

METACERCARIAE OF TREMATODA IN FISH MUSCULATURE FROM LATVIAN WATER BODIES

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Abstract

Data, concerning fish parasitological investigation during the period from 1949 through 2010 in Latvia, is summarized in this short review. More than 60 fish species were investigated, and five metacercariae of trematode species in fish musculature were found: *Paracoenogonimus ovatus*, *Hysteromorpha triloba*, *Posthodiplostomum cuticola*, *Bucephalus polymorphus* and *Apharhyngogstrigea cornu*. Metacercariae *P. ovatus* is the most common parasite in freshwater fish musculature and was detected in 17 fish species. Prevalence of invasion varies from 3.3% to 88.8%. Intensity of invasion was 12.8 – 98.3 metacercariae per 10 grams of muscle. Encysted *H. triloba* metacercariae was detected in six fish species from lakes, prevalence of infection varied between 12.5% and 92.5%. *P. cuticola* is widespread pathogenic for fish parasite was detected in muscles of four fish species in lakes, rivers and carps ponds. Prevalence of invasion grows up to 100% in some lakes. In mass infection case, parasite were found in muscle under fish skin. *B. polymorphus* was found in muscle of seven fish species. Metacercariae *A. cornu* was found only in carp (*Cyprinus carpio*), under skin and in deeper layers of muscle.

Keywords: Metacercariae, fish musculature, *P. ovatus*, *H. triloba*, *P. cuticola*, *B. polymorphus*, *A. cornu*.

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INTRODUCTION

The study of fish muscles for metacercariae presence, detection and knowledge of their life cycles is an important aspect of the prevention of fish-borne zoonoses. Agents of trematodosis have a complex life cycles, in which the first intermediate hosts are molluscs, second intermediate, or additional, hosts are freshwater fish, and the final hosts are – birds, animals, and humans.

Fish muscles habited both metacercariae pathogenic and non-pathogenic for humans. Second one, in the adult stage, are found in the intestine of fish-eating birds (gulls, herons) and predatory fish (e.g. pike). For differentiation of these larvae by species, morphological characters are used, such as cysts size and form, larvae activity in cysts, size of the excretory bladder, size of suckers. Pathogenic to humans and animals, metacercariae, from Opisthorchidae family (Opisthorchis, Metorchis, Pseudamphistomas, Clonorchis), are

characterized by the presence of two round suckers of same size, which are colored lighter than the body of larva. A black excretory vesicle, oval or pear-shaped, occupies 1/3–1/4 of metacercaria body. Live larvae are characterized by active movement in cyst. The movements of not pathogenic to human metacercariae species in cysts are not active, sometimes even barely noticeable. Movement is active in the released larvae of *B. polymorphus*. For *O. filineus*, size of a cyst is 0.28–0.38x0.18–0.28 mm; form is oval, but rarely round. The outer cyst membrane evenly adjoins the inner one. Suckers are round, mouth sucker size is 0.088 mm; ventral sucker size is 0.077 mm. Body of the larva is covered with spines up to level of a ventral sucker, posterior end of body is spindle-shaped. In turn, body of *P. ovatus* is covered with spines, in contrast to *B. polymorphus* and *P. cuticola*. Metacercariae *O. filineus* localize in the upper layer of fish muscles at a depth of 2–3.4 cm, *H. triloba* are more often found in the dorsal muscles, *B. polymorphus* in upper layers of the muscles, *P. cuticola* – on / under the skin and *A. cornu* throughout fish muscles (Sudarikov et al. 2002).

Second intermediate hosts are molluscs of the Bithyniidae family and fish of the cyprinid family, as well as definitive host, humans or carnivores, participate in lifecycle of the fluke *O. felineus*. Second intermediate hosts of fluke in water bodies are fish of the Cyprinidae family, which is the richest in number of species.

Fish parasitological investigation have a long history, due to the fact that fish is one of important component of human diet. Thus, fish musculature is most studied, number of metacercariae are described, and life cycles are known.

MATERIAL AND METHODS

Literature data, concerning fish full parasitological investigation are summarized in this short review. Fish parasite studies were carried out over the period from 1949 through 2010 by several scientists in Latvia. More than 60 fish species were investigated. Data about fish infection,

animals serving potential first, second intermediate and definitive hosts are given.

RESULTS

Metacercariae of trematode detected in fresh water fish musculature from 1949 till 2010

The following five metacercariae species in fish musculature were found: *Paracoenogonimus ovatus*, *Hysteromorpha triloba*, *Posthodiplostomum cuticola*, *Bucephalus polymorphus*, *Apharhyngostrigea cornu*.

Paracoenogonimus ovatus Katsurada, 1914

For the first time the parasite has been reported by Shulman in 1949 as syn. *Neodiplostomum hughesi* (Markevich, 1934). The dominant muscle parasite in freshwater fish *P. ovatus* was registered in 17 fish species: bream (*Abramis brama*), white bream (*Blicca bjorkna*), roach (*Rutilus rutilus*), tench (*Tinca tinca*), rudd (*Scardinius erythrophthalmus*), vimba (*Vimba vimba*), bleak (*Alburnus alburnus*), asp (*Aspius aspius*), crucian carp (*Carasius carasius*), gudgeon (*Gobio gobio*), ruffe (*Gymnocephalus cernuus*), chub (*Leuciscus cephalus*), ide (*L. idus*), dace (*L. leuciscus*), zander (*Sander lucioperca*), perch (*Perca fluviatilis*), pike (*Esox lucius*) from lakes and rivers. Prevalence of infection varied between 3.3% and 86.6%. High natural infection parameters in roach (P=86.6%), bream (P=85.5%) and rudd (P=80%) were detected. Highest intensity of infection was 98.3 specimens per 10 grams roach muscles (Shulman 1949, Kirjusina & Vismanis 2004). In roach and bream from lakes, *P. ovatus* metacercariae was found not only in musculature but in liver, kidneys, and eyes as well (Kirjusina 2004).

First intermediate hosts of trematode are *Viviparus viviparus* and *V. contectus*, gastropod of genus *Viviparus* (Viviparidae, Vivipariformes) (Komiya 1938, Kozicka & Niewiadomska 1958, Ginicinskaja 1968). Lange reported cercaria stage from *V. contectus* (Lange 1968). Molluscs *V. viviparus* and *V. contectus* frequently occurs throughout whole territory of Latvia, mainly in flowing waters,

like rivers and lakes (Rudzite et al. 2010). Range of definitive hosts is wide, mainly diurnal piscivorous birds from order Falconiformes and Anseriformes (Mergidae) (Kozicka & Niewiadomska 1958).

Hysteromorpha triloba (Rudolphi, 1819) Lutz, 1931

For the first time parasite has been reported by Reinsone in 1955 (a, b) as syn. *Neascus musclicola* (Waldenburg, 1860). *Hysteromorpha triloba* is a type species of genus *Hysteromorpha*. Encyst metacercariae *H. triloba* were detected in back and abdominal musculature of six fish species – bream, white bream, roach, rudd, tench and zander from lakes. Prevalence of infection varied between 12.5% and 92.5% in different hosts and lakes. However, intensity of infection was low. More often roach was infected (P=70.0%). (Kirjusina & Vismanis 2004).

First intermediate hosts of *H. triloba* are molluscs *Gyraulus albus* (Klochkova 1982), which have relatively frequent occurrence in freshwater environmental in Latvia (Rudzite et al. 2010). Adult trematode is a specific intestine parasite of fish-eating birds of the genera *Phalacrocorax* (Huggins 1954, Sudarikov 2022). Great Cormorants *Phalacrocorax carbo* L. were found across Latvia, at both inland and coastal sites (Lindelu 1995, Millers 2014).

Posthodiplostomum cuticola (Nordmann, 1832) Dubois, 1936

For the first time parasite has been reported by Shulman in 1949 as syn. *Neascus cuticola* (Nordmann, 1832).

P. cuticola is widespread pathogenic fish parasite was detected in lakes, rivers and carps ponds for 13 fish species: bream, white bream, bleak, roach, rudd, crucian carp, carp (*Cyprinus carpio*), wild carp (*Cyprinus carpio haematopterus*), vimba, ruffe, chub, ide, and perch. Prevalence of invasion grows up to 100% in some lakes. In heavy invasion cases parasite occurred in muscle under fish skin. *P. cuticola* metacercaria was only sporadically

found in bream, white bream, vimba, and rudd, in the upper layers of the muscles.

Gastropods *Planorbis planorbis*, *P. carinatus* serve as first intermediate hosts. Definitive hosts of parasite are heron Ardeidae family birds (Niewiadomska 2003).

Bucephalus polymorphus Baer, 1827

For the first time parasite was reported by Shulman in 1949. *B. polymorphus* was found in tench and rainbow trout muscles, roach, bream, white bream, gudgeon, bleak musculature, and gills. The prevalence of *B. polymorphus* in fish ranged from 6.6% to 16% and highest infection intensity was 4.5 specimens per 10 grams of muscles (Shulman 1949, Kirjusina & Vismanis 2007).

First intermediate hosts of parasite are bivalves molluscs of genus *Anodonta* and *Unio*. Adult fluke *B. polymorphus* inhabit primarily the intestine of many piscivorous fish species (Ondračková et al. 2015).

Apharhyngostrigea cornu (Zeder, 1890) Ciurea, 1927

A. cornu was found in carp (*Cyprinus carpio*) under skin and in deeper layers of muscle. First intermediate hosts are mollusc *Bathymphalus contortus*. *B. contortus* (syn. *Anisus contortus*) relatively frequent occurrence in freshwater biotopes in Latvia. Trematoda is a specific parasite of different species of herons (Rudzite et al. 2010, Niewiadomska 2003).

CONCLUSIONS

In bream and white bream musculature, four metacercariae species were detected – *P. ovatus*, *H. triloba*, *B. polymorphus*, *P. cuticola*. Three metacercariae species were reported in roach (*P. ovatus*, *H. triloba*, *B. polymorphus*), rudd (*P. ovatus*, *H. triloba*, *P. cuticola*), tench (*P. ovatus*, *H. triloba*, *B. polymorphus*). Two trematode larvae species were found in vimba (*P. ovatus* and *P. cuticola*). In muscles of rudd, bream and

roach were found in mix invasion – *H. triloba* and *P. ovatus* metacercariae.

Opisthorchis felineus is human opisthorchiasis causative agent with distribution in Eurasia. Humans can become infected by consuming raw or partially cooked freshwater fish infected with metacercariae (Pozio 2013, Gómez-Morales 2022). Given the wide spread of the parasite and the presence of all life cycle hosts in nature of Latvia, it is important not to miss this highly pathogenic agent and to continue parasitological studies of fish.

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