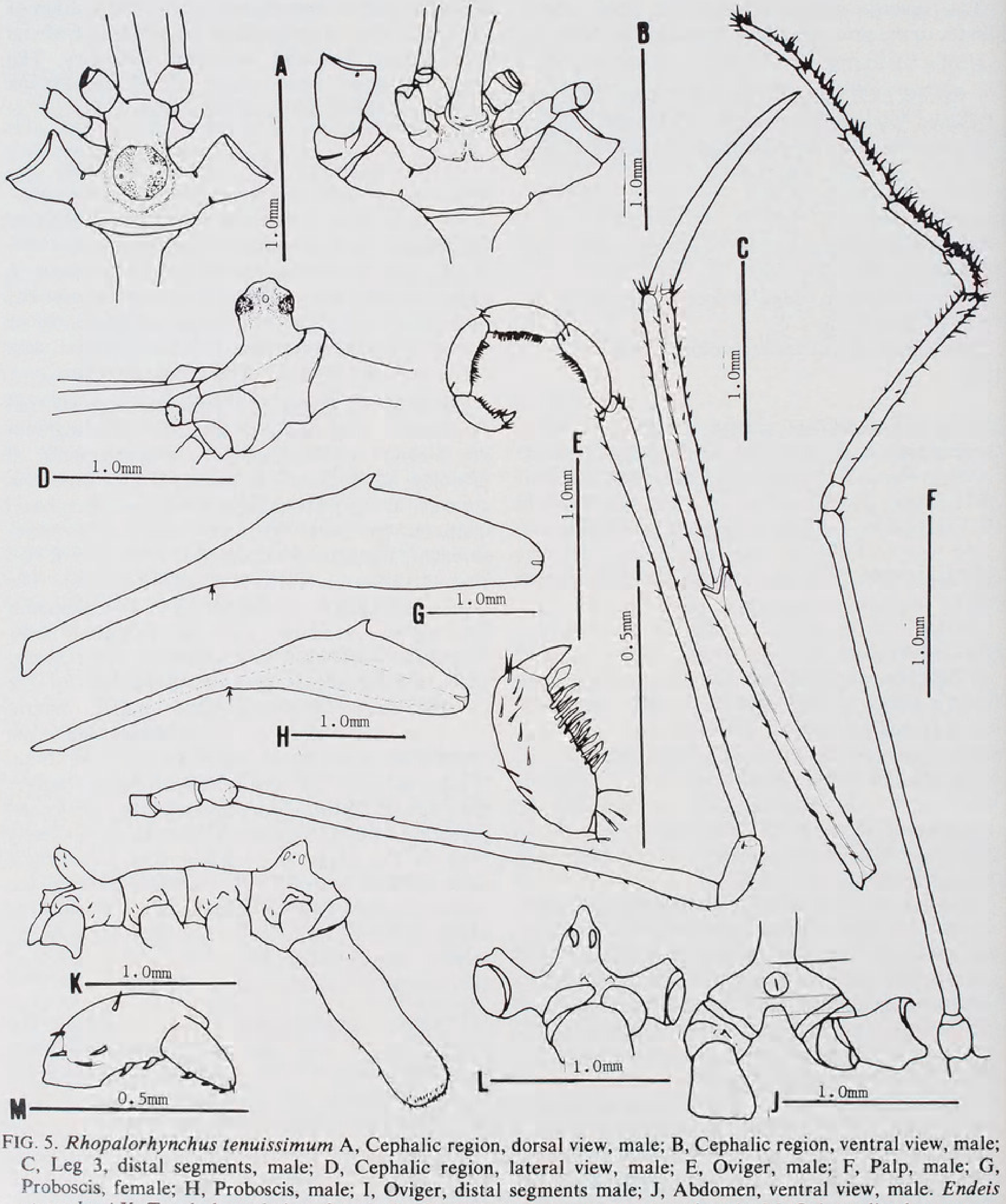


FIG. 5. *Rhopalorhynchus tenuissimum* A, Cephalic region, dorsal view, male; B, Cephalic region, ventral view, male; C, Leg 3, distal segments, male; D, Cephalic region, lateral view, male; E, Oviger, male; F, Palp, male; G, Proboscis, female; H, Proboscis, male; I, Oviger, distal segments male; J, Abdomen, ventral view, male. *Endeis straughani* K, Trunk, lateral view, female; L, Cephalic region, anterior view, female; M, Oviger, distal segments, male.

part (32–38%). *Rh. kroeyeri, Rh. tenuissimum* and *Rh. sibogae* all agree in having a low conical eye tubercle. *Rh. tenuissimum* appears closes to *Rh. sibogae* with which it agrees in the general shape of the proboscis and by possessing a strong dorsal denticle (small in *Rh. kroeyeri*). In the position of the dorsal denticle *Rh. tenuissimum* is intermediate between *Rh. sibogae* (39–43%) and *Rh. kroeyeri* (49–54%). As in *Rh. lomani*, the tarsus in *Rh. tenuissimum* may be longer or shorter than the propodus. The tarsal ratio of *Rh. sibogae* (85–99%) falls within the range of that for *Rh. tenuissimum*. The ratio of palp segment six to seven in *Rh. tenuissimum* differs from that of both *Rh. sibogae* and *Rh. kroeyeri* (50–66%).

I have not examined specimens of *Rh. kroeyeri* or *Rh. sibogae*, however on the basis of published descriptions it is difficult to find characters which are not shared by at least one of the other species suggesting that *Rh. tenuissimum* may be an intermediate form linking *Rh. kroeyeri* and *Rh. sibogae*.

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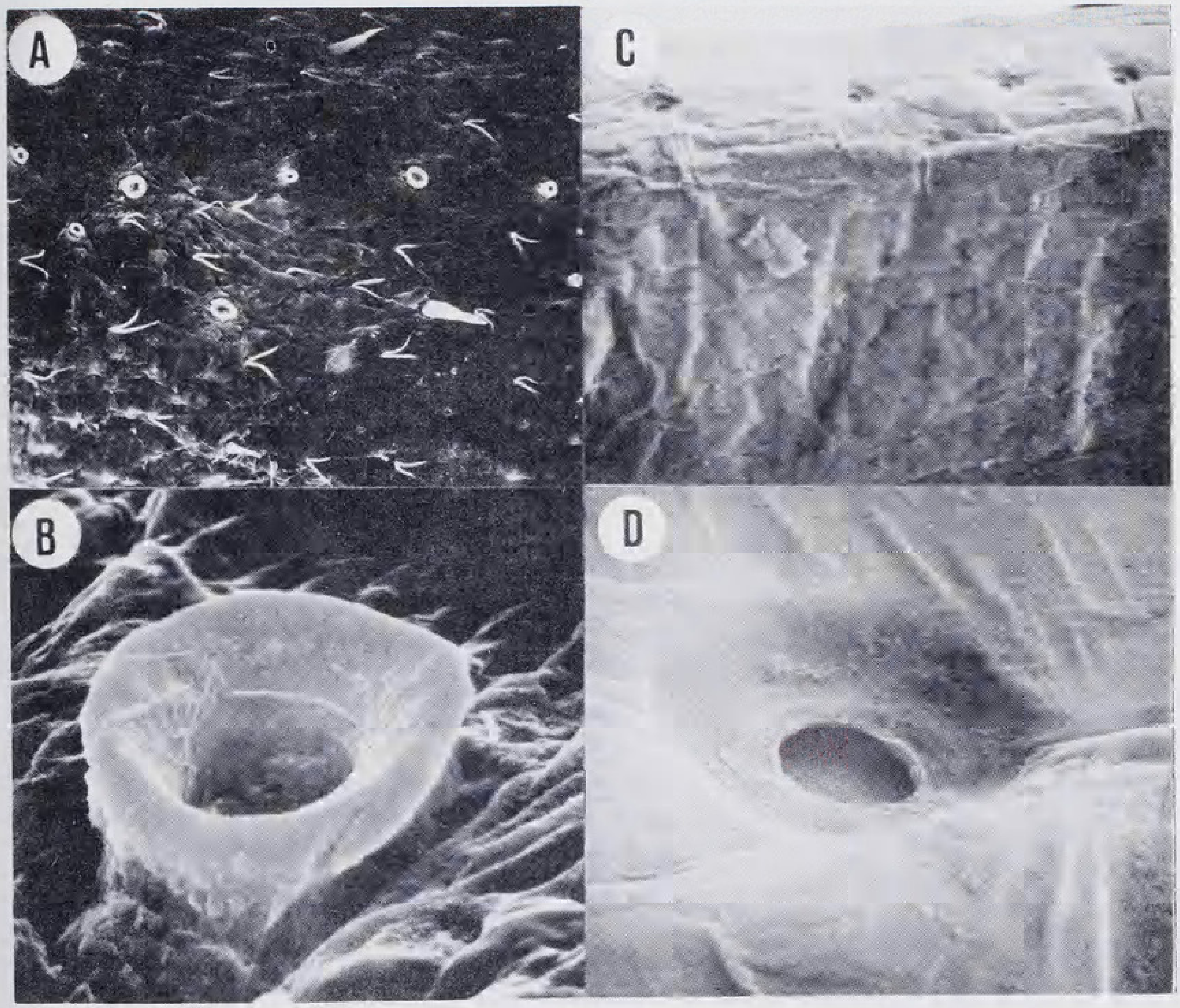
PLATE 1

*Endeis straughani* A, Cement gland ducts (x 300); B, Cement gland duct (x 5600); *Anoplodactylus simplex* C, Cement gland ducts (x 400); D, Cement gland duct (x 2800) (S.E.M. photographs).


A
C
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