

New species of free-living aquatic nematodes from south-western Australia (Nematoda: Axonolaimidae and Desmodoridae)

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ABSTRACT – Descriptions of 10 new species of free-living aquatic nematodes are presented. Four of the new species belong to the Axonolaimidae, i.e. *Ascolaimus australis*, *Parascolaimus brevisetus*, *Odontophora serrata* and *Parodontophora aurata*. The remaining six species belong to the Desmodoridae, i.e. *Bolbonema spiralis*, *Onyx cephalispiculus*, *O. potteri*, *Eubostrichus otti*, *Catanema australis* and *Leptonemella peronensis*. All 10 species were found in sediments taken from near-shore waters of either the Swan River Estuary or marine waters of the Perth region (Western Australia). *Ascolaimus australis* differs from its only congener *A. elongatus* in that its spicules are non-barbed and have rounded proximal cephalations. *Parascolaimus brevisetus* is different from its four other congeners by its short cephalic setae, which are less than one quarter the length of any other *Parascolaimus*, and the spicule cephalations are rounded rather than simple or spade-shaped. *Parodontophora aurata* is distinguished from six morphologically similar species by the unique arrangement ((4D-2V)2) and greater length (6 µm) of the opisthocephalic setation. *Odontophora serrata* is distinct from other *Odontophora* species in that each odontium bears seven dentate projections, which is more projections than similar species, *O. bermudensis* (5), *O. villoti* (3) and *O. paravilloti* (3). *Bolbonema spiralis* has spiral amphids with two turns, in contrast to those of *B. longisetosum*, which are only a single loop. *Onyx cephalispiculus* is most similar to *O. sagittarius* but has more robust spicules with large, bilobed cephalations. *Onyx potteri* is the only *Onyx* species to exhibit spicules with a distinct constriction and one of only two species with ten tubular precloacal supplements. The other, *O. dimorphus*, has sexually dimorphic amphids whereas *O. potteri* does not. *Eubostrichus otti* is most similar to *E. topiarus* but is only half the size. Cephalic setation is also divergent, with *E. otti* having two cephalic crowns, eight setae in the anterior, four in the posterior, whereas this arrangement is reversed for *E. topiarus*. *Catanema australis* is most similar to *C. exilis* but is distinguished from that species by the lack of prominent, tubular, postcloacal supplements and having only four pairs of normal setae on the tail. *Leptonemella peronensis* is most similar to *L. granulosa* but differs in its non-granular cephalic capsule, shorter tail and different circumcloacal setation (two precloacal, four postcloacal and one terminal double pair v. *L. granulosa*'s seven postcloacal pairs).

KEYWORDS: morphology, taxonomy.

INTRODUCTION

During extensive studies of the free-living marine and estuarine nematode assemblages of south-western Australia, many previously undescribed species were found, ten of which are now formally described. These comprise two separate families, the Axonolaimidae Filipjev, 1918 (four species) and the Desmodoridae Filipjev, 1922 (six species) and encompass all of the new species which belong to those families that were encountered during these studies. The four representatives of the Axonolaimidae belong to four separate genera, i.e. *Ascolaimus*, *Parascolaimus*, *Odontophora* and *Parodontophora*. Of the six new species within Desmodoridae, one species belongs to the

Desmodorinae (*Bolbonema*), two species to the Spirininae (two *Onyx* species), and the final three species to the Stilbonematinae (one each of *Eubostrichus*, *Catanema* and *Leptonemella*).

Greenslade (1989) provides a comprehensive checklist of the nematode species recorded in Australian marine and estuarine environments prior to 1989 and also details the relevant taxonomic articles. Since that publication, a considerable number of taxonomic papers on Australian free-living nematodes have been produced (e.g. Greenslade and Nicholas 1991; Nicholas 1993, 1996, 2002; Blome and Riemann 1994; Gourbault and Vincx 1994; Stewart and Nicholas 1994, 1995; Nicholas and Trueman 2002). However, these latter publications consider only

species from the east and south coast of Australia, primarily as a reflection of the centers of Australian nematological research. The most recent descriptions of local Western Australian free-living nematode species are those of Inglis (1970, 1971), which describe several species of Cyatholaimidae and Enoplidae, respectively.

The specimens used to describe the 10 species below were collected during the studies detailed by Hourston et al. (2005, 2009). From those publications it is apparent that more than half of the species encountered could not be assigned to previously described species and in some cases, genera. In many instances this is because they represent new species, although it is acknowledged that some species have only been identified to a putative level and that the completion of the taxonomy is an ongoing task given the paucity of local relevant taxonomic research.

Taxonomic research is ongoing for the remaining unidentified species encountered during recent ecological studies in Western Australia (Hourston et al. 2005, 2009). The present paper represents the first of several taxonomic works required to complete this body of work.

METHODS

The methodology for the collection, preservation, mounting and identification for individuals is detailed in Hourston et al. (2005). Reference slides for type material, were prepared by transferring specimens from mixed assemblage slides to individual species reference slides in glycerol, and sealed with slide sealant. All drawings were made using an Olympus CH40 compound light microscope with incorporated drawing tube. All type material for each of the 10 species has been deposited at the Western Australian Museum, Perth (WAM), the specimens indicated as 'other material examined' are currently held by Murdoch University. Further specimens may be lodged as they become available. The registration numbers for each type series are included in the descriptions below.

Family Axonolaimidae Filipjev, 1918

Subfamily Axonolaiminae Filipjev, 1918

Genus *Ascolaimus* Ditlevsen, 1919

Ascolaimus Ditlevsen, 1919: 229.

TYPE SPECIES

Bathylaimus filiformis Ditlevsen, 1918 (junior synonym of *Monhystera elongata* Bütschli, 1874), by monotypy.

Ascolaimus australis sp. nov.

Figures 1A–C; Table 1

MATERIAL EXAMINED

Holotype

Australia: Western Australia: ♂, Leighton Beach

(32°01'43"S, 115°44'51"E), 19 February 2001, M. Hourston (WAM V7450).

Paratypes

Australia: Western Australia: 1 ♀, 1 juvenile, Leighton Beach (32°01'43"S, 115°44'51"E), 19 February 2001, M. Hourston (WAM V7450).

DIAGNOSIS

Ascolaimus australis differs from its only other valid congener, *A. elongatus* Bütschli, 1874, in that the male spicules have simple not barbed distal tips, and rounded proximal cephalations as opposed to spade-shaped cephalations.

DESCRIPTION

Male (holotype)

Body: slender, medium length, predominantly transparent, distinct but fine annulations from posterior of amphid to caudal tip. *Tail:* short, conical. *Setation:* labial; 6, minute; cephalic; 4. Somatic; 4 files, over oesophagus, alternating insertion point between dorso-lateral and ventro-lateral files (Figure 1a.). Terminal; absent. *Buccal cavity:* double conical, weakly sclerotised, unarmed. *Oesophagus:* no bulbs/swellings, cardia indistinct. *Amphid:* large, circular loop, over posterior of buccal cavity. *Spicules:* short, evenly arcuate (90°), distally simple point, proximally cephalate with dorso-lateral twist to the cephalation. *Gubernaculum:* encases distal spicule tips, substantial dorso-caudal apophysis. *Testes:* paired, outstretched, right of intestine. *Supplementary organs:* absent.

Female (paratype)

Same diagnostic structures for body, setation, buccal cavity, amphids. Ovaries: paired, opposed, outstretched, right of intestine.

HABITAT

Type specimens were collected from sub- and supratidal sediments at a moderately high-energy beach in south-western Australia (Leighton Beach). Sediments at this location are predominantly biogenic and calcareous, medium grained and have very low organic content.

REMARKS

Ascolaimus contains only one other valid species, i.e. *A. elongatus*, which has been reported from many locations throughout Europe and North America in many separate articles, many of which provide detailed illustrations. While some details of *A. elongatus* differ among depictions, this species' spicules invariably have distinctive barbed distal ends and spade-shaped proximal cephalation (e.g. De Coninck and Schuurmans-Stekhoven 1932; Gerlach 1953; Warwick et al. 1998). Both distinctive characteristics of the above species are lacking in the presently described species. The spicules of *A. australis* have simple straight distal tips and rounded cephalations.

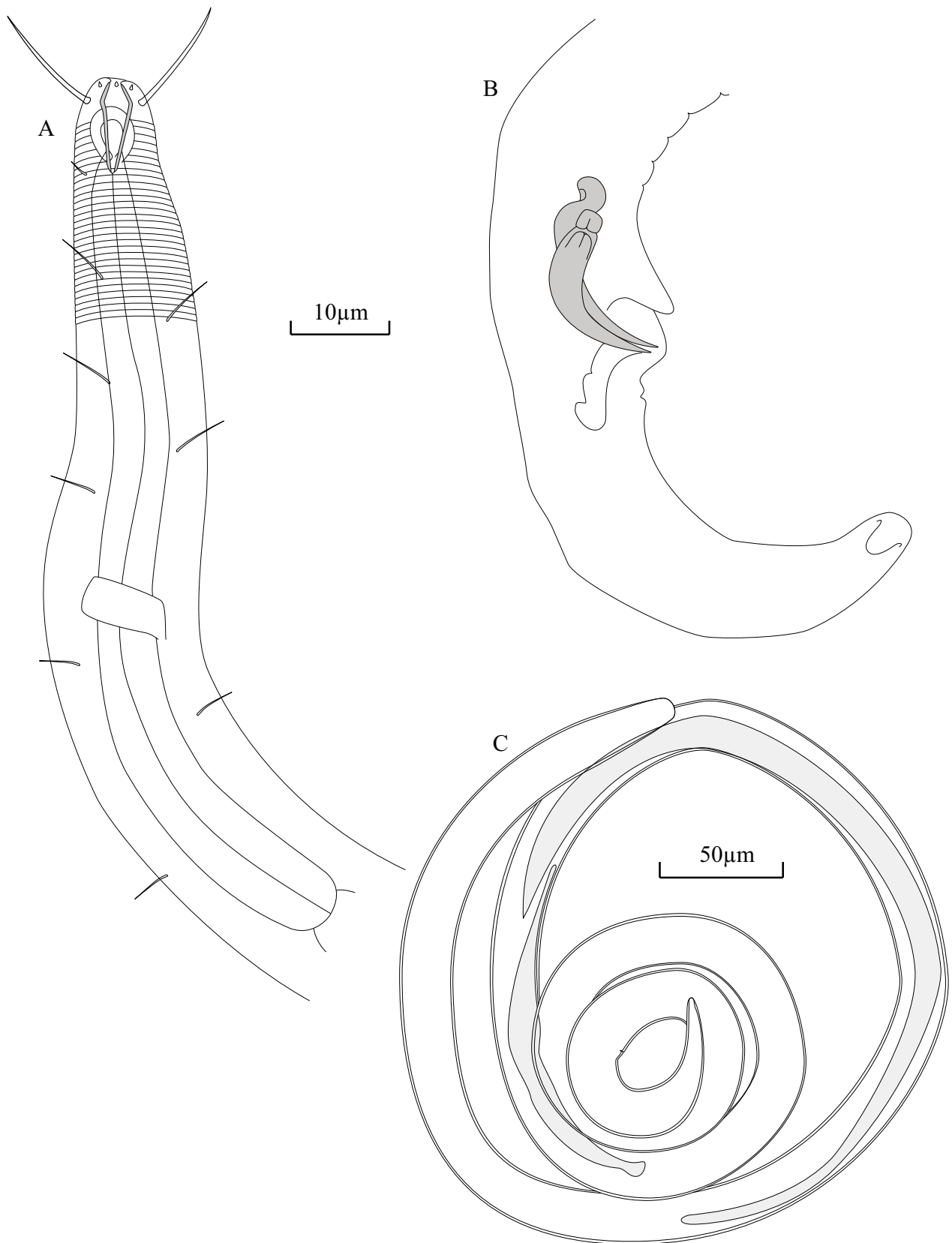


FIGURE 1 *Ascolaimus australis* sp. nov.: A, head and oesophageal region of holotype; B, caudal region of holotype; C, total body of paratype male.

TABLE 1 Morphological measurements for the holotype of *Ascolaimus australis*, as well as those for the male and female paratype specimens. All measurements are in μm unless otherwise stated in tables 1–4 and 6–11. a = body length / maximum body diameter, b = body length/oesophagus length, c = body length/tail length, cbd = corresponding body diameter, from ant = distance from anterior, V (%) = percentage of vulva distance from anterior to total body length, ABD = anal body diameter. All abbreviations used are consistent across tables 1–4 and 6–11. Where sufficient paratype material was available, the ranges of values for the morphological measurements are given.

| | | Holotype | Paratype ♀ | Paratype ♂ |
|-------------------------------|--------------|----------|------------|------------|
| Body length (mm) | | 1.186 | 1.376 | 1.355 |
| a | | 49.4 | 49.1 | 56.4 |
| b | | 8.8 | 9.3 | 8.7 |
| c | | 15.2 | 16.9 | 16.1 |
| head diameter | | 10 | 10 | 13 |
| Setae length | Cephalic | 12 | 15 | 20 |
| | Somatic | 6 | 6 | 5 |
| Buccal cavity length/diameter | | 13/4 | 14/5 | 13/5 |
| Amphid: | from ant | 5 | 8 | 9 |
| | length/width | 7/7 | 7/7 | 7/8 |
| | cbd | 12 | 14 | 18 |
| Nerve ring: | from ant | 72 | 80 | 88 |
| | cbd | 22 | 23 | 22 |
| Oesophagus length | | 134 | 147 | 155 |
| Max diameter | | 24 | 28 | 24 |
| Vulva: | from ant | - | 780 | - |
| | V (%) | - | 57 | - |
| | cbd | - | 28 | - |
| Spicule length (arc) | | 34 | - | 31 |
| ABD | | 25 | 20 | 22 |
| Tail length | | 78 | 81 | 84 |

ETYMOLOGY

Since the only other *Ascolaimus* species (*A. elongatus*) has, to date, only been found in northern hemisphere localities, *A. australis* has been named in contrast, to reflect its southern hemisphere type locality.

Genus *Parascolaimus* Wieser, 1959

Parascolaimus Wieser, 1959: 66.

TYPE SPECIES

Parascolaimus tau Wieser, 1959, by original designation.

***Parascolaimus brevisetus* sp. nov.**

Figures 2A–D, Table 2

MATERIAL EXAMINED

Holotype

Australia: Western Australia: ♂, Fish Market

Reserve (31°53'43"S, 115°57'33"E), 17 August 2005, M. Hourston (WAM V7451).

Paratypes

Australia: Western Australia: 2 ♂, 4 ♀, Fish Market Reserve (31°53'43"S, 115°57'33"E), 17 August 2005, M. Hourston (WAM V7451).

OTHER MATERIAL EXAMINED

Australia: Western Australia: 3 ♂, 3 ♀, Fish Market Reserve (31°53'43"S, 115°57'33"E), 20 August 2005, M. Hourston.

DIAGNOSIS

Parascolaimus brevisetus can be discriminated from its four described congeners in that its cephalic setae are only 5 μm long, less than 1/4 the length of any other *Parascolaimus* species. Also the proximal ends of the spicules have distinct and rounded cephalations rather than simple, spade-shaped or weakly rounded.

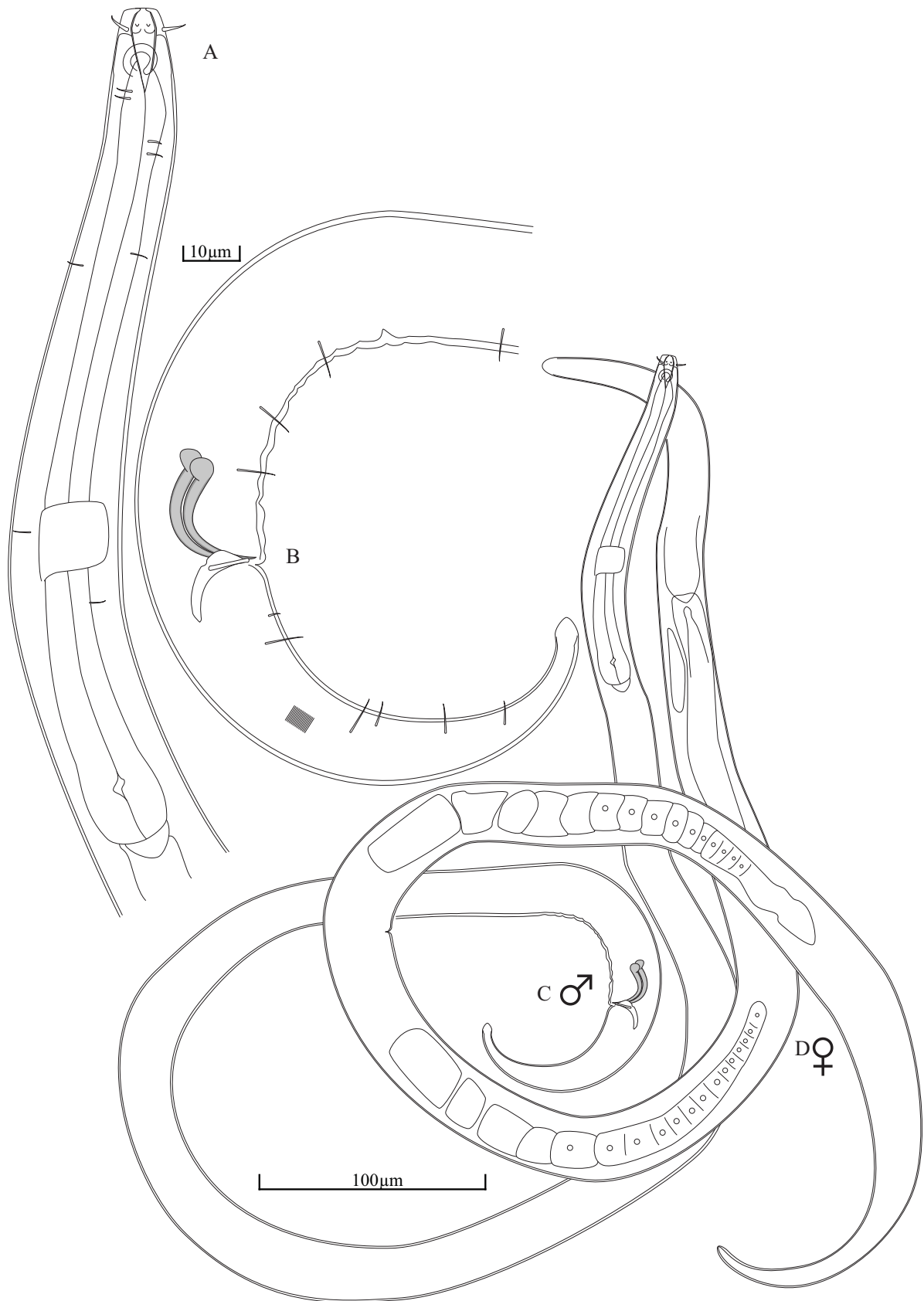


FIGURE 2 *Parascolaimus brevisetus* sp. nov.: A, head and oesophageal region of holotype; B, caudal region of holotype; C, total body of holotype; D, total body of paratype female.

TABLE 2 Morphological measurements for the holotype of *Parascolaimus brevisetus*, as well as the range for female and male paratype specimens.

| | Holotype | Paratype ♀ | Paratype ♂ |
|-------------------------------|----------|-------------|-------------|
| Body length (mm) | 1.035 | 0.935–0.045 | 0.801–1.035 |
| a | 41.4 | 30.4–34.8 | 36.3–41.4 |
| b | 6.0 | 7.3–8.3 | 5.8–6.7 |
| c | 11.0 | 9.3–9.7 | 9.2–11.0 |
| Setae length | | | |
| Cephalic | 5 | 4–5 | 4–5 |
| Somatic | 3 | 3–4 | 3–4 |
| Buccal cavity Length/Diameter | 15/4 | 14/4–16/4 | 12/4–15/5 |
| Head diameter | 9 | 6–8 | 8–9 |
| Amphid: | | | |
| from ant | 7 | 5–8 | 4–7 |
| length/width | 6/6 | 5/5–6/6 | 5/5–6/6 |
| cbd | 11 | 10–12 | 10–11 |
| Oesophagus length | 182 | 113–142 | 119–182 |
| Nerve ring: | | | |
| from ant | 88 | 71–86 | 73–88 |
| cbd | 20 | 18–20 | 17–20 |
| Max diameter | 25 | 27–31 | 20–25 |
| Vulva: | | | |
| from ant | – | 475–585 | – |
| V (%) | – | 51–56 | – |
| cbd | – | 27–31 | – |
| Spicule length (arc) | 26 | – | 25–26 |
| ABD | 22 | 17–19 | 17–22 |
| Tail length | 94 | 100–107 | 87–94 |

DESCRIPTION

Male (holotype)

Body: slender, small, colourless, fine and indistinct annulations visible on posterior of body. *Tail*: short, conical, slight terminal swelling. *Setation*: Cephalic; four, 5 µm from the anterior. Cervical; four pairs, dorso-lateral/ventro-lateral position. Somatic; sparse, short. Sub-ventral; 7 µm, 2 files on posterior body and tail. Terminal; absent. *Buccal cavity*: double conical, lightly sclerotised, labial ‘claws’ *sensu* Wieser (1959). *Oesophagus*: slight posterior bulb, distinct cardia. *Amphid*: circular loop, 7 µm from anterior, over posterior cone of buccal cavity. *Spicules*: slim, moderately arcuate, distinctive rounded cephalations. *Gubernaculum*: two parts, Dorsal part; with apophysis. Ventral part; paired, tubular, parallel to distal end of spicules. *Supplementary organs*: none visible, possible minute structures. *Testis*: large, single, outstretched, left of intestine. Spermatozoa; spherical, readily visible.

Female (paratypes)

Same diagnostic structures for body; setation; buccal cavity, amphids. Ovaries: paired, opposed, outstretched, left of intestine.

HABITAT

Individuals of this species are present in the mid to upper reaches of the Swan River Estuary. Type specimens were found in sediment types ranging from clay/mud to coarse sand, but more commonly occurred in the latter.

REMARKS

Parascolaimus brevisetus is assigned to *Parascolaimus* on the basis of the ‘claw-like’ structures in the buccal cavity as described by Wieser (1959) and a complex, two-part gubernaculum. Within the genus, the present species can be easily discriminated from the other four described species in that the length of the cephalic setae (5 µm) are less than one quarter the length of that described for *P. tau* Wieser, 1959 (36–47 µm), *P. unguatus* Belogurov and Kartavtseva, 1975 (26–40 µm), *P. amphidoporus* Wieser, 1959 (c. 60 µm) and *P. proprius* Belogurov and Kartavtseva, 1975 (c. 40 µm). Furthermore, males of the present species possess distinctly rounded cephalate spicules whereas those of the other four species are either simple, spade-shaped or slightly cephalate. Additionally, the amphids of the present species (50% cbd) are smaller than those of *P. tau* (75% cbd), larger than those of *P. unguatus* (25% cbd) and *P. proprius* (30% cbd), and of a different shape to *P. amphidoporus*.

ETYMOLOGY

Parascolaimus brevisetus has been named for one of the primary features that discriminates it from other *Parascolaimus* species, i.e. its relatively much shorter cephalic setae.

Genus *Odontophora* Bütschli, 1874

Odontophora Bütschli, 1874: 49.

TYPE SPECIES

Odontophora marina Bütschli, 1874 by subsequent designation of Allgén, 1929.

***Odontophora serrata* sp. nov.**

Figures 3A–D; Table 3

MATERIAL EXAMINED

Holotype

Australia: Western Australia: ♂, Chidley Point (32°01'03"S, 115°46'52"E), 6 February 2005, M. Hourston (WAM V7452).

Paratypes

Australia: Western Australia: 1 ♂, 1 ♀, Chidley Point (32°01'03"S, 115°46'52"E), 6 February 2005, M. Hourston (WAM V7452).

Other material examined

Australia: Western Australia: 2 ♂, 3 ♀, 5 juveniles, Penguin Island (32°18'25"S, 115°41'30"E), 20 July 2001, M. Hourston; 1 ♂, 2 ♀, 2 juveniles, Becher Point (32°22'8"S, 115°43'05"E), 20 July 2001, M. Hourston.

DIAGNOSIS

Odontophora serrata is distinct from other *Odontophora* species in that each odontium bears 7 'dentate' projections, creating a serrated appearance. *O. bermudensis*, Jensen and Gerlach, 1976, *O. villoti* Luc and De Coninck, 1959 and *O. paravilloti* Blome, 1982 are the only other recorded species to bear dentate odontia, however, they have only 5, 3 and 3 projections per odontium, respectively.

DESCRIPTION

Male (holotype)

Body: long, slender. *Cuticle:* mainly smooth, fine

TABLE 3 Morphological measurements for the holotype of *Odontophora serrata*, as well as those for the female and male paratype specimens.

| | | Holotype | Paratype ♀ | Paratype ♂ |
|----------------------|--------------|----------|------------|------------|
| Body length (mm) | | 3.080 | 3.086 | 3.061 |
| a | | 64.1 | | 66.5 |
| b | | 18.9 | 19.2 | 19.8 |
| c | | 29.3 | 30.2 | 24.6 |
| Head diameter | | 26 | 30 | 31 |
| Setae length | Cephalic 1 | 36 | 32 | 37 |
| | Cephalic 2 | 8 | 6 | 8 |
| | Subcephalic | 33 | 31 | 30 |
| | Subterminal | 64 | - | 65 |
| Amphid: | from ant | 6 | 2 | 3 |
| | length/width | 6/6 | 7/7 | 8/7 |
| | cbd | 25 | 30 | 27 |
| Nerve ring: | from ant | 115 | 114 | 113 |
| | cbd | 36 | 44 | 38 |
| Oesophagus length | | 163 | 161 | 154 |
| Max diameter | | 48 | 63 | 46 |
| Vulva: | from ant | - | 1700 | - |
| | V (%) | - | 55 | - |
| | cbd | - | 63 | - |
| Spicule length (arc) | | 50 | - | 52 |
| ABD | | 41 | 36 | 40 |
| Tail length | | 105 | 102 | 124 |

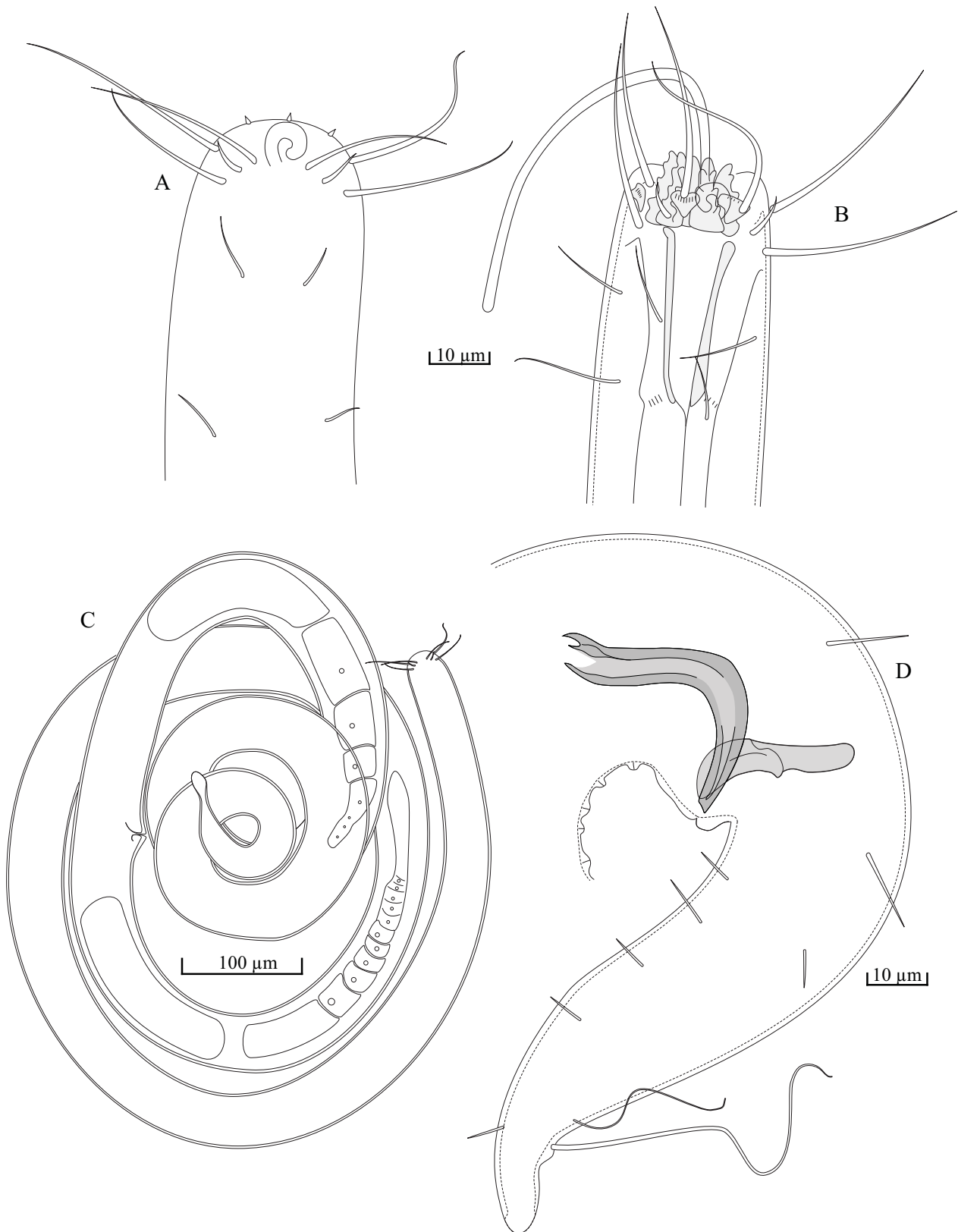


FIGURE 3 *Odontophora serrata* sp. nov.: A, head of paratype female, external only; B, head of holotype, internal and external; C, total body of paratype female; D, caudal region of holotype.

annulations on tail. *Setation*: Labial; six, papillae. Anterior cephalic; six, long, insert level with posterior of amphid. Posterior cephalic; four, shorter, 4 µm behind anterior cephalic. Subcephalic; four, long, 4 µm behind posterior cephalic. Cervical; four files, extending along oesophagus. Somatic; absent. Caudal; thick, four submedian files. Subterminal; conspicuous, thick, 32 and 64 µm long. *Amphid*: small, round loop, extruded corpus gelatum. *Buccal cavity*: typical of *Odontophora*, conical, posterior walls cuticularised, contains odontia. *Odontia*: six, well developed, each has 7 projections, serrated appearance. *Inter-odontial plates*: cuticularised, triangular, anterior edge denticulate. *Oesophagus*: anterior/posterior bulbs absent, cardia present. *Excretory pore*: level with subcephalic setae. *Spicules*: well developed, strongly arcuate, c. 90° angle, proximal end slightly cephalate and dorsally angled. *Gubernaculum*: cuticularised, conspicuous, long dorsal apophysis. *Supplementary organs*: 17, preanal, minute papillae with fine pores. *Testis*: single, outstretched, left of intestine.

Female (paratype)

Similar to male in body shape, anterior setation, amphid, buccal cavity. *Caudal setation*: sparser, conspicuous subterminal setae absent. *Ovaries*: paired, opposed, outstretched, left of intestine, mature eggs large (44 x 160 µm), elongate, conspicuous.

HABITAT

Odontophora serrata is found in calcareous sediments within both marine and estuarine environments of south-western Australia, but is usually only present in low numbers.

REMARKS

Jensen and Gerlach (1976) discussed the difficulties involved in separation of the large number of species in this genus, which differ only in minor features. They describe the 'denticulate projections' on the odontia of *O. bermudensis* Jensen and Gerlach, 1976 as peculiar and suggest that their presence is best seen on specimens on which the odontia are protruded, and that the form of the odontia in descriptions where this is not the case is unknown. However, the three pairs of lateral projections on each odontium of *O. serrata* are very obvious even on specimens where they are not protruded and we do not feel that they could have been overlooked if this species had been described earlier. There are three other species on which similar projections on the odontia have been identified, i.e. *O. villoti* Luc and De Coninck, 1959 and *O. paravilloti* Blome, 1982 which have one pair of projections on each odontium (three-lobed) and *O. bermudensis* which has two pairs (five-lobed). In contrast, *O. serrata* has three pairs of projections on each odontium (seven-lobed). Species in this morphologically similar sub-group also share the presence of a pair of long dorsolateral setae near the tail tip, but none so long as *O. serrata*.

ETYMOLOGY

This species had been named for its characteristic odontia, which have a distinctly serrated appearance due to the projections along their edges.

Genus *Parodontophora* Timm, 1963

Parodontophora Timm, 1963: 35.

TYPE SPECIES

Pseudolella paraganulifera Timm, 1952, by original designation.

Parodontophora aurata sp. nov.

Figures 4A–D, Tables 4, 5

MATERIAL EXAMINED

Holotype

Australia: Western Australia: ♂, Fish Market Reserve (31°53'43"S, 115°57'33"E), 8 February 2005, M. Hourston (WAM V7453).

Paratypes

Australia: Western Australia: 1 ♂, 2 ♀, Fish Market Reserve (31°53'43"S, 115°57'33"E), 8 February 2005, M. Hourston (WAM V7453).

Other material examined

Australia: Western Australia: 2 ♂, 2 ♀, Coode St Jetty (31°58'23"S, 115°52'08"E) 08 February 2005, M. Hourston.

DIAGNOSIS

Parodontophora aurata is one of six morphologically similar species. It is distinguished from those other five primarily by the unique arrangement (two dorsal files of three or four setae each and two ventral files of two setae) and greater length (6 µm) of the opisthocephalic setation.

DESCRIPTION

Holotype

Body: medium size, stout, dark amber in colour. *Tail*: conical. *Cuticle*: light annulations over entire body. *Setation*: Labial; 6, papillae. Cephalic; 4. Opisthocephalic; (*sensu* Wu et al. 2000), four files, dorso-lateral files 3–4 setae, ventro-lateral files 2 setae. Cervical; sparse, fine. Caudal; 2 subventral files. *Buccal cavity*: long, narrow, parallel and sclerotised walls. *Odontia*: six, simple, well developed. *Amphid*: 'crook-shaped', entirely over buccal cavity, shorter leg c. 70% of longer leg. *Oesophagus*: narrow, not surrounding buccal cavity, wider posterior to nerve ring. *Oesophageal bulb*: absent. *Renette cell*: large, 54 µm long, 36% oesophagus length. *Spicules*: slender, arcuate, split proximal cephalations. *Gubernaculum*: triangular, narrow dorso-caudal apophysis. *Supplementary organs*: absent. *Testes*: paired, outstretched, right of intestine.

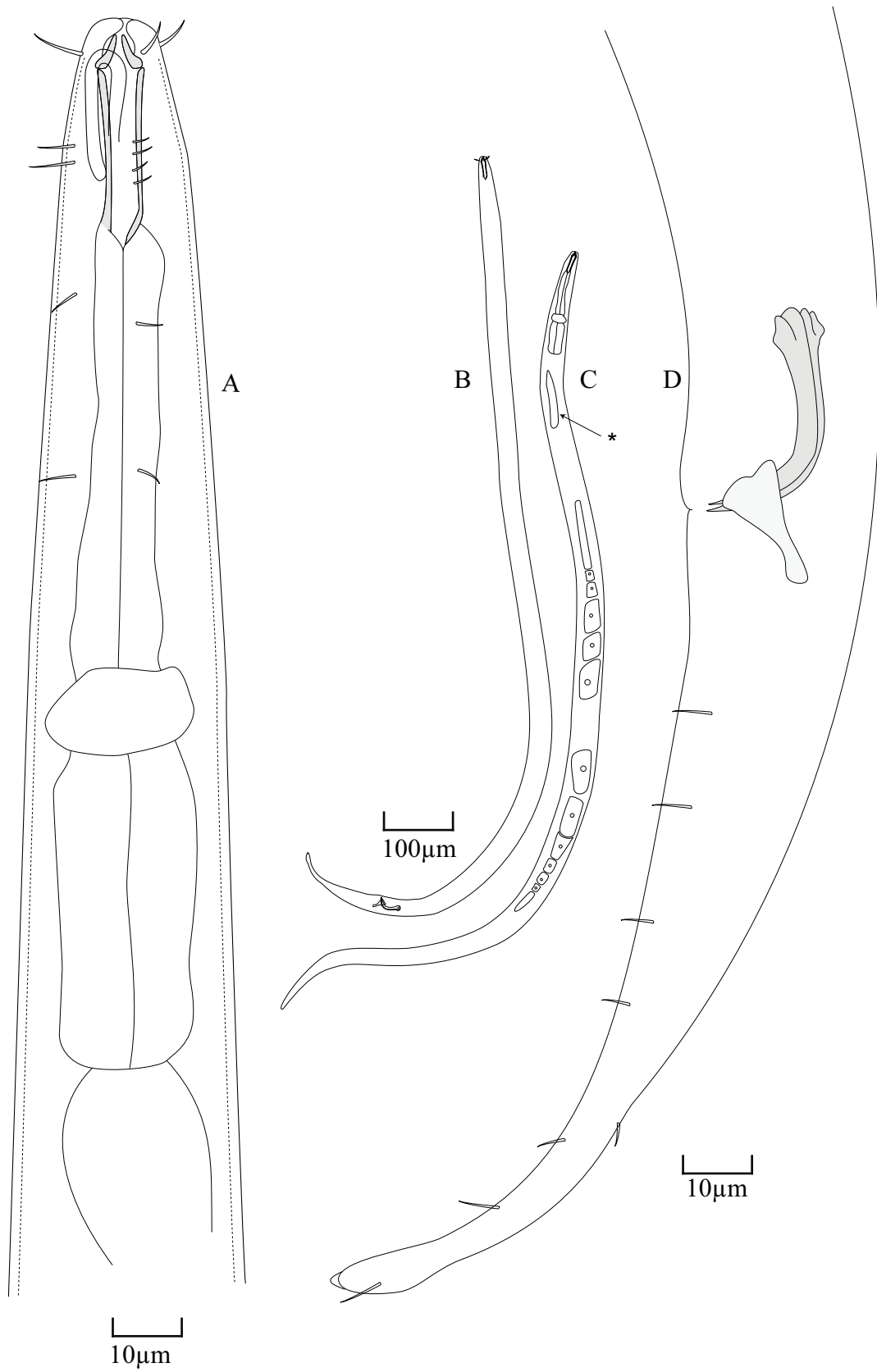


FIGURE 4 *Parodontophora aurata* sp. nov.: A, head of holotype; B, total body of holotype; C, total body of paratype female showing renette cell (*); D, caudal region of holotype.

TABLE 4 Morphological measurements for the holotype of *Parodontophora aurata* sp. nov., as well as the range of measurements for female and male paratype specimens.

| | | Holotype | Paratype ♀ | Paratype ♂ |
|-------------------------------|-----------------|----------|-------------|-------------|
| Body length (mm) | | 1.170 | 1.160–1.322 | 1.174–1.329 |
| a | | 39 | 27.5–35.1 | 39.0–44.0 |
| b | | 8.2 | 7.7–8.1 | 7.1–8.9 |
| c | | 9.1 | 9.6–11.8 | 8.5–11.0 |
| Head diameter | | 18 | 14–14 | 12–18 |
| Setae length | Cephalic | 8 | 7–8 | 7–8 |
| | Opisthocephalic | 6 | 5–6 | 5–6 |
| | Cervical | 6 | 5–5 | 5–6 |
| Buccal cavity Length/Diameter | | 33/6 | 30/7–33/8 | 30/5–48/7 |
| Amphid: | from ant | 5 | 2–5 | 2–5 |
| | dorsal arm | 20 | 16–17 | 18–20 |
| | ventral arm | 14 | 13–14 | 14–15 |
| | cbd | 18 | 31–33 | 25–30 |
| Nerve ring: | from ant | 94 | 95–97 | 84–94 |
| | cbd | 29 | 28–31 | 25–30 |
| Oesophagus length | | 142 | 150–162 | 142–167 |
| Max diameter | | 30 | 33–45 | 28–30 |
| Vulva: | from ant | – | 620–680 | – |
| | V (%) | – | 50–54 | – |
| | cbd | – | 33–45 | – |
| Spicule length (arc) | | 40 | – | 33–40 |
| ABD | | 26 | 22–26 | 26–28 |
| Tail length | | 129 | 98–135 | 120–140 |

Female (paratypes)

Similar to male, lower DeMan a ($\delta=39$ v. $\delta<35$).
Ovaries: paired, opposed, outstretched, right of intestine.

HABITAT

Individuals of *Parodontophora aurata* are relatively common in sediments at upper estuarine/riverine locations in the Swan River Estuary. This species does not exhibit any marked preference for sediment type and is found in types ranging from gravels to fine clay/mud.

REMARKS

Parodontophora aurata can be distinguished from the majority of other congeneric species by the fact that the two arms of the amphid are not extremely different in length, and the longer arm does not extend past the base of the buccal cavity, such as the case for example, *P. wuleidaowanensis* Zhang, 2005. Of the remaining species, a group of morphologically similar species was identified by Wu et al. (2000) in which *P. aurata* should also now be included. The latter authors present a table summarising the distinguishing characteristics for

those five allied *Parodontophora* species. It is evident from Table 5 that although comparable values for most characters can be found among the other five species, the particular combination of characters found for *P. aurata* is unique. Those characters for which there are no exact match in the other five species are the length and arrangement of the opisthocephalic setae (see Diagnosis).

ETYMOLOGY

This species has been named for the distinct and consistent colouration of individuals, which ranges from light yellow through to dark amber.

Family Desmodoridae Filipjev, 1922

Subfamily Desmodorinae Filipjev, 1922

Genus *Bolbonema* Cobb, 1920

Bolbonema Cobb, 1920: 264.

TYPE SPECIES

Bolbonema brevicolle Cobb, 1920, by monotypy.

TABLE 5 An adaptation of Table 2 as presented in Wu *et al.* (2000) with *P. aurata* included for comparison. In those situations where a character is similar for both *P. aurata* and another species, that character has been highlighted.

| | <i>Parodontophora aurata</i> | <i>Parodontophora limnophilla</i> | <i>Parodontophora marisjaponici</i> | <i>Parodontophora breviampifida</i> | <i>Parodontophora quadristica</i> | <i>Parodontophora marina</i> |
|-----------------------------------|------------------------------|-----------------------------------|-------------------------------------|-------------------------------------|-----------------------------------|------------------------------|
| Cephalic setae length (µm) | 8 | 4 | 7 | 7-8 | 10.5 | 6-7.5 |
| Opisthocephalic setae length (µm) | 6 | 2 | 3.6-4.0 | ? | ? | ? |
| Opisthocephalic setae arrangement | (3/4D-2V)2 | (3D-1V)2 | (3D-1V)2 | (1D-2V)2 | (4D-3V)2 | (3D-1V)2 |
| amphidial dorsal/ventral arm | 70% | 50% | 80% | < 50% | ? | > 65% |
| Position of excretory pore | mid-stoma | anterior stoma | anterior stoma | anterior stoma | mid-stoma | mid-stoma |
| Renette cell/ oesophagus length | 36% | 34-47% | 35-40% | 40% | 50-55% | 45-57% |

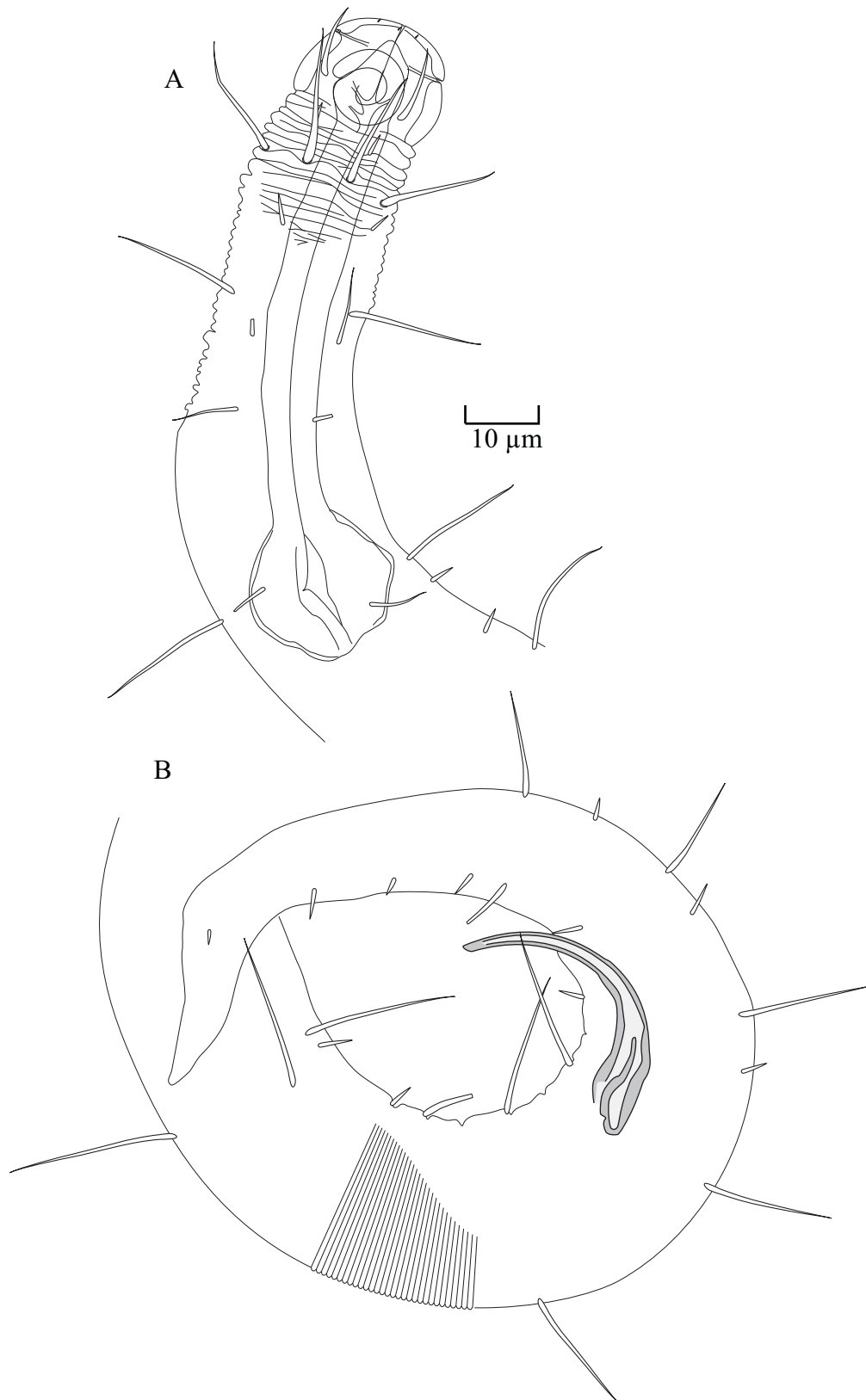


FIGURE 5 *Bolbonema spiralis* sp. nov.: A, head and oesophageal region of holotype; B, caudal region of holotype.

***Bolbonema spiralis* sp. nov.**

Figures 5A, B, Table 6

MATERIAL EXAMINED

Holotype

Australia: Western Australia: ♂, Mangles Bay (32°16'08"S, 115°41'34"E), 14 February 2004, R. Caccianiga (WAM V7454).

Paratypes

Australia: Western Australia: 6 ♂, 6 ♀, Mangles Bay (32°16'08"S, 115°41'34"E), 14 February 2004, R. Caccianiga (WAM V7454).

Other material examined

Australia: Western Australia: 1 ♂, 1 ♀, Chidley Point (32°01'03"S, 115°46'52"E), 6 February 2005, M. Hourston; 2 ♀, Mosman Waters (32°01'29"S, 115°46'26"E), 10 July 2005, M. Hourston.

DIAGNOSIS

Bolbonema spiralis differs from its described congeners by having distinctly spiral amphids with two turns, whereas the others have only a single loop. *B. spiralis* also differs from *B. longisetosum* as that former species has no pre- or post-cloacal supplements.

DESCRIPTION

Male (holotype)

Body: medium size, brown. *Tail:* short, conical. *Cuticle:* annulated, coarse/irregular anteriorly, fine/regular posteriorly. *Cephalic capsule:* distinct from body, smooth, abscission at 30% from anterior is semi-complete and interrupted by amphid. *Amphid:* large, spiral, 2 turns. *Setation:* Labial; 6, papillae. Cephalic; 4, level with amphid centre. Subcephalic; 4, at cephalic capsule base. Somatic; eight files regularly spaced radially, setae longitudinally alternate long (c. 22 µm) and short (c. 4 µm), extend from cephalic capsule base to posterior of cloaca. Terminal; absent. *Buccal cavity:* minute, unarmed. *Oesophagus:* short, narrow, non-muscular, oesophageal bulb distinct, cardia absent. *Spicules:* even arc, simple proximal cephalation. *Gubernaculum:* indistinct, small, simple, slender dorsal apophysis. *Supplementary organs:* indistinct or absent. *Testis:* single, outstretched, right of intestine.

Female (paratypes)

Similar to male. Comparable length, much greater girth. *Amphid:* 1.75 turns. *Ovaries:* paired opposed, reflexed, right of intestine.

TABLE 6 Morphological measurements for the holotype of *Bolbonema spiralis* sp. nov., as well as the range of measurements for the female and male paratype specimens.

| | | Holotype | Paratype ♀ | Paratype ♂ |
|----------------------|--------------|----------|-------------|-------------|
| Body length (mm) | | 1.093 | 0.974–1.145 | 0.984–1.079 |
| a | | 32.1 | 26.6–31.3 | 34.2–39.3 |
| b | | 11.5 | 10.0–13.0 | 10.1–11.5 |
| c | | 12.8 | 10.2–13.7 | 10.8–11.8 |
| Head diameter | | 19 | 17–19 | 17–18 |
| Setae length | Cephalic | 9 | 10–11 | 9–12 |
| | Subcephalic | 4 | 4–5 | 4–5 |
| Amphid: | from ant | 5 | 3–5 | 4–6 |
| | length/width | 11/11 | 9/9–10/10 | 10/10–13/13 |
| | cbd | 19 | 17–19 | 17–18 |
| Nerve ring: | from ant | 56 | 55–64 | 58–63 |
| | cbd | 26 | 24–27 | 22–25 |
| Oesophagus length | | 94 | 88–97 | 91–102 |
| Max diameter | | 34 | 33–42 | 25–30 |
| Vulva: | from ant | – | 520–587 | – |
| | V (%) | – | 50–53 | – |
| | cbd | – | 33–38 | – |
| Spicule length (arc) | | 48 | – | 43–57 |
| ABD | | 18 | 16–18 | 18–20 |
| Tail length | | 84 | 71–104 | 87–100 |

TABLE 7 Morphological measurements for the holotype of *Onyx cephalispiculus* sp. nov., as well as the range of measurements for the female and male paratype specimens.

| | Holotype | Paratype ♀ | Paratype ♂ |
|----------------------|--------------|-------------|-------------|
| Body length (mm) | 1.204 | 1.215–1.268 | 1.232–1.284 |
| a | 20.7 | 21.7–22.0 | 25.1–27.2 |
| b | 5.1 | 5.7–6 | 6.3–6.4 |
| c | 11.7 | 11.8–13.0 | 9.7–14.0 |
| Head diameter | 34 | 33–33 | 29–32 |
| Setae length | | | |
| | Labial | 5–5 | 4–6 |
| | Cephalic | 13 | 12–15 |
| | Subcephalic | 7 | 6–11 |
| Amphid: | | | |
| | from ant | 1 | 0–1 |
| | length/width | 6/7 | 5/7–5/7 |
| | cbd | 24 | 12–22 |
| Nerve ring: | | | |
| | from ant | 115 | 102–112 |
| | cbd | 47 | 45–49 |
| Oesophagus length | 235 | 202–223 | 193–201 |
| Max diameter | 58 | 55–58 | 47–49 |
| Vulva: | | | |
| | from ant | – | – |
| | V (%) | – | – |
| | cbd | – | – |
| Spicule length (arc) | 69 | – | 65–75 |
| No. of supplements | 24 | – | 18–23 |
| ABD | 47 | 34–36 | 45–49 |
| Tail length | 112 | 93–107 | 88–128 |

HABITAT

All type specimens are from near-shore, sandy marine sediments. Additional individuals were recorded from the marine reaches of the Swan River Estuary, also in similar sediments.

REMARKS

Vershelde et al. (1998) ascribe two other species to the genus *Bolbonema*, namely *B. brevicolle* Cobb, 1920, and *B. longisetosum* Jensen, 1985. The latter species has longitudinally oval amphids describing a single loop in the male, with distinct pre- and post-cloacal supplements. *B. brevicolle* was rather inadequately described by Cobb (1920) on the basis of a single female specimen, the amphids of which are in the form of a single circular loop like those depicted by Jensen (1985) for a juvenile *B. longisetosum*. The synonymy of *B. brevicolle* and *B. longisetosum* cannot be dismissed on the basis of the published taxonomic literature alone.

ETYMOLOGY

The specific epithet refers to the spiral nature of the amphids, which are a primary diagnostic feature within the genus.

Subfamily Spiriniinae Gerlach and Murphy, 1965

Genus *Onyx* Cobb, 1891

Onyx Cobb, 1891: 146.

TYPE SPECIES

Onyx perfectus Cobb, 1891, by monotypy.

Onyx cephalispiculus sp. nov.

Figures 6A–C, Table 7

MATERIAL EXAMINED

Holotype

Australia: Western Australia: ♂, Mosman Waters (32°01'29"S, 115°46'26"E), 6 February 2005, M. Hourston (WAM V7455).

Paratypes

Australia: Western Australia: 7 ♂, 5 ♀, Mosman Waters (32°01'29"S, 115°46'26"E), 6 February 2005, M. Hourston (WAM V7455).

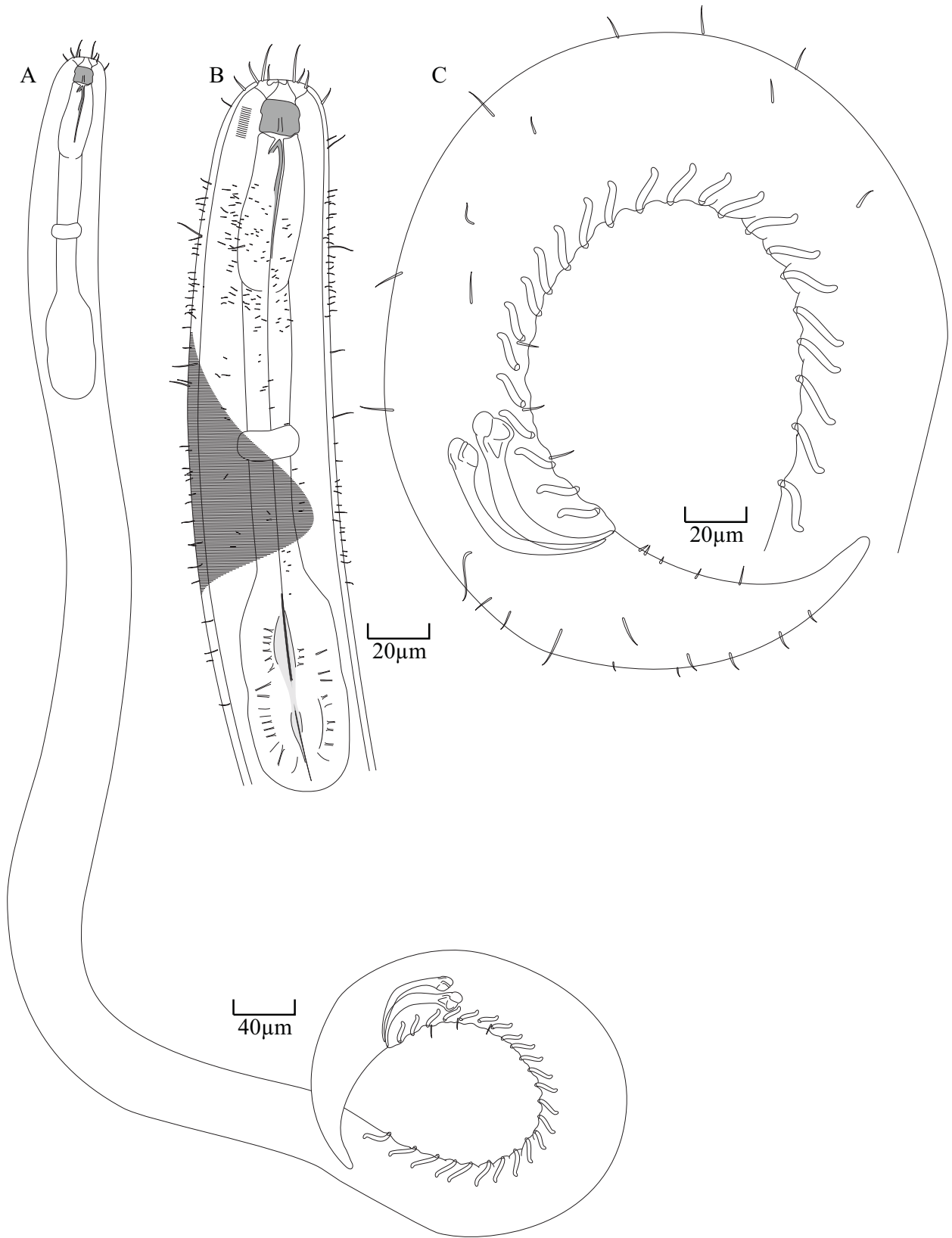


FIGURE 6 *Onyx cephalispiculus* sp. nov.: A, total body of holotype; B, head and oesophageal region of holotype; C, caudal region of holotype.

Other material examined

Australia: Western Australia: 10 ♂, 12 ♀, Mosman Waters (32°01'29"S, 115°46'26"E), 20 February 2005, M. Hourston; 2 ♂, 4 ♀, Chidley Point (32°01'03"S, 115°46'52"E), 6 February 2005, M. Hourston.

DIAGNOSIS

Onyx cephalispiculus, and the previously described *O. sagittarius* Gerlach, 1950, share the largest number of precloacal supplements of any *Onyx* species (24). *O. cephalispiculus* differs from *O. sagittarius* as it has larger, more robust spicules which are more arcuate and have large, bilobed proximal cephalations.

DESCRIPTION

Male (holotype)

Body: medium sized, red/brown. *Tail:* short, conical. *Cuticle:* very finely annulated. *Amphid:* simple single loop, extreme anterior placement. *Setation:* Labial; 6, setiform. Cephalic; 4, level with amphid. Subcephalic; 8, posterior to amphid. Cervical; four dense fields, very short and fine. Somatic; short, fine, sparse. Postcloacal; 2 subventral files, conspicuous cluster immediately post cloacal. Terminal; absent. *Buccal cavity:* strongly sclerotised forming a ring anterior to tooth. *Dorsal tooth:* well-developed, hollow, sclerotised. *Oesophagus:* narrow isthmus, anterior bulb well developed, posterior bulb very well developed, elongate, sclerotised inner lining, lacunae present *sensu O. macramphis* Blome and Riemann, 1994. *Nerve ring:* distinct, 50% oesophagus length. *Spicules:* distinct, arcuate, large bilobed cephalations. *Supplements:* 24, S-shaped, equally-sized. *Testis:* single outstretched, left of intestine.

Female (paratypes)

Similar to holotype, slightly less hirsute. *Ovaries:* paired, opposed, reflexed, left of intestine.

HABITAT

All type specimens for *Onyx cephalispiculus* were collected subtidally in the predominantly marine lower Swan River Estuary. Sediment had heterogeneous grain size with low to moderate particulate organic content.

REMARKS

An annotated list of *Onyx* species is presented in Blome and Riemann (1994) which presents a summary of the diagnostic characters of the eight species previously described for the genus, to which *O. cephalispiculus* (and *O. potteri* sp. nov., see later) should now be added.

Onyx cephalispiculus most resembles *Onyx sagittarius* in that the males of both species possess up to 24 strongly cuticularised, S-shaped, precloacal supplements; a feature which distinguishes these two species from all of the other known species of this

genus. *Onyx cephalispiculus* can be discriminated from *O. sagittarius* by the shapes of both the spicules and gubernaculum. The spicules of *O. cephalispiculus* are strongly arcuate and cephalated, with the cephalation being abscised laterally giving it a bilobed appearance while those of *O. sagittarius* are non-cephalated and not as strongly arcuate. Also, the gubernaculum and its dorsal apophysis are larger and more robust for the present species than depicted for *O. sagittarius*. The post cloacal, subventral cuticular elevations noted for *O. sagittarius* are absent on the present species. The fields of short setae in the cervical region of individuals of both sexes are a unique feature of this species.

ETYMOLOGY

The species epithet 'cephalispiculus' reflects the distinctive cephalations of this species' spicules, which are unique within the genus *Onyx*.

***Onyx potteri* sp. nov.**

Figures 7A–D, Table 8

MATERIAL EXAMINED

Holotype

Australia: Western Australia: ♂, Leighton Beach (32°01'43"S, 115°44'51"E), 30 January 2001, M. Hourston (WAM V7456).

Paratypes

Australia: Western Australia: 1 ♀, 4 juveniles, Leighton Beach (32°01'43"S, 115°44'51"E), 30 January 2001, M. Hourston (WAM V7456).

DIAGNOSIS

Onyx potteri is the only *Onyx* species to exhibit spicules which are distinctly constricted as depicted in Figure 7c. Furthermore, except *O. dimorphus* Gerlach, 1963 it is only 1 of 2 species with 10 tubular precloacal supplements. *Onyx dimorphus* displays marked sexual dimorphism in amphid structure where as *O. potteri* does not.

DESCRIPTION

Male (holotype)

Body: moderately long, slim, dark brown. *Cuticle:* fine distinct annulations, posterior of amphid to tail tip. *Amphid:* anterior placement, conspicuous, spiral, 2.75 turns. *Setation:* Cephalic; 2 crowns, 6 short anterior, 4 longer posterior. Sub-cephalic; 8, at posterior amphid edge. Cervical; irregular, long, over oesophagus. Somatic; short, fine, irregular, sparse. Terminal; absent. *Dorsal spines:* dorsal file, caudal region, regular wide spacing. Most very short (3 µm), two long on tail (20 µm). *Cloacal thorn:* present, minute. *Buccal cavity:* cup shaped, lightly sclerotised, distinct rugae. *Dorsal tooth:* well developed, hollow, sclerotised. *Oesophagus:* well

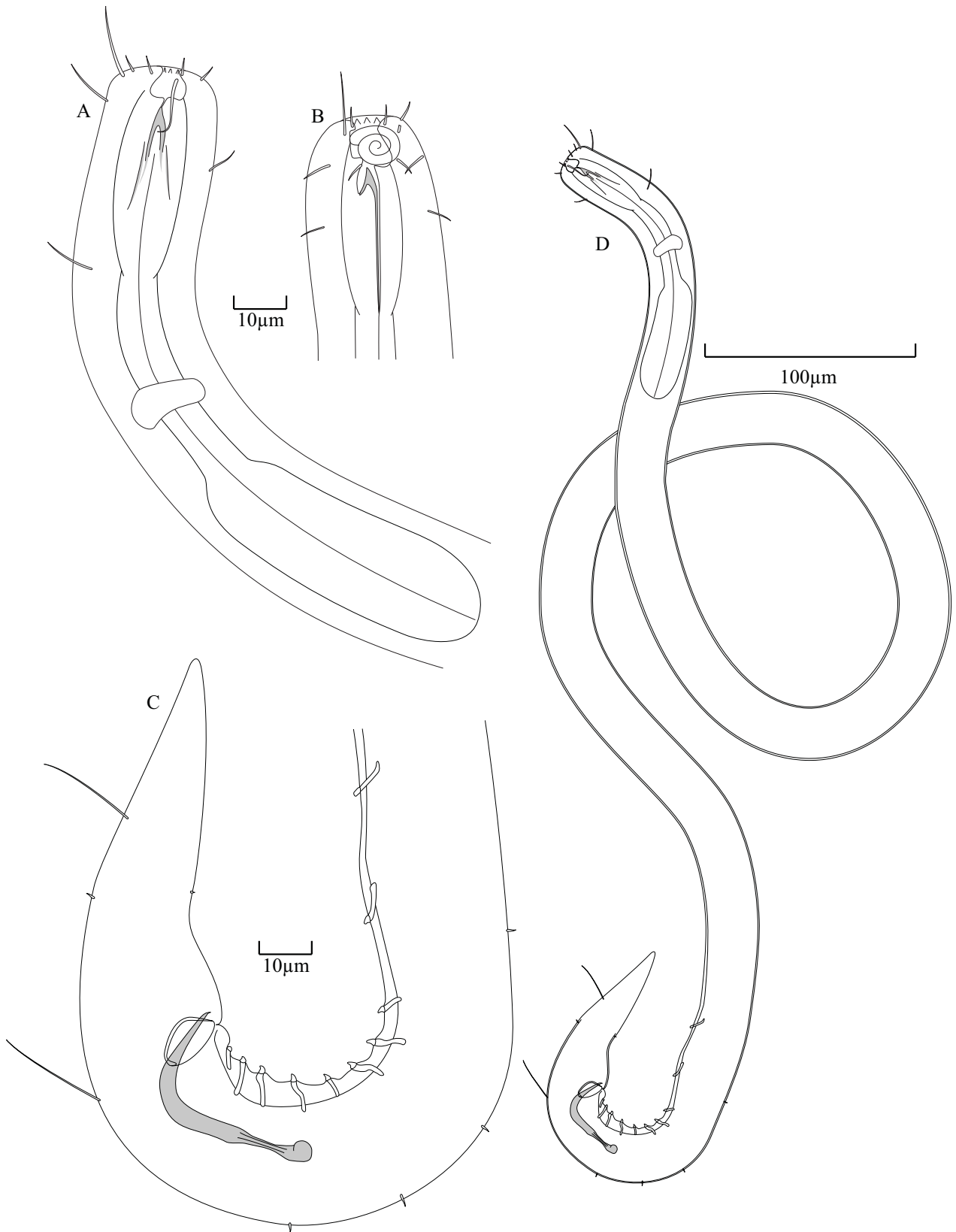


FIGURE 7 *Onyx potteri* sp. nov.: A, head and oesophageal region of holotype; B, head of paratype female; C, caudal region of holotype; D, total body of paratype male.

TABLE 8 Morphological measurements for the holotype of *Onyx potteri*, as well as those for the female paratype and the range of measurements for the juvenile paratype specimens.

| | Holotype | Paratype ♀ | Paratype. Juv |
|----------------------|----------|------------|---------------|
| Body length (mm) | 1.112 | 0.776 | 0.660–0.839 |
| a | 39.7 | 26.8 | 25.3–33.5 |
| b | 8.1 | 5.6 | 5.8–7.0 |
| c | 13.7 | 12.9 | 10.4–12.1 |
| Head diameter | 20 | 21 | 18–23 |
| Setae length: | | | |
| Labial | 4 | 3 | 3–3 |
| Cephalic | 14 | 11 | 9–14 |
| Subcephalic | 9 | 6 | 6–10 |
| Amphid: | | | |
| from ant | – | 2 | 1–7 |
| length/width | 8/8 | 8/8 | 7/8–10/10 |
| cbd | 21 | 18 | 17–21 |
| Nerve ring: | | | |
| from ant | 63 | 67 | 60–63 |
| cbd | 23 | 28 | 21–25 |
| Oesophagus length | 137 | 138 | 106–125 |
| Max diameter | 28 | 29 | 25–26 |
| Vulva: | | | |
| from ant | – | 426 | – |
| V (%) | – | 55 | – |
| cbd | – | 29 | – |
| Spicule length (arc) | 50 | – | – |
| ABD | 27 | 23 | 20–21 |
| Tail length | 81 | 60 | 60–69 |

developed anterior/posterior bulbs, narrow isthmus, posterior bulb elongate, lacunae absent, non-sclerotised, cardia absent. *Spicules*: moderately sclerotised, slender, distinct angle, simple distal tip, distinct constriction, small proximal cephalations. *Supplements*: 10; posterior eight well defined, closely spaced, thick surrounding cuticle. anterior two inconspicuous, set apart, thin surrounding cuticle. *Gubernaculum*: oval, sclerotised posterior margin, surrounds spicule tips. *Testis*: single, left of intestine.

Female (paratype)

Similar to holotype. *Amphid*: similar dimensions, 2.5 turns. *Ovaries*: paired, opposed, reflexed, left of intestine. Uteri each contain a single large elongate egg (80 x 25 µm).

HABITAT

The type specimens were collected from nearshore marine waters along the lower west coast of Western Australia during the study by Hourston et al. (2005). The individuals were present in the calcareous sediments at the relatively high-energy site (Leighton Beach).

REMARKS

According to the annotated list of *Onyx* species in

Blome and Reimann (1994) only *O. dimorphus* also has ten tubular precloacal supplements. *Onyx dimorphus* is further described as having sexually dimorphic amphid structure, and depicted as relatively hirsute. This is in contrast to *O. potteri* in which the sexes have similar amphids, and are comparatively glabrous. Furthermore, there are no described species of *Onyx* that have spicules with the distinct constriction below the cephalation.

ETYMOLOGY

This species is dedicated to Prof. Ian Potter for his major contribution to marine and estuarine research in Western Australia.

Subfamily Stilbonematinae Chitwood, 1936

Genus *Eubostrichus* Greef, 1869

Eubostrichus Greef, 1869: 117.

TYPE SPECIES

Eubostrichus filiformis Greef, 1869, by subsequent designation of Stiles and Hassal (1905).

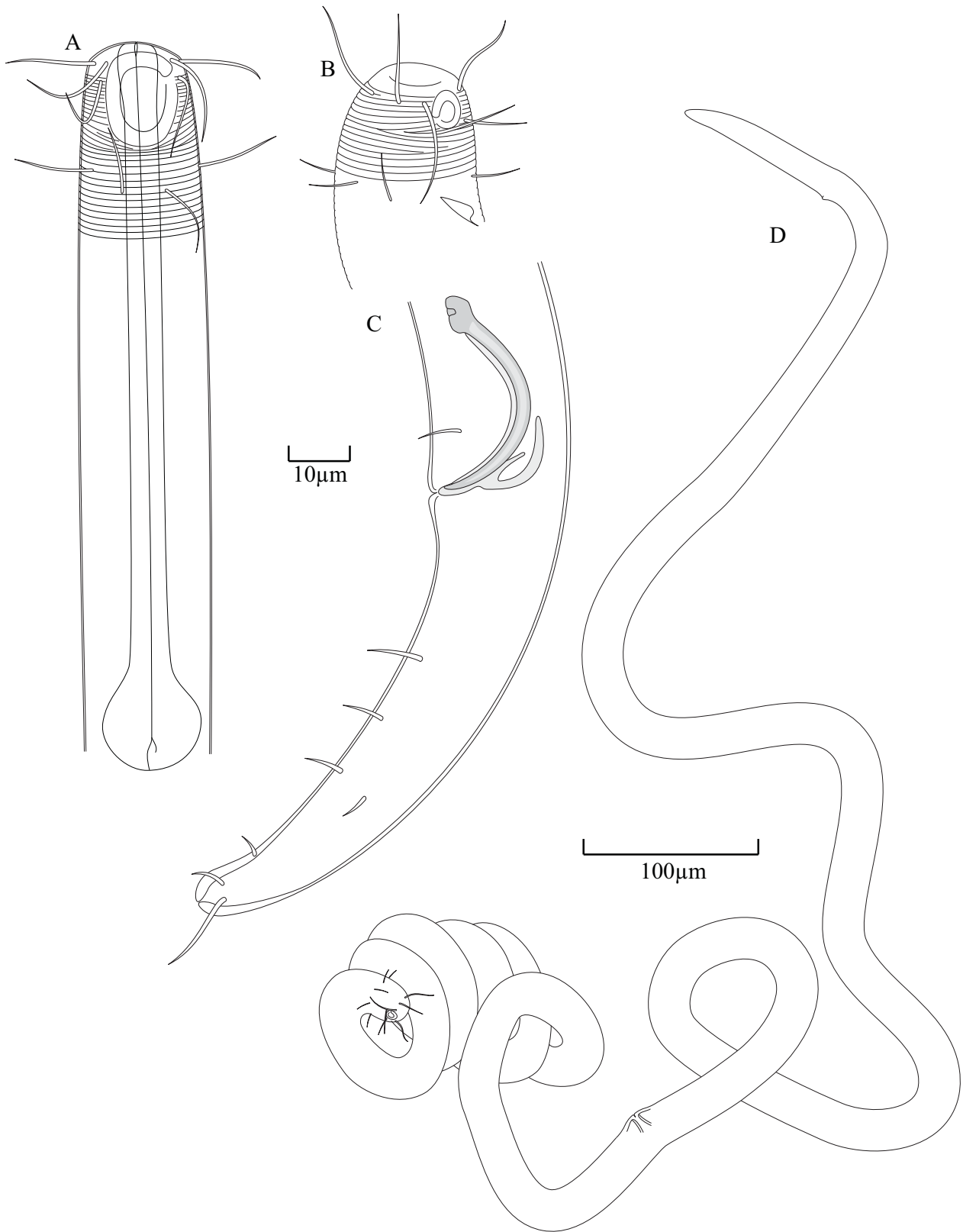


FIGURE 8 *Eubostrichus otti* sp. nov.: A, head and oesophageal region of holotype; B, head of paratype female; C, caudal region of holotype; D, total body of paratype female.

TABLE 9 Morphological measurements for the holotype of *Eubostrichus otti* sp. nov., as well as the range of measurements for the female and juvenile paratype specimens.

| | Holotype | Paratype ♀ | Paratype Juv |
|----------------------|----------|-------------|--------------|
| Body length (mm) | 3.230 | 2.314–3.147 | 1.239–2.678 |
| a | 134.5 | 96.4–125.2 | 72.8–127.5 |
| b | 27.3 | 24.8–33.1 | 14.7–29.4 |
| c | 36.2 | 24.3–36.6 | 16.5–28.7 |
| Head diameter | 18 | 15–20 | 13–15 |
| Setae length: | | | |
| Cephalic | 15 | 15–20 | 8–14 |
| Subcephalic 1 | 15 | 10–14 | 4–12 |
| Subcephalic 2 | 14 | 8–12 | 9–14 |
| Amphid: | | | |
| from ant | 2 | 0–2 | 2–3 |
| length/width | 16/12 | 7/7–8/10 | 6/7–8/9 |
| cbd | 18 | 15–20 | 13–15 |
| Nerve ring: | | | |
| from ant | 64 | 63–71 | 54–70 |
| cbd | 22 | 21–24 | 16–23 |
| Oesophagus length | 118 | 93–109 | 88–93 |
| Max diameter | 24 | 24–30 | 17–21 |
| Vulva: | | | |
| from ant | – | 1142–1746 | – |
| V (%) | – | 52–61 | – |
| cbd | – | 24–30 | – |
| Spicule length (arc) | 43 | – | – |
| ABD | 24 | 16–18 | 12–14 |
| Tail length | 89 | 86–95 | 75–83 |

***Eubostrichus otti* sp. nov.**

Figures 8A–D, Table 9

MATERIAL EXAMINED

Holotype

Australia: Western Australia: ♂, Pelican Point (32°01'43"S, 115°44'51"E), 7 February 2005, M. Hourston (WAM V7457).

Paratypes

Australia: Western Australia: 1 ♀, Pelican Point (31°59'14"S, 115°49'28"E), 9 April 2005, M. Hourston (WAM V7457); 2 ♀, Applecross (32°00'38"S, 115°49'44"E), 9 April 2005, M. Hourston; 3 juveniles, Chidley Point (32°01'03"S, 115°46'52"E), 8 April 2005, M. Hourston.

DIAGNOSIS

Eubostrichus otti is most similar to *E. topiarus* Berger et al., 1996 but is approximately half the size. Also the cephalic setation is divergent, with *E. otti* having an anterior cephalic crown of eight setae and a posterior of four (8+4), which is the opposite to *E. topiarus* which has 4+8. The other similar species,

E. longisetosus Berger et al., 1996 and *E. africanus* Muthumbi et al., 1995, which both have both 4+4.

DESCRIPTION

Male (holotype)

Body: extremely elongate, slender, colourless. *Cuticle:* fine indistinct annulations, sickle-shaped epibiotic bacteria. *Amphid:* large, oval, single loop. *Setation:* Labial; obscured. Cephalic; eight long, anterior margin of amphid. Sub-cephalic; four, long, mid-amphid, sublateral. Cervical; eight, long. Caudal; all c. 8 µm long, 1 pair subventral-precloacal, five pairs subventral-postcloacal, one pair lateral-postcloacal, one double pair lateral-subterminal. Somatic; absent. *Buccal cavity:* minute, unarmed. *Oesophagus:* very narrow, non-muscular, distinct round posterior bulb, cardia absent. *Tail:* conico-cylindrical. *Spicules:* evenly arcuate, slim, well defined, proximal cephalations notched. *Gubernaculum:* small, narrow, conspicuous sickle-shaped dorsal apophysis. *Testis:* single, outstretched, right of intestine

Female (paratype)

Similar to holotype in cuticular ornamentation and epibionts. Differences to holotype. *Body:* substantially

longer. *Tail*: relatively longer. *ABD*: relatively narrower. *Amphid*: much smaller. *Cephalic setation*: posterior cephalic at posterior edge of amphid (Figures 8a v. 8b). *Caudal setation*: absent. *Ovaries*: paired, opposed, reflexed, right of intestine.

HABITAT

All of the type material for *Eubostrichus otti* was collected from sediment cores taken from the saline, lower/middle reaches of the Swan River Estuary in Melville Water. Individuals of this species were present in only a few samples and never in large quantities. Specimens were found in sediment types ranging from coarse biogenic sands to fine muds. All specimens found have been lodged as type material.

REMARKS

The bacterial coat of the holotype specimen covers only small areas of the body; however, inspection of the paratype material suggests that in life, the coat would have covered the majority of the body.

Notably, one of the juvenile paratype specimens hosted two different types of epibiont. It was covered by the crescent shaped epibionts on the posterior half of the body, while the anterior half was covered with a coccoid species, similar to those displayed by *Catanema australis*.

Of the members of the subfamily Stilbonematinae, *Eubostrichus otti* most resembles *E. topiarius*, sharing features such as amphid, spicule and gubernaculum

structure, cuticle ornamentation, crescent-shaped epibionts and caudal setation arrangement. However these two species are distinct, with the most conspicuous discriminating feature being the size of adults, which is up to 6 mm in *E. topiarius* while the largest individual found for the presently described species was only 3.2 mm. Additionally, the different arrangement of anterior setation is a notable divergence.

ETYMOLOGY

This species is named after Prof. Jörg Ott in recognition of his pioneering work with stilbonematids.

Genus *Catanema* Cobb, 1920

Catanema Cobb, 1920: 271.

TYPE SPECIES

Catanema exilis Cobb, 1920, by original designation.

***Catanema australis* sp. nov.**

Figures 9A–F, Table 10

MATERIAL EXAMINED

Holotype

Australia: Western Australia: ♂, Penguin Island (32°18'25"S, 115°41'30"E), 10 February 2001, M. Hourston (WAM V7458).

TABLE 10 Morphological measurements for the holotype of *Catanema australis* sp. nov., as well as the range of measurements for the female and male paratype specimens.

| | | Holotype | Paratype ♀ | Paratype ♂ |
|----------------------|------------|----------|-------------|-------------|
| Body length (mm) | | 2.166 | 2.750–3.217 | 2.110–2.529 |
| a | | 77 | 88.7–103.7 | 78.1–97.2 |
| b | | 26 | 23.9–33.5 | 23.7–24.5 |
| c | | 25 | 28.9–36.5 | 25.7–30.7 |
| Head diameter | | 19 | 21–23 | 19–22 |
| Setae Length | Cephalic 1 | 15 | 12–14 | 11–11 |
| | Cephalic 2 | 6 | 4–5 | 5–5 |
| | Cervical | 4 | 3–4 | 3–3 |
| Nerve ring: | from ant | 52 | 53–65 | 51–51 |
| | cbd | 24 | 25–28 | 22–25 |
| Oesophagus length | | 82 | 96–115 | 89–103 |
| Max diameter | | 28 | 30–31 | 26–27 |
| Vulva: | from ant | – | 1810–1490 | – |
| | V (%) | – | 54–57 | – |
| | cbd | – | 30–31 | – |
| Spicule length (arc) | | 38 | – | 33–39 |
| ABD | | 26 | 20–21 | 26–26 |
| Tail length | | 87 | 86–95 | 82–84 |

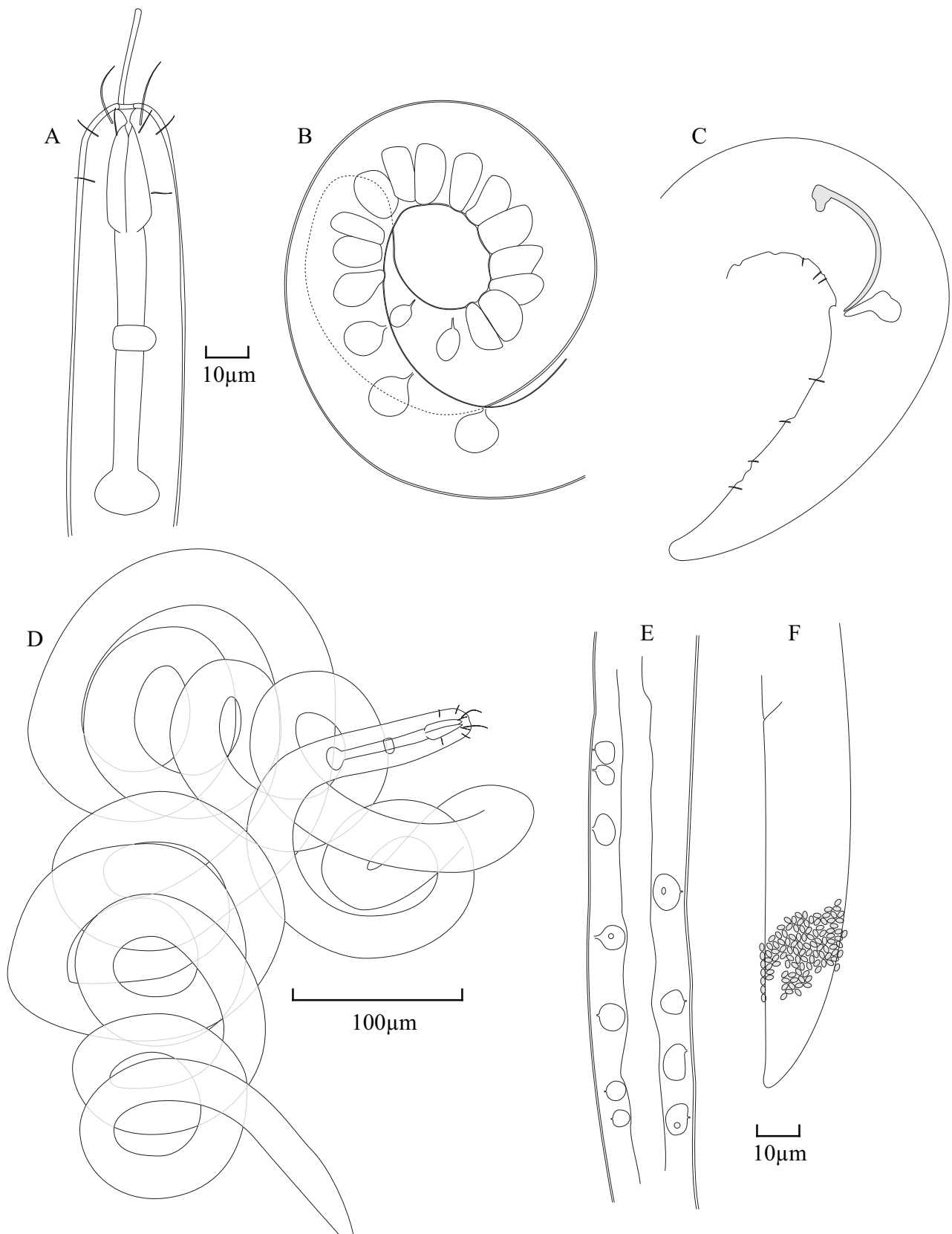


FIGURE 9 *Catanema australis* sp. nov.: A, head and oesophageal region of paratype female; B, head and cervical region of holotype showing GSOs; C, caudal region of holotype; D, total body of paratype female; E, paratype female midbody showing GSOs; F, caudal region of paratype female showing epibionts.

Paratypes

Australia: Western Australia: 3 ♂, 3 ♀, Penguin Island (32°18'25"S, 115°41'30"E), 10 February 2001, M. Hourston (WAM V7458).

Other material examined

Australia: Western Australia: 5 ♂, 5 ♀, Penguin Island (32°18'25"S, 115°41'30"E), 10 October 2001, M. Hourston (bulk mounted specimens).

DIAGNOSIS

Catanema australis is most similar to *C. exilis* Gerlach, 1963 in the location of the amphid and arrangement of the cephalic setae. The species are distinguished by *C. australis* possessing no supplements and only four pairs of normal setae or spines on the tail, whereas *C. exilis* has seven pairs of subventral, tubular, postcloacal supplements.

DESCRIPTION**Male (holotype)**

Body: extremely elongate, slender, dark brown. **Cuticle:** indistinct ornamentation, obscured, coccoid epibiotic bacteria. **Amphid:** extreme anterior, obscured, corpus gelatum conspicuous. **Setation:** Anterior cephalic; 4. Subcephalic; 8. Cervical; four. Somatic; absent. Caudal; 4 unpaired ventral precloacal, 4 pairs subventral post cloacal. **Buccal cavity:** minute, unarmed. **Oesophagus:** muscular anterior bulb surrounding buccal cavity, narrow isthmus, small posterior bulb. **Glandular sensory organs (GSOs):** present, no associated spines, largest and most numerous in ventral cervical region. **Spicules:** evenly arcuate, short, very slender, proximally cephalate. **Gubernaculum:** small, block-shaped caudal apophysis. **Testis:** single, outstretched, right of intestine

Female (paratypes)

Similar to holotype in cuticular ornamentation and epibionts. Differences to holotype. **Body:** substantially longer. **Caudal setation:** absent. **GSOs:** large and numerous near vulva as well as cervical region. **Ovaries:** paired, opposed, reflexed, right of intestine

HABITAT

Catanema australis occurs in marine sediments, type specimens were collected at a low energy beach with high sedimentary organic material. See locality details in Hourston et al. (2005) under the incorrect designation '*Leptonemella* sp.'

REMARKS

Confusion exists as to the validity of the genus *Catanema* and whether its species should be reassigned to *Leptonemella*. Until the taxonomic issue is resolved, this species remains within *Catanema* since it meets the generic diagnostic criteria of an unarmed and minute buccal cavity enclosed in a muscular anterior oesophageal bulb, in contrast to *Leptonemella*, which

has no anterior oesophageal bulb.

Catanema australis is most similar to *C. exilis* in the extreme anterior position of the amphids (anterior to the four long cephalic setae) and the fact that the subcephalic and subamphidial seate (terminology of Platt and Zhang 1982) comprise a single circle of eight at the same level (collectively termed Subcephalic in the above description). The form of the amphids cannot be ascertained, but their location is indicated by the origin of the corpus gelatum, which is extruded in most specimens. In contrast, *C. exilis* has seven pairs of prominent subventral tubular supplements on the male tail, whereas *C. australis* has only four pairs of apparently normal setae or spines.

GSOs, similar to those described for *Eubostrichus topiarus* by Berger et al. (1996), are present but are not associated with hollow spines nor any visible setae as were those that latter species. GSOs are present over the majority of the body, but tend to be more numerous, larger and more closely spaced on the ventral surface in the cervical region of the male type specimens (Figure 9b v. 9e) than on the rest of the body, and additionally, near the vulva in female paratypes.

ETYMOLOGY

This species is named to reflect its southern hemispheric distribution in comparison to the northern hemispheric distribution of its described congeners.

Genus *Leptonemella* Cobb, 1920

Leptonemella Cobb, 1920: 244.

TYPE SPECIES

Leptonemella cincta Cobb, 1920, by monotypy.

***Leptonemella peronensis* sp. nov.**

Figures 10A–E, Table 11

MATERIAL EXAMINED**Holotype**

Australia: Western Australia: ♂, Point Peron (32°16'08"S, 115°41'34"E), 14 February 2005, R. Caccianiga (WAM V7459).

Paratypes

Australia: Western Australia: 1 ♂, 1 ♀, Point Peron (32°16'08"S, 115°41'34"E), 14 February 2005, R. Caccianiga (WAM V7459).

DIAGNOSIS

Leptonemella peronensis is most similar to *L. granulosa* Boucher, 1975 but differs in its non-granular cephalic capsule and a shorter tail. Furthermore, *L. peronensis* has 2 precloacal, 4 postcloacal and one double pairs of setae near the tail tip, in contrast to *L. granulosa* which has seven post cloacal pairs of setae.

TABLE 11 Morphological measurements for the holotype of *Leptonemella peronensis* sp. nov., as well as those for the female paratype specimen.

| | Holotype | Paratype ♀ |
|-------------------|------------|------------|
| Body length (mm) | 2.040 | 3.113 |
| a | 68.1 | 103.7 |
| b | 20.6 | 27.1 |
| c | 25.2 | 30.2 |
| Head diameter | 24 | 26 |
| Setae length: | | |
| | Cephalic 1 | 23 |
| | Cephalic 2 | 13 |
| | Cervical | 4 |
| Nerve ring: | | |
| | from ant | 47 |
| | cbd | 28 |
| Oesophagus length | 99 | 115 |
| Max diameter | 30 | 30 |
| Vulva: | | |
| | from ant | – |
| | V (%) | – |
| | cbd | – |
| Spicule (arc) | 40 | – |
| ABD | 27 | 24 |
| Tail length | 81 | 103 |

DESCRIPTION

Male (holotype)

Body: very elongate, slender, dark brown. *Cuticle*: coarse regular annulations. *Tail*: short, conical. *Amphid*: extreme anterior, obscured. *Cephalic capsule*: distinct, smooth. *Setation*: Labial; obscured. Anterior cephalic; four, 23 µm. Posterior cephalic, six, 13 µm. Cervical; eight, 4 µm, on cephalic capsule. Caudal; one pair subventral prelocal, four pairs subventral postcloacal, two pairs subdorsal post cloacal, one double pair subterminal. *Buccal cavity*: minute, unarmed. *Oesophagus*: narrow, poorly developed anterior and posterior bulbs. *Spicules*: strongly arcuate, cuticularised, distinct cephalation. *Gubernaculum*: narrow, parallel to posterior of spicules, apophysis absent. *Testis*: single, outstretched, right of intestine.

Female (paratype)

Similar to holotype in body morphology, cuticular ornamentation, setation pattern. Differences to holotype. *Body*: longer (♀ = 3.1 mm v. ♂ = 2.04 mm). *DeMan a*: greater (♀ = 103 v. ♂ = 68). *Tail*: relatively longer. *Caudal setation*: absent. *Ovaries*: paired, opposed, outstretched, right of intestine.

HABITAT

Type specimens were collected from a low energy, shallow, near-shore marine environment at Point Peron, south-western Australia. The sediment was relatively

coarse and calcareous, and contained appreciable amounts of seagrass detritus.

REMARKS

In contrast to many other species of Stilbonematinae, the type specimens of the present species lack any sheath of epibionts. It is not implicit that this sheath does not occur on individuals of this species, only that it is absent for the described individuals in their preserved state.

This species is similar to *L. granulosa* in many respects. The only appreciable differences are the surface texture of the cephalic capsule, the tail length and the circum-cloacal setation. *Leptonemella peronensis* does not have the noticeably granular cephalic capsule which is characteristic of *L. granulosa*. Furthermore, *L. peronensis* has a shorter tail than that described for *L. granulosa*, particularly males where it is only 3 ABD compared to 5.6 ABD. The holotype of *L. granulosa* is depicted as having 7 pairs of short post-cloacal spines on the subventral surfaces and none anterior to the cloaca, whereas *L. peronensis* has two pre-cloacal pairs of setae, only four post-cloacal pairs and a double pair near the tail terminus.

ETYMOLOGY

This species is named after its type locality, Point Peron, Western Australia.

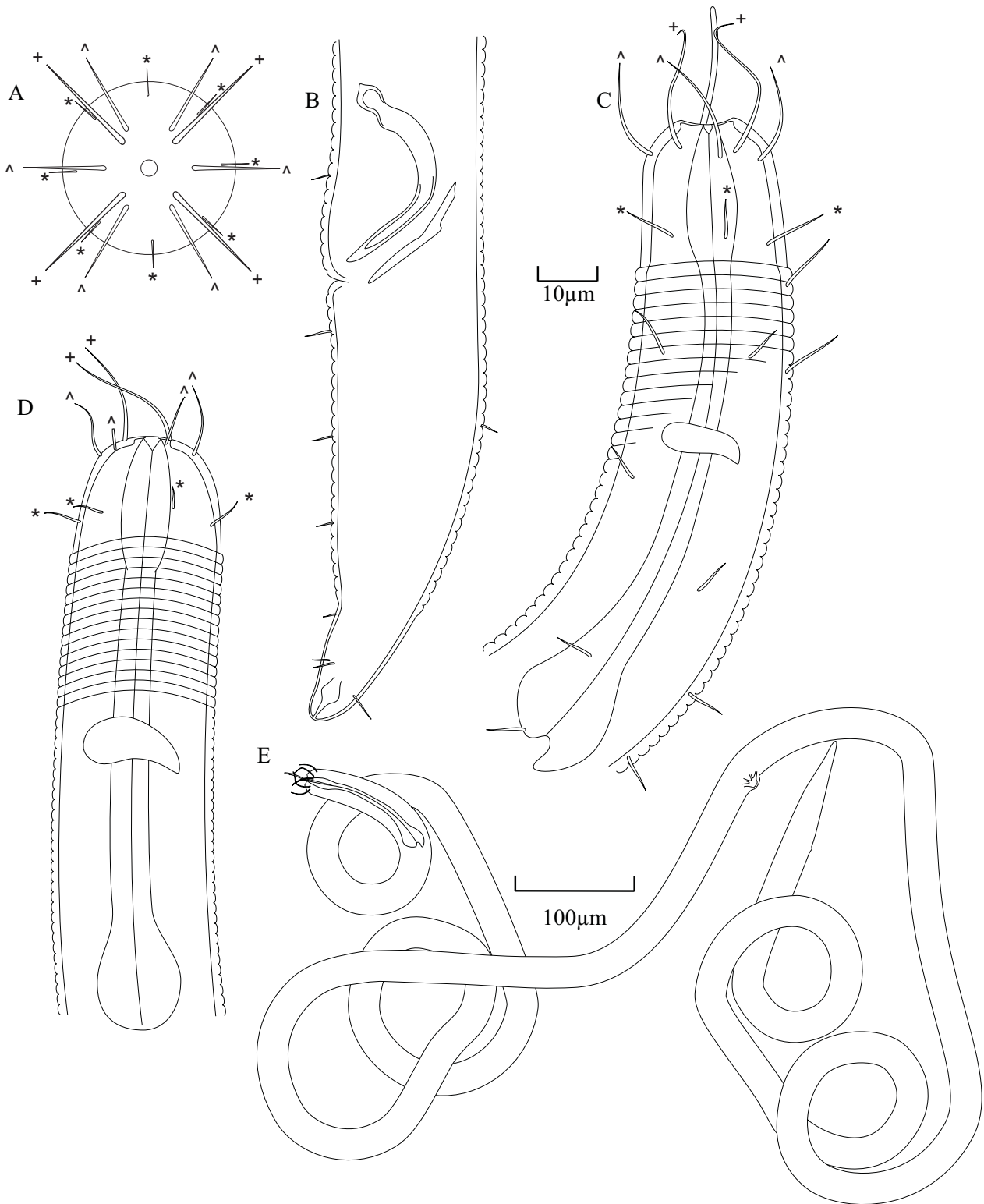


FIGURE 10 *Leptonemella peronensis* sp. nov.: A, diagram of the arrangement of anterior cephalic (+), posterior cephalic (^), and cervical (*) setation, not to scale. Setation symbology is consistent through the remainder of Figure 10; B, caudal region of holotype; C, head and oesophageal region of paratype female; D, head and oesophageal region of holotype; E, total body of paratype female.

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