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# One new genus and two new free-living nematode species (Desmodorida, Desmodoridae) from the continental margin of New Zealand, Southwest Pacific Ocean

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## Abstract

One new genus and two new species of the family Desmodoridae are described from the upper continental slope of New Zealand, at 350–1240 m water depths. *Onepunema* **gen. n.** is characterised by a striated head capsule, small buccal cavity without teeth, and presence of two testes. *Onepunema* **gen. n.** can be differentiated from all other genera of the family by the presence of two testes, which is an exception to the holapomorphic character (*i.e.* monorchic males) of the Desmodoroidea. *Onepunema enigmaticum* **gen. et sp. n.** shares characters typical of the subfamilies Spiriniinae (small buccal cavity without distinct teeth) and Desmodorinae (presence of head capsule). *Onepunema* **gen. n.** is placed within the Desmodorinae based on the latter trait, which is never found within the Spiriniinae. The type species, *Onepunema enigmaticum* **gen. et sp. n.**, is characterised by the presence of two laterodorsal and two lateroventral rows of pores with conspicuous ducts, slender pharynx with rounded terminal bulb, presence of two types of cells in intestinal epithelium, and presence of four or five pre-cloacal supplements consisting of thickened areas of cuticle in males. The genus *Pseudonchus* is recorded for the first time from the deep sea (1240 m water depth) and from the New Zealand region. *Pseudonchus virginiae* **sp. n.** is characterised by its stout body, short cephalic setae, monospiral amphideal fovea, short arcuate spicules with capitulum, five regularly-spaced precloacal setae, and short conical tail. A key to all known valid species of the genus *Pseudonchus* is provided.

**Key words:** Desmodorinae, Spiriniinae, Pseudonchinae, dichotomous key, deep-sea, continental slope, meiofauna, Chatham Rise, Challenger Plateau

## Introduction

New Zealand's Exclusive Economic Zone covers over 4 million km$^2$ and is among the largest in the world. Recent studies have described high levels of local and regional diversity of free-living nematodes in open slope environments of the region (Leduc *et al*. 2012a b). Only twelve nematode species, however, have been described/ recorded so far from New Zealand's deep-sea habitats (> 200 m water depth) (Wieser 1956; Leduc *et al.* 2012c; Leduc 2012).

Species of the family Desmodoridae are not usually common in samples from open slope and abyssal plain environments, but can be abundant in some deep-sea habitats such as seamounts, seeps, and vents (e.g., *Desmodora* spp., Vanreusel *et al*. 2010). There is no known holapomorphy for this family, which shows that the relationships between this and the other two families comprising the superfamily Desmodoroidea (i.e., the Epsilonematidae and Draconematidae) are still incompletely understood (Lorenzen 1981). The Desmodoridae are mainly defined as members of the Desmodoroidea that lack features typical of the Epsilonematidae and Draconematidae, such as adhesion tubes or ambulatory setae. The Desmodoridae comprises six subfamilies, *viz*., Pseudonchinae, Stilbonematinae, Molgolaiminae, Prodesmodorinae, Spiriniinae, and Desmodorinae (Decraemer & Smol 2006).

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Species of the subfamily Desmodorinae are characterised by thick cuticle, presence of a head capsule, and buccal cavity with distinct dorsal and ventrosublateral teeth, whilst species of the subfamily Spiriniinae are characterised by absence of head capsule, a minute to medium-sized buccal cavity with distinct or minute dorsal tooth, and with or without ventrosublateral teeth. Species of Pseudonchinae can easily be recognised by the presence of a large tubular buccal cavity with bilateral symmetry. Here, we describe *Onepunema enigmaticum* **gen. et sp. n.**, which possesses traits typical of the subfamilies Desmodorinae and Spiriniinae, from Chatham Rise on the continental slope of New Zealand. *Pseudonchus virginiae* **sp. n.** is also described from the same region.

## Methods

**Study region and sample processing.** Samples for species descriptions were obtained from Chatham Rise and Challenger Plateau, Southwest Pacific Basin. The Chatham Rise is a submarine ridge that extends eastwards from the South Island of New Zealand, with water depths ranging from *ca.* 250 to 3000 m. The highly productive Subtropical Front (STF) is geographically constrained near the southern flank of the rise at *ca.* 44˚S (Murphy *et al.* 2001). The Challenger Plateau encompasses water depths from *ca.* 400 to 3000 m in an area of generally low biological productivity to the northwest of the South Island, New Zealand (Murphy *et al.* 2001). Sampling sites were described by Leduc *et al.* (21012a, b). Briefly, samples were collected along a transect at 178º30′E across the Chatham Rise during the austral spring (September-October) 2001 during National Institute of Water and Atmospheric Research (NIWA) cruise TAN0116. Additional samples were taken on the Chatham Rise and Challenger Plateau in March–April and May–June 2007, during NIWA cruises TAN0705 and TAN0707, respectively, as part of the Ocean Survey 20/20 initiative.

Sediment samples were collected using an Ocean Instruments MC-800A multicorer (MUC; core internal diameter = 9.52 cm). Each sample consisted of one subcore of internal diameter 26 mm taken to a depth of 5 cm. Samples were fixed in 10% formalin and stained with Rose Bengal. They were subsequently rinsed on a 1 mm sieve to remove large particles and on a 45 mm sieve to retain nematodes. Nematodes were extracted from the remaining sediments by Ludox flotation and transferred to pure glycerol (Somerfield & Warwick 1996) for mounting and examination. Species descriptions were made from glycerol mounts using differential interference contrast microscopy and drawings were made with the aid of a camera lucida. All measurements are in µm, and all curved structures are measured along the arc. Type specimens are held in the NIWA Invertebrate Collection (NIC), Wellington, New Zealand and Ghent University Zoology Museum (UGMD), Ghent, Belgium. Abbreviations in the text are as follows: a, body length/maximum body diameter; abd, anal body diameter; b, body length/oesophagus length; c, body length/tail length; cbd, corresponding body diameter; %V, vulva distance from anterior end of body × 100/total body length.

**Terminology.** A variety of terms are used to describe the head region within the Desmodoroidea. Verschelde & Vincx (1996) defined a **head capsule** as a non-annulated, well set off head region with an extra thick (inner) layer of the head cuticle (*e.g. Zalonema* Cobb, 1920); a **non-annnulated head region** is similar but without the extra thick layer within its cuticle (*e.g. Chromaspirina vanreuselae;* Verschelde & Vincx 1996); finally they define an **annulated head region** which lacks the extra thick inner cuticle but has annuli extending as far as the lip region (*e.g. Echinodesmodora moensi;* Verschelde & Vincx 1996). *Onepunema enigmaticum* **gen. et sp. n.** has a **striated head capsule**, which should not be mistaken for annuli: the striations surrounding the amphids do not go deep into the cuticle, and closer examination shows the inner thick cuticle is not divided into annuli (the sutures do not run through the entire cuticle) and the striations on the head capsule are superficial only (restricted to the outer (epi-) cuticle). Another striation runs around the amphid which could create the illusion of the presence of an amphideal plate.

The shape of the amphideal fovea within the Desmodoroidea is also described using a range of terms. The term **unispiral** is used to describe an amphideal fovea with a circular outline and a central spot e.g., (*Metachromadora* (*Bradylaimus*) *nyalii*, Verschelde & Vincx 1996). An amphideal fovea with an outline that is comma-shaped or an interrupted circle (i.e., start- and endpoints of the circle do not meet), and with a central spot is described as a **cryptospiral** (e.g., *Desmodora alberti;* Verschelde *et al.* 1998). We propose the term **cryptocircular** for describing an amphideal fovea with similar outline as a cryptospiral amphideal fovea but without a central spot, as in *Onepunema enigmaticum* **gen. et sp. n.** and *Pseudonchus virginiae* **sp. n.**

## Taxonomy

### Superfamily DESMODOROIDEA Filipjev, 1922

**Diagnosis** (modified from Decraemer & Smol 2006). Desmodorida. Cuticle annulated or striated, never punctated. Amphideal fovea spiral, cryptospiral, or cryptocircular. Male with a single testis, rarely with two opposed testes. Females with two reflexed ovaries, vulva usually posterior to mid-body.

### Family DESMODORIDAE Filipjev, 1922

**Diagnosis** (from Lorenzen 1981 and Decraemer & Smol 2006). Desmodoroidea. Cuticle with coarse annulations, at least in anterior body region, or striated. Specialised somatic setae such as adhesion tubes or ambulatory setae absent. Gubernaculum without dorsal apophyses. Vulva usually posterior to middle of body. Tail conical.

### Subfamily SPIRINIINAE Gerlach & Murphy, 1965

**Diagnosis** (from Decraemer & Smol 2006). Desmodoridae. Body cuticle finely striated. Head not demarcated as a cephalic capsule. Amphideal fovea a simple spiral, usually located far anteriorly on the body. Buccal cavity small, from minute to medium-sized, with a distinct or a minute dorsal tooth; two small ventrosublateral teeth may be present or absent.

#### List of valid genera (Cavalcanti *et al*. 2009)

*Alaimonema* Cobb, 1920
*Chromaspirina* Filipjev, 1918
*Metachromadora* Filipjev, 1918
*Onyx* Cobb, 1891
*Papillonema* Verschelde *et al*., 1995
*Parallelocoilas* Boucher, 1975
*Perspiria* Wieser and Hopper, 1967
*Polysigma* Cobb, 1920
*Pseudometachromadora* Timm, 1952
*Sigmophoranema* Hope & Murphy, 1972
*Spirinia* Gerlach, 1963
*Spirodesma* Cavalcanti *et al*., 2009

### Subfamily DESMODORINAE Micoletzky, 1924

**Diagnosis.** (modified from Decraemer & Smol 2006). Desmodoridae. Body cuticle annulated except in head region. Head region with thickened cuticle except in lip region and usually set off as a conspicuous cephalic capsule. Amphideal fovea in general not surrounded by annulations; may be located on cuticularised plate. Buccal cavity usually with distinct teeth. Pharyngeal bulb round to elongated.

#### List of valid genera (Verschelde *et al*. 2006)

*Acanthopharyngoides* Chitwood, 1936
*Acanthopharynx* Marion, 1870
*Bolbonema* Cobb, 1920

*Croconema* Cobb, 1920
*Desmodora* de Man, 1889
*Desmodorella* Cobb, 1933
*Echinodesmodora* Blome, 1982
*Paradesmodora* Schuurmans Stekhoven, 1950
*Psammonema* Verschelde & Vincx, 1996
*Pseudochromadora* Daday, 1899
*Pseudodesmodora* Boucher, 1975
*Sibayinema* Swart & Heyns, 1991
*Stygodesmodora* Blome, 1982
*Zalonema* Cobb, 1920

## Genus *Onepunema* gen. n.

**Diagnosis.** Body cylindrical with blunt head region. Thick, annulated cuticle, with annuli extending from posterior edge of amphideal aperture to near the tail tip. Though longitudinal rows of pores are distinct, somatic setae are unclear or hardly distinguishable in the pharyngeal region, and totally absent along the rest of the body except for the tail region where there can be a few pairs of pre-, para-, and/or postcloacal somatic setae. Striated head capsule separated into labial and main head regions. Six outer labial setae located close to four cephalic setae at junction of labial and main head regions. Cryptocircular amphideal fovea surrounded by fine striation in outer cuticle, giving the false impression of the presence of an amphideal plate; circular amphideal aperture. Buccal cavity small, teeth inconspicuous, presumably absent. Slender pharynx with conspicuous rounded terminal bulb, not partitioned.

Males with two opposed, outstretched testes. Short, arcuate spicules and complex arcuate gubernaculum, which can show a broad median part (cuneus) and lateral crurae. Four or five pre-cloacal supplements present. Females with vulva situated slightly anterior to middle of body. Short conical tail with spinneret.

**Etymology.** The genus name is derived from the Maori word *onepū* (= sand) and Greek word *nema* (= thread; gender neutral).

**Remark.** *Onepunema* **gen. n.** shows characters of both Desmodorinae (thick cuticle, presence of head capsule) and Spiriniinae (small buccal cavity with inconspicuous teeth). Whilst head capsules are never found in species of Spiriniinae, some species of Desmodorinae possess buccal cavities with small or inconspicuous teeth, such as *Zalonema myrianae* Verschelde & Vincx, 1996 and *Echinodesmodora moensi* Verschelde & Vincx, 1996, and large teeth are found in some genera within the Spiriniinae, such as in *Chromaspirina* and *Metachromadora*. Because the size of the teeth varies considerably within each subfamily, we assign *Onepunema* **gen. n.** to the subfamily Desmodorinae based on the presence of a head capsule.

**Differential diagnosis.** *Onepunema* n. gen. can be differentiated from all other genera of the family Desmodoridae by the presence of a striated head capsule, and the presence of two outstretched testes. The latter trait is unique within the entire superfamily Desmodoroidea, the holophyly of which was established based on a yellowish to brownish colour of the body in glycerine preparations, and the presence of only one anterior testis (Lorenzen 1981).

*Onepunema* **gen n.** resembles *Metadesmodora* (Desmodorinae) in the presence of a small buccal cavity without distinct teeth, but differs from the latter in the absence of a cuticularised amphideal plate and in the presence of a slender pharynx with conspicuous rounded terminal bulb. *Onepunema* **gen. n.** is similar to *Zalonema* (Desmodorinae) in the presence of a relatively narrow head capsule (*vs* broad head capsule in genera such as *Desmodora*), but differs from the latter in amphideal fovea shape (cryptocircular *vs* multispiral), absence of somatic setae (present in *Zalonema*), and indistinct teeth (small to large teeth in *Zalonema*). *Onepunema* **gen. n.** resembles *Spirinia* and *Chromaspirina* (Spiriniinae) in the general shape of the head region, small size of buccal cavity, as well as structure of pharynx and spicules, but can be distinguished from them by the absence of distinct teeth in the buccal cavity and absence of somatic setae along the body. *Onepunema* **gen. n.** is also similar to *Spirodesma* in general body shape, thick cuticle, slender pharynx with conspicuous rounded terminal bulb, shape of amphideal fovea, and structure of the spicules. *Onepunema* **gen. n.** differs from the latter in the presence of head capsule (absent in *Spirodesma*), and buccal cavity without teeth (three equal teeth in *Spirodesma*).

**Type species.** *Onepunema enigmaticum* **gen. et sp. n.**

***Onepunema enigmaticum* gen. et sp. n.**
(Figs 1–4, Table 1)

**Measurements.** See Table 1.

**Type specimens.** Holotype male, collected 19 April 2007 (NIWA cruise TAN0705, station 196), northeastern Chatham Rise (42.615° S, 178.338 W), water depth: 1194 m, sediment depth: 0–5 cm, silt/clay content: 32.2%, $CaCO_3$ content: 59.9%, sediment chlorophyll *a* concentration: 34 ng/gDW sediment (NIC 865968).

**TABLE 1**. Morphometrics (µm) of *Onepunema enigmaticum* **gen. et sp. n.** and *Pseudonchus virginiae* **sp. n.** (a, body length/maximum body diameter; abd, anal body diameter; b, body length/pharynx length; c, body length/tail length; cbd, corresponding body diameter; V, vulva distance from anterior end of body; %V, V/total body length).

| Species | *Onepunema enigmaticum* **gen. et sp. n.** | | | *Pseudonchus virginiae* **sp. n.** | |
|---|---|---|---|---|---|
| | Males | | Female | Male | Female |
| | Holotype | Paratypes | Paratypes | Holotype | Paratype |
| n | | 2 | 2 | | |
| L | 1184 | 844–882 | 859–1055 | 1206 | 1110 |
| a | 33 | 26–29 | 23–25 | 20 | 13 |
| b | 8 | 8 | 8–9 | 8 | 8 |
| c | 15 | 11 | 11–13 | 18 | 16 |
| Head diam.* | 18 | 14–15 | 14–15 | 18 | 19 |
| Length of outer labial sensillae | 3 | 2–3 | 2 | 1 | 1-2 |
| Length of cephalic setae | 2 | 2 | 2 | 2 | 3 |
| Amphid height | 10 | 7–9 | 9 | 12 | 8 |
| Amphid width | 10 | 9 | 9 | 11 | 9 |
| Amphid width/cbd (%) | 55 | 60–64 | 60-–64 | 38 | 26 |
| Amphid from anterior end | 5 | 3–4 | 3–6 | 15 | 19 |
| Nerve ring from anterior end | 72 | 53–58 | 67–69 | 95 | 85 |
| Nerve ring cbd | 33 | 28–30 | 30 | 48 | 47 |
| Pharynx length | 122 | 104–107 | 102–121 | 150 | 135 |
| Pharynx cbd | 36 | 30–33 | 32–34 | 53 | 57 |
| Pharyngeal bulb diam. | 26 | 21–23 | 23–25 | 30 | 37 |
| Max. body diam. | 36 | 30–33 | 35–45 | 60 | 83 |
| Spicule length | 40 | 30–38 | - | 55 | - |
| Gubernaculum length | 20 | 14–15 | - | 24 | - |
| Anal body diam. | 32 | 26–27 | 25 | 44 | 39 |
| Tail length | 80 | 77–78 | 79–83 | 66 | 69 |
| Tail length/abd | 2.5 | 2.9–3.0 | 3.2–3.3 | 1.5 | 1.8 |
| V | - | - | 356–484 | - | 690 |
| %V | - | - | 41–45 | - | 62 |
| Vulval body diam. | - | - | 35–45 | - | 83 |

*At level of amphid.

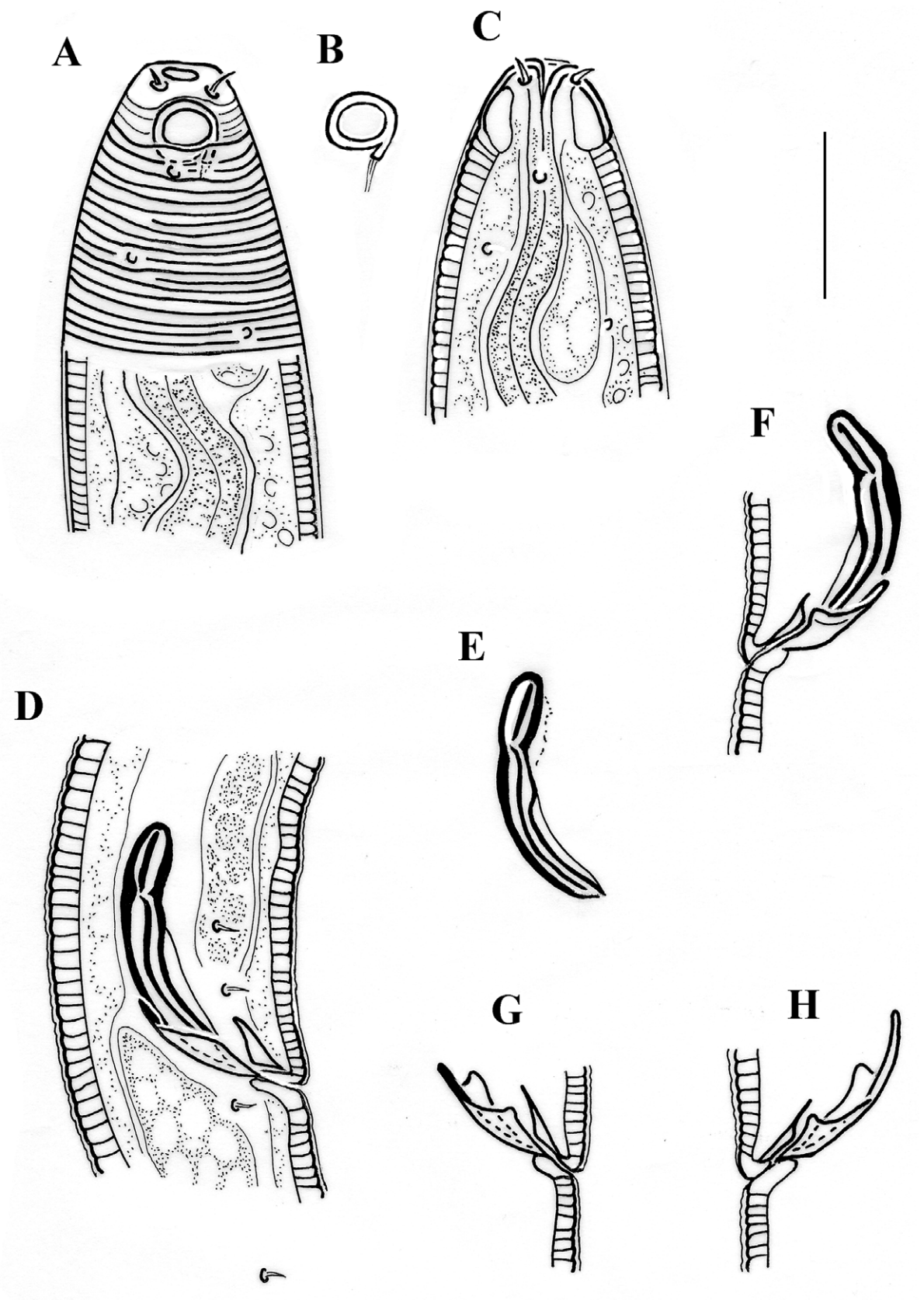


**FIGURE 1**. *Onepunema enigmaticum* **gen. et sp. n**. A: head region, surface view; B: detail of fovea- (outer line) and amphideal aperture (inner line); C: head region, cross-section view; D: cloacal region with right spicule, gubernaculum, and pre-, para- and post-cloacal setae; E: right spicule; F: left spicule and gubernaculum; G: gubernaculum, right hand side view; H: gubernaculum, left hand side view. Scale bar = 20 µm.

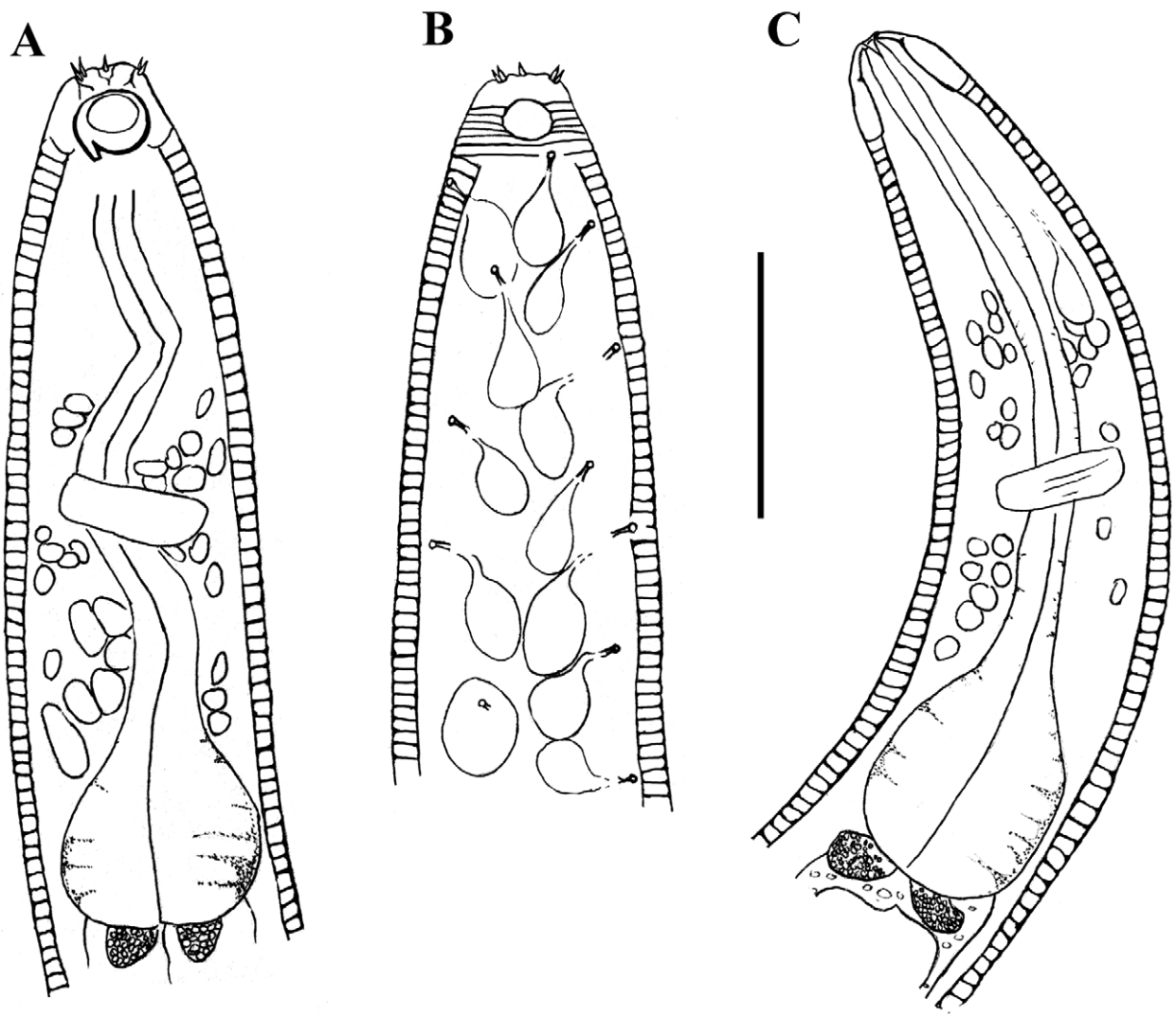


**FIGURE 2.** *Onepunema enigmaticum* **gen et sp. n.** A: Male anterior region; B: male anterior region showing amphideal aperture and position of glands and pores; C: female anterior region. Scale bar = 35 µm.

Paratypes. One male, collected 16 April 2007 (NIWA cruise TAN0705, station 157), northeastern Chatham Rise (42.782° S, 176.715° W), water depth: 1029 m, sediment depth: 0–1 cm, silt/clay content: 37.5%, $CaCO_3$ content: 61.6%, sediment chlorophyll *a* concentration: 7 ng/gDW sediment (UGMD 104261). One paratype male and one paratype female, collected 6 June 2007 (NIWA cruise TAN0707, station 99), eastern Challenger Plateau (40.126 ° S, 170.222° E), water depth: 804 m, sediment depth: 0–5 cm, silt/clay content: 83.3%, CaCO3 content: 68.8%, sediment chlorophyll *a* concentration: 15 ng/gDW sediment (NIC 865969). One paratype female, collected 5 October 2001 (NIWA cruise TAN0116, station U2582A), Chatham Rise crest (43.433° S, 178.500° E), water depth: 350 m, sediment depth: 0–5 cm, silt/clay content: 33.0%, $CaCO_3$ content: 40.5%, sediment chlorophyll *a* concentration: 185 ng/gDW sediment (NIC 865970).

**Etymology.** The species name is derived from the Latin word *aenigma* (= something obscure, inexplicable), because this species possesses an unusual combination of traits and some of its characters are unclear or indistinct.

**Description.** *Males.* Cylindrical body, orange colour, tapering slightly towards both extremities. Cuticle thick with coarse annuli, no lateral differentiation. Distinct longitudinal rows of pores. Somatic setae unclear or hardly distinguishable in pharyngeal region, and absent along the rest of the body except for tail region where two pairs of pre-, one pair of para-, and one pair of postcloacal somatic setae are present. Two subventral and two subdorsal rows of pores with conspicuous ducts extending from posterior edge of amphid to tail tip, and four additional rows of pores, two ventrosublateral and two dorsosublateral, also present in pharyngeal region. Each pore connected to a single gland (Figure 2B).

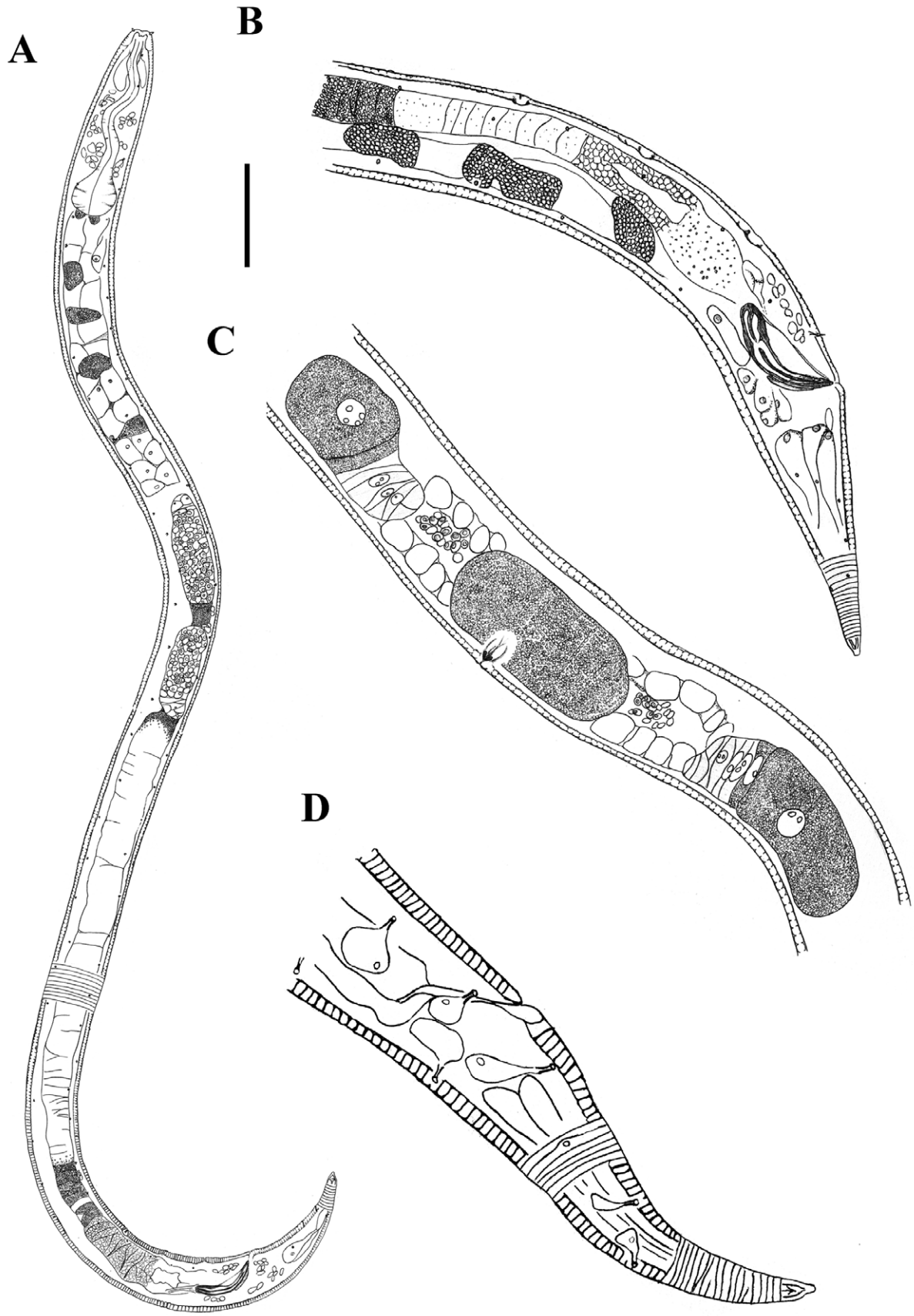


**FIGURE 3.** *Onepunema enigmaticum* **gen. et sp. n.** A: Entire male in cross-section view showing position and arrangement of testes; B: posterior male region, showing spicules and pre-cloacal supplements; C: female reproductive system; D: female tail, with details of glands and pores. Scale bar: A = 60 µm; B and C = 30 µm; D = 20 µm.

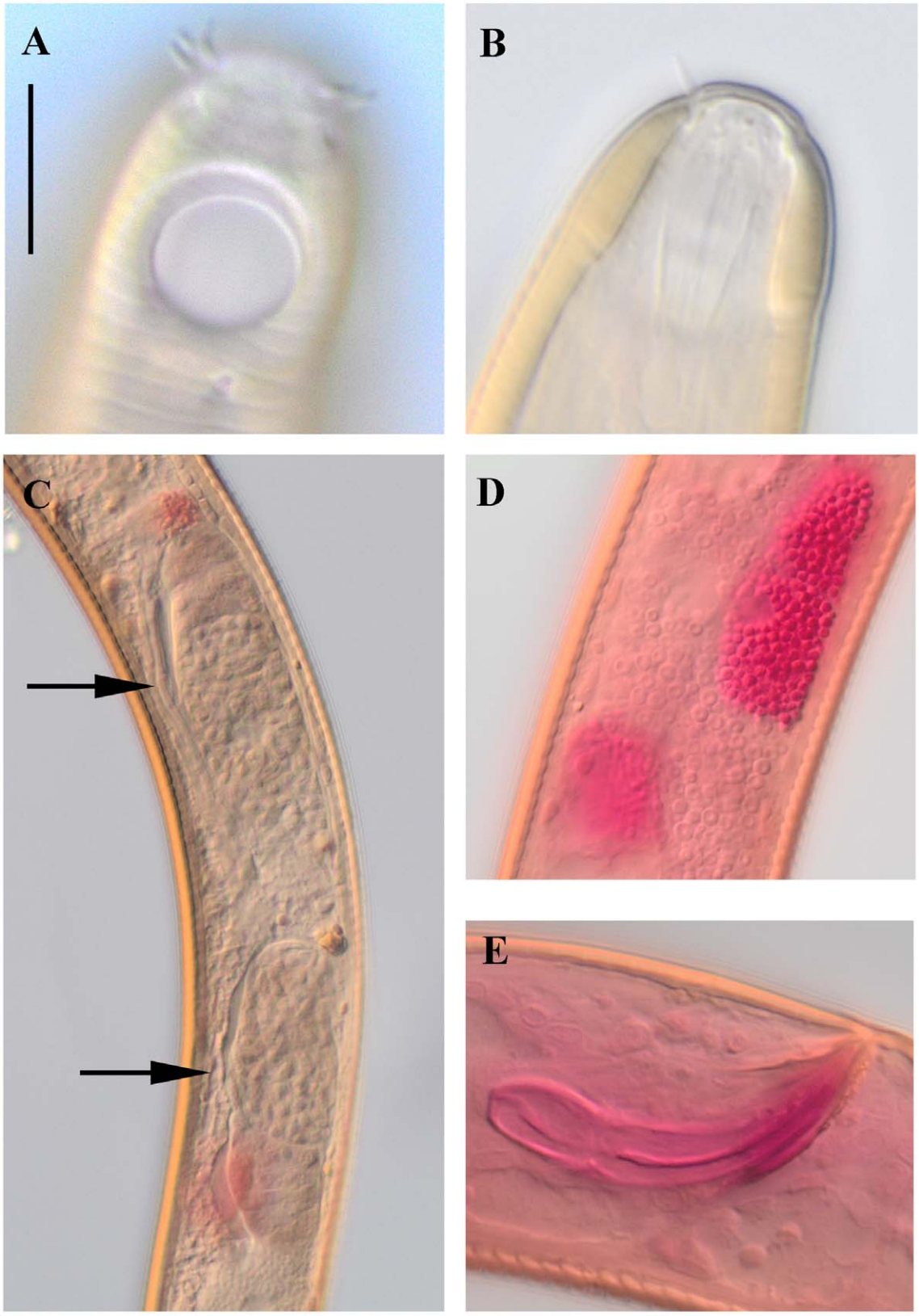


**FIGURE 4.** *Onepunema enigmaticum* **gen. et sp. n. Light micrographs.** A: Right lateral view of female head, showing unusual arrangement of head sensillae, cuticle annulations, and circular amphideal aperture; B: cross-section view of female head, showing thickened cuticle of main head region, reduced buccal cavity, and extended labial region; C: male mid-body region showing anterior (top) and posterior (bottom) testes; D: cross-section view of male middle body region, showing two types of cells in intestinal epithelium with numerous round inclusions; E: spicule. Arrows point towards the testes. Scale bar: A and B = 10 µm; C = 35 µm; D = 20 µm; E = 16 µm.

Striated head capsule with fine groove (sutura) in the cuticle separating lip region from main head region. Striations can give a false impression of the presence of annuli on head capsule, but striations do not run all the way through the thick inner layer of the cuticle. One striation runs around amphid, giving false impression of amphideal plate. Labial region folded inwards in holotype and one paratype, extended in one paratype specimen. Cuticle of main head region conspicuously thicker than lip and somatic regions, striations extend from anterior edge of amphideal aperture. Six setiform outer labial sensillae on labial region and four slightly shorter cephalic setae at level of sutura. Outer labial sensillae and cephalic setae very close to each other. Inner labial sensillae not observed. Subcephalic setae absent. Large cryptospiral amphideal fovea located on main head region, surrounded by fine line in outer cuticle. Smaller circular amphideal aperture. Protruding corpus gelatum, long and narrow in shape. Body annuli extend from the posterior edge of amphideal aperture to the non-annulated tail tip.

Buccal cavity small, teeth not observed. Ducts extending from head sensillae towards nerve ring sometimes conspicuous, dark orange in colour. Pharynx muscular, narrow, may be bent, with well-defined, rounded pharyngeal bulb. Nerve ring at 50–60% of pharynx length. Secretory-excretory system not observed. Cardia short. Intestinal epithelium consists of at least two types of cells (heterocytous); the first, most common type of cell only slightly stained by Rose Bengal, second type heavily stained. Both cell types contain numerous round inclusions, 1–2 µm in diameter (Figure 4D).

Reproductive system diorchic with two short testes, 53–63 µm long, outstretched and opposed. Position of testes within body cavity difficult to ascertain; appear to be located either both on the left of intestine, both on the right of intestine, or with anterior testis to the left and posterior testis to the right of intestine in the respective specimens examined. Mature sperm small, globular, 2–4 µm in diameter. Short, arcuate spicules with central cuticularised projection present along entire length of spicules, with discontinuity at level of capitulum; velum present (Figure 1D). Complex arcuate gubernaculum proximally surrounding spicules, with broad cuneus and lateral crurae (Figure 1D, F). Four or five pre-cloacal supplements consisting of thickened areas of cuticle. Two pairs of pre-, one pair of para- and one pair of postcloacal somatic setae. Tail conical with three caudal glands and clear spinneret.

*Female.* Similar to males, but with greater body diameter and slightly smaller amphideal aperture. Labial portion of head capsule extended in one specimen. Arrangement and structure of labial sensillae similar to males, but in one specimen right lateral outer labial sensilla is situated close to right laterodorsal cephalic seta instead of being located laterally (Figure 4A). Female reproductive system didelphic, amphidelphic with reflected ovaries. Position of ovaries difficult to ascertain; in one specimen appear to be located ventrally, in the other to the right of intestine. Vulva located slightly pre median. Cuticular pars distalis vaginae and pars proximalis vaginae surrounded by constrictor muscle.

**Diagnosis.** *Onepunema enigmaticum* **gen. et sp. n.** is the type species of *Onepunema* **gen. n.** *Onepunema enigmaticum* **gen. et sp. n.** is characterised by the presence of two laterodorsal and two lateroventral rows of pores with conspicuous ducts, slender pharynx with rounded terminal bulb, presence of two types of cells in intestinal epithelium. Males are characterised by the presence of four or five pre-cloacal supplements consisting of thickened areas of cuticle.

**Differential diagnosis.** *Onepunema enigmaticum* **gen. et sp. n.** resembles some species of the genus *Chromaspirina*, such as *C. pontica* Filipjev, 1918 and *C. parapontica* Luc & De Coninck, 1959 in shape of body and head region, but can easily be distinguished from them as these species all have distinct teeth in their buccal cavity (absent in *Onepunema enigmaticum* **gen. et sp. n.**) and distinct somatic setae (absent along the body in *Onepunema enigmaticum* **gen. et sp. n.**). *Onepunema enigmaticum* **gen. et sp. n.** resembles *Spirinia parasitifera* (Bastian, 1865) in the small buccal cavity and shape of the spicules, but can be distinguished from it as *S. parasitifera* has papilliform outer labial sensillae, unispiral amphids, obvious somatic setae and slender body annuli. *Onepunema enigmaticum* **gen. et sp. n.** resembles *Spirinia schneideri* Luc & De Coninck, 1959 in head and buccal cavity shape, but can be distinguished from it as *S. schneideri* has unispiral amphids and a very short, blunt tail. *Zalonema myrianae* Verschelde & Vincx, 1996 is similar to *Onepunema enigmaticum* **gen. et sp. n.** in the shape of the head capsule and buccal cavity with inconspicuous teeth, but differs from the latter in the presence of cheilorhabdia (not observed in *Onepunema enigmaticum* **gen. et sp. n.**), and subcephalic setae (absent in *Onepunema enigmaticum* **gen. et sp. n.**), and multispiral amphideal fovea (cryptocircular in *Onepunema enigmaticum* **gen. et sp. n.**).

## Subfamily PSEUDONCHINAE Gerlach & Riemann, 1973

**Diagnosis** (from Decraemer & Smol 2006). Buccal cavity bilaterally symmetrical, large, tubular, subdivided with ventrosublateral teeth at junction of subdivisions.

## Genus *Pseudonchus* Cobb, 1920

### *Pseudonchus virginiae* sp. n.

(Figs 5–6, Table 1)

**Type sepcimens.** Holotype male, collected 6 April 2007 (NIWA cruise TAN0705, station 45), southwestern Chatham Rise (44.485° S, 177.141° E), water depth: 1240 m, sediment depth: 1–5 cm, silt/clay content: 82.9%, $CaCO_3$ content: 38.5%, sediment chlorophyll *a* concentration: 32 ng/gDW sediment (NIC 865971). Paratype female, same data as holotype (NIC 865972).

**Etymology.** The species is named in honour of Virginie Gagnon-Leduc.

**Description.** *Male.* Stout cylindrical body, orange colour, tapering slightly towards head and tail. Cuticle thin (1–2 µm thick), with slight transverse striations beginning posterior to cephalic setae to tail tip. No lateral differentiation. Eight rows of short (2 µm), sparse somatic setae, each connected to a single, nucleated gland, mostly visible in anterior region. Chords with numerous, irregularly-shaped, dark orange inclusions (Figure 7D).

Six setiform outer labial sensillae and four slightly longer cephalic setae. Inner labial sensillae not observed. Sub-cephalic setae absent. Cryptocircular amphideal fovea turning ventrally and smaller, circular amphideal aperture. Large buccal cavity divided into anterior protostomal and posterior metastomal regions, heavily cuticularised. Anterior margin of protostome with two rows of seven incurving teeth. Six larger teeth at junction of protostome and mesostome, two dorsally and four ventrosublaterally. Pharynx muscular, surrounding metostome, with small terminal bulb. One ventral and two dorsosublateral pharyngeal tubes. Nerve ring at 60% of pharynx length from anterior. Secretor-excretory system not observed. Cardia short.

Reproductive system monorchic with one anterior, outstretched testis situated ventrally relative to intestine. Short, arcuate spicules with well-developed capitulum. Short, slightly bent gubernaculum. Five short pre-cloacal setae, beginning 32 µm anterior of cloaca, 27–33 µm apart. Short conical tail, with three caudal glands and well-defined spinneret.

*Female.* Similar to male, but with greater body diameter and smaller, multispiral (1.3–1.4 turns) amphids. Reproductive system with two reflexed ovaries situated ventrally relative to intestine. Vulva located at almost two thirds of body length.

**Diagnosis and relationships.** *Pseudonchus virginiae* **sp. n.** is characterised by short cephalic setae, sexual dimorphism in amphid shape (cyptocircular amphideal fovea in males *vs* multispiral in females), short arcuate spicules with capitulum, five regularly-spaced precloacal setae, and short conical tail.

Nine valid *Pseudonchus* species have been described so far, viz., *P. rotundicephalus* Cobb, 1920, *P. symmetricus* De Coninck, 1942, *P. kosswigi* Murphy, 1964a, *P. jenseni* Murphy, 1964b, *P. gerlachi* (Gerlach, 1953) Warwick, 1969, *P. deconincki* Warwick, 1969, *P. northumbriensis* Warwick, 1969, *P. decempapillatus* Ward, 1974, and *P. pachysetosus* Blome, 1982. *P. virginiae* n. sp. can be distinguished from all other species of the genus based on the combination of the following characters: relatively small body size (1100–1200 µm), short tail (< 2.0 abd), and presence of five small precloacal setae.

**Discussion.** This is the first record of the genus *Pseudonchus* within the New Zealand region, and, to our knowledge, from the deep sea (>200 m water depth). This genus is unusual in that the dorsal sector of the buccal cavity has been lost, resulting in a lateral symmetry instead of the usual triradial symmetry found in most other nematode taxa. This loss of the dorsal sector is mostly restricted to the labial and buccal regions, however, and only affects the anterior extremity of the pharynx, as suggested by De Coninck (1945) based on observations on *P. symmetricus*. The presence of three marginal tubes in the pharynx of *P. virginiae* **sp. n.** (one ventral and two dorsosublateral) is consistent with these observations.

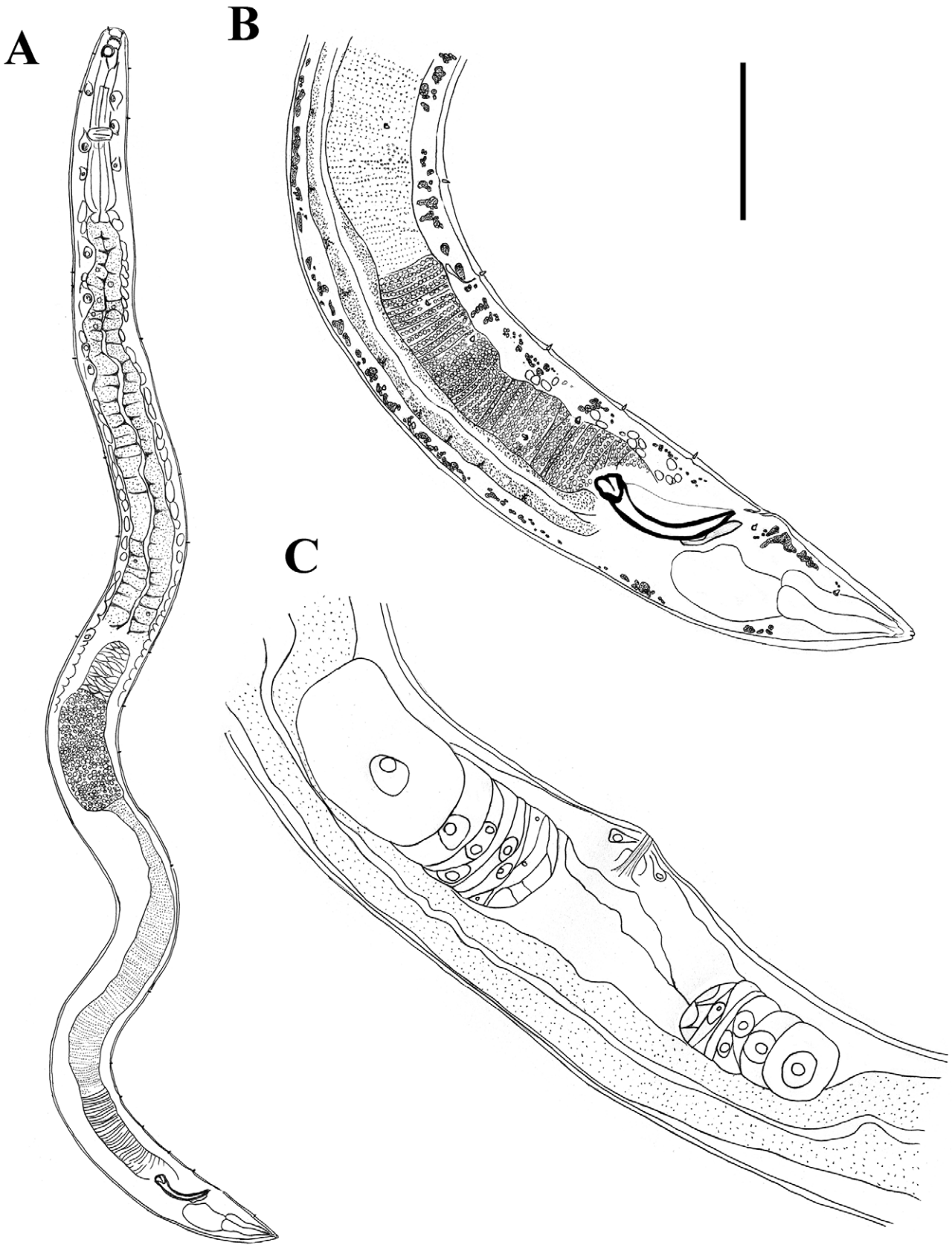


**FIGURE 5.** *Pseudonchus virginiae* **sp. n.** A: Entire male in cross-section view; B: lateral view of male posterior region; C: female reproductive system. Scale bar: A = 150 µm; B and C = 53 µm.

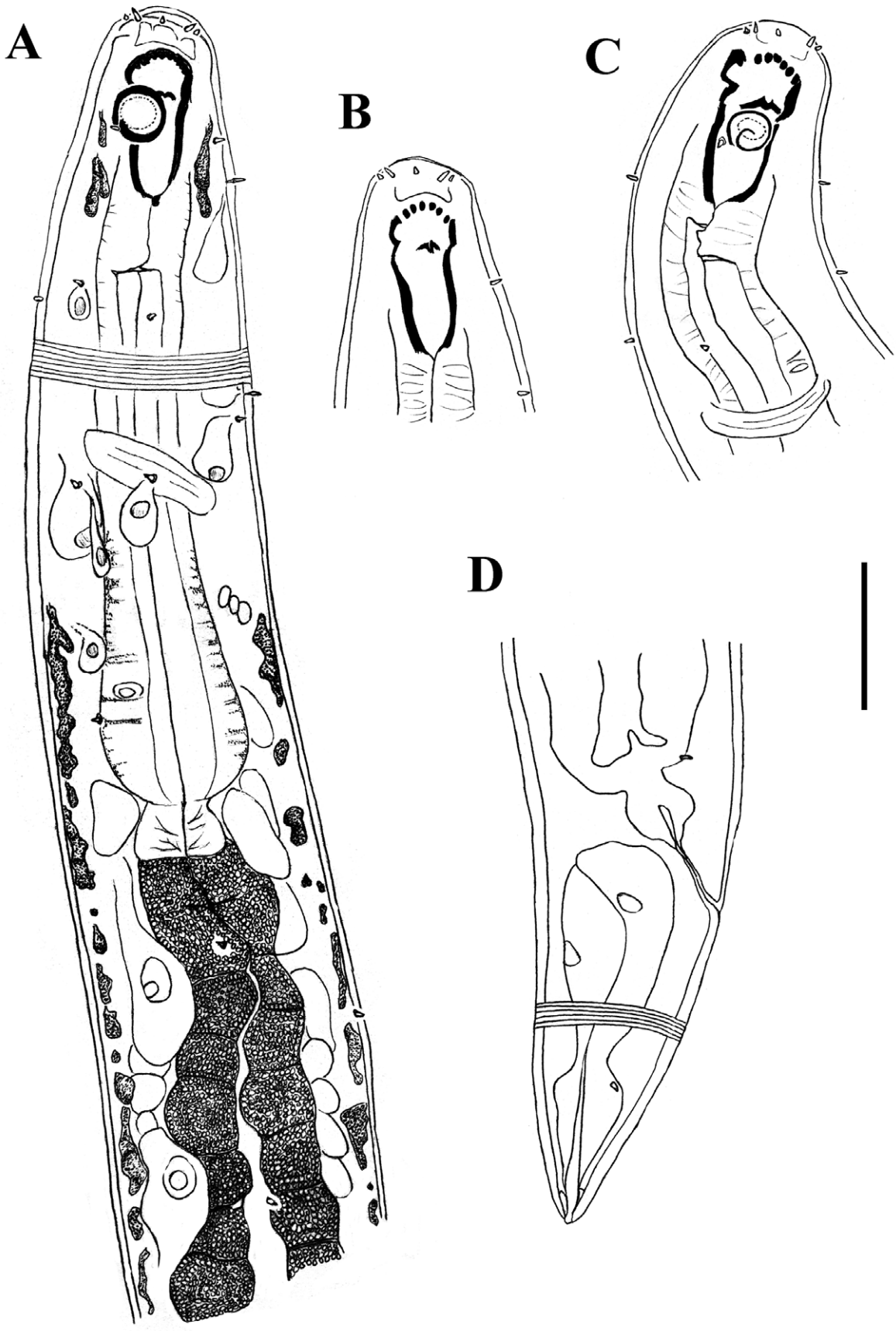


**FIGURE 6.** *Pseudonchus virginiae* **sp. n.** A: Lateral view of male anterior region; B: lateral view of male head showing buccal cavity; C: lateral view of female head; D: female tail. Scale bar = 30 µm.

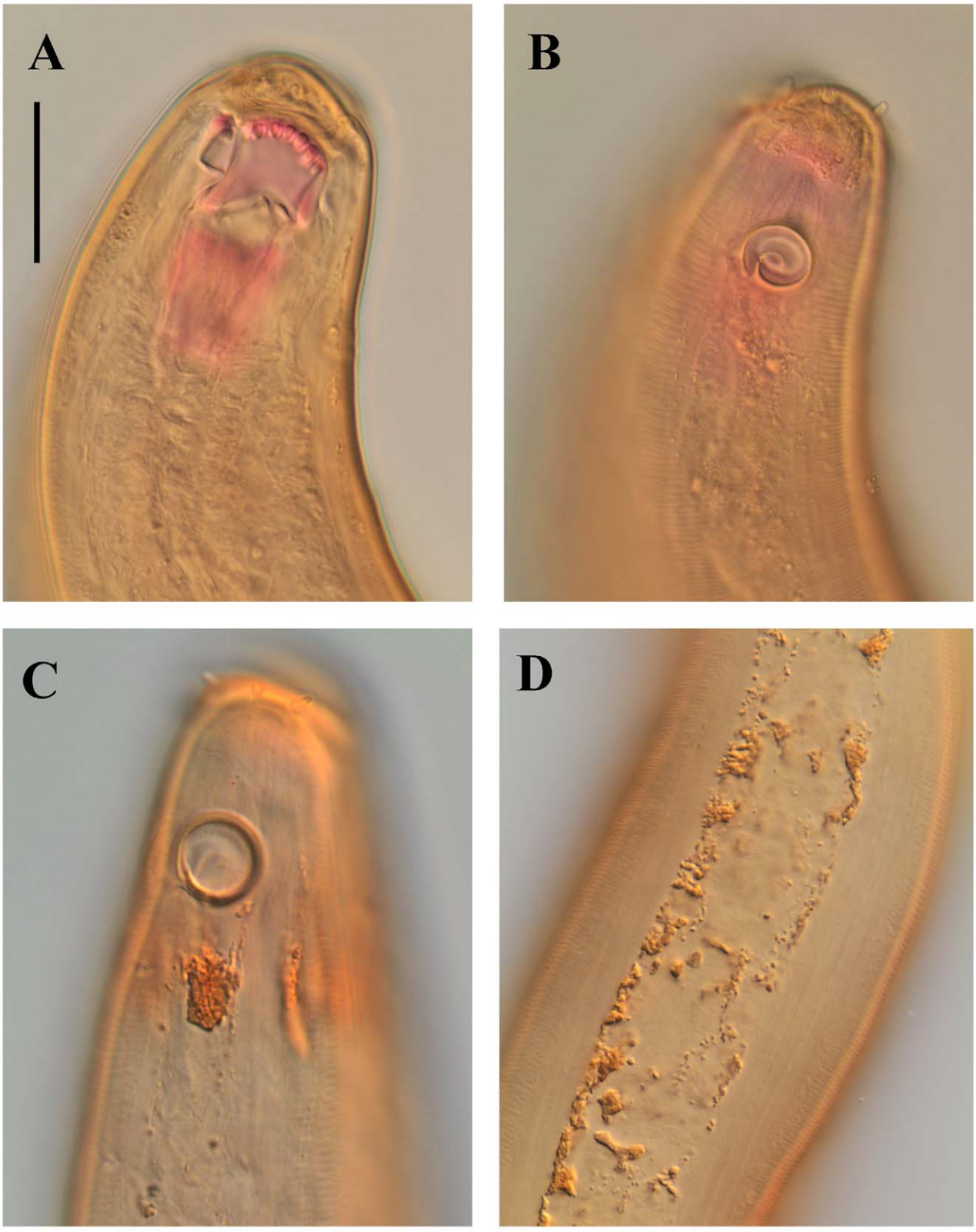


**FIGURE 7.** *Pseudonchus virginiae* **sp. n. Light micrographs.** A: Lateral view of female head showing anterior portion of buccal cavity and teeth (optical section); B: lateral surface view of female head, showing multispiral amphideal fovea and cuticle striations; C: lateral surface view of male head showing cryptocircular amphideal fovea; D: lateral view of male middle body region showing lateral chord with granular inclusions. Scale bar: A, B and C = 20 µm; D = 27 µm.

## Key to all known species of *Pseudonchus*

| | | |
|---|---|---|
| 1 | Male amphideal fovea 30% of cbd or less | 2 |
| - | Male amphideal fovea more than 30% of cbd | 4 |
| 2 | Male with pre-cloacal supplements | 3 |
| - | Male with no supplement or genital setae | *P. kosswigi* Murphy, 1964a |
| 3 | Male with prominent swollen pre-cloacal supplements and genital setae | *P. symmetricus* De Coninck, 1942 |
| - | Male with pre-cloacal ventral ala and 7–10 tubular pre-cloacal supplements | *P. jenseni* Murphy, 1964b |
| 4 | Male amphideal fovea circular or cryptocircular | 5 |
| - | Male amphideal fovea unispiral or multispiral | 6 |
| 5 | Male amphideal fovea circular, body slender (a = 50), one large double-jointed pre-cloacal papilla | *P. northumbriensis* Warwick, 1969 |
| - | Male amphideal fovea cryptocircular, body stout (a = 20), five short pre-cloacal setae | *P. virginiae* **sp. n.** |
| 6 | Male amphideal fovea multispiral | *P. rotundicephalus* Cobb, 1920 |
| - | Male amphideal fovea unispiral | 7 |
| 7 | Male with tubular pre-cloacal supplements, spicules with rounded capitulum | 8 |
| - | Male with no supplements, spicules with squared capitulum | *P. gerlachi* (Gerlach, 1953) Warwick, 1969 |
| 8 | Cephalic setae > 10 µm long, caudal setae present | 9 |
| - | Cephalic setae < 5 µm long, caudal setae absent | *P. deconincki* Warwick, 1969 |
| 9 | Body length < 2.5 mm, tail ~3 abd long | *P. decempapillatus* Ward, 1974 |
| - | Body length >3.0 mm, tail ~2 abd long | *P. pachysetosus* Blome, 1982 |

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