

[Report and Opinion]

## The first record of *Pomphorhynchus laevis* (Acanthocephala) in Chub, *Squalius cephalus* (Linnaeus, 1758) from Gamasiab River, Hamedan, Iran

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### ABSTRACT

*Pomphorhynchus laevis* is a common fish parasite in Europe which has been reported from *Acipenser stellatus*, *Barbus capito*, *Barbus lacerta*, *Barbus mursa* and *Onchorhynchus mykiss* in Iran. In a survey on the aquaculture potential of Gamasiab River in Hamedan Province, endemic fish parasites were investigated in summer and autumn 2008. After recording biometric characteristics, common necropsy and parasitology methods were used. Live acanthocephalans were relaxed in distilled water at 4 °C for 1 h and fixed in 10% hot buffered formalin. All specimens fixed in 10% formalin were stained with aqueous acetocarmine, dehydrated and mounted in Permount. The worms were identified using parasite identification keys. A total of 36 individuals of Chub, *Squalius cephalus*, were investigated and 459 individuals of *Pomphorhynchus laevis* were recovered from intestine of 32 fish specimens. The prevalence mean intensity and mean abundance of *P. laevis* were %88.9, 14.3 and 12.7, respectively. The maximum number of the parasite recorded in a five years old fish (403gr in weight) was 130 plerocercoids. Chub, *Squalius cephalus*, is reported for the first time as a new host record for *P. laevis* in Iran.

**Key words:** Fish, Parasite, *Squalius cephalus*, *Pomphorhynchus laevis*, Acanthocephala, Gamasiab,

### INTRODUCTION

Gamasiab is one of the the longest river in Iran, located in Nahavand plain of Hamedan Province. In order to investigate the aquaculture potential of this river, survey of endemic fish parasites were done in summer and autumn 2008. Chub, *Squalius cephalus*, is a member of Cyprinidae family and one of the endemic species in Gamasiab River. This fish commonly lives in small rivers and large streams of barbel zone in riffles and pools. Adults are solitary while juveniles occur in groups. Juveniles feed on a wide variety of aquatic and terrestrial animals and plant

material but large individuals prey predominantly on fishes (Kottelat & Freyhof, 2007). The species of the genus *Pomphorhynchus* Monticelli, 1905 (Acanthocephala: Pomphorhynchidae) are cosmopolitan and common parasites of fishes. This genus is characterized by a cylindrical proboscis, and an extremely long neck with a bulbous anterior expansion (Yamaguti, 1963). A number of marine and freshwater fishes have been reported as definitive hosts of the acanthocephalan *P. laevis* (Ziolkowska & Rokicki, 2003). It occurs predominantly in cyprinid and also in salmonid fishes (Dudinak

& Snabel, 2001; Nedeva *et al.*, 2003). Buchvarov (1977) recorded *P. laevis* in *Rana ridibunda* from Northern Bulgaria. Moravec and Scholz, (1991) investigated *P. laevis* biology in chubs of the Danube river basin of the Czech and Slovak republics. Also, Tieri *et al* (2006) observed *P. laevis* in chub (*Leuciscus cephalus*) in two rivers of the Abruzzo region in Italy. Koyun (2001) reported *P. laevis* in chubs of Enne Dam Lake in Turkey (Innal and Keskin, 2006). Surprisingly, Dimitrova *et al.* (2008) reported *P. laevis* infection of a mammal species, Eurasian otter *Lutra lutra* (L.) in Bulgaria. It has been reported from a limited number of fish species in Iran: *Acipenser stellatus* (Mokhayer, 1981), *Barbus capito*, *B. lacerta*, *B. mursa* (Pazooki and Masoumian., 2012) and *Onchorhynchus mykiss* (Abdi *et al*, 2006). In the present study, infection of Chub to *Pomphorhynchus laevis* was investigated (Fig.1).

#### MATERIALS AND METHODS

A total of 36 individuals of chub, *S. cephalus*, were collected from Gamasiab River (34° 5'N 48° 25'E) in Hamedanan Province, Iran on 4 separate occasions from August through October 2008. Fish which were trapped with drop net or electrofishing, were transported to the Parasitology laboratory alive in water obtained from the collection site. A dissolved oxygen saturation of approximately 85-90% were maintained during transport. Dissolved oxygen were measured using a dissolved oxygen meter (Oxi- 323 B/SET). Upon arrival, fish were weighed and measured (Table1.) and then examined for intestinal parasites by opening the intestine tract. After recording biometric characteristics, common necropsy and parasitology methods (Stoskopf, 1993)

were used. Live acanthocephalans were relaxed in distilled water at 4 °C for 1 h and fixed in 10% hot buffered formalin. All specimens fixed in 10% formalin were stained with aqueous acetocarmine (Fig. 2), dehydrated and mounted in Permount. The worms were identified using parasite identification keys (Yamaguti, 1961; Bykhovskaya- Pavlovskaya *et al* , 1962 ; Moravec, 1994) and then were deposited at the Laboratory of Fish Diseases, National Inland Water Aquaculture Research Institute (Anzali, Iran). Standard statistical computations (mean intensity, standard deviation, prevalence and abundance) were carried out using Microsoft Excel (Office 2007). The results were analysed using nonparametric Kruskal-wallis test and pairwise comparisons were done with the Conover-Inman test. Results were considered significant at the 95% level ( $p < 0.05$ ). Computations were performed using SPSS, 15. Programme at the National Inland Water Aquaculture Research Institute computer services was utilized.

#### RESULTS

Totally, 459 individuals of *P. laevis* Plerocercoids were recovered from 36 chubs, *S. cephalus*. Infected fish were found to contain between 1 and 130 worms. The worms were deeply penetrated through all intestinal layers and their proboscis were visible from the other side of intestinal wall (Fig.1).

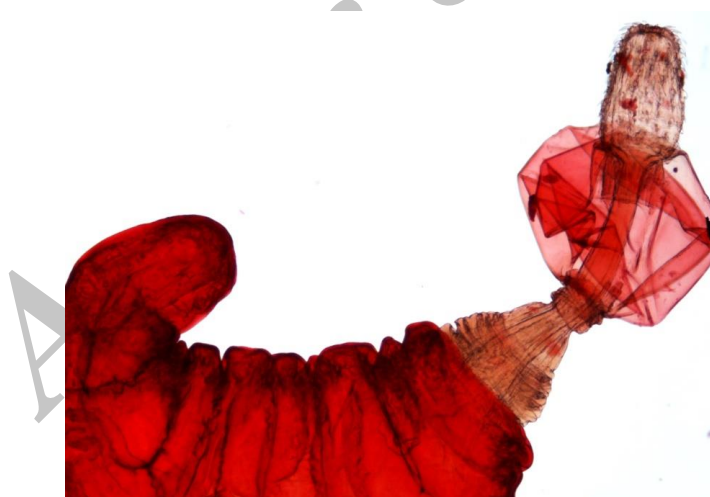
Biometrical characteristics of studied fish are shown in Table 1. Prevalence and mean intensity of infection in different fish ages are shown in Table 2. The population of *S. cephalus* were classified in 3 age groups. The maximum number of parasites were 130 plerocercoids recorded in a five-year old fish (403g in weight).

**Table 1.** Biometrical characteristics of examined Fish.

<i>S.cephalus</i>	length(cm)	weight(gr)	Age(year)
Min-Max	9.3-38.2	6-636	1-6
Mean	21.96	79.39	2.4
Standard deviation	±6.80	±128.58	±1.25

**Table 2.** Prevalence and mean intensity of infection with *P. laevis* in *S.cephalus* of Gamasiab River

Fish groups	Prevalence (%)	Mean intensity $\pm$ SD	Abundance $\pm$ SD	Parasite Range	Total Parasite
1-2 (year) (No=26)	84.6	5.5 $\pm$ 9.0 <sup>a</sup>	4.7 $\pm$ 8.5	0-42	122
3-4 (year) (No=8)	100	19.4 $\pm$ 21.3 <sup>a</sup>	19.4 $\pm$ 21.3	1-65	155
5-6 (year) (No=2)	100	91 $\pm$ 55.1 <sup>b</sup>	91 $\pm$ 55.1	52-130	182
Total (No=36)	88.9	14.3 $\pm$ 26.4	12.7 $\pm$ 25.3	0-130	459

**Fig.1.** *P. laevis* Plerocercoids in *S.cephalus* intestine.**Fig.2.** *P. laevis* recovered from *S. cephalus* intestine stained with acetocarmine.

### Discussion

*P. laevis* is a common fish parasite in Europe. This acanthocephalan is a typical parasite that ecologists use as an accumulation indicator of heavy metal pollution and environmental quality (Galli et al., 2001; Sures et al., 2003). In Iran *P. laevis* has been reported from *A. stellatus* (Mokhayer, 1981) *B. capito*, *B. lacerta*, *B. mursa* (Pazooki & Masoumian., 2012) and *O. mykiss*

(Abdi et al., 2006). But this is the first report of *P. laevis* from Chub, *S. cephalus*, in Iran. As shown in Table 2, by increasing the age of chubs, the mean intensity, abundance and total number of the parasite increased. Conover-Inman test also shows significant differences between the mean intensity of parasites in 5-6 years old fish comparing to the younger ones ( $p < 0.05$ ). Observations of Moravec and Scholz

(1991) on the biology of *P. laevis* demonstrated that *P. laevis* infections in chub depend upon the body size of fish hosts; as the largest chub in their study being the most heavily infected. They also suggested that the infections are associated with changes in the food composition of chub of different size groups.

Young Chubs feed on a wide variety of aquatic and terrestrial animals and plant material but large individuals prey predominantly on fishes (Kottelat and Freyhof, 2007). Since *P. laevis* like the other acanthocephalans transmits from prey to predators, large individual chubs' infection chance to *P. laevis* increases. So the significant differences between the 5-6 years old fish infection by the younger ones is justifiable by their age and diet conditions. The results of the present study are compatible with the results of Moravec & Scholz (1991).

In the literature, there are reports that infection of gastrointestinal tract by helminths has detrimental effects on digestive function (Hoste, 2001). On the other hand, Dezfuli *et al.* (2011) showed that members of the genus *Pomphorhynchus* are among a few acanthocephalan species which, as a result of their morphological adaptation, often penetrate deeply through the host alimentary canal and inflict extensive damage. The results of the present study like those of Dezfuli *et al.* (2011), showed the worms deeply penetrated through all intestinal layers and their proboscis were visible from the other side of intestinal wall. These acanthocephalans may cause heavy infections accompanied with high mortality in aquaculture (Mehlhorn, 2008). In conclusion, in order to prevent *P. Laevis* occurrence in under construction fish ponds, preventive methods should be prepared to avoid the entrance of amphipods and undesirable fish to ponds to minimize the infection and mortality of cultured fish.

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## اولین گزارش از آلودگی ماهی سفید رودخانه ای (*Squalius cephalus* (Linnaeus.1758) به انگل (*Pomphorhynchus laevis* (Acanthocephala) در رودخانه گاماسیاب همدان

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### چکیده

آکانتوسفال *Pomphorhynchus laevis* انگل شایعی در ماهیان اروپا به شمار می رود. این انگل در ایران پیشتر از ماهیان *Barbus* ارزیابی پتانسیل آبی پروری رودخانه گاماسیاب در استان همدان بررسی انگل شناسی ماهیان بومی این رودخانه طی نمونه برداری در دو فصل تابستان و پائیز ۱۳۸۷ انجام گرفت. کلیه ماهیان پس از زیست سنجی با استفاده از روش های مرسوم مورد بررسی انگل شناسی قرار گرفتند. آکانتوسفال های زنده پس از جدا سازی از روده بمدت یک ساعت در آب مقطر  $4^{\circ}\text{C}$  قرار داده شدند و سپس در بافر فرمالین ۱۰٪ فیکس شدند. کلیه نمونه ها توسط استوکارمین رنگ آمیزی، دهیدراته و مونته شدند. کلیه نمونه ها با استفاده از کلیدهای تشخیصی شناسائی شدند. از مجموع ماهیان بررسی شده ۳۶ قطعه ماهی سفید رودخانه ای با نام علمی *Squalius cephalus* بودند که از بررسی دستگاه گوارش این تعداد ماهی در مجموع ۴۵۹ عدد آکانتوسفال *P. laevis* جدا گردید. درصد شیوع این آکانتوسفال در ماهیان بررسی شده ۸۸/۹٪ بود. میانگین شدت و فراوانی آلودگی در این ماهیان بترتیب ۱۴/۳ و ۱۲/۷ بود. بیشترین تعداد پلوسرکوئید از ماهی پنج ساله ای بوزن ۴۰۳ گرم به تعداد ۱۳۰ عدد شمارش گردید. این نخستین گزارش از آلودگی ماهی سفید رودخانه ای در استان همدان و ایران به انگل *P. laevis* است. در نهایت از آنجایی که این انگل از آمفی پودها به عنوان میزبان واسط استفاده می کند لازم است برای به حداقل رساندن تلفات و خسارات در ماهیان پرورشی تمهیدات و اقدامات پیشگیرانه ای به منظور جلوگیری از ورود آمفی پودها و ماهیان هرز به استخرها اندیشیده شود.

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