

Elasipod holothurians from the continental slope of Australia

P. Mark O'Loughlin

Department of Invertebrate Zoology, Museum of Victoria, Melbourne, Vic., Australia

ABSTRACT: Twenty one bathyal elasipod holothurian species are recorded for the continental slope of Australia and Lord Howe Rise in the Tasman Sea. Six species were reported by Rowe & Gates (1995) - *Oneirophanta mutabilis* Théel, *Laetmogone violacea* Théel, *L. maculata* (Théel), *L. fimbriata* (Sluiter), *Pannychia moseleyi* Théel and *Benthodytes lingua* Perrier. Fifteen new records are reported here - *Deima validum validum* Théel, *Laetmogone interjacens* Sluiter, *L. ijimai* (Mitsukuri), *Benthodytes typica* Théel, *B. sanguinolenta* Théel, *Psychropotes depressa* (Théel), *P. longicauda* Théel, *Peniagone challengerii* Théel, *P. vitrea* Théel, *Amperima furcata* (Hérourard) and *Elpidia theeli* Hansen. A *Oneirophanta* sp., *Laetmogone* sp., *Peniagone* sp. and *Achlyonice* sp. are undescribed species. A map, table and annotated list are provided for the 21 records, with systematic and distributional data and remarks.

INTRODUCTION

The Australian continental slope depth range and the bathyal zone (following Hansen 1975: 214) are considered herein to coincide, and to extend from 200 m to 2600 m. The *Challenger* Expedition (1873-1876) collected from the eastern Australian slope off Sydney at Station 164 (34°8' S, 152°0' E, 1739 m), which became the type locality for the elasipods *Laetmogone violacea* Théel and *Pannychia moseleyi* Théel (see Théel 1882: 7). Dr. T. Mortensen's Pacific Expedition (1913-1916) collected a third elasipod species, *Laetmogone maculata* (Théel), from the slope off north-eastern Tasmania at 183-458 m (see Hansen 1975: 64). During fisheries research off New South Wales and eastern Victoria (1975-1989), the FRV *Kapala* collected from the slope (to 1250 m). In 1982 the NZOI *Tangaroa* collected off New South Wales (to 5000 m). The RV *Franklin* collected off northern Queensland in 1988 (to 2000 m), and on Lord Howe Rise in the Tasman Sea in 1989 (to 2600 m). This material is held in the Australian Museum (AM). For the Southern Program (1984-87) of the Australian Commonwealth Scientific and Industrial Research Organization (CSIRO), the FRV *Soela* collected from the slope off eastern Tasmania and to the east and west of Bass Strait (to 1000 m). This material is held in the AM and Museum of Victoria (MoV). Based on material in the AM, Rowe & Gates (1995) recorded six elasipod species for the

slope off eastern Australia, three in addition to those referred to above - *Oneirophanta mutabilis* Théel, *Laetmogone fimbriata* (Sluiter) and *Benthodytes lingua* Perrier.

For the MoV's South-Eastern Australian Slope Study (1986 & 1988), the RV *Franklin* collected from the slope off southern New South Wales, eastern Victoria and eastern Tasmania (to 2900 m). This material is held in the MoV, as is additional material from the slope collected during CSIRO fisheries research off south-eastern Australia by the FRV *Soela* and during the CSIRO Western Deep Water Fishery Survey off Western Australia by the FRV *Southern Surveyor*. Some slope material from off Victoria and South Australia was contributed to the MoV by the FRV *Sarda* and FV *Halcyon*.

Earlier determinations of AM material were made by Dr. F.W.E. Rowe, and reported in Rowe & Gates (1995). The remaining AM and MoV material has been determined by the author. There are an additional fifteen elasipod species, making a total of twenty one Australian records. Four of these species are undescribed. Three are represented by good material for which descriptions are in preparation. A list of all recorded species, with number of specimens, depth, distribution and previous records, is given in Table 1. Locations are shown in the accompanying map (Fig. 1). An annotated list follows, with number of stations, precise locations, and systematic and distributional observations.

Table 1. Australian continental slope elaspipods (previous records from Hansen 1975)

Taxon Number of specimens	Depth range (m) (previous)	Slope location (previous records)
<i>Deima validum validum</i> Théel 3 AM, 7 MoV	1250-1960 (724-4820)	southern NSW, Lord Howe Rise (almost cosmopolitan)
<i>Oneirophanta mutabilis</i> Théel 1 AM	959-1150 (deep abyssal)	central New South Wales (cosmopolitan)
<i>Oneirophanta</i> sp. 2 AM	1960-3058	central NSW, Lord Howe Rise
<i>Laetmogone interjacens</i> Sluiter 1 AM	990-1053 (794-924)	northern Queensland (Indonesia)
<i>Laetmogone violacea</i> Théel 159 AM, 105 MoV	500-1750 (225-1804)	Q, NSW, Vic., Tas., SA (N. Atlantic, Indian, W. Pacific)
<i>Laetmogone maculata</i> (Théel) 9 AM, 24 MoV	345-458 (141-732)	northern NSW, Vic., Tas., SA (W. Pacific, Indonesia)
<i>Laetmogone ijimai</i> (Mitsukuri) 6 AM	472-549 (130-900)	northern Q to southern NSW (Japan to Indonesia)
<i>Laetmogone fimbriata</i> (Sluiter) 9 AM, 17 MoV	345-523 (164-1300)	New South Wales, Victoria (S. Africa, Indo-west-Pacific)
<i>Laetmogone</i> sp. 9 MoV	690-850	eastern South Australia
<i>Pannychia moseleyi</i> Théel 14 AM, 6 MoV	458-1042 (212-2598)	central NSW, Vic., Tas., eastern SA (Pacific)
<i>Benthodytes lingua</i> Perrier 14 AM	472-2053 (860-3192)	Q, NSW, Lord Howe Rise (North and south Atlantic)
<i>Benthodytes typica</i> Théel 26 AM	960-2500 (1873-4700)	central NSW, Lord Howe Rise (cosmopolitan)
<i>Benthodytes sanguinolenta</i> Théel 1 AM, 2 MoV	990-1136 (768-7250)	northern Q, central WA (Indo-Pacific)
<i>Psychropotes depressa</i> (Théel) 1 AM	2600 (957-4060)	Lord Howe Rise (cosmopolitan)
<i>Psychropotes longicauda</i> Théel 19 AM	2006-2053 (2210-5173)	northern Queensland (cosmopolitan)
<i>Peniagone challengerii</i> Théel 3 AM, 22 MoV	1500-1750 (3294)	Queensland, New South Wales (south of Australia)
<i>Peniagone vitrea</i> Théel 23 MoV	1360-1986 (1790-4507)	southern NSW, eastern Victoria (east & central Pacific, Antarctic)
<i>Peniagone</i> sp. 1 MoV	800	eastern Tasmania
<i>Achlyonice</i> sp. 2 AM, 4 MoV	1040-1750	central New South Wales
<i>Amperima furcata</i> (Hérouard) 23 MoV	1642-2250 (1846-2320)	southern NSW, eastern Victoria (north Atlantic)
<i>Elpidia theeli</i> Hansen 170 MoV	1500-1850 (650-4510)	eastern Victoria (Tasman Sea, Antarctic)

ANNOTATED LIST

Elasipodida Théel, 1882

Deimatidae sensu Ekman, 1926

Deima validum validum Théel, 1879

Four eastern Australian stations off Nowra (34°42' S, 151°22' E & 34°57' S, 151°26' E) and on Lord Howe Rise (27°12' S, 160°38' E & 27°59' S, 162°49' E). Found previously in the Tasman Sea off northern New South Wales at abyssal depths (4530 m) at

Galathea Stn. 550 (see Hansen 1975: 18). Specimens have large perforated plates (up to 5 mm long), small number of dorsal and ventro-lateral papillae pairs (up to 5) characteristic of the sub-species, but single pair of pre-anal tube feet more characteristic of the sub-species *D. validum pacificum* Ludwig, 1894 (see Hansen 1975: 17-24).

Oneirophanta mutabilis Théel, 1879

One eastern Australian station off Newcastle (estimated 33° S, 152-153° E); 1 AM specimen determined by Dr. F.W.E. Rowe. Uncharacteristically

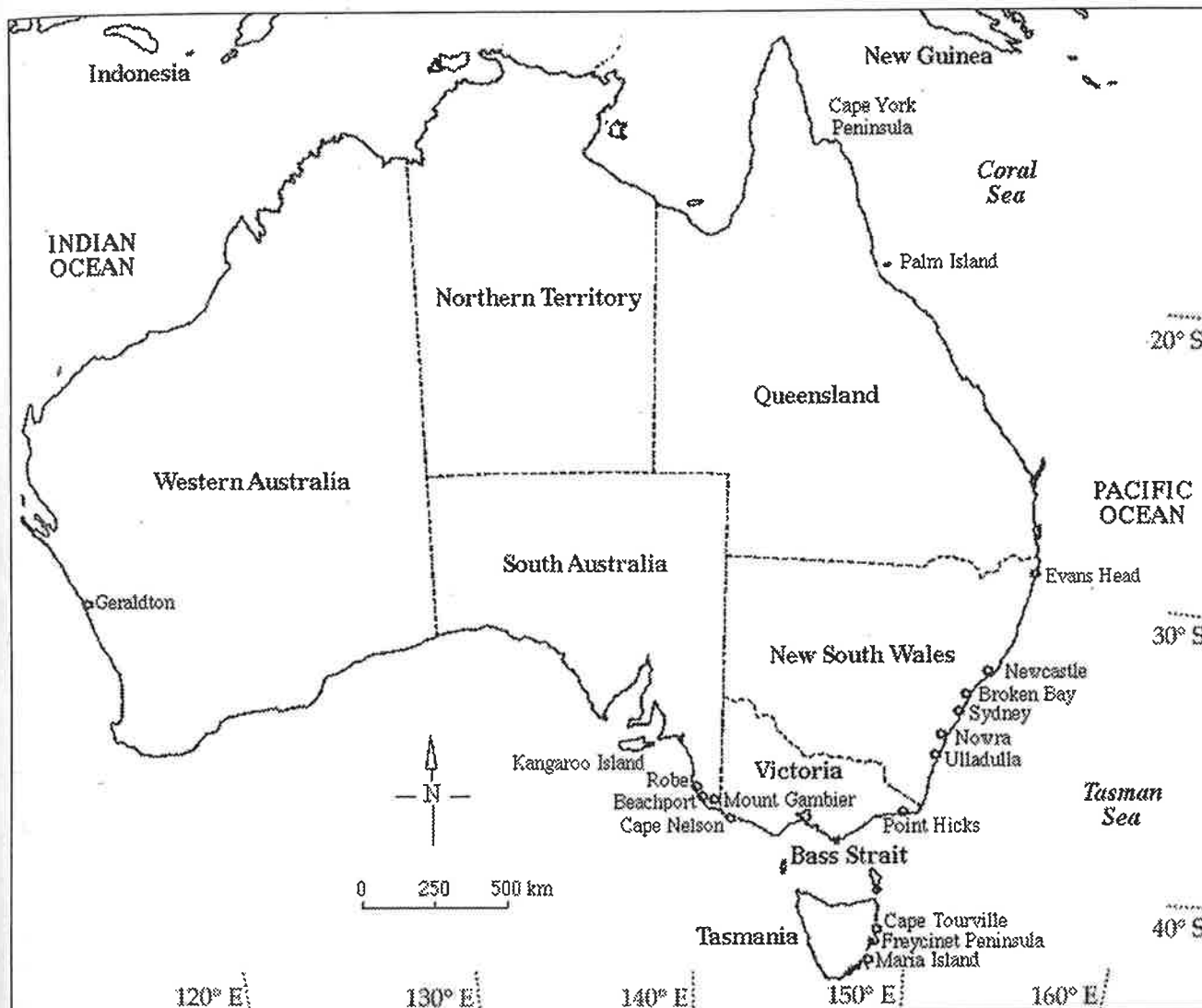


Figure 1. Map of Australia showing locations.

bathyal (959-1150 m). Found previously off South Australia at abyssal depths (4758 m) at *Challenger* Stn. 160 (see Théel 1882: 6-7). Determination uncertain as specimen is small, damaged, with uncharacteristic spatulated crosses in papillae.

Oneirophanta sp. [Description in preparation]

Two eastern Australian stations off Newcastle (estimated 33° S, 152-153° E) and on Lord Howe Rise (27°12' S, 160°38' E). Two specimens with circum-anal tube feet, spatulated rods, and abundant small spinous rods as in *Orphnurgus asper* Théel, 1879 (see Hansen 1975: 38, fig. 11).

Laetmogonidae Ekman, 1926

Laetmogone interjacens Sluiter, 1901

One north-eastern Australian station off Cape York (10°37' S, 144°22' E). Previously known from 3

specimens from Indonesia (see Hansen 1975: 53).

Laetmogone violacea Théel, 1879

Forty eight eastern and south-eastern Australian stations from off Palm Island (18°08' S, 147°30' E) south to Cape Tourville (41°49' S, 148°44' E) and west to Robe (37°18' S, 138°31' E); sometimes in big numbers (70 specimens in lot AM J22950). Body colour of preserved specimens varies through cream, very pale violet, dark violet, to almost black. Concave spinous crosses always present, but vary in degree of concavity, number of arms (3-7, predominantly 4-5), and thickness of arms.

Laetmogone maculata (Théel, 1879)

Seven eastern and south-eastern Australian stations from off Evans Head (estimated at 29°15' S, 153°75' E) south to Maria Island (42°41' S, 148°25' E) and west to Beachport (37°49' S, 139°45' E). One lot (MoV

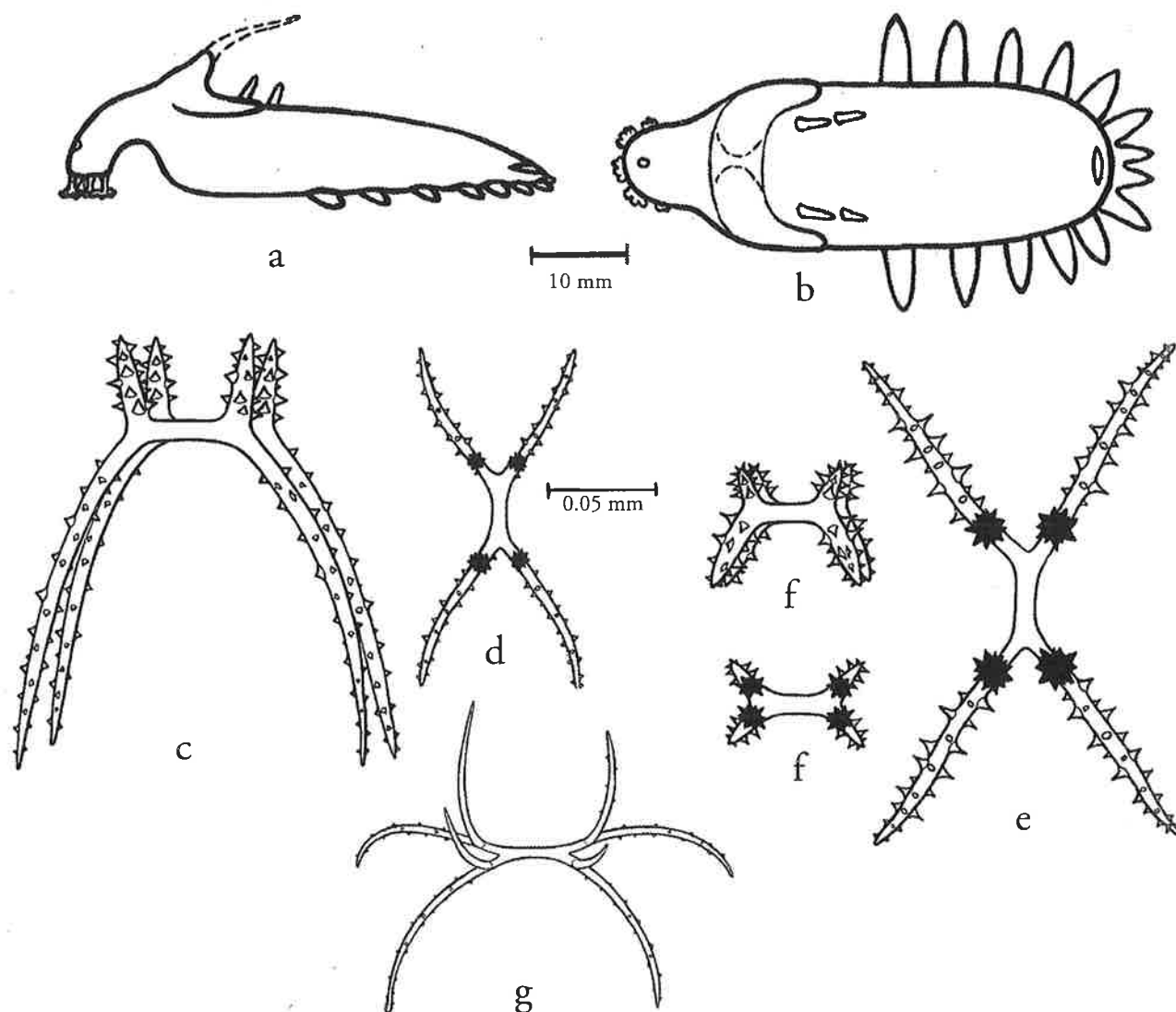


Figure 2. Composite drawings. a-d, *Peniagone challengeri* (Australian material): body form - a, lateral view, b, dorsal view; typical ossicles - c, dorsal, d, ventral. e-f, *Peniagone challengeri* (type): characteristic ossicles - e, large, f, small. g, ossicle of *Peniagone* species.

F77710) is associated with a species of *Rocinela*, usually fish ectoparasitic isopods (Dr. G. Poore, MoV, pers comm).

Laetmogone ijimai (Mitsukuri, 1897)

Three eastern Australian stations from off Palm Island (18°11' S, 147°26' E) south to Ulladulla (35°32' S, 150°48' E). Previously known from Japan and Indonesia (see Hansen 1975: 67).

Laetmogone fimbriata (Sluiter, 1901)

Eight eastern and south-eastern Australian stations from off Broken Bay (33°30' S, 152°05' E) south to Cape Nelson (estimated 38°40' S, 141°30' E).

Laetmogone sp. [Description in preparation]

Three southern Australian stations from off Mount Gambier (37°48' S, 139°36' E) west to Kangaroo Island (36°58' S, 137°26' E). Specimens with characteristic *Laetmogone* morphology, but lacking wheel ossicles and a combination of characters of a described species.

Pannychia moseleyi Théel, 1882

Ten eastern and south-eastern Australian stations from off Broken Bay (33°36' S, 152°03' E) south to Cape Tourville (41°53' S, 148°39' E) and west to Robe (37°18' S, 138°31' E).

Psychropotidae Théel, 1882

Benthodytes lingua Perrier, 1896

Eight eastern Australian stations from east of Cape York (11°42' S, 145°37' E) south to Broken Bay (33°42' S, 152°05' E), and on Lord Howe Rise (28°6' S, 163°6' E). First records outside the Atlantic, with a shallower depth record.

Benthodytes typica Théel, 1882

Three eastern Australian stations off Newcastle (32°57' S, 152°43' E) and on Lord Howe Rise (26°52' S, 159°49' E & 27°12' S, 160°38' E). Found previously off north-eastern Australia in the Coral Sea at *Challenger* Stn. 184 at 2562 m (see Théel 1882: 7 & Hansen 1975: 93), and off eastern Australia in the Tasman Sea at *Galathea* Stn. 575 at 3710 m (see Hansen 1975: 89). Shallowest reported depth.

Benthodytes sanguinolenta Théel, 1882

Two eastern and western Australian stations east of Cape York (10°37' S, 144°22' E) and off Geraldton (29°35' S, 113°45' E). Collected previously off eastern Australia in the Tasman Sea at *Galathea* Stn. 607 at 3580 m (see Hansen 1975: 94).

Psychropotes depressa (Théel, 1882)

One eastern Australian station on Lord Howe Rise (29°42' S, 159°48' E).

Psychropotes longicauda Théel, 1882

One north-eastern Australian station off Cape York (11°42' S, 145°37' E). Found previously at *Galathea* Stn. 601 in the Tasman Sea at 4400 m (see Hansen 1975: 116).

Elpidiidae Théel, 1882

Peniagone challenger Théel, 1882

Four eastern Australian stations from off Cape York (11°33' S, 145°19' E) south to Nowra (34°57' S, 151°26' E). Specimens very damaged, up to 50 mm long, 17 mm broad, with anterior end strongly down-turned (Fig. 2a). Seven to eight pairs of long conical tube feet ventro-laterally, bordering posterior half of body, decreasing in size posteriorly (from 9 mm to 4 mm long), anteriorly spaced to posteriorly adjacent or partly webbed (Fig. 2b). Tentacle trunks long (up to 5 mm), discs large (up to 5 mm long) with deeply divided margin. Velum comprises two transverse pairs of fused dorsal papillae; lost in all but one specimen which has two long slender papillae remnants. Two dorsal pairs of radial papillae (up to 4 mm long) posterior to velum; lost or were not present in many specimens. Gonad tubules dendritically branched. Two polian vesicles. Ossicles vary in size but consistently with four arms, long stem, four short

apophyses, large spines. Arms of dorsal crosses commonly about 0.16 mm long, to varying degrees strongly down-turned; apophyses about 0.04 mm long (Fig. 2c). Arms of ventral crosses commonly half this size, only slightly down-turned (Fig. 2d).

P. challenger is known from only two type specimens held in The Natural History Museum, London (No. 83.6.18.26), taken at abyssal depths (3294 m) south of Australia at *Challenger* Stn. 158 (see Théel 1882: 6). Both have been examined. The smaller (34 mm long, 7 mm broad) has no ossicles, velum, dorsal papillae or tentacles. The single remaining tube foot is on the posterior half of the body. The gonad tubules are dendritically branched. The larger type specimen (44 mm long, 9 mm broad) is fragile, with well preserved ossicles, but with the velum and some dorsal body wall detached. Théel (1882: 49) reported the size as 65 mm long and 13 mm broad. Théel (1882: 49) referred to the velum as an oblique transverse lobe, which is illustrated (pl. IX, figs 6-8). The specimen was preserved with a deep, oblique, anterior, dorsal body wall fold, which could give an impression of an oblique velum. The velum was probably transverse. It is bifid, with lobes 5 mm and 6 mm long. The body wall is wrinkled, with no evidence of papillae posterior to the velum. There were probably eight pairs of ventro-lateral tube feet on the posterior half of the body. They are conical, spaced and up to 5 mm long anteriorly, and decrease in separation and size to be adjacent and 2 mm long posteriorly. The dorsal and ventral ossicles are similar, and are of two types as illustrated in Théel (1882: pl. XXXIII, fig. 16). All consistently have four arms, long stem, four short apophyses, and large spines. The arms of the larger ossicles are up to 0.16 mm long ventrally and 0.10 mm long dorsally, and none are strongly down-turned (Fig. 2e). The smaller ossicles have short, stout, spinous arms and apophyses, the down-turned arms about 0.03 mm long (Fig. 2f). The largest arms reported by Théel (1882: 50) were 0.12 mm long, but in the plate explanation 0.2 or 0.3 mm long.

Based on relative size of specimens; number, form and distribution of tube feet; and size, form and spinous nature of ossicles, the Australian slope material is determined as *P. challenger*. The large dorsal ossicles with strongly down-turned arms in the Australian material were not observed in the type, and the small stocky ossicles in the type were not observed in the Australian material, but there are similar ossicles in both. Ossicle spines are slightly larger in the type. Paired post-velar papillae were not evident on the type specimens, and tube feet are larger in the Australian material. The form of the type is more elongate, but this may be enhanced by the state of preservation. The Australian material is close to *P. papillata* Hansen, 1975, but is distinguished by significantly more spinous ossicles.

Peniagone vitrea Théel, 1882

Two eastern Australian stations off Nowra (34°42' S, 151°22' E) and Point Hicks (38°31' S, 149°21' E). First record for the western Pacific, at bathyal not characteristically abyssal depths. Ossicles typical of the species with four thin arms (0.5-0.6 mm long), short stem and predominantly two (up to four) tall thick apophyses, longer than the arms and with distally-directed spines (see Hansen 1975: 149).

Peniagone sp.

One eastern Australian station off the Freycinet Peninsula (42°02' S, 148°39' E). Specimen 6 mm long; very damaged, with tentacles, velum, tube feet lost. Mouth is down-turned. Undamaged parts of body with microscopically bristly appearance. Ossicles abundant, mostly broken, similar dorsally and ventrally. Small, thin crosses with long stem; four smooth to minutely spinous, slightly down-turned arms, up to 0.1 mm long, pointed or slightly clubbed distally; four smooth to slightly spinous, pointed apophyses, up to 0.08 mm long (Fig. 2g).

The ossicles are typical of *Peniagone*, but insufficient for species determination. They are quite different to the ossicles of *P. vitrea* (two very tall, thick, spinous apophyses) and *P. challenger* (four very short, strongly spinous apophyses), reported here from greater depths on the Australian slope. In terms of specimen size, having ossicles which are slender crosses with four tall apophyses, and depth of capture, this specimen is possibly conspecific with four small *Peniagone* specimens taken at 610 m off New Zealand in the Tasman Sea at *Galathea* Stn. 626 (see Hansen 1975: 155).

Achlyonice sp. [Description in preparation]

Two eastern Australian stations off Newcastle (32°49' S, 152°49' E) and Nowra (34°57' S, 151°26' E). Similar in form to *Amperima furcata* (Hérouard, 1899), but dorsal ossicles have three straight, vertical, unbranched apophyses.

Amperima furcata (Hérouard, 1899)

Three eastern Australian stations from off Nowra (34°42' S, 151°22' E) south to Point Hicks (38°28' S, 149°20' E). First records outside the North Atlantic, for similar bathyal depths. Specimens are identical with the North Atlantic material as described and illustrated by Hérouard (1902: 40-41, pl. III, fig. 7 & pl. VI, figs 4-10) and Hansen (1975: 159). One C-shaped ossicle was observed in each of two preparations, possibly contaminants, but providing uncertain evidence that the genus is *Amperima* Pawson, 1965 and not *Achlyonice* Théel, 1879 as considered by Hansen (1975: 159).

Elpidia theeli Hansen, 1956

Two eastern Australian stations off Point Hicks (38°25' S, 149°00' E & 38°26' S, 148°58' E).

Recorded previously from the Tasman Sea at *Galathea* Stn. 602, the type locality, at abyssal depths (4510 m), and at bathyal depths (650-700 m) from the Antarctic (see Hansen 1975: 174). Largest 12 mm long. Ossicles characteristically small, up to 0.6 mm long (see Hansen 1975: 174).

SUMMARY

This report adds 15 to make a total of 21 elasipod species collected from relatively few stations, principally on the eastern and south-eastern Australian slope. Most of the Australian continental slope remains unsampled, and there is insufficient data for a discussion of distribution patterns. Further to the comprehensive discussion by Hansen (1975), this record of elasipods on the Australian slope indicates a more cosmopolitan distribution for the previously Atlantic species *Benthodytes lingua* and *Amperima furcata*; a western Pacific record of the previously central and eastern Pacific and Antarctic species *Peniagone vitrea*; a more southerly occurrence of the north-western Pacific species *Laetmogone ijimai*; and a bathyal depth occurrence of the characteristically abyssal genus *Peniagone* and abyssal species *Benthodytes typica* and *Psychropotes longicauda*.

ACKNOWLEDGEMENTS

I wish to acknowledge, with appreciation, comments on the manuscript by Ms S Boyd, Mr T O'Hara and Mr P Lambert; assistance with materials and resources by Ms S Boyd, Mr T Stranks, Mr C Rowley, Dr G Poore and Ms T Bardsley (Museum of Victoria), Dr P Berents (Australian Museum) and Ms A Morgan (The Natural History Museum, London); determination of *L. violacea* material by Mr B Miqueu; and layout by Mr A Kuppe.

REFERENCES

- (Limited to those cited. Complete list in Hansen, 1975)
- Hansen, B., 1975. Systematics and biology of the deep-sea holothurians. Part I. Elasipoda. *Galathea Report* 13: 1-262, pls 1-14.
- Hérouard, E., 1902. Holothuries provenant des campagnes de la *Princesse-Alice* (1892-1897). *Résultats des Campagnes Scientifiques du Prince Albert I de Monaco* 21: 1-62, pls 1-8.
- Rowe, F.W.E. and Gates, J., 1995. Echinodermata, in Wells, A. (ed.) *Zoological Catalogue of Australia* 33: xiii+510. Melbourne: CSIRO.
- Théel, H., 1882. Report on the Holothurioidea, 1. *Report on the Scientific Results of the Voyage of H.M.S. Challenger, 1873-1876, Zoology* 4, 13: 1-176, pls 1-46.