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Philometroides acanthopagri sp. nov., a new philometrid (Nematoda, Philometridae) from the musculature of *Acanthopagrus latus* (Sparidae) from marine waters of Iraq

František Moravec^{1*}, Abdul Amer R. Jassim² and Nadrah K. Al-Salim³

¹Institute of Parasitology, Biology Centre of the Academy of Sciences of the Czech Republic, Branišovská 31, 370 05 České Budějovice, Czech Republic; ²Department of Vertebrates, Marine Science Center, University of Basrah, Iraq; ³Department of Fisheries and Marine Resources, College of Agriculture, University of Basrah, Iraq

Abstract

A new nematode species, *Philometroides acanthopagri* sp. nov. (Philometridae), is described from gravid and subgravid specimens found in the musculature near pectoral fins and in nasal cavity of the yellowfin seabream *Acanthopagrus latus* (Houttuyn) (Sparidae, Perciformes) from marine waters off the coast of southern Iraq. Based on light and scanning electron microscopical examination, the new species differs from its congeners in a combination of morphological and biometrical features. It is the first species of *Philometroides* reported from a sparid fish and the first representative of this genus recorded from fishes in the Arabian Gulf. A key to *Philometroides* species parasitizing marine and brackish-water fishes is provided.

Keywords

Parasitic nematode, *Philometroides*, marine fish, *Acanthopagrus*, Arabian Gulf, Iraq

Introduction

The fauna of nematode parasites of marine fishes in the Arabian (= Persian) Gulf remains little studied (El-Naffar *et al.* 1992; Kardousha 1992, 1999; Petter and Sey 1997; Moravec and Ali 2005; Al-Salim and Ali 2011). To date, the following four nominal species of philometrid nematodes have been reported from this region: *Philometra globiceps* (Rudolphi, 1819) from the gonad of *Alepes djedaba* (Forsskål) (Carangidae) (Petter and Sey 1997), *Philometra lateolabracis* (Yamaguti, 1935) from the ovaries of eight species belonging to different fish families (Lutjanidae, Mugilidae, Psettodidae, Scombridae, Serranidae, Synodontidae, Trichiuridae) (Kardousha 1999), *Philometra strongylurae* Moravec *et al.*, 2005 from the musculature and subcutaneous tissue of *Strongylura leiura* (Bleeker) and *S. strongylura* (van Hasselt) (Belonidae) (Moravec and Ali 2005) and *Philometra tylosuri* Moravec *et al.*, 2005 from the musculature and subcutaneous tissue of *Tylosurus crocodilus* (Péron et Lesueur) (Belonidae) (Moravec and Ali 2005). Moreover, *Philometra ivaschkini* Parukhin, 1976 and *P. lateolabracis* were reported from the stomach

wall of *Trichiurus lepturus* Linnaeus and the ovary of “*Epinephelus ascolatus*“ (?), respectively, off the nearby coast of Oman (Parukhin 1976). However, taking into account the papers of Moravec (2008) and Quiazon *et al.* (2008), the above-mentioned records of *P. lateolabracis* should be considered as misidentifications, probably representing several other different species. Also the identification of philometrids reported as *P. globiceps* in a carangid fish (see above) can be questioned (Moravec 2006).

During recent studies on helminth parasites of marine fishes in the Arabian Gulf, off the coast of southern Iraq, female nematodes of the genus *Philometroides* Yamaguti, 1935 were found in the flesh near the base of pectoral fins and in nose cavity of the yellowfin seabream *Acanthopagrus latus* (Houttuyn) (Sparidae, Perciformes). Their closer examination revealed that they represent a new species, which is described herein. *Acanthopagrus latus* (maximum body length 50 cm, maximum weight 1.5 kg) is a tropical, marine commercial fish distributed in the Indo-Pacific, from the Persian Gulf and along the coast of India to the Philippines, north to Japan, and south to Australia (Froese and Pauly 2012).

*Corresponding author: moravec@paru.cas.cz

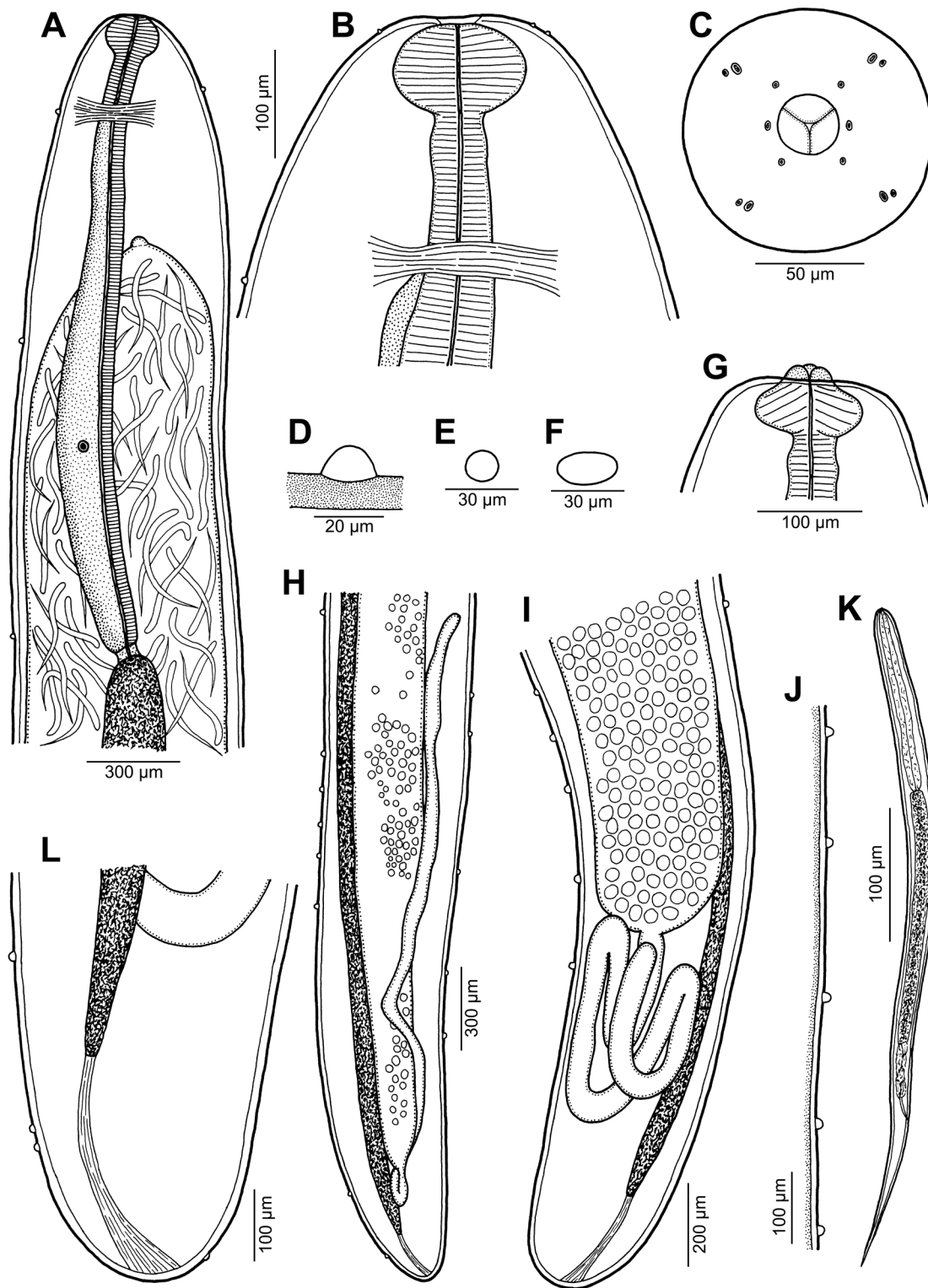


Fig. 1. *Philometroides acanthopagri* sp. nov., female: **A** – anterior end of gravid specimen, lateral view; **B** and **C** – cephalic end, lateral and apical views; **D** – cuticular boss, lateral view; **E** and **F** – cuticular bosses, apical views; **G** – cephalic end of subgravid specimen with protruding oesophageal lobes (teeth), lateral view; **H** – posterior part of body of gravid specimen, lateral view; **I** – same, larger magnification; **J** – distribution of cuticular bosses at middle part of body; **K** – larva from uterus; **L** – caudal end of gravid specimen, lateral view

Materials and methods

Fish were caught by using a drift gill net in Iraqi coastal waters of the Arabian Gulf (localities: 29°40.809'N, 48°44.236'E; 29°46.782'N, 48°45.658'E; 29°44.445'N, 48°46.872'E) in the period from March 2011 to January 2012. A total of 146 specimens of *A. latus* (body length 13–36 cm, weight 37–972 g) was examined for the presence of helminth parasites. The nematodes recovered were washed in physiological saline and then fixed in cold 70% ethanol. For light microscopy examination,

the nematodes were cleared with glycerine. Drawings were made with the aid of a Zeiss drawing attachment. Specimens used for scanning electron microscopy were postfixed in 1% osmium tetroxide (in phosphate buffer), 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 mode. All measurements are in micrometres unless otherwise indicated. The names of fishes follow FishBase (Froese and Pauly 2012).

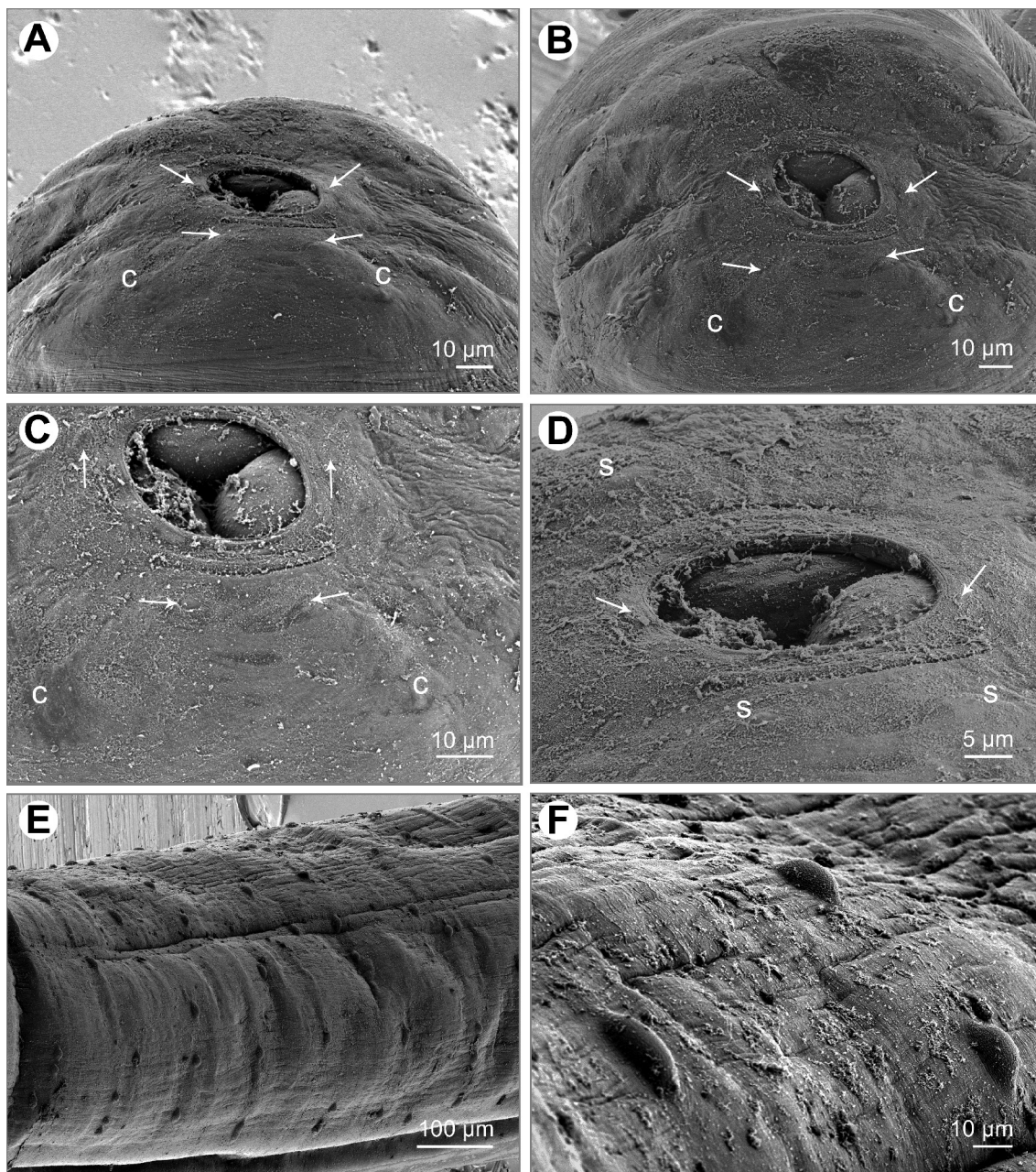


Fig. 2. *Philometroides acanthopagri* sp. nov., female, scanning electron micrographs: **A** and **B** – cephalic end, ventral and apical views (arrows indicate internal cephalic papillae); **C** – region of oral aperture, subapical view (arrows indicate internal cephalic papillae); **D** – same, higher magnification (arrows indicate lateral papillae of internal circle); **E** – cuticular bosses at middle part of body; **F** – cuticular bosses, higher magnification. **Abbreviations:** c – pair of external cephalic papillae; s – submedian papilla of internal circle

Results

Family Philometridae Baylis et Daubney, 1926

Philometroides acanthopagri sp. nov. (Figs 1, 2)

Description: Gravid female (4 specimens, measurements of holotype in parentheses). Body of fixed specimens yellowish, filiform, 48–71 (55) mm long and 694–979 (802) in maximum width; maximum width/length ratio of body 1: 69–75 (1 : 69). Width of cephalic end 245–408 (272), that of caudal end 272–340 (286). Entire body with sparsely distributed small cuticular bosses 9–12 (9–12 high) on surface; bosses rare on anterior and posterior body parts. Cephalic end rounded, cephalic papillae indistinct in lateral view. Oral aperture circular, relatively small. Bottom of mouth formed by three flat oesophageal lobes. Cephalic papillae small, arranged in two circles: external circle formed by four pairs of submedian papillae, internal circle consisting of six papillae (four submedian and two lateral) surrounding oral aperture. Lateral amphids indistinct. Oesophagus muscular, inflated at anterior end to form distinct bulb, 1.59–1.74 (1.67) mm long, representing 2.5–3.3% (3.0%) of body length; maximum width of oesophagus including oesophageal gland 122–163 (163). Oesophageal bulb transversely oval, 82–95 (95) long and 136–150 (136) wide. Dorsal oesophageal gland well developed, starting at level of nerve ring and extending posteriorly to end of oesophagus; nucleus of oesophageal gland situated 1.01 (1.01) mm from anterior end of body. Small ventriculus 27 (27) long and 68–82 (82) wide, opening into intestine through valve. Nerve ring 218–272 (231) from anterior extremity. Intestine light-coloured, straight, displaced laterally by uterus and extending posteriorly nearly to posterior extremity; anterior end of intestine narrow; posterior end of intestine atrophied, forming short ligament 204–381 (285) long attached to posterior extremity. Posterior end of body rounded, without any caudal projections. Ovaries long, situated near anterior and posterior body ends. Uterus occupying major part of body, filled with numerous larvae and eggs. Larvae 468–510 (not measured in holotype) long, maximum width 18–21; oesophagus 141–162 long, representing 30–33% of body length; length of tail 114–120, representing 23–24%.

Subgravid female (2 specimens). Body 35–38 mm long, 503–666 wide; maximum width/length ratio of body 1 : 57–70. Width of cephalic end 190–218, that of caudal end 190–204. Embossment of cuticle same as in gravid specimens; bosses 6–9 high. Oesophagus 1.56 mm long, representing 4.4% of body length; maximum width of oesophagus including oesophageal gland 95. Oesophageal bulb 68–82 long and 122–136 wide. Nucleus of oesophageal gland 952 from anterior end of body. Ventriculus 41 long, 41 wide. Nerve ring 218 from anterior extremity. Ligament 204–286 long. Posterior end of body rounded, without any caudal projections. Uterus filled with numerous eggs.

Male. Unknown.

Type host: Yellowfin seabream, *Acanthopagrus latus* (Sparidae, Perciformes), body length 19–24 cm.

Site of infection: Musculature (in flesh near the base of pectoral fins and deeply in nose cavity).

Type locality: Arabian Gulf, off Iraq (collected March 2011–January 2012).

Prevalence and intensity: 2% (3 fish infected/146 fish examined); altogether 26 nematode specimens found.

Deposition of type specimens: Holotype and 4 paratypes in the Helminthological Collection of the Institute of Parasitology, Biology Centre, Academy of Sciences of the Czech Republic, in České Budějovice (Cat. No. N-989).

Etymology: The specific name of this nematode relates to the genitive form of the generic name of the type host.

Discussion

Moravec (2006) recognised 11 genera in the family Philometridae, but one additional genus, *Afrophilometra* Moravec, Charo-Karisa et Jirků, 2009, has been erected since (Moravec *et al.* 2009). According to the key to philometrid genera provided by Moravec (2006), the specimens of the present material belong to *Philometroides*; in contrast to *Afrophilometra* whose gravid females have the dorsal and ventral body surface with numerous transverse semicircular bands of inflated cuticle separated by smooth lateral fields, the cuticular ornamentations of *Philometroides* are formed by irregularly scattered bosses.

According to Moravec *et al.* (2012a), at present the genus *Philometroides* includes 29 valid species. Most of them were described only from females, whereas conspecific males are known for eight species. The majority of species (19) are parasites of freshwater fishes, whereas only nine have been described from marine fishes and one from a brackish-water fish. As other philometrids, *Philometroides* spp. are known to exhibit a relatively high degree of host specificity, and individual species are characterized, in addition to morphological features and molecular sequence data, by the location of gravid females in the host (Moravec 2006, Moravec *et al.* 2012a).

The following species of *Philometroides* are known as parasites of marine and brackish-water fishes: *P. atropi* (Parukhin, 1966), *P. branchiostegi* Moravec, Nagasawa et Nohara, 2012, *P. denticulatus* Rasheed, 1965, *P. grandipapillatus* Moravec et Bakenhaster, 2010, *P. indonesiensis* Moravec, Walter et Yuniar, 2012, *P. marinus* Moravec et de Buron, 2009, *P. oveni* Parukhin, 1975, *P. paralichthydis* Moravec et de Buron, 2006, *P. seriola* (Ishii, 1931) and *P. trichiuri* Moravec, Walter et Yuniar, 2012; except for *P. indonesiensis* and *P. paralichthydis*, they are all parasites of Perciformes (see Moravec 2006; Moravec and de Buron 2009; Moravec and Bakenhaster 2010; Moravec *et al.* 2012a, b). All these species differ distinctly from *Philometroides acanthopagri* sp. nov. in the combination of morphological and biometrical features, which is evident from the key provided at the end of Discussion.

The new species is the first representative of *Philometroides* recorded from fishes of the family Sparidae. Other philometrid nematodes so far reported from fishes of this family belong to five nominal species of *Philometra* Costa, 1845: *P. filiformis* (Stossich, 1896), *P. lateolabracis* and *P. salgadoi* Vidal-Martínez, Aguirre-Macedo et Moravec, 1995 from fish gonads (records of the two last-named species from sparids are evident misidentifications), *P. spari* Yamaguti, 1961 from the swimbladder and *P. obladae* Moravec, Gaglio, Panebianco et Giannetto, 2008 from the body cavity; there are also several records of specifically unidentified philometrids in sparid fishes, reported as *Philometra* sp. (e.g., Yamaguti 1961, Parukhin 1976, Al-Bassel 2005, Moravec 2006, Moravec *et al.* 2008).

Further studies of *Philometroides acanthopagri* sp. nov. are desirable, especially the discovery of the conspecific males and the recognition of the biology of this nematode parasite.

Key to species of *Philometroides* from marine and brackish-water fishes

- 1 Body of gravid female longer than 150 mm 2
 - Body of gravid female shorter than 150 mm 4
- 2 Body of gravid female up to 600 mm long. Entire body densely covered with cuticular bosses. Parasitic in musculature of carangid fish (*Seriola*) in western North Pacific and Inland Sea of Japan *P. seriolae*
 - Body of gravid female at most 550 mm long. Extent of body embossment different. Location in host different 3
- 3 Cephalic end with four large dome-shaped cephalic protrusions. Caudal projections large. Cuticular embossment restricted to anterior part of body. Body length 550 mm. Parasitic in abdominal cavity of rachycentrid fish (*Rachycentron*) in northern West Atlantic *P. marinus*
 - Cephalic end rounded, without dome-shaped projections. Caudal projections small. Cuticular embossment throughout body length. Length of body 250–320 mm. Parasitic in abdominal cavity and swimbladder of haemulid (*Pomadasys*) and sciaenid (*Otolithes*) fishes in Indian Ocean (off Pakistan) *P. denticulatus*
- 4 Body of gravid female 143 mm long, scarcely embossed throughout. Cephalic papillae small, indistinct in lateral view. Caudal projections absent. Parasitic in musculature of belonid fish (*Tylosurus*) in Indian Ocean (off Indonesia) *P. indonesiensis*
 - Body length of gravid female less than 50 mm 5
- 5 Eight cephalic papillae of external circle conspicuously large .. 6
 - Cephalic papillae of external circle small, indistinct in lateral view 8
- 6 Caudal projections well developed. Body embossed throughout; bosses circular in apical view. Body 18 mm long. Par-

- asitic in malacanthid fish (*Branchyostegus*) (localization unknown) in Sea of Japan *P. branchyostegi*
 - Caudal projections absent. Body embossed except for anterior part; bosses transversely expanded 7
- 7 All cuticular bosses transversely oval in apical view. Body length of gravid female 20–45 mm. Maximum body width/length ratio 1: 38–52. Larvae 441–474 µm long. Parasitic in subcutaneous tissue and muscles of carangid fish (*Caranx*) in Gulf of Mexico *P. grandipapillatus*
 - Cuticular bosses transversely oval or in form of transverse mounds; posterior part of body also with longitudinal mounds. Body length of gravid female 11–29 mm. Maximum body width/length ratio 1: 11–22. Larvae 345–390 µm long. Parasitic in mouth and subcutaneous tissue of head and fins of paralichthyid fish (*Paralichthys*) in estuarine systems of West Atlantic and Gulf of Mexico *P. paralichthydis*
 - 8 Anterior oesophageal inflation absent or slightly outlined. Cuticular bosses absent from anterior part of body 9
 - Anterior end of oesophagus with distinct bulbous inflation. Body embossed throughout 10
 - 9 Anterior oesophageal inflation absent. Cephalic region markedly protruding out from remaining part of body. Body length of gravid female 20–36 mm. Parasitic in abdominal cavity and stomach wall of carangid fishes (*Atropus*, *Selar*) in South China Sea, Gulf of Tonkin and Red Sea *P. atropi*
 - Anterior oesophageal inflation slightly outlined. Cephalic region not protruding. Body of gravid female 25–35 mm. Parasitic in orbit and under cornea of eye in serranid fish (*Serranus*) in Mediterranean Sea *P. oveni*
 - 10 Entire body densely covered by cuticular bosses; bosses transversely oval or in form of transverse mounds in apical view. Body of gravid female 13–22 mm long; maximum body width/length ratio 1: 14–20. Oesophagus 0.73–0.93 mm long; anterior oesophageal bulb 136–245 × 150–204 mm. Parasitic in dorsal fin of trichiurid fishes (*Trichiurus*, *Lepturacanthus*) in Indian Ocean (off Indonesia) *P. trichiuri*
 - Cuticular bosses scarcely scattered on body, very few on anterior and posterior parts of body; bosses circular in apical view. Body of gravid female 48–71 mm long; maximum body width/length ratio 1: 69–75. Oesophagus 1.59–1.74 mm long; anterior oesophageal bulb 82–95 × 136–150 mm. Parasitic in musculature of sparid fish (*Acanthopagrus*) in Persian Gulf (off Iraq) *P. acanthopagri* sp. nov.

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