



<http://dx.doi.org/10.11646/zootaxa.4019.1.16>

<http://zoobank.org/urn:lsid:zoobank.org:pub:B8E7FD63-30C0-4B21-B824-36D778D175A0>

## Nephtyidae (Annelida: Phyllodocida) of Lizard Island, Great Barrier Reef, Australia

ANNA MURRAY<sup>1\*</sup>, EUNICE WONG<sup>1</sup> & PAT HUTCHINGS<sup>1</sup>

<sup>1</sup>Australian Museum Research Institute, Australian Museum, 6 College Street, Sydney, NSW, 2010, Australia.

\*Corresponding author: [anna.murray@austmus.gov.au](mailto:anna.murray@austmus.gov.au)

### Abstract

Seven species of the family Nephtyidae are recorded from Lizard Island, none previously reported from the Great Barrier Reef. Two species of *Aglaophamus*, four species of *Micronephthys*, one new and one previously unreported from Australia, and one species of *Nephtys*, were identified from samples collected during the Lizard Island Polychaete Workshop 2013, as well as from ecological studies undertaken during the 1970s and deposited in the Australian Museum marine invertebrate Collections. A dichotomous key to aid identification of these species newly reported from Lizard Island is provided.

**Key words:** Taxonomy, Queensland, polychaetes, dichotomous key

### Introduction

The family Nephtyidae is a group of benthic polychaetes which commonly occurs worldwide at all depths (Wilson 2000; Ravara *et al.* 2010a, b), although more species have been recorded burrowing subsurface in sandy and muddy bottoms from shallow waters than in other habitats. They are mostly considered to be carnivorous predators but a few species may be subsurface deposit feeders (Wilson 2000; Rouse & Pleijel 2001; Jumars *et al.* 2015). Currently, there are five accepted genera found worldwide: *Aglaophamus*, *Inermonephthys*, *Micronephthys*, *Nephtys* and *Bipalponephthys*, with 129 described species (WoRMs 2015). Although there is some ambiguity about the validity of *Bipalponephthys* (Dnestrovskaya & Jirkov 2010; Ravara 2011; Jirkov & Dnestrovskaya 2012; Dnestrovskaya 2013; Read 2015), and acceptance of synonymy of the genus *Dentinephthys* with *Nephtys* by Ravara *et al.* (2010a) (Alalykina & Dnestrovskaya 2015) there appears to have been no resolution to date. The most diverse genera both worldwide and in Australia are *Aglaophamus* and *Nephtys*, with eight and seven species now known in Australia respectively. *Micronephthys* is represented in Australia by three species and *Inermonephthys* by two species (Dixon-Bridges *et al.* 2014) whereas *Bipalponephthys* has not yet been reported from Australia.

The first recorded Australian species of nephtyid was *Nephtys longipes* Stimpson 1856 described from Botany Bay, New South Wales (NSW). Subsequent studies by Augener (1913, 1922), Benham (1915, 1916), Fauchald (1965), Rullier (1965), Knox & Cameron (1971), Paxton (1974), Rainer & Hutchings (1977) and Rainer & Kaly (1988) described additional Australian species. Most recently, Dixon-Bridges *et al.* (2014) described another two species—a species of *Micronephthys* from NSW, and a species of *Nephtys* from sandy beaches of NSW and Queensland—bringing the total number of nephtyid species recorded from Australia to twenty.

However, although some studies have recorded nephtyids from along the tropical Queensland mainland coast (Stephenson *et al.* 1970, 1974; Rainer & Hutchings 1977), no publications have yet recorded nephtyids from Lizard Island, or indeed, anywhere on the Great Barrier Reef. Hartmann-Schröder (1991) reported no nephtyids from Heron Island (located in the southern Great Barrier Reef) in her publication of polychaetes from Queensland.

Some previous ecological studies undertaken at Lizard Island by Australian Museum (AM) staff have led to the deposition of specimens into the AM collections (including nephtyid polychaetes), e.g., Jones & Short's benthic study in 1977–78 (Jones 1984). These specimens, as well as the recent collections made during the Lizard Island Polychaete Workshop in August 2013, were examined to provide the basis for the species reported in this present paper.

## Material and methods

Most specimens were fixed in 5–10 % formalin and preserved in 70–80% ethanol, except for some collected during the Lizard Island Polychaete Workshop 2013 (LIPW 2013), which were fixed and preserved in 95% ethanol. All observations were made using a compound microscope with interference contrast optics (Nomarsky). Specimens of some species were also prepared for examination under a Scanning Electron Microscope (SEM) at the AM. Specimens were dried via critical point, coated in gold, and observed under a Zeiss EVO LS15 SEM with a Robinson Backscatter detector. Some preserved specimens were stained with methyl blue to enhance details and increase resolution for photography with a Leica MZ16 microscope and Spot flex 15.2 camera attachment, and images were generated using a montage program. Parapodia and chaetae of some specimens were dissected off, mounted on microscope slides and also photographed using an Olympus BX50 compound microscope with a Spot Flex CCD camera attached, and images were generated using the stacking montage program Helicon Focus. For each species, measurements were recorded of maximum body length, which excluded the terminal cirrus, and maximum width, which included parapodia but not chaetae. Material examined is cited with the number of specimens in parenthesis, and complete details about collection events occurring during LIPW 2013 (i.e., those with MI QLD numbers) are given in Table 1 of Ribas & Hutchings (2015, *Zootaxa* 4019). Collection information for other previously collected material is given in full under Material examined sections of each species.

Specimens designated as types herein were deposited at the Australian Museum (AM). Type material of *Micronephthys oculifera* Mackie, 2000 was borrowed from National Museum of Wales (NMW) for comparison with Lizard Island specimens.

## Results

Seven species were represented in samples, none previously reported from Lizard Island or from the Great Barrier Reef.

## Taxonomic account

### Family Nephtyidae Grube, 1850

Nephtyidae Grube, 1850: 249–364.—Fauchald 1977: 96–97; Ravara *et al.* 2010b: 5.

**Diagnosis.** Elongate compact bodies with an eversible pharynx. Prostomium with a pair of palps, antennae present or absent, nuchal organs present at base of prostomium. Pharynx with terminal papillae, longitudinal rows of subterminal papillae present or absent, proximal surface may be smooth or covered with small verrucae, subterminal jaws present.

Parapodia biramous, typically with well separated rami, with acicular, pre- and postchaetal lobes, and ventral and dorsal cirrus. Chaetae simple, often barred or spinose, lyrate chaetae present or absent, aciculae thick. Branchiae, when present, typically on the ventral margin of notopodia below dorsal cirrus occupying interramal space, and may be involute, straight or recurved. Terminal anus with single cirrus.

**Remarks.** The above definition is based on the description of the family given by Ravara *et al.* (2010b). A combination of characters are used to distinguish between genera: the presence or absence of antennae, palps single or bifid, the shape of the nuchal organs or pits, the presence or absence of pharyngeal papillae, the number of pharyngeal jaws, the presence or absence of branchiae, the curvature of the branchiae, the degree of development of parapodial lobes, the shape of the acicular lobes, and the form of the preacicular chaetae (Ravara *et al.* 2010a, Dnestrovskaya 2013). Species characters include the shape of the branchiae, the chaetiger corresponding to the beginning of the branchiae along the body, the number of pairs of branchiae, the number of rows of subterminal pharyngeal papillae, the number of pharyngeal papillae in each subterminal row, presence or absence of elongate middorsal and midventral papilla, presence or absence of pharyngeal verrucae, the presence of serrated and/or spinose chaetae, the presence or absence of lyrate chaetae (previously reported as a generic character by Dnestrovskaya 2013), lyrate chaetal shape, the shape of the dorsal and ventral cirri, and the shape of the distal end

of the aciculae. The use of prostomium shape proposed by Ohwada (1985) has subsequently been dismissed as a useful character by various authors due to the highly “plastic” nature of the soft-tissue of the prostomium, as shape has been observed to depend on the extent of the eversion of the pharynx as well as the form and degree of fixation (Dnestrovskaya 2013; Dixon-Bridges *et al.* 2014). We have followed the chaetal terminology of Dnestrovskaya & Jirkov (2010, 2011) who recognise four main types: capillary, barred, chaetae with spines (spinose and/or serrated) and lyrate.

### Genus *Aglaophamus* Kinberg, 1866 (*sensu* Hartman, 1950) emended

*Aglaophamus*.—Fauchald 1977: 97; Rainer & Kaly 1988: 686; Ravara *et al.* 2010a: 402; Ravara *et al.* 2010b: 7.

**Type-species.** *Aglaophamus lyratus* Kinberg, 1866, by monotypy.

**Diagnosis.** Antennae and palps present. Pharynx with variable number of subterminal papillae in 14–22 longitudinal rows, elongate subdistal middorsal papillae present or absent, proximal region of pharynx smooth or with verrucae. Branchiae present, involute or recurved. Lyrate chaetae present or absent. Barred chaetae present. Acicular lobes acutely pointed, aciculae curved at tip.

**Remarks.** The presence of verrucae is noted for some *Aglaophamus* species, including *A. australiensis* (Fauchald, 1965) recently transferred by Ravara *et al.* (2010a), and the species reported herein. Also included in the emended diagnosis is the presence of an elongate subdistal pharyngeal papilla in some *Aglaophamus* species, erroneously stated as absent for the genus in the diagnosis given by Ravara *et al.* (2010b) (Ravara, pers. comm.). Currently, the only diagnostic differences between the genera *Aglaophamus* and *Nephtys* are the shape of the acicular lobe—acutely pointed in the former, and conical, rounded or bilobed in the latter—and the absence of lyrate chaetae in *Nephtys*, though they may be present or absent in *Aglaophamus*. The recent inclusion of presence of lyrate chaetae in the generic diagnosis for *Nephtys* by Dixon-Bridges *et al.* (2014), is an error (Hutchings, pers. obs., see also Remarks under *Nephtys* generic diagnosis herein), and thus the presence of lyrate chaetae also distinguishes *Aglaophamus* spp. from *Nephtys* spp.

### *Aglaophamus* cf. *lobatus*

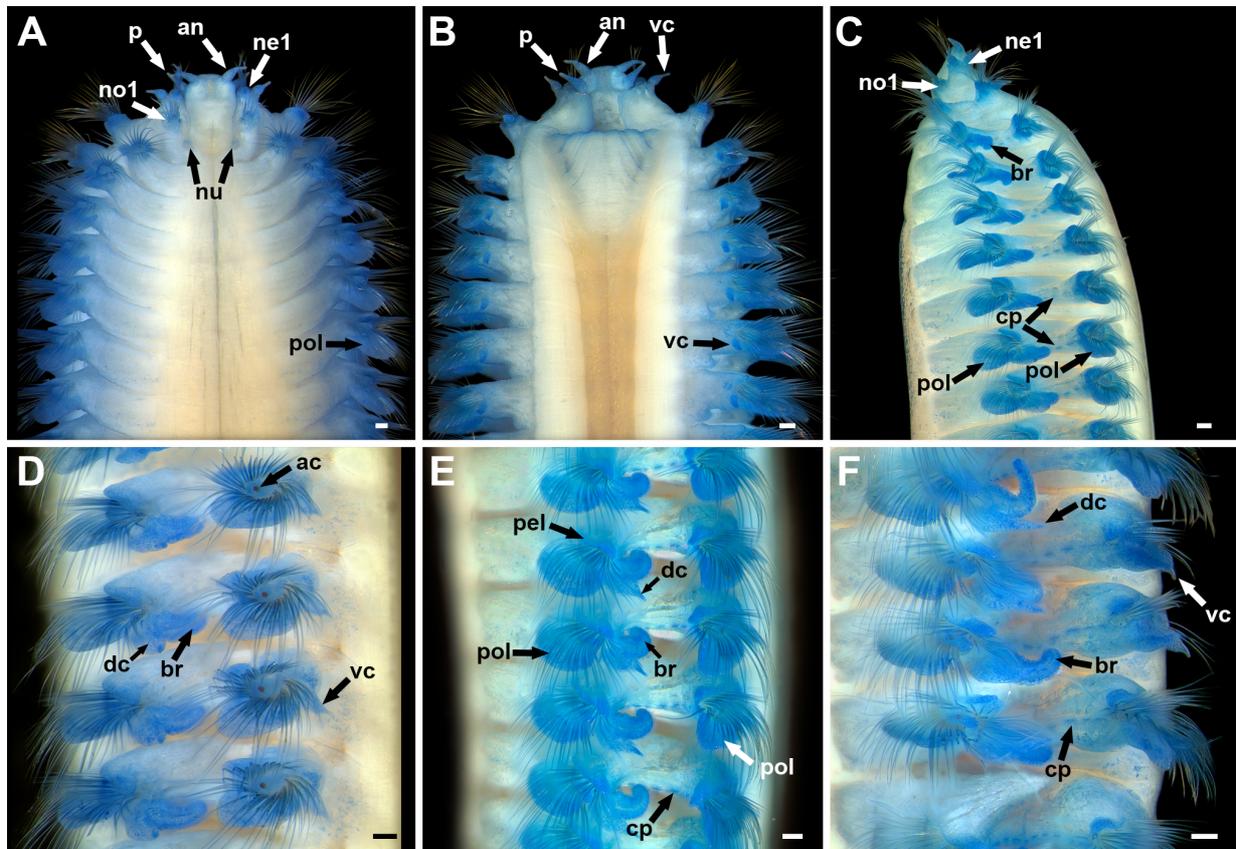
(Figs 1–2)

*Aglaophamus lobatus* Imajima & Takeda, 1985:75–78, fig. 9.

**Material examined.** Queensland, Lizard Island: AM W.47230 (1), AM W.46973 (5, 1 on SEM), MI QLD 2440; AM W.46975 (2), MI QLD 2444; AM W.46976 (2, 1 photographed), MI QLD 2441; AM W.47502 (1), Watsons Bay, 400 m off Chinamans Ridge, 14°40'S, 145°27'E, sand with filamentous algae, 12 m, 13 Oct 1978.

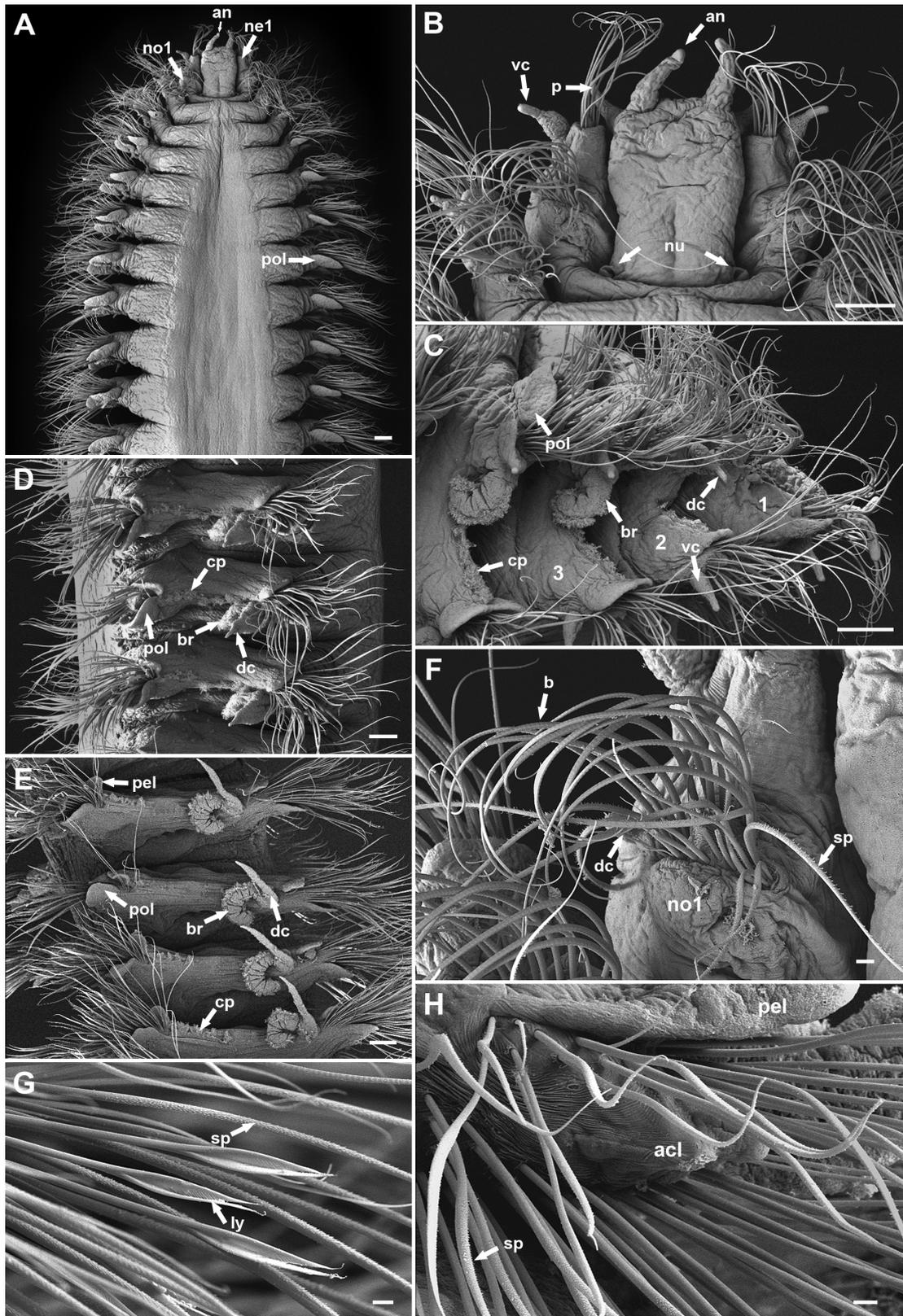
**Description.** Specimens range in size from 15–20 mm in length and 2 mm in width, with 51–67 chaetigers. Prostomium rectangular, 2 times longer than wide; antennae at anterolateral margins and palps ventral to antennae, all conically tapering with slightly swollen tips; nuchal pits round, at posterolateral prostomial margins (Figs 1A, 2A–B). Pair of subdermal eyes embedded dorsally midchaetiger 2, not visible through body wall. No pigment present on body or prostomium. Pharynx with 10 pairs of terminal bifid papillae, separated dorsally by gap, no single terminal papilla present, and 14 longitudinal rows of subterminal papillae, 4–8 per row; elongate middorsal subdistal pharyngeal papilla present, approximately 3–4 times length of other distalmost subterminal papillae. Verrucae present proximally on pharynx. First parapodia directed forward, slightly smaller than subsequent parapodia and with pyriform dorsal and ventral cirri (Fig. 2A–B, F). Notopodia from chaetiger 2 onwards with well developed dorsal cirri, thin and scoop-shaped (foliose) and distally tapering, as long as notopodial postacicular lamellae (Figs 1D, 2D). Posteriorly, dorsal cirri becoming elongate and longer than postacicular lamellae (Fig. 2E). Ventral cirri pyriform (Figs 1B–D, 2C). Parapodial postacicular lamellae anteriorly large, auricular; preacicular lamellae smaller, leaf-shaped (Figs 1A, 1D, 2C). Interramal space widely V-shaped. Notopodial interramal branchiae starting on chaetiger 3, involute, ciliated, and filling approximately  $\frac{1}{2}$  of interramal space anteriorly (Figs 1C, 2C), up to  $\frac{1}{3}$  of interramal space in posterior segments (Figs 1D–F, 2D–E), continue to within last few posterior chaetigers. Neuropodial interramal branchiae absent. Parapodial acicular lobes acutely pointed (Fig. 2H);

aciculae golden-coloured, curved distally. Chaetae of 3 types: barred chaetae (Fig. 2F) present in preacicular position in noto- and neuropodia; spinose chaetae present in postacicular position in both noto- and neuropodia (Fig. 2F–G); and lyrate chaetae with equal rami in postacicular position (Fig. 2G), present by chaetiger 4. Pygidial cirri are absent or missing.



**FIGURE 1.** *Aglaophamus* cf. *lobatus*, specimen stained with methyl blue, AM W.46976. A. Anterior end, dorsal view; B. Anterior end, ventral view; C. Anterior end, lateral view, branchiae starting from chaetiger 3; D. Anterior chaetigers, lateral view; E. Mid-body chaetigers, lateral view; F. Posterior chaetigers, lateral view. Abbreviations: ac = acicula, an = antenna, br = interramal branchia, cp = cilia patch, dc = dorsal cirrus, ne1 = neuropodium 1, no1 = notopodium 1, nu = nuchal pit, p = palp, pel = preacicular parapodial lobe, pol = postacicular parapodial lobe, vc = ventral cirrus. Scale bars: A–F = 0.1 mm.

**Remarks.** These specimens from Lizard Island most closely resemble *A. lobatus* Imajima & Takeda, 1985 from Japan, which also possesses involute notopodial interramal branchiae from chaetiger 3, large, “flattened” dorsal cirri, large foliose postacicular lamellae, 14 longitudinal rows of pharyngeal papillae, and with verrucae proximally on the pharynx, but differ slightly from the original description of *A. lobatus* by the presence of subdermal eyes (eyes are “absent” in *A. lobatus*), 10 pairs of terminal bifid pharyngeal papillae (*A. lobatus* has “22 rows (sic) of terminal papillae”), more pharyngeal papillae in the subterminal rows (4–5 in *A. lobatus*), and a much more elongate single middorsal subterminal pharyngeal papilla (“short” in *A. lobatus*, and which we suspect may belong to one of the subterminal rows). The original description is of material collected in northern Japanese waters from 10–270 m with no habitat data provided. In contrast, the material from Lizard Island was collected in tropical waters from shallow subtidal depths, which appears to be a very different habitat. To date, also, there are no other records of *A. lobatus* from any location between northern Japan and northern Australia, giving the species a widely disjunct distribution. The specimens described by Imajima & Takeda (1985) were slightly smaller (up to 17 mm in length) and were incomplete (with up to 42 segments), so the morphological differences shown in the Lizard Island specimens may possibly be due to the size difference. For these reasons we have provided a comprehensive description and illustrations of the specimens from Lizard Island. At this stage we are tentatively referring them to *A. lobatus* until type material can be examined to confirm the identification. One of the specimens from Lizard Island was collected in 1978, which is prior to the original 1985 description of this species from Japan by Imajima & Takeda.



**FIGURE 2.** *Aglaophamus* cf. *lobatus*, SEM photos of AM W.46973. A. Anterior end, dorsal view; B. Prostomium and chaetigers 1–2, dorsal view; C. Chaetigers 1–4, lateral view; D. Chaetigers 10–12, lateral view; E. Posterior chaetigers, lateral view; F. Notopodium 1, right side, dorsal view, showing barred and spinose chaetae and dorsal cirrus; G. Lyrate and spinose chaetae; H. Notochaetae of parapodium 20. Abbreviations: an = antenna, acl = acicular lobe, b = barred chaeta, br = interramal branchia, cp = cilia patch, dc = dorsal cirrus, ly = lyrate chaeta, ne1 = neuropodium 1, no1 = notopodium 1, nu = nuchal pit, p = palp, pel = preacicular parapodial lobe, pol = postacicular parapodial lobe, sp = spinose chaeta, vc = ventral cirrus. Scale bars: A–F = 0.1 mm; G–H = 0.01 mm.

**Habitat.** In depths of 10–270 m from Japanese waters; from Lizard Island, in sandy mud, sand and seagrass, in 14–24 m depth.

**Distribution.** Japan, Australia (Queensland: Lizard Island).

### ***Aglaophamus verrilli* (McIntosh, 1885)**

(Fig. 3)

*Nephtys verrilli* McIntosh, 1885: 163–164, pl. 26, figs 6, 7, pl. 32A, fig. 8.

*Nephtys dibranchis*.—Hartman 1938: 146 (in part); Hartman 1940: 237 (in part); Rullier 1965: 182–183; Stephenson *et al.* 1970: 470.

*Aglaophamus dicirris* Hartman, 1950: 122–124, pl. 18, figs 1–18.

*Aglaophamus verrilli*.—Knox 1960: 115; Paxton 1974: 199, fig. 1; Rainer & Hutchings 1977: 316–320, figs 7–11, 41, table 3; Dixon-Bridges *et al.* 2014: 515.

**Material examined.** Queensland, Lizard Island: AM W.46971 (3), QLD 822, Lagoon, 14°40'S, 145°27'E, reef rock, coll. P.A. Hutchings & P.B. Weate, 6 Jan 1975.

**Description.** Preserved specimens complete, 35–42 mm long, 3–3.5 mm wide, with up to 88 chaetigers, colourless. Body robust. Prostomium rectangular, at least 1.5 times longer than wide (with pharynx partially or fully everted), single small pair of widely separated eyes near posterior margin of prostomium (Fig. 3A). Pharynx with 10 pairs bifid terminal papillae and single short simple middorsal and midventral terminal papillae, 22 subterminal rows of papillae (7–8 per row), and proximally with numerous small verrucae (Fig. 3B–C). Noto- and neuropodia with enlarged, rounded, postacicular parapodial lamellae, projecting beyond tips of acicular lobes; neuropodial preacicular lamellae small, incised; parapodial acicular lobes acutely pointed; aciculae with curved tips (Fig. 3D). Interramal notopodial branchiae involute, present from chaetiger 7; interramal neuropodial branchiae involute, present from chaetiger 10 (Fig. 3D). Four types of chaetae: capillary and barred in preacicular position; spinose in both pre- and postacicular positions; and lyrate in postacicular position, present from chaetiger 4. Pygidial cirrus long, length of posteriormost 10 chaetigers, arising ventrally from anal ring.

**Remarks.** These specimens mostly agree with the descriptions of other Australian specimens of this species published by Paxton (1974) and Rainer & Hutchings (1977). There are a few differences, however, between these specimens and those described by Rainer & Hutchings (1977): the involute interramal neuropodial branchiae start from chaetiger 10, not 8, and the shape of the prostomium is rectangular, not square (with the pharynx partially or fully everted). This species has previously only been reported in Australia from Queensland, off Townsville and in Moreton Bay (Stephenson *et al.* 1974; Rainer & Hutchings 1977). This is the first record for Lizard Island. The apparently wide geographical distribution of this species in a variety of habitats should perhaps be confirmed with molecular studies.

**Habitat.** In Australia, from sand, mud, or coral rubble, in shallow waters, to 30 m depth.

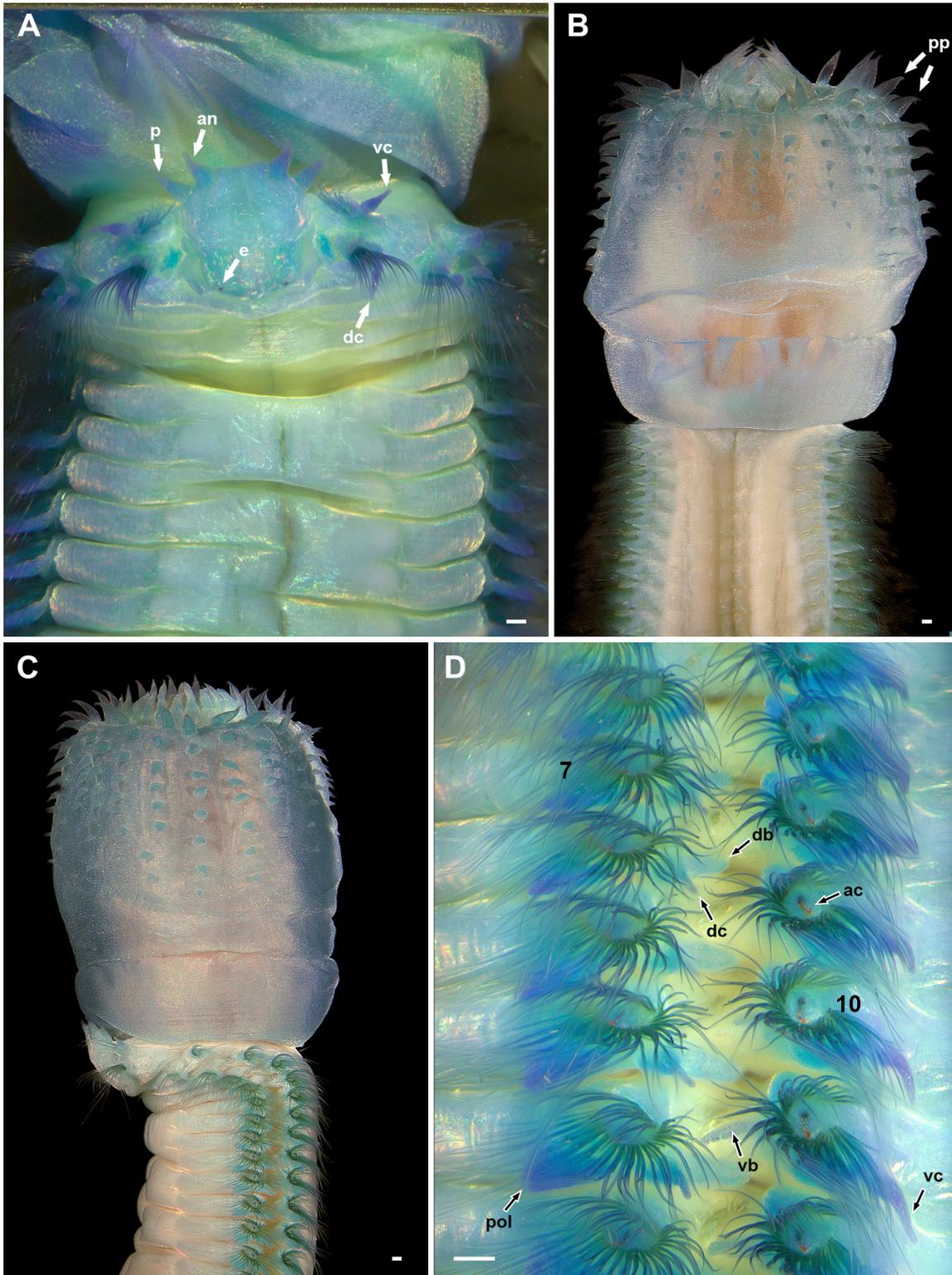
**Distribution.** New Zealand, India, North America to Panama, Australia (Queensland).

### **Genus *Micronephthys* Friedrich, 1939**

*Micronephthys*.—Hartman 1950: 130; Fauchald 1977: 96–97; Paxton 1974: 204; Rainer & Kaly 1988: 696; Ravara *et al.* 2010b: 23–24.

**Type-species.** *Micronephthys minuta* (Théele, 1879), by monotypy.

**Diagnosis.** Body of small size. Antennae and palps present. Pharynx with subterminal papillae, middorsal papilla present or absent, proximal region smooth or with verrucae. Nuchal organs round. Branchiae absent or, if present, reduced, nearly straight and present on few chaetigers only. Acicular lobes conical, pre- and postacicular lobes rudimentary, neuropodial postacicular lobes reduced or absent. First chaetiger not reduced, similar to remaining ones. Barred chaetae present or absent. Lyrate chaetae present or absent. Aciculae of median and posterior parapodia with curved tips.



**FIGURE 3.** *Aglaophamus verrilli*, specimen stained with methyl blue, AM W.46971. A. Anterior end, dorsal view; B. Anterior end, ventral view, pharynx everted; C. Anterior end, lateral view, pharynx everted; D. Anterior segments, lateral view. Abbreviations: ac = acicula, an = antenna, db = dorsal interramal branchiae, dc = dorsal cirrus, e = eye, p = palp, pol = postacicular parapodial lobe, pp = pharyngeal papillae, vb = ventral interramal branchiae, vc = ventral cirrus. Scale bars: A–D = 0.1 mm.

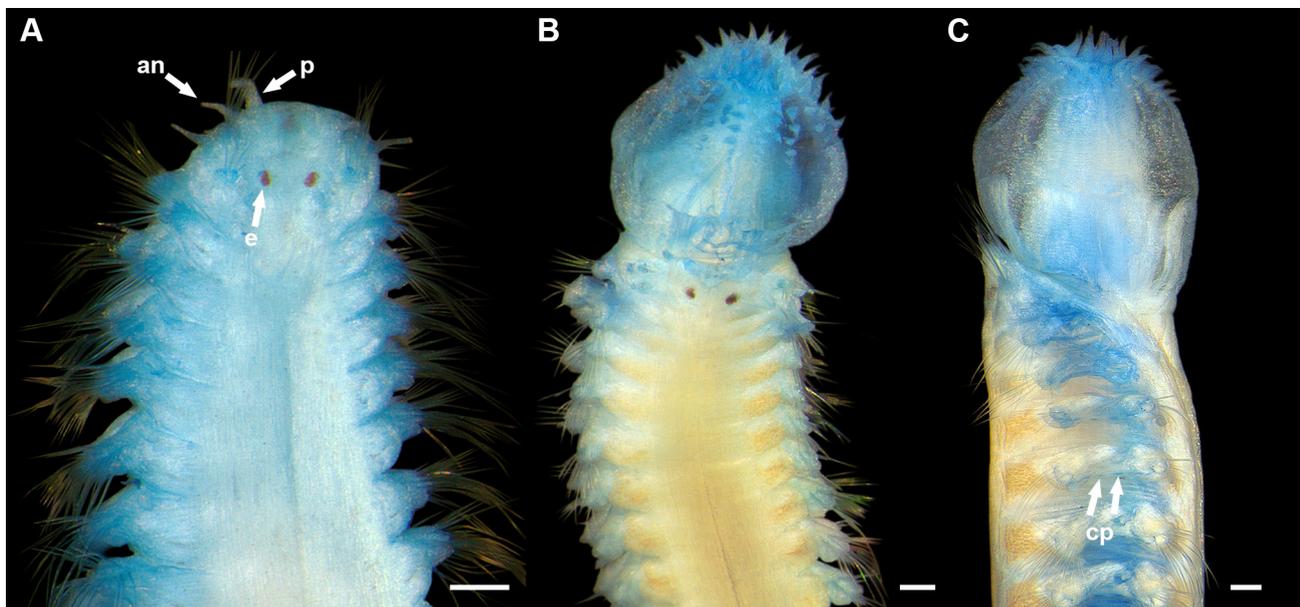
**Remarks.** As remarked by Dixon-Bridges *et al.* (2014), following the modified generic diagnosis of Ravara *et al.* (2010b), some branchiate *Micronephthys* species that lack lyrate chaetae may be mistaken for small or juvenile *Nephtys* specimens. However, reduced or rudimentary parapodial lobes and few pairs of branchiae are features of such *Micronephthys* species, and as such should distinguish them from *Nephtys* specimens, in which well developed parapodial lobes and numerous branchiae exist even in small specimens.

***Micronephthys oculifera* Mackie, 2000**

(Figs 4–5)

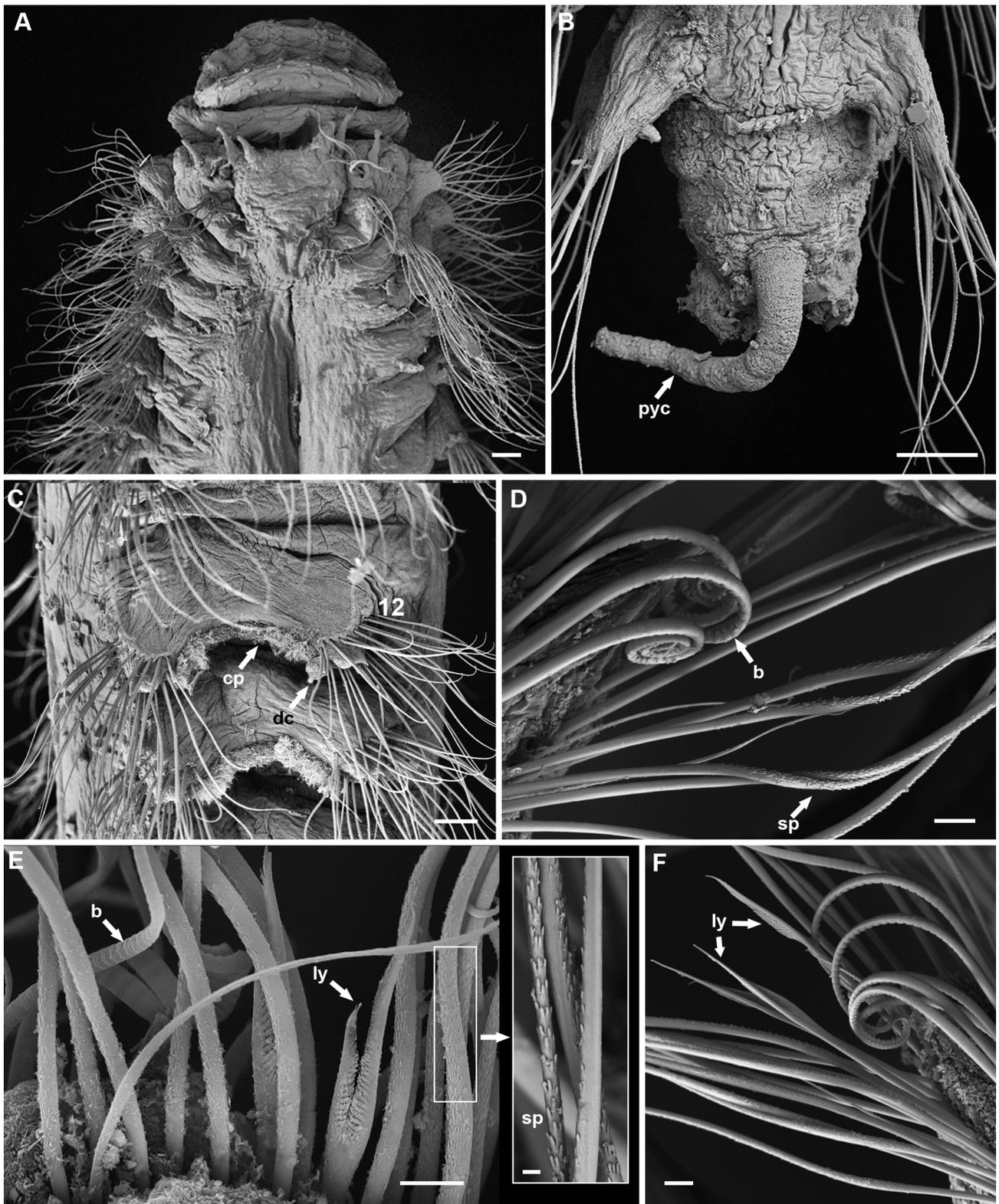
*Micronephthys oculifera* Mackie, 2000: 518–524, figs 1–4.

**Material examined.** Queensland, Lizard Island: AM W.45039 (2), AM W.46977 (1), MI QLD 2441; AM W.45170 (8), AM W.46979 (2), MI QLD 2440; AM W.46978 (1), MI QLD 2443; AM W.46984 (1), MI QLD 2366; AM W.46985 (3), MI QLD 2432; AM W.46986 (1), MI QLD 2421; AM W.46987 (1), MI QLD 2433; AM W.47227 (2), 100 m off Mangrove Beach, 14°40'S, 145°28'E, sand, 3 m, 30 Sep 1978; AM W.47399 (4), 100 m off eastern end of Mangrove Beach, 14°40'S, 145°28'E, sand, 3.6 m, 11 Oct 1978.



**FIGURE 4.** *Micronephthys oculifera*, specimens stained with methyl blue. A. Anterior end, dorsal view, AM W.41544; B. Anterior end, dorsal view, pharynx everted, AM W.41511; C. Anterior end, lateral view, AM W.41578. Abbreviations: an = antenna, e = eye, cp = ciliated patches, p = palp. Scale bars: A–C = 0.1 mm.

**Other material examined.** New South Wales, Port Stephens area, 32°42'S, 152°10'E: AM W.41579 (1), AM W.41541 (2), AM W.41578 (1, lateral photograph), AM W.43653 (1 on SEM), AM W.43574 (2), AM W.41514 (1), AM W.41543 (1), AM W.41544 (3, 1 anterior dorsal photograph), AM W.41545 (1), AM W.41540 (4), AM W.41577 (1), AM W.41580 (1), AM W.41519 (1), AM W.41518 (1 on SEM), AM W.41511 (1), AM W.41515 (1), AM W.41516 (3), AM W.41546 (1), AM W.41517 (2), AM W.41512 (1), AM W.41576 (1), AM W.41472 (1), AM W.41542 (2), AM W.41582 (1 on SEM); Hawkesbury River area, 33°33'30"S, 151°14'E: AM W.23988 (1), AM W.23983 (1), AM W.23984 (3), AM W.23985 (1), AM W.23986 (2), AM W.23987 (3); Pittwater area, 33°35'40"S, 151°18'30"E: AM W.32509 (1), AM W.23979 (2), AM W.23982 (4), AM W.23977 (4), AM W.23976 (4), AM W.23975 (6), AM W.23980 (2), AM W.23981 (6), AM W.23978 (3); Botany Bay, 33°58'11"S, 151°11'10"E: AM W.23974 (1), sandy mud, 18.4 m, Dec 1994. Hong Kong: 1 paratype of *M. oculifera*, NMW Z.1986.079.0158, Hoi Ha Wan, west of Ngan Chau (Flat Island), 22°28'44"N, 114°19'48"E, silty fine to medium sand between corals, 4 m, Apr 1986; 1 paratype of *M. oculifera*, NMW Z.1986.079.0164, east side of Wang Mun Hoi (Deep Pass) near Tai Kok Tau (northwest point of Crescent Island), 22°31'59"N, 114°18'26"E, heterogeneous shell sand and gravel with silt and organic matter, 4 m, Apr 1986.



**FIGURE 5.** *Micronephthys oculifera*, SEM photos, AM W.43653 (A–C), AM W.41518 (D–F). A. Anterior end, dorsal view; B. Posterior end, ventral view; C. Chaetigers 12–13, lateral view; D. Barred and spinose chaetae, chaetiger 36; E. Barred and lyrate chaetae, inset with magnification of spinose chaetae, chaetiger 20; F. Postacicular lyrate chaetae, chaetiger 21. Abbreviations: b = barred chaeta, cp = cilia patch, dc = dorsal cirrus, ly = lyrate chaeta, pyc = pygidial cirrus, sp = spinose chaeta. Scale bars: A = 0.1 mm, B–C = 0.05 mm, D–F = 0.01 mm except for enlarged image 2  $\mu$ m.

**Description.** Complete, preserved specimens from Lizard Island range from 3–12 mm long, 0.4–1.2 mm wide, for 20–55 chaetigers. Prostomium as long as wide in specimens with pharynx not everted, antennae and palps conical with swollen tips, antennae with wide separation, palps inserted ventrolateral to antennae on prostomium (Figs 4A, 5A). Nuchal pits round (Fig. 5A). Two pairs of overlapping lensed eyes present on prostomium (Fig. 4A), in some older preserved specimens these are faded to light red/orange; in some specimens dark pigment spots present in small patch between antennae (Fig. 4A–B). Pharynx with 10 pairs of bifid terminal papillae and 22 subterminal longitudinal rows of 8–9 papillae (Fig. 4B–C); single middorsal subterminal papilla absent, verrucae present proximally. Branchiae absent but ciliated patches present on margins of interramal space (Figs 4C, 5C). Dorsal and ventral cirri small, pyriform (Fig. 5C), except on chaetiger 1, with ventral cirri similar in shape and length to palps and antennae (Fig. 5A), dorsal cirri half as long and cirriform, tapering. Parapodial lobes all reduced; anteriorly, acicular lobes conical (Fig. 5C), preacicular lobes rounded, postacicular lobes bluntly conical; midbody acicular lobes conical, preacicular lobes rounded, postacicular lobe rounded on notopodia, absent from neuropodia; posteriorly notopodial pre- and postacicular lobes rounded, neuropodial postacicular lobe absent, preacicular lobe rounded. Aciculae with distally curved tips. Chaetae of 4 types: smooth capillaries present only in neuropodia of chaetiger 1; barred (Fig. 5D–F) in preacicular positions in noto- and neuropodia (except neurochaetiger 1); lyrate with unequal rami and spinose blades, in postacicular position (Fig. 5E–F), starting from chaetigers 4–8; spinose capillaries in post-acicular position (Fig. 5D–E). Pygidium with single thick terminal cirrus (Fig. 5B).

**Remarks.** The Lizard Island specimens agree well with Mackie's (2000) type material originally collected from Hong Kong waters. However, we did not observe what Mackie (2000) describes as "broad-bladed serrated chaetae" which he notes were present in juvenile specimens. Some specimens collected in 1978 from Lizard Island were originally noted to be "yellow" in colour, but have since lost all colouration, including eye pigment; some specimens from N.S.W. display orange-pigmented dorsolateral longitudinal stripes along the body which fade with preservation and remain as granular stripes, most conspicuous from about chaetiger 10 onwards to posterior segments, and also possess aciculae with red tips which just emerge from the parapodial lobes.

This species has not previously been reported from Australia but appears to be widespread and abundant along the east coast of Australia, and has probably only ever been recorded as *Micronephthys* sp. in many ecological studies, from the 1970s onwards. Some specimens were collected from Lizard Island in 1978, which pre-dates the original description of this species from Hong Kong by Mackie (2000).

**Habitat.** Sandy mud, muddy sand, and sand, associated with seagrass, algae and soft corals, in intertidal and shallow subtidal depths.

**Distribution.** Hong Kong, Australia (Queensland, New South Wales).

### ***Micronephthys platycephala* n. sp.**

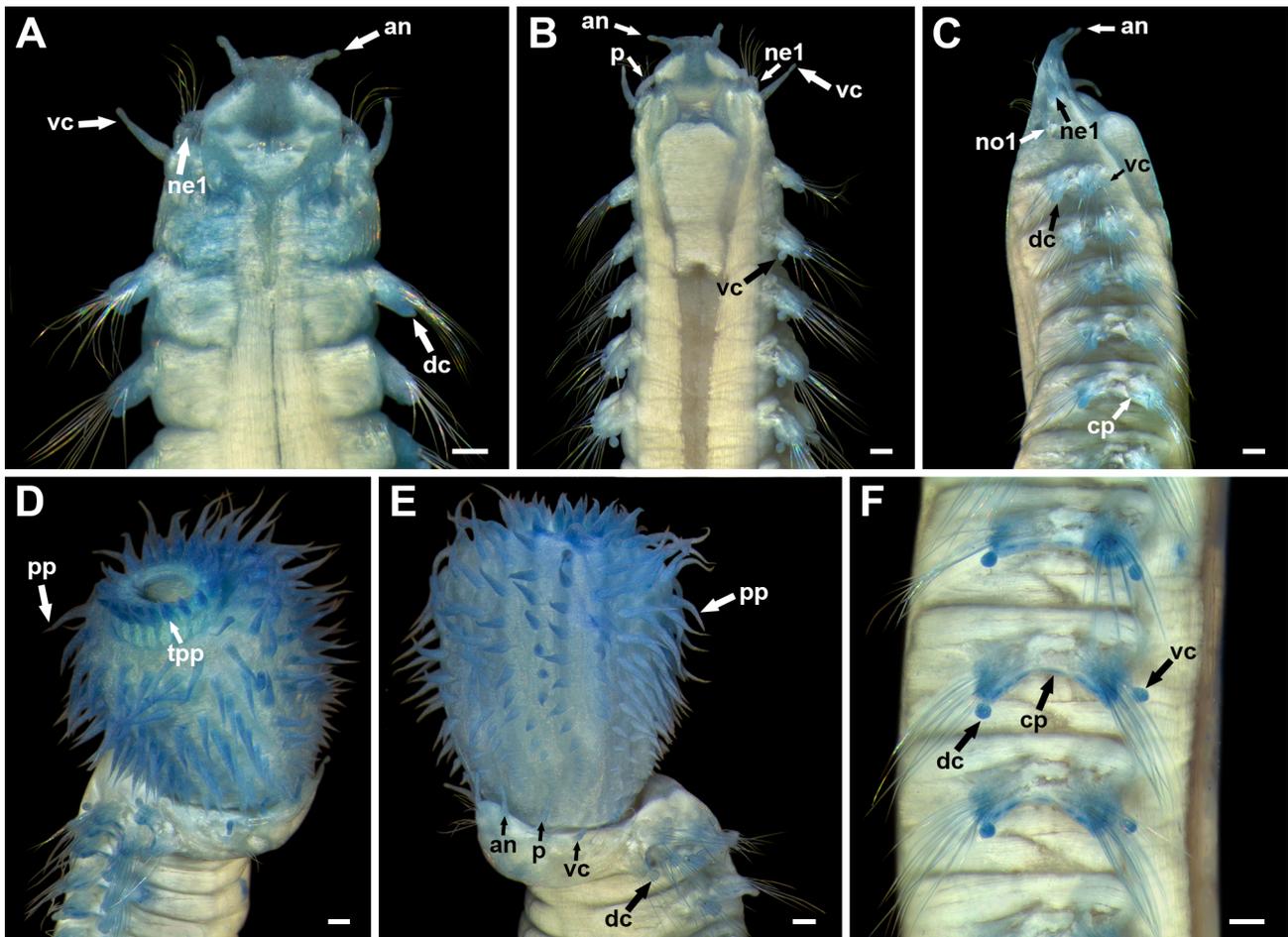
(Figs 6–7)

**Type material.** Holotype: AM W.47397, Queensland, Great Barrier Reef, Carter Reef, 14°34'S, 145°34'E, 30–36 m, plankton tow, 31 Jan 1982. Paratypes: AM W.46844 (1 on SEM, 1 photographed), AM W.47398 (2, 1 photographed), from same sample as holotype.

**Other material examined.** Queensland, Lizard Island: AM W.47229 (3), 100 m off Chinamans Ridge, 14°40'S, 145°27'E, sand, 9 m, 13 Oct 1978; AM W.47396 (3), between bommies inside lagoon entrance, 14°40'S, 145°28' E, medium to fine sediment, 18 m, 9 Oct 1978.

**Description.** Holotype incomplete, 20 mm long, 1 mm wide, with 51 chaetigers, robust. No pigment present on body or prostomium. Prostomium broad, flattened dorsoventrally, partially semi-transparent; anterior margin straight; antennae at corners of anterior margin; palps at base of lateral extensions of prostomium, widely separated from antennae; anterolateral margin (between palps and antennae) convex; posterior margin of prostomium V-shaped (Figs 6A–C, 7A–C). Antennae and palps long, tapering with swollen tips, antennae about 3/4 length of palps (Figs 6A–B, 7A–B). Nuchal pits round (Fig. 7A). Pair of subdermal eyes, not visible, at posterior margin of chaetiger 2. Pharynx not everted, description from paratype specimen (AM W.47398): pharynx with 19 bifid terminal papillae, simple middorsal terminal papilla absent, 22 subdistal rows of elongate papillae (distalmost papillae of mid row as long as or longer than palps), with 8–15 papillae per row, proximally decreasing in size to small micropapillae which extend to base of pharynx; elongate middorsal and midventral subdistal papillae absent (Fig. 6D–E). Chaetiger 1

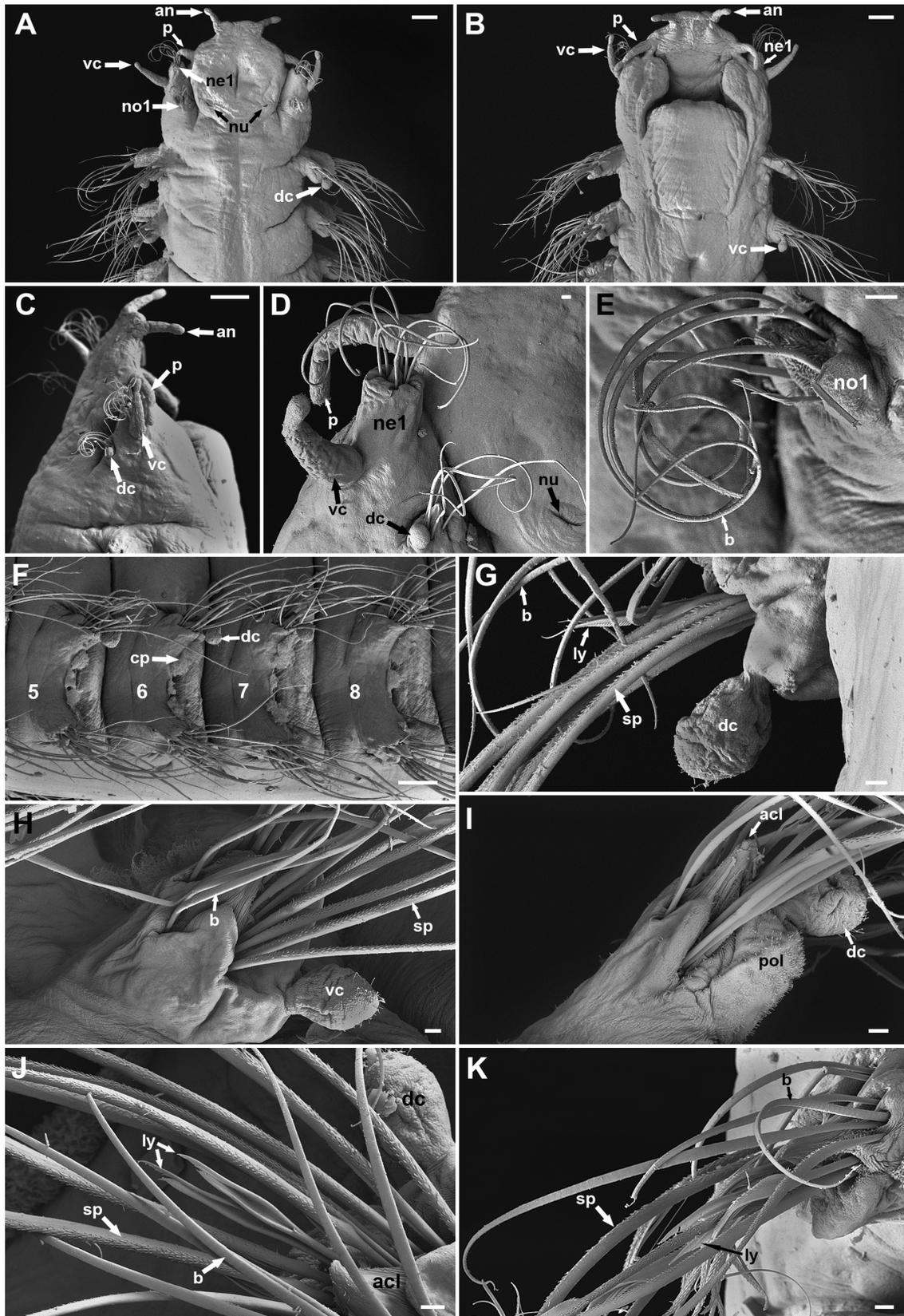
anteriorly directed, of similar size to subsequent chaetigers, with ventral cirri elongate, similar in shape and length to palps (Figs 6A, 7A, 7C), dorsal cirri present as very small papilla (Fig. 7C–D). Following chaetigers with small dorsal and ventral cirri, ovoid to spherical in shape (Figs 6F, 7F–H). Interramal branchiae absent. Interramal patches of cilia present (Fig. 7F). Parapodial acicular lobes conical to pointed (Fig. 7I–J), aciculae golden-coloured, distally curved. Anterior parapodial postchaetal lobes poorly developed, low, rounded, subequal in length to acicular lobes, and longer than rudimentary prechaetal lobes; posteriorly postchaetal lobes slightly longer than acicular lobes (Fig. 7H–I). Chaetae of 4 types: chaetiger 1 with capillary chaetae in noto- and neuropodia, barred chaetae present in preacicular position in notopodia only (Fig. 7D–E); following chaetigers with barred preacicular chaetae (Fig. 7J–K) and spinose postacicular chaetae in both noto- and neuropodia (Fig. 7G–H, J–K); lyrate chaetae with unequal rami present in postacicular position (Fig. 7G, 7J), starting from chaetiger 5.



**FIGURE 6.** *Micronephthys platycephala* n. sp., specimens stained with methyl blue, AM W.46844 (A–C, F), AM W.47398 (D–E). A. Anterior end, dorsal view; B. Anterior end, ventral view; C. Anterior end, lateral view; D. Pharynx, anterolateral view; E. Pharynx, lateral view; F. Midbody chaetigers, lateral view. Abbreviations: an = antenna, cp = cilia patch, dc = dorsal cirrus, ne1 = neuropodium 1, no1 = notopodium 1, p = palp, pp = pharyngeal papillae, tpp = terminal ring of pharyngeal papilla, vc = ventral cirrus. Scale bars: A–F = 0.1 mm.

**Variation.** Paratypes are all incomplete. Three complete specimens from AM W.47229, each possess a single long tapering terminal cirrus, up to eight posterior segments in length.

**Remarks.** *Micronephthys platycephala* n. sp. is distinguished from other species by a combination of characters: body large and robust, pharynx with 19 bifid terminal papillae and 22 rows of subdistal papillae, absence of single middorsal terminal papillae and elongated middorsal and midventral subdistal papillae, presence of micropapillae proximally on the pharynx, prostomium anteriorly flattened and semitransparent, eyes not visible externally but deeply subdermal in segment 2, presence of capillary, barred, spinose and lyrate chaetae (dentate chaetae absent from the first notopodia), spherical dorsal cirri, absence of interramal branchiae, and poorly developed parapodial lobes



**FIGURE 7.** *Micronephthys platycephala* n. sp., SEM photos of AM W.46844. A. Anterior end, dorsal view; B. Anterior end, ventral view; C. Anterior end, lateral view; D. Chaetiger 1, dorsal view; E. Notochaetae of chaetiger 1; F. Lateral view of chaetigers 5–8; G. Notopodium of chaetiger 5; H. Neuropodium of posterior chaetiger; I. Posterior chaetiger notopodium; J. Chaetae of chaetiger 12; K. Chaetae of posterior chaetiger. Abbreviations: acl = acicular lobe, an = antenna, b = barred chaeta, cp = cilia patch, dc = dorsal cirrus, ly = lyrate chaeta, ne1 = neuropodium 1, no1 = notopodium 1, nu = nuchal pit, p = palp, pol = postacicular parapodial lobe, sp = spinose chaeta, vc = ventral cirrus. Scale bars: A–C, F = 0.1 mm, D–E, G–K = 0.01 mm.

and lamellae. There appears to be no other species described that possesses this combination of features, and none described as having this unusual form of the prostomium. This species shares similarities with *Micronephthys sphaerocirrata* (Wesenberg-Lund, 1949)—the form and arrangement of pharyngeal subdistal papillae and proximal micropapillae—but differs from it by possessing a larger, robust body, anteriorly flattened and semitransparent prostomium, the absence of visible eyes, and the absence of a single middorsal papilla on the terminal ring of papillae of the pharynx.

While the type material was collected in a plankton tow, all the additional material was collected as benthos and we suggest that the type material was accidentally dislodged from surface sediments by the plankton tow.

**Etymology.** The species name is derived from the greek words "platys" (flat) and "kephale" (head) and refers to the flattened prostomium.

**Habitat.** Sand and muddy sand, from shallow subtidal depths to 30 m.

**Type locality.** Carter Reef, Great Barrier Reef, Queensland.

**Distribution.** Australia (Queensland: Lizard Island, Great Barrier Reef).

### *Micronephthys* cf. *sphaerocirrata* (Wesenberg-Lund, 1949)

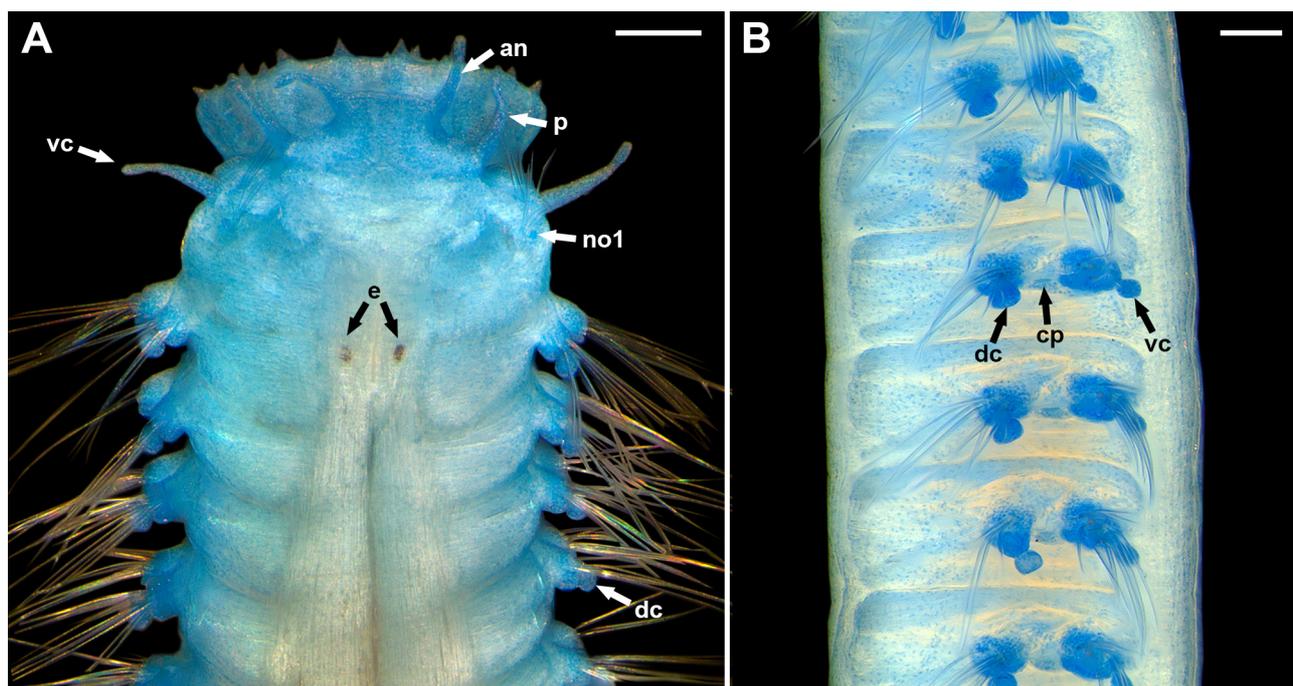
(Figs 8–9)

*Nephthys sphaerocirrata* Wesenberg-Lund, 1949: 294–296, figs 24–26.

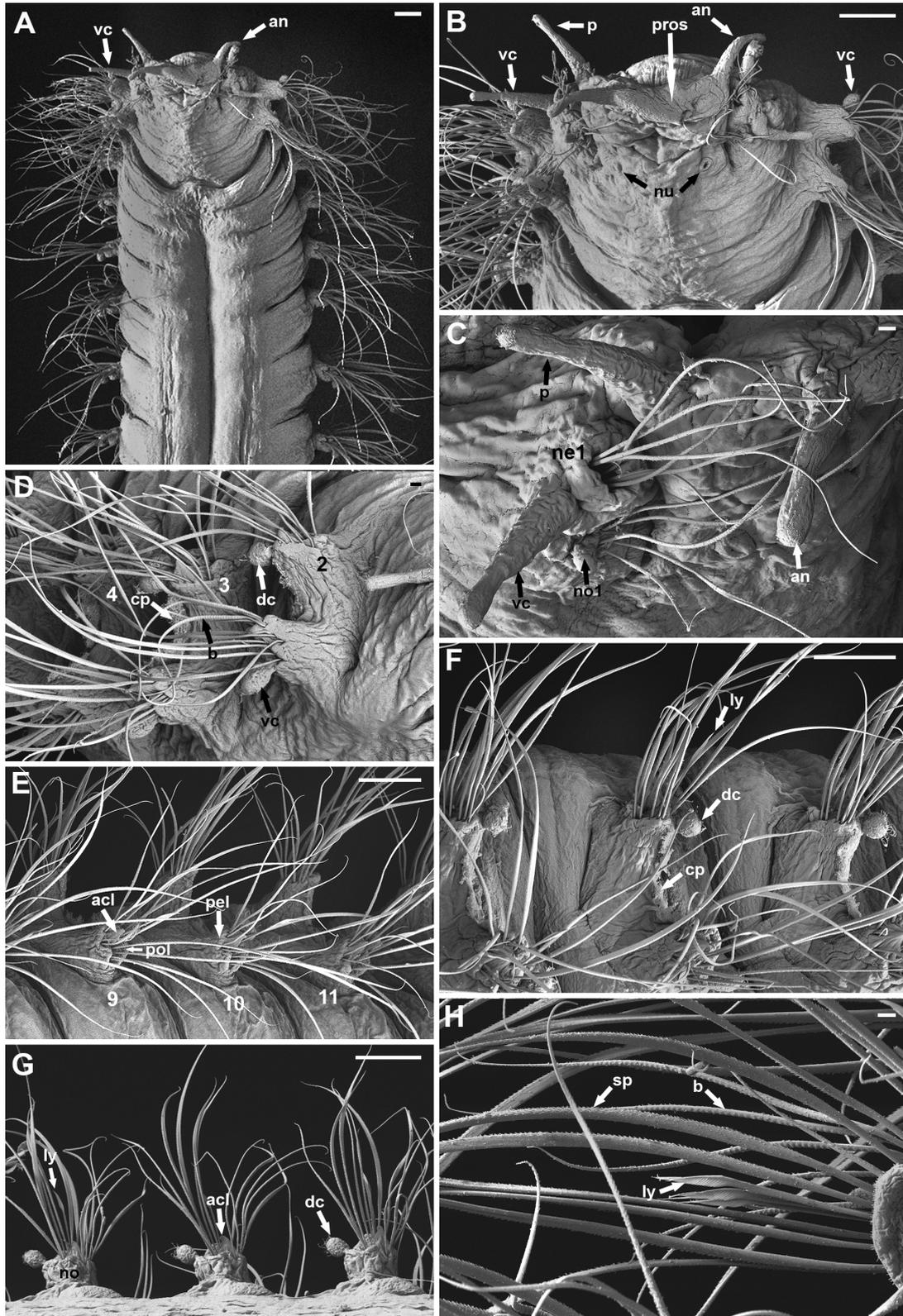
*Micronephthys sphaerocirrata*.—Rainer & Hutchings 1977: 320–322, figs 12–13.

**Material examined.** Queensland, Great Barrier Reef: AM W.46983 (9, 1 on SEM), MI QLD 2449.

**Other material examined.** Queensland: AM W.8463 (2), AM W.8464 (1), Middle Banks, Moreton Bay, 27°13'S, 153°19'E, Sep 1973; AM W.8658 (2), Townsville, 19°21'S, 147°15'E, sand, 4 m, 16 Apr 1975.



**FIGURE 8.** *Micronephthys* cf. *sphaerocirrata*, specimen stained with methyl blue, AM W.46983. A. Anterior end, dorsal view; B. Chaetigers 2–8, lateral view. Abbreviations: an = antenna, cp = cilia patch, dc = dorsal cirrus, e = eye, no1 = notopodium 1, p = palp, vc = ventral cirrus. Scale bars: A–B = 0.1 mm.



**FIGURE 9.** *Micronephthys* cf. *sphaerocirrata*, SEM photos of AM W.46983. A. Anterior end, dorsal view (prostomium folded over dorsally); B. Prostomium and chaetigers 1–4, anterodorsal view; C. Chaetiger 1 and prostomium, anterolateral view; D. Chaetigers 2–4, anterolateral view; E. Chaetigers 9–11, dorsolateral view; F. Midbody chaetigers, lateral view; G. Midbody neuropodia, ventral view; H. Chaetae, neuropodium 16. Abbreviations: acl = acicular lobe, an = antenna, b = barred chaeta, cp = cilia patch, dc = dorsal cirrus, ly = lyrate chaeta, ne1 = neuropodium 1, no1 = notopodium 1, nu = nuchal pit, p = palp, pel = preacicular parapodial lobe, pol = postacicular parapodial lobe, pros = prostomium, sp = spinose chaeta, vc = ventral cirrus. Scale bars: A–B, E–G = 0.1 mm, C–D, H = 0.01 mm.

**Description.** Specimens from Lizard Island all incomplete, up to 9 mm long, 1 mm wide, with 51 chaetigers. Body without pigment. Posteriorly, body somewhat moniliform, constrictions at segment boundaries. Prostomium subpentagonal; antennae located on anterior margin; palps anterolateral, slightly ventral to and widely separated from antennae (Figs 8A, 9A–B); lateral margin between antennae and palps concave to slightly convex (Fig. 8A); posterior margin V-shaped (Fig. 8A). Antennae and palps long, tapering with swollen tips, similar in length (Figs 8A, 9A–C). Nuchal pits round (Fig. 9B). Pair of eyes visible middorsally on chaetiger 2 (Fig. 8A). Pharynx with 19 bifid terminal papillae, simple dorsal papilla absent, 22 subdistal rows of elongate papillae (distalmost papillae of mid row as long as or longer than antennae and palps), with 8–15 papillae per row, proximally decreasing in size to small micropapillae, elongate middorsal and midventral subdistal papillae absent. First chaetiger with small papilla-like dorsal cirrus and elongated ventral cirrus, similar in shape and length to palps, following chaetigers with subspherical globular dorsal cirri and ovate ventral cirri (Figs 8B, 9B, 9F–G). Parapodial acicular lobes conical (Fig. 9G); postacicular lobes reduced, preacicular lobes rudimentary (Fig. 9E–G). Interramal branchiae absent. Interramal patches of cilia present (Figs 8B, 9F). Aciculae with curved tips (Fig. 9G). Four types of chaetae: capillary in the first noto- and neuropodia (Fig. 9C); barred chaetae in preacicular position of first notopodia and all following parapodia (Fig. 9C–D, H); spinose chaetae in postacicular position of all following parapodia (Fig. 9D–F, H); and lyrate chaetae with unequal rami in postacicular position (Fig. 9E, G–H), from chaetiger 4.

**Remarks.** These Australian specimens are remarkably similar to *M. sphaerocirrata*, which was originally described from the Persian Gulf, but vary from the most recent and detailed description of the species by Ravara *et al.* (2010b, pp. 26–27) by the insertion of the palps on the prostomium, anterolaterally instead of ventrolaterally, by possessing only 19 bifid and no simple terminal pharyngeal papillae, and having globular dorsal cirri rather than spherical ones with conical tips. They are similar to the specimens from Queensland described by Rainer & Hutchings (1977) as *M. sphaerocirrata*, and after examination of their material, those specimens were also found to have only 19 bifid and no simple terminal pharyngeal papillae, small micropapillae proximally on the pharynx, and lyrate chaetae starting from chaetiger 4. The specimens differ from *M. stammeri* (Augener, 1932) in the lack of thick dentate chaetae in the first notopodia, and from *M. platycephala* n. sp. in the smaller size and the presence of visible eyes on chaetiger two.

Ravara *et al.* (2010b) redescribed *M. sphaerocirrata* from syntype material as well as from South African specimens, but there is no distinction between type and non-type material in their description. They described the species as having a pharynx with “7–10 conical subterminal papillae, followed by several minute papillae, extending to base of pharynx; proximal region smooth” as well as “10 pairs of terminal, bifid papillae, separated by dorsal simple papilla”, none of which agrees with our specimens. However, other specimens that have been attributed to *M. sphaerocirrata*, also show a large variation in the number of subterminal pharyngeal papillae in each row, and the development of the parapodial lamellae proportions (Ravara *et al.* 2010b, p.27). For instance, *M. sphaerocirrata orientalis* Lee & Jae, 1983 from Korea and Vietnam, reportedly possesses 12–15 subterminal pharyngeal papillae per row, and prominent preacicular lamellae, whereas *M. sphaerocirrata* from Thailand has well developed neuropodial prechaetal and notopodial postchaetal lamellae (Nateewathana & Hylleberg 1986). Because of this variation, and because the Australian specimens also show subtle differences to Wesenberg-Lund’s (1949) original description, we refer our specimens tentatively to *M. sphaerocirrata*. Also, because of the reported morphological variation and the range of depths from which this species has been recorded, we suspect that *Micronephthys sphaerocirrata* contains a suite of cryptic species, and in order to resolve their identity, further analysis of populations using molecular as well as morphological data is necessary.

**Habitat.** Sand and muddy sand, in shallow subtidal depths to 500 m.

**Distribution.** Persian Gulf, southwest Africa, South Africa, Australia (Queensland).

### ***Micronephthys stammeri* (Augener, 1932)**

(Figs 10–11)

*Nephtys stammeri* Augener, 1932: 678, fig. 2.

*Nephtys inermis* Augener, 1932: 663.

*Micronephthys stammeri*.—Hartman 1950: 131; Banse 1959: 302, fig. 6.

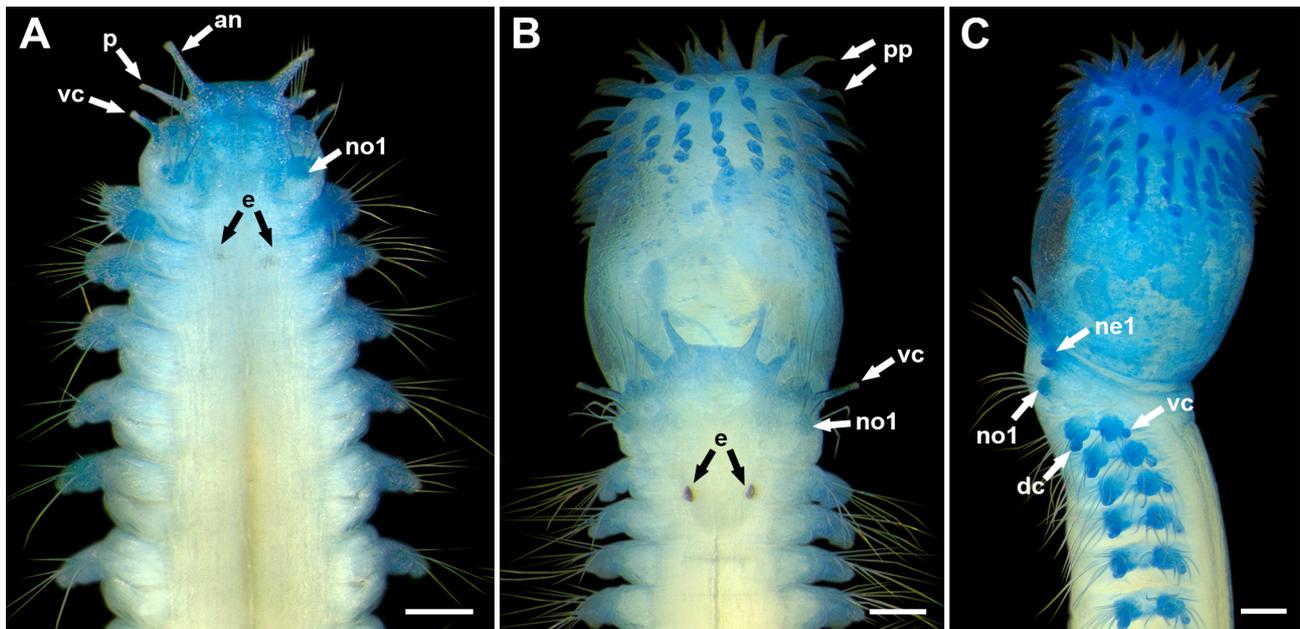
*Micronephthys maryae* San Martín, 1982: 428–433, figs 1–3.

non *Micronephthys maryae*.—Rainer & Kaly 1988: 696–698, fig. 5.

non *Micronephthys cf. stammeri*.—Dixon-Bridges *et al.* 2014: 515.

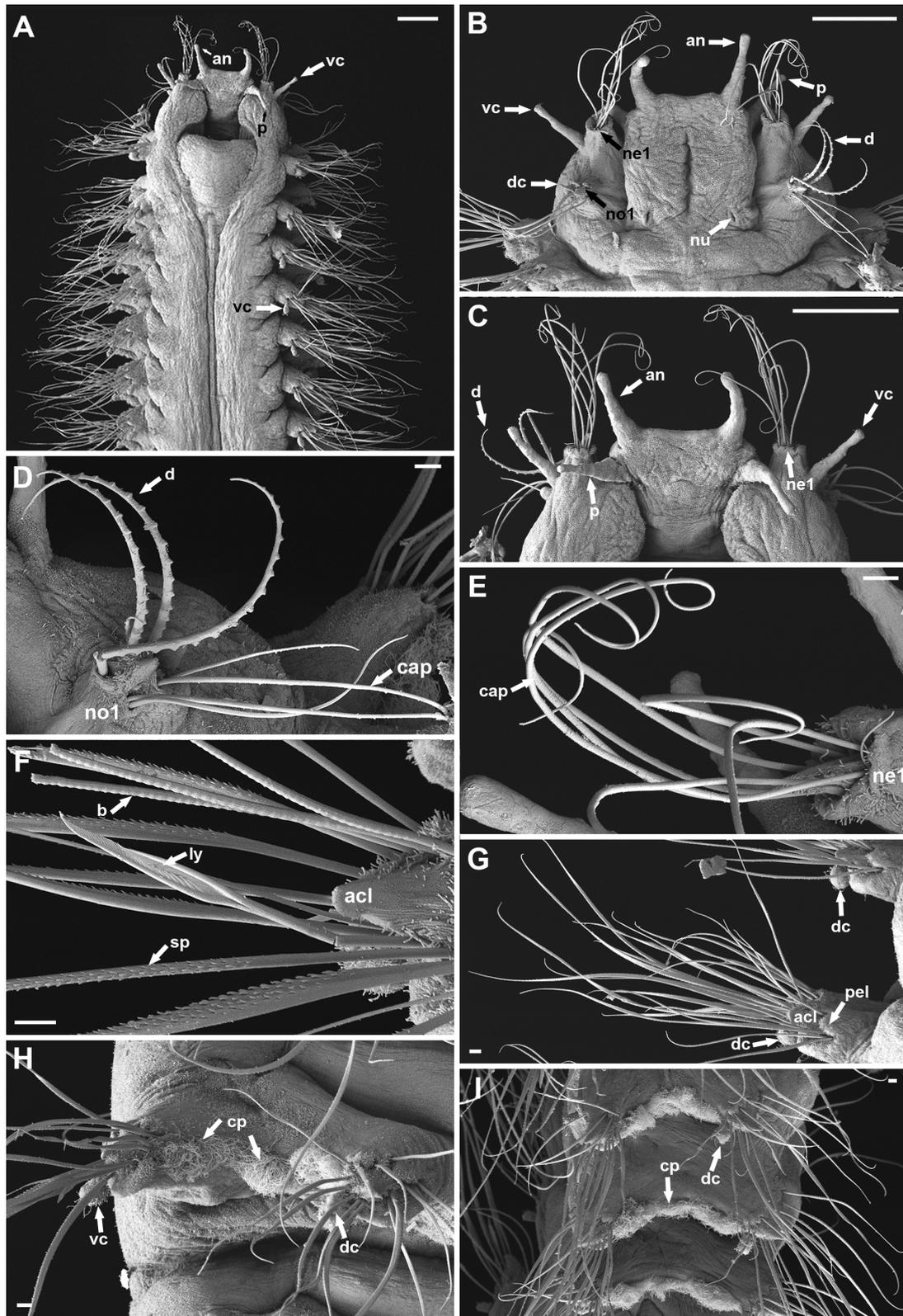
**Material examined.** Queensland, Lizard Island: AM W.44021 (1), MI QLD 2340; AM W.45036 (2), AM W.45157 (4), AM W.45502 (1), MI QLD 2441; AM W.45173 (2), AM W.46972 (many, 2 photographed), MI QLD 2440; AM W.45474 (1), MI QLD 2444; AM W.45501 (2), MI QLD 2443; AM W.46980 (3, 1 on SEM), MI QLD 2432; AM W.46982 (1), MI QLD 2431; AM W.47228 (10), 100 m off Mangrove Beach, 14°40'S, 145°28'E, sand, 3.6 m, 11 Oct 1978.

**Comparative material examined.** Specimens identified by Rainer & Kaly (1988: 696–698, fig. 5) as *Micronephthys maryae*: Western Australia, Northwest Shelf, CSIRO North-West Shelf Project, FRV "Soela": AM W.200668 (1), 19°58'48"S, 117°51'24"E, 41 m, 26 Oct 1983; AM W.200669 (1), 19°59'12"S, 118°04'00"E, 32 m, 10 Dec 1982; AM W.200670 (3), 19°04'18"S, 119°00'36"E, 82 m, 1 Sep 1983.



**FIGURE 10.** *Micronephthys stammeri*, two specimens stained with methyl blue from AM W.46972. A. Anterior end, dorsal view; B. Anterior end, dorsal view, pharynx everted; C. Anterior end, lateral view. Abbreviations: an = antenna, dc = dorsal cirrus, e = eye, ne1 = neuropodium 1, no1 = notopodium 1, p = palp, pp = pharyngeal papillae, vc = ventral cirrus. Scale bars: A–C = 0.1 mm.

**Description.** Complete specimens up to 14 mm long, 1.4 mm wide, and > 60 chaetigers for longest specimens. Preserved specimens without pigment. Prostomium subquadrangular to subpentagonal in shape. Antennae and palps equal in length and cirriform with swollen tips (Figs 10A, 11A–C). Nuchal pits round and situated at posterior corners of prostomium. Two pairs of visible subdermal coalesced eyes present middorsally in chaetiger two (with pharynx everted, Fig. 10B) or in anterior part of chaetiger 3, (with pharynx not everted, Fig. 10A); (Fig. 11B). Pharynx with 9 pairs of terminal bifid papillae with a single middorsal terminal papilla, and 20–22 subdistal longitudinal rows of 5–9 elongate papillae, which diminish in size and continue proximally as rows of minute papillae (Fig. 10B–C); elongate middorsal and midventral subdistal papillae absent; verrucae absent proximally. Ventral cirri of chaetiger 1 similar in length and form to antennae, dorsal cirri minute, papillae-like (Figs 10C, 11C–D); subsequent ventral cirri short, ovoid, dorsal cirri larger than those of chaetiger 1, subspherical (Figs 10C, 11A, 11G–I). Acicular lobes conical, pre- and postchaetal lobes rudimentary (Fig. 11G–H). Aciculae tips curved. Five types of chaetae: thick, dentate chaetae present on first notopodia only (Fig. 11D); capillary chaetae present in noto- and neuropodia of first chaetiger only (Fig. 11D–E); barred chaetae in preacicular position of all following parapodia (Fig. 11F); spinose chaetae in postacicular position of all following parapodia (Fig. 11F), and lyrate chaetae with unequal rami in postacicular position (Fig. 11F) from chaetiger 4. Interramal cirri absent, ciliated patches present between parapodial rami, posteriorly continuous (Fig. 11H–I). Pygidium with short filiform cirrus, equal in length to last segment.



**FIGURE 11.** *Micronephthys stammeri*, SEM photos of AM W.46980. A. Anterior end, ventral view; B. Prostomium and chaetigers 1–2, dorsal view; C. Prostomium and chaetiger 1, ventral view; D. Dentate and capillary notochaetae of chaetiger 1; E. Capillary neurochaetae of chaetiger 1; F. Notochaetae of chaetiger 14; G. Notopodia of chaetigers 14–15, dorsal view; H. Chaetiger 14, lateral view; I. Posterior chaetigers, lateral view. Abbreviations: acl = acicular lobe, an = antenna, b = barred chaeta, cap = capillary chaeta, cp = cilia patch, d = dentate chaeta, dc = dorsal cirrus, ly = lyrate chaeta, ne1 = neuropodium 1, no1 = notopodium 1, nu = nuchal pit, p = palp, pel = preacicular parapodial lobe, sp = spinose chaeta, vc = ventral cirrus. Scale bars: A–C = 0.1 mm, D–I = 0.01 mm.

**Remarks.** Ravara *et al.* (2010b), redescribed *M. stammeri* from specimens collected from the type locality (Adriatic Sea) as the holotype has been lost (Banse 1959). They also synonymised *M. maryae* San Martin, 1982, with *M. stammeri*, and assigned Rainer & Kaly's (1988) Australian specimens identified as *M. maryae* to *M. stammeri*, with doubts, due to Rainer & Kaly's description of the Australian specimens having 14 longitudinal rows of subdistal pharyngeal papillae, instead of 20–22 rows which *M. stammeri* possesses. After examination of Rainer & Kaly's specimens from Western Australia, it is impossible to confirm any pharyngeal features, as the three specimens are now badly damaged and the pharynx is missing from all. It is possible that the Western Australian specimens represent another species altogether, as Rainer & Kaly stated that the "proximal region" of the pharynx had "14 rows of subdistal papillae...up to 17 in each row", a feature that is not consistent with *M. stammeri*, or with the Lizard Island specimens. The inclusion of *M. cf. stammeri* in the key to Australian Nephtyidae in Dixon-Bridges *et al.* (2014, p. 515) was based on Ravara's synonymy of *M. maryae* with *M. stammeri*, and even though the specimens are no longer identifiable, the differences between *M. stammeri* and the description of Rainer & Kaly's specimens alone should have discounted the presence of *M. stammeri* in Australia. However, the specimens from Lizard Island are consistent with the redescription of *M. stammeri* by Ravara *et al.* (2010b), except that they are larger, and lyrate chaetae are present from chaetiger 4 rather than 3, so we are tentatively assigning them to this species. As there is a valid uncertainty whether Rainer & Kaly's specimens from Western Australia are *M. stammeri*, or may represent another species altogether, we report this species for the first time from Australia, at Lizard Island. With such a geographically disjunct distribution reported for *Micronephthys stammeri*, it may be, however, that it represents a suite of cryptic species, the identity of which may only be resolved by the use of genetic analysis of "populations" in conjunction with morphological data.

**Habitat.** In Lizard Island waters, from sand, sandy mud, and sediment associated with seagrass and algae, in intertidal and subtidal shallow water.

**Distribution.** Adriatic Sea, Mediterranean Sea, Japan, Marshall Islands, Australia (Queensland: Lizard Island).

### Genus *Nephtys* Cuvier, 1817 (*sensu* Hartman, 1959)

*Nephtys* Cuvier, 1817: 173.

*Nephtys*.—Hartman 1950: 89; 1959: 282; Ravara *et al.* 2010b: 30; Dixon-Bridges *et al.* 2014: 521.

*Dentinephthys* Imajima & Takeda, 1987: 43.—Ravara *et al.* 2010a: 402.

**Type-species.** *Nephtys hombergii* Savigny in Lamarck, 1818, subsequent designation by Hartman (1959).

**Diagnosis.** The genus *Nephtys* currently includes species with conical, rounded or bilobed acicular lobes and well developed parapodial lobes. Pair of antennae and palps present. Pharynx usually with rows of less than 10 subterminal papillae (usually up to 5–7); elongate middorsal papilla present or absent; proximal region smooth or covered with small verrucae. Branchiae recurved. Lyrate chaetae absent. Aciculae of median and posterior parapodia with curved tips. Jaws conical, hook-like. Nuchal organs round.

**Remarks.** Dixon-Bridges *et al.* (2014) modified the generic diagnosis to include the presence of lyrate chaetae, but this is now ascertained to be an error (Hutchings, pers. obs.). The conical shape of the acicular lobes appears to be the only morphological character that now distinguishes *Nephtys* from *Aglaophamus*, which has acutely pointed acicular lobes, and as this character would seem to be subject to interpretation, and may even depend on the state or type of preservation, it is obvious that a revision of the characters used to define nephtyid genera is required. However, this is beyond the scope of the present study.

### *Nephtys inornata* Rainer & Hutchings, 1977

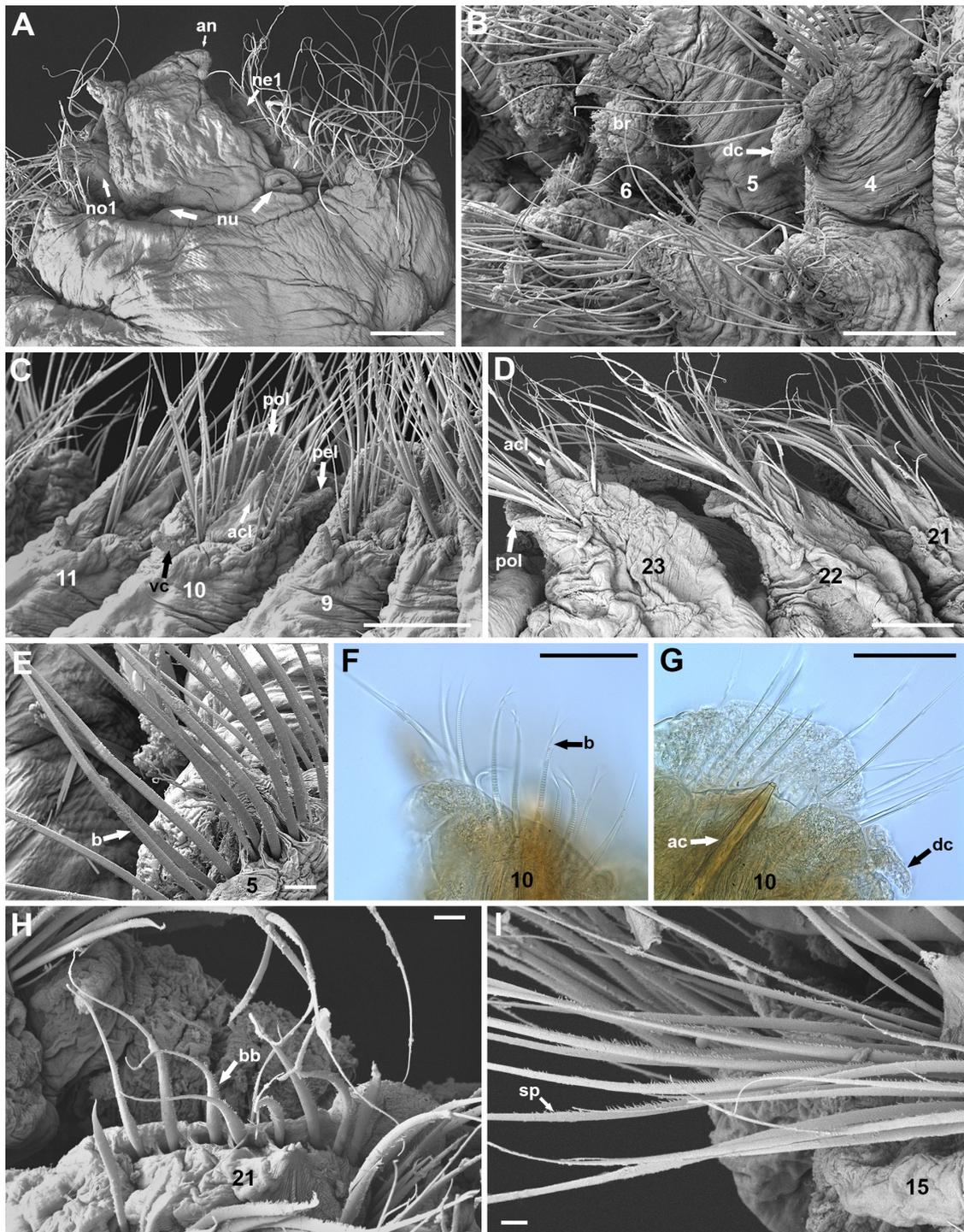
(Fig. 12)

*Nephtys inornata* Rainer & Hutchings, 1977: 327, figs 23–28, 43.

*Nephtys inornata*.—Rainer & Kaly 1988: 699, fig. 7e; Dixon-Bridges *et al.* 2014: 515, 531, 534.

**Material examined.** Queensland, Lizard Island: AM W.47395 (1), 250 m east southeast of Palfrey Island, south end of lagoon, 14°40'S, 145°28'E, sand, 12 m, 12 Oct 1978; AM W.47400 (1), 100 m off eastern end of Mangrove Beach, 14°40'S, 145°28'E, sand, 3.6 m, 11 Oct 1978; AM W.47401 (2), Lagoon, midchannel between Bird Islet and

Trawler Beach, 14°40'S, 145°28'E, fine sediment, 10.6 m, 12 Oct 1978; AM W.47501 (1), Lagoon, 200 m southwest of Freshwater Beach, 14°40'S, 145°27'E, medium-grained sediment, 3 m, 10 Oct 1978.



**FIGURE 12.** *Nephtys inornata*, SEM and light microscope photos of AM W.47395. A. Prostomium, dorsal view, palps not visible, folded under ventrally; B. Chaetigers 4–6, anterolateral view, showing dorsal cirri and start of interramal branchiae; C. Neuropodia 9–11, lateral view; D. Notopodia 21–23, dorsolateral view; E. Barred preacicular chaetae of notopodium 5; F. Light microscope photograph of barred preacicular chaetae of neuropodium 10; G. Notopodium 10, anterior view, light microscope photograph of acicula with tip curving anteriorly (towards viewer), and postacicular lamella behind; H. Preacicular group of chaetae of notopodium 21, barred chaetae absent; I. Postacicular group of chaetae of neuropodium 15, showing spinose chaetae. Abbreviations: ac = acicula, acf = acicular lobe, an = antenna, b = barred chaeta, bb = broad-bladed, finely spinose chaetae, br = interramal branchia, dc = dorsal cirrus, ne1 = neuropodium 1, no1 = notopodium 1, nu = nuchal pit, pel = preacicular parapodial lobe, pol = postacicular parapodial lobe, sp = spinose chaeta, vc = ventral cirrus. Scale bars: A–D, F–G = 0.1 mm, E, H, I = 0.01 mm.

**Other material examined.** AM W.8706, holotype, and AM W.8707–8710, paratypes of *Nephtys inornata*, all from Port Hacking, New South Wales, 34°04'30"S, 151°08'54"E.

**Description.** Preserved specimens from Lizard Island without pigment, up to 25 mm long, 1.5 mm wide for 63 segments. Prostomium as long as wide, wider than long with pharynx basally everted, antennae and palps close together, short, similar in size, arising from outer anterior margins. Nuchal pits round (Fig. 12A). Pair of eyes present middorsally near posterior margin of chaetiger 2. Pharynx with 9 pairs of bifid terminal papillae and 20 longitudinal rows of subdistal conical papillae (4–7 per row), elongate middorsal and midventral subdistal papillae absent, proximal surface smooth, without verrucae. First chaetiger with short ventral cirri, about  $\frac{1}{3}$  length of palps, dorsal cirri papillae-like. Dorsal cirri of chaetiger 2 papillae-like, those of following chaetigers small, digitiform, swollen basally (Fig. 12B, G); ventral cirri small, digitiform (Fig. 12C). Interramal notopodial branchiae starting from chaetiger 5, initially short, recurved (Fig. 12B), becoming longer and cirriform midbody (occupying up to approximately half interrampal space) then decreasing in size posteriorly, continuing to far posterior segments. Patches of cilia present in interrampal space on midbody and posterior segments. Acicular lobes conical and pointed (Fig. 12C–D). Aciculae large, golden, with tips fine, curved, or broken off (Fig. 12G). Notopodial lobes with low preacicular lamellae, anteriorly lamellae slightly longer than acicular lobes, elliptical and foliose, becoming reduced posteriorly. Postacicular notopodial lamellae well developed, low, foliose (Fig. 12D), longer than preacicular lamellae. Neuropodial preacicular lamellae initially small, foliose, becoming longer than acicular lobes in anterior parapodia, then reducing slightly in size midbody and posteriorly. Postacicular neuropodial lamellae well developed, foliose, longer than preacicular lamellae (Fig. 12C), slightly reduced posteriorly and of similar size to notopodial postacicular lamella. Three types of chaetae present: barred chaetae (Fig. 12E–F) present in preacicular position of noto- and neuropodia 1–15, absent thereafter (Fig. 12H); broad-bladed capillaries, some with finely spinose margins, present in preacicular position of noto- and neuropodia posterior to chaetiger 15 (Fig. 12H); finely spinose chaetae (Fig. 12I) present in postacicular position of noto- and neuropodia from chaetiger two; lyrate chaetae absent. Pygidium with short terminal cirrus.

**Remarks.** These specimens found in older collections are somewhat damaged, but identifiable as *Nephtys inornata*, and agree well with Rainer & Hutchings' (1977) description. First record for Queensland.

**Habitat.** Sand, muddy sand or mud, shallow depths, intertidal to 25 m.

**Distribution.** Australia (New South Wales, Victoria, Queensland).

## Key to species of Nephtyidae of Lizard Island

1. Parapodia with branchiae (Figs 1C, 2C, 3D) ..... 2
- Parapodia without branchiae (Figs 5C, 6F), or if present, reduced in size and straight ..... 3 (*Micronephthys*)
2. (1) Lyrate chaetae present (Fig. 2G); notopodial interrampal branchiae involuted (Fig. 2C, E); proximal region of pharynx with verrucae ..... 6
- Lyrate chaetae absent; notopodial interrampal branchiae recurved, start on chaetiger 5 and continue to posterior chaetigers; proximal region of pharynx smooth ..... *Nephtys inornata*
3. (1) Notopodia of chaetiger 1 with specialised dentate chaetae (margin with teeth fused to form knobs, Fig. 11D); eyespots present between chaetigers 2 and 3 ..... *M. stammeri*
- Notopodia of chaetiger 1 without specialised dentate chaetae ..... 4
4. (3) Eyes externally visible (Figs 4A, 8A) ..... 5
- Eyes not visible externally ..... *M. platycephala* n.sp.
5. (4) Two pairs of lensed overlapping eyes present on prostomium (Fig. 4A) ..... *M. oculifera*
- One pair of eyes present at level of chaetiger 2 (Fig. 8A) ..... *M. cf. sphaerocirrata*
6. (2) Involute interrampal notopodial branchiae present from chaetiger 7, interrampal neuropodial branchiae present from chaetiger 8–10 (Fig. 3D); middorsal subdistal pharyngeal papilla absent ..... *Aglaophamus verrilli*
- Involute interrampal notopodial branchiae present from chaetiger 3, neuropodial branchiae absent (Fig. 1C, E); elongate middorsal subdistal pharyngeal papilla present ..... *Aglaophamus cf. lobatus*

## Discussion

Up until now, no species of nephtyid polychaetes have been reported from Lizard Island, although specimens have been collected during ecological surveys previous to the 2013 Lizard Island Polychaete Workshop, from the

1970s–80s. Their absence from the literature is probably due to several reasons: the family is notoriously difficult taxonomically, as the generic characters overlap, and a thorough revision of the family is required, with the result that when specimens are collected they are usually identified to family level only; the family is not a large component of the polychaete fauna, nor do they occur in large numbers—when collected they are usually in numbers of 1–10 individuals—so they are not considered as important as the more abundant taxa in ecological studies, and again, are identified to family level only. This study only initiates the identification of the nephtyid fauna of Lizard Island, with 7 species recorded and described herein, one of them new. However, this taxonomic account is not definitive. There are indications that nephtyid diversity in Lizard Island is still underestimated, as there were many preserved specimens in the AM collections that were excluded from this study because they were too badly damaged due to inadequate fixation or from handling during processing samples, making identification to species and even genus impossible. This also means that the key to species provided herein is preliminary only, because we anticipate that more species will be found if sampling specifically targets those soft sediment habitats in which nephtyids are known to live. Such habitats were relatively poorly sampled during the Lizard Island Polychaete Workshop 2013, and attempts to sample inter-reefal sediments between Lizard Island and the Outer Barrier Reef were unsuccessful, due to malfunction of the soft-sediment grab.

## Acknowledgements

We would like to thank the many people, institutions and organisations that made this publication possible. We are particularly grateful to the directors of Lizard Island Research Station, Anne Hoggett and Lyle Vail, their staff, and all the colleagues and assistants attending the Lizard Island Polychaete Workshop in August 2013, who all combined to make the stay and logistics smooth and productive. The Workshop would have been impossible without funding from Lizard Island Reef Research Foundation and a collecting permit G12/35718.1 issued by the Great Barrier Reef Marine Park Authority. Material from other previous surveys has also been valuable for the present study. Our thanks go to Stephen Keable, Collection Manager of marine invertebrates at the AM, for permitting one of us (AM) to attend the Workshop and to arrange loans and curation of specimens collected, as well as granting access to specimens from other surveys and years to complete the dataset. Australian Museum SEM Lab Manager Sue Lindsay provided invaluable assistance with SEMs, for which we thank her, as well as for her patience. We also thank Ascensão Ravara and Hannelore Paxton who made extremely helpful suggestions that greatly improved the manuscript.

## References

- Alalykina, I.L. & Dnestrovskaya, N. Yu. (2015) *Nephtys sachalinensis* sp. n. (Annelida: Nephtyidae): a new species from the upper sublittoral zone of Northeastern Sakhalin Island, the Sea of Okhotsk. *Russian Journal of Marine Biology*, 41 (2), 127–135.
- Augener, H. (1913) Polychaeta 1, Errantia. In: Michaelsen, W. & R. Hartmeyer (Eds.), *Die Fauna Südwest-Australiens. Ergebnisse der Hamburger südwest-australischen Forschungsreise*, 4, 65–304. [1905]  
<http://dx.doi.org/10.5962/bhl.title.7416>
- Augener, H. (1922) Australische Polychaeten des Hamburger Zoologischen Museums. *Archiv für Naturgeschichte Berlin*, 88 (A), 1–37.
- Augener, H. (1932) Die Polychaeten und Hirudineen des Timavo-gebietes in der Adriatischen Karstregion. *Abdruck aus Zoologische Jahrbücher. Abteilung für Systematik, Ökologie und Geographie der Tier*, 63 (5–6), 657–680.
- Banse, K. (1959) Polychaeten aus Rovinj (Adria). *Zoologischer Anzeiger*, 162, 296–313.
- Benham, W. (1915) Report on the Polychaeta obtained by the F.I.S. Endeavour on the coasts of New South Wales, Victoria, Tasmania and South Australia. Part I. In: *Biological Results of the Fishing Experiments carried on by the F.I.S. ENDEAVOUR*, 3 (4), 173–237. [1909–14]
- Benham, W. (1916) Report on the Polychaeta obtained by the F.I.S. Endeavour on the coasts of New South Wales, Victoria, Tasmania and South Australia Part II. In: *Biological Results of the Fishing Experiments carried on by the F.I.S. ENDEAVOUR*, 4, 125–162. [1909–14]
- Cuvier, Georges, L. (1817) Le règne animal distribué d'après son organisation: pour servir de base à l'histoire naturelle des animaux et d'introduction à l'anatomie comparée. Volume 4. *Les Zoophytes, les Tables, et les Planches*. Deterville, Paris, 255 pp.

<http://dx.doi.org/10.5962/bhl.title.56726>

- Dixon-Bridges, K., Gladstone, W. & Hutchings, P. (2014) One new species of *Micronephthys* Friedrich, 1939 and one new species of *Nephtys* Cuvier, 1817 (Polychaeta: Phyllodocida: Nephtyidae) from eastern Australia with notes on *Aglaophamus australiensis* (Fauchald, 1965) and a key to all Australian species. *Zootaxa*, 3872 (5), 513–540.  
<http://dx.doi.org/10.11646/zootaxa.3872.5.5>
- Dnestrovskaya, N. Yu. (2013) The new species character of Nephtyidae (Polychaeta), taxonomic significance of morphological characters. *Proceedings of the conference “Marine biology, geology, oceanography – interdisciplinary research in marine hospitals”, dedicated to the 75<sup>th</sup> anniversary of the White Sea Biological Station of Moscow State University (Moscow, Feb 27 – Mar 1, 2013): Abstract reports*. KMK Scientific Press Ltd., Moscow, pp. 8–12.
- Dnestrovskaya, N. Yu. & Jirkov, I.A. (2010) *Micronephthys* (Polychaeta: Nephtyidae) of Northern Europe and Arctic. *Invertebrate Zoology*, 7 (2), 107–121.
- Dnestrovskaya, N. Yu. & Jirkov, I.A. (2011) Microscopical studies of nephtyid chaetae (Annelida: Polychaeta: Nephtyidae) from Northern Europe and Arctic. *Italian Journal of Zoology*, 87 (S1), 219–228.
- Fauchald, K. (1965) Some Nephtyidae (Polychaeta) from Australian waters. *Records of the Australian Museum*, 26, 333–340.  
<http://dx.doi.org/10.3853/j.0067-1975.26.1965.682>
- Fauchald, K. (1977) The polychaete worms, definitions and keys to the orders, families and genera. *Natural History Museum of Los Angeles County: Los Angeles, CA (USA) Science Series*, 28, 1–188.
- Grube, A. (1850) Die Familien der Anneliden. *Archiv für Naturgeschichte*, 16, 249–364.
- Hartman, O. (1938) Review of the annelid worms of the family Nephtyidae from the northeast Pacific, with descriptions of five new species. *Proceedings of the United States National Museum*, 85 (3034), 143–158.
- Hartman, O. (1940) Polychaetous annelids. Part II. Chrysopetalidae to Goniadidae. *Allan Hancock Pacific Expeditions*, 7 (3), 173–287.
- Hartman, O. (1950) Goniadidae, Glyceridae and Nephtyidae. *Allan Hancock Pacific Expeditions*, 15, 84–117.
- Hartman, O. (1959) Catalogue of the polychaetous annelids of the world. Part 1. Occasional Paper. *Allan Hancock Foundation Publications*, 23, 1–353.
- Hartmann-Schröder, G. (1991) Teil 16. Die Polychaeten der subtropischen-tropischen bis tropischen Ostküste Australiens zwischen Maclean (New South Wales) und Gladstone (Queensland) sowie von Heron Island (Großes Barriere-Riff). In: Hartmann-Schröder, G., & Hartmann, G. Zur Kenntnis des Eulitorals der australischen Küsten unter besonderer Berücksichtigung der Polychaeten und Ostracoden. *Mitteilungen aus dem Hamburgischen Zoologischen und Institut*, 88, 17–71.
- Imajima, M. & Takeda, Y. (1985) Nephtyidae (Polychaeta) from Japan. I. The genera *Inermonephthys*, *Micronephthys* and *Aglaophamus*. *Bulletin of the National Science Museum, Tokyo, Series A (Zoology)*, 11 (2), 57–90.
- Imajima, M. & Takeda, Y. (1987) Nephtyidae (Polychaeta) from Japan. II. The genera *Dentinephthys* and *Nephtys*. *Bulletin of the National Science Museum, Tokyo, Series A (Zoology)*, 13 (2), 41–77.
- Jirkov, I.A. & Dnestrovskaya, N. Yu. (2012) The answer to Ascensão Ravara (2011) about taxonomic status of *Bipalponephthys* (Polychaeta: Nephtyidae). *Invertebrate Zoology*, 9 (1), 53–54.
- Jones, A.R. (1984) Sedimentary relationships and community structure of benthic crustacean assemblages of reef-associated sediments at Lizard Island, Great Barrier Reef. *Coral Reefs*, 3, 101–111.
- Jumars, P.A., Dorgan, K.M. & Lindsay, S.M. (2015) Diet of worms emended: an update of polychaete feeding guilds. *Annual Review of Marine Science*, 7, 497–520 & Supplements.  
<http://dx.doi.org/10.1146/annurev-marine-010814-020007>
- Kinberg, J.G.H. (1866) *Annulata nova. Öfversigt af Konglich Vetenskapsakademiens förhandlingar*, Stockholm, 23 (9), 337–357.
- Knox, G.A. (1960) Biological Results of the Chatham Islands 1954 Expedition. Part 3. Polychaeta Errantia. *New Zealand Department of Scientific and Industrial Research Bulletin*, 139 (3), 77–143.
- Knox, G.A. & Cameron, D. (1971) Port Phillip Bay survey 1957–1963, Victoria, Australia. Part 2 (4). Polychaeta. *Memoirs of the National Museum of Victoria*, 32, 21–42.
- Lee, J.-H. & Jae, J.-G. (1983) Polychaetous annelids from the Yellow Sea. I. Family Nephtyidae. *Bulletin of the Korea Ocean Research and Development Institute*, 5, 19–27.
- McIntosh, W.C. (1885) Report on the Annelida Polychaeta collected by H.M.S. Challenger during the years 1873–76. *Report of the Scientific Results of the Voyage of H.M.S. Challenger during the years 1873–76*, 12, 1–554.
- Mackie, A. (2000) *Micronephthys oculifera* (Polychaeta: Nephtyidae), a remarkable new species from Hong Kong, China. *Bulletin of Marine Science*, 67 (1), 517–528.
- Nateewathana, A. & Hylleberg, J. (1986) Nephtyid polychaetes from the west coast of Phuket Island, Andaman Sea, Thailand, with a description of five new species. *Proceedings of the Linnean Society of New South Wales*, 108 (3), 195–215.
- Ohwada, T. (1985) Prostomium morphology as a criterion for the identification of Nephtyid polychaetes (Annelida: Phyllodocida) with reference to the taxonomic status of *Aglaophamus neotenus*. *Publications Seto Marine Biology Laboratory*, 30 (1/3), 55–60.
- Paxton, H. (1974) Contribution to the study of the Australian Nephtyidae (Polychaeta). *Records of the Australian Museum*, 29 (7), 197–208.  
<http://dx.doi.org/10.3853/j.0067-1975.29.1974.226>

- Rainer, S. & Hutchings, P. (1977) Nephtyidae (Polychaeta : Errantia) from Australia. *Records of the Australian Museum*, 31 (8), 307–347.  
<http://dx.doi.org/10.3853/j.0067-1975.31.1977.216>
- Rainer, S. & Kaly, U. (1988) Nephtyidae (Polychaeta: Phyllodocida) of Australia: new species from the North West Shelf, and a key to Australian species. *Journal of Natural History*, 22 (3), 685–703.
- Ravara, A., Wiklund, H., Cunha, M. & Pleijel, F. (2010a) Phylogenetic relationships within Nephtyidae (Polychaeta, Annelida). *Zoologica Scripta*, 39, 394–405.  
<http://dx.doi.org/10.1111/j.1463-6409.2010.00424.x>
- Ravara, A., Cunha, M. & Pleijel, F. (2010b) Nephtyidae (Annelida, Polychaeta) from southern Europe. *Zootaxa*, 2682, 1–68.
- Ravara, A. (2011) Comment on the paper by Dnestrovskaya & Jirkov relating to the genus *Micronephthys* (Polychaete: Nephtyidae). *Invertebrate Zoology*, 8 (2), 137–137.
- Read, G. (2015). *Bipalponephthys* Ravara, Wiklund, Cunha & Pleijel, 2010. In: Read, G. & Fauchald, K. (Eds.) (2015) World Polychaeta database. World Register of Marine Species. Available from: <http://www.marinespecies.org/aphia.php?p=taxdetails&id=547401> (accessed 23 March 2015)
- Ribas, J. & Hutchings, P. (2015) Lizard Island Polychaete Workshop: sampling sites and a checklist of polychaetes. *Zootaxa*, 4019 (1), 7–34.  
<http://dx.doi.org/10.11646/zootaxa.4019.1.4>
- Rouse, G. & Pleijel, F. (2001) *Polychaetes*. Oxford University Press, Oxford, 354 pp.
- Rullier, F. (1965) Contribution à la faune des annélides polychètes du Dahomey et du Togo. *Cahiers ORSTOM (Office de la Recherche Scientifique et Technique Outre-Mer)*, Series Océanographie, 3, 5–66.
- San Martín, G. (1982) Una nueva especie de Nephtyidae (Poliquetos: Errantes) del Mediterraneo: *Micronephthys maryae* n. sp. *Cahiers de Biologie Marine*, 23 (4), 427–434.
- Stephenson, W., Williams, W.T. & Lance, G.N. (1970) The macrobenthos of Moreton Bay. *Ecological Monographs*, 40 (4), 459–494.
- Stephenson, W., Williams, W.T. & Cook, S.D. (1974) The benthic fauna of soft bottoms, southern Moreton Bay. *Memoirs of the Queensland Museum*, 17 (1), 73–124.
- Stimpson, W. (1856) Description of some new marine invertebrates. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 7 (10), 385–395.
- Théel, H. (1879) Les annélides polychètes des mers de la Nouvelle-Zemble. *Kungliga Svenska Vetenskapsakademiens Handlingar*, 16 (3), 1–75.
- Wesenberg-Lund, E. (1949) Polychaetes of the Iranian Gulf. *Danish Scientific Investigations in Iran*, 4, 247–400.
- Wilson, R. (2000) Family Nephtyidae. In: Beesley, P., Ross, G., & Glasby, C. (Eds.), *Polychaetes & Allies: The Southern Synthesis. Fauna of Australia. Vol. 4A. Polychaeta, Myzostomida, Pogonophora, Echiura, Sipuncula*. CSIRO Publishing, Melbourne, pp. 136–137.
- WoRMS (2015) Nephtyidae Grube, 1850. In: Read, G. & Fauchald, K. (Eds.), World Polychaeta database. World Register of Marine Species. Available from: <http://www.marinespecies.org/aphia.php?p=taxdetails&id=956> (accessed 29 May 2015)