

## A NOTE ON THE PRESENCE OF PHILOMETRID FISH PARASITES IN ROMANIA, WITH EMPHASIS ON *Philometroides sanguineus* (Rudolphi, 1819)

Mala-Maria STAVRESCU-BEDIVAN, Gina VASILE SCĂEȚEANU

University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of  
Agriculture, 59 Mărăști Blvd, 011464, Bucharest, Romania

Corresponding author email: mala\_stavrescu@yahoo.com

### Abstract

In February 2020, the nematode *Philometroides sanguineus* was detected in *Carassius gibelio* collected from Razim Lake and sold for human consumption at a fish market in Bucharest. Along with a parasitological examination, biometric information for the sample of Prussian carp was recorded. The features of philometrid adult females on their host were compared with similar studies. The size, body color, location site of attachment and seasonality of parasite occurrence were in agreement with previous reports of this nematode species.

Also, a review of scientific and grey databases concerning species of *Philometra* Costa, 1845 and *Philometroides* Yamaguti, 1935 genera parasitising ichthyofauna of Romania was made.

To our knowledge, after the source provided by Cojocaru (2010) this paper highlights for the second time in Romanian parasitological literature the use of scientific name *Philometroides sanguineus*. However, the adopted synonyms and the site of infection recorded by other authors suggest an earlier presence of this helminth species in gibel (Prussian) and crucian carps from various freshwater resources of Romania.

**Key words:** *Carassius gibelio*, distribution, fish market, nematode, philometrids.

### INTRODUCTION

Philometrids are worldwide nematodes parasitising the body cavities, tissues and gonads of freshwater, brackish-water and marine fishes (Moravec and de Buron, 2013). Most species of *Philometra* Costa, 1845 and *Philometroides* Yamaguti, 1935 genera are encountered in Cypriniformes from continental waters of Eurasia (Negreiros et al., 2019). These parasites are known for their sexual dimorphism, with female of larger size comparing to the conspecific male (Moravec and Justine, 2008).

*Philometroides sanguineus* (Rudolphi, 1819) sometimes referred to *Philometroides sanguinea* is a parasite typically found on the fins of freshwater teleost fish belonging to *Carassius* genus (Schäperclaus, 1992) but *Scardinius erythrophthalmus* was also mentioned as host (Andrews and Chubb, 1984).

*Philometroides carassii*, *Philometra carassii*, *Philometra sanguinea*, *Filaria sanguinea*, *Ichthyonema sanguineum* and *Philometra trilabiata* were synonyms used over time for this helminth species, however the valid name

currently considered is *Philometroides sanguineus* (Moravec, 2004; Quiazon et al., 2008; Brewster, 2016; <https://fauna-eu.org/>).

This worm is transmitted via ingestion of the intermediate host, represented by free-living parasitized copepods (Pegg et al., 2011). While males are present in the body cavity of the fish host throughout the year, after fertilization the females migrates into the fins being increasingly in numbers during autumn and winter and by the end of June, left the fins to release larvae into the lake waters (Chubb, 1982).

*P. sanguineus* could be highly pathogenic causing philometroidosis, a serious disease in wild and cultured freshwater carps from Europe and Asia, such as crucian (*Carassius carassius*) and Prussian or gibel (*C. gibelio*) carps, especially in juvenile fish (Moravec and de Buron, 2013; Williams, 2007).

Molnar et al. (2006) reported that *P. sanguineus* leads to fraying of the fin rays, while Williams et al. (2012) noticed that the presence of gravid female parasite within the fins of juvenile hosts led to distortion,

displacement of tissues, compression and localized degenerative changes.

In the parasitofauna of Romania, the available information on philometrids, their effects and distribution is sparse and, to the best of our knowledge, only one concrete naming of *P. sanguineus* was made so far (Cojocaru, 2010).

On the one hand, the present study aimed to review what has already been investigated by the specialist literature upon the presence of philometrid parasites in Romania, and on the other hand to discuss some characteristics of *Philometroides sanguineus* and its host *Carassius gibelio*.

## MATERIALS AND METHODS

A review of the scientific and grey published information was conducted in order to reveal the current state of knowledge about the philometrid species of *Philometra* and *Philometroides* genera in Romania. This documentation was motivated by gross observations of some carps initially purchased for food purposes.

On 26<sup>th</sup> of February 2020, 40 individuals of *Carassius gibelio* (gibel carp or Prussian carp) were bought from a fish market located in Bucharest. According to the local seller, cyprinids were caught in the Razim (Razelm) Lake (44°49'36"N, 28°59'05"E). In lake-complexes such as Razim-Sinoie from the Danube Delta Biosphere Reserve, main fish species is *C. gibelio*, native species in this freshwater resource (Năstase et al., 2019).

Fish specimens were transported directly in the laboratory for biometric and parasitological analysis.

Each individual of *C. gibelio* was measured for standard length (SL  $\pm$  1 mm) and weighted (TW  $\pm$  0.01 g). The length-weight relationship (LWR) was expressed by using the equation:  $TW = aSL^b$ , where intercept (coefficient *a*) describes the rate of change of weight with length and slope of the regression line (coefficient *b*) gives information about isometric or allometric growth pattern (Froese, 2006; Stavrescu-Bedivan et al., 2018). The linear regression, allometric type of growth and Fulton's condition factor (K) were computed and interpreted according to previous similar

studies (Karachle and Stergiou, 2012; Nehemia et al., 2012; Stavrescu-Bedivan et al., 2015). The external body surface of freshly *C. gibelio* specimens was macroscopically examined in order to record the presence of ectoparasites and their site of infection. The fins of each Prussian carp were checked under a binocular microscope and the adult nematodes were handled using a dissection scissor and tweezers (Figure 1).

The nematode *Philometroides sanguineus* syn. *P. sanguinea* was identified according to the keys of Bauer (1987).

## RESULTS AND DISCUSSIONS

### *Philometroides sanguineus* on *Carassius gibelio* in Romania

Overall, four adult females of *Philometroides sanguineus* measuring between 40 and 42 mm were collected from the caudal fins of their hosts. For each nematode, the red body color and the U-shaped positioning between caudal fin rays were registered as common features.

The size, color, position site of attachment and seasonality of parasite occurrence were consistent with previous reports of this nematode species.

It is already known that the unfertilised female worm of *P. sanguineus* initially localised on the wall of swim bladder where causes little damage, after copulation migrates into the fins where reaches up to 4 cm or even 5 cm in length and has the potential to produce substantial tissue damage (Schäperclaus, 1992; Pegg et al., 2011).

Living in the blood vessels, the color of *P. sanguineus* adult females is blood-red, like many other haematophagous philometrids (Molnar et al., 2006; Moravec and de Buron, 2013).

Similar position in U-shape for *P. sanguineus* adult female was found in the caudal fins of *Carassius carassius* from England (Williams et al., 2012).

In this study, the four Prussian carps each carrying into the caudal fin a single parasitic nematode had a standard length ranging from 14.4 to 20.9 cm.

The biometric data for the sample of 40 *Carassius gibelio* were registered as: SL (min. 14.4 - max. 22.1 cm, with a mean of 17.94 cm)

and TW (min. 87.0 - max. 340.0 g, with an average of 157.22 g). The linear regression of the log-transformed values was calculated as  $\text{Log (TW)} = 2.3739 \text{ L Log (SL)} - 0.7908$  ( $r^2 = 0.798$ , 95% CL of the parameters  $a$  and  $b$ ); the corresponding nonlinear equation was calculated as  $\text{TW} = 0.1619 \times \text{SL}^{2.3739}$ . Growth type for Prussian carp from Razim Lake was determined as negative allometric since  $b < 3$ , and Fulton's condition factor  $K$  had a mean value of 2.68 (min. 2.00 - max. 3.90).



Figure 1. *Philometroides sanguineus* in the caudal fin of *C. gibelio* from Razim Lake

The value of Fulton's condition index may reflect good fitness for Prussian carps but the actual poor sample prevents us from determining if fishes were well adapted in their living environment.

In addition to philometrids, four adult females of *Lernaea cyprinacea* and also ulcerations caused by these crustaceans were noticed on the external surface of other carp individuals caught from Lake Razim.

At the time of purchase from the fish market, most carps had missing scales, hemorrhages or

fringed fins. Although neither the anchor worm nor *Philometroides sanguineus* raise transmission problems to humans, after recording the data, injured fish individuals were not recommended for human consumption.

Moreover, in 2020, *P. sanguineus* has been identified in the caudal fins of some specimens of *C. gibelio* caught by local fishermen in freshwater ecosystems from Teleorman County: an artificial lake from Baldovinești (February 16<sup>th</sup>) (Figure 2) and Suhaia pond (May 14<sup>th</sup>) (Figure 3) (Nicolae and Stavrescu-Bedivan, pers. obs.).

Thus, the time of the year when adult worms were found between the bony rays of caudal fin was the same mentioned by Williams et al. (2012) who detected gravid females of *P. sanguineus* from early September until May, in the crucian carp from England.



Figure 2. *P. sanguineus* (black arrows) in the caudal fin of carps from Baldovinești (photo by Melania Nicolae)



Figure 3. *P. sanguineus* (black arrow) in the caudal fin of carps from Suhaia pond (photo by Melania Nicolae)

### Philometrid distribution in Romania based on the literature overview

The members of Philometridae family existing in the ichthyofauna of Romania are listed in

Table 1 in chronological order, by the author who first reported the nematode species.

At the parasitological examination of fish stocks from aquatic farms belonging to Iași County, Vulpe (2002) mentioned *Philometroides lusiana* on the skin of common carp and *Philometra carassi* on skin and fins of *Carassius auratus gibelio*.

Table 1. Philometrid parasites in Romania - a review

Species*	Host*	Author
<i>Philometroides lusiana</i>	<i>Cyprinus carpio</i>	Vulpe (2002)
<i>Philometra carassi</i>	<i>Carassius auratus gibelio</i>	
<i>Philometra abdominalis</i>	<i>Scardinius erythrophthalmus</i>	Cojocaru (2003)
<i>Philometroides lusiana</i>	<i>Tinca tinca</i>	
<i>Philometroides</i> sp.	<i>Carassius carassius</i>	Mihalca et al. (2008)
<i>P. lusiana</i>	<i>Cyprinus carpio carpio</i>	Radu et al. (2008)
<i>Philometroides sanguineus</i>	<i>Carassius auratus gibelio</i>	Cojocaru (2010)
<i>Philometra cyprini</i>	<i>Cyprinus carpio</i>	
<i>Philometra</i> sp.	Various marine fishes, unspecified	Radu et al. (2013)
<i>P. sanguineus</i>	<i>Carassius gibelio</i>	Present study

\*as mentioned in original source by author

Following the investigation of Banat ichthyoparasitic fauna, Cojocaru (2003) has found two species of philometrids with low-medium pathogenicity: *Philometra abdominalis* in the abdominal cavity of *Scardinius erythrophthalmus* from Ghiroda reservoir and *Philometroides lusiana* on the skin of *Tinca tinca* coming from the irrigation channel of Giroc-Chișoda.

Mihalca et al. (2008) have noticed one specimen of *Philometroides* sp. in the caudal fin of a juvenile belonging to *Carassius carassius* from a private pond in Cluj-Napoca.

Radu et al. (2008) registered a single specimen of *Philometroides lusiana* on the tegument of common carp (*Cyprinus carpio carpio*) belonging to Ropșa breed from SCDP Nucet ponds. It has been shown that *Philometroides lusiana* is a junior synonym for the valid name *Philometroides cyprini* (Moravec and Červinka, 2005).

In Romania, the first concrete mention of *Philometroides sanguineus* in gibel (Prussian) carp can be attributed to Cojocaru (2010) who also cited *Philometra cyprini* in an update

concerning monitoring of fish parasites in Romanian waters between 2000 and 2010. Nevertheless, according to the published site of infection and the used synonym, it could be assumed that in the case of *Philometroides* from Cluj County (Mihalca et al., 2008) and of *Philometra carassii* from Iași County (Vulpe, 2002) respectively, it was also about the presence of *Philometroides sanguineus*.

It can be suggested that in Romania, like in other European regions where the parasite is regarded as non-native, *Philometroides sanguineus* infects both crucian and gibel carps. In our country, these cyprinids are regarded as native species (Oțel, 2019; <https://www.fishbase.se/>).

Chubb (1982) reported that nematode *P. sanguinea* was found at *C. auratus gibelio* and *C. carassius* in USSR fish farms. Furthermore, Brewster (2016) mentioned that there is evidence of transmission of *P. sanguineus* from goldfish (*Carassius auratus*) to the crucian carp, both fish being native species in UK.

Concerning other philometrid species, it was assumed that the presence of *Philometroides barbi* can be expected in Romania due to the distribution area of *Barbus meridionalis* (Moravec et al., 2006). In 2015, it was stipulated that the future threat for Mediterranean barbel could be *P. barbi* that causes high mortality in other European freshwater fish species, as mentioned in the Management Plan of Natura 2000 ROSCI 0062 of Defileul Crișului Repede - Pădurea Craiului site (<http://apmbh.anpm.ro/>).

## CONCLUSIONS

The scarce data available on parasitism induced by philometrid parasites in the ichthyofauna of Romania has generated the necessity to initiate the present survey.

Accordingly, it was provided some features of host-parasite relationship between *Carassius gibelio* purchased from a fish market in Bucharest and the nematode *Philometroides sanguineus* located on its caudal fin. The valid name *P. sanguineus* is mentioned for the second time in Romanian literature herein but considering the synonyms and the site on infections noted by other authors, this species is included into specialist publications since 2002.

To date, the occurrence of this philometrid worm in *C. gibelio* and *C. carassius* could be related to freshwater natural and artificial ecosystems at least in the following Romanian counties: Cluj, Iași, Teleorman, Timiș and Tulcea.

Based on literature sources on philometrid parasites, it can be concluded that in Romania were published so far three nominal species of *Philometra* genus (*P. abdominalis*, *P. carassi*, *P. cyprini*) and two species of *Philometroides* genus (*P. lusiana*, *P. sanguineus*). In addition to these, *Philometroides barbi* was mentioned as a potential presence taking into account the geographic range of the host species.

Species of *Philometra* genus were cited in cyprinids belonging to both freshwater and marine ecosystems.

These data could represent useful references for future outline of an area distribution range map for cyprinids and their associated philometrids.

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