

Two new gonad-infecting *Philometra* species (Nematoda: Philometridae) from the marine fish *Lutjanus vitta* (Perciformes: Lutjanidae) off New Caledonia

František Moravec¹ and Jean-Lou Justine^{2,3}

¹Institute of Parasitology, Biology Centre of the Academy of Sciences of the Czech Republic, Branišovská 31, 370 05 České Budějovice, Czech Republic;

²UMR 7138 Systématique, Adaptation, Évolution, Muséum National d'Histoire Naturelle, 57, rue Cuvier, 75231 Paris cedex 05, France;

³Aquarium des Lagons, B.P. 8185, 98807 Nouméa, New Caledonia

Abstract: Two new gonad-infecting species of *Philometra* Costa, 1845 (Philometridae), *P. brevicollis* sp. n. and *P. mira* sp. n., are described from the ovary of the brownstripe red snapper, *Lutjanus vitta* (Quoy et Gaimard) (Lutjanidae, Perciformes), from the South Pacific Ocean off the coast of New Caledonia. Based on light and scanning electron microscopy examination, these new nematodes are compared with all other gonad-infecting species of *Philometra*. The former species (males and mature and gravid females available) mainly differs from its congeners in the length of males (5.39–5.92 mm), equally long spicules (279–312 µm), and the gubernaculum (151–168 µm), in that the distal end of the gubernaculum bears dorsolateral transverse lamella-like structures, and in the structure of the male caudal end. The latter species (only males available) is characterized by the length of males (3.47–3.66 mm), equally long spicules (96–105 µm), and the gubernaculum (78–84 µm), the absence of a dorsal reflected barb or lamella-like structures on the distal end of gubernaculum, and by the structure of the male caudal end. Judging from the occurrence in the host, *P. brevicollis* is the main philometrid parasitizing the gonads of *L. vitta*, in which it can reproduce, whereas this fish probably serves as only the paradesinitive host for *P. mira*. Both *P. brevicollis* and *P. mira* are the first nominal species of *Philometra* described from fishes of the family Lutjanidae.

Keywords: parasitic nematode, *Philometra*, marine fish, *Lutjanus*, New Caledonia, South Pacific

Gonad-infecting species of *Philometra* Costa, 1845 (Philometridae, Dracunculoidea) are widely distributed in marine fishes of the Atlantic, Indian and Pacific Oceans, sometimes also occurring in brackish-water environments (Moravec et al. 2011). These parasites may be severely pathogenic in fish ovaries and can affect reproduction (Sakaguchi et al. 1987, Clarke et al. 2006, Moravec 2006, Moravec et al. 2007, Quiazon et al. 2008a, Perez et al. 2009).

To date, the following five gonad-infecting species of *Philometra* have been recorded from marine fishes of the families Lethrinidae, Priacanthidae, Serranidae and Tetraodontidae from the South Pacific Ocean off the coast of New Caledonia: *Philometra cyanopodi* Moravec et Justine, 2008, *P. fasciati* Moravec et Justine, 2008, *P. lethrini* Moravec et Justine, 2008, *P. priacanthi* Moravec et Justine, 2009 and *P. tenuicauda* Moravec et Justine, 2009 (see Moravec and Justine 2005, 2008, 2009). Moravec and Justine (2008) also reported one subgravid and one nongravid female of *Philometra* sp. from the ovary of the

only specimen of *Lutjanus vitta* (Quoy et Gaimard) (Lutjanidae) examined from New Caledonian waters in October of 2006. Additional *Philometra* specimens, males and mature nongravid females, were recovered from ovaries of two specimens of the same host species from the same locality in April of 2009. This material made possible to establish two new species of *Philometra*, which are described herein.

The brownstripe red snapper *L. vitta* (maximum body length 40 cm) is a marine, reef-associated tropical commercial fish distributed in the Indo-West Pacific, including Seychelles, then southern India to New Caledonia and Gilbert Islands, extending northward to the Ryukyu Islands (Froese and Pauly 2011).

MATERIALS AND METHODS

Lutjanids from the lagoon and deep-sea off Nouméa, New Caledonia were examined for philometrids. Abdominal organs were examined in 106 specimens belonging to 18 species (methods in Justine et al. 2010). Only *Lutjanus vitta* harboured philo-

metrids: no philometrids were found in the abdominal cavity of 31 examined specimens with immature ovaries, but 3 of the 4 specimens with mature ovaries (220–257 mm in fork length and 163–296 g in weight) had philometrids. Negative results in 17 of the 18 species of lutjanids examined may be due to the fact that only a minority of the specimens had mature ovaries.

For morphological studies, the nematodes were fixed in hot 4% formaldehyde solution in physiological saline. For light microscopical examination, they were cleared with glycerine. Drawings were made with the aid of a Zeiss microscope drawing attachment. The specimens used for scanning electron microscopy (SEM) were stored in 4% formaldehyde solution and then postfixed in 1% osmium tetroxide, dehydrated through a graded acetone series, critical point dried and sputter-coated with gold; they were examined using a JEOL JSM-7401F scanning electron microscope at an accelerating voltage of 4 kV GB low. All measurements are in micrometres unless otherwise stated. Fish names follow FishBase (Froese and Pauly 2011).

RESULTS

Philometra brevicollis sp. n.

Figs. 1, 2

Male (11 specimens; measurements of holotype in parentheses): Body filiform, whitish, 5.39–5.92 (5.73) mm long, maximum width at posterior part 66–78 (78); anterior part of body somewhat narrowed just posterior to cephalic end (Figs. 1 D, 2 D); body width at this narrowed part 33–39 (36). Maximum width/body length ratio 1:72–89 (1:73). Cuticle smooth. Cephalic end rounded, 48–54 (51) wide. Oral aperture small, triangular, surrounded by 14 minute cephalic papillae arranged in two circles: external circle formed by four submedian pairs of papillae (each pair consisting of one circular and one narrower, more elongate papilla); internal circle by four submedian and two lateral papillae. Small lateral amphids just posterior to lateral papillae of internal circle (Figs. 1 E, 2 A,B). Oesophagus well visible, 555–720 (582) long, forming 10–12 (10)% of body length, with distinct inflation at anterior end measuring 60–69 × 33–42 (69 × 33) (Fig. 1 D); posterior part of muscular oesophagus overlapped by well-developed oesophageal gland with large cell nucleus in middle; maximum width of gland 27–42 (33). Small ventriculus 6–9 (9) long, 6–12 (12) wide. Oesophagus opening into intestine through distinct valve. Oesophageal nucleus and nerve ring 405–531 (459) and 207–240 (228), respectively, from anterior extremity (Fig. 1 D). Excretory pore 240–279 (279) from anterior end. Testis extending anteriorly to short distance anterior to anterior end of intestine, overlapping thus posterior end of oesophagus. Posterior end of body blunt, 39–51 (45) wide, provided with broad U-shaped mound situated laterally and dorsally to cloacal opening (Figs. 1 N, 2 C); three adanal pairs of very flat, hardly visible caudal papillae present. Phasmids not located. Spicules slender, needle-like, equally long, with somewhat expanded proximal and sharply pointed distal tips (Figs. 1 K,L, 2 C); length of spicules 279–312 (288), representing 5.0–5.3 (5.0)% of

body length. Gubernaculum narrow, 151–168 (151) long, with anterior portion somewhat dorsally bent; length of anterior bent part 27–42 (33), representing 17–27 (22)% of entire gubernaculum length. Distal part of gubernaculum with distinct transverse lamella-like structures arranged on both sides of dorsal surface, demarcating broad smooth field between them; ventral surface of gubernaculum distal portion with two conspicuous longitudinal grooves (Figs. 1 F,G,K,L, 2 C,F,G). Length ratio of gubernaculum and spicules 1:1.79–1.93 (1:1.91). Spicules and gubernaculum well sclerotized; spicules and gubernaculum yellowish, anterior part of gubernaculum colourless.

Subgravid female (1 specimen – allotype; after Moravec and Justine 2008): Body of fixed specimen brownish, with dark brown intestine visible through cuticle. Body filiform, 25.70 mm long, maximum width 381. Maximum width/body length ratio 1:67. Cuticle smooth. Cephalic end rounded; cephalic papillae indistinct in lateral view. Oral aperture oval, surrounded by small cephalic papillae arranged in two circles and slightly outlined lateral amphids; internal circle of papillae consisting of four submedian and two lateral single papillae, whereas external circle formed by four submedian pairs of papillae, each composed of one short and one elongate papilla (Fig. 1 B). Oesophagus including anterior bulbous inflation 1.09 mm long, representing 4% of body length; bulb well developed, 84 long and 87 wide; maximum width of oesophagus including oesophageal gland 95. Oesophageal gland well developed, with large cell nucleus at middle. Nerve ring and nucleus of oesophageal gland 258 and 639, respectively, from anterior extremity. Ventriculus 33 long and 75 wide. Oesophagus opening into intestine through distinct valve (Fig. 1 A). Intestine ending blindly, its posterior end attached by long ligament ventrally to body wall near caudal end; ligament 272 long. Vulva and anus absent. Ovaries long, narrow, reflected, situated near body ends. Uterus containing spherical eggs. Caudal end rounded, with two small, lateral papilla-like projections (Fig. 1 M).

Mature female (5 specimens): Body filiform, whitish, 5.45–6.57 mm long, maximum width 63–72; anterior part of body somewhat narrowed just posterior to cephalic end; body width at this narrowed part 36–39. Maximum width/body length ratio 1:76–100. Cuticle smooth. Cephalic end rounded, 39–42 wide. Oesophagus well visible, 684–774 long, forming 11–14% of body length, with distinct inflation at anterior end measuring 42–51 × 27–33; posterior part of muscular oesophagus overlapped by well-developed oesophageal gland with large cell nucleus in middle; maximum width of gland 33–39. Small ventriculus 9–12 long, 15–24 wide. Oesophagus opening into intestine through distinct valve. Oesophageal nucleus and nerve ring 396–480 and 156–195, respectively, from anterior extremity (Fig. 1 C). Excretory pore 192–228 from anterior end. Anus absent. Vulva postequatorial, situated 3.56–4.58 mm from anterior extremity, at 65–70% of

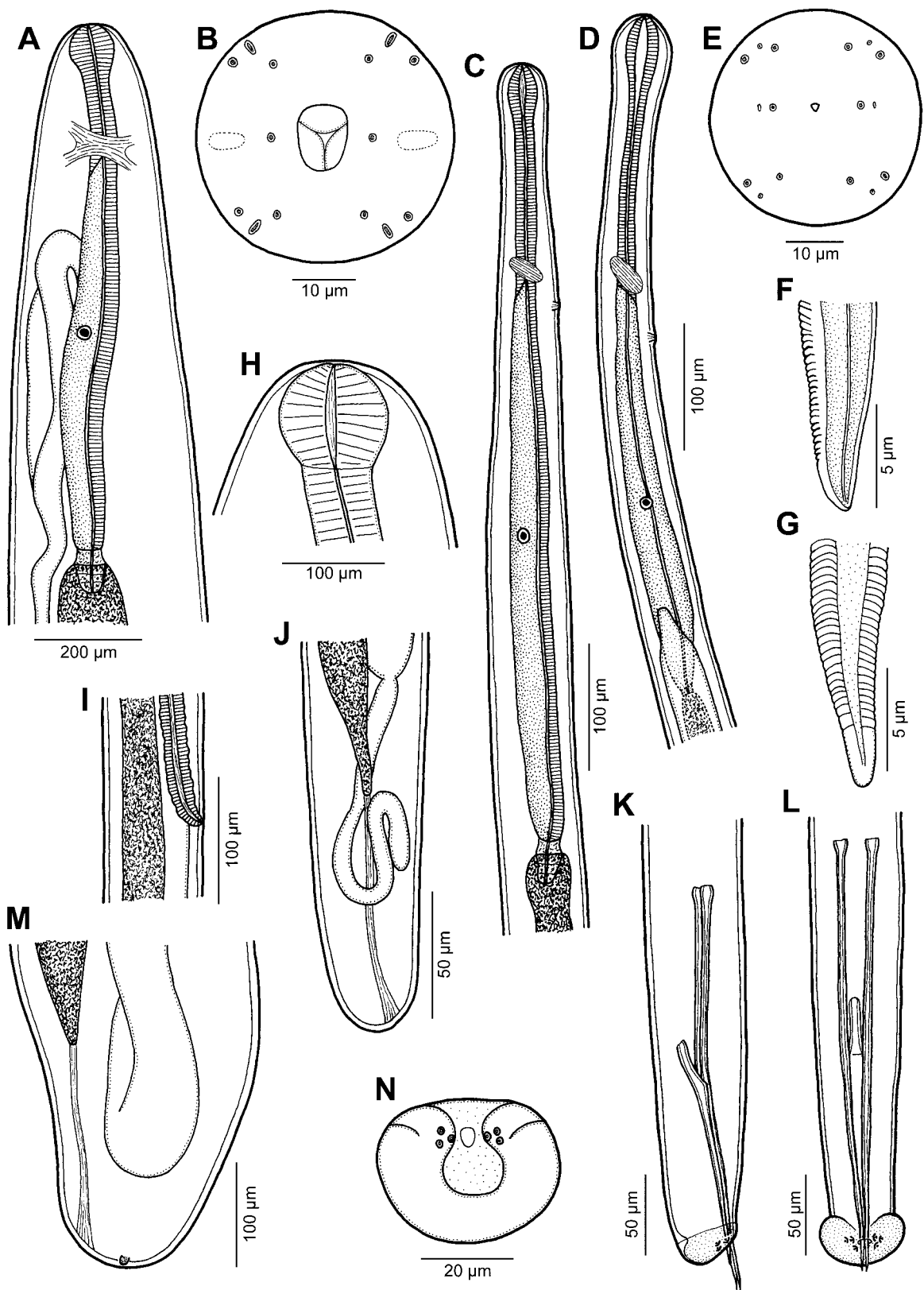


Fig. 1. *Philometra brevicollis* sp. n. **A** – anterior end of subgravid female, lateral view; **B** – cephalic end of subgravid female, apical view; **C** – anterior end of mature female, lateral view; **D** – anterior end of male, lateral view; **E** – cephalic end of male, apical view; **F, G** – distal end of gubernaculum, ventral and dorsal views; **H** – cephalic end of subgravid female, lateral view; **I** – vulva of mature female, lateral view; **J** – posterior end of mature female, lateral view; **K, L** – posterior end of male, lateral and ventral views; **M** – caudal end of subgravid female, lateral view; **N** – tail of male, apical view.

body length; short vagina directed anteriorly from vulva (Fig. 1 I). Uterus amphidelphic, empty, extending posteriorly to short distance from posterior end of body. Ovaries short, situated near both ends of uterus. Caudal end rounded, 33–39 wide, without any projections (Fig. 1 J).

Type host: Brownstripe red snapper, *Lutjanus vitta* (Lutjanidae, Perciformes).

Site of infection: Ovary.

Type locality: South Pacific Ocean, off Nouméa, New Caledonia (collected 10 October 2006 and 16 April 2009).

Prevalence and intensity: 3 fish infected/4 fish examined; 2–22 (mean 14) specimens per fish.

Deposition of types: Muséum National d'Histoire Naturelle, Paris (JNC 2901 – holotype and 9 paratypes, 6 males and 3 mature females, JNC 2038A – allotype, subgravid female) and Institute of Parasitology, Biology Centre, ASCR, České Budějovice (N-967 – 4 paratypes, males).

Etymology: The specific Latin name *brevicollis* (= with a short neck) relates to a characteristic feature of this species, i.e., the narrows behind the cephalic extremity in males and mature females.

Comments. At present, there are 30 gonad-infecting species of *Philometra* parasitizing marine and brackish-water fishes that can be considered valid (Moravec et al. 2011). All species with described males can be easily distinguished from *P. brevicollis* by the length of spicules. The great majority of them possess spicules shorter than 160 (vs. 279–312) and one species, *P. katsuwoni* Petter et Baudin-Laurencin, 1986, has very unequal spicules the larger of which is 1.75–2.57 mm long (Moravec 2006, Moravec et al. 2008a, 2011, Cárdenas et al. 2009). Spicules of length somewhat similar to that in *P. brevicollis* occur only in five species: shorter spicules in *P. cyanopodi* (183–228), *P. floridensis* Moravec, Fajer-Avila et Bakenhaster, 2011 (138–204), *P. jordanoi* (López-Neyra, 1951) (260–265) and (245–249), whereas longer spicules in *P. margolisi* Moravec, Vidal-Martínez et Aguirre-Macedo, 1995 (432–468). However, in contrast to the new species, the males of all these five species are distinctly smaller, not exceeding 4.5 mm (vs. 5.4–5.9 mm) in length.

Whereas some gonad-infecting species of *Philometra* have a smooth gubernaculum, sometimes provided with a conspicuous, reflected dorsal barb on the distal tip (e.g., *P. carolinensis* Moravec, de Buron et Roumillat, 2006 and *P. floridensis* – see Moravec et al. 2006, 2010a, Moravec and de Buron 2009), the following ten species were described to possess marked dorsal lamella-like structures on the distal part of the gubernaculum, resembling thus *P. brevicollis*: *P. charlestonensis* Moravec, de Buron, Baker et González-Solís, 2008, *P. cyanopodi*, *P. genypteri* Moravec, Chávez et Oliva, 2011, *P. lateolabracis* (Yamaguti, 1935), *P. madai* Quiazon, Yoshinaga et Ogawa, 2008, *P. nemipteri* Luo, 2001, *P. priacanthi*, *P. saltatrix* Ramachandran, 1973, *P. sarawa* Quiazon, Yoshinaga et Ogawa, 2008 and *P. sciaenae* Yamaguti,

1941 (Moravec and Justine 2008, 2009, Moravec et al. 2008a,b, 2011, Quiazon et al. 2008a,b). However, in all these species the transverse lamella-like structures cover the entire dorsal surface of the gubernaculum distal end, whereas these lamellar structures form two dorsolateral margins demarcating a wide smooth field between the margins in *P. brevicollis*. This is a unique feature among all philometrids.

Six gonad-infecting species of *Philometra*, *P. inimici* Yamaguti, 1941, *P. managatuwo* Yamaguti, 1941, *P. nepotomeni* Mateo, 1972, *P. scomberomori* (Yamaguti, 1935), *P. sebastisci* Yamaguti, 1941 and *P. serranellicambrillae* Janiszewska, 1949, are known only by females, with mostly uniform morphology, whereas conspecific males have not yet been discovered. Since philometrids exhibit a fairly high degree of host specificity (Moravec 2006), these six species can be distinguished from *P. brevicollis* only by their host types (Lutjanidae vs. Centrolophidae, Scombridae, Sebastidae, Serranidae, Stromateidae, Synanceiidae) and geographical distribution, because none of the above mentioned six gonad-infecting species has been reported from the region of the western South Pacific.

Moravec and Justine (2008) recorded one subgravid female (25.7 mm long) and a body fragment of one non-gravid female of *Philometra* from the ovary of *L. vitta* in New Caledonia and designated them *Philometra* sp. Since *P. brevicollis* seems to be the abundant parasite of *L. vitta* in this locality, the above-mentioned females can be assigned to this species. Nevertheless, it is highly desirable to describe the gravid (larvigerous) female of *P. brevicollis* in the future.

Lutjanus spp. have already been recorded as hosts of gonad-infecting species of *Philometra*. Linton (1907) and Rees (1970) reported *Ichthyonema* (= *Philometra*) sp. or *Philometra* spp. from the gonads of *Lutjanus synagris* (Linnaeus) and *Lutjanus* spp., respectively, from Bermuda, which were considered by Moravec et al. (1988) to be probably *Philometra lateolabracis*. However, with respect to the redescription of *P. lateolabracis* by Quiazon et al. (2008b), these nematodes apparently belong to a different species and should be designated *Philometra* sp. until their detailed morphology, including that of the male, is described (Moravec 2008). Recently, Santos Cavalcanti et al. (2010) reported *Philometra* sp. from the gonads of *L. synagris* from off the Brazilian Atlantic coast. Consequently, *P. brevicollis* is the first nominal species of gonad-infecting philometrid described from fishes of the family Lutjanidae. Specimens of 17 additional species of lutjanids were examined in New Caledonia, but only *L. vitta* had philometrids.

To date, the only other philometrid reported from a lutjanid fish has been *Dentiphilometra lutjani* González-Solís, Moravec et Tuz Paredes, 2007, based solely on gravid and subgravid females recovered from the body

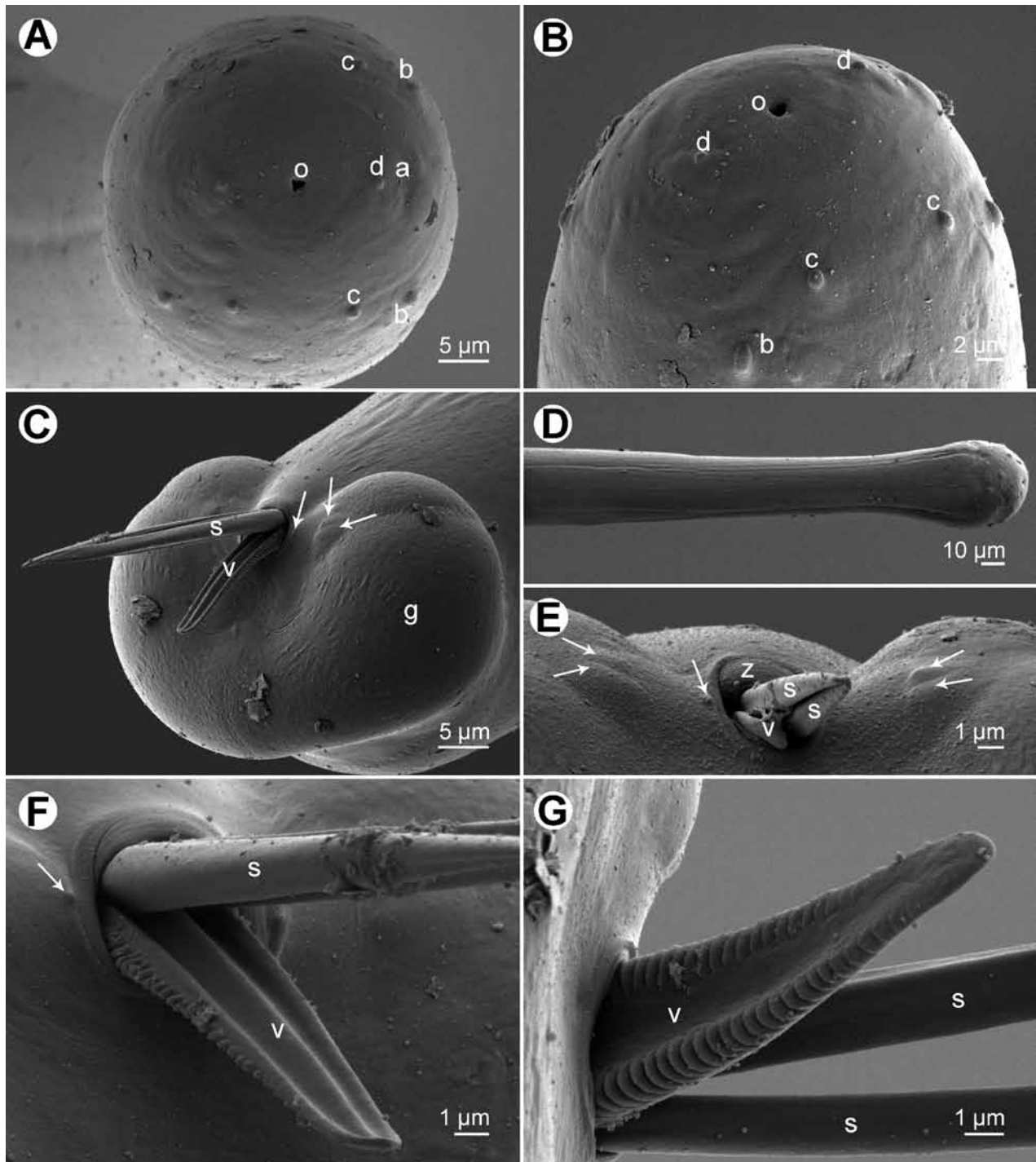


Fig. 2. *Philometra brevicollis* sp. n., scanning electron micrographs of male. **A, B** – cephalic end, apical and sublateral views; **C** – caudal end, sublateral view (arrows indicate genital papillae); **D** – anterior end of body, lateral view; **E** – region of cloacal aperture, subapical view (arrows indicate genital papillae); **F** – cloacal aperture with protruding spicules and gubernaculum, sublateral view (arrow indicates genital papilla); **G** – same, dorsal view. *Abbreviations:* a – amphid; b – pair of submedian cephalic papillae of external circle; c – submedian cephalic papilla of internal circle; d – lateral cephalic papilla of internal circle; g – caudal mound; o – oral aperture; s – spicule; v – gubernaculum; z – anterior cloacal lip.

musculature of *Lutjanus griseus* (Linnaeus) from off the Caribbean coast of Mexico (González-Solís et al. 2007). A single male of *Philometra* sp. from the fin of the same

host species (*L. griseus*) in southern Gulf of Mexico was described by González-Solís in his unpublished Ph.D. thesis (González-Solís 2001).

***Philometra mira* sp. n.**

Figs. 3, 4

Male (4 specimens; measurements of holotype in parentheses): Body filiform, whitish, 3.47–3.66 (3.54) mm long, maximum width at posterior part 45–51 (45); anterior part of body somewhat narrowed just posterior to cephalic end; body width at this narrowed part 27–33 (27) (Fig. 3 A). Maximum width/body length ratio 1:70–79 (1:79). Cuticle smooth. Cephalic end rounded, 36–42 (36) wide. Oral aperture triangular, surrounded by 14 minute cephalic papillae arranged in two circles: external circle formed by four submedian pairs of papillae (each pair consisting of one circular and one narrower, more elongate papilla); internal circle by four submedian and two lateral papillae. Small lateral amphids just posterior to lateral papillae of internal circle (Figs. 3 B,E, 4 A). Oesophagus well visible, 345–621 (345) long, forming 10–18 (10)% of body length, with distinct inflation at anterior end measuring $42 \times 48 \times 18$ – $33 (42 \times 30)$ (Fig. 3 E); posterior part of muscular oesophagus overlapped by well-developed oesophageal gland with large cell nucleus in middle; maximum width of gland 18–24 (18) (Fig. 3 A). Ventriculus not measured. Oesophagus opening into intestine through distinct valve. Oesophageal nucleus and nerve ring 246–312 (312) and 159–186 (168), respectively, from anterior extremity. Excretory pore 204–216 (204) from anterior end. Testis extending anteriorly to short distance anterior to anterior end of intestine, overlapping posterior end of oesophagus. Posterior end of body blunt, 30–39 (30) wide, with broad U-shaped mound extending dorsally and laterally (Figs. 3 F, 4 B); one pair of adanal and two pairs of postanal very flat, hardly visible caudal papillae present (Figs. 3 C,D,F, 4 B). Phasmids not located. Spicules slender, needle-like, equally long, with somewhat expanded proximal and sharply pointed distal tips (Fig. 3 C,D); length of spicules 96–105 (99), representing 2.8–2.9 (2.8)% of body length. Gubernaculum narrow, 78–84 (78) long, with anterior portion somewhat dorsally bent (Fig. 3 C); length of anterior bent part 39–45 (39), representing 46–54 (50)% of entire gubernaculum length; distal part of gubernaculum appearing to be smooth. Length ratio of gubernaculum and spicules 1:1.14–1.30 (1:1.27). Spicules and gubernaculum well sclerotized.

Type host: Brownstripe red snapper, *Lutjanus vitta* (Lutjanidae, Perciformes).

Site of infection: Ovary.

Type locality: South Pacific Ocean, off New Caledonia (collected 16 April 2009).

Prevalence and intensity: 2 fish infected/4 fish examined; 1 and 3 specimens per fish.

Deposition of types: Muséum National d'Histoire Naturelle, Paris (JNC 2901 – holotype) and Institute of Parasitology, Biology Centre, ASCR, České Budějovice (N-968 – paratype).

Etymology: The specific Latin name *mira* (= strange) relates to the fact that this species accompanies *Philometra brevicollis* with the same location in the host.

Comments. As compared to the foregoing species (*P. brevicollis*), the male specimens of this form are distinctly smaller (3.47–3.66 vs. 5.39–5.92 mm long), their spicules are conspicuously shorter (96–105 vs. 279–312) and the length ratio of the gubernaculum and spicules is different (1:1.14–1.30 vs. 1:1.79–1.93). The gubernaculum and spicules are as well sclerotized as in *P. brevicollis*. The anterior bent portion of gubernaculum represents 46–54 (vs. 17–27)% of its entire length and the length of spicules forms 2.8–2.9 (vs. 5.0–5.3)% of the total body length. These marked differences indicate that these nematodes are not conspecific with *P. brevicollis*, but represent a separate species. The similar structure of the oesophageal part of body suggests that both these species may be related.

Considering the gonad-infecting species of *Philometra*, by the length of spicules *P. mira* resembles the following 11 species, all parasites of perciform fishes: *P. cephalus* Ramachandran, 1975 (spicules 74–116 long), *P. filiformis* (Stossich, 1896) (90–93), *P. isaki* Quiazon, Yoshinaga et Ogawa, 2008 (105–127), *P. lateolabracis* (71–124), *P. lethrini* (102–114), *P. madai* (77–100), *P. mexicana* (Moravec et Salgado-Maldonado, 2007) (90–120), *P. nemipteri* (85–126), *P. saltatrix* (84–111), *P. sarawa* (71–135) and *P. sciaenae* (96–138) (Ramachandran 1975, Moravec et al. 1998, Moravec and Salgado-Maldonado 2007, Moravec and Justine 2008, Quiazon et al. 2008a,b, Gaglio et al. 2009, Moravec and de Buron 2009).

However, the males of *P. mexicana* and *P. sciaenae* are distinctly shorter (1.6–1.9 and 1.5–2.6, respectively, vs. 3.5–3.7 mm), whereas those of *P. filiformis* and *P. lethrini* are distinctly longer (5.2–5.4 and 4.5–5.1 mm, respectively). The gubernaculum of *P. cephalus* bears a small dorsal barb, which is absent in the new species. In contrast to *P. mira*, the male caudal mound of *P. isaki*, *P. lateolabracis*, *P. madai*, *P. nemipteri*, *P. saltatrix*, *P. sarawa* and *P. sciaenae* is distinctly separated dorsally, forming thus two lateral lobes; in having an unseparated, U-shaped male caudal mound, *P. mira* is similar to *P. brevicollis* (see above). Moreover, the posterior end of gubernaculum in *P. lateolabracis*, *P. madai*, *P. nemipteri*, *P. sarawa*, *P. saltatrix* and *P. sciaenae* (as well as *P. brevicollis*) bears transverse lamella-like structures. These structures were not observed in the only *P. mira* examined by SEM, but their presence cannot be excluded in this species. Distinction of *P. mira* from the gonad-infecting species of *Philometra* for which males remain unknown is the same as with *P. brevicollis* (see above), i.e., by the host types and geographical distribution.

Males of *P. mira* were found in two specimens of *L. vitta*, always in co-infection with *P. brevicollis*. One fish harboured 7 males of *P. brevicollis* and 3 males of *P. mira*, whereas the other fish 14 males (but also 6 mature females) of the former and 1 male of the latter species. Judging from the occurrence of both species, *P. brevicollis* appears to be the main parasite of *L. vitta* and, no doubt,

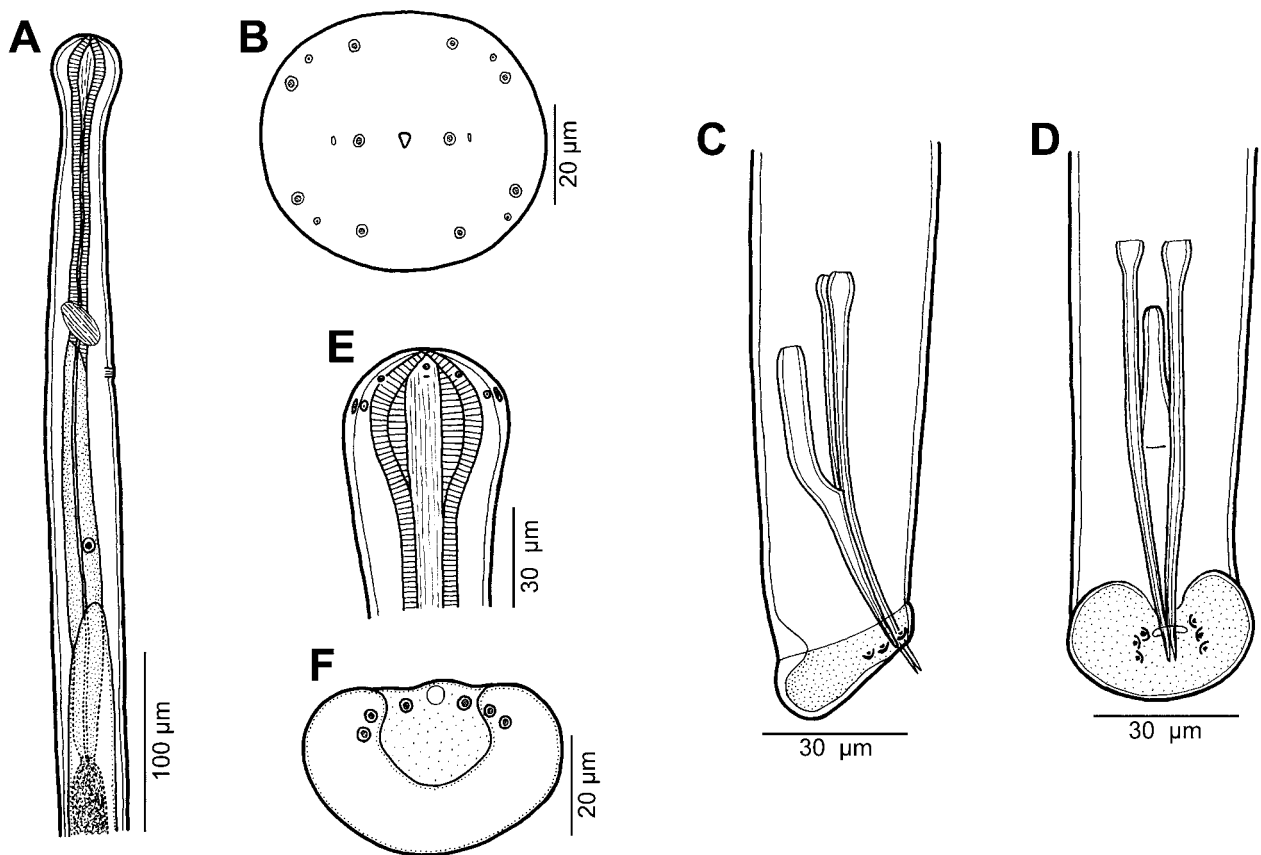


Fig. 3. *Philometra mira* sp. n., male. **A** – anterior end of body, lateral view; **B** – cephalic end, apical view; **C, D** – posterior end, lateral and ventral views; **E** – cephalic end, lateral view; **F** – caudal end, apical view.

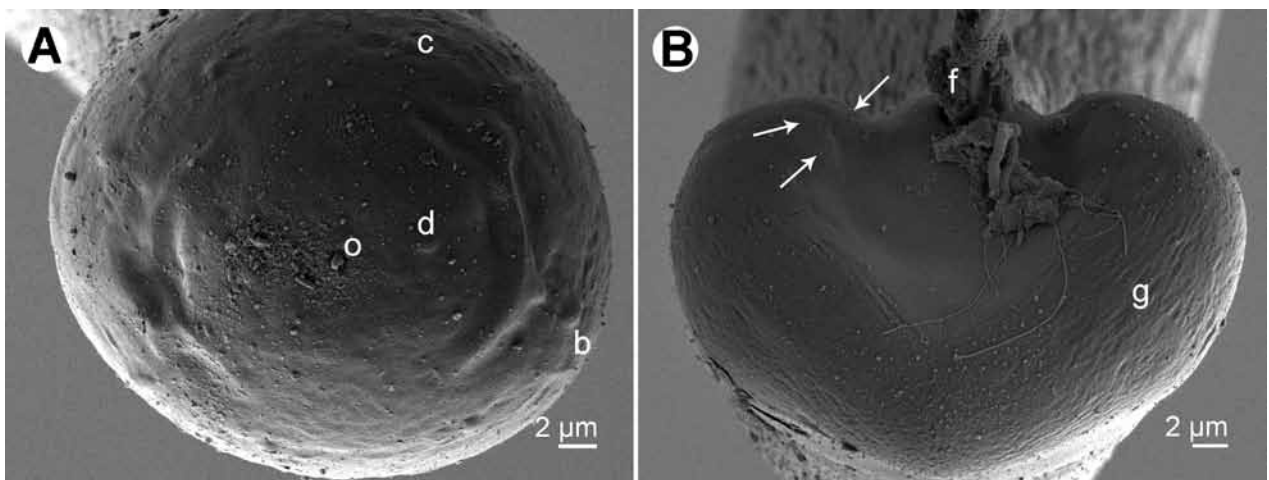


Fig. 4. *Philometra mira* sp. n., scanning electron micrographs of male. **A** – cephalic end, apical view; **B** – caudal end, apical view (arrows indicate genital papillae). *Abbreviations:* b – pair of submedian cephalic papillae of external circle; c – submedian cephalic papilla of internal circle; d – lateral cephalic papilla of internal circle; f – cloacal opening; g – caudal mound; o – oral aperture.

this fish serves as its true definitive host. Therefore, the philometrid females recorded from the gonads of *L. vitta* are considered to belong to this species (even though the presence of apparently indistinguishable females of *P. mira* among them cannot be excluded). Although it cannot be excluded that *L. vitta* is also the definitive host of *P. mira*, it may well be that *L. vitta* serves only as the pardefinitive host for this gonad-infecting nematode, in which the parasite attains maturity but is unable to reproduce (Odening 1976). Such cases were observed in some *Philometra* spp.; for example, males and small mature females of *P. cyprinirutili* (Creplin, 1825), a common parasite of some European cyprinids, were recorded from atypical hosts such as *Anguilla anguilla* (L.) (Anguillidae), *Proterorhinus marmoratus* (Pallas) (Gobiidae) or *Tinca tinca* (L.) (Cyprinidae) (Vojtek 1959, Moravec 1985, 2006, Koubková and Baruš 2000), or small mature females and larvae of *Philometra* sp. in *Rhodeus sericeus* (Pallas) (Cyprinidae) in Europe (Dávidová et al. 2005), where no *Philometra* species reproducing in this host is known.

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- It can be assumed that females of this nematode are unable to attain gravidity in this host species and, consequently, that *L. vitta* does not serve as the true definitive host of *P. mira*. Another possibility is that *P. mira* is also a specific parasite of *L. vitta*, whose gravid females have a different localisation in the host than those of *P. brevicollis*. In such a case, the males of *P. mira*, possibly located in the host body cavity or some tissues, could occasionally penetrate into the ovary. It is well known that one fish species may harbour two or more species of *Philometra*, which differ from each other by the location of their gravid females in the host (Moravec et al. 2009, 2010b). Further studies of *P. mira* are necessary.
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