

First record of *Philometra ovata* (Nematoda) infection in *Gobio lozanoi* in Portugal

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Gobio lozanoi, from the River Febros northern Portugal, contained female *Philometra ovata* in the body cavity causing abdominal swelling. A mild chronic inflammation and some tissue necrosis were observed in infected fish. Significant correlations were found between occurrence of infection and host length, and gonado-somatic index; and between intensity of infection and condition factor.

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The genus *Philometra* comprises several species of nematodes of the abdominal cavity and tissues of fishes (Moravec *et al.*, 1998; Anderson, 2000). In recent years, there has been a growing awareness of the importance of philometrid nematodes because they may cause serious damage to the ovaries and also parasitic castration (Moravec, 2006). *Philometra ovata* (Zeder, 1803) Skryabin, 1923, referred to frequently as its junior synonym *Philometra abdominalis* Nybelin, 1928, is a parasite of cyprinids of the genera *Gobio*, *Phoxinus* and *Leuciscus* (Moravec, 2004). It has been recorded in several European countries but never in the Iberian Peninsula.

During ichthyological surveys carried out in several tributaries of the River Douro system, northern Portugal, during January 2007, more than half of the sampled *Gobio lozanoi* Doadrio & Madeira, the gudgeon species that occurs in Iberian Peninsula and southern France, were infected with *P. ovata*. In order to characterize the *G. lozanoi*–*Philometra* infection, including the associated pathology in the host population during its reproductive period (spring), a

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parasitological survey was conducted in April 2007, in River Febros, a tributary of River Douro system (41°07' N; 8°35' W).

A total of 97 fish were captured by electrofishing, measured (fork length, L_F) to the nearest mm, weighed (total mass, M) to the nearest g, sexed, gonad removed and weighed (gonad mass, M_G) to the nearest g and examined for parasites. Fulton's condition factor (K) was calculated from $100ML_F^{-3}$ and the gonado-somatic index (I_G) from $I_G = 100 M_G M^{-1}$. Parasites were removed, counted, fixed in hot 70% ethanol and the prevalence, intensity and abundance of infection determined according to Bush *et al.* (1997). Differences in occurrence and intensity of infection among males, females and immature specimens were analysed by χ^2 and Kruskal–Wallis tests. Spearman's test (r_S ; Siegel & Castellan, 1989) was used to identify correlations between occurrence and intensity of infection, and L_F , K and I_G .

For histological studies, some fish were fixed in 10% neutral buffered formalin, routinely processed and stained with Mallory.

Specimens of *P. ovata* females were located in the body cavity causing abdominal swelling [Fig. 1(a), (b)]. When a small incision was made in the body wall, the worms would emerge from the incision. Infected fish had

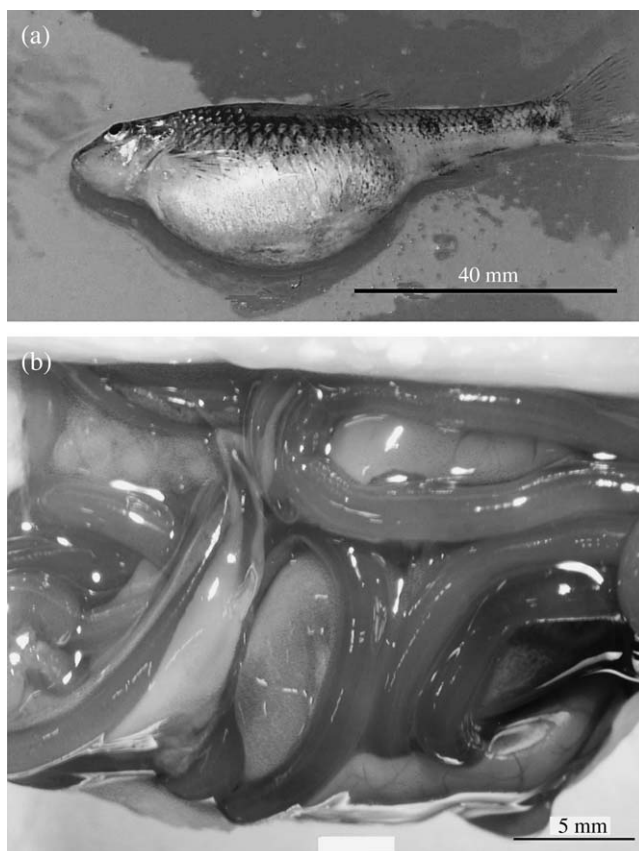


FIG. 1. *Gobio lozanoi* heavily infected with *Philometra ovata* showing: (a) a swollen abdomen and (b) female worms coiled among visceral organs.

TABLE I. Fork length (L_F) Fulton's condition index (K) and gonado-somatic index (I_G) (mean \pm s.d. and range) of *Gobio lozanoi* collected in River Febros in April 2007 and prevalence intensity and abundance (mean \pm s.d. and range) of infection by *Philometra ovata* of all, immature, male and female fish

Index	Fish examined (n)				
	Total (97)*	Immature (23)	Male (43)	Female (27)	
L_F (mm)	76 \pm 26 (33–128)	45 \pm 10 (33–68)	84 \pm 20 (47–113)	83 \pm 19 (52–125)	
K	1.32 \pm 0.21 (0.83–2.25)	1.38 \pm 0.30 (0.83–2.25)	1.29 \pm 0.16 (0.99–1.77)	1.33 \pm 0.17 (1.06–1.68)	
I_G	4.2 \pm 3.9 (0.1–14.9)	—	2.0 \pm 0.8 (0.1–3.9)	8.4 \pm 3.5 (2.4–14.9)	
Prevalence (%)	53.6	34.8	51.2	74.1	
Intensity	7.4 \pm 7.6 (1–30)	5.2 \pm 6.2 (1–19)	6.5 \pm 7.3 (1–25)	9.3 \pm 8.6 (1–30)	
Abundance	4.0 \pm 6.7 (0–30)	1.8 \pm 4.3 (0–19)	3.3 \pm 6.1 (0–25)	6.9 \pm 8.5 (0–30)	

*Sex was not determined in four fish.

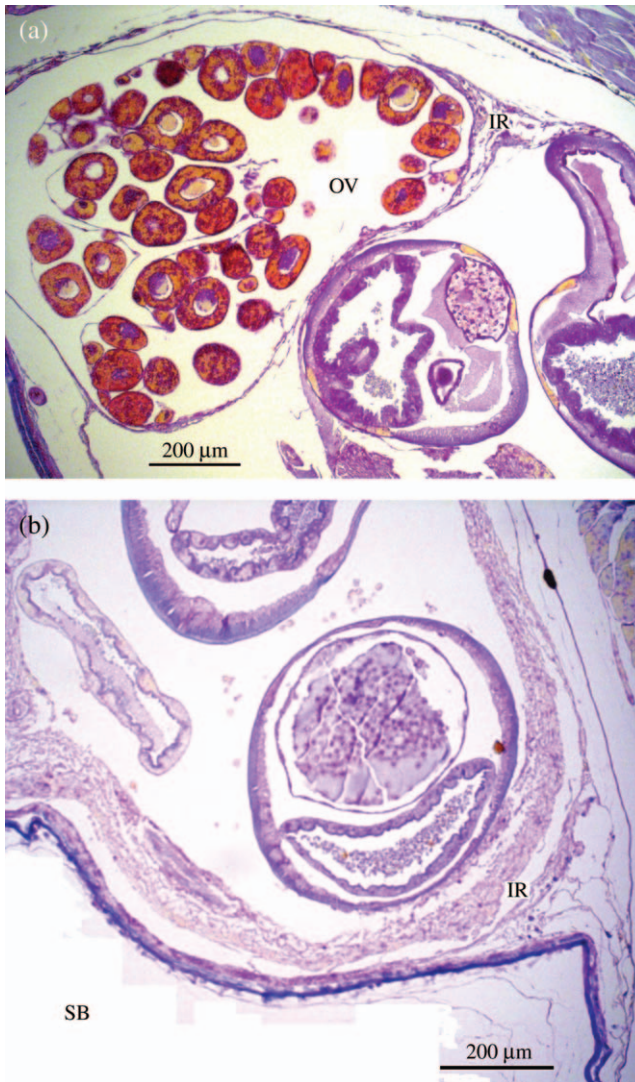


FIG. 2. Body cavity of *Gobio lozanoi* infected with *Philometra ovata* showing (a) a mild inflammatory response (IR) near the ovary (OV) caused by the nematodes and (b) necrosis of the swimbladder (SB) and an inflammatory host response (IR) around the nematodes.

impaired mobility that reduced their ability to escape. In some females, 30 large nematodes were detected amounting to 20% of *M*.

Data on L_F , K , I_G and the parasitological variables prevalence, intensity and abundance are presented in Table I.

Occurrence of infection was significantly different among male, female and immature specimens (χ^2 , $P < 0.05$). Female fish showed the highest prevalence (74.1%). Intensity of infection was not significantly different among sex and maturity groups (Kruskal–Wallis, $P > 0.05$), but the highest value was observed in females.

Significant positive correlations were found between occurrence of infection and L_F ($n = 97$, $P < 0.05$) and I_G ($n = 74$, $P < 0.05$) and between intensity and K ($n = 52$, $P < 0.05$).

Histological examination of infected fish showed a mild chronic inflammatory response and, in some cases, some necrotic tissue [Fig. 2(a), (b)].

Although prevalence was high in both sexes, females were more often infected, as also reported by Hesp *et al.* (2002) for *Philometra lateolabracis* in west Australian dhufish *Glaucosoma hebraicum* Richardson.

Occurrence of infection was positively related to host L_F and to sexual development (I_G). Philometrids utilize copepods as intermediate hosts so higher infection rates can be expected in fish that have fed on a larger number of prey items. This relationship also seemed to be confirmed by the positive correlation between intensity of infection and K .

The most visible effects of infection were the abdominal swelling and increase of M caused by nematode load that decreased swimming ability.

The low number of females captured in the present study may reflect a higher mortality rate due to high infection levels that cause lower escape efficiency. This is supported by data from Miñano *et al.* (2003) from south-east Spain, who showed that the sex ratio of *G. lozanoi* is slightly biased in favour of females.

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