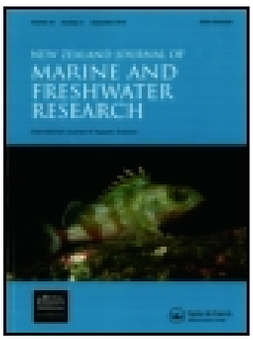

New Zealand Journal of Marine and Freshwater Research

ISSN: 0028-8330 (Print) 1175-8805 (Online) Journal homepage: http://www.tandfonline.com/loi/tnzm20

Pycnogonida of the Antipodes Islands

W. C. Clark

To cite this article: W. C. Clark (1971) Pycnogonida of the Antipodes Islands , New Zealand Journal of Marine and Freshwater Research, 5:3-4, 427-452, DOI: 10.1080/00288330.1971.9515396

To link to this article: http://dx.doi.org/10.1080/00288330.1971.9515396

PYCNOGONIDA OF THE ANTIPODES ISLANDS*

W. C. CLARK

Zoology Department, University of Canterbury, Christchurch, New Zealand

(Received for publication 5 January 1971)

ABSTRACT

Pycnogonida collected at the Antipodes Islands (49° 45′ S, 178° 45′ E) by the University of Canterbury Antipodes Islands Expedition 1969 and during New Zealand Oceanographic Institute cruises are reported on here, and constitute all material known for this group of animals from these islands. To date eight species are known; two are endemic, (*Pallenopsis antipoda* n.sp. and *Ammothea antipodensis* n.sp.); two constitute a circum-polar element (*Tanystylum cavidorsum* Stock and *Austrodecus breviceps* Gordon); the remaining four species are known also from New Zealand mainland waters (*Pallenopsis obliqua* (Thomson), *P. kupei* n.sp., *Achelia dohrni* (Thomson) and *Ammothea magniceps* Thomson), as is *T. cavidorsum*. An attempt is made to indicate the range of variation in *Achelia dohrni*, and *Pallenopsis mauii* Clark, 1958 is redescribed although not a part of the Antipodes Islands fauna.

INTRODUCTION

Most of the material considered in this paper was collected by Mr I. Mannering from the shore during the University of Canterbury Antipodes Islands Expedition 1969. Specimens as small as *Austrodecus breviceps* and some of the *Achelia* juveniles testify to the thoroughness with which he collected on the limited amount of the island's shoreline accessible to him. Other material was collected by the New Zealand Oceanographic Institute (henceforth referred to as NZOI) and by Dr E. J. Batham, Portobello Marine Biological Station. The Pycnogonida of the shores of the Antipodes Islands were previously quite unknown and the pycnogonid faunas of the ocean about these islands are still not well known. Fry and Hedgpeth (1969) contributed notably to knowledge of the Antarctic Pycnogonida, but had little to say about those of the Subantarctic region.

The eight species now known from the vicinity of the Antipodes Islands are:

Pallenopsis antipoda n.sp.; *P. kupei* n.sp.; *P. obliqua* (Thomson, 1884). *Ammothea antipodensis* n.sp.; *A. magniceps* Thomson, 1884. *Tanystylum cavidorsum* Stock, 1957. *Achelia dohrni* (Thomson, 1884). *Austrodecus breviceps* Gordon, 1938.

Apart from the *Pallenopsis* species, which are all moderately long-legged forms, and which are usually (occasionally in *P. obliqua*) found

*University of Canterbury Antipodes Islands Expedition 1969, Paper No. 5.

in water more than 100 m deep, the rest of the known fauna consists of short-legged species of modest to very small size from littoral habitats. These short-legged littoral forms, often considered prone to the production of local forms, have evolved but a single endemic species, *Ammothea antipodensis* n.sp. This low level of endemism suggests a fair rate of genetic influx from populations of the same species on islands further to the west in the West Wind Drift. Stock's (1956, p. 149) record of six specimens of "*Tanystylum neorhetum* Marcus" (? = *T. cavidorsum* Stock) "1 sea-mile E. of Auckland Islands. On floating 'Lessonia'. Nov. 28, 1914, Dr Th Mortensen collector" supports the possibility of the rafting of new genetic material. Hedgpeth (1948) discussed such dispersal on floating seaweed, and his fig. 8 shows a sargassum bladder bearing at least two specimens of *T. orbiculare*.

With the exception of the endemics *Ammothea antipodensis* and *Pallenopsis antipoda*, all six other species are known to inhabit waters to the west of the Antipodes; with the further exception of *Austrodecus breviceps*, the remaining five species are all known from the coasts of mainland New Zealand, but of these *Tanystylum cavidorsum* appears to be a truly circumpolar species; *Austrodecus breviceps*, otherwise well known only from Macquarie Island (Stock 1957b, Gordon 1938, 1944), may also be a circumpolar element. However, useful discussion of *Austrodecus* distribution is difficult, because there is no information on reproduction in this family (ovigerous males of *Austrodecus* are unknown), and because such small animals (of about 1.5 mm trunk length) are easily missed by collectors.

SYSTEMATICS

Family Callipallenidae Hilton, 1942

Genus **Pallenopsis** Wilson, 1881

Pallenopsis (Pallenopsodon) antipoda n.sp. Fig. 1A–G

MATERIAL EXAMINED

1 ♀ (holotype) NZOI Sta. F127, T.A.M., 49° 22′ S, 176° 16′ E, 1280 m, sand, rocks and pebbles, 28 January 1965.

DESCRIPTION

Trunk robust, well segmented, lateral processes separated by about half their own width (Fig. 1A is foreshortened). Cephalon length equal to trunk segments 2 and 3 combined. Cephalon with only a moderate 'neck'. Apart from a very few minor spinules at the ends of the lateral processes, dorsum not ornamented.

Ocular tubercle at anterior limit of cephalon, low, rounded, with 4 pigmented eyes.

Proboscis directed somewhat ventrally, length equal to distance between anterior margin of cephalon and origin of abdomen. Greatest diameter near middle with a marked constriction either side of this. Wider distally than proximally.

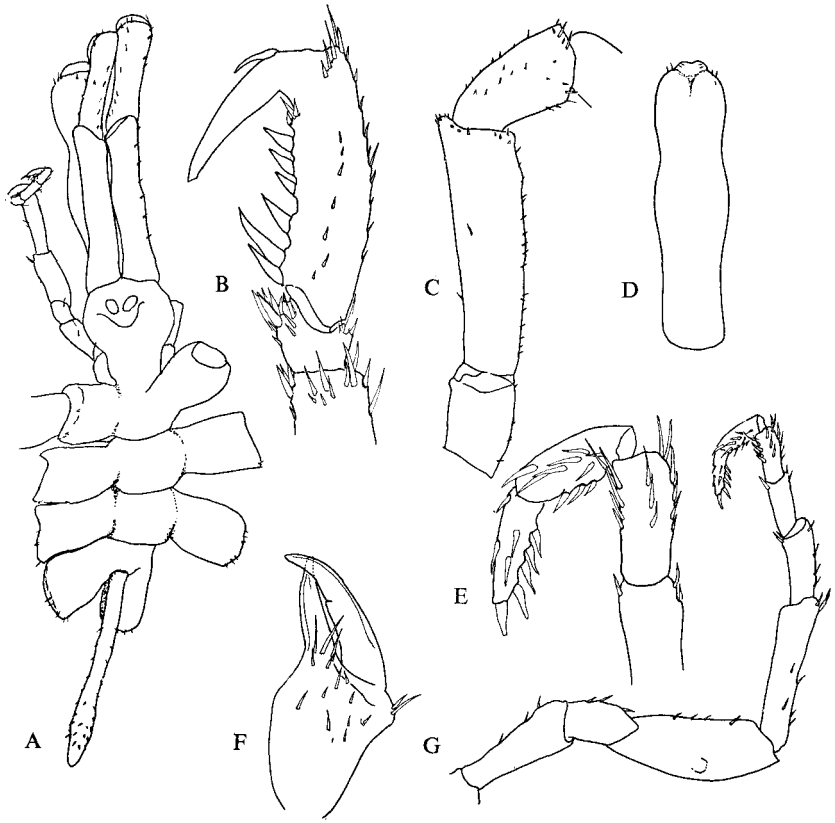

FIG. 1—*Pallenopsis antipoda* n.sp. Holotype ♀; A dorsal view of trunk, B propodus 3, C proximal segments of leg 3, D proboscis, E terminal segments of oviger, F chela, G oviger. (Measurements in text.)

Abdomen set at about 30° from horizontal, equal in length to the three posterior trunk segments, clavate near tip, where it is ornamented dorsally with scattered spinules.

Chelophores with 2-segmented scape reaching to tip of proboscis. Palm at right angles to scape. Palm about equal in length to fingers. Fingers bowed, dactylus a little longer than immovable finger; tips cross when closed, margins entire. No spinose pad at base of dactylus, but a few long setae at base of fingers. Small spinules scattered over surface of palm.

Palps reduced to a single button-like segment.

Female oviger 10-segmented in female (only 9 shown in Fig. 1G); segment 4 longest and broadest with a slight lateral process as in *P.* (*Pallenopsodon*) *brevidigitata* Möbius. Segment 6 half as long as segment 4. Segments 8–10 subequal in length but decreasing in width, and armed with 3 rows of simple spines.

Leg 3 long, moderately robust without any apophyses or other pronounced processes. All setae shorter than half the width of the leg at the point of their insertion. Tibia 1 and femur almost equal; tibia 2 the longest segment. Propodus short in relation to long segments (= $^1/_{10}$ length of tibia 2) and almost straight;

bearing 6 large sole spines and 3 smaller ones. Terminal claw more than half as long as propodus. Auxiliary claws small and weak, almost 1/3 as long as terminal claw.

Genital pores small, patent on ventral distal extremity of coxae 2 of all legs of the female holotype.

MEASUREMENTS (mm): Female oviger segment 2 1.31, 3 0.77, 4 1.79, 5 1.7, 6 0.86, 7 0.61, 8 0.54, 9 0.5, 10 0.5. Trunk (tip of cephalon to tip of fourth lateral process) 9.0, cephalon 3.8, width across second lateral processes 5.5, length chelophore scape (both segments) 6.5, length proboscis 6.5, greatest width proboscis 1.8, length abdomen 4.6. Leg 3: coxa 1 2.0, coxa 2 5.5, coxa 3 2.7, femur 18.3, tibia 1 17.5, tibia 2 22.5, tarsus 0.62, propodus 2.3, main claw 1.37, auxiliary claws 0.42.

TYPE SPECIMEN: Holotype in type collection, New Zealand Oceanographic Institute, Wellington, Reg. No. 118.

REMARKS: Stock (1964) discussed the problems of determining differentia for the subgenus *Pallenopsodon*. A consideration of the species in the genus *Pallenopsis sensu latu* indicates that this is a new species, characterised chiefly by this combination of characters:

auxiliary claws small but present,
two segmented chelophore scape,
no long setae on the legs,
and no spinose pad at the base of the dactylus.

The oviger characters appear unique, viz., 3 parallel rows of simple spines on the three terminal segments; segment 10 with a single strong terminal spine almost worthy of being called a terminal claw (which would further upset the chaotic arrangement of genera within this family).

Generally *P. antipoda* appears to be most closely related to *P. (Pallenopsodon) brevidigitata* Möbius, 1902, from South Africa. *P. brevidigitata* differs from *P. antipoda* in having auxiliary claws only one-seventh as long as the terminal claw, an abdomen which does not project even to the posterior limit of the fourth lateral processes, and (*fide* Flynn 1928) many more sole spines on the propodus, albeit very much smaller ones. Size appears to be similar in both species, but Möbius' figure (Taf. IV, fig. 7), and Flynn's measurements suggest that *brevidigitata* has much longer lateral processes.

Pallenopsis kupei n.sp. Fig. 2A–J

Pallenopsis mauii Clark, 1958 (in part); pp. 4–6, figs 9, 10, 12, 13, 15, 17.

MATERIAL EXAMINED

1 ♀ (damaged), Victoria University Zoology Department Collection, Cook Strait Sta. KOP off Palliser Bay, 41° 45′ S, 174° 53′ E; 24 November 1956; 1330–1530 hrs; 914–1097 m; in meshes of baited trap (this specimen was an allotype of *P. mauii* Clark, 1958).

3 ♂♂, 7 ♀♀ (one ♂ is the holotype, one ♀ is the allotype) Portobello Marine Biological Station Mu 67/142, 45° 51′ S, 171° 02′ E; Papanui Canyon (Canyon B) 730 m, bottom muddy sand, Agassiz trawl, 1967.

1 ♂, Portobello Marine Biological Station Mu 67/110, 45° 52′ S, 171° 41′ E; Papanui Canyon (Canyon D) 770 m, bottom muddy sand, Agassiz trawl, 1967.

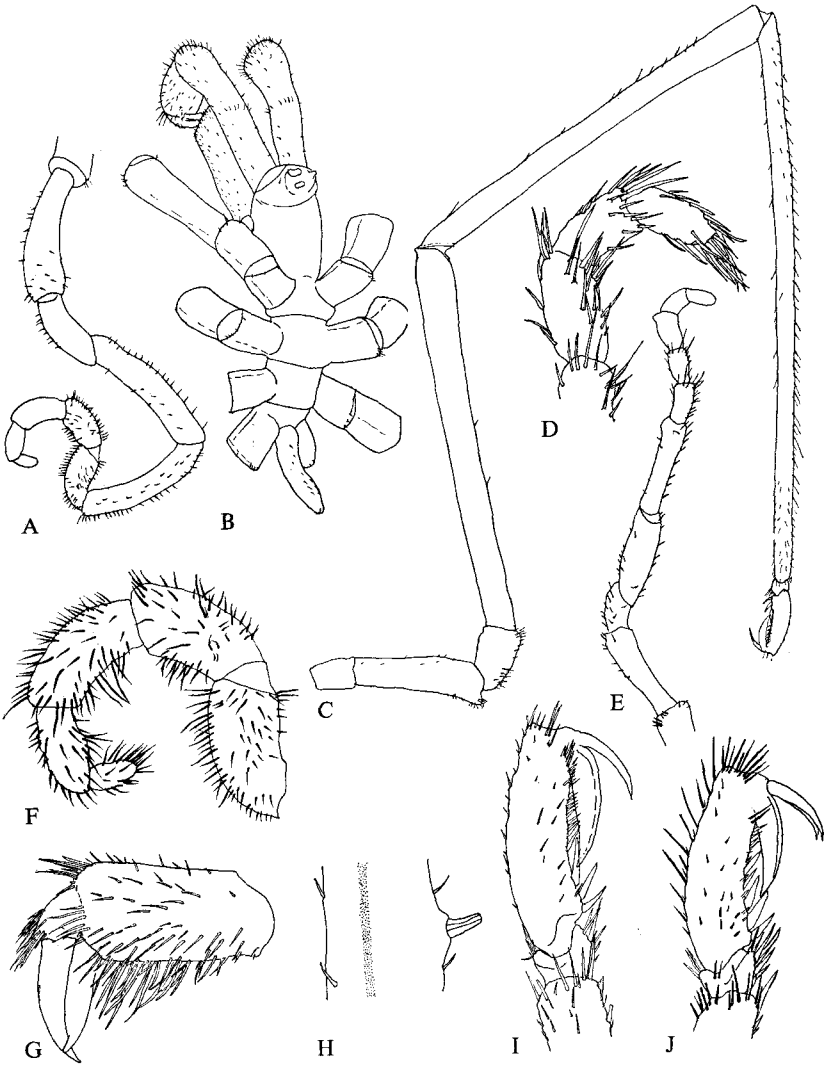

FIG. 2—*Pallenopsis kupei* n.sp. All figs from paratypes. A ♂ oviger, B dorsal view of ♂ trunk, C ♀ leg 3, D and E ♀ oviger, F tip of ♂ oviger, G ♂ chela, H part of ♂ femur to show cement gland duct, I and J ♂ propodes 3. (Measurements in text.)

1 ♀ (paratype), NZOI Sta. A 740, 49° 41′ S, 178° 40.2′ E, off Antipodes Islands, 315 m, D.C.M., 9 November 1962.
1 ♀ (paratype), NZOI Sta. E 413, 45° 12′ S, 171° 44′ E; about 35 miles ESE of Oamaru, 249 m, medium and fine sand with mud and broken shells, 11 October 1965.
2 ♀♀ NZOI Sta. E 719, 38° 46′ S, 178° 48′ E; 750–913 m, fine brown sand, 23 March 1967.
1 ♀, NZOI Sta. D 17, 52° 31′ S, 160° 31′ E; 121 m, 23 April 1963.
1 ♀, NZOI Sta. E 237b, 54° 51.0′ S, 158° 38.0′ E; 146 m (slightly to the west of the mid point between the southern tip of Macquarie Island and the Bishop and Clerk Islands), 27 February 1965.

DESCRIPTION

Trunk large, robust, lateral processes separated by less than half their own width proximally, and less than their own width distally. Dorsum smooth, unadorned apart from a few small spines at the ends of the lateral processes. Intersegmental lines of trunk distinct. Cephalon somewhat expanded anterior to first lateral processes. Length cephalon equal to length of remaining trunk segments.

Ocular tubercle situated at anterior limit of cephalon, and overhanging base of proboscis. Base of tubercle broad, spreading across whole width of anterior margin of cephalon, upper half of tubercle broadly conical, tip usually pointed, but may be rounded. Eyes 4, well pigmented, in anterior and posterior pairs usually at same height on tubercle.

Proboscis inserted on ventral surface of cephalon, directed ventrally and anteriorly at about 30° from the horizontal. Proboscis cylindrical, beset with sparse small spines on sides, and longer and denser spinules about mouth.

Abdomen long, straight or arcuate in dorso-ventral plane, becoming semi-erect, armed with fine sparse spinules, larger near tip. Anus terminal.

Chelophore scape of a single segment often marked on the dorsal surface with a faint trace of a segmentation line, and/or a transverse row of spinules. Spinules present throughout length of scape, but mostly very small, except distally. Chelophores reach beyond the proboscis. Chela palm at right angle to scape. Palm rather oblong in outline, setose, with a lateral fringe of setae about half as long as fingers. Spinose pad present at base of dactylus. Fingers at right angle to palm; tips cross slightly when closed, margins entire.

Palps reduced to a short, dorso-ventrally flattened knob-like segment, breadth almost twice length.

Oviger 10-segmented in both sexes. Male oviger with setae on all segments, segments 4 and 5 longest, armed with many simple spines. Female oviger less well developed than male, but, apart from lesser development of spination, similar to male.

Leg 3 rather slender, not markedly setose; coxa 2 longer than coxae 1 and 3 combined, tibia 2 the longest joint; femur and tibia 1 almost equal and three times as long as coxa 2. Propodus almost straight, with 3 strong spines on a slight heel, more distal sole spines weaker; claw about half as long as propodus; auxiliary claw more than half as long as main claw and about half as long as propodus.

Genital pores on ventral surface of all coxae 2 in ♀ and on coxae of legs 3 and 4 in ♂.

MEASUREMENTS (mm): (Holotype ♂ first then allotype ♀ in parentheses.) Length trunk (tip of cephalon to tip of abdomen) 5.8 (6.8), length cephalon 2.6 (3.0), width across second lateral processes 3.4 (3.5), length chelophore scape 2.8 (4.0), length abdomen 2.6 (3.5), length proboscis 3.0 (3.7), greatest width proboscis 1.0 (1.3). Leg 3: coxa 1 1.0 (1.1), coxa 2 3.2 (3.6), coxa 3 1.5 (2.2), femur 9.6 (12.6), tibia 1 10.0 (12.0), tibia 2 12.3 (15.8), tarsus 0.6 (0.6), propodus 1.8 (2.1), claw 0.8 (1.1), auxiliary claw 0.6 (0.7).

TYPE SPECIMENS: Holotype ♂ (Reg. No. Pyc. 24), allotype ♀ (Reg. No. Pyc. 25) and 3 ♀♀ paratypes (Reg. Nos. Pyc. 26. 2 from Mu 67/142; Pyc. 27, 1 from VUZ KOP) in Dominion Museum, Wellington, remaining paratypes in Portobello Marine Biological Station (Reg. No. Portobello 67/1 from Mu 67/142: 2 ♂♂ and

4 ♀♀) and NZOI collection (Reg Nos. P185 from Sta. A740 and P186 from Sta. E413).

REMARKS: This species is closest to an undescribed species in my collection from Macquarie Island, from which both sexes are most readily separated by the proportions of the legs. In *P. kupei* n.sp. the second coxae are only about one-third as long as the femora (or first tibiae), but in the Macquarie Island species the second coxae are half as long as the femora (or first tibiae). If males are available, the femoral cement gland ducts of *P. kupei* are half as long as the femur is wide, but in the Macquarie Island species the ducts are as long as the femur is wide.

One of the specimens (♀ paratype Dom. Mus. Pyc. 27, from VUZ Sta. KOP) now referred to this species was originally mis-associated by me with *Pallenopsis mauii*. The female of *P. mauii* remains unknown but the association of males and females in the present species seems indubitable.

The distribution is interesting and extends from Bay of Plenty in the north through two *Munida* stations off Otago, to the Antipodes in the south-east and to the south of Macquarie Island in the south-west. Whether the shallower depths of the more southerly localities have any special significance is not known. Near Macquarie Island the species appears to be sympatric with *P. obliqua* and an undescribed *Pallenopsis* sp.

The species is named for the legendary Maori navigator Kupe, presumably New Zealand's first oceanographer.

Pallenopsis mauii Clark, 1958 Fig. 3A–G

Pallenopsis mauii Clark, 1958; pp. 4–6, figs 11, 14, 16, 18, 19.

MATERIAL EXAMINED

1 ♂ (holotype) Victoria University Zoology Department Collection 96, Sta. BOQ, off Palliser Bay, 41° 31′ S, 174° 55′ E; 28 August 1957; 1330–1530 hrs; about 380 fathoms (712 m); mud, stones, rock; beam trawl.

DESCRIPTION

Trunk slender, lateral processes separated proximally by not more than half their own width; clearly segmented; dorsum smooth, without ornamentation. Cephalon somewhat expanded anteriorly but with a sharp marked constriction just anterior to the oviger bases and posterior to the palps. Trunk segments 2–4 (excluding the abdomen) longer than cephalon.

Ocular tubercle at anterior extremity of cephalon, about as high as diameter at base, lower walls vertical, hemispherical above, 4 well pigmented eyes present (Fig. 3B).

Abdomen fusiform, carried at about 40° from horizontal, anus terminal.

Chelophores with a 2-segmented scape; suture between scape segments distinct, oblique, with only very small setae. Chela at right angles to scape; palm rectangular, longer than fingers, setose especially in distal half with setae near bases of fingers the longest. Fingers slightly arcuate, margins entire and meeting throughout their length, tips cross slightly when closed. No spinose pad at base of dactylus (Fig. 3F).

Palps fairly large for the genus. Inserted on ventro-lateral margins of cephalon neck so that they are readily visible from above (Fig. 3A).

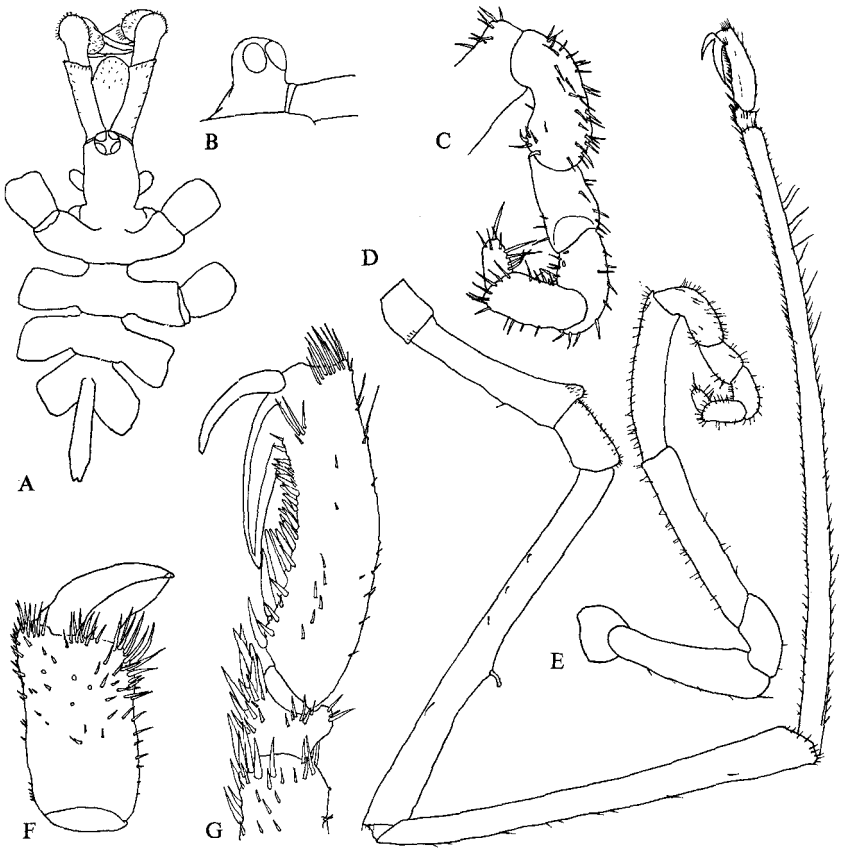

FIG. 3—*Pallenopsis mauii* Clark, 1958. Holotype ♂; A trunk, B lateral view of ocular tubercle, C tip of oviger, D leg 3, E oviger, F chela, G propodus 3. (Measurements in text.)

Oviger (♂) length of segment 1 0.5, 2 2.25, 3 1.25, 4 2.75, 5 2.3, 6 1.0, 7 0.7, 8 0.7, 9 0.6, 10 0.35. All segments bear some simple spines (Fig. 3C and E) but the spination of the terminal segments (Fig. 3C) is somewhat sparse.

Leg 3 slender, tibia 2 (the longest segment) moderately setose, the other segments sparingly so (Fig. 3D). Duct of femoral cement gland situated at five-ninths of the femoral length, a little shorter than the width of the femur at that point. Propodus slightly arcuate (Fig. 3G) with sole spines crowded distally, but larger and more widely spaced in the heel region. Dorsal extremity with a well marked fringe of long slender spinules. Claw more than half as long as propodus, auxiliary claws more than half as long as main claw and one-third as long as propodus.

Genital pores on the ventral distal extremities of coxae 2 of legs 3 and 4.

MEASUREMENTS (mm): Length trunk (tip of cephalon to tip of abdomen) 9.8, length cephalon 3.8, width across second lateral processes 4.4, length chelophore scape 3.6, length proboscis 4.0, greatest width proboscis 1.1, length abdomen 2.2. Leg 3: coxa 1 1.5, coxa 2 4.5, coxa 3 1.9, femur 11.9, tibia 1 12.5, tibia 2 17.2, tarsus 0.6, propodus 2.4, claw 1.3, auxiliary claw 0.8.

TYPE SPECIMEN: Holotype in Dominion Museum, Wellington, Reg. No. Pyc. 1.

REMARKS: Confirmation of the fact that I had in 1958 mis-associated the material originally included under *Pallenopsis mauii* has necessitated the redescription of the species, which is not a part of the Antipodes Islands fauna. The specimen, previously regarded as a female paratype, is now referred to *P. kupei* n.sp.; this specimen was used for the whole trunk illustrations, and in part in compiling the species description (Clark 1958). Although it is clear where this had been done a redescription was necessary here because the whole conspectus of *P. mauii* was becoming rather confused.

The female of this species is still unknown.

Pallenopsis obliqua (Thomson, 1884)

For synonymy and literature *see* Clark 1971.

MATERIAL EXAMINED

1 ovigerous ♂, 3 juveniles, NZOI Sta. 738, 49° 40.1′ S, 178° 47.3′ E (off Antipodes Is), 62 m, 9 November 1962.

REMARKS: These are typical specimens of this species, which is now known to be widespread, usually in modest depths, about the mainland coasts and from most of the subantarctic islands of New Zealand.

Family Ammotheidae Dohrn, 1881

Genus **Ammothea** Leach, 1814

Ammothea antipodensis n.sp. Fig. 4A–K

MATERIAL EXAMINED

1 ♂ (holotype), 2 juveniles (paratypes), Canterbury University Zoology Department* Antipodes Sta. A.M. 8.21, associated with bryozoans in a crevice in the reef which separates the large pool on Reef Point from the open sea, coll. I. Mannering, 26 February 1969.

DESCRIPTION

Trunk oval in outline, compact, well-segmented. Lateral processes separated by less than half their own width and armed distally with a few minute spinules. Cephalon slightly less than half as long as trunk; only dorsal eminence is the ocular tubercle, though cephalon is marked by a deep arcuate furrow which passes transversely behind the ocular tubercle. Trunk segments 2 and 3 each with a dorsal median pointed tubercle almost as high as ocular tubercle or abdomen. Posterior face of trunk segments 1–3 excavated somewhat to produce a thin postero-dorsal rim or collar.

*Henceforth referred to as CUZ.

Ocular tubercle about as tall as diameter at base (lateral view), pointed above, with 4 well-pigmented eyes and two small circular areas (? pressure-receptors) demarcated on the cuticle just below the apex of the tubercle.

Proboscis somewhat pyriform, with a constriction at about one-third of the distance from the base; somewhat truncated at tip.

Abdomen erect with 2 short spinules near tip. In dorsal view does not reach to end of fourth lateral processes. With a marked dorso-suranal apophysis (Fig. 4C).

Chelophores with a scape of 1 segment and chelae reduced to fusiform knobs. Scape with a terminal dorsal apophysis.

Palps 9-segmented (segment 1 not shown in Fig. 4D), and reach beyond tip of proboscis. Segments 5–8 strikingly triangular in lateral view (Fig. 4E). Terminal segment fusiform. Segments 5–9 with ventral fringes of setae. Lengths of palp segments (mm): 2 0.57, 3 0.17, 4 0.6, 5 0.16, 6 0.12, 7 0.1, 8 0.1, 9 0.17.

Oviger (♂) of 10 segments; basal segment short, segment 2 the longest; segments 3–5 subequal; segments 6–10 decreasing fairly regularly in size. Segment 7 with a distinct patch of spines on one corner. Segments 8–10 bear well-formed, though minute, compound oviger spines according to the formula 2 : 3 : 2. Terminal claw absent.

Leg 3 moderately robust, sparsely spinose. Length of femur almost equal to length of all coxal joints combined. Coxa 2 near its mid-point bears 2 divergent dorsal spines conspicuous in dorsal views of the entire animal. Cement gland opens as a simple pore at about 80% of femoral length from its proximal end. Tibiae 1 and 2 almost equal in length and shorter than femur. Propodus markedly arcuate for the genus, with a well developed group of 6 heel spines which are finely crenulate near the tips. Main claw strong with auxiliary claws half as long as main claw.

Genital pores of male placed ventrally and distally on coxae 2 of legs 3 and 4. Genital mounds or eminences absent.

MEASUREMENTS (mm): Holotype ♂; length trunk (tip of cephalon to tip of fourth lateral processes) 1.57, length cephalon 0.65, width across second lateral processes 1.17, chelophore scape 0.325, length proboscis 1.12, greatest width proboscis 0.55, length abdomen 0.35. Leg 3: coxa 1 0.37, coxa 2 0.72, coxa 3 0.62, femur 1.62, tibia 1 1.45, tibia 2 1.25, tarsus 0.2, propodus 0.87, claw 0.5, auxiliary claw 0.3. Lengths of segments 2–10 of ♂ oviger: 2 0.6, 3 0.42, 4 0.5, 5 0.45, 6 0.27, 7 0.17, 8 0.1, 9 0.1, 10 0.067.

TYPE SPECIMENS: Holotype ♂ (Reg. No. Pyc. 30) and 2 juveniles (paratypes) (Reg. No. Pyc. 31) deposited in the Dominion Museum, Wellington.

REMARKS: *Ammothea antipodensis* is readily recognised by its small size, the presence of tall median dorsal tubercles on trunk segments 2 and 3 only, the arcuate propodus with six well-developed heel spines, the triangular palp segments, and the number and distribution of compound oviger spines. Any of these characters alone would identify the species, but in combination they are powerful evidence for a new taxon.

The occurrence of a new species of *Ammothea* in the Subantarctic is of considerable interest. The genus *Ammothea* was long considered to be strictly Antarctic in distribution; the two long-standing exceptions to this, the New Zealand species *A. magniceps* Thomson, 1884 and the Australian species *A. australiensis* Flynn, 1919, had been inexplicably overlooked. *A. antipodensis* n.sp. serves to some extent to close the geographic gap between the bulk of the species with Antarctic distributions and the species further to the north. The occurrence together on the Antipodes of *A. antipodensis* and *A. magniceps* may serve to reinforce the idea of a southern centre for the genus, and possibly of a more

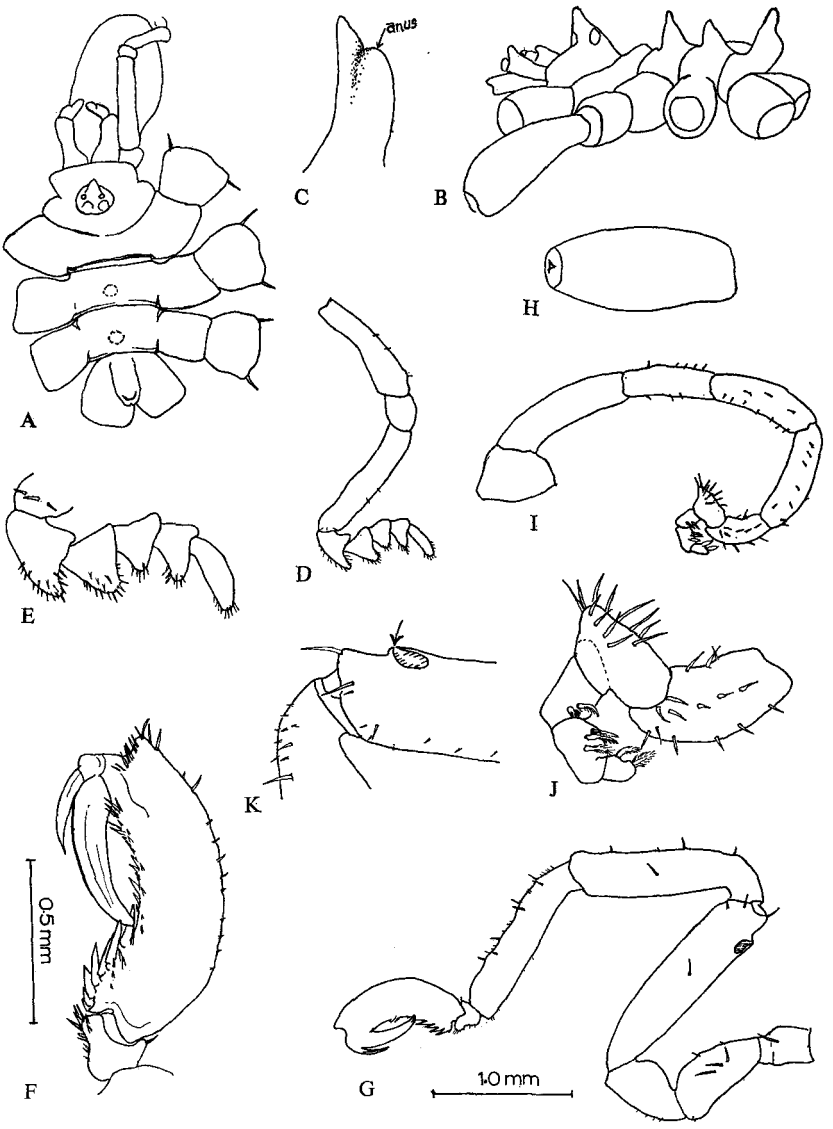

FIG. 4—*Ammothea antipodensis* n.sp. Holotype ♂: A dorsal view of trunk, B lateral view of trunk, C lateral view of abdomen, D palp, E terminal palp segments, F propodus, G leg 3, H proboscis, I oviger, J terminal segments of oviger, K femur–tibia 1 articulation to show femoral cement gland duct. (Measurements in text.)

or less continuous distribution of the genus from the Antarctic up to at least the Subtropical Convergence in the New Zealand region.

The synonymising of *Ammothea* with *Lecythorhynchus* by Stock (1956) and subsequent discoveries reported by Utinomi (1959), Losina-Losinsky (1961) and Stock (1966) have established the existence of four *Ammothea* species in the North Pacific and one in the South Pacific besides those from the South Pacific mentioned above (*See* also remarks under *A. magniceps* below).

Ammothea magniceps Thomson, 1884 Fig. 5A–F

A. magniceps Thomson, 1884, p. 244 Pl. XV, figs 1–5. Hutton 1904, p. 247. Stock, 1956, pp. 43–5, fig. 8A–K. Clark, 1963, p. 59.
A. (*Theammoa*) *magniceps* Fry & Hedgpeth, 1969, pp. 71–2, 81–3, figs 120, 121 (not 122?).

MATERIAL EXAMINED

1 ovigerous ♂, large pool on reef, Anchorage Bay, CUZ Antipodes Sta. AM 4.26, coll. I. Mannering, 26 February 1969.
1 juvenile on *Halopteris* sp. in large pool, Anchorage Bay, CUZ Antipodes Sta. AM 4.34, coll. I. Mannering, 20 February 1969.
1 ♀, under stone in large pool, Reef Point, Antipodes Island, CUZ Antipodes Sta. AM 8.18, coll. I. Mannering, 26 February 1969.
1 ♀, large pool. Reef Point. CUZ Antipodes Sta. AM 8.2, coll. I. Mannering, 24 February 1969.

REMARKS: The descriptions of females based on material from Lyttelton and Akaroa Harbours (Thomson 1884, Stock 1956) are adequate for the recognition of this species. The male of this species is illustrated here for the first time. The species is known to me from several localities in the South Island and from near Wellington. In the Auckland area it appears to be replaced by an as yet undescribed species of which I hold material.

Fry and Hedgpeth (1969) placed *Ammothea australiensis* Flynn, 1919 in synonymy with this species, but they examined only Australian material, which on a geographical basis could be expected to be *A. australiensis* rather than *A. magniceps*, and they did not figure the crucial Port Phillip Bay specimens on which they based their conclusion. In the meantime, I prefer to keep these taxa separate: to regard the smaller form from Australia with median dorsal tubercles on the transverse trunk ridges as *A. australiensis*, and to regard the larger form from New Zealand and the Subantarctic without these tubercles as *A. magniceps*. In Clark (1963), note the *lapsus* in the caption to fig. 29A–G which should read "*Ammothea australiensis* all figs of *male* except F", not "female".

By Fry and Hedgpeth's (1969) key, the males of the species discussed here cannot be identified. In couplet 5, which serves to separate the males from the females, the fact has been overlooked that *A. australiensis* and *A. magniceps* males have their genital pores of the second coxae of the last two pairs of legs only, whilst the females have genital pores on the second coxae of all legs.

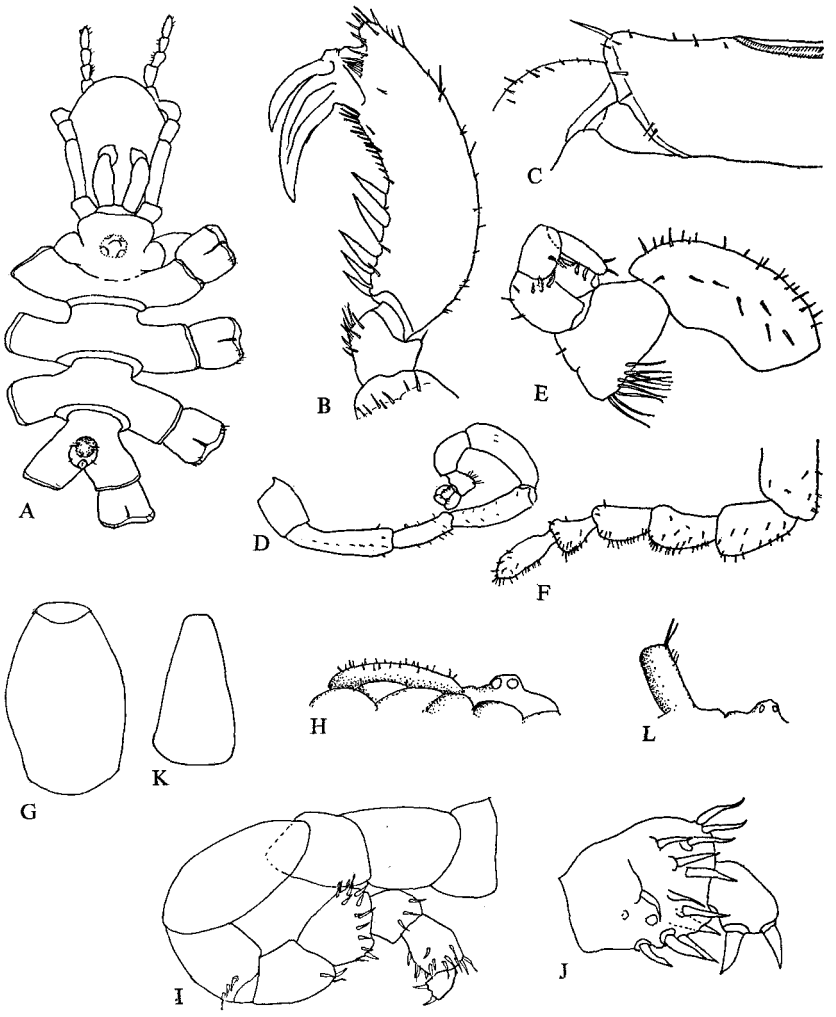

FIG. 5—*Ammothea magniceps* Thomson, 1884. ♂: A trunk, B propodus, C femur–tibia 1 articulation to show femoral cement gland duct, D oviger, E terminal oviger segments, F terminal palp segments.

Tanystylum cavidorsum Stock, 1957a. ♀: G proboscis, H lateral view of trunk to show horizontal abdomen, I oviger, J terminal oviger segments.

Tanystylum neorhetum Marcus, 1940. ♀ from Macquarie Island at same scale as G and H to show differences in proboscis (K) and abdomen (L).

Genus **Tanystylum** Miers, 1879

Tanystylum cavidorsum Stock, 1957a Fig. 5G–J

Tanystylum cavidorsum Stock, 1957a, pp. 98–100, fig. 15. Arnaud 1970, pp. 1424–6, figs 1, 2, 6.
Tanystylum cavidorsum steatopygidium Hedgpeth, 1960, pp. 12–4, fig. 9a–f.
Tanystylum neorhetum Stock, 1954, [*non* Marcus, 1940] pp. 149–51, figs 73–4.

MATERIAL EXAMINED

1 ovigerous ♂, 1 ♀, under stones, mid-tide level, Hut Cove, Antipodes Islands, associated fauna *Margarella hinemoa* and *Exosphaeroma gigas*, coll. I. Mannering, 4 February 1969.
1 ♀, data as above, 13 February 1969.

REMARKS: This species has been recorded from the Snares Islands and the New Zealand mainland by Clark (1971). The subantarctic *Tanystylum* spp. are clearly in need of taxonomic revision. Although the Antipodes Islands specimens before me differ from all published figures, they do so only in quite minor features of oviger spination, and I do not feel impelled to erect yet another taxon in this confused group. I have compared these Antipodes Islands specimens with others from Macquarie Island, which fit the description and figures of *T. pfefferi* Bouvier, 1913 [= *T. neorhetum* Marcus, 1940 (nom. nov. pro *T. pfefferi* Bouv. preocc.)] given by Gordon (1932a) in her redescription of the types.

The important features in which Gordon's description and figures agree with the Macquarie Island material, and in which they do not fit the Antipodes Islands specimens or Stock's (1954) Auckland Island material are: "Abdomen much elevated, so that it does not extend beyond the fourth lateral process" and "Proboscis conical, directed obliquely downward". The Macquarie Island material which I assign to *Tanystylum neorhetum* also matches Gordon's (1932a) figs 3a and 4a; the abdomen is semi-erect, spinose only near the tip, and not horizontal and spinose throughout its length, as in the Antipodes Islands material and Stock's figures: fig. 73a (1954) and fig. 15a (1957a). In the Antipodes Islands material which I refer to *T. cavidorsum* there is a spreading, inflated, setose base to the abdomen, as figured by Stock (1957a) and Hedgpeth (1960).

In *Tanystylum cavidorsum*, the long, horizontal abdomen with a spreading, inflated, spinose base is constantly associated with a short, obtuse proboscis carried at about 15° from the horizontal; but in *T. neorhetum* the short, semi-erect, terminally setose abdomen without a spreading or setose base is regularly associated with a short, conical proboscis carried at about 45° from the horizontal. The differences between the two forms are seen in Fig. 5G, H, K, L; in the form regarded here as *T. cavidorsum* the diameter at the middle of the proboscis is more than half that of the proboscis length, whereas in the form called *T. neorhetum* the diameter at the middle of the proboscis is much less than half its length. Distinctions based on length of the leg segments

do not appear to be useful. Gordon (1944) appears to have recorded *T. cavidorsum* from Kerguelen Island, and *T. neorhetum* from Macquarie Island.

Probably records of *Tanystylum neorhetum* from Tristan da Cunha (Gordon 1932b, Stock 1955); Gough Island (Gordon 1932b); the Chilean Coast (Hedgpeth 1960); the coast of Argentina at 46° S 63° W, South Georgia, Falkland Islands, Bouvet Island, and Macquarie Island (all *in* Stock 1957a) all refer to the taxon discussed under that name (*neorhetum*) here. Further, I believe that the form here called *T. cavidorsum* is conspecific with the form Stock (1957a) first recorded from South Georgia as *T. cavidorsum*, but which he had earlier (1954) recorded from the Auckland Islands as *T. neorhetum*. Hedgpeth's (1960) subspecies *steatopygidium* came from the vicinity of the island of Chiloe, off Chile. Arnaud (1970) recorded *T. cavidorsum* from the Crozet Islands: the Antipodes Island specimens appear to conform to *cavidorsum* as understood here, and not to *neorhetum* (= *T. pfefferi* Bouv.) *sensu* Gordon (1932a).

Genus **Achelia** Hodge, 1864

Achelia dohrni (Thomson, 1884) Figs 6A–H, 7A–J, 8A–I, 9A–H, 10A–R

Ammothea pycnogonoides Thomson *nec* Nob., 1882, p. 28.
Ammothea dohrni Thomson, 1884, pp. 243–5, Pl. xiv, figs 5–9. Hutton, 1904, p. 247. Helfer & Schlottke, 1935, p. 285.
Achelia dohrni Stock, 1954, pp. 107–9, figs 50–51; 1956, p. 42; 1968, p. 17, fig. 4b.
Achelia (*Ignavogriphus*) *dohrni* Fry & Hedgpeth, 1969, pp. 101–3, 106, fig. 156.

MATERIAL EXAMINED

New Zealand Mainland: 1 ovigerous ♂, Taylors Mistake, intertidal rocks, coll. W. C. Clark, 18 September 1955.
1 ovigerous ♂, Taylors Mistake, intertidal rocks, coll. G. Bird, 21 September 1952.
1 larvigerous ♂, Taylors Mistake, low water, on *Corallina*, coll. Class field trip, September 1957.
2 ♀♀, Taylors Mistake, 12 June 1946.
1 ♂, Menzies Bay, Banks Peninsula, coll. R. Jenkin, 18 September 1951.
1 ♀, Menzies Bay, Banks Peninsula, in plankton tow, August 1957.
1 ovigerous ♂, Menzies Bay, Banks Pennisula, in young fish trawl, coll. W. C. Clark, August 1951.
2 ♀♀, 1 larvigerous ♂, Menzies Bay, Banks Peninsula, 2 September 1947.
1 ♀, Menzies Bay, Banks Peninsula, coll. W. C. Clark, August 1954.
1 sub-adult ♂, 1 adult ♂, Brighton, Dunedin, January 1890.
1 ovigerous ♂, 'Nora Niven' N.Z. Government Trawling Expedition, 1907, Sta. 79, Porangahau Bay, 16.5 m, 15 August 1907.
2 ♀♀, Kaikoura, coll. Class field trip, August 1961.
Many ♀♀, ♂♂ and juveniles off *Obelia geniculata* on *Cystophora*, Kaikoura, coll. W. C. Clark, 26 August 1968.
1 ♀, Morgan's Pool, Kaikoura, 29 May 1963.
3 ♀♀, 6 ♂♂ (4 ovigerous), 63 juveniles, Kaikoura, on hydroids on *Cystophora*, coll. I. Mannering, 27 September 1969.

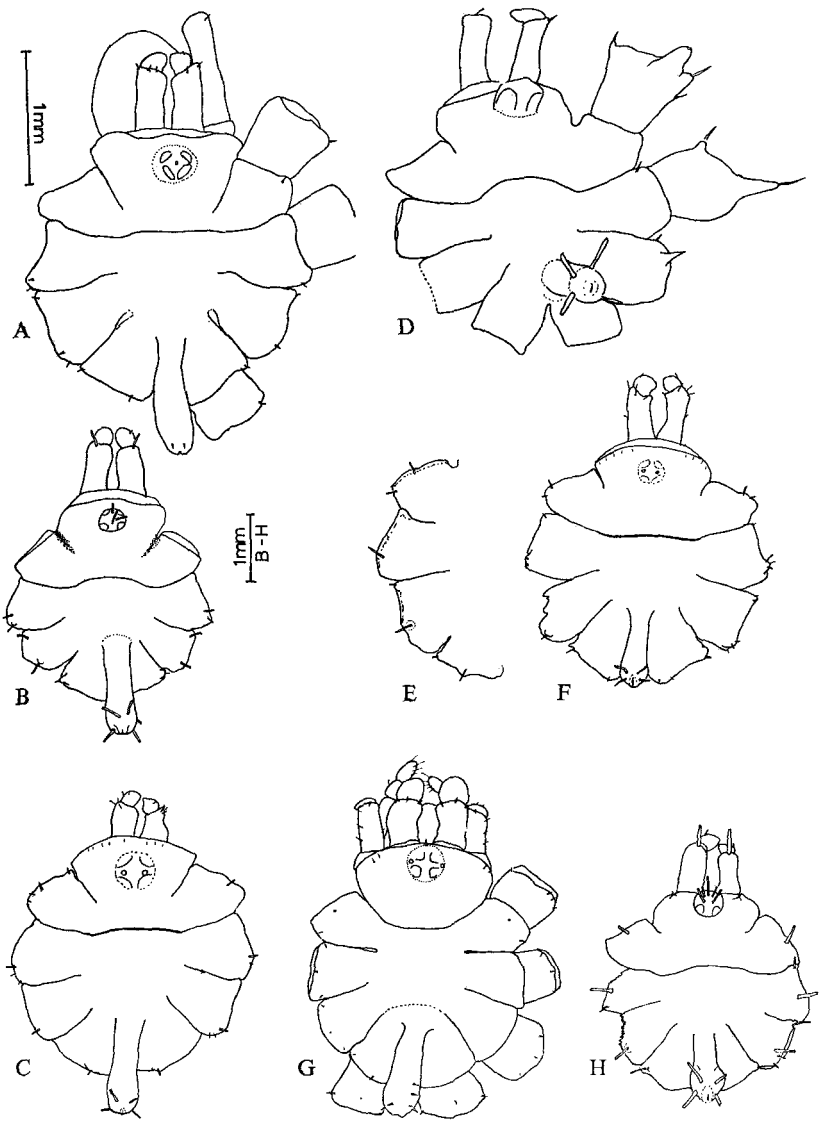

FIG. 6—*Achelia dohrni* (Thomson, 1884). Dorsal view of trunks: A ♀, NZOI Sta. C 795 (off Waihi Beach), B female, Perseverance Harbour, Campbell Island, C female, Sumner, D male, NZOI Sta. D 62, 51° 31.3′ S, 166° 16.9′ E (south of Auckland Islands), E and F ♂♂, Sumner, G ♀, Reef Point, Antipodes Islands, H ♂, Perseverance Harbour, Campbell Island.

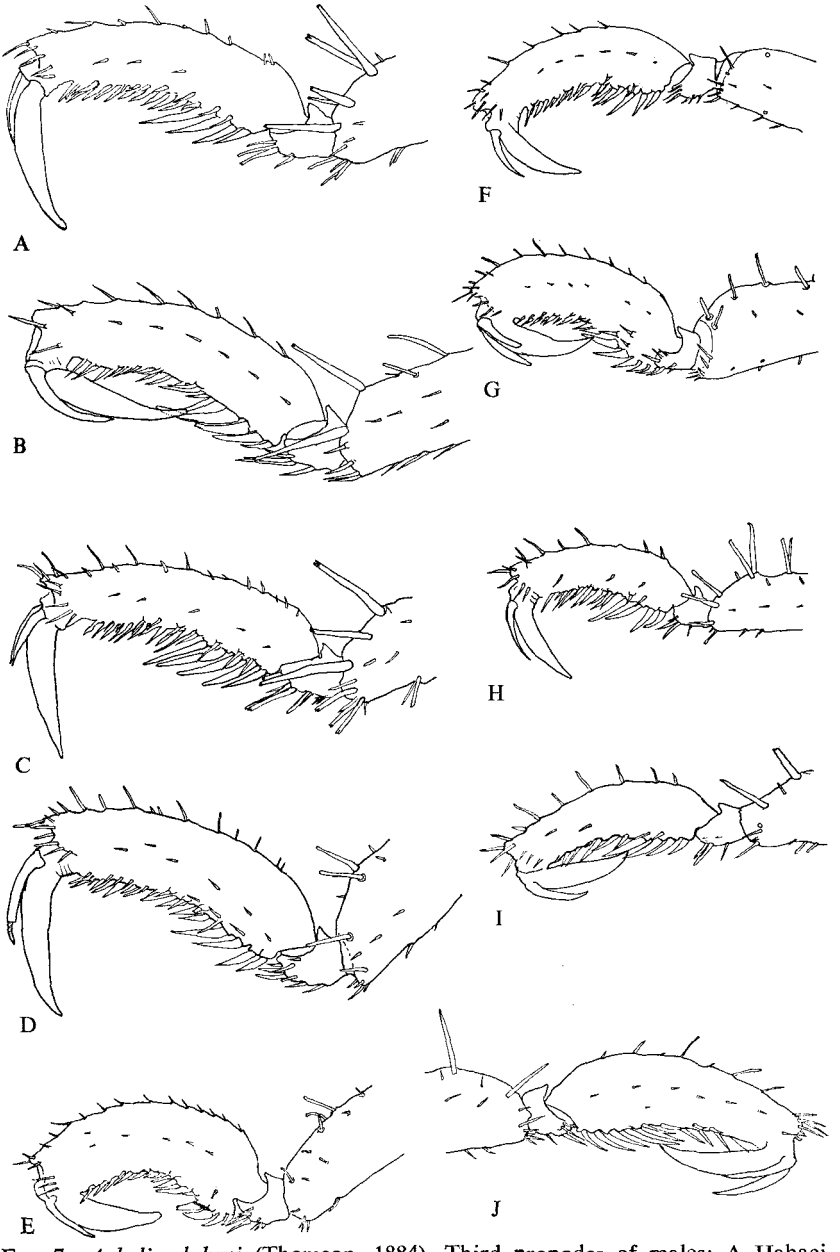

FIG. 7—*Achelia dohrni* (Thomson, 1884). Third propodes of males: A Hahaei, B Porangahau Bay, C Sumner, D Antipodes, E Snares, F NZOI Sta. D 62 (south of Auckland Islands), G New Brighton, H Sumner, I French Island, Auckland Islands, J Perseverance Harbour, Campbell Island. All to same scale.

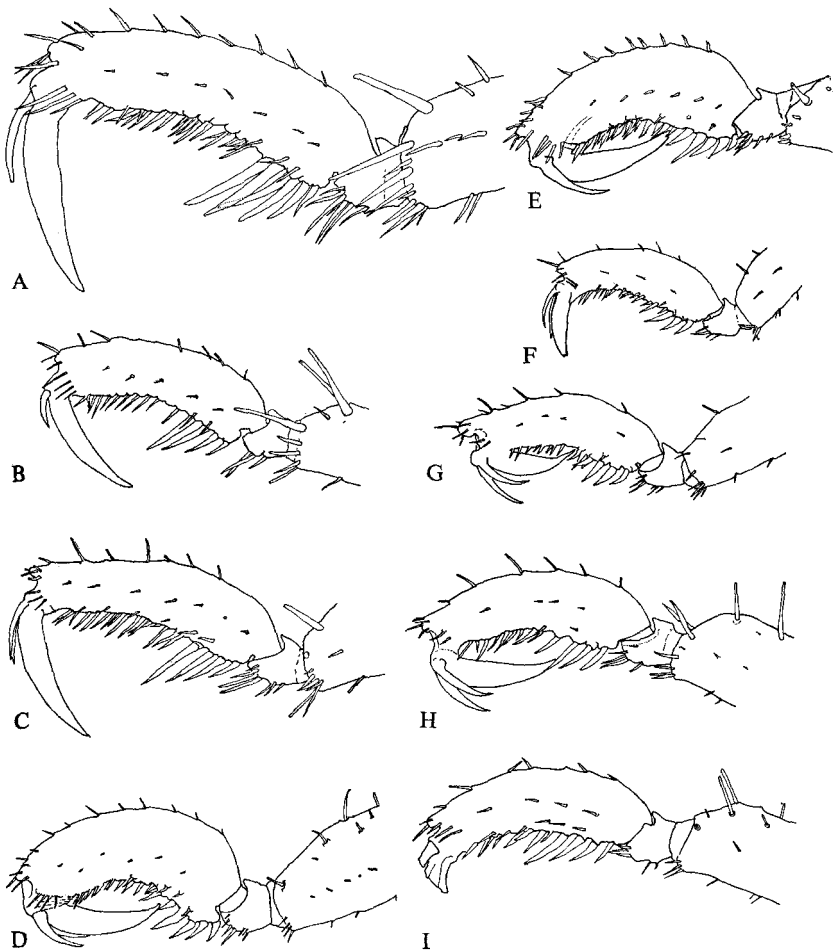

FIG. 8—*Achelia dohrni* (Thomson, 1884). Third propodes of females: A Waihi Beach, B and C Sumner, D Antipodes Islands, E Snares Islands, F NZOI Sta. D 62 (south of Auckland Islands), G Carnley Harbour, Auckland Islands, H Perseverance Harbour, Campbell Island, I NZOI Sta. Z 1895, Beeman Jetty, Campbell Island. All to same scale.

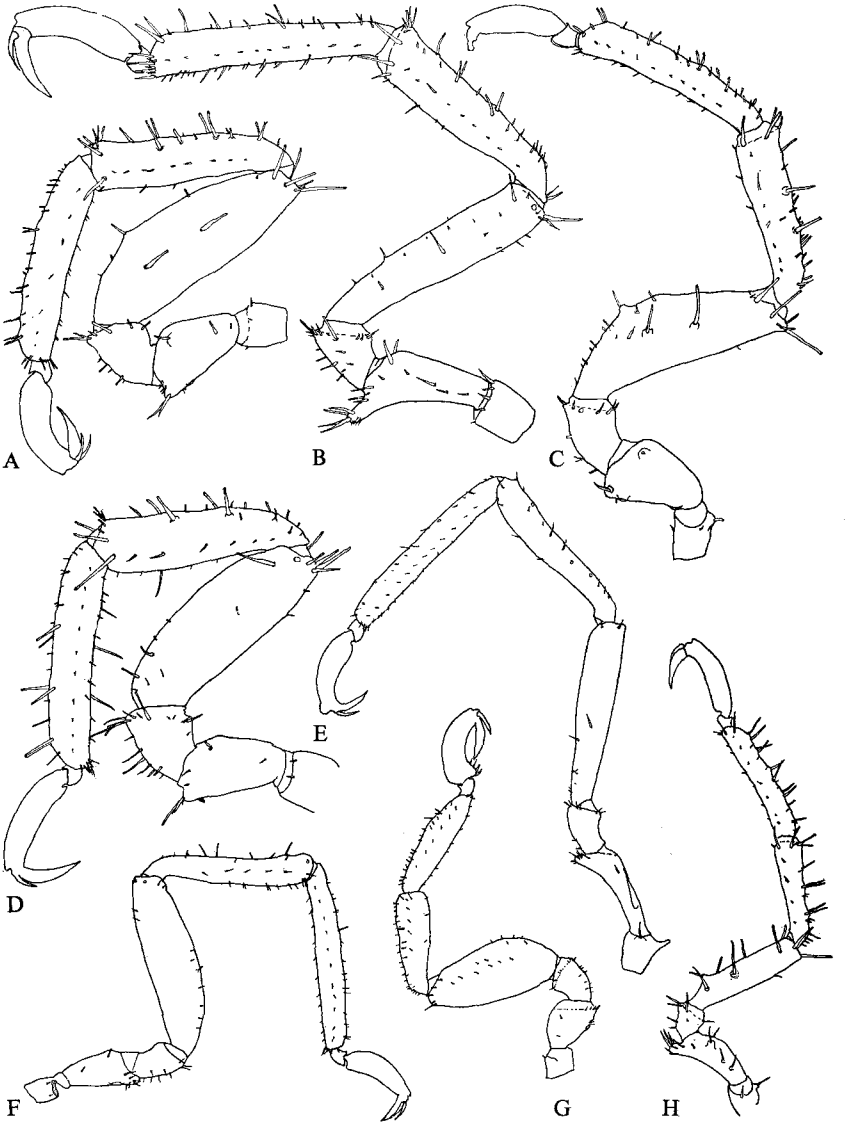

FIG. 9—*Achelia dohrni* (Thomson, 1884). Third legs: A ♀, Perseverance Harbour, Campbell Island, B ♂, Sumner, C ♀, NZOI Sta. Z 1895, Beeman Jetty, Campbell Island, D ♀, Sumner, E ♂, NZOI Sta. D 62 (south of Auckland Islands), F ♀, NZOI Sta. D 62 (south of Auckland Islands), G ♀, Antipodes Islands, H ♂, Sumner. All to same scale.

61 specimens, many ovigerous and larvigerous ♂♂, under stones, Seal Reef, Kaikoura, coll. I. Mannering, 12 August 1968.
4 ♀♀, 3 ♂♂, 4 juveniles, off Sumner, in seine trawl, coll. E. Percival, 4 April 1954.
1 ♀, NZOI Sta. C 795, north of Waihi Beach, 37° 20′ S, 175° 57′ E, 192 m, fine grey sandy mud, 23 February 1962.
1 ovigerous ♂, Hahei, Coromandel Peninsula, offshore, coll. F. R. Allison, 31 December 1948.
1 ♂, Pegasus Bay, otter trawl, coll. T. Gorman, 26 November 1958.
3 ♀♀, 1 larvigerous ♂, 1 juvenile, Little Papanui, Otago Peninsula, coll. E. J. Batham, 3 August 1953.

Stewart Island: 1 juvenile, Hellfire, West Coast, in rock pools in *Durvillea* zone, coll. G. A. Knox, 22 January 1964.

Snares Islands: 1 ♀, 1 ♂, 1 juvenile, Snares Islands 1968–69 Expedition, holdfast fauna collection, coll. D. Cameron.

Auckland Islands: 1 juvenile, Port Ross, Auckland Is, coll. J. Moreland, 15 January 1963.
1 ♂, French Island, Auckland Is, lower littoral, coll. G. A. Knox, 13 January 1963.
1 ♀ near meteorological station, Carnley Harbour, Auckland Islands, 12.8 m, coll. W. H. Dawbin, 15 February 1943.
3 ♀♀, 2 ♂♂, 1 juvenile, NZOI Sta. D 62, 51° 31.3′ S, 166° 16.9′ E, 22 m, fine shelly sand, 10 May 1963.

Campbell Islands: 27 juveniles, 2 ♀♀ with hydroids in pool, *Durvillea* zone, Perseverance Harbour, Campbell Island, coll. I. Mannering, 20 January 1969.
1 ♀, NZOI Sta. Z1895, low tide, seaweed, Beemans Jetty, Campbell Island, coll. A. Wright, 29 June 1963.
5 juveniles, base of *Xiphophora*, at wharf, Perseverance Harbour, Campbell Island, coll. P. M. Johns, 14 January 1961.

Antipodes Islands: 1 ♀, 8 juveniles, from bryozoans in crevice pool in barrier reef separating main pool from sea, large pool, Reef Point, CUZ Antipodes Sta. AM 8.21, coll. I. Mannering, 26 February 1969.
1 ♂, large pool, Reef Point, CUZ Antipodes Sta. AM 8.2, coll. I. Mannering, 24 February 1969.

DESCRIPTION

Trunk almost circular in outline, lateral processes touching or nearly touching throughout their length; often armed distally on the dorsal surface with up to 3 small, spinule-bearing tubercles. Median region of dorsum devoid of spines, tubercles or other ornamentation. Suture between trunk segments 1 and 2 usually fairly well developed, other sutures obsolescent or absent. Size variable; *see* Fig. 6.

Ocular tubercle variable in shape from rounded to pointed above, but generally blunt-topped; about as high as diameter at base; may bear 1 or more setae. Eyes 4, usually pigmented.

Proboscis: length usually × 2.5 its greatest diameter, (range × 2–3 greatest diameter). Shape almost cylindrical with a slight median constriction. Proboscis usually directed ventrally.

Abdomen slightly clavate. Usually armed near tip with 4 spinules (*see* Fig. 6A–H) set at 30–60° from the horizontal. This angle greatly affects the apparent length of the abdomen; it seems to reach beyond the level of the first coxae in some specimens and scarcely to the level of the distal ends of the fourth lateral processes in others.

Chelophores with a scape of 1 segment and chelae reduced to achelate knobs.

Palps 8-segmented, reaching beyond tip of proboscis. Segment 5 articulated anaxially with segment 6, to give palp a permanently geniculate appearance (Fig. 10). As with most other limbs, the detailed spination, segment proportions and detailed shapes of the segments all vary greatly (*see* Figs 10B–K). The anaxial articulation of segments 5 and 6 is the one constant feature of the palp.

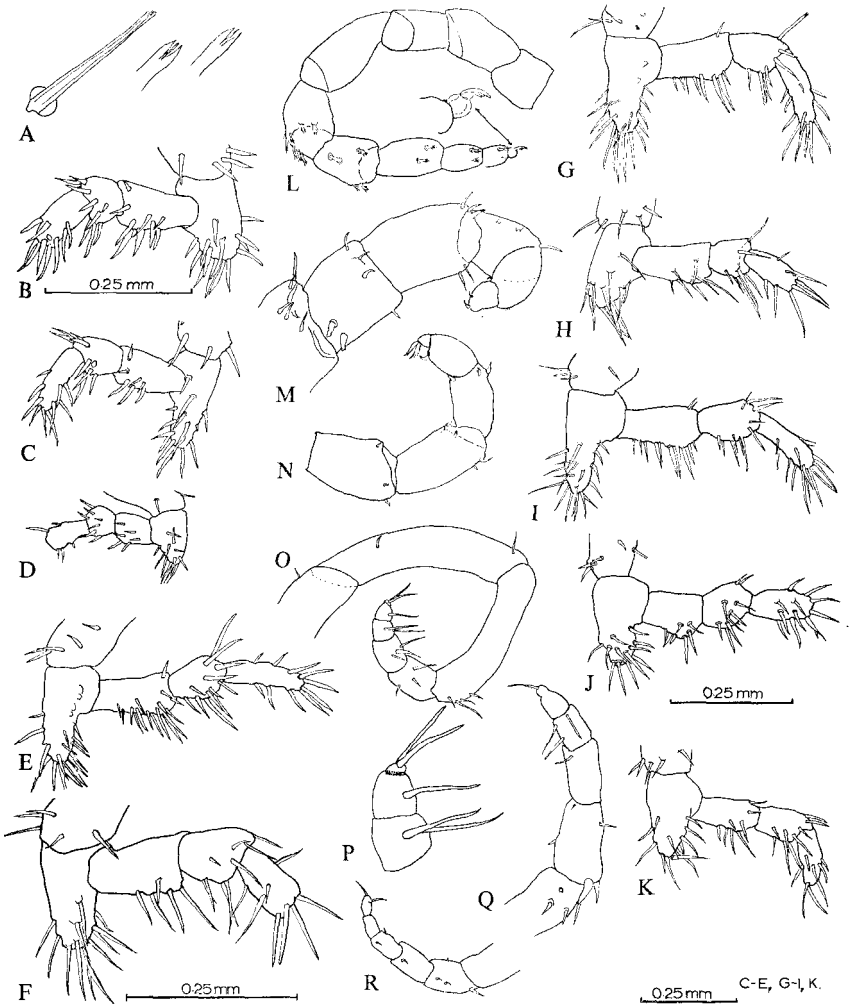

FIG. 10—*Achelia dohrni* (Thomson, 1884). A details of leg spines, B–K terminal palp joints (B–F ♂♂ from New Brighton, Antipodes Islands, NZOI Sta. D 62, Sumner, Pegasus Bay and Kaikoura respectively; G–K ♀♀ from Sumner, Pegasus Bay, Sumner, Antipodes Islands and NZOI Sta. Z 1895 at Campbell Island respectively), L–R ovigers (L–N ♀♀ from Antipodes Islands, Waihi Beach, and Sumner respectively; O–R ♂♂ from Sumner, Antipodes Islands and NZOI Sta. D 62 respectively).

Ovigers 10-segmented. Compared with those of most congeners, the compound oviger spines in females are greatly reduced, to only 2, sometimes 1, on segment 10. In males the compound spines are even more reduced, often to short setae with faintly crenulate margins. Details of the spination of the terminal oviger segments are so highly variable that it is difficult to find two specimens with the same formula (Fig. 10L–R).

Leg 3 very variable in absolute and relative size, and in development of spines (*see* Figs 7–9). Most mainland specimens have a well developed 'wreath' of spines about the distal ends of the femora and first tibiae, but these are small and inconspicuous in Snares, Antipodes, and some Auckland Island specimens. At low magnifications most of the spines on the legs appear round tipped, but at higher magnifications are seen to be trifid; 2 lateral rounded terminal processes surrounding a much smaller median pointed process (*see* Fig. 10A). Propodes (Figs 7 and 8) very variable, ranging from almost straight to arcuate. Usually markedly arcuate propodal soles are associated with small size. Arcuate propodes often with a well-marked heel (e.g., Snares and Antipodes Is specimens). Main spines of heel region with crenulate distal margins. Claw at least half as long as propodus; auxiliary claws about half as long as main claw.

Genital pores on coxae 2 of all legs in the females and on pronounced ventral eminences on the distal ends of the second coxae of legs 3 and 4 of the males.

Diagnostic features: *Achelia dohrni* is probably the most variable pycnogonid in the New Zealand region, but is identified with certainty by the anaxial articulation of palp segments 5 and 6, and by the trifid tips of the leg spines. Both features appear unique; together they strongly confirm the animal's identity.

REMARKS: *Achelia dohrni* is one of the most commonly collected pycnogonids of the New Zealand region, and I have spent much time examining the variation in the material available to me. Althought at one time I thought that there was more than one species involved, I am now convinced that there is but a single, very variable taxon. Whether the specimen figured by Thomson came from Dunedin or Oamaru is unknown; his type specimens no longer appear to exist. The extensive figures accompanying this description may help future workers to grasp the range of variability of morphology and size within this species. The specimens from NZOI Sta. D 62 are the most extreme, with very long proboscides and spurs on the distal ends of the propodes, as in Stock's (1968) *Galathea* material.

I have chosen not to employ the subgeneric name *Ignavogriphus* of Fry and Hedgpeth (1969) mainly because I consider that if, as they state (p. 103) ". . . it is not possible to give useful diagnoses of the three new taxa proposed here", then there is no point in either proposing or using them.

The list of material examined shows that the range of this new species now extends to the Snares and Antipodes Islands. Stock had previously (1954) recorded the species from Carnley Harbour (Auckland Islands) on the basis of a single juvenile and in 1968 from Campbell Island on the basis of *Galathea* material. The only sizeable subantarctic island from which the species is apparently absent is Macquarie Island.

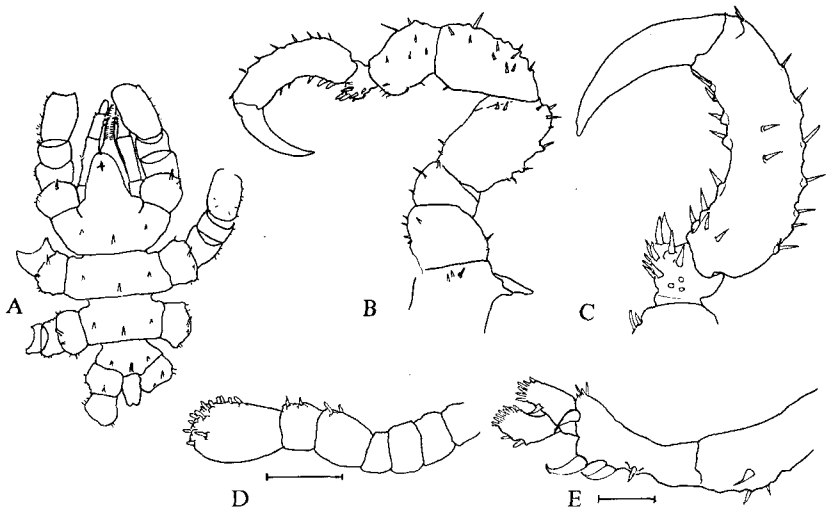

FIG. 11—*Austrodecus breviceps* Gordon, 1938. ♂: A trunk, B leg 3, C propodus, D oviger, E palp. Scale marks for (D) and (E) = 0.1 mm.

Family AUSTRODECIDAE, Stock, 1954

Austrodecus breviceps Gordon, 1938 Fig. 11A–E

Austrodecus breviceps Gordon, 1938, pp. 25–6, figs 7, 8. Stock, 1957b, pp. 59–63, figs 29–32.

MATERIAL EXAMINED

1 ♂, CUZ Antipodes Sta. AM 8.21, from bryozoans in crevice, large pool on Reef Point, coll. I. Mannering, 26 February 1969.

REMARKS: The specimen is readily referable to this species from either Stock's or Gordon's accounts, although the propodus and the terminal joint of the oviger appear to differ slightly from their figures.

The signficance of this one record is in additional information on distribution, because all previous specimens of *Austrodecus breviceps* came from Macquarie Island (Gordon 1938, 1944). Furthermore, Stock (1957b) showed that New Zealand is very rich in *Austrodecus* species, and that each of the subantarctic islands to the south apparently has its own species of *Austrodecus*. Even Tristan da Cunha and Gough Islands have each their own species. Now, contrarily, we find that the species previously regarded as characteristic of Macquarie Island is also found on the Antipodes Islands, about 500 miles (800 km) to the east and almost 5° further north.

Thus the islands of the Antipodes and Macquarie may share an apparently sedentary species of *Austrodecus*, and yet paradoxically have

different species of mobile genera such as *Tanystylum*, known to be transported on hydroid-bearing algae (Hedgpeth 1948).

Other workers on the Austrodecidae have not commented on the many species with very strong, laterally directed spines along the inner margins of the palps, especially along segment 4. Although most of these spines are applied to the dorsal surface of the slender distal part of the proboscis, there always appears to be at least one strong spine on each palp which engages the ventral surface of the proboscis. This spine is usually one of the most distal of all the spines on segment 4 of the palp. Fry (1965) described the food of *Austrodecus glaciale* and the anatomy of the proboscis; this species feeds on the zooecia of polyzoans, and he suggests (p. 219) that to do this the proboscis is brought down on to the frontal pore area of the zooecium with sufficient force to rupture its walls. He suggested that this may be safer as a way in than through the ascopore, where the slender proboscis may become trapped by the operculum.

The palps may perhaps direct the proboscis in attacking a polyzoan. From their abundant setation, the distal ends of the palps may be presumed to have a tactile sensory function, perhaps of great importance in the Austrodecidae; the palps of most species have bifid tips, achieved by the anaxial articulation of the last segment on the penultimate one. Bifid tips might be merely a step in the evolution of chelate palps along a sequence such as *Austrodecus confusum–gordonae–elegans–tristanense –breviceps*, i.e., from synaxial articulation, though increasing degrees of anaxial articulation, to a fully chelate condition. However, I think that the chelate form *per se* is not important, but that wide separation between the sensory areas may be associated with deriving increased amounts of sensory information. With such increased sensory information, the strong spines of the palps could be used to guide, strengthen, and add force to the proboscis, which it cannot exert alone because of its flexibility, and possibly also because of reduced musculature in the proboscis–cephalon articulation (Fry 1965). In feeding, the need for sensory input is obvious, but this must be tactile rather than visual, because the eyes are directed upwards and anyway probably cannot form an image.

ACKNOWLEDGMENTS

I thank Mr J. M. Brodie, Director of the New Zealand Oceanographic Institute, Dr Elizabeth Batham, Director, Portobello Marine Biological Station and Professor G. A. Knox of the University of Canterbury for the opportunity to examine material collected by their respective institutions.

Acknowledgment is also made to the Trans Antarctic Expedition Fund for financial support for the Antipodes Islands Expedition.

LITERATURE CITED

ARNAUD, F. 1970: Pycnogonides subantarctiques des Iles Crozet. *Bulletin du Museum National d'Histoire Naturelle, 2 ser., 41*: 1423–8.

BOUVIER, E. L. 1913: Pycnogonides du *"Pourquoi pas?"*: Deuxieme expedition antarctique francaise (1908–1910). Paris. 169 pp.

CLARK, W. C. 1958: Some Pycnogonida from Cook Strait, New Zealand, with descriptions of two new species. *Zoology Publications from Victoria University of Wellington (23)*: 1–7.

———— 1963: Australian Pycnogonida. *Records of the Australian Museum 26 (1)*. 81 pp.

———— 1971: Pycnogonida of the Snares Islands. *N.Z. Journal of Marine and Freshwater Research 5* (2): 329–41. (Published April 1972.)

FLYNN, T. T. 1919: Two new Australian Pycnogonida. *Royal Society of Tasmania: Papers and Proceedings 1918*: 91–100, Pl. XIII, XIV.

———— 1928: Pycnogonida of the Marine Survey of South Africa. *Union of South Africa Fisheries and Marine Biological Survey. Report No. 6 for the year 1927–1928*. 36 pp.

FRY, W. G. 1965: The feeding mechanisms and preferred foods of three species of Pycnogonida. *Bulletin of the British Museum (Natural History) Zoology 12 (6)*: 197–223, 5 pls.

FRY, W. G. and HEDGPETH, J. W. 1969: The Fauna of the Ross Sea, Part 7. Pycnogonida 1. Colossendeidae, Pycnogonidae, Endeidae, Ammotheidae. *N.Z. Department of Scientific and Industrial Research Bulletin 198*: 1–139.

GORDON, I. 1932a: Redescription of two species of Pycnogonida of the genus *Tanystylum*. *Annals and Magazine of Natural History, Ser. 10, 10*: 87–93.

———— 1932b. Pycnogonida. *Discovery Reports 6*. 138 pp.

———— 1938: Pycnogonida. *Australasian Antarctic Expedition 1911–14 Scientific Reports, Ser. C (Zoology and Botany) 2 (8)*. 40 pp.

———— 1944: Pycnogonida. *B.A.N.Z. Antarctic Research Expedition 1929–31 Reports, Ser. B (Zoology and Botany) 5 (1)*. 72 pp.

HEDGPETH, J. W. 1948: The Pycnogonida of the Western North Atlantic and the Caribbean. *Proceedings of the United States National Museum 97*: 157–242.

———— 1960: Report of the Lund University Chile Expedition 1948–49. 40 Pycnogonida. *Lunds Universitets Årsskrift, N.F., Avd. 2, 57 (3)*: 1–18.

HELFER, E. and SCHLOTTKE, E. 1935: Pantopoda. Buch 2, Abteilung IV, Arachnoidea, Band 5: Arthropoda *in* Bronn's "*Klassen und Ordnungen des Tierreichs*". Akademische Verlagsgesellschaft, Leipzig. 315 pp.

HUTTON, F. W. 1904: "Index Faunae Novae Zealandiae". Philosophical Institute of Canterbury, New Zealand. 372 pp.

LOSINA-LOSINSKY, L. K. 1961: Mnogokolenchatze (Pantopoda) dalnevostochnykh morei SSSR. *Isseldovaniya Dal'nevostochnÿkh Morei SSSR 7*: 47–117.

MARCUS, E. 1940: Os Pantopoda brasileiros e os demais sul-americanos. *Universidade de Sao Paulo Boletins da Faculdade de Filosofia, Ciencias e Letras, 19 Zoologia (4)*: 3–180.

MÖBIUS, K. 1902: Die Pantopoden der deutschen Tiefsee-Expedition 1898–1899 ("Valdivia"). *Wissenschaftliche Ergibnisse der Deutschen Tiefsee-Expedition auf dem Dampfer 'Valdivia' 1898–1899, 3*: 175–96.

STOCK, J. H. 1954: Pycnogonida from Indo-West-Pacific, Australian, and New Zealand waters. *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening i Kjobenhavn 116*: 1–168.

———— 1955: Pycnogonida from Tristan da Cunha. *Results of the Norwegian Scientific Expedition to Tristan da Cunha 1937–38 (33)*: 1–13.

———— 1956: Pantopoda aus dem Zoologischen Museum Hamburg. *Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut 54*: 33–48.

———— 1957a: Pantopoda aus dem Zoologischen Museum Hamburg, 2 Teil. *Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut 55*: 81–106

———— 1957b: The pycnogonid family Austrodecidae. *Beaufortia 6 (68)*: 1–81.

———— 1964: Deep-sea Pycnogonida collected by the "Cirrus" in the Northern Atlantic *Beaufortia 11 (135)* : 45–52.

———— 1966: Campagne de la *Calypso* au large des Cotes Atlantique de l'Amerique du Sud (1961–1962) 1. 4 Pycnogonida. *Resultats Scientifiques des Campagnes de la 'Calypso' 7*: 385–406.

———— 1968: Pycnogonida collected by the *Galathea* and *Anton Brunn* in the Indian and Pacific Oceans. *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening 131*: 7–65.

THOMSON, G. M. 1882: On a common New Zealand pycnogonid, together with a translation of Semper's key to the genera. *N.Z. Journal of Science 1*: 28.

———— 1884: On the New Zealand Pycnogonida, with descriptions of new species. *Transactions and Proceedings of the New Zealand Institute 16*: 242–8, pls 14–16.

UTINOMI, H. 1959: Pycnogonida of Sagami Bay. *Publications of the Seto Marine Biological Laboratory 1*: 197–222.