

## Symbiotic polychaetes from Papua New Guinea associated with echinoderms, with descriptions of three new species

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**Abstract:** Six species of symbiotic polychaetes, three of them new to Science, were found in association with echinoderms collected in Papua New Guinea. More than 500 echinoderms were sampled, on (or in) which occurred ca.185 polychaetes. About 25% of the echinoderms were infested. The number of polychaetes per host infested was from one to four. Crinoids were the most infested, then ophiuroids, asteroids, and holothurians. No polychaetes were observed on echinoids. The polynoid scaleworm *Gastrolepidia clavigera*, a well known symbiont with a wide Indo-Pacific distribution, was found on four species of holothurians. The polynoid *Hololepidella millari* sp. nov. infested species of two asteroids and one crinoid; the polynoids *Paradyte crinoidicola* and *Hololepidella laingensis* sp. nov. both occurred on 24 species of crinoids. *Hololepidella nigropunctata* and the phyllocid *Eumida ophiuricola* sp. nov. were associated with two ophiuroid species. *E. ophiuricola* was found in the ophiuroid bursae while the five former species were ectosymbionts. *E. ophiuricola* is the second registered symbiotic species among the phyllococids. The polychaetes are described and notes on their taxonomy and ecology are given, together with a list of the host species.

**Résumé:** Polychètes symbiotiques de la Papouasie Nouvelle-Guinée associés à des Echinodermes et description de trois espèces nouvelles. Six espèces de Polychètes symbiotiques dont trois nouvelles pour la science ont été trouvées en association avec des Echinodermes de Papouasie Nouvelle-Guinée. Plus de 500 Echinodermes ont été récoltés, sur (ou dans) lesquels se trouvaient ca. 185 Polychètes. Environ 25 % des Echinodermes étaient infestés. Le nombre de Polychètes par hôte variait de un à quatre. Les Crinoïdes étaient les plus infestés, puis venaient les Ophiures, les Astéries et les Holothuries. Aucun Polychète n'a été observé sur les Echinides. Le Polynoïdé *Gastrolepidia clavigera*, un symbiote courant, qui a une large aire de répartition dans tout l'Indo-Pacifique, a été retrouvé sur quatre espèces d'Holothuries. Le Polynoïdé *Hololepidella millari* sp. nov. infestait deux espèces d'Astéries et un Crinoïde. Les Polynoïdes *Paradyte crinoidicola* et *Hololepidella laingensis* sp. nov. infestaient tout les deux 24 espèces de Crinoïdes. Le Polynoïdé *Hololepidella nigropunctata* et le Phyllococidé *Eumida ophiuricola* sp. nov. étaient associés à deux espèces d'Ophiures. *E. ophiuricola* vit dans la lumière des bourses des Ophiures alors que les cinq autres espèces sont ectosymbiotiques. *E. ophiuricola* est la seconde espèce symbiotique observée appartenant aux Phyllococidae. Le présent article comprend la description taxonomique de toutes les espèces ainsi que des données sur leur écologie et la liste de leurs hôtes.

**Keywords:** Polychaeta, Echinodermata, Symbiosis, Systematics

### Introduction

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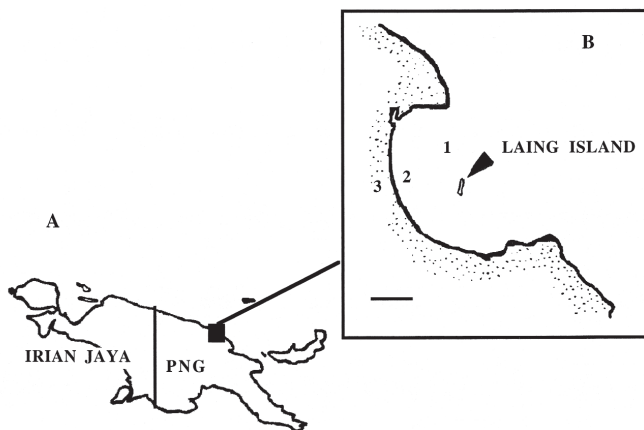
Among polychaetes which, for the most part, are free-living, crawling, burrowing and tube-dwelling animals, the setting-

up of close associations with other marine invertebrates is a rather common phenomenon (Martin & Britayev, 1998). About 370 species of polychaetes are symbiotic organisms (*i.e.*, commensals, mutualists or parasites) and amongst their host, the echinoderms form the taxa that has the largest number of species harbouring polychaetes (Martin & Britayev, 1998).

Symbiotic polychaetes are not rare in shallow waters of tropical Pacific. Some data on these animals have been obtained from Hawaii (Devaney, 1967), from South Japan (Uchida, 1975), from the Philippines (Hartmann-Schröder, 1981, 1984), from the Banda Sea (Petersen & Britayev, 1997) and from the Solomon Islands (Gibbs, 1969). The latter study revealed twelve species of symbiotic polychaetes in the littoral zone of the Solomon (Gibbs, 1969). Eighteen species of myzostomes, sometimes considered as a family of Polychaeta (Rouse & Fauchald 1997), have been recently described from Papua New Guinea (Eeckhaut & al. 1998). Only one symbiotic polychaete *sensu stricto*, *Malmgreniella pettiti* Pettibone, 1993, is known to infest an Alcyonaria in this region (Pettibone, 1993). The present paper reports on six other species of polychaetes, three of them new to science, found in association with echinoderms in a bay on the north coast of New Guinea, and also provides some ecological data about the echinoderm infestations by these polychaetes.

## Materials and methods

Echinoderm hosts with polychaetes were collected at low tides around Laing Island (Madang Province, PNG) or by Scuba diving in Hansa Bay (1 to 30 m depth) during five missions performed between 1994 and 1997 (Fig. 1). The



**Figure 1.** A. Map of New Guinea (Irian Jaya and Papua New Guinea). B. Detail of Hansa Bay with the location of sampling sites: 1, Durangit Reef; 2, Japanese wreck; 3, Nubia village.

**Figure 1.** A. Carte de la Nouvelle-Guinée (Irian Jaya et Papouasie Nouvelle-Guinée). B. Détail de la Baie de Hansa avec la localisation des sites de récolte : 1, le récif de Durangit ; 2, l'épave japonaise ; 3, le village de Nubia.

various sites prospected during the dives were the reef slopes of Laing Island and of Durangit (a reef located north of Laing Island), and a Japanese wreck in front of Nubia village (Fig. 1). During collections, echinoderms were placed individually in plastic bags. Once in the laboratory at the Biological Station King Leopold III, each echinoderm was placed in a dish filled with 70% ethanol and shaken vigorously. Most polychaetes fell from their hosts, while others were found after having checked the hosts carefully under a stereomicroscope. Polychaetes were then counted and put into fixatives for morphological studies.

For SEM observation, individuals were fixed in Bouin's fluid for 24 h, and transferred to 70% ethanol for preservation. Once in Belgium, samples were dehydrated in graded concentrations of ethanol and dried by the critical point method using CO<sub>2</sub> as the transition fluid. They were then mounted on aluminium stubs, coated with gold in a sputter coater, and observed with a JEOL JSM 6100 scanning electron microscope.

The sex of polychaetes was determined after partial dissections of specimens and examination of gonads' fragments under the microscope.

Type material was deposited in the Zoological Museum of Moscow State University (ZMMU). Material prepared for SEM observations was given to the Belgian National Museum of Natural History. Other specimens are kept in the collection of the A.N. Severtzov Institute of Ecology and Evolution (Moscow).

## Results and Discussion

### Systematics

#### Family POLYNOIDAE

#### *Hololepidella laingensis* sp. nov.

(Figs 2-12)

Type Locality. - Laing Island, Hansa Bay, Papua New Guinea, Bismarck Sea.

Material examined. - 30 June - 18 July 1994, 1-30 m, one anterior fragment and a number of dried specimens mixed in jars with *Paradyte crinoidicola* (Potts, 1910) and coming from 24 out of the 25 species of sampled crinoids (Table 1); June 1994, 10 m, 18 specimens (including holotype ZMMU 854 and 10 paratypes ZMMU 855-864) with the crinoid *Capillaster multiradiatus* (Linné, 1758); June 1994, 10 m, three specimens and 8 July 1994, 15 m, four specimens (paratypes ZMMU 865-868) with the crinoid *Dichrometra flagellata* (J. Müller, 1841); July 1994, 15 m, four specimens with the crinoid *Lamprometra palmata* (J. Müller, 1841); 8 July 1996, two specimens with the crinoid *Himerometra robustipinna* (Carpenter, 1881); 19 July 1996, 15 m, one specimen with the crinoid *Oxycomanthus bennetti* (J. Müller, 1841); March 1996, 15 m, one specimen with the crinoid *Comaster* sp., June 1997, 15 m, ten specimens on *Comaster multifidus* (J. Müller, 1841) = 45 specimens + dried ones.

Etymology: referring to Laing Island, the type locality.

#### Description

Holotype (ZMMU 854): complete mature male, 8 mm long, 0.91 mm wide without parapodia, with 38 chaetigers and 17 pairs of elytra. 14 paratypes (ZMMU 855-868).

Body short, flattened, tapering posteriorly (Fig. 2), with up to 40 chaetigers, and up to 18 pairs of elytra. Length up to 9 mm, width up to 0.77-2.02 mm, with parapodia but without chaetae, 0.38-0.96 mm without parapodia.

Prostomium bilobed, 1.5 times as wide as long, roughly hexagonal, with cephalic peaks (paratype ZMMU 855) or, with slight indication of peaks (holotype) (Figs 2, 3); with two pairs of dark brown eyes (Fig. 11a); anterior pair larger, located laterally at the widest part of prostomium; smaller posterior pair located dorsally at posterior edge of prostomium, surrounded by lighter pigmentation; in some specimens eyes nearly invisible due to camouflage with dark pigmentation; ceratophore of median antenna conical, in median notch (Fig. 3); median antenna lost in all studied specimens; lateral antennae arising anteriorly, adjacent and slightly ventral to median antenna, with short, subulate style (about 1/3 times as long as prostomium) (Fig. 3); palps stout, tapered, relatively long (twice as long as prostomium) (Fig. 3); all without papillae.

First or tentacular segment not visible dorsally; without nuchal fold; tentaculophores lateral to prostomium with one to three chaetae, with two pairs of slender and long tentacular cirri, dorsal ones slightly longer than ventral ones (Figs 3, 4, 12b). Pharynx with nine dorsal and nine ventral large terminal papillae (Fig. 5) and one pair of jaws. Second segment bearing the first pair of elytriphores, biramous parapodia and one pair of ventral buccal cirri similar to tentacular cirri.

Elytra 13-18 pairs present on segments 2, 4, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, then present on segments 26, 29, 31, 34, 36, 38, 40 (Fig. 2); last two segments with dorsal cirri (Fig. 11b). Elytra large, covering dorsal surface completely, oval, delicate, transparent, with group of conical microtubercles on anterior part (Fig. 12a).

One transverse ciliary band per segment, connecting the bases of cirrophores or elytriphores, running along anterior edge of segment (Figs 2, 6, 11a). Each cirrigerous segment with two conical projections at same sites as elytriphores in segments bearing elytra.

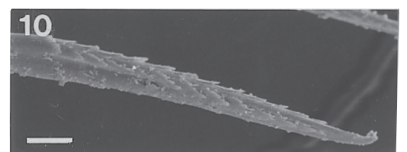
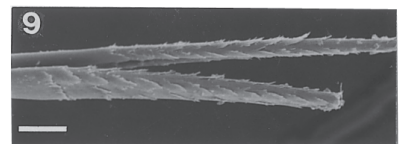
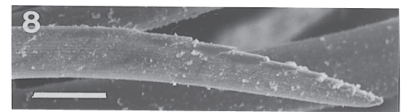
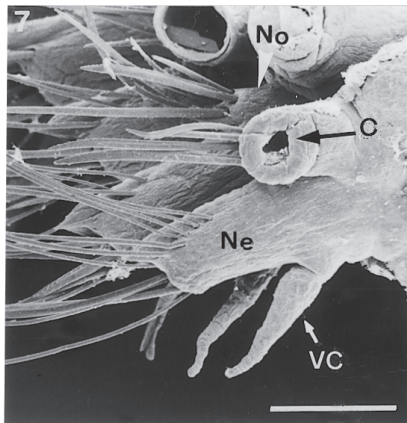
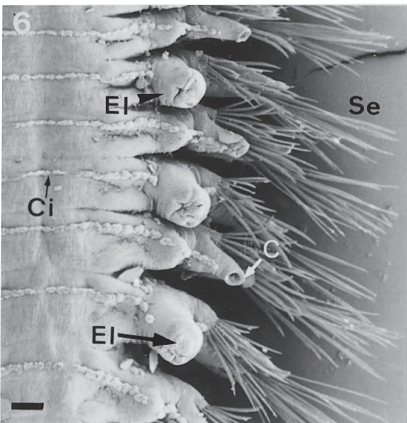
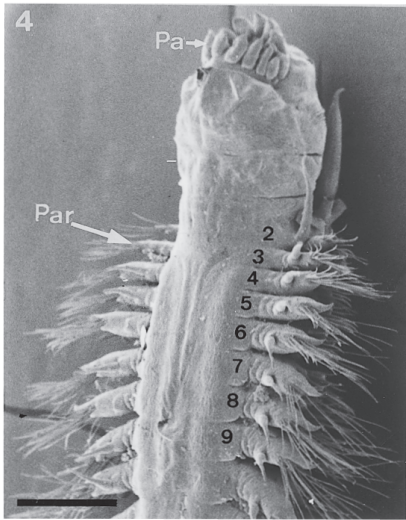
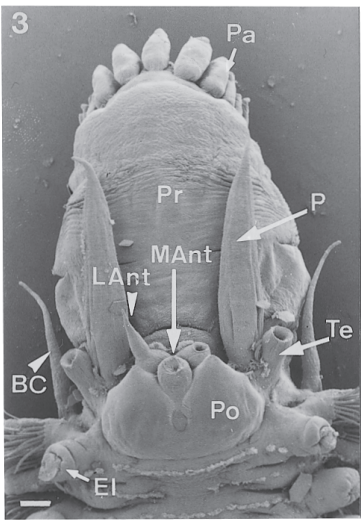
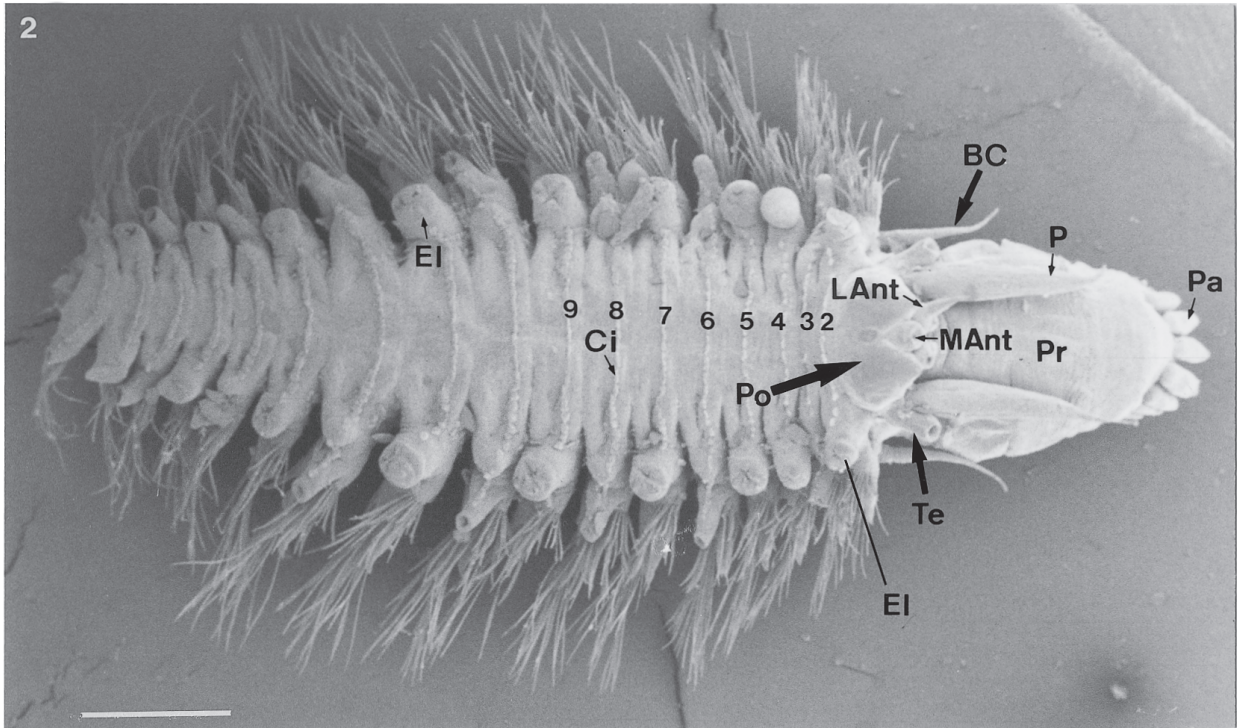
Parapodia biramous; smaller rounded notopodium with projecting acicular lobe on lower side; larger neuropodium with conical prechaetal acicular lobe and shorter rounded or triangular postchaetal lobe (Figs 6, 7, 12c). Dorsal cirri with long (equal to neuropodia), cylindrical cirrophores, with long tapered styles extending beyond neurochaetae (Fig. 7). Ventral cirri short and conical, ending at same level as tips of neuropodial lobes (Fig. 7).

Notochaetae stouter than neurochaetae, relatively few, about 4-26, slightly curved, with blunt entire or slightly notched tip and 8-16 (usually 10-12) teeth along convex margin (Figs 7, 8, 12g). Neurochaetae about 5-23 with faint spinous rows; supraacicular chaetae slender, with bidentate tips and longer spinous regions than those of subacicular ones (Figs 9, 10, 12d); latter with very weak serration and slightly bidentate (most chaetae) or entire (1-3 per bundle) tips (Fig. 12d-f).

Anus terminal (Fig. 11b) with two tapering anal cirri observed on some specimens (probably lost in others).

Pigmentation is rather variable. Most specimens have a variable amount of brown pigmentation varying from dark brown, nearly black to light brown. Common type of pigmentation includes: well pigmented prostomium with pale median groove and areas surrounding posterior eyes; pigmented dorsal surface with two pale longitudinal bands along body; ventral surface lighter than dorsal one with more intensively pigmented regions at bases of parapodia; elytra transparent or semitransparent with light brown pigmentation. Variations in pigment pattern include development of more intense pigmentation or decrease in pigmentation. Prostomium of most intensively pigmented individual dark brown with anterior pair of eyes camouflaged with intense pigmentation; dorsal and ventral surface with uniform intense pigmentation without distinctive pale longitudinal bands. The lightest specimen was associated with the crinoid *Dichrometra flagellata*. It had a prostomium without pigmentation; dorsal surface with brown pigmentation on bases of cirrophores and on dorsal tubercle; median part, parapodia and ventral surface without pigmentation. However more pigmented specimens have been found in association with *D. flagellata*. A specimen associated with *Comaster sp.* differs in its grayish pigmentation, but the pigmentation pattern is similar to the most common type.

Remarks. - *Hololepidella laingensis* sp. nov. belongs to a group of *Hololepidella* with a short body together with six described species: *H. commensalis* Willey, 1905, *H. nigropunctata* (Horst, 1915), *H. ophiuricola* Gibbs, 1969, *H. arabica* (Monro, 1937), *H. comatula* Uchida, 1975 and *H. boninensis* Nishi & Tachikawa, 1998. *H. laingensis* resembles *H. comatula* by having a similar pigmentation pattern, by the presence of frontal peaks and 1-3 unidentate neurochaetae, but it differs by the presence of microtubercles in the anterior part of the elytra and, probably, in having 1-3 chaetae in the tentaculophores (this feature was not mentioned by Uchida). The new species differs from *H. nigropunctata* by its pigmentation pattern (Uchida, 1975) and the presence of unidentate neurochaetae. The type species of the genus, *H. commensalis* is incompletely described (according to



Pettibone, 1969b), nevertheless it clearly differs from the new species in lacking bidentate neurochaetae. The new species differs from *H. ophiuricola* and *H. boninensis* by the presence of microtubercles on the elytra and of chaetae in the tentaculophores. It further differs from *H. ophiuricola* in having smooth (not papillate) tentacular cirri and bidentate neurochaetae. The new species differs from *H. arabica* by the presence of one transversal ciliated band per segment instead of two, microtubercles on the elytra, and the smooth (not papillate) antennae and cirri.

**Biology.** - *Hololepidella laingensis* sp. nov. is commensal with the unstalked crinoids *Capillaster multiradiatus*, *Dichrometra flagellata*, *Himerometra robustipinna*, *Oxycomanthus bennetti*, *Lamprometra palmata* and some other crinoid species mentioned in Table 2. Many specimens have damaged and/or regenerated elytra, cirri, parapodia and posterior body part suggesting either frequent intraspecific fighting or attacks by predators. Three specimens collected in June 1994 show swollen segments in midbody (8-19 setiger) likely induced by parasites. The relative number of females was slightly higher than males (male/female ratio - 5/8), but this is probably due to difficulties with sex determination of young males.

**Distribution.** - Hansa Bay, Papua New Guinea.

*Hololepidella millari* sp. nov.  
(Figs 13-14)

**Type Locality.** - Hansa Bay, Papua New Guinea, Bismarck Sea.

**Material examined.** - July 1994, 20 m, incomplete specimens: five anterior, one posterior (pygidial part) and nine fragments of middle part of the body (Holotype ZMMU 843 and four paratypes ZMMU 844-847) on crinoid *Comanthus alternans* (Carpenter, 1881); July 1994, 15 m; three specimens with starfishes *Linckia guildingui* Gray, 1840 and *L. laevigata* (Linné, 1758); July 1994, 10 m, one specimen with *L. guildingui* and one specimen with *L. laevigata*.

**Etymology.** - Dedicated to the Papuan technician, Millar Magat, who worked at the Biological Station King Léopold III since its creation. He died tragically on the road between Laing Island and Madang in 1997.

**Description**

**Holotype** (ZMMU 843; Fig. 13a) consisting of an anterior fragment 5 mm long, 2.0 mm wide with parapodia but without chaetae at widest part of fragment, 0.77 mm wide without parapodia, with 19 segments and ten pairs of elytra; four paratypes (ZMMU 844-847). Body flattened, relatively narrow and long, with up to 75 segments and 37 pairs of elytra, 0.72-2.40 mm wide with parapodia but without chaetae, 0.26-1.00 mm wide without parapodia, up to 22 or more mm long.

Prostomium bilobed, slightly wider than long, or as wide as long, hexagonal, without distinctive frontal peaks, with two pairs of eyes, grayish in specimens preserved in alcohol (Fig. 13a); anterior pair visible dorsally in widest part of prostomium, slightly smaller posterior pair at posterior edge of prostomium; median antenna subulate, relatively short, equal to length of prostomium, lateral antennae conical, very short, 1/3-1/4 times as long as median antenna, with ventral swollen ceratophores (Fig. 13a); palps stout, tapered, relatively long (1.5 times as long as prostomium); all without papillae (Fig. 13a).

Tentaculophores of segment 1 lateral to prostomium, each with an acicula (Fig. 13c), without nuchal fold, with two pairs of slender, long tentacular cirri, dorsal ones as long as palps and ventral ones somewhat shorter (Fig. 13a,c). Pharyngeal structures not observed. Segment 2 with first pair of elytraphores, with biramous parapodia and one pair of ventral buccal cirri almost as long as ventral tentacular cirri (Fig. 13a).

Elytra up to 30 or more pairs on segments 2, 4, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 26, 29, 31, 34, thereafter attachment pattern varying between specimens, usually on alternating



**Figures 2-10.** *Hololepidella laingensis* sp. nov. (SEM). **2.** Dorsal view of a specimen (pygidium missing) with its proboscis everted; **3.** Dorsal view of anterior end and two first chaetigers of the specimen; **4.** Ventro-lateral view of the anterior part of the body; **5.** Detail of the proboscis, ventral view; **6.** Dorsal view of the right part of segments 6-12 from the same specimen; **7.** Detail of the right parapodium of segment 17, ventral view; **8.** Notochaete; **9.** Upper neurochaetae; **10.** Lower neurochaetae. Abbreviations: (BC) buccal cirrus, (C) cirrophore, (Ci) cilia, (El) elytraphore, (LAnt) lateral antenna, (MAnt) median antenna, (Ne) neuropodium, (No) notopodium, (P) palp, (Pa) papilla, (Par) parapodium, (Po) prostomium, (Pr) proboscis, (Se) chaetae, (Te) tentaculophore, (VC) ventral cirrus. Segment numbering are indicated on figures 2 and 4, on anterior body region.

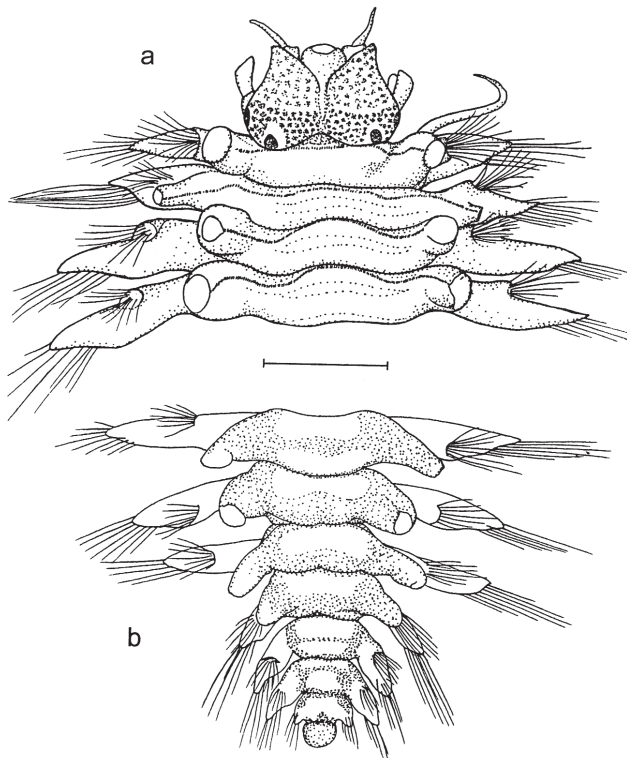
Scale bars: Figs 2, 4 = 1 mm, figs 3, 5-7 = 100 µm, figs 8-10 = 10 µm.

**Figures 2-10.** *Hololepidella laingensis* sp. nov. (MEB). **2.** Vue dorsale d'un spécimen (pygidium manquant) avec proboscis dévaginé; **3.** Vue dorsale de la région antérieure et des deux premiers sétigères; **4.** Vue ventro-latérale de la partie antérieure du corps; **5.** Détail du proboscis, vue ventrale; **6.** Vue dorsale de la partie droite des segments 6-12 du même spécimen; **7.** Détail du parapode droit du segment 17, vue ventrale; **8.** Soies notopodiales; **9.** Soies neuropodiales supérieures; **10.** Soies neuropodiales inférieures. Abréviations: (BC) cirre buccal, (C) cirrophore, (Ci) cils, (El) élytraphore, (LAnt) antenne latérale, (MAnt) antenne médiane, (Ne) neuropode, (No) notopode, (P) palpe, (Pa) papille, (Par) parapode, (Po) prostomium, (Pr) proboscis, (Se) soies, (Te) tentaculophore, (VC) cirre ventral. La numérotation des segments est indiquée sur les figures 2 et 4, sur la région antérieure du corps.

Echelles: figs 2 et 4 = 1 mm; figs 3, 5-7 = 100 µm; figs 8-10 = 10 µm.

**Table 1.** Characteristics of the echinoderm sampled in Hansa Bay with data on their association with polychaetes**Tableau 1.** Caractéristiques des récoltes d'Echinodermes effectuées dans la baie de Hansa et données sur leur association avec les Polychètes.

	N. of sampled species	N. of infested species	N. of sampled specimens	N. of infested specimens	Maximum number of polychaetes/specimen
Crinoidea	25	24	144	81	4
Ophiuroidea	8	2	210	38	1
Asteroidea	11	3	42	3	2
Holothuroidea	18	4	89	4	2
Echinoidea	3	0	18	0	0
Total	65	33	503	126	

**Figure 11.** *Hololepidella laingensis* sp. nov. Holotype, **a.** Anterior part of the body; **b.** posterior end, with details of pigmentation.

Scale bar: 300 µm

**Figure 11.** *Hololepidella laingensis* sp. nov. Holotype, **a.** extrémité antérieure du corps ; **b.** extrémité postérieure, avec détails de la pigmentation.

Echelle : 300 µm.

segments to end of body but with some elytra on consecutive segments and often asymmetrical (35, 37, 39, 41, 43, 45, 47, 48, 50, 52, 53 left [54 right], 55 l [56 r], 57 l [58 r], 59 l [60 r] in paratype ZMMU 844, and 36, 38, 40,

42, 43, 45, 47, 49, 51 in paratype ZMMU 845). Regular alternation of segments with cirri and elytra on one posterior pygidial fragment with 21 pairs of elytra allowed us to evaluate the total number of elytra and segments to no less than 37 and 75, respectively. Elytra large, oval, delicate, smooth except for some microtubercles on anterior part (Fig. 13b), cover dorsal surface of the body completely.

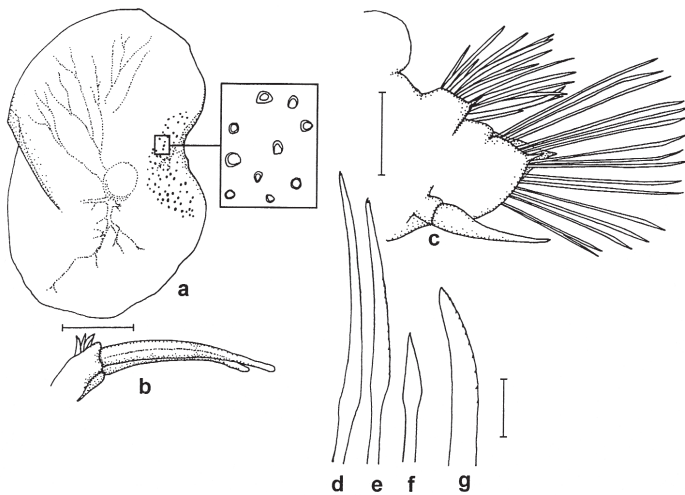
Each cirrigerous segment with a pair of conical cirri at same sites as elytophores on segments with elytra. Dorsal surface with one transverse dorsal ciliated band per segment.

Parapodia biramous (Fig. 14a-c). Dorsal cirri smooth, slender and long, extending beyond tips of notochaetae. Ventral cirri conical and short, projecting laterally but no longer than neuropodial lobes. Notopodia with projecting acicular lobe, neuropodia with digitiform prechaetal acicular lobe and shorter triangular postchaetal lobe.

Notochaetae about same width as neurochaetae, 6-12 per bundle, slightly curved, upper notochaetae with entire tips, inferior ones with bidentate (or split) tips and 18-24 rows of spines along the convex edge (Fig. 14d-f). Neurochaetae 10-19 per bundle, upper ones (2-3) slender with longer spinous region, all with bidentate, hooked tips and serrated edge (Fig. 14g-i).

Body without distinctive pigmentation.

Remarks. - *Hololepidella millari* sp. nov. belongs to a group of *Hololepidella* that includes three species: *Hololepidella alba* Hartmann-Schröder, 1981, *H. obtusa* Hartmann-Schröder, 1984 and *H. lobata* Hartmann-Schröder, 1984. All three have an elongated body with more than 55 segments, 25 pairs of elytra, and bidentate neurochaetae. *H. millari* sp. nov. resembles *H. alba* in lacking prominent pigmentation but differs from it by the presence of one acicula in each tentaculophore, by the smaller number of neurochaetae per bundle (10-19 instead of 25), and by microtubercles on the elytra. It differs from *H. obtusa* and *H. lobata* in lacking pigmentation, by the absence of



**Figure 12.** *Hololepidella laingensis* sp. nov. **a.** Anterior elytron (chaetiger 4) with detail (not to scale) of microtubercles; **b.** Tentacular cirri with tentaculophore; **c.** Parapodium of chaetiger 17, posterior view; **d-f.** Upper, middle and lower neurochaetae; **g.** Notochaeta.

Scale bars: a-c = 200  $\mu$ m, d-g = 40  $\mu$ m.

**Figure 12.** *Hololepidella laingensis* sp. nov. **a.** Elytre antérieure (4<sup>e</sup> sétigère) avec détails des microtubercules ; **b.** cirres tentaculaires avec tentaculophore ; **c.** parapode du 17<sup>e</sup> sétigère, vue postérieure ; **d-f.** soies neuropodiales supérieures, médianes et inférieures ; **g.** soies notopodiales.

Echelles : a-c = 200  $\mu$ m, d-g = 40  $\mu$ m.

unidentate notochaetae and by having fewer neurochaetae (30-43 in the former and 35-40 in the latter).

**Biology.** - Commensal with the unstalked crinoid *Comanthus alternans* and with two species of starfishes, *Linckia laevigata* and *L. guildingui*. In two specimens damaged and regenerated parapodia have been found, indicating either an intraspecific aggressive interaction or predator attacks. Juvenile 2.1 mm long, collected in July 1994, may indicate period of settlement.

**Distribution.** - Hansa Bay, Papua New Guinea.

*Hololepidella nigropunctata* (Horst, 1915)  
(Figs 15-18)

*Polynoe nigro-punctata* Horst, 1915: 20

*Malmgrenia marquesensis* - Day, 1962: 628; 1967: 50, fig. 1.4.p-s.

*Hololepidella minuta* - Gibbs, 1969: 448-449, fig. 131

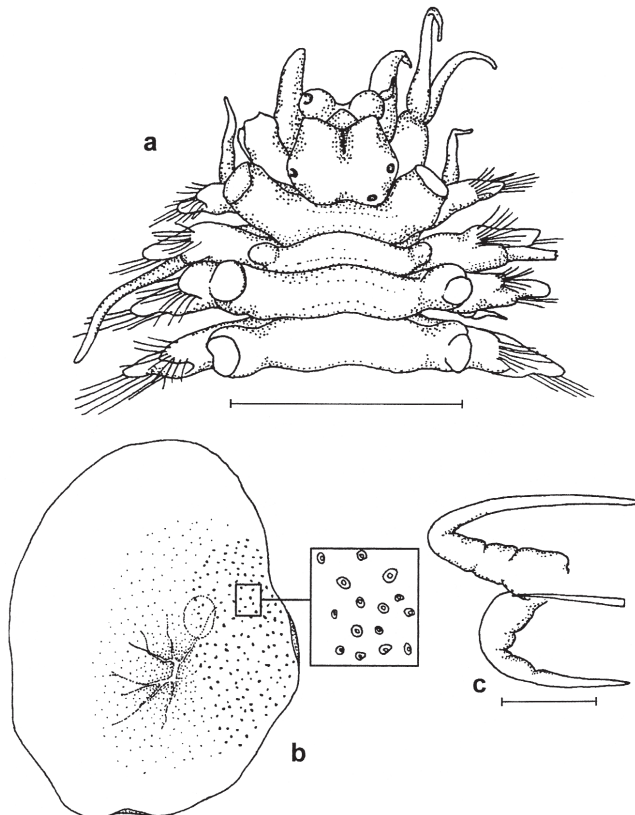
*Hololepidella nigropunctata* - Pettibone, 1993: 4-7, figs. 2-3. [synonymy].

**Material examined.** - Papua New Guinea, Bismarck Sea, Laing Island, Hansa Bay, July 1994, low tide, posterior fragment, with ophiuroid *Macrophiothrix belli* (Döderlein, 1896); 20 July 1995, 20 m, 5 specimens, with ophiuroid *Ophiothrix purpurea* von Martens, 1867.

**Description**

Body relatively short, flattened, tapering posteriorly, largest incomplete specimen (anterior fragment) 4.9 mm long, 1.3 mm wide with parapodia but without chaetae, 0.6 mm wide with parapodia and chaetae, with 32 chaetigers; juveniles 2.7-3.4 mm long, 0.77-1.34 mm wide with parapodia but without chaetae, 0.2-0.3 mm wide without parapodia, with 22-28 chaetigers.

Prostomium bilobed, wider than long, roughly hexagonal, most specimens without or with slight indication of cephalic peaks; median antenna present on one juvenile, about four times as long as lateral ones; lateral antennae short, conical (slightly shorter than prostomium); palps stout, tapered, relatively long (2.5-3 times as long as prostomium); all without papillae.

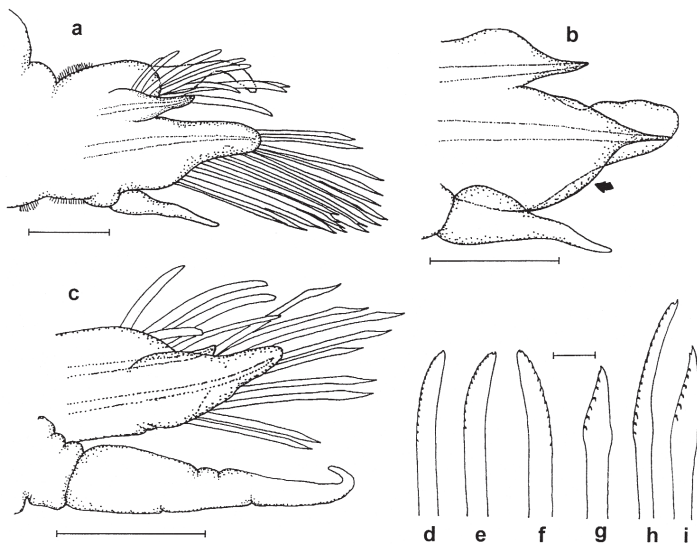


**Figure 13.** *Hololepidella millari* sp. nov. **a.** Anterior end of the holotype. This specimen has only 3 eyes, instead of 4 normally; **b.** Elytron with detail of microtubercles (not to scale); **c.** Tentacular cirri with acicula in tentaculophore.

Scale bars: a-b = 1 mm, c = 200  $\mu$ m.

**Figure 13.** *Hololepidella millari* sp. nov. **a.** Extrémité antérieure de l'holotype (ce spécimen présente seulement 3 yeux, au lieu de 4 normalement) ; **b.** élytre avec détails des microtubercules ; **c.** cirres tentaculaires avec acicule au sein du tentaculophore.

Echelles : a-b = 1 mm, c = 200  $\mu$ m.



**Figure 14.** *Hololepidella millari* sp. nov. **a.** Left parapodium of segment 52, anterior view (paratype ZMMU 845); **b.** Parapodium of a posterior segment, posterior view; arrow indicates postchaetal lobe; **c.** Right parapodium of segment 2 (paratype ZMMU 847), anterior view; **d-f.** Notochaetae; **g-i.** Lower, upper and middle neurochaetae.

Scale bars: a-c = 200  $\mu$ m, d-i = 40  $\mu$ m.

**Figure 14.** *Hololepidella millari* sp. nov. **a.** Parapode gauche du segment 52, vue antérieure (paratype ZMMU 845); **b.** Parapode d'un segment postérieur, vue postérieure, la flèche indique le lobe postchaetal. **c.** Parapode droit du segment 2, vue antérieure (paratype ZMMU 847); **d-f.** soies notopodiales supérieures et inférieures; **g-i.** Soies neuropodiales inférieures, supérieures et médianes.

Echelles : a-c = 200  $\mu$ m, d-i = 40  $\mu$ m.

Tentacular segment not visible dorsally, without nuchal fold; tentaculophores lateral to prostomium with 1-3 chaetae, and two pairs of slender and long tentacular cirri, dorsal ones slightly longer than ventral ones (Fig. 15). Second segment with first pair of elytraphores, with biramous parapodia and one pair of ventral buccal cirri extending as far as tips of chaetae.

Largest specimen with 14 pairs of elytra on segments 2, 4, 5, 7, 9, 11, 13, 15, 17, 19, 23, 26, 29, 31. Elytra lost in most specimens; in one juvenile they are relatively small, oval, delicate, transparent, without distinctive microtubercles.

One transverse ciliary band per segment, connecting bases of cirrophores or elytraphores, running along the anterior edge of segments (Fig. 17).

Parapodia biramous, smaller rounded notopodium with projecting acicular lobe on lower side; larger neuropodium with conical prechaetal acicular lobe and shorter rounded or triangular postchaetal lobe (Fig. 16). Dorsal cirri with cylindrical cirrophores and long tapered styles extending beyond neurochaetae. Ventral cirri short and conical, ending at the same level as tips of neuropodial lobes (Fig. 16).

Notochaetae stouter than neurochaetae, about 10-19, with blunt entire or slightly notched tip and 10-15 teeth along convex side. Neurochaetae about 15-23, with faint spinose rows and bidentate or slightly bidentate tips (Fig 18).

Juveniles without distinctive pigmentation. One adult specimen with uniform light brown pigmentation. Largest specimen (male) with prostomium covered by dark brown pigmented spots with pale median groove and areas surrounding posterior eyes; dorsal surface with brown pigmentation at bases of cirrophores and on dorsal tubercles; median part of anterior one third with light-brown transversal lines.

**Biology.** - In Hansa Bay, *Hololepidella nigropunctata* is commensal with ophiuroids *Macrophiothrix belli* and *Ophiothrix purpurea*. Recorded previously as commensal with (1) ophiuroids: *Ophiocoma dentata* Müller and Troschel, 1842, *O. brevipes* Peters, 1851, *O. erinaceus* Müller and Troschel, 1842 (Hawaiian Islands); *O. anaglyptica* Ely, 1944 (Marshall Islands); *O. doderleini* Loriol, 1899 (Marquesas Islands: Devaney, 1967); *O. dentata*, *O. brevipes* and *Ophiarthrum elegans* Peters, 1851 (Solomon Islands: Gibbs, 1969, 1971); *Ophiocoma dentata* and *Ophiarthrum elegans* (Cook Islands: Gibbs, 1972); (2) asteroids: *Acanthaster planci* (Linné, 1758) (Oahu, Hawaii: Devaney, 1967; and Kushimoto, Japan: Uchida, 1975), *Mithrodia* sp. (Oahu, Hawaii: Pettibone, 1993), *Linckia multifora* (Lamarck, 1816) (Inhaca Island, Mosambique: Pettibone, 1993); (3) sponges (Gulf of Elat: Pettibone, 1993); and (4) the solitary coral *Fungia scutaria* Lamark, 1801 (Gulf of Elat: Pettibone, 1993). Prevalence in Hansa Bay about 10%. One juvenile has damaged and regenerated elytra, indicating intraspecific fighting or predator attacks. Three of the five specimens collected in July 1994 were juveniles, perhaps indicating the period of settlement.

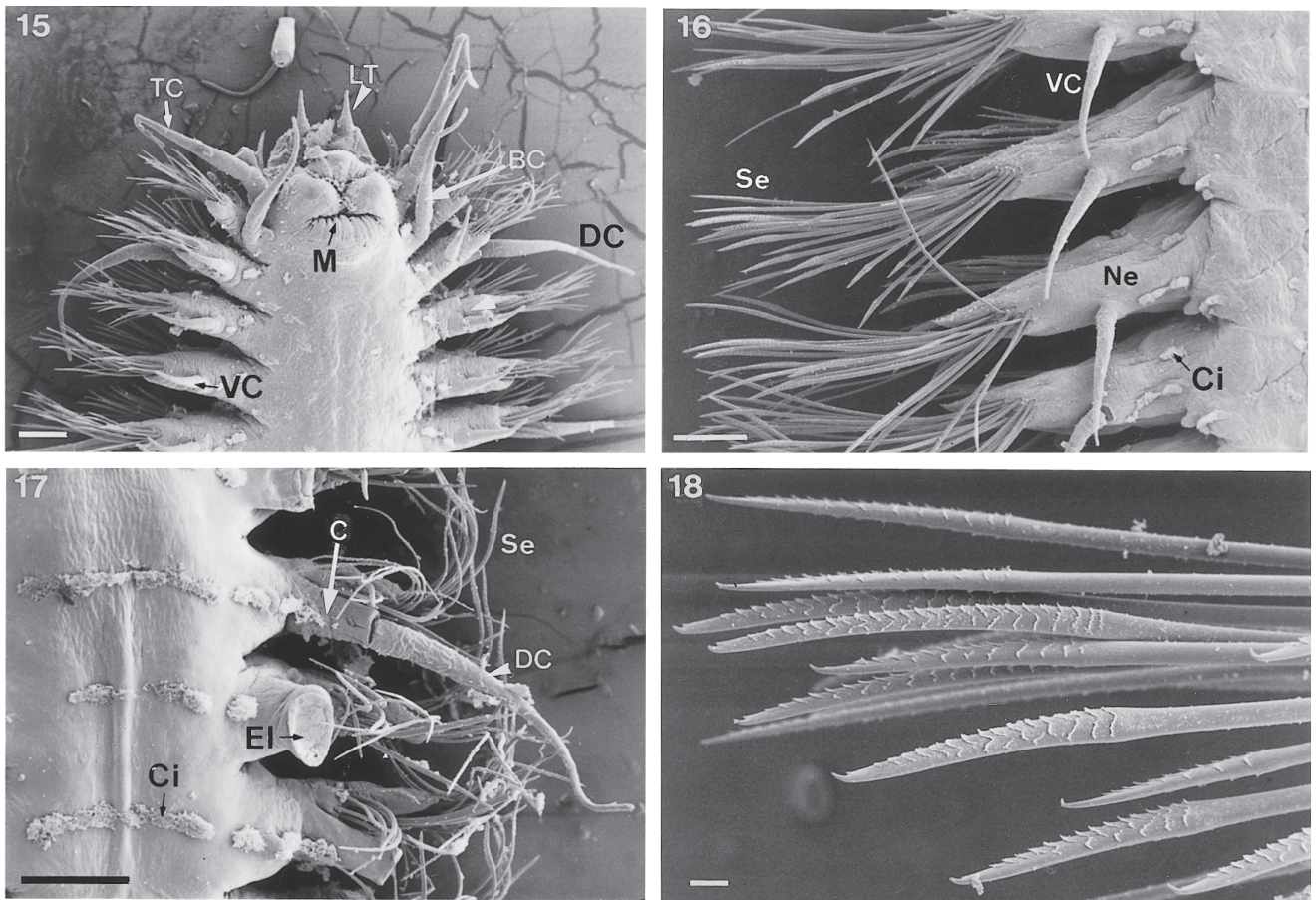
**Distribution.** - Indo-west and central Pacific Ocean. Intertidal to 57 m depth.

*Gastrolepidia clavigera* Schmarida, 1861  
(Figs 19-23)

*Gastrolepidia clavigera* Schmarida, 1861: 159, pl. XXXVI, fig. 316; Hanley, 1989: 17-23, figs. 8-10.

**Material examined.** - Papua New Guinea, Bismarck Sea, Hansa Bay, 20 June 1995, 12 m, one specimen associated with *Thelenota anax* Clark, 1921; 1 July 1995, 12 m, one specimen with *Stichopus variegatus* Semper, 1868; 19 June 1995, 15 m, one specimen with *Holothuria edulis* Lesson, 1830; 9 July 1996, 15 m, one specimen with *Holothuria coluber* Semper, 1868.





**Figures 15-18.** *Hololepidella nigropunctata* (Horst, 1915) (SEM). **15.** Ventral view of anterior end; **16.** Details of middle right parapodia in ventral view; **17.** Dorsal view of 3 parapodia; **18.** Details of neurochaetal apices. Abbreviations: (BC) buccal cirrus, (C) cirrophore, (Ci) cilia, (DC) dorsal cirrus, (EI) elytophore, (LT) lateral antenna, (M) mouth, (Ne) neuropodium, (Se) chaetae, (TC) tentacular cirrus, (VC) ventral cirrus.

Scale bars: 15-17 = 100  $\mu$ m, 18 = 10  $\mu$ m.

**Figures 15-18.** *Hololepidella nigropunctata* (MEB). **15.** Vue ventrale de l'extrémité antérieure d'un spécimen ; **16.** Détails des parapodes droits du milieu du corps, vue ventrale ; **17.** Vue dorsale de trois parapodes ; **18.** Détails de l'apex des soies neuropodiales. Abréviations ; (BC) cirre buccal, (C) cirrophore, (Ci) cils, (DC) cirre dorsal, (EI) élytophore, (LT) antenne latérale, (M) bouche, (Ne) neuropode, (Se) soies, (TC) cirre tentaculaire, (VC) cirre ventral.

Echelles : 15-17 = 100  $\mu$ m, 18 = 10  $\mu$ m.

### Description

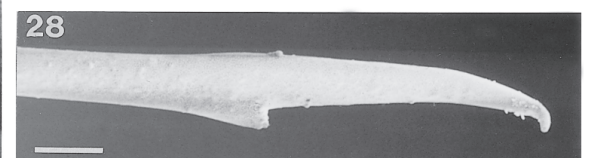
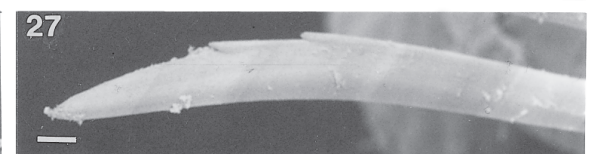
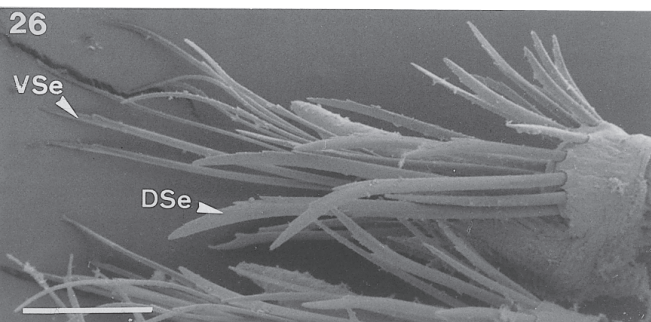
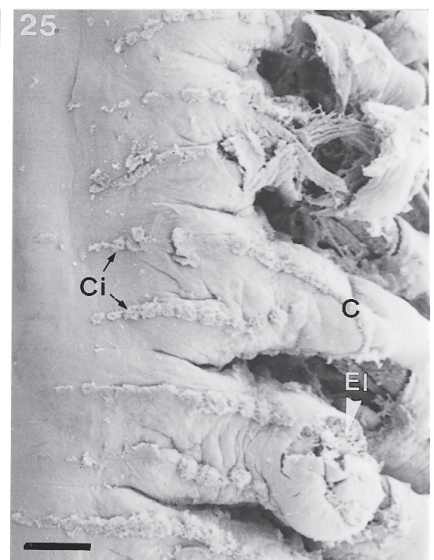
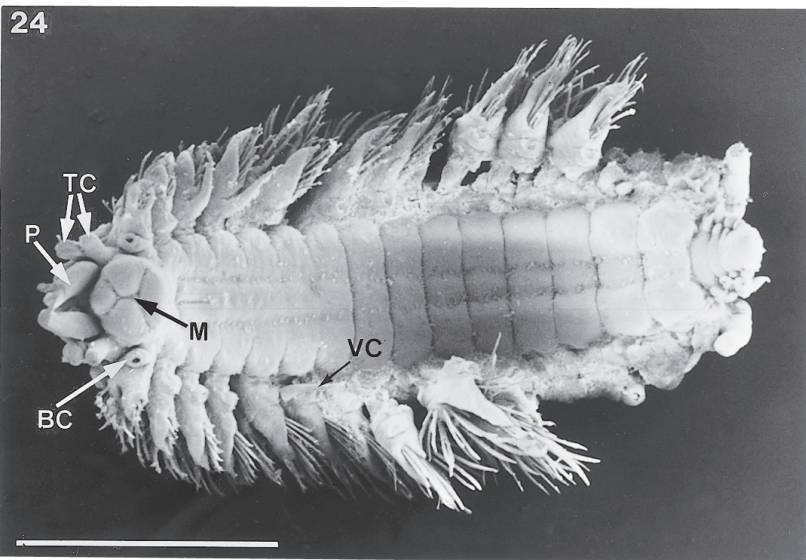
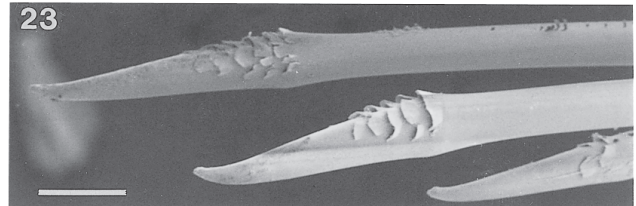
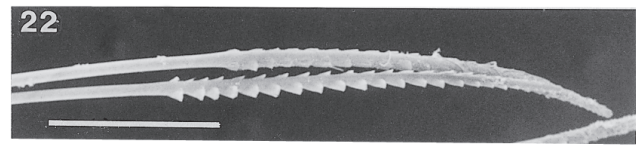
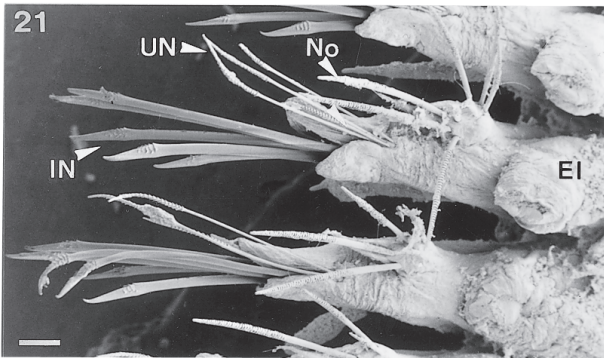
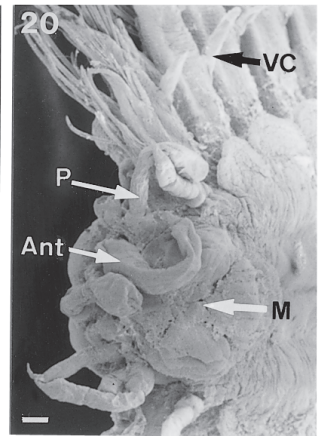
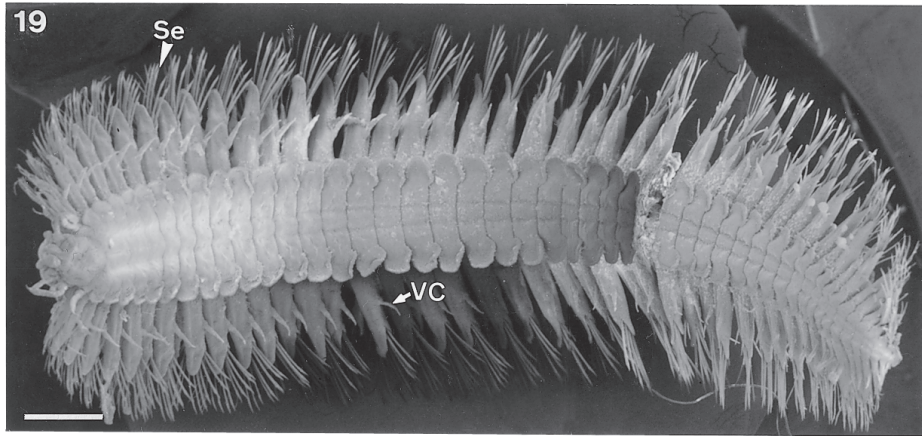
Body flattened, widest part of body in anterior third, with more than 49 chaetigers, more than 17.5 mm long and up to 4.6 mm wide with parapodia but without chaetae, up to 2.4 mm wide without parapodia. Conspicuous scute-like processes at the base of each parapodium from segment 3 onward (Fig. 19).

Prostomium bilobed, wider than long, without frontal peaks, with two pairs of eyes, anterior pair in widest part of prostomium, slightly larger than posterior pair. Palps short, subulate; median antenna large, distally expanding into bulbous subterminal inflation, then sharply tapering to

filiform tip (Fig. 20); lateral antennae similar to median one but shorter.

Tentacular segment not visible dorsally, tentaculophores lateral to prostomium, achaetous, with two pairs of dorsal and ventral tentacular cirri that are similar in length to median antenna.

Elytra large, soft, smooth without papillae, more than 23 pairs on segments 2, 4, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 26, 29, 32, 35, 36, 38, 40, 42...; small indentation in margin created by folded pouch, usually occupied by cirrophore of dorsal cirrus of preceding segment.



Parapodia biramous (Fig. 21). Dorsal cirri on segments without elytra, with long smooth style, expanding into large subterminal inflation and sharply tapered filiform tip. Ventral cirri shorter than parapodial lobe, subulate. Notopodia with long flattened acicular lobe. Neuropodia with longer and thinner rounded prechaetal lobe and shorter postchaetal lobe.

Notochaetae variable in length, curved, with serration along outer edge, with notched tips. Neurochaetae long, straight; upper group slender with serrated edge and hooded, notched tips (Fig. 22); middle group stout, with fewer rows of serration and unidentate tips; and lower group similar with very few rows of serration (Fig. 23).

Specimen associated with *Holothuria edulis* yellowish brown when preserved in Bouin's fluid. Prostomium with granules of brown pigment more intensive in median groove and especially in lateroposterior area, masking eyes; brown antennae and palps; dorsal surface with light background and transversal wide brown bands connecting cirrophores or elyrophores in each segment, two additional narrow bands bordering neighbouring segments; dorsal side of parapodia with less intense brown pigmentation; ventral surface without pigmentation.

Remarks. - This species is very fragile and easily sheds its posterior end, which is why it is very difficult to get a complete specimen. According to Hanley (1989), the attachment pattern of elytra after segment 42 varies between specimens. In our material, specimen associated with *Holothuria coluber* had an asymmetrical attachment pattern of elytra after segment 35.

Biology. - In Hansa Bay, *Gastrolepidia clavigera* is commensal with holothuroids *Thelenota anax*, *Stichopus variegatus*, *Holothuria edulis* and *H. coluber*. The association with the last species is here reported for the first

time. The species has been recorded previously with about 20 species of stichopodiid and holothuriid holothuroids (Britayev & Zamishliak, 1996; Martin & Britayev, 1998). Each host may house from one to four polychaetes, but they usually bear a heterosexual pair of scaleworms. Prevalence varied from 32 to 80% depending on host and location (Britayev & Zamishliak, 1996). One specimen had a swollen elyrophore (chaetiger 9) and cirrophore (chaetiger 12) probably induced by parasites, and damaged and regenerated parapodia on segments 12-13 indicating intra- or interspecific fight.

Distribution. - Tropical Indo-west Pacific. From intertidal zone to 20 m depth.

*Paradyte crinoidicola* (Potts, 1910)  
(Figs 24-29)

*Polynoe crinoidicola* Potts, 1910: 337, pl.18, fig. 10, pl.20, fig. 30, pl. 21, figs. 39-41.

*Scalissetosus crinoidicola* - Horst, 1917: 98, pl. 16, figs. 6-8, pl. 21, fig.1; Okuda, 1936: 564, fig. 3.

*Adyte crinoidicola* - Hanley, 1984: 87-92, fig. 1 A-L.

*Paradyte crinoidicola* - Pettibone, 1969a: 13, 16, fig. 7a-g; Gibbs, 1971: 126; Tchesunov et al., 1989: 169-172; Hanley & Burke, 1991: 13-15, fig. 1.

Material examined. - Papua New Guinea, Bismarck Sea, Hansa Bay. 30 June-18 July 1994, 5-30 m, 13 fragments and a number of dried specimens mixed in jars with *Hololepidella laingensis* sp. nov. and coming from 24 out of the 25 species of sampled crinoids (Table 1); June 1994, 10 m, two specimens with crinoid *Capillaster multiradiatus*; July 1994, 20 m, two juveniles with crinoid *Comanthus alternans*; June 1994, 10 m, one specimen with crinoid *Dichrometra flagellata*; August 1995, 20 m, two fragmented specimens with crinoid *Comaster multifidus*; March 1996, 15 m, eleven specimens, 19 July, 1996, 15 m, ten specimens with crinoid *Oxycomanthus bennetti*; 8 July, 10 m, 8 July, 10 m,



**Figures 19-23.** *Gastrolepidia clavigera* Schmarida, 1861 (SEM). **19.** Ventral view of a specimen; **20.** Details of anterior part of specimen in ventral view; **21.** Middle left parapodia in ventral view; **22.** Upper neurochaetae; **23.** Inferior and middle neurochaetae. Abbreviations: (Ant) antenna, (El) elyrophore, (IN) inferior neurochaetae, (M) mouth, (No) notochaetae, (P) palp, (Se) chaetae, (UN) upper neurochaetae, (VC) ventral cirrus.

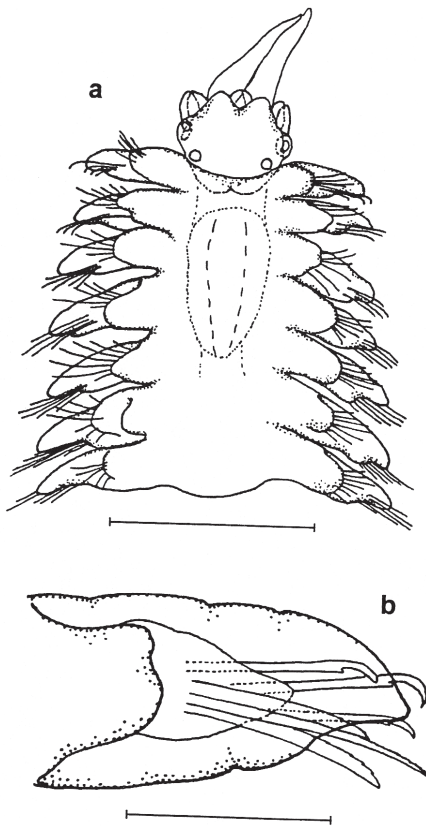
**Figures 24-28.** *Paradyte crinoidicola* (Potts, 1910) (SEM). **24.** Ventral view of a specimen with posterior end regenerated; **25.** Dorsal view of the middle right part of a specimen; two transverse ciliary bands per segment are visible; **26.** Left parapodium; **27.** Notochaetae. **28.** Subacicular neurochaetae. Abbreviations: (BC) buccal cirrus, (C) cirrus, (Dse) dorsal chaetae, (El) elyrophore, (M) mouth, (P) palp, (TC) tentacular cirrus, (VC) ventral cirrus, (Vse) ventral chaetae.

Scale bars: 19 = 1 mm, 20-22 = 100 µm, 23 = 50 µm, 24 = 1 mm, 25-26 = 100 µm, 27-28 = 10 µm.

**Figures 19 à 23.** *Gastrolepidia clavigera* (MEB). **19.** Vue ventrale d'un spécimen ; **20.** détails de la partie antérieure du spécimen, vue ventrale ; **21.** parapodes gauches médians, vue ventrale ; **22.** Soies neuropodiales supérieures ; **23.** Soies neuropodiales inférieures et médianes. Abréviations : (Ant) antenne, (El) élytrophore, (IN) Soies neuropodiales inférieures, (M) bouche, (No) soies notopodiales, (P) palpe, (Se) soies, (UN) Soies neuropodiales supérieures, (VC) cirre ventral.

**Figures 24-28.** *Paradyte crinoidicola* (MEB). **24.** Vue ventrale d'un spécimen ; **25.** vue dorsale de la partie droite d'un spécimen ; **26.** parapode gauche ; **27.** Soies notopodiales ; **28.** Soies neuropodiales supérieures. Abréviations : (BC) cirre buccal, (C) cirre, (Ci) cils, (DSe) soies dorsales, (El) élytrophore, (M) bouche, (P) palpe, (TC) cirre tentaculaire, (VC) cirre ventral, (VSe) soies ventrales.

Echelles: 19 = 1 mm, 20-22 = 100 µm, 23 = 50 µm, 24 = 1 mm, 25-26 = 100 µm, 27-28 = 10 µm.



**Figure 29.** *Paradyte crinoidicola* (Potts, 1910). Juvenile specimen. **a.** Anterior end; **b.** Right parapodium of segment 2, dorsal view.

Scale bars: a = 360  $\mu$ m, b = 70  $\mu$ m.

**Figure 29.** *Paradyte crinoidicola*. Spécimen juvénile. **a.** extrémité antérieure ; **b.** parapode droit du segment 2, vue dorsale. Echelles : a = 360  $\mu$ m, b = 70  $\mu$ m.

one specimen with crinoid *Capillaster multiradiatus*; 29 July 1996, 10 m, one specimen with *Colobometra perspinosa* (Carpenter, 1881); June 1997, 15 m, ten specimens on *Comaster multifidus*.

#### Description

Body flattened, elongate-oval, tapered posteriorly. Largest complete specimen 12 mm long, 3.40 mm wide with parapodia but without chaetae, 1.0 mm wide without parapodia, with 38 chaetigers and 15 pairs of elytra, posterior 4-6 segments without elytra; smallest juvenile specimen 1.4 mm long, 0.36 mm wide with parapodia but without chaetae, 0.17 mm wide without parapodia, with 16 segments.

Prostomium bilobed, wider than long, without frontal peaks, with two pairs of eyes, anterior pair in widest part of prostomium, slightly larger than posterior pair; with 2 palps and 3 antennae (Fig. 29a); median antenna and palps about 1.5-2 times as long as prostomium; lateral antennae shorter than median one, their ceratophores inserted ventrally.

Tentacular segment with 2 pairs of tentacular cirri (Fig. 24), dorsal ones longer than ventral ones; without

chaetae. Second (buccal) segment with small nuchal fold covering the base of prostomium, with first pair of elytraphores, with biramous parapodia and long ventral buccal cirri.

Elytra delicate, smooth, without tubercles; on segments 2, 4, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 26, 29 and 32.

Two transverse ciliary band per segment, connecting the bases of cirrophores or elytraphores, dorsal tubercles un conspicuous (Fig. 25).

Parapodia biramous, with smaller triangular notopodium and larger neuropodium with long conical prechaetal acicular lobe and shorter rounded postchaetal lobe. Dorsal cirri with cylindrical cirrophores, bulbous basally (Fig. 25), with long tapered styles extending beyond neurochaetae. Ventral cirri short, subulate (Fig. 24).

Notochaetae stouter than neurochaetae, sabre-like, about 17-20, with notched tips and 1-5 widely spaced spines (Fig. 26-27). Neurochaetae about 20-30, of two kinds, both with basal semilunar pockets; supraacicular group slender, slightly curved, with long spinous region and bidentate tips; subacicular group more stout, with tips entire and falcate (Fig. 26-28).

The specimens examined fall into two main groups of pigmentation. The first group includes specimens with uniform pigmentation. It varies from light pinkish to dark brown, nearly black. Pigmentation of the elytra is in accordance with the body pigmentation, sometimes with light or dark spots. The second group includes specimens with pigment patterns of different types: (A) light body with a longitudinal dark band covering prostomium and middle of the dorsal surface up to bases of parapodia, ventral surface without pigment; (B) pigment predominates, light areas restricted to elytraphores, to dorsal tubercles and prostomium, ventral surface with pigmented areas at base of parapodia; (C) similar to B but without pigment on ventral side. Pigmentation of elytra in the three types usually uniform, in accordance with body colour, sometimes lighter or with dark or light spots. In second group colour may vary from dark gray to lilac. Four specimens collected on *Oxycomanthus bennetti* have similar grayish-violet and very contrasting-colouring of the type B pattern.

**Biology.** - *Paradyte crinoidicola* is the most common polychaete associated to echinoderms in Hansa Bay. Commensal with the crinoids *Capillaster multiradiatus*, *Oxycomanthus bennetti*, *Colobometra perspinosa*, *Comanthus alternans*, *Comaster multifidus*, *Dichrometra flagellata*. Associations with the last three species are here reported for the first time. Recorded previously with 22 species of unstalked crinoids (Martin & Britayev, 1998). The species is one of the most common scaleworms in Indo-West Pacific. Each host may harbour one to four polychaetes, prevalence varied from 14 to 48 % (Zmarzly, 1984). One specimen with swollen midbody segments

(10-12 chaetigers) likely induced by parasites. Juveniles (1.2-1.4 mm long) collected in July 1994 and male with mature sperm collected in June 1994, March and July 1996 likely indicate this time as the period of reproduction and settlement. A relatively large proportion of specimens (three out of 13 collected in June-July 1994) have damaged and regenerated elytra indicating frequent intraspecific fights or predator attacks.

Distribution. - Tropical Indo-West Pacific. From intertidal zone to 52 m depth.

Family PHYLLODOCIDAE

*Eumida ophiuricola* sp. nov.

(Figs 30-34)

Type locality. - Laing Island, Hansa Bay, Papua New Guinea, Bismarck Sea.

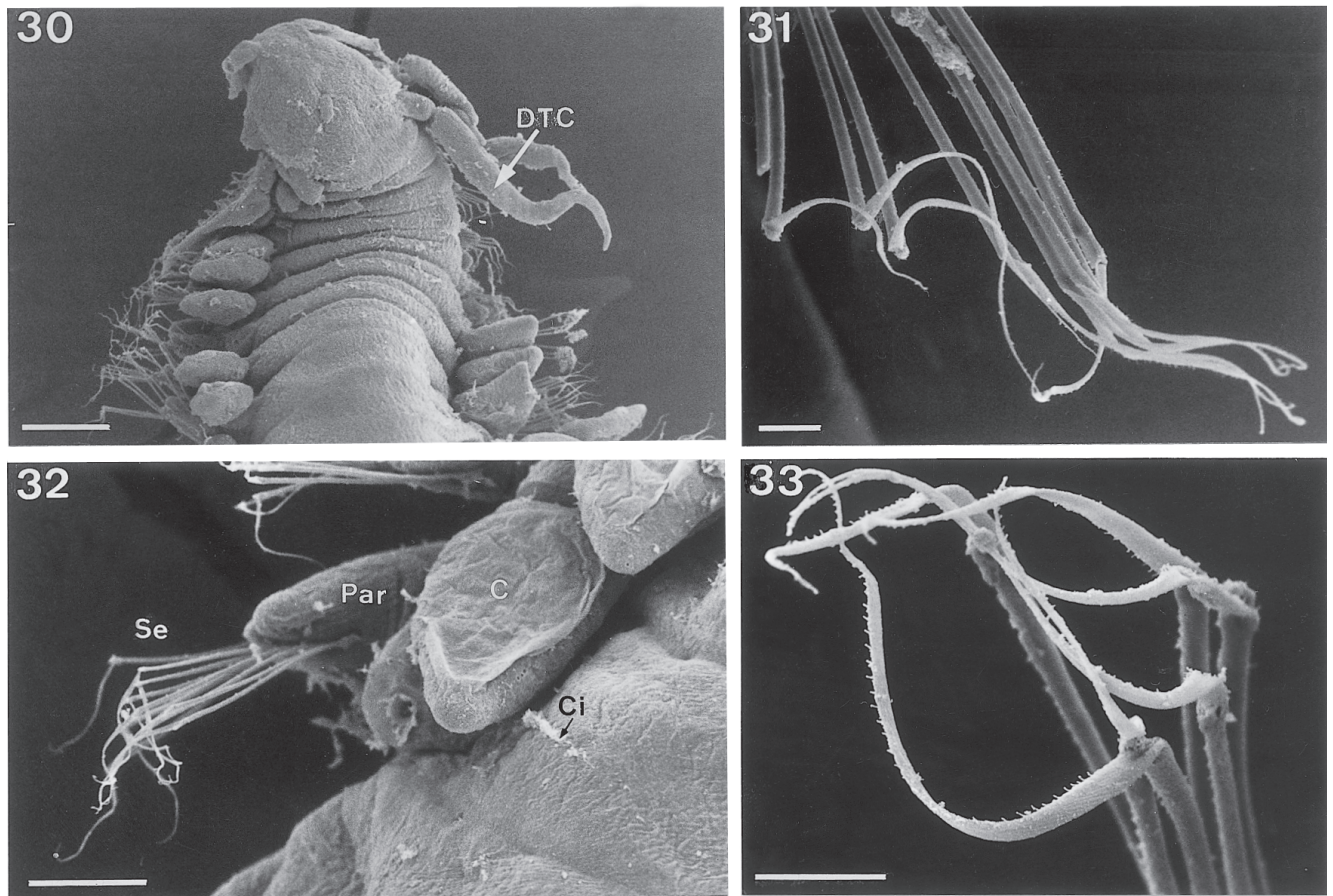
Material examined. - 6 July 1996, 15 m, 2 entire specimens found in bursa of *Ophiothrix purpurea* after dissections.

Etymology. - Referring to ophiuroids, the hosts in which the type has been found.

Description

Holotype (ZMMU 848) mature male, 15 mm long, 1.2 mm wide at midlength with parapodia but without chaetae, 0.72 mm wide without parapodia, with 65 chaetigers. Body flattened ventrally and rounded dorsally, spindle-shaped, more tapered anteriorly (Fig. 34a). Paratype prepared for SEM observations.

Prostomium relatively small, as wide as long (200 x 200  $\mu$ m in holotype) (Figs 34a,b). Frontal paired antennae slightly shorter than prostomium, median antenna shorter than frontal ones, inserted on level with anterior margin of eyes. Eyes dark, large (80  $\mu$ m in diameter), with

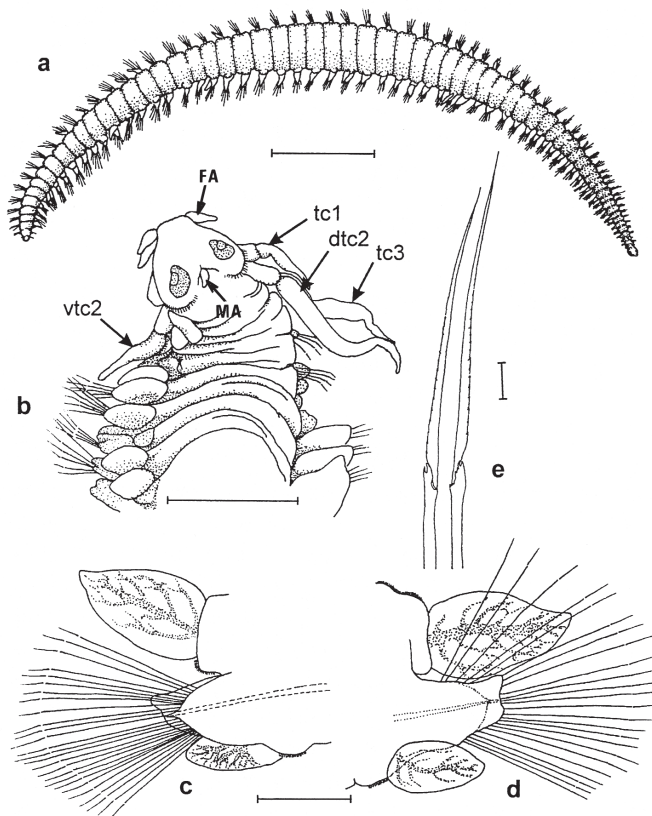


**Figures 30-33.** *Eumida ophiuricola* sp. nov. (SEM). **30.** Dorsal view of anterior part of paratype; **31.** Compound chaeta; **32.** Middle parapodium in dorsal view; **33.** Details of chaetal apices. Abbreviations: (DTC) dorsal tentacular cirrus of segment 2, (C) dorsal parapodial cirrus, (Par) parapodium, (Se) chaetae.

Scale bars: 30 and 32 = 100  $\mu$ m, 31 and 33 = 10  $\mu$ m.

**Figures 30-33.** *Eumida ophiuricola* sp. nov. (MEB). **30.** Vue dorsale de la partie antérieure d'un spécimen ; **31.** soies composées ; **32.** parapode médian observé du côté dorsal ; **33.** détails de l'apex des soies. Abréviations : (DTC) cirre dorsal tentaculaire, (C) cirre parapodial, (Ci) cils, (Par) parapode, (Se) soies.

Echelles : 30 et 32 = 100  $\mu$ m, 31 et 33 = 10  $\mu$ m.



**Figure 34.** *Eumida ophiuricola* sp. nov. **a.** Holotype: dorso-lateral view; **b.** Anterior part of paratype; **c.** Parapodium of chaetiger 21, posterior view; **d.** Parapodium of chaetiger 26, anterior view; **e.** Compound chaetae.

Abbreviations: (FA) frontal antenna, (MA) median antenna, (tc1) tentacular cirrus of segment 1, (dtc2) dorsal tentacular cirrus of segment 2, (vtc2) ventral tentacular cirrus of segment 2, (tc3) tentacular cirrus of segment 3.

Scales: a = 2 mm, b-d = 200  $\mu$ m, e = 10  $\mu$ m.

**Figure 34.** *Eumida ophiuricola* n. sp. **a.** Holotype, vue générale de l'holotype ; **b.** Paratype, vue antérieure ; **c.** parapode du 21<sup>e</sup> sétigère, vue postérieure ; **d.** parapode du 26<sup>e</sup> sétigère, vue antérieure ; **e.** soies composées. Abréviations : (FA) antenne frontale, (MA) antenne médiane, (tc1) cirre tentaculaire du 1er segment, (dtc2) cirre tentaculaire dorsal du 2<sup>e</sup> segment, (vtc2) cirre tentaculaire ventral du 2<sup>e</sup> segment, (tc3) cirre tentaculaire du 3<sup>e</sup> segment.

Echelles : a = 2 mm, b-d = 200  $\mu$ m, e = 10  $\mu$ m.

conspicuous lens located anterolaterally. Proboscideal structures not studied. Two pairs of tentacular cirri, those of segment one reaching segment five, dorsal cirri of segments two and three reaching at least segment eight. Dorsal cirri of segment two nearly twice as long as ventral ones. Chaetae present from segment two, arising from ventral side of ventral cirrophores.

Parapodia uniramous, with single aciculum (Figs 34c, d).

All cirri slightly asymmetrical, dorsal cirri of median segments lanceolate, longer than broad (L/W ratio = 1.7)

with distinctive cirrophores, extending beyond tips of parapodial lobes (Figs 34c, d). Prechaetal lobe slightly asymmetrical with longer upper part, postchaetal lobe rounded (Fig. 34c-d). All chaetae compound, about 40 in median segments. Rostrum of chaetal shaft with two large and several small teeth, blades long and slender (Figs 30, 32, 34c-d). Pygidial cirri lost.

Each segment with one transversal dorsal (Fig. 31) and one ventral ciliary band connecting base of parapodia. Small groups of cilia at the ventral base of dorsal and ventral cirri (Fig. 34c-d).

Without distinctive pigmentation: fixed specimen with brown dorsal and ventral cirri, and dark brown eyes.

Remarks. - The reduction of segment 1 and the arrangement of the median antenna and tentacular cirri indicate the proximity of *Eumida ophiuricola* sp. nov. to both the genera *Eumida* and *Sige*. *Eumida* has a rounded prechaetal lobe, while that of *Sige* has a prolonged, nearly digitiform, upper part (e.g. Pleijel, 1993). The prechaetal lobe of our specimens has an asymmetrical longer upper part intermediate between those of *Eumida* and *Sige*. However, taking into account the absence of a really digitate upper part in our specimens and the asymmetrical lips in some *Eumida* species (e.g. *E. tubifrons* Moore, 1909 or *E. trifasciata* Eibye-Jacobsen, 1991) we include the new species in the genus *Eumida*. It differs from other known species of *Eumida* by a combination of several features: small size when mature; lanceolate shape of dorsal and ventral cirri; asymmetrical longer upper part of parapodia, in absence of distinctive pigmentation and presence of transversal dorsal and ventral ciliary bands on each segment.

Biology. - *Eumida ophiuricola* sp. nov. is commensal with the ophiuroid *Ophiothrix purpurea*. This host also housed in its bursae a species of polyclad flatworm (Deheyn et al. 1998) with which *E. ophiuricola* never co-occurred. *Hololepidella nigropunctata* and a new species of copepod also lived on the ophiuroid surface. The genus *Eumida* has been recently revised by Eibye-Jacobsen (1991) and no species were indicated as symbiont.

Distribution. - Hansa Bay, Papua New Guinea.

#### Ecological remarks

Sixty-five species of echinoderms representing more than 500 specimens have been collected in Hansa Bay (Table 1). Most of the species were crinoids, then holothuroids, asteroids, ophiuroids and echinoids. The number of sampled specimens was highest for ophiuroids, lowest for echinoids. Thirty-three echinoderm species out of the 65 sampled were infested by polychaetes and 25% of the specimens were

infested. The number of polychaetes per echinoderm ranged from one to four. Crinoidea was the most infested echinoderm class: polychaetes were found on 24 out of the 25 collected species; 56% of the crinoid specimens were infested. Polychaetes were not found on sea urchins but this could be due to the small number of sampled specimens (Table 1).

Table 2 gives details about the polychaete associations with crinoids. Most of the latter belong to the Comasteridae. Generally one or two polychaetes were observed on feather stars; however, the larger they are and the more dichotomized arms they have, the more infested they can be. The largest crinoids with numerous dichotomized arms (e.g., *Comanthus alternans*, *Oxycomanthus bennetti*) generally housed two to four scaleworms while the smallest (e.g., *Lamprometra palmata*, *Stephanometra oxyacantha*) usually harboured only one individual. In other words, the larger crinoids provide more space, which reduces intraspecific competition among symbionts and allows several polychaetes to inhabit the same host. This is in close accordance with the situation described quantitatively for hermatypic coral and associated decapods (Abele & Patton, 1976; Black & Prince, 1983) where the positive relationship between size of coral colony and abundance of associates has been clearly demonstrated. The high frequency of specimens with damaged and/or regenerated elytra, parapodia and cirri, in *Paradyte crinoidicola* and *Hololepidella* spp., as well as an infestation limited mainly to one or two symbionts per host, indicates an intensive intra- and/or interspecific competition. This phenomenon has been demonstrated earlier in *Hololepidella nigropunctata* by Devaney (1967) and in some other scaleworms (for references see Martin & Britayev, 1998).

Only two species of crinoids were cryptic during the day: *Alloeocomatella pectinifera* (A.H. Clark, 1911) and *Dichrometra flagellata*. Both have a few non-dichotomized arms and are relatively small. The first species was the only feather star where no scaleworms occurred but only two specimens of the crinoid were collected. The second species was well infested: five of the six specimens sampled were infested.

Of the six species of polychaetes observed, five were ectocommensal: *Hololepidella laingensis* sp. nov., *Hololepidella millari* sp. nov., *Hololepidella nigropunctata*, *Gastrolepidia clavigera* and *Paradyte crinoidicola*. These species generally were found at the base of the crinoid arms, in the ambulacral grooves of arms of asteroids and ophiuroids, or on the dorsal surface of holothuroids. The sixth species, *Eumida ophiuricola* sp. nov., was found in the bursal lumen of ophiuroids. This association appeared to be neutral for the hosts and consequently, according to Kinne's definitions (1980), *E. ophiuricola* must be considered as an endocommensal. Co-infestation of polychaetes occurred between *Hololepidella laingensis* sp. nov and *Paradyte*

**Table 2.** Characteristics of the different species of crinoids sampled in Hansa Bay and data on their association with polychaetes.

**Tableau 2.** Caractéristiques des différentes espèces de Crinoïdes récoltées dans la baie de Hansa et données sur leurs associations avec des polychètes.

Crinoid taxa specimens	No. of infested specimens/ No. of sampled specimens	No. of polychaetes per infested specimen: Average (range)
<b>COMASTERIDAE</b>		
<i>Comaster multifidus</i>	6/9	1.2 (1-2)
<i>Comaster gracilis</i>	3/4	2 (1-3)
<i>Comaster multibrachiatus</i>	1/2	1
<i>Comanthus parvicirrus</i>	5/8	1.6 (1-3)
<i>Comanthus alternans</i>	4/7	2.5 (1-4)
<i>Comanthus mirabilis</i>	2/2	1.5 (1-2)
<i>Comanthus suavius</i>	1/1	2 (1-2)
<i>Comanthus gisleni</i>	1/2	1
<i>Comanthus wahlbergi</i>	1/1	1
<i>Clarkcomanthus littoralis</i>	1/4	1
<i>Clarkcomanthus albinotus</i>	1/12	1
<i>Oxycomanthus bennetti</i>	13/21	1.5 (1-2)
<i>Comatella stelligera</i>	3/8	1.3 (1-2)
<i>Capillaster multiradiatus</i>	9/22	1.3 (1-3)
<i>Comanthina shlegelii</i>	1/1	1
<i>Comanthina audax</i>	1/2	1
<i>Alloeocomatella pectinifera</i>	0/2	0
<b>COLOBOMETRIDAE</b>		
<i>Cenometa bella</i>	4/5	1.2 (1-2)
<i>Colobometra perspinosa</i>	2/2	2 (1-2)
<b>HIMEROMETRIDAE</b>		
<i>Himerometra robustipinna</i>	5/6	1.6 (1-2)
<i>Heterometra savignii</i>	1/1	2 (1-2)
<b>MARIAMETRIDAE</b>		
<i>Dichrometra flagellata</i>	11/13	1.4 (1-2)
<i>Lamprometra palmata</i>	1/1	1
<i>Stephanometra oxyacantha</i>	2/5	1
<i>Stephanometra spicata</i>	2/3	1.5 (1-2)

*crinoidicola* on *Comaster multifidus*, *Capillaster multiradiatus*, *Dichrometra flagellata* and *Oxycomanthus bennetti*. Non-polychaete symbionts observed on echinoderm hosts included nematods, turbellarians, eulimid gastropods, crabs, pontonin and synalpheid shrimps, galatheans, myzostomes, ophiuroids and fishes. Except for nematods, representatives of the other taxa were sometimes present on echinoderms together with polychaetes.

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