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# Some Nemerteans (Nemertea) from Queensland and the Great Barrier Reef, Australia

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**ABSTRACT**—Three species of marine nemerteans described and illustrated from Queensland and the Great Barrier Reef, Australia, include one new genus and two new species: these are the monostiliferous hoplonemerteans *Thallassionemertes leucocephala* gen. et sp. nov. and *Correanemertes polyophthalma* sp. nov. A new colour variety of the heteronemertean *Micrura callima* is also reported, this species previously only being known from Rottneest Island, Western Australia. A key for the field identification of the marine nemerteans recorded from coastal Queensland and the Great Barrier Reef is provided.

**Key words:** Nemertea, Australia, Key, new taxa

## INTRODUCTION

The earliest report of Australian nemerteans is Quoy and Gaimard's (1833) brief account of two species of marine heteronemerteans, *Borlasia vittata* (now *Lineus vittatus*) from Tasmania and *Borlasia viridis* (subsequently synonymised with *Notospermus tricuspoidatus*) from New South Wales (Table 1). Excluding terrestrial and freshwater taxa, a total of 61 species of nemerteans has now been recorded from Australian waters (Gibson, 1995, 1997, 1999; Sundberg and Gibson, 1995) (Table 1). Of these, 25 species (41%) have been recorded from Queensland and the Great Barrier Reef (Table 1), two-thirds of these belonging to the anoplan subclass Heteronemertea.

During a visit to Queensland in 1995, several further species of nemerteans were discovered by PS. One of these proved to be a new colour morph of a species, the heteronemertean *Micrura callima* Sundberg and Gibson, 1995, previously known only from Rottneest Island, Western Australia (Sundberg and Gibson, 1995; Gibson, 1999). The remaining taxa were previously unknown and two of these, both monostiliferous hoplonemerteans, are named and described for the first time in the present paper.

## MATERIALS AND METHODS

The nemerteans were collected during July and August 1995 from several sampling sites, either on the Queensland coast or within

the Great Barrier Reef area. Specimens were anaesthetized in MgCl<sub>2</sub>, examined for external features and then fixed in a seawater Bouin's solution. Sections were subsequently cut at 7 µm in 58°C m.p. paraffin wax and stained by the Mallory trichrome method. Type material is deposited in the Museum of Tropical Queensland (MTQ), Townsville, Australia.

## SYSTEMATICS

Class Anopla

Subclass Heteronemertea

Genus *Micrura* Ehrenberg, 1828

*Diagnosis:* The following diagnosis of the genus *Micrura* is based upon information given by Sundberg and Gibson (1995: 120): heteronemerteans with single pair of horizontal lateral cephalic furrows, posteriorly enlarged to form wide bays, from which ciliated cerebral canals emerge from median or ventral walls; proboscis unbranched, typically containing two muscle layers (outer circular, inner longitudinal), some species with incomplete outer longitudinal layer, and none, one or two muscle crosses; rhynchocoel circular musculature not interwoven with adjacent body wall inner longitudinal muscle layer; dorsal fibrous cores of cerebral ganglia forked only at rear into upper and lower branches; nervous system with neither neurochords nor neurochord cells, neuroganglionic tissues of brain lobes not usually separated from body wall muscles by outer neurilemma; foregut with or without somatic muscles, if present variably composed of circular and/or longitudinal fibres; dermis variable, mostly with distinct connective tissue layer separating glandular zone from body wall musculature; caudal cirrus present; foregut without subepithelial gland cell

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**Table 1.** Species of marine nemerteans previously recorded from Australia. Taxa reported from Queensland and the Great Barrier Reef are listed in **bold italics**. Higher taxonomic categories are used in accordance with Sundberg's (1991) proposals. E = possibly endemic species which thus far have only been found in Australian waters.

Taxon	Reference first recording species from Australian waters and comments
<b>Class Anopla</b>	
<b>Subclass Palaeonemertea</b>	
<i>Carinoma patriciae</i> Gibson, 1979	E Gibson, 1979a
<i>Cephalotrichella alba</i> Gibson and Sundberg, 1992	Sundberg and Gibson, 1995
<i>Hubrechtella malabarensis</i> Gibson, 1979	E Gibson, 1979b
<b><i>Hubrechtella queenslandica</i></b> Gibson, 1979	E Gibson, 1979a
<i>Procephalothrix arenarius</i> Gibson, 1990	Sundberg and Gibson, 1995
<b>Subclass Heteronemertea</b>	
<b><i>Aetheorhynchus actites</i></b> Gibson, 1981	E Gibson, 1981a
<i>Australineus albidecus</i> Gibson, 1990	E Gibson, 1990a
<b><i>Baseodiscus delineatus</i></b> (Delle Chiaje, 1825)	Punnett, 1900, as <i>Eupolia delineata</i>
<b><i>Baseodiscus hemprichii</i></b> (Ehrenberg, 1831)	Gibson, 1979c
<b><i>Baseodiscus quinquelineatus</i></b> (Quoy and Gaimard, 1833)	Bürger, 1895, as <i>Eupolia septemlineata</i>
<b><i>Bennettiella insularis</i></b> (Gibson, 1981)	E Gibson, 1981a, as <i>Bennettia insularis</i>
<i>Cerebratulus australis</i> (Stimpson, 1857)	E Stimpson, 1857, as <i>Meckelia australis</i> ; inadequately described
<b><i>Cerebratulus haddoni</i></b> Punnett, 1900	E Punnett, 1900; inadequately described
<i>Cerebratulus johnstoni</i> Wheeler, 1940	E Wheeler, 1940; inadequately described
<b><i>Cerebratulus magneticus</i></b> Gibson, 1981	E Gibson, 1981a
<b><i>Cerebratulus queenslandicus</i></b> Punnett, 1900	E Punnett, 1900; inadequately described
<b><i>Cerebratulus torresianus</i></b> Punnett, 1900	E Punnett, 1900; inadequately described
<b><i>Colemaniella albulus</i></b> (Gibson, 1981)	E Gibson, 1981a, as <i>Colemania albulus</i>
<b><i>Gorgonorhynchus repens</i></b> Dakin and Fordham, 1931	Dakin and Fordham, 1931
<i>Kirsteueria abocellus</i> Gibson, 1978	E Gibson, 1978
<i>Kohnia rotnestensis</i> Sundberg and Gibson, 1995	E Sundberg and Gibson, 1995
<i>Lineus bioculatus</i> Sundberg and Gibson, 1995	E Sundberg and Gibson, 1995
<i>Lineus gilviceps</i> Sundberg and Gibson, 1995	E Sundberg and Gibson, 1995
<i>Lineus vittatus</i> (Quoy and Gaimard, 1833)	E Quoy and Gaimard, 1833, as <i>Borlasia vittata</i> ; inadequately described
<i>Micrura callima</i> Sundberg and Gibson, 1995	E Sundberg and Gibson, 1995
<b><i>Notospermus geniculatus</i></b> (Delle Chiaje, 1828)	E Gibson, 1981a, as <i>Micrura tridacnae</i> ; redescribed by Riser, 1991
<b><i>Notospermus tricuspидatus</i></b> (Quoy and Gaimard, 1833)	Quoy and Gaimard, 1833, as <i>Borlasia viridis</i>
<b><i>Parborlasia hutchingsae</i></b> Gibson, 1978	E Gibson, 1978
<i>Quasilineus lucidocolatus</i> Gibson, 1990	E Gibson, 1990a
<b><i>Quasilineus pulcherrimus</i></b> Gibson, 1981	E Gibson, 1981a
<i>Urcholema nigricans</i> Sundberg and Gibson, 1995	E Sundberg and Gibson, 1995
<b><i>Valencinina albula</i></b> Gibson, 1981	E Gibson, 1981b
<b>Class Enopla</b>	
<b>Subclass Hoplonemertea</b>	
<b>Superorder Monostilifera</b>	
<i>Aegialonemertes chlorophthalma</i> Gibson, 1990	E Gibson, 1990a
<i>Aenigmanemertes norenburgi</i> Sundberg and Gibson, 1995	E Sundberg and Gibson, 1995
<i>Ammonemertes erseusi</i> Gibson, 1990	E Gibson, 1990a
<i>Amphiporus rhomboidalis</i> (Stimpson, 1855)	E Stimpson, 1855, as <i>Polia rhomboidalis</i> ; inadequately described, identified as a <i>nomen dubium</i> by Gibson & Crandall, 1989
<i>Carcinonemertes australiensis</i> Campbell, Gibson and Evans, 1989	E Campbell <i>et al.</i> 1989
<i>Carcinonemertes cf. carcinophila</i> (Kölliker, 1845)	Bell and Hickman, 1985; identified as similar to variety <i>imminuta</i> Humes, 1942
<i>Carcinonemertes humesi</i> Gibson and Jones, 1990	E Gibson and Jones, 1990
<i>Crybelonemertes arenicolus</i> Sundberg and Gibson, 1995	E Sundberg and Gibson, 1995
<i>Digononemertes australiensis</i> Gibson, 1990	E Gibson, 1990a
<i>Eonemertes emmyakos</i> Gibson, 1990	E Gibson, 1990a
<i>Gononemertes australiensis</i> Gibson, 1974	E Gibson, 1974
<i>Halimanemertes slacksmithae</i> Gibson, 1990	E Gibson, 1990a
<i>Ischyronemertes albanyensis</i> Gibson, 1990	E Gibson, 1990a
<i>Ischyronemertes erythrophleps</i> Gibson, 1990	E Gibson, 1990a
<i>Ischyronemertes tetraphthalma</i> Gibson, 1990	E Gibson, 1990a
<i>Pantinonemertes daguilarensis</i> Gibson and Sundberg, 1992	E Sundberg and Gibson, 1995
<b><i>Pantinonemertes enalios</i></b> Moore and Gibson, 1981	E Moore and Gibson, 1981

<b><i>Pantinonemertes mooreae</i></b> Gibson, 1982	E	Gibson, 1982
<b><i>Pantinonemertes winsori</i></b> Moore and Gibson, 1981 (strictly an estuarine species)	E	Moore and Gibson, 1981
<i>Paranemertopsis wellsii</i> Gibson, 1990	E	Gibson, 1990a
<i>Pheroneonemertes diana</i> Gibson, 1990	E	Gibson, 1990a
<b><i>Poseidonemertes bothwellae</i></b> Gibson, 1982	E	Gibson, 1982
<b><i>Tetranemertes hermaphroditicus</i></b> (Gibson, 1982)	E	Gibson, 1982, as <i>Nemertes hermaphroditicus</i>
<i>Tetrastemma tristibruna</i> Sundberg and Gibson, 1995	E	Sundberg and Gibson, 1995
<i>Zygonemertes wadjemupensis</i> Gibson, 1999	E	Gibson, 1999
<b>Superorder Polystilifera</b>		
<i>Drepanophorella tasmani</i> Wheeler, 1940	E	Wheeler, 1940; inadequately described
<i>Drepanophorus serraticollis</i> (Hubrecht, 1874)		Hubrecht, 1887; no longer a valid species (Gibson, 1995), the identification of this taxon remains unknown (Gibson, 1997)
<b><i>Urichonemertes pilorhynchus</i></b> Gibson, 1983	E	Gibson, 1983
<b><i>Xenonemertes rhamphocephalus</i></b> Gibson, 1983	E	Gibson, 1983

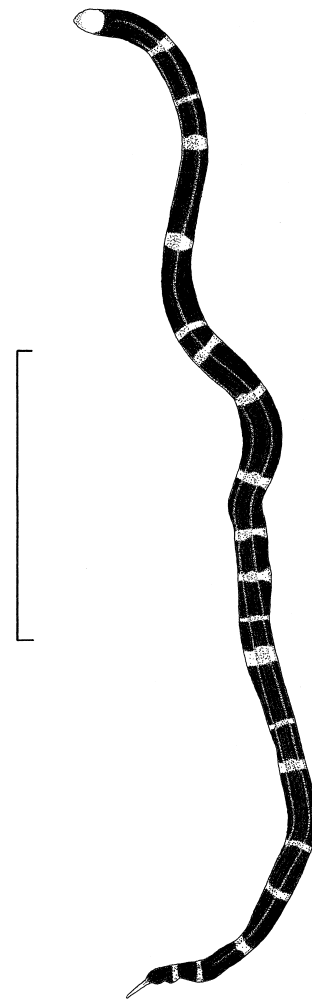
layer; cephalic glands normally well developed, occasionally weakly formed or absent; apical organ usually present; eyes present or absent; sexes separate.

***Micrura callima*** Sundberg and Gibson, 1995

**Material examined:** 1 specimen collected 12 July 1995 from rock, covered with coralline algae, exposed at low tide, Turtle Beach, Cape Ferguson (19°16.2'S, 147°3.4'E); 1 specimen collected 5 August 1995 from coral rubble on the reef flat, Lizard Island, Watson Bay (14°40.0'S, 145°26.7'E).

**External features:** The general appearance resembled that described for *Micrura callima* but the colour pattern differed in being black with a white head tinged orange towards its tip, the ventral surface was completely black, and the dorsal side banded and striped in various shades of grey-black (Fig. 1). The two small eyes were distinctly red, the two dorsal longitudinal stripes had a faint orange tint and the transverse bands a tinge of sulphurous yellow. The specimens were up to about 20 mm long and 1–2 mm wide.

**Internal anatomy and remarks:** The anatomy of *Micrura callima*, a species previously known only from Rottneest Island, Western Australia (Sundberg and Gibson 1995; Gibson 1999), has already been fully described. Studies on sections of the present material closely conform with the original description given by Sundberg and Gibson (1995: 116–120, figs 15–17), the only differences being found relating to dimensions of tissues and organs which can vary quite considerably in nemerteans depending upon their degree of contraction or extension at the time of preservation. It is therefore on morphological grounds not possible to distinguish between the vividly coloured species (dorsally a general purplish-brown colour marked with magenta-pink and orange-brown longitudinal stripes, ventrally a bright magenta) known from Rottneest Island and the present specimens. However, in all the Queensland examples the colour pattern, though resembling that of the Western Australian specimens in terms of its complex pattern of longitudinal and transverse bands, white head patch and dorsolateral speckles, is primarily in shades of black, grey and white, with only faint traces of other colours. We conclude that, with no significant morphological differences



**Fig. 1.** *Micrura callima*. Drawing of complete individual in dorsal view based on a colour photograph of the living specimen. Scale bar=5 mm.

evident between the two colour morphs, the present specimens merely represent a colour variety of *Micrura callima* which has not previously been described. Our conclusion is supported by the fact that a few of the specimens previously found at Rottneest Island were distinctly darker than others,

though still showing the overall brilliant colour pattern originally described for this taxon (P.S., pers. obs.).

Class Enopla  
Subclass Hoplonemertea  
Superorder Monostilifera

Genus *Thallassionemertes* gen. nov.

**Diagnosis:** Monostiliferous marine hoplonemertean; rhynchocoel extending to posterior tip of body, with wall containing two distinct muscle layers; anterior region of proboscis with outer circular and inner longitudinal muscle layers; proboscis armature consisting of single central stylet and two accessory stylet pouches; body wall musculature without diagonal layer, longitudinal muscles not divided anteriorly; pre-cerebral septum ventrally incomplete; frontal organ present, frontal glands arranged as short dorsal and paired ventrolateral groups; cephalic glands absent; cerebral sensory organs massive, posteriorly reaching below front of brain lobes; cerebral ganglia large, with neither neurochord cells nor inner neurilemma; lateral nerve cords without accessory nerves; foregut divisible into oesophagus, stomach and pylorus, intestinal caecum dorsal, short, without lateral diverticula but with pair of long anterior pouches; blood system consisting of simple vascular loop in head and three post-cerebral vessels not transversely linked by pseudometameric connectives; parenchyma extremely sparse; excretory system confined to foregut region of body; eyes numerous, irregularly distributed; sexes probably separate.

**Etymology:** The generic name is formed by prefixing the name *nemertes* with the Greek *thallassios* (=marine) (masculine).

**Type species:** *Thallassionemertes leucocephala* sp. nov.

***Thallassionemertes leucocephala* sp. nov.**

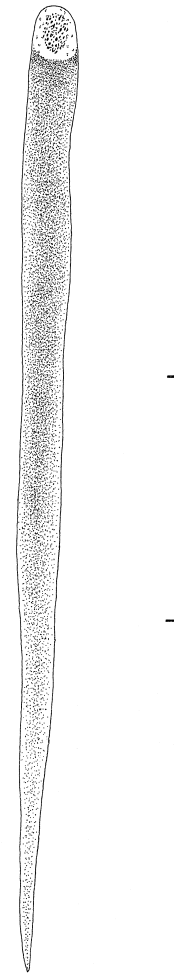
**Type specimen:** Holotype immature female, complete set of mixed transverse and longitudinal sections, 5 slides, MTQ G20023.

**Type locality:** Turtle Beach (19°16.2'S, 147°3.4'E), Cape Ferguson, Queensland, Australia, on rock covered with coral-line algae, exposed at low tide.

**Etymology:** The specific epithet, referring to the colour of the head, is a composite between the Greek words *leukos* (=white) and *kephale* (=a head).

**External features:** Body slender, about 1 mm maximum width, 25 mm long, tapering posteriorly to end in sharply pointed tail (Fig. 2). General colour dark greyish-brown, paler posteriorly. Bluntly rounded head white, median dorsal region speckled with large number of irregularly distributed grey and black flecks. White cephalic area sharply marked off from remainder of body.

**Body wall, musculature and parenchyma:** Epidermis thickest in cerebral and cephalic regions of body, where it varies from 20–40 µm in height, but becomes progressively thinner posteriorly and in intestinal regions is at most only 12–15 µm tall. Throughout its length acidophilic epidermal glands are the most obvious, but large goblet cells also evident and resemble mucus-secreting type described by Norenburg (1985).



**Fig. 2.** *Thallassionemertes leucocephala* gen. et sp. nov. Drawing of holotype, viewed dorsally, based on a colour photograph of the living specimen. Scale bar=5 mm.

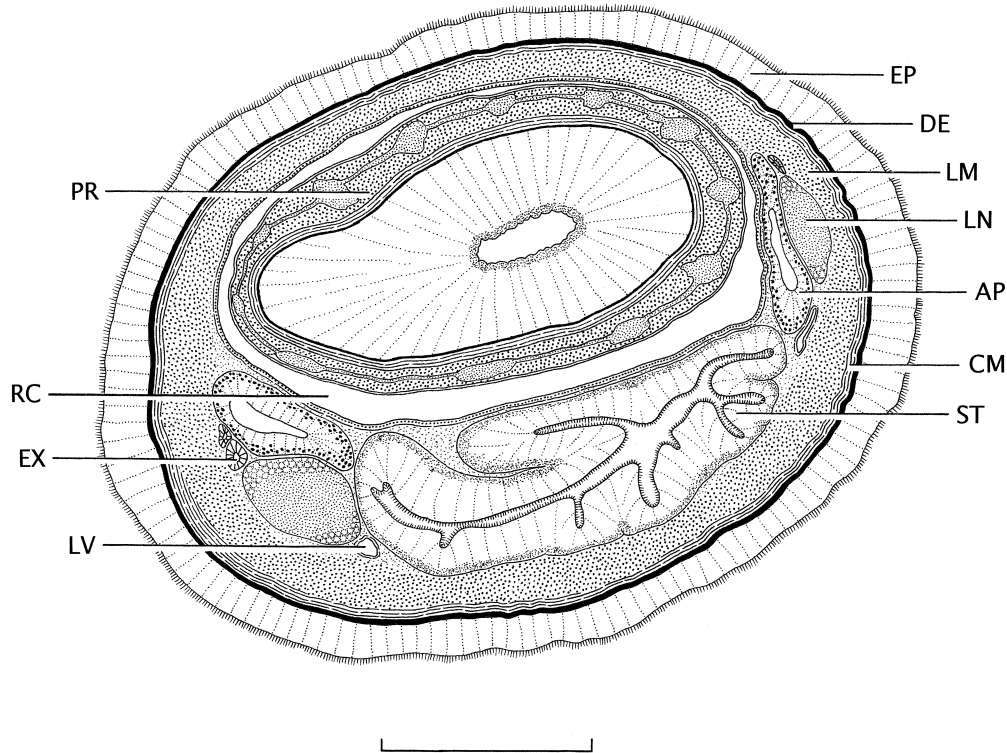
Proximally connective tissue dermis is 2–4 µm thick, its outer surface forming cup-like developments described for many other hoplonemertean species.

Body wall musculature consists of outer circular and inner longitudinal layers (Fig. 3), respectively 3–5 µm and 15–20 µm thick. Both muscle layers extend to tip of head. Longitudinal layer not anteriorly divided and no trace of diagonal layer distinguished. There are also neither dorsoventral muscle bundles in any part of body, nor somatic muscles associated with foregut.

Parenchymatous connective tissues moderately developed, particularly around alimentary tract.

**Proboscis apparatus:** Proboscis pore opens ventrally, almost at tip of head, from short, median ciliated furrow. It leads into thin-walled rhynchodaeum whose epithelium is neither ciliated nor glandular.

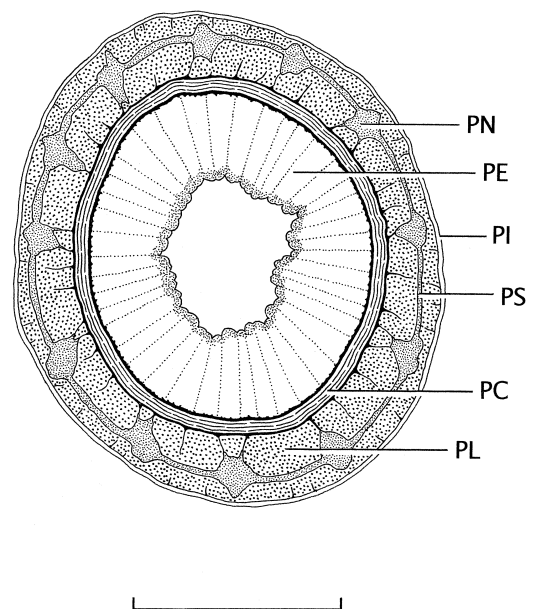
Rhynchocoel extends to posterior tip of body. Its wall contains separate outer circular and inner longitudinal muscle layers (Fig. 3); their delicate slender appearance, in places only a single fibre thick, is most probably a consequence of massive proboscis being in fully retracted position. Proboscis



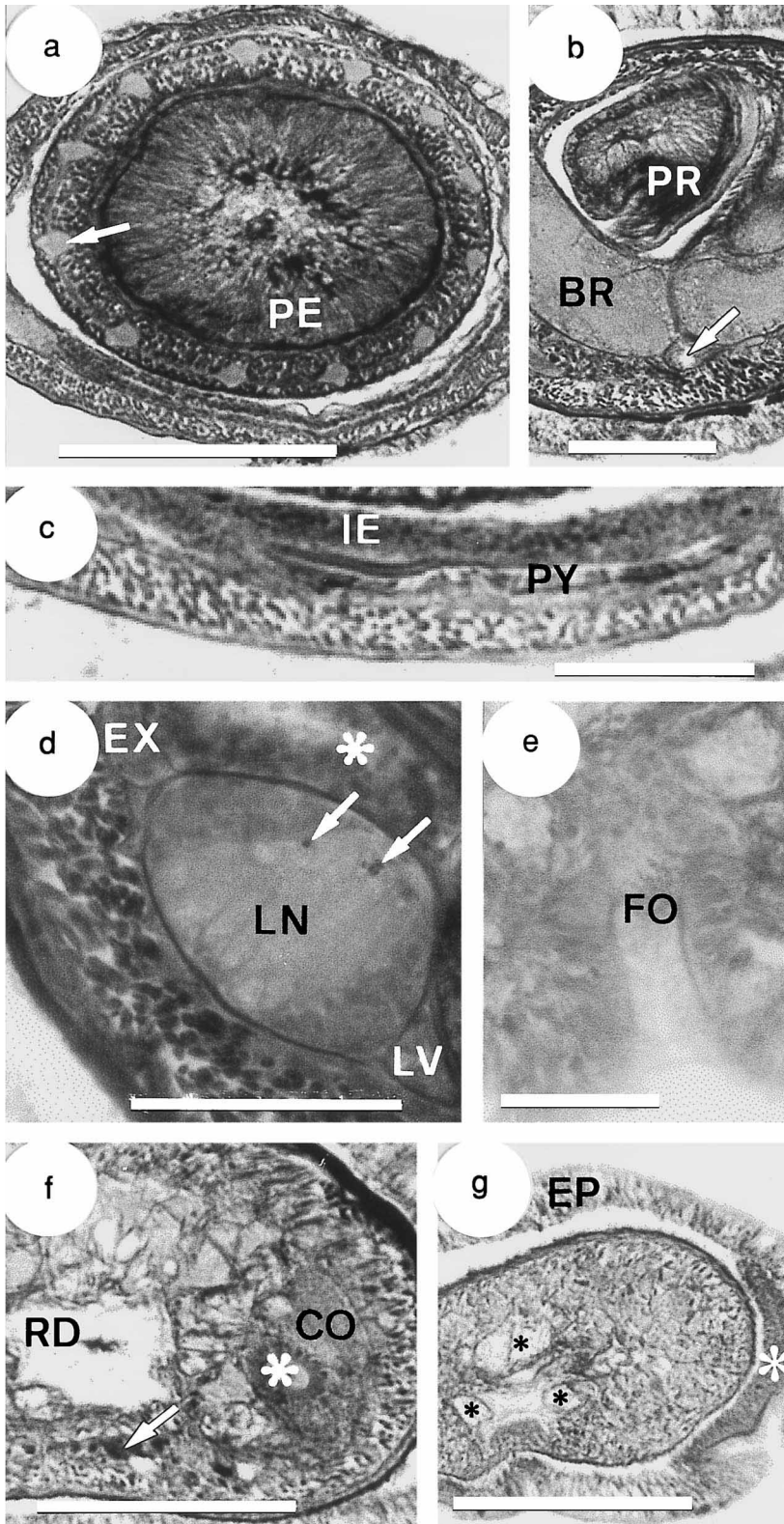
**Fig. 3.** *Thalassionemertes leucocephala* gen. et sp. nov. Transverse section of holotype to show the arrangement of the various body structures in the foregut region. Scale bar=100  $\mu$ m. AP, anterior pouch of intestinal caecum; CM, body wall circular muscle layer; DE, dermis; EP, epidermis; EX, excretory tubule; LM, body wall longitudinal muscle layer; LN, lateral nerve cord; LV, lateral blood vessel; PR, proboscis; RC, rhyncocoel; ST, stomach.

insertion located immediately in front of brain, formed by longitudinal muscle fibres leading inwards from body wall longitudinal muscle layer.

Extreme anterior portion of proboscis, about 80–90  $\mu$ m long, consists of epithelium which contains no gland cells internally bounded by distinct connective tissue lining, a longitudinal muscle layer in which rudimentary proboscis nerves can be distinguished, and inner connective tissue epithelium. Epithelium of this region increases in thickness posteriorly, commensurate with increase in overall diameter of proboscis. Main anterior chamber of proboscis gradually increases in diameter posteriorly to maximum of about 250  $\mu$ m, eventually occupying some 90% of body diameter, i.e., relative to size of specimen, it is massive (Figs 3, 5a). Epithelium, 60  $\mu$ m or more thick, not developed into distinct papillae, as found in many hoplonemertean species, nor is it richly provided with gland cells, only irregularly scattered glands being evident throughout its length. Musculature of this proboscis region comprises outer circular layer, 3–7  $\mu$ m across, and inner longitudinal layer 25–30  $\mu$ m thick (Fig. 4). Each of tissue layers separated from those adjacent by thin but distinct connective tissue coat, radial strands from inner connective tissue layer and that separating the two proboscis muscle layers extending between longitudinal muscle fibres. The 12 large proboscis nerves (Figs 3, 4, 5a), linked by distinct circumferential neural layer, situated in proximal half of proboscis longitudinal muscle layer.



**Fig. 4.** *Thalassionemertes leucocephala* gen. et sp. nov. Transverse section to show the structure of the anterior portion of the proboscis of the holotype. Scale bar=100  $\mu$ m. PC, proboscis circular muscle layer; PE, proboscis epithelium; PI, proboscis inner lining layer; PL, proboscis longitudinal muscle layer; PN, proboscis nerve; PS, proboscis neural sheath.



**Fig. 5.** *Thallassionemertes leucocephala* gen. et sp. nov. (a) Transverse section through the anterior portion of the proboscis, showing the 12 distinct nerves; one of the nerves is indicated by the arrow. (b) Oblique section through the mid-brain region, showing the oesophagus (arrowed) below the ventral cerebral commissure. (c) Transverse section to show the extreme posterior pyloric portion of the foregut lying ventrally below the intestinal epithelium. (d) Transverse section through a lateral nerve cord, anterior pouch of the intestinal caecum (indicated by the asterisk) and part of the excretory system; the arrows indicate myofibrillae running at the margin of the neuropil. (e) Transverse section through the tip of the head to show the frontal organ. (f) Transverse section through the ventral part of the head to show the irregularly-shaped, acidophilic submuscular glands (arrowed) and part of a cerebral sensory organ with the dorsal and ventral regions flanking a ciliated canal (asterisk). (g) Transverse section close to the tip of the head to show one of the cephalic furrows; note the difference in the appearance of the furrow epithelium (white asterisk) compared with the epidermis. Black asterisks indicate the three groups of frontal glands. Scale bars: a=150  $\mu$ m; b, f, g=100  $\mu$ m; c, d=50  $\mu$ m; e=25  $\mu$ m. BR, brain lobe; CO, cerebral sensory organ; EP, epidermis; EX, excretory tubule; FO, frontal organ; IE, intestinal epithelium; LV, lateral blood vessel; PE, proboscis epithelium; PR, proboscis; PY, pyloric portion of foregut; RD, rhynchodaeum. All photomicrographs of sections of holotype stained with the Mallory trichrome method.

Stylet bulb region exhibits typical monostiliferous appearance, with no unusual features. Two accessory stylet pouches each contain two incompletely developed reserve stylets, the central stylet basis is 30  $\mu$ m maximum diameter and about 50–60  $\mu$ m long. Main stylet not evident in sections.

Posterior chamber of proboscis comprises low epithelium dominated by basophilic gland cells, outer circular muscle layer, thin longitudinal muscle coat and inner lining. Posterior proboscis region much smaller than anterior, with maximum overall diameter of about 65–70  $\mu$ m.

*Alimentary canal:* Oesophagus opens from ventral margin of rhynchodaeum just in front of proboscis insertion. Its epithelium not ciliated but contains scattered acidophilic gland cells and is enclosed by thin but distinct connective tissue basement layer. As it passes below ventral cerebral commissure it forms slender tubular canal about 15  $\mu\text{m}$  diameter (Fig. 5b).

Immediately behind ventral commissure oesophagus enlarges and its epithelium begins to develop cilia as it merges with anterior part of stomach. Extreme anterior portion of stomach short, about 35–40  $\mu\text{m}$  long, and comprises unfolded epithelium 20  $\mu\text{m}$  or more thick which has no acidophilic glands, but for most of length stomach typically hoplonemertean with deeply folded epithelium (Fig. 3) which contains both acidophilic and basophilic gland cells. Stomach epithelium, 8–30  $\mu\text{m}$  thick depending upon degree of folding, enclosed by distinct connective tissue basement layer but has no somatic muscles. Overall length of stomach, excluding pyloric region, about 230–250  $\mu\text{m}$ . Towards rear of stomach its wall becomes progressively less folded, thinner and dorsoventrally compressed as it leads into short pyloric region of foregut, which is only about 70  $\mu\text{m}$  long. Pyloric epithelium completely lacks gland cells. Unusual feature of pyloric/intestinal junction is that pylorus leads directly into anterior intestine but with intestinal caecum that extends anteriorly above pylorus (Fig. 5c), not below as typical of most hoplonemerteans.

Intestinal caecum at first forms wide, dorsoventrally compressed tube, extending anteriorly for about only about 30  $\mu\text{m}$  before branching to form pair of long, lateral anterior pouches (Fig. 3) which reach forwards to end immediately behind or above brain. One of anterior pouches throughout its length runs immediately above a lateral nerve cord and ends at rear of brain, other for most of its length extends below nerve cord but passes around its inner margin close behind brain and ends dorsolaterally above dorsal brain lobe. Shorter of the two anterior pouches some 220  $\mu\text{m}$  long, longer about 280  $\mu\text{m}$ . Neither intestinal caecum nor anterior pouches possess lateral diverticula.

Intestine forms thin-walled, dorsoventrally compressed canal extending to posterior end of body below rhynchocoel. It does not possess lateral diverticula but, in its approximately posterior half, does have shallow and irregularly distributed lateral pouches extending between gonads.

*Blood system:* Just behind proboscis pore simple supra-rhynchodaeal vascular loop crosses head. Thick-walled, paired, cephalic vessels run posteriorly, one close on either side of rhynchodaeum. As they pass cerebral sensory organs vessels run in an inner median 'groove' along organs, effectively flanked above and below by neural and glandular components of cerebral organs. Behind proboscis insertion cephalic vessels enter cerebral ring, becoming small and inconspicuous as they do so. Within brain region course of vessels could not be traced, but by beginning of stomach region three longitudinal blood vessels evident, one running below each lateral nerve cord (Fig. 3) and one medially between gut and rhynchocoel. In many parts of foregut region

mid-dorsal vessel so compressed that it is almost or even completely indistinguishable. Origin of mid-dorsal blood vessel, and whether or not it forms vascular plug, could not be determined.

Throughout post-cerebral regions of body the three longitudinal blood vessels do not communicate with each other until they meet at posterior sub-intestinal connective. Blood system of present species thus represents simple monostiliferous hoplonemertean pattern.

*Nervous system:* Brain lobes large relative to size of body (Fig. 5b), ventral lobes being somewhat larger than dorsal. Thin but distinct connective tissue outer neurilemma invests brain lobes as a whole, but there is no inner neurilemma separating fibrous and ganglionic neural components. Dorsal cerebral commissure, 10–12  $\mu\text{m}$  thick, situated anterior to thicker (30–35  $\mu\text{m}$ ) ventral commissure. No evidence of neurochord cells in any part of brain. Lateral nerve cords throughout their length contain only single fibrous neuropil (Figs 3, 5d), i.e., there is no accessory lateral nerve. Myofibrillae extend through inner lateral margins of neuropil (Fig. 5d).

Peripheral nerve supply well developed. Thick nerve trunk leads from outer surface of each dorsal lobe, just behind ventral commissure, and curves anteroventrally and outwards to lead to cerebral sensory organ. Several thick nerves also lead forwards from front of brain lobes into head, but ultimate fate of most of these nerves not traced; one of nerves from front of each dorsal lobe enters proboscis insertion to form origin of proboscis neural supply.

*Frontal organ, frontal glands and submuscular glands:* Single frontal organ, appearing as ciliated pit about 35  $\mu\text{m}$  in diameter, opens near tip of head (Fig. 5e). It leads into short, thick-walled and ciliated chamber from which three groups of lightly basophilic frontal glands extend back (Fig. 5g), one median dorsal cap reaching for about 80–90  $\mu\text{m}$  and two ventrolateral bundles reaching somewhat further back on either side of rhynchodaeum. Cells of frontal organ chamber have distinctly vacuolate appearance.

Small, irregularly-shaped acidophilic submuscular glands occur only on ventral side of head (Fig. 5f), their distribution extending from anterior margin of cerebral sensory organs back to level of proboscis insertion.

Typical, lobular, neutrophilic cephalic glands, as found in many hoplonemerteans, completely missing from present species.

*Sense organs:* Cerebral sensory organs enormous, almost as large as brain lobes. They fill much of precerebral region, opening from short oblique ventrolateral ciliated furrows (Fig. 5g) which, on each side of head, run from just behind level of proboscis pore obliquely backwards to lateral body margins, about 70  $\mu\text{m}$  behind tip of head. Ciliated cerebral canals, 20–25  $\mu\text{m}$  in diameter, thick-walled; they lead obliquely inwards and backwards to meet anterior glandular regions of cerebral organs. These consist of large, lobular dorsal and ventral accumulations of vacuolar cells containing dark brown granules and orange-staining globules, the two glandular regions being medially separated by neural tissues of cerebral organs



(Fig. 5f). Ciliated canal then turns posteriorly and continues back through middle of cerebral organs, its outer margin becoming enclosed by neuroganglionic tissues. Ciliated canals end in small, thin-walled chamber at about level of proboscis insertion. Cerebral organs themselves about 90 µm in diameter, 140–150 µm long, extending from short distance behind proboscis pore back to below ventrolateral borders of brain lobes.

In histological sections indistinct eyes, 10–12 µm in diameter, each has appearance of a spherical accumulation of fine brown particles surrounding small central lumen, but they lack typical pigment cup ocellus construction of most other hoplonemerteans. There are about 8 eyes each side of head, irregularly scattered from close to anterior tip back to above anterior regions of cerebral organs.

**Excretory system:** Excretory system extends for most of foregut length, anteriorly terminating alongside outer margins of brain lobes. Mostly consists of single tubule, about 10 µm in diameter, extending along dorsolateral body margin, close above lateral nerve cords and outside anterior pouches of intestinal caecum (Fig. 3). As it approaches rear of brain lobes tubule becomes thicker walled and somewhat convoluted, a slender efferent canal leading from this region to open at lateral body surface via small nephridiopore.

**Reproductive system:** Single specimen sectioned an immature female. Ovaries scattered between intestinal pouches in intestinal body regions. Whether sexes separate or not remains unknown.

**Systematic discussion:** The Hoplonemertea is a monophyletic group according to the phylogenetic analysis based on 18S rDNA gene sequences in Sundberg *et al.* (in press). Their analysis included only monostiliferous hoplonemerteans, of which there are at present 97 recognised genera (Gibson, 1995; Sundberg and Gibson, 1995; Rogers *et al.*, 1996; Chernyshev, 1998; Crandall and Gibson, 1998; Kajihara *et al.*, in press) in eight families. These families, however, are poorly defined and their definitions in general are not based on explicit phylogenetic analyses. We are therefore reluctant to place this new species in any taxon more inclusive than the genus. We erect a new genus for this species because of the unusual arrangement of the alimentary canal where although the pylorus leads directly into the anterior intestine, there is an intestinal caecum with long anterior pouches extending forwards above the pylorus, between it and the rhynchocoel wall (see *Alimentary canal* above). No comparable arrangement has been reported for any previous monostiliferous hoplonemertean and we regard this as a synapomorphy which allows *Thalassionemertes* to be identified as a monophyletic genus for which only the species *Thalassionemertes leucocephala* sp. nov. is so far known.

Genus ***Correanemertes*** Kirsteuer, 1967

**Diagnosis:** Kirsteuer (1974: 159) gave the following emended diagnosis for the genus *Correanemertes*: “Body shape resembling that of *Amphiporus* species; body wall musculature without diagonal fiber layer, longitudinal muscle layer divided in

anterior region of body, outer portion reaches together with circular muscle layer into tip of head; precerebral septum lacking, proboscis insertion formed by fibers from inner portion of longitudinal musculature; head retractors related to outer and inner portion of longitudinal musculature; cerebral organs anterior to brain; lateral nerve cords with one fibrous core; musculature of proboscis sheath in separate layers, rhynchocoel without diverticula, and extending into posterior half of body; foregut opens into rhynchodaeum; intestinal caecum present; blood-vascular system without cephalic lacunae and extracerebral vessels; excretory system present; (sexes probably separate).”

**Type species:** *Correanemertes bioculatus* (Corrêa, 1958)

***Correanemertes polyophthalma*** sp. nov.

**Type specimens:** Holotype, sex undetermined, series of transverse sections through the anterior body region, 13 slides, MTQ G20024; paratype, immature, transverse sections through anterior body and anterior intestinal region, 5 slides, MTQ G20025.

**DNA-sequence:** Sequence for the 18S rDNA gene from another specimen of this species collected from the type locality at the same occasion as the holotype is deposited with Genbank (accession number AY 062924). A small part of the specimen was placed in 70% ethanol for later DNA extraction using the Dneasy kit (QIAgen, Inc.). An approximately 1900 bp region of the 5' end of the 18S rDNA gene was amplified by the Polymerase Chain Reaction (PCR) based on eukaryotic specific primers (Medlin *et al.*, 1988) using a PTC-100™, MJ Research Inc. Amplifications were performed in 50 µl volume of a solution containing 5–100 ng template DNA, MgCl<sub>2</sub> 2.0 µM, each primer (PCRA and PCRB) at 2.0 µM, each dNTP at 200 µM, 1 x reaction buffer (10 mM Tris-HCl pH 8.3, 50 mM KCl) and 2 units of Taq polymerase (Perkin Elmer). The PCR cycling parameters for double stranded amplification were 2 min. 30 sec. at 95°C for initial denaturation, followed by 60 cycles of 30 sec. at 95°C, 30 sec. at 45–58°C, and 2 min. at 72°C. The cycling was ended with 7 min. sequence extension at 72°C. Amplified products were purified by QIAquick PCR Purification Kit (QIAgen Inc.).

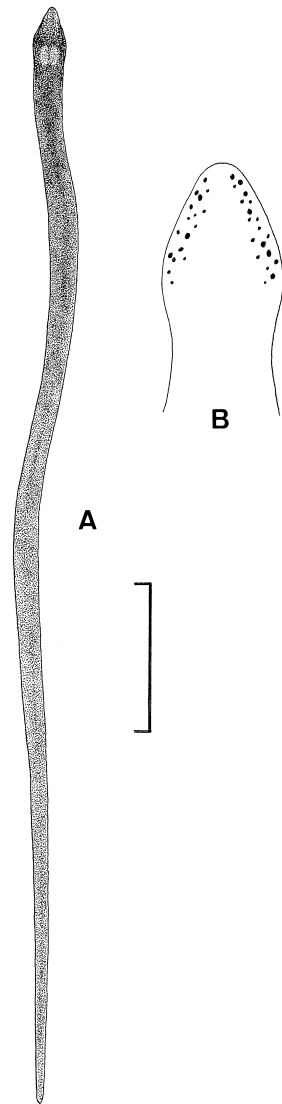
Sequencing was performed using Cy5-labelled primers on an ALF-Express Automatic Sequencer (Pharmacia). ThermoSequenase sequencing kit (Amersham) was used for the sequencing reactions applying a two-step cycle 2 min. denaturation at 96°C, followed by 20 cycles of 30 sec. at 95°C and 40 sec. at the annealing/extension temperature. Both strands were sequenced twice for the specimen.

**Type locality:** Among algae, Turtle Beach (19°16.2'S, 147°3.4'E), Cape Ferguson, Queensland, Australia, on rock exposed at low tide.

**Etymology:** The specific epithet is a composite of the Greek words *poly* (=many) and *ophthalmos* (=the eye) and refers to the numerous eyes which occur in this species.

**Additional material:** One specimen among algae collected from the flat of Rib Reef (18°28.8'S, 146°52.4'E) north-east of the Palm Islands, depth about 2 m.

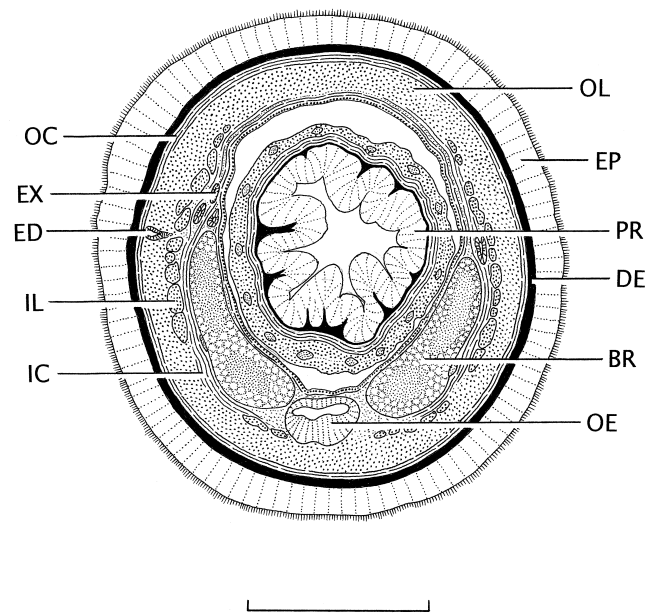
**External features:** Up to 80 mm long, 1–2 mm in maximum



**Fig. 6.** *Correanemertes polyophthalma* sp. nov. (A) Drawing of complete specimen in dorsal aspect based on a colour photograph of the living animal. (B) Enlargement of head to show the distribution of the eyes. Scale bar=10 mm (refers to A only).

width, body long and slender with a pointed posterior tip (Fig. 6A), with a well demarcated, flattened and rather pointed head (Fig. 6B). The overall colour is a uniform chocolate brown. Just at the rear of the head a slight reddish tinge indicates the position of the brain lobes. On either side of the head there are about 15–20 variably sized eyes arranged in a single wide and scattered row.

**Body wall, musculature and parenchyma:** Close behind brain epidermis 45  $\mu\text{m}$  or more thick, internally bordered by distinct connective tissue dermis up to 8–10  $\mu\text{m}$  across. Body wall musculature consisting of outer circular layer, mostly 6–7  $\mu\text{m}$  thick, and inner longitudinal layer 30–35  $\mu\text{m}$  deep. No diagonal muscle layer evident. Just behind brain the longitudinal layer divides into inner and outer portions which are separated by connective tissue (Figs 7, 8a). The inner fibres alone contribute to the proboscis insertion, i.e., there is thus no pre-



**Fig. 7.** *Correanemertes polyophthalma* sp. nov. Transverse section through the posterior cerebral region of holotype to show the divided body wall longitudinal musculature and arrangement of various body structures. Scale bar=250  $\mu\text{m}$ . BR, brain lobe; DE, dermis; ED, efferent canal of excretory system; EP, epidermis; EX, excretory tubule; IC, body wall inner circular muscle layer; IL, body wall inner longitudinal muscle layer; OC, body wall outer circular muscle layer; OE, oesophagus; OL, body wall outer longitudinal muscle layer; PR, proboscis.

cerebral septum as defined by Kirsteuer (1974). Both inner and outer portions of the longitudinal muscle layer continue in front of the brain to form cephalic retractor muscle bundles. In posterior foregut region of body longitudinal muscle layer up to 60  $\mu\text{m}$  or more thick, outer circular 10–12  $\mu\text{m}$ .

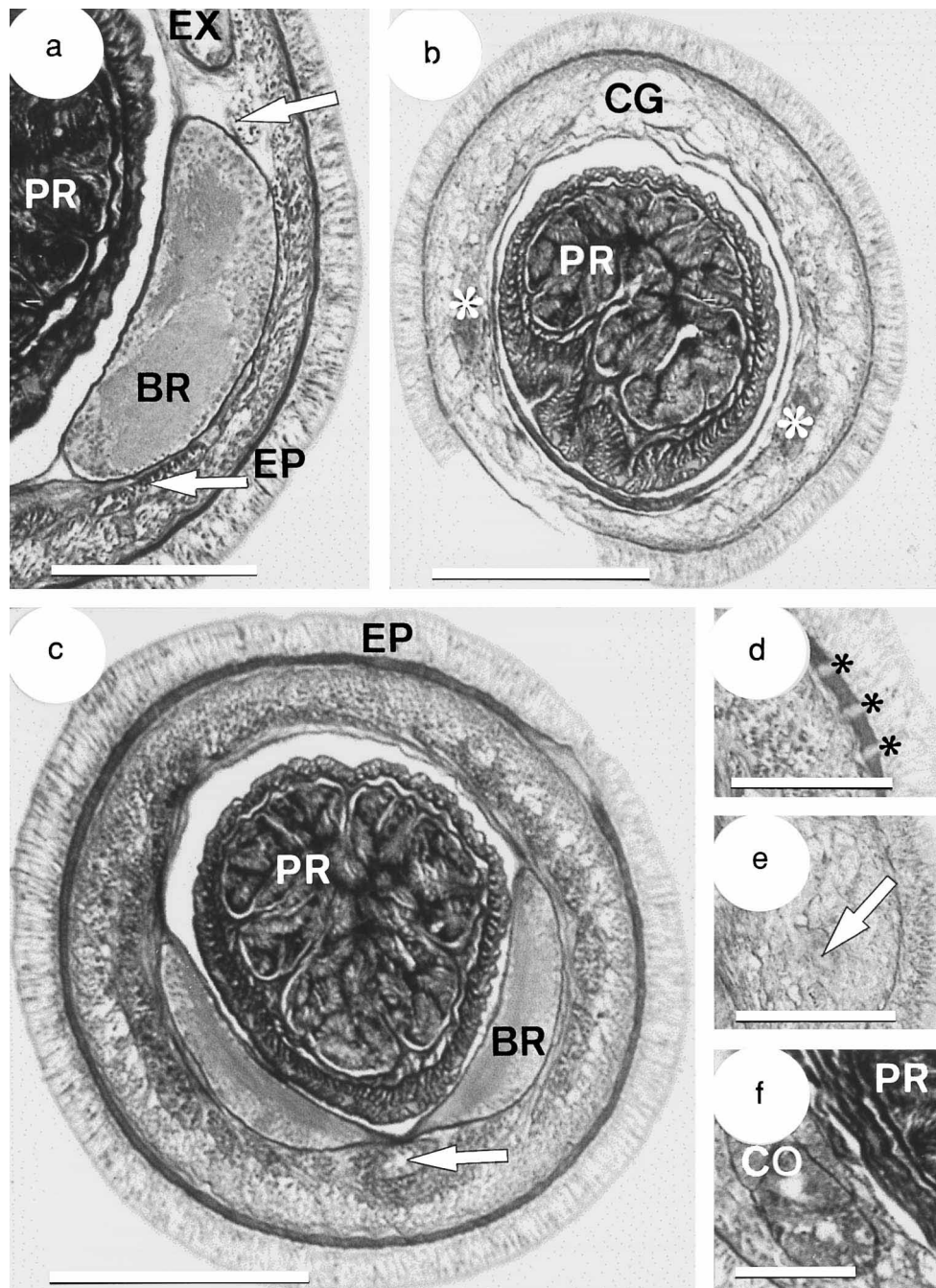
In stomach region an incomplete layer of inner circular muscle fibres extends from close to the mid-dorsal line, around the rhynchocoel and lateral and ventrolateral foregut borders almost to the mid-ventral line. These inner circular muscles are separated from the rhynchocoel wall musculature by a thin but distinct connective tissue membrane. Effectively these inner circular muscles appear the equivalent of dorsoventral muscles.

Cephalic retractor muscles derived from outer portion of divided body wall longitudinal musculature, in front of brain separating off to extend forwards as discrete fibre bundles enclosed by connective tissue membranes, i.e., fasciculated.

Parenchymatous connective tissues fairly well developed around the various body structures.

**Proboscis apparatus:** Proboscis pore ventral, subterminal. Rhynchodaeal wall thin, without its own musculature but flanked dorsally and laterally by longitudinal muscle bundles which appear to represent cephalic retractors derived from the inner portion of the divided longitudinal muscles. Inner and outer retractors are separated by parenchymatous connective tissue behind the cephalic glands.

Rhynchocoel wall with separate circular and longitudinal muscle layers. Extends almost to rear of body. Large numbers of gregariniform parasites fairly abundant in the rhy-



**Fig. 8.** *Correanemertes polyophthalma* sp. nov. (a) Transverse section through part of the body wall in the posterior brain region to show bundles of the inner longitudinal muscle layer (indicated by arrows), an excretory tubule and the distinct outer neurilemma enclosing the brain lobes. (b) Transverse section through the head, showing the size of the proboscis and mid-dorsal bundle of cephalic glands; asterisks indicate the cerebral sensory organs. (c) Transverse section through the cerebral region just in front of the ventral cerebral commissure to show the inner and outer portions of the divided body wall longitudinal muscle layer and the oesophagus (arrowed). (d) Part of the dorsolateral cephalic region in transverse section to show three of the independent ducts (asterisked) through which the cephalic glands discharge to the body surface. (e) Transverse section through the anterior head to show one of the pigment-cup ocelli (arrowed). (f) Transverse section through a cerebral sensory organ. Scale bars: a, d, e=100  $\mu$ m; b, c=250  $\mu$ m; f=50  $\mu$ m. BR, brain lobe; CG, cephalic glands; CO, cerebral sensory organ; EP, epidermis; EX, excretory tubule; PR, proboscis. All photomicrographs of sections of holotype stained with the Mallory trichrome method.

nchocoel of one additional specimen from type locality, these parasites being up to about 25  $\mu$ m long and 7–8  $\mu$ m wide, with a single nucleus about mid-body level.

Main, anterior, chamber of proboscis comprises richly glandular epithelium developed into papillae, glands predomi-

nantly basophilic, epithelium up to 25–30  $\mu$ m thick, then thick outer connective tissue zone which extends peripherally to form core of epithelial papillae, outer circular muscle layer about 15  $\mu$ m maximum thickness, middle connective tissue layer which is moderately thick and distinct, inner longitudinal

musculature 35–40  $\mu\text{m}$  across, inner thin connective tissue layer and flattened inner lining. In retracted position overall proboscis diameter about 50–66% of body diameter (Figs 7, 8b). The 13–14 proboscis nerves are large and obvious, peripherally linked by a circumferential nerve ring some 4–5  $\mu\text{m}$  thick. Three of four specimens examined histologically had 14 proboscis nerves, one 13.

*Alimentary canal:* Oesophagus neither ciliated nor glandular. Pre-cerebrally forms dorsoventrally compressed tube, about 100  $\mu\text{m}$  wide but only 15  $\mu\text{m}$  or less in the vertical axis. As it approaches the front of the brain the oesophagus forms a more rounded channel about 60  $\mu\text{m}$  in diameter, flanked by longitudinal muscle bundles derived from the inner portion of the body wall longitudinal layer (Fig. 8c). Close behind the brain the oesophagus begins to expand, its epithelium remaining unciliated but containing finely granular basophilic glands and ventrally being up to about 35–40  $\mu\text{m}$  in maximum height. Junction between oesophagus and stomach marked by appearance of dense epithelial cilia, anterior portion of stomach with wall up to 60  $\mu\text{m}$  or more thick, without lightly basophilic gland cells which characterise the major portion of the stomach, but packed with strongly basophilic, finely granular, glands similar to those found in the posterior region of the oesophagus.

Main stomach large, with moderately folded walls, epithelium dominated by basophilic gland cells, either staining pale and with homogeneous contents, or darkly staining and packed with finely granular contents, and up to about 75  $\mu\text{m}$  in maximum thickness. The muscle fibres of the body wall inner circular muscle layer ventrolaterally extend to incompletely surround the stomach, mainly on its lateral and ventrolateral margins. Towards its rear the finely granular glands disappear from the stomach epithelium, at the same time as it begins to gradually narrow as it merges into the pyloric portion of the foregut. Posteriorly the pylorus gradually loses its gland cells, its epithelium becomes thinner and it forms a dorsoventrally compressed channel which narrows as it extends back.

An intestinal caecum, about 0.5 mm long, extends anteriorly below the pyloric portion of the foregut. The caecum possesses neither lateral diverticula nor anterior pouches.

Intestine normal hoplonemertean type, unbranched lateral diverticula present, extending between gonads in sexually mature specimens.

*Blood system:* Three longitudinal blood vessels in post-cerebral region of body (paired lateral and single mid-dorsal). No vascular plug seen, nor could origin of mid-dorsal vessel be traced. Head with simple vascular loop. In intestinal region all blood vessels very small, lateral vessels extending above nerve cords, with no evidence of pseudometameric transverse connectives.

*Nervous system:* Brain lobes quite small relative to the size of the body (Figs 7, 8c), dorsal lobes smaller than ventral and set more widely apart (proboscis retraction), with distinct outer neurilemma but no inner neurilemma. Ventral cerebral commissure only about 20  $\mu\text{m}$  thick, appears to be stretched and

elongate, probably as a consequence of the large proboscis being in the retracted position. Dorsal cerebral commissure very long and slender, stretched around dorsal half of rhynchocoel and only about 5  $\mu\text{m}$  thick. Lateral nerve cords with only a single neuropil – i.e., no accessory nerve. No neurochord cells in brain.

*Frontal organ, frontal glands and cephalic glands:* No frontal organ or glands seen.

Cephalic glands present in head, in front of proboscis pore filling most of cephalic region, farther back forming median dorsal mass (Fig. 8b), with a typical appearance. Open to exterior via independent ducts extending across dorsal half of head (Fig. 8d). Above the proboscis pore the glands form a median dorsal mass, but scattered smaller lobules also occur more laterally between the head muscles and nerves. Cephalic glands do not extend back much beyond the rear of the proboscis pore, ending some distance in front of the brain.

*Sense organs:* Eyes 15–30  $\mu\text{m}$  diameter, pigment cup ocelli (Fig. 8e) with finely granular brown pigment.

Ciliated cerebral canals open ventrolaterally towards tip of head directly from small pores, with no trace of cephalic furrows. Ciliated canal at first runs posteriorly just below the dermis, forming a bilaterally compressed canal about 15  $\mu\text{m}$  wide and 45  $\mu\text{m}$  dorsolaterally. Each canal angles slightly upwards as it extends back for about 100  $\mu\text{m}$ , where it then meets an anterior dorsal glandular cerebral organ lobe. Slightly farther back a similar sized ventral lobe appears, the ciliated canal extending directly posteriorly along the inner margins of the cerebral organs (Fig. 8f). At this point the cerebral organs are about 100–110  $\mu\text{m}$  in dorsoventral height but only about 30–35  $\mu\text{m}$  wide. The organs are positioned close to the tip of the head but extend back, about 150  $\mu\text{m}$ , just beyond the rear of the proboscis pore. The ciliated canals end in a basophilic posterior glandular mass beginning about half way along the length of the cerebral organs.

*Excretory system:* Well developed, located in foregut region close behind brain. Collecting tubules thick-walled, one to three, occasionally more, per side close above lateral nerve cords and blood vessels, 15–25  $\mu\text{m}$  in diameter (Fig. 8b). Single efferent canal, 7–8  $\mu\text{m}$  diameter, leads to lateral nephridiopore on each side of body in region of junction between oesophagus and stomach. Excretory system extends from posterior cerebral region well back into the pyloric portion of the body.

*Reproductive system:* Sexes separate. Ovaries in females arranged throughout intestinal region between intestinal diverticula, several eggs in each gonad (up to 15 or more), most in similar state of development but a few very small, immature ova are also distinguishable in many of the ovaries.

*Systematic discussion:* An anteriorly divided body wall longitudinal muscle layer is a feature of comparatively few of the existing monostiliferous hoplonemertean genera and most can be distinguished by the character states of seven anatomical features (Table 2). Among these only one taxon, the monotypic genus *Correanemertes*, is characterised by the following combination of character states: inner and outer layers of

**Table 2.** Summary of some of the morphological characters which can be used to distinguish between monostiliferous hoplonemertean taxa with an anteriorly divided body wall longitudinal muscle layer. Data taken from McIntosh, 1873–74; Oudemans, 1885; Joubin, 1890; Bürger, 1895; Coe, 1901, 1905; Bergendal, 1903; Friedrich, 1940; Kirsteuer, 1965, 1967, 1974; Sánchez and Cancino, 1980, Moore and Gibson, 1981, 1988a, b; Gibson, 1982, 1990a, b; Gibson *et al.*, 1982, 1990; Stricker, 1982; Roe and Wickham, 1984; Gibson and Moore, 1985; Riser, 1988; Gibson and Crandall, 1989; Kajihara *et al.*, in press.

Taxon	1	2	3	4	5	6	7
<i>Alaxinus</i>	C	O	O	O	I	+	O
" <i>Amphiporus hastatus</i> group" <sup>a</sup>							
<i>A. bioculatus sensu</i> McIntosh, 1873–74 <sup>b</sup>	?	O	O	?	?	+	?
<i>A. hastatus</i> McIntosh, 1873–74 <sup>b</sup>	?	E+	O	?	?	+	?
<i>A. korschelti</i> Friedrich, 1940 <sup>c</sup>	?	E	+	O	?	+	O?
<i>A. nebulosus</i> Coe, 1901 <sup>c</sup>	G	E	O	?	?	+	O?
<i>Correanemertes</i>	C	O	O	O	O+I	+	O?
<i>Cryptonemertes</i> <sup>d</sup>	G	E+	O	O	O	O	O
<i>Dananemertes</i>	G	O	+	C	?	+	?
<i>Diopsonemertes</i>	C	O	+	O	I	+	O
<i>Eonemertes</i>	G	O	O	O	O	O	O
<i>Fasciculonemertes</i>	C	O	+	O	I	+	+
<i>Notogaeonemertes</i> <sup>d</sup>	G	E	O?	O	?	+	+?
<i>Pantinonemertes</i>	G	O <sup>e</sup>	+	O	O	+	O
<i>Paramphiporus</i> <sup>d</sup>	C	O	O	C	O	+	O?
<i>Paranemertes</i> <sup>f</sup>	?	O <sup>g</sup>	O	? <sup>h</sup>	? <sup>h</sup>	O <sup>i</sup>	O?
<i>Paranemertopsis</i> <sup>d</sup>	G	O	+	C/O <sup>j</sup>	O	O	O
<i>Plectonemertes</i>	C+G	O	O	O	O	+ <sup>k</sup>	O
<i>Poseidonemertes</i>	C	O	+	S	I	+	O <sup>l</sup>
<i>Prosadenoporus</i> <sup>d</sup>	G	O	+	S	I	+	+
<i>Prosorhochmus</i>	G	O	+	S	I	+	O
<i>Tetranemertes</i>	C	O	O	O	O	O	O
<i>Correanemertes polyophthalma</i>	C	O	O	O	O+I	+	O

- 1: Inner and outer layers of body wall longitudinal musculature separated by connective tissue (C) or glandular tissues (posterior extensions of cephalic glands or accumulations of subepithelial glands) (G)
- 2: Cephalic blood system a simple vascular loop (O), with extra-cerebral vessels (E) or forming a lacunar complex (+)
- 3: Body wall musculature with (+) or without (O) diagonal layer between circular and longitudinal coats
- 4: Pre-cerebral septum closed (C), split (S) or absent (O) (see Kirsteuer, 1974, for explanation of terminology)
- 5: Cephalic retractor muscles derived from inner (I) or outer (O) portions of body wall longitudinal muscles
- 6: Rhynchocoel more than half the body length (+) or confined to anterior regions, mostly less than one-third body length (O)
- 7: Neurochord cells present (+) or absent (O) in brain

<sup>a</sup> The "*Amphiporus hastatus* group" is a paraphyletic assemblage of taxa originally separated from *Amphiporus sensu stricto* by Friedrich (1955); the group is at present retained within the genus only because none of them is sufficiently well described to be assigned to other genera (Kirsteuer, 1974; Gibson and Crandall, 1989; Gibson, 1995)

<sup>b</sup> Identified as *nomina dubia* by Gibson and Crandall (1989) but included as currently valid by Gibson (1995)

<sup>c</sup> Regarded as *species inquirendae* by Gibson and Crandall (1989) but retained as valid by Gibson (1995)

<sup>d</sup> The body wall longitudinal muscle layer in these genera is incompletely divided, though in different ways in the different genera (Kirsteuer, 1965; Gibson, 1986, 1990b; Moore and Gibson, 1988b; Riser, 1988)

<sup>e</sup> Except in *P. californiensis* Gibson, Moore and Crandall, 1982, where the cephalic blood supply is developed into a capillary network of small vessels

<sup>f</sup> In *P. incola* Iwata, 1952, and *P. plana* Iwata, 1957, the longitudinal musculature is not anteriorly divided and neither species probably belongs in the genus *Paranemertes*

<sup>g</sup> Except in *P. biocellatus* Coe, 1944, where the cephalic blood supply includes extra-cerebral vessels (Kirsteuer, 1974)

<sup>h</sup> Except in *P. biocellatus*, *P. sanjuanensis* Stricker, 1982, and *P. brattstroemi* Friedrich, 1970; in the first two species there is no pre-cerebral septum and cephalic retractor muscles are formed from the inner portion of the longitudinal musculature, in the third species no pre-cerebral septum has been noted but the cephalic retractors are derived from the outer portion of the longitudinal musculature (Kirsteuer, 1974; Stricker, 1982).

<sup>i</sup> Except in *P. biocellatus*, *P. incola* and some records of *P. peregrina* Coe, 1901, where the rhynchocoel is reported as reaching well beyond the middle region of the body (Coe, 1944; Iwata, 1952; Kirsteuer, 1974)

<sup>j</sup> The pre-cerebral septum in this genus is described as intermediate between the closed type and no septum (Gibson, 1990a)

<sup>k</sup> In this genus the rhynchocoel extends a short way beyond the middle of the body (Gibson, 1990b)

<sup>l</sup> Most accounts of *Poseidonemertes* species include no reference to neurochord cells but there are none in *P. collaris* Roe and Wickham, 1984

body wall longitudinal musculature separated by connective tissues; cephalic blood supply consisting of a simple vascular loop; body wall musculature without diagonal layer; no pre-cerebral septum; cephalic retractor muscles derived from both

inner and outer portions of divided body wall longitudinal muscle layer; rhynchocoel more than half the body length; nervous system without neurochord cells. The present species from Australia also possesses these characteristics and

is accordingly placed in the genus *Correanemertes*, which up to now has contained only the single species *Correanemertes bioculatus* (Corrêa, 1958).

The genus *Correanemertes* was established by Kirsteuer (1967) for *Amphiporus bioculatus sensu* Corrêa, 1958, a shallow sublittoral form found off the coast of São Paulo, Brazil, which Kirsteuer considered was quite distinct from the northern hemisphere species originally named *Amphiporus bioculatus* by McIntosh (1873–74). Corrêa's (1958) species, however, differs from the Queensland form in possessing only two eyes, in being uniformly coloured reddish-purple, and in its anterior proboscis region possessing a gelatinous layer between the two muscle coats and only 10 nerves. These differences are too great to be considered as intraspecific variation and the Australian specimens are thus identified as a new species, *Correanemertes polyophthalma* sp. nov.

### TAXONOMIC KEY

Key to the marine nemerteans of coastal Queensland and the Great Barrier Reef.

The following key is intended as a field-based key requiring nothing more than a reasonably powerful hand lens. Species which are either inadequately described or whose appearance in life is unknown are marked with an asterisk.

1. With distinct colour pattern consisting of longitudinal stripes and/or transverse bands extending full length of body, or body more or less uniformly coloured but with either distinct pattern on head or head a different colour to remainder of body ..... 2  
Body more or less uniformly coloured or mottled, but without distinct colour pattern ..... 13
2. Colour pattern distinct, confined to head, or head white, rather speckled, remainder of body dark greyish-brown ..... 3  
Colour pattern extending full length of body ..... 5
3. Head bluntly rounded, white but appearing dorsally speckled because of large numbers of irregularly distributed grey and black eyespots; white cephalic region sharply marked off from remainder of body which is a dark greyish-brown, paler posteriorly ..... *Thallassionemertes leucocephala*  
Head with obvious colour pattern ..... 4
4. Overall colour dark green but head with distinct looped and W-shaped dorsal white collar .....  
..... *Notospermus tricuspoidatus*  
Overall colour dark chocolate brown dorsally, paler ventrally, tip of head white marked with distinct chevron-shaped patch of blackish-brown *Aetheorhynchus actites*
5. Colour pattern of longitudinal stripe or stripes, with or without additional markings on head ..... 6  
Colour pattern of transverse bands or rings, with or without longitudinal stripes ..... 12
6. Longitudinal stripes on both dorsal and ventral surfaces ..... 7  
Longitudinal stripe or stripes confined to dorsal surface only ..... 9
7. Longitudinal stripes dark, not more than seven; general body background colour white to cream ..... 8  
Longitudinal stripes brown, numerous, often irregular and sometimes merging; general body background colour pale brownish to reddish-brown, ventral surface and stripes often paler than dorsal ..... *Baseodiscus delineatus*
8. Longitudinal stripes dark brown or black, three or five dorsal and two ventral, sometimes irregularly interrupted ...  
..... *Baseodiscus quinquelineatus*  
Single median dorsal and ventral longitudinal stripes of black, purplish-black, dark brown or maroon; dorsal stripe at back of head expands to form transverse collar which may/may not meet mid-ventrally, head in front of collar with variably shaped and sized pigment patch of same colour dorsally ..... *Baseodiscus hemprichii*
9. With single mid-dorsal pale or dark longitudinal stripe only ..... 10  
Dorsal surface with median longitudinal black stripe flanked on either side by pale yellowish lime-green, a slender black stripe and narrow outer stripe of bright orange; mid-dorsal stripe expands at front to form roughly pentagonal black patch, surrounded on three sides by white, at rear of head, tip of head dorsally with bilobed transverse patch of vivid orange ..... *Quasilineus pulcherrimus*
10. With four distinct eyes on head, anterior pair larger than posterior ..... 11  
Without eyes; colour in life not known but after preservation general colour a dark olive-brown with slender pale mid-dorsal stripe ..... *Cerebratulus queenslandicus*
11. Dorsal body surface slate grey with single dark grey or black mid-dorsal longitudinal stripe *Pantinonemertes mooreae*  
Dorsal body surface dark purplish brown or grey, with single pale mid-dorsal longitudinal stripe; estuarine .....  
..... *Pantinonemertes winsori*
12. General body colour dark green to dark brown, paler ventrally, with pattern of yellow, cream or white transverse bands which may be ventrally complete or broken; pale transverse band on head typically looped forwards to form V-shape; without longitudinal stripes .....  
..... *Notospermus geniculatus*  
General body colour dark purplish-brown to black dorsally, black or bright magenta ventrally, with or without mid-dorsal longitudinal stripe of magenta, with two dorsolateral stripes of pale orange to orange-brown and with transverse bands of grey to white, with tinge of yellow or edged with irregular yellow patches; head with white patch dorsally tinged orange or yellow towards its tip ... *Micrura callima*
13. Eyes distinct ..... 14  
Eyes indistinct or absent ..... 18
14. Four large eyes, dorsal body surface fawn-brown, orange-brown or orange, with crescent-shaped darker pigmented area over anterior pair of eyes .....  
..... *Pantinonemertes enalios*  
Eyes numerous, arranged in two or four longitudinal rows on head ..... 15
15. Less than about 40 eyes, head without mid-dorsal longi-

- tudinal lobe ..... 16  
 At least 100 eyes, head with distinct median dorsal longitudinal lobe ..... 17
16. About 20 eyes arranged in two longitudinal rows on either side of head; general body colour dusky pink with transparent margins, ovaries in sexually mature specimens appear as white spots in intestinal region; head bluntly rounded ..... *Tetranemertes hermaphroditicus*  
 About 15–20 variably sized eyes arranged in single wide, scattered, row on either side of head; general body colour a uniform chocolate brown; head flattened and rather pointed ..... *Correanemertes polyophthalma*
17. Eyes in four longitudinal rows on head, body distinctly flattened dorsoventrally in intestinal region, general body colour a dull pale grey ..... *Urichonemertes pilorhynchus*  
 Eyes in single row along each side of head forming a dark greyish band, head anteriorly produced into obvious 'beak', general body colour a pale yellowish-tan .....  
 ..... *Xenonemertes rhamphocephalus*
18. With a distinct lateral horizontal cephalic furrow on each side of head ..... 19  
 Without lateral cephalic furrows or furrows very shallow and indistinct ..... 26
19. General body colour in shades of brown, red, orange or dull pinkish ..... 21  
 Body an overall white or cream colour ..... 20
20. Head distinctly pointed, body an overall translucent white ..... *Colemaniella albulus*  
 Head bluntly rounded, body an overall cream-white .....  
 ..... *Valencinina albula*
21. Overall body colour distinctly a bright red or orange, sometimes slightly paler on ventral surface ..... 22  
 Overall body colour in shades of brown, grey or pink ..... 23
22. Body a bright brick red, head orange; head distinctly marked off from body by a constricted 'neck', tip of head pointed, body dorsoventrally flattened in intestinal region ..... *Cerebratulus magneticus*  
 Body bright orange; head not marked off from body by constriction, tip of head rounded, body not obviously flattened in intestinal region ..... *Gorgonorhynchus repens*
23. Anterior fifth of body creamish-white, remaining body coloured a dark pinkish-brown, with paler mid-ventral region, fading to cream towards tail .....  
 ..... *Bennettiella insularis*  
 General body colour more or less uniformly in shades of brown or olive brown or darkly mottled overall ..... 24
24. Colour in life not known; preserved colour greyish-white with dark mottlings overall except on tip of head .....  
 ..... \**Cerebratulus haddoni*  
 General body colour uniform, without mottlings ..... 25
25. Overall colour brown; intestinal region distinctly flattened dorsoventrally ..... \**Cerebratulus torresianus*  
 Colour in life not known; preserved colour olive-brown to buff; body bulky throughout, not dorsoventrally flattened in intestinal region ..... \**Parborlasia hutchingsae*
26. General body colour dark brown, head bluntly rounded; tip of head with four small eyes which in life are hidden by the brown pigmentation .... *Poseidonemertes bothwellae*  
 General body colour cream, whitish or yellowish, without eyes ..... 27
27. Body overall a cream-white colour, head narrower than trunk but without constricted 'neck', with wide thick median dorsal lobe ..... *Carinoma patriciae*  
 Anterior quarter of body a translucent white, remainder a rich cream-yellow; head oval, with distinct constricted 'neck' ..... *Hubrechtella queenslandica*

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## REFERENCES

- Bell PJ, Hickman JL (1985) Observations on *Carcinonemertes* (Nemertea: Carcinonemertidae) associated with the smooth pebble crab, *Philyra laevis*. Pap Proc R Soc Tasm 119: 65–68
- Bergendal D (1903) Till kännedomen om de nordiska Nemertinerna. 4. Förteckning öfver vid Sveriges vestkust iakttagna Nemertiner. Ark Zool 1: 85–156
- Bürger O (1895) Die Nemertinen des Golfes von Neapel und der angrenzenden Meeres-Abschnitte. Fauna Flora Golf Neapel 22: 1–743
- Campbell A, Gibson R, Evans LH (1989) A new species of *Carcinonemertes* (Nemertea: Carcinonemertidae) ectohabitant on *Panulirus cygnus* (Crustacea: Palinuridae) from Western Australia. Zool J Linn Soc 95: 257–268
- Chernyshev AV (1998) Novuie monostiliferuie nemertini (Enopla, Monostilifera) iz yaponskogo morya. Zool Zh 77: 397–403
- Coe WR (1901) Papers from the Harriman Alaska Expedition. XX. The nemerteans. Proc Wash Acad Sci 3: 1–110
- Coe WR (1905) Nemerteans of the west and northwest coasts of America. Bull Mus comp Zool Harv 47: 1–318
- Coe WR (1944) A new species of hoplonemertean (*Paranemertes biocellatus*) from the Gulf of Mexico. J Wash Acad Sci 34: 407–409
- Corrêa DD (1958) Nemertinos do litoral Brasileiro (VII). Anais Acad bras Ciênc 29: 441–455
- Crandall FB, Gibson R (1998) A second genus of pelagic Cratene-mertidae (Nemertea, Hoplonemertea). Hydrobiologia 365: 173–198
- Dakin WJ, Fordham MGC (1931) A new and peculiar marine nemertean from the Australian coast. Nature Lond 128: 796
- Friedrich H (1940) Einige neue Hoplonemertinen aus der Ostsee. Kieler Meeresforsch 3: 233–251
- Friedrich H (1955) Beiträge zu einer Synopsis der Gattungen der Nemertini monostilifera nebst Bestimmungsschlüssel. Z wiss Zool 158: 133–192
- Gibson R (1974) A new species of commensal hoplonemertean from Australia. Zool J Linn Soc 55: 247–266
- Gibson R (1978) Two new lineid heteronemerteans from Australia. Zool J Linn Soc 62: 1–37
- Gibson R (1979a) Nemerteans of the Great Barrier Reef. 1. Anopla Palaeonemertea. Zool J Linn Soc 65: 305–337
- Gibson R (1979b) *Hubrechtella malabarensis* sp. nov. (Palaeonemertea: Hubrechtidae), a new nemertean from Australia. Zool Anz 202: 119–131
- Gibson R (1979c) Nemerteans of the Great Barrier Reef. 2. Anopla Heteronemertea (Baseodiscidae). Zool J Linn Soc 66: 137–160
- Gibson R (1981a) Nemerteans of the Great Barrier Reef. 3. Anopla

- Heteronemertea (Lineidae). Zool J Linn Soc 71: 171–235
- Gibson R (1981b) Nemerteans of the Great Barrier Reef. 4. Enopla Heteronemertea (Valenciiniidae). Zool J Linn Soc 72: 165–174
- Gibson R (1982) Nemerteans of the Great Barrier Reef. 5. Enopla Hoplonemertea (Monostilifera). Zool J Linn Soc 75: 269–296
- Gibson R (1983) Nemerteans of the Great Barrier Reef. 6. Enopla Hoplonemertea (Polystilifera: Reptantia). Zool J Linn Soc 78: 73–104
- Gibson R (1986) Redescription and taxonomic reappraisal of *Nemertopsis actinophila* Bürger, 1904 (Nemertea: Hoplonemertea: Monostilifera). Bull mar Sci 39: 42–60
- Gibson R (1990a) The macrobenthic nemertean fauna of the Albany region, Western Australia. In "Proceedings of the Third International Marine Biological Workshop: the Marine Flora and Fauna of Albany, Western Australia Vol. 1" Ed by FE Wells, DI Walker, H Kirkman, R Lethbridge, Western Australian Museum, Perth, pp 89–194
- Gibson R (1990b) The macrobenthic nemertean fauna of Hong Kong. In "Proceedings of the Second International Marine Biological Workshop: the Marine Flora and Fauna of Hong Kong and Southern China Vol. 1" Ed by B Morton, Hong Kong University Press, Hong Kong, pp 33–212
- Gibson R (1995) Nemertean genera and species of the world: an annotated checklist of original names and description citations, synonyms, current taxonomic status, habitats and recorded zoogeographic distribution. J nat Hist 29: 271–561
- Gibson R (1997) Nemerteans (Phylum Nemertea). In "Marine Invertebrates of Southern Australia, Part III" Ed by SA Sheppard, M Davies, South Australian Research and Development Institute (Aquatic Sciences) in association with the Flora and Fauna of South Australia Handbooks Committee, Adelaide, pp 905–974
- Gibson R (1999) Further studies on the nemertean fauna of Rottnest Island, Western Australia. In "Proceedings of the Ninth International Marine Biological Workshop: the Seagrass Flora and Fauna of Rottnest Island, Western Australia" Ed by DI Walker, FE Wells, Western Australian Museum, Perth, pp 359–376
- Gibson R, Crandall FB (1989) The genus *Amphiporus* Ehrenberg (Nemertea, Enopla, Monostiliferoidea). Zool Scr 18: 453–470
- Gibson R, Jones DS (1990) A new species of *Carcinonemertes* (Nemertea: Enopla: Carcinonemertidae) from the egg masses of *Naxia aurita* (Latreille) (Decapoda: Brachyura: Majidae) collected in the Albany region of Western Australia. In "Proceedings of the Third International Marine Biological Workshop: the Marine Flora and Fauna of Albany, Western Australia Vol. 1" Ed by FE Wells, DI Walker, H Kirkman, R Lethbridge, Western Australian Museum, Perth, pp 195–202
- Gibson R, Moore J (1985) The genus *Prosorhochmus* Keferstein, 1862 (Hoplonemertea). J Zool Lond 206A: 145–162
- Gibson R, Moore J, Crandall FB (1982) A new semi-terrestrial nemertean from California. J Zool Lond 196: 463–474
- Gibson R, Wickham DE, Kuris AM (1990) A new genus and species of monostiliferoidean nemertean (Nemertea: Enopla) found on an egg mass of the anomuran decapod *Paralithodes camtschatica*. Zool J Linn Soc 98: 185–198
- Hubrecht AAW (1887) Report on the Nemertea collected by H. M. S. Challenger during the years 1873–76. Rep Sci Res Voyage H.M.S. Challenger 1873–76, Zool 19: 1–150
- Iwata F (1952) Nemertini from the coasts of Kyusyu. J Fac Sci Hokkaido Univ, Ser 6, Zool, 11: 126–148
- Joubin L (1890) Recherches sur les Turbellariés des côtes de France (Némertes). Archs Zool exp gén, Sér 2, 8: 461–602
- Kajihara H, Gibson R, Mawatari SF (in press) A new genus and species of monostiliferous hoplonemertean (Nemertea: Enopla: Monostilifera) from Japan. Hydrobiologia
- Kirsteuer E (1965) Über das Vorkommen von Nemertinen in einem tropischen Korallenriff. 4. Hoplonemertini monostilifera. Zool Jb Abt Syst Ökol Geogr Tiere 92: 289–326
- Kirsteuer E (1967) New marine nemerteans from Nossi Be, Madagascar. Zool Anz 178: 110–122
- Kirsteuer E (1974) Description of *Poseidonemertes caribensis* sp. n., and discussion of other taxa of Hoplonemertini Monostilifera with divided longitudinal musculature in the body wall. Zool Scr 3: 153–166
- McIntosh WC (1873–74) A Monograph of the British Annelids Part I The Nemerteans. Ray Society, London
- Medlin L, Elwood HJ, Stickel S, Sogin ML (1988) The characterization of enzymatically amplified eukaryotic 16S-like rRNA-coding regions. Gene 71: 491–499
- Moore J, Gibson R (1981) The *Geonemertes* problem (Nemertea). J Zool Lond 194: 175–201
- Moore J, Gibson R (1988a) Further studies on the evolution of land and freshwater nemerteans: generic relationships among the paramonostiliferous taxa. J Zool Lond 216: 1–20
- Moore J, Gibson R (1988b) Marine relatives of terrestrial nemerteans: the genus *Prosadenoporus* Bürger, 1890 (Hoplonemertea). Hydrobiologia 156: 75–86
- Norenburg JL (1985) Structure of the nemertine integument with consideration of its ecological and phylogenetic significance. Am Zool 25: 37–51
- Oudemans AC (1885) The circulatory and nephridial apparatus of the Nemertea. Q Jl microsc Sci 25 (Suppl.): 1–80
- Punnett RC (1900) On some nemerteans from Torres Straits. Proc Zool Soc Lond: 825–831
- Quoy JRC, Gaimard JP (1833) Voyage de découvertes de l' Astrolabe exécute par ordre du Roi, pendant les années 1826–1827–1828–1829, sous le commandement de M. J. Dumont d'Urville, Zoologie, Vol 4 J Tastu Paris
- Riser NW (1988) *Notogaeonemertes folzae* gen. n., sp. n., an additional ecologically restricted hoplonemertean from New Zealand. Hydrobiologia 156: 125–133
- Riser NW (1991) New Zealand nemertines from kelp holdfasts: Heteronemertinea *Notospermus geniculatus* (Delle Chiaje, 1828) n. comb. N Z J Zool 18: 427–438
- Roe P, Wickham DE (1984) *Poseidonemertes collaris*, n. sp. (Nemertea Amphiporidae) from California, with notes on its biology. Proc Biol Soc Wash 97: 60–70
- Rogers AD, Gibson R, Tunnicliffe V (1996) A new genus and species of monostiliferous hoplonemertean colonizing an inchoate hydrothermal field on Juan de Fuca Ridge. Deep-Sea Res 43: 1581–1599
- Sánchez M, Cancino J (1980) *Fasciculonemertes arenicola* gen. et sp. n. (Hoplonemertini Monostilifera) de Chile central. Bolm Zool Univ S Paulo 5: 149–168
- Stimpson W (1855) Descriptions of some new marine Invertebrata. Proc Acad nat Sci Philad 7: 385–394
- Stimpson W (1857) Prodromus descriptionis animalium evertebratorum, quae in Expeditione ad Oceanum Pacificum Septentrionalem, a Republica Federata missa, Cadwaladaro Ringgold et Johanne Rodgers Ducibus, observavit et descripsit. Pars II. Turbellarieorum Nemertineorum. Proc Acad nat Sci Philad: 159–165
- Stricker SA (1982) The morphology of *Paranemertes sanjuanensis* sp. n. (Nemertea, Monostilifera) from Washington, USA. Zool Scr 11: 107–115
- Sundberg P (1991) A proposal for renaming the higher taxonomic categories in the phylum Nemertea. J nat Hist 25: 45–48
- Sundberg P, Gibson R (1995) The nemerteans (Nemertea) of Rottnest Island, Western Australia. Zool Scr 24: 101–141
- Sundberg P, Turbeville JM, Lindh S (in press) Phylogenetic relationships among higher nemertean (Nemertea) taxa inferred from 18S rDNA sequences. Mol Phylogeny Evol
- Wheeler JFG (1940) Nemerteans of Kerguelen and the southern ocean. Rep B.A.N.Z antarct Res Exped 1929–31, Ser B 4: 233–256

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