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Philometroides barbi sp. nov. (Nematoda, Philometridae) from *Barbus meridionalis*, a new philometrid from European freshwater fish

František Moravec[1]*, Andrea Šimková[2], Vladimíra Hanzelová[3], Marta Špakulová[3] and Predrag Cakić[4]

[1]Institute of Parasitology, Academy of Sciences of the Czech Republic, Branišovská 31, 370 05 České Budějovice, [2]Department of Zoology and Ecology, Faculty of Science, Masaryk University, Kotlářská 2, 61137 Brno; Czech Republic; [3]Parasitological Institute, Slovak Academy of Sciences, Hlinkova 3, 040 01 Košice, Slovak Republic; [4]Institute of Biological Research "Sinisa Stanković", Despota Stefana Blv. 142, 11000 Belgrade, Serbia and Montenegro

Abstract

A new species of parasitic nematode, *Philometroides barbi* sp. nov., is described from subgravid and mature females parasitic in the Mediterranean barbel *Barbus meridionalis* Risso (Pisces, Cyprinidae) in France, Serbia and Slovakia. Mature females were recorded under the serosa of the host's swimbladder, whereas large subgravid females (body length 62.0–80.9 mm) were found in the abdominal cavity. One small subgravid specimen (body length 10.4 mm) was recovered from the fin. The new species differs from other congeners in possessing four conspicuously large caudal lobes; from many species it can be also differentiated by the distribution of cuticular bosses and by the structure and length of the oesophagus. *P. barbi* is the third species of *Philometroides* known from European freshwater fishes and the only representative of this genus in barbels (*Barbus* spp.).

Key words

Parasitic nematode, *Philometroides*, freshwater fish, *Barbus meridionalis*, France, Serbia, Slovakia

Introduction

Due to problems with the identification of philometrid nematodes, associated with their morphological and biological peculiarities, many species of these important parasites remain undiscovered or poorly known to date (Moravec 2004a, Moravec and Genc 2004). In European freshwater fishes, the family Philometridae is represented by five species of *Philometra* Costa, 1845 [*P. cyprinirutili* (Creplin, 1825), *P. kotlani* (Molnár, 1969), *P. obturans* (Prenant, 1886), *P. ovata* (Zeder, 1803), *P. rischta* Skryabin, 1923] parasitic in cyprinids or pike and by two species of *Philometroides* Yamaguti, 1935, of which *P. cyprini* (Ishii, 1931) is an introduced specific parasite of carp (*Cyprinus carpio* L.), whereas *P. sanguineus* (Rudolphi, 1819) is specific to *Carassius* spp. (see Moravec 1994, 2004b).

Kašťák (1956, 1957) listed *Philometra sanguinea* (= *Philometroides sanguineus*) from *Barbus meridionalis petényi* (= *B. meridionalis* Risso) from the Myslavský Brook in Košice, eastern Slovakia. The author neither described the specimen(s) nor mentioned the site of infection in the host; his material is no longer available and it can be only assumed from the date of collection (5 December 1955) that the specimen(s) was/were moderately developed; the identification was probably made only on the basis of the presence of bosses on the nematode cuticle. Later Cakić *et al*. (2002) described three large-sized subgravid females of *Philometroides* found in the abdominal cavity of *B. meridionalis* from the Uvac River basin in Serbia, considering them to be *Philometroides cyprini* [syn. *P. lusiana* (Vismanis, 1966)]. However, this identification could be questioned, because the described morphology distinctly differed from that of *P. cyprini* females from carp (Moravec and Červinka 2005).

An examination of a few recently collected *Philometroides* specimens from *B. meridionalis* from southern France and eastern Slovakia and a re-evaluation of published data in

*Corresponding author: moravec@paru.cas.cz

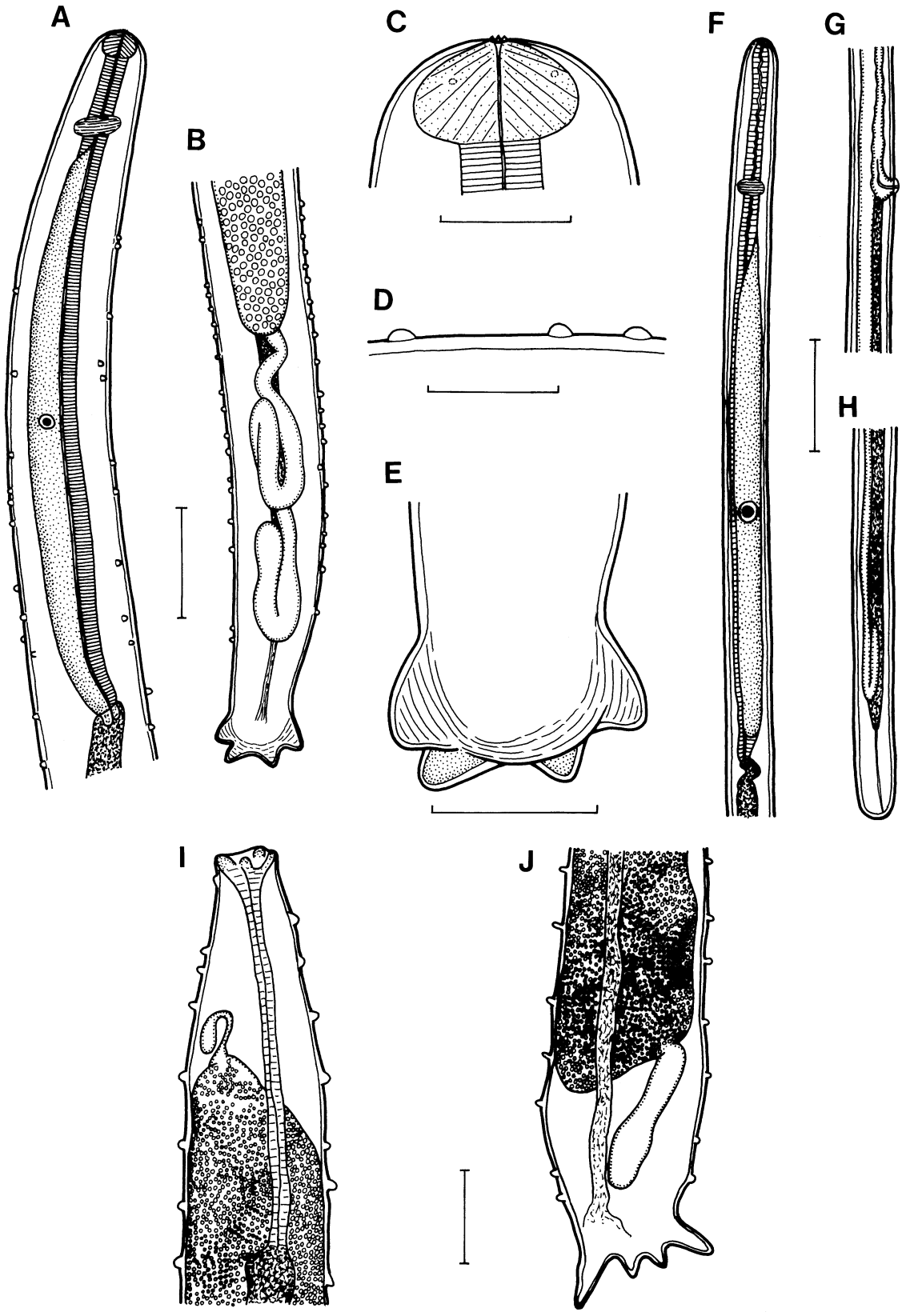

Fig. 1. *Philometroides barbi* sp. nov., female: **A-E** – subgravid female from the host's fin (**A** and **B** – anterior and posterior ends of body, **C** – cephalic end, **D** – cuticular bosses, **E** – caudal end); **F-H** – mature female from swimbladder (**F** – anterior end, **G** – region of vulva, **H** – posterior end); **I** and **J** – large subgravid female from body cavity (**I** – anterior end, **J** – posterior end). Scale bars: A and B – 0.2 mm; C and E-H – 0.1 mm; D – 0.05 mm; I and J – 0.5 mm (I and J adapted from Cakić *et al*. 2002)

the paper by Cakić *et al*. (2002) show that the nematodes from this host represent a new species of *Philometroides*, which is described herein.

Materials and methods

On 4 September 2003, four specimens of the Mediterranean barbel *Barbus meridionalis* Risso caught in the Tinne stream, an affluent of the Var River, about 60 km north of Nice, southern France, were sent to the laboratory of the University of Montpellier for a parasitological examination. The total body length of fish was 20–25 cm. In addition to other helminth parasites, one fish harboured a single specimen (small subgravid female) of *Philometroides* in the fin. This was fixed in 70% ethanol. In addition, two small mature females supposed to be *Philometroides* were collected from the swimbladders (under serosa) in two of fifteen *B. meridionalis* specimens (total body length 17 and 23 cm) caught in the Myslavský Brook in Košice, eastern Slovakia, on 1 July 2004; these were fixed in 70% ethanol. An examination of additional thirteen specimens of *B. meridionalis* of approximately the same size from this locality on 2 June 2005 gave negative results. Unfortunately, the mounted *Philometroides* specimens from *B. meridionalis* collected in Serbia [Jablanica River, Uvac River basin (43°00´–43°30´N, 19°45´–20°00´E)] and described by Cakić *et al*. (2002) have been destroyed and could not be re-examined. For light microscopical examination, the nematodes were cleared with glycerine. Drawings were made with the aid of a Zeiss microscope drawing attachment. All measurements are in micrometres unless otherwise stated. The scientific names of fishes follow Froese and Pauly (2005).

Results

***Philometroides barbi* sp. nov.** (Fig. 1)

Description (subgravid female, holotype): Body elongate, yellowish, 10.40 mm long, maximum width 245; width of anterior end 109, of posterior end (just anterior to caudal lobes) 122. Cephalic end rounded; cephalic papillae indistinct. Oral aperture with three small, anteriorly protruding oesophageal teeth 3 long. Body covered with numerous, irregularly distributed cuticular bosses up to 6 high; bosses start at short distance posterior to level of nerve ring, being most distinct on middle and posterior parts of body. Oesophagus 1.31 mm long (representing 13% of body length), maximum width 109, with distinct anterior bulb 42 long and 57 wide. Oesophageal gland well developed, opening just posterior to level of nerve ring; large nucleus of gland 762 from anterior extremity. Oesophagus opening into intestine through distinct valve. Nerve ring encircling oesophagus 231 from anterior end of body. Intestine narrow, light-coloured, ending blindly, its posterior end being attached by short ligament to ventral body wall at level of caudal lobes. Vagina and vulva absent. Uterus filled with numerous spherical eggs 9–12 in diameter, anteriorly not reaching posterior end of oesophagus. Anterior and posterior ends of uterus provided with ovaries. Caudal end with four distinct lobes containing darker tissue; anterior lateral lobes larger, 45–51 in length, width of bases 69–72; posterior sublateral lobes 27–36 in length, width of bases 39–42.

More developed subgravid females (3 specimens) (adapted from Cakić *et al*. 2002): Body length 62.00–80.90 mm, width at middle 500–910. Cephalic end with four flat papillae. Mouth three-branched. Whole body embossed. Oesophagus 1.11–1.92 mm long. Uterus well developed, containing large number of eggs 3–6 mm wide. Caudal end with four blunt lobes, two of which being more developed.

Mature female (1 specimen, paratype): Body filiform, light-coloured, 2.57 mm long, maximum width 45. Cuticle smooth. Cephalic end rounded, cephalic papillae indistinct. Entire oesophagus 684 long, without anterior bulb. Oesophageal gland well developed, 456 long, opening posterior to level of nerve ring; large cell of gland 435 from anterior extremity. Nerve ring 114 from anterior end of body. Intestine narrow, light-coloured, ending in short ligament attached ventrally to body wall at caudal region. Vulva covered with plug situated 786 from posterior end of body; vagina directed anteriorly from vulva. Uterus tubular, empty. Ovaries near ends of body. Caudal end rounded, without any lobes.

Male: Unknown.

Type host: Mediterranean barbel, *Barbus meridionalis* (Cyprinidae, Cypriniformes).

Site of infection: Fins and body cavity (subgravid females) and under serosa of swimbladder (mature females).

Type locality: Tinne stream, an affluent of Var River, about 60 km north of Nice, southern France.

Other localities: Jablanica River (Uvac River basin), southwestern Serbia and Myslavský Brook in Košice (Danube River basin), eastern Slovakia.

Deposition of specimens: Holotype and paratypes in the helminthological collection of the Institute of Parasitology, ASCR, in České Budějovice (Cat. no. N-850).

Discussion

The genus *Philometroides* includes a total of 22 species parasitizing both freshwater and marine fishes. Males are known only for 9 of them. Accordingly, most morphological differential features are found in gravid females. Even though fully gravid females of *Philometroides barbi* sp. nov. containing larvae were not available, the large-sized subgravid females studied are comparable with them; these were collected in May, when females of the majority of philometrids of the temperate zone attain their gravidity and produce larvae, so that they can be considered to be shortly before becoming gravid.

A unique morphological feature of *P. barbi* is the presence of four conspicuously large caudal projections, by which it differs from all its congeners. Four caudal projections were described by Vismanis (1966) and Vismanis *et al*. (1987) also

in *P. cyprini* (reported as *P. lusiana*), but the recent study of this species by Moravec and Červinka (2005) has shown that only two large lateral caudal projections and a small ventral cuticular lobe are present. Caudal projections of *P. cyprini* are much smaller than those in *P. barbi*. Both species also differ in the location of gravid and subgravid females in the host (in the beds of scales in *P. cyprini* vs. in abdominal cavity or fins in *P. barbi*) and in the host species (*Cyprinus carpio* vs. *Barbus meridionalis*). Females of another European *Philometroides* species, *P. sanguineus*, have only two small papilla-like caudal projections.

Three small oesophageal teeth protruding out of the mouth were observed in the holotype specimen (Fig. 1C). Similar teeth were observed, e.g. in *P. sanguineus*, but are absent in *P. cyprini* (see Moravec and Červinka 2005). Because of a very limited material, cephalic papillae could not be studied by SEM.

There may be interspecific differences in the character and distribution of cuticular bosses in large females of *Philometroides*. The body of *P. barbi* seems to be embossed in a similar way as, for example, that of *P. cyprini* or *P. sanguineus*. The cuticular bosses are generally absent from the body surface of conspecific males and mature females, as already observed by Rasheed (1963). The mature females in the present material were assigned to *P. barbi* because they were found in the same host (*B. meridionalis*) and locality (Myslavský Brook) where *Philometroides* was previously recorded by Kašt'ák (1956, 1957). Molnár (1967) mentioned the finding of *Philometra ovata* (reported as *P. abdominalis*), a common parasite of cyprinids of the genera *Gobio*, *Phoxinus* and *Leuciscus*, from *Barbus meridionalis* in Hungary (Magyarkút and Kemence Brooks in the mountain Börzsöny), but only small mature females on the swimbladder were found. Therefore, it is highly probable that, in fact, they were also *P. barbi*.

Philometroides barbi is the third species of the genus described from European freshwater fishes. Although *Barbus meridionalis* seems to be the only definitive host of this parasite, it cannot be excluded that other species of *Barbus* may also serve as its hosts. Moravec *et al*. (1997) recorded *Philometra* sp. larvae from *Barbus barbus* (Linnaeus) in the Czech Republic. It cannot be excluded that they belonged to *Philometroides barbi*, because cuticular bosses are present only in subgravid and gravid females. Further studies on *P. barbi* are necessary, including SEM and DNA examinations.

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