PRELIMINARY DATA REGARDING THE SIGNALLING OF THE ACANTHOCEPHALAN *Pomphorhynchus laevis* IN THE *Oncorhynchus mykiss* SPECIES (ORD. SALMONIFORMES, FAM. SALMONIDAE) WITHIN A FISH FARM IN MAGLAVIT (DOLJ, ROMANIA)

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Abstract. The signalling of the acanthocephalan *Pomphorhynchus laevis* in the *Oncorhynchus mykiss* species (Ord. Salmoniformes, Fam. Salmonidae), was carried out in a rainbow trout fishery arrangement within the locality of Maglavit (Dolj, Romania). Fifteen rainbow trout specimens with obvious signs of disease were examined. Acanthocephaliasis evolved clinically between July and August 2017 with obvious signs of morbidity and mortality and the parasite was identified macroscopically and stereomicroscopically at the Dolj Veterinary Sanitary Laboratory and Food Safety Laboratory, with confirmation by the Bucharest Institute of Animal Hygiene and Health. The literature mentions that the more elements of the food chain, plants or animals are present in the aquatic environment, the higher the chances that the fish will meet intermediate primary hosts or accumulation of parasites represented by gamarus crustaceans (*Rivulogamarus* sp., *Gammarus* sp.). Control measures are based on prophylactic measures aimed at disrupting the biological cycle by clearing fish ponds, clearing the substrate as a favourable environment for some aquatic crustaceans, fishing and destroying final host infected fish with other vertebrates, destroying aquatic crustaceans (*Rivulogamarus*, *Gammarus*) through treatment of basins with lime chloride, but also the administration of anthelmintics introduced in fish feed.

Keywords: *Pomphorhynchus laevis, Oncorhynchus mykiss*, Salmonidae, Maglavit, Dolj.

Rezumat. Date preliminare privind semnalarea acantocefalului *Pomphorhynchus laevis* la specia *Oncorhynchus mykiss* (Ord. Salmoniformes, Fam. Salmonidae) prezentă într-o amenajare piscicolă situată pe raza localității Maglavit (Dolj, Romania). Semnalarea acantocefalului *Pomphorhynchus laevis* la specia *Oncorhynchus mykiss* (Ord. Salmoniformes, Fam. Salmonidae), a fost efectuată într-o amenajare piscicolă de păstravi curcubeu de pe raza localității Maglavit (Dolj, România). Au fost examinate cincisprezece exemplare de păstravi curcubeu care prezentau evidente semne de boală. Acantocefaloza a evoluat clinic în perioada iulie - august 2017 cu evidente semne de morbiditate şi mortalitate, iar parazitul a fost identificat macroscopic şi stereomicroscopic în cadrul Laboratorului Sanitar Veterinar şi pentru Siguranța Alimentelor Dolj, cu confirmare efectuată de către Institutul de Igienă şi Sănătate Animală Bucureşti. Literatura de specialitate menționează faptul că, cu cât în mediul acvatic sunt prezente mai multe elemente ale lanţului trofic, plante sau animale, şansele ca peştii să întâlnească gazde intermediare primare sau de acumulare ale paraziţilor reprezentate de crustacee gamaride (*Rivulogamarus* sp., *Gammarus* sp.) sunt tot mai mari. Acțiunile de combatere se bazează pe măsurile profilactice care vizează întreruperea ciclului biologic prin decolmatarea bazinelor piscicole, prin curățarea substratului ca mediu prielnic pentru unele crustacee acvatice, pescuirea şi distrugerea peştilor infectaţi gazde finale alături de alte vertebrate, distrugerea crustaceelor acvatice (*Rivulogammarus*,*Gammarus*) prin tratarea bazinelor cu clorură de var, dar şi administrarea unor antihelmintice introduse în hrana peştilor.

Cuvinte cheie: *Pomphorhynchus laevis, Oncorhynchus mykiss*, Salmonidae, Maglavit, Dolj.

INTRODUCTION

Oncorhynchus mykiss is a representative of the salmonid family native from North America, and it is present on all continents today. It is found in fish farms, being less pretentious compared to the indigenous trout (*Salmo trutta*). *O. mykiss* is not as demanding in terms of water temperature and oxygen content and can be found even at low altitudes where the water is warmer, sometimes cloudier and lower in oxygen. Its adaptability in different habitats has led to the encouragement of the population of fishing facilities such as the one in the Maglavit area. Because fishing was done both for commercial purposes and for sport during July - August 2017, specimens were observed with obvious signs of disease, which were collected in order to establish the degree of parasitism. The fish were transported using live plastic containers, and the dead fish were transported refrigerated. The transport was done quickly, and the examination and the diagnosis of the fish was done in the parasitology laboratory within the Dolj Veterinary Sanitary and Food Safety Directorate with the confirmation made by the Bucharest Institute of Diagnosis and Animal Health. Following macroscopic and stereomicroscopic examination, the parasite *Pomphorhynchus laevis* was identified. The acanthocephalan is known since the 18th century and has an extensive zoogeographic area affecting many species of farmed and even wild fish that are found in various types of aquatic ecosystems around the globe. The aquatic ecosystem plays an important role in the appearance and spread of parasites in fish and the degree of water pollution influences the incidence of certain species of parasites (BOGATU & MUNTEANU, 2008).

The parasite *P. laevis* was identified in the rainbow trout species (*O. mykiss*) in a fishery within Maglavit locality, Dolj county (Fig. 1).

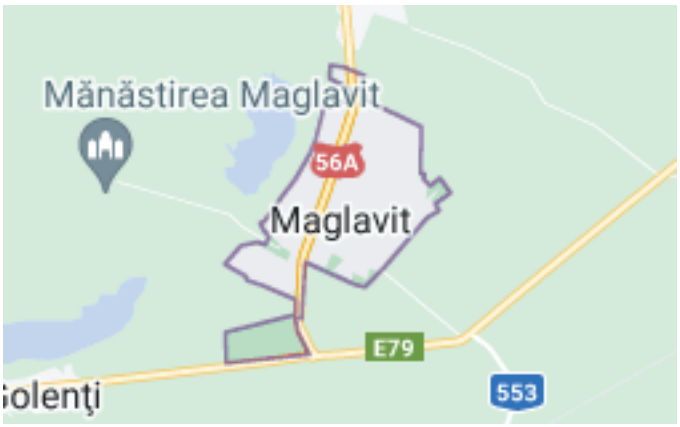

Figure 1. Location of Maglavit locality at the level of Dolj County.
(Source: Google maps, July 2021).

This acanthocephalan is a worm that parasitizes the gut of the adulthood fish. The presence of worms in the intestine, with the proboscis fixed in the intestinal wall and the body fixed in the lumen, prevents the circulation, digestion and absorption of food in the body of fish (BOGATU & MUNTEANU, 2008). Studies in Romania on parasitic fauna are more frequent in the Danube Delta (ROMAN, 1956); In 1949, Rădulescu and Vasiliu published a paper on the infestation of fish in our waters with *P. laevis*, in which they give a detailed morphological description of this parasite and explain experimentally its biological cycle. In the fish from Banat (COJOCARU, 2006), seven species of acanthocephalan were identified, *P. laevis* being present in chub (*Leuciscus cephalus*), barbell (*Barbus barbus*), native trout (*Salmo trutta*), rainbow trout (*O. mykiss*). In 2013 (GOGA & TÎMBURESCU, 2013), the infection with the acanthocephalan *P. laevis* on carp (*Cyprinus carpio*) was reported during autumn in the dam lakes on the Valea Preajba river in the lower sector of the Jiu river. The parasite causes local damage to the intestinal wall of fish, but they are not affecting host growth rate or cause direct mortality and *P. laevis* cannot be regarded as an important pathogen (HINE & KENNEDY, 1974).

MATERIALS AND METHODS

With the help of tweezers and the scalpel, the trout carcasses were dissected and examined both macroscopically and stereomicroscopically. An incision was made in the abdomen to examine both the insides and the organs or muscles as well. The intestines, their contents and their mucosa were also examined. A number of 44 specimens were identified in the abdominal cavity, internal organs, intestine and previsceral tissue using the method: "Detection of acanthocephalan by direct stereomicroscopic and microscopic examination" (Figs. 2, 3).

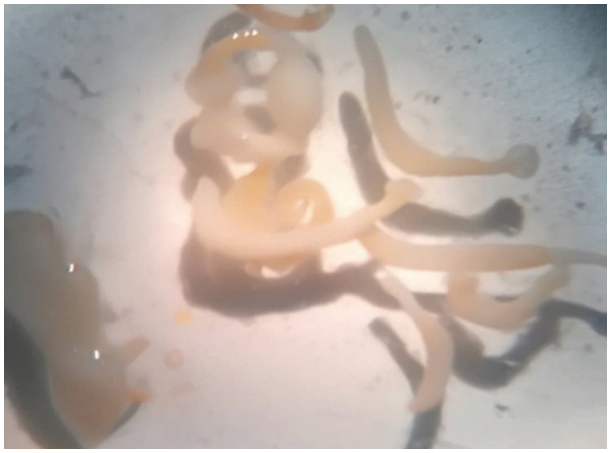

Figure 2. Stereomicroscopic view.

Figure 3. Macroscopic view.

RESULTS AND DISCUSSION

The bodies of the fifteen trout specimens collected and studied following clinical and morphopathological investigations and were identified: blackened skin, blackened cornea, oral haemorrhages, eroded abdominal fins, gills with haemorrhagic stripes, excess mucus and splenomegaly, acanthus larvae on peritoneum and viscera. The lesions were: inflammation and ulceration of the intestinal mucosa, perforated intestinal wall, evidence of enteritis and accumulation of ascites fluid in the cavity of the abdominal body of the intensely parasitized trout. Determinants of host

specificity and patterns of host include factors such as distribution, abundance and relative suitability of host species (PERROT- MINNOTA et al., 2019). Adult forms parasitize in the gut of vertebrates, while larval forms are housed in invertebrates (amphipod and isopod crustaceans). Fish are the main final hosts, although they can also parasitize amphibians, reptiles, birds and mammals. The eggs are laid by the parasite into the intestine of the vertebrate host and released into the external environment with the faeces of the host. Once in the aquatic environment, the eggs can be ingested by an invertebrate (usually a crustacean or mollusk), which will act as an intermediate host. In the intermediate host, the larvae develop in the digestive tract and then enter its walls, reaching the abdominal cavity, where it becomes a acanthus. In the body cavity, the larvae of the acanthocephalan enclose. When the invertebrate is eaten by a vertebrate (fish, amphibians, birds), the latter ingests cystacants. The cystic form becomes activated and turns into an infectious phase. Once in the intestine of the final host, the acanthocephalan attaches to the host. Then the reproductive system develops, fertilization can take place and a new cycle can begin.

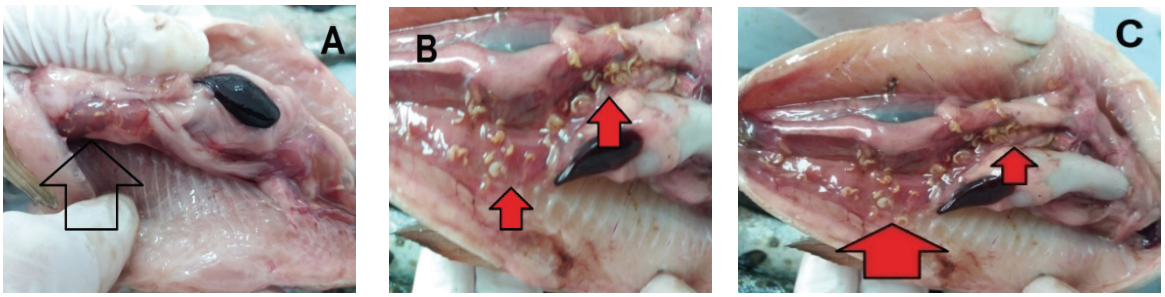

Figure 4. Acanthocephalous worms in rainbow trout highlighted by macroscopic examination of the body cavity (A, B, C).

Following the necropsy examination of the fish and the intestines, congestion was observed, along with the presence of numerous parasitic, cylindrical, white - yellowish and yellowish - orange formations fixed in the mucosa (Fig. 4). The identified *P. laevis* acanthocephalan had a size between 22-28 mm in females and 13-16 mm in males, the body was narrowed at the extremities with a cylindrical appearance (BOGATU & MUNTEANU, 2008) (Figs. 5, 6, 7, 8).

Figure 5. Anterior extremity 4x stereomicroscopic.

Figure 6. Posterior extremity 4x stereomicroscopic.

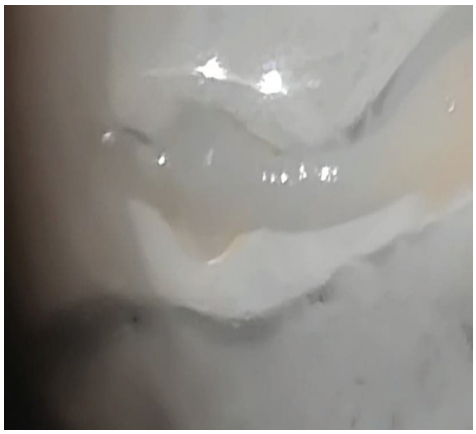

Figure 7. Anterior extremity – closer view.

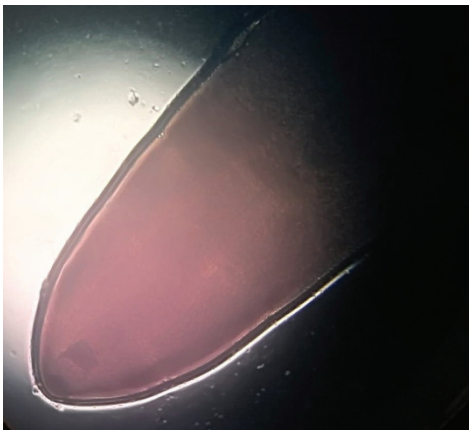

Figure 8. Posterior extremity 10x microscopic view.

The cylindrical tube, armed with 16 rows and 10 hooks per row, protrudes from a pocket through a 5-5.5 mm long neck, previously dilated like a sphere (BOGATU & MUNTEANU, 2008) (Figs. 9, 10) and serves to fix the parasite to the intestinal walls of the fish. Once fixed, the worms can no longer come off. In acanthocephalosis, the symptoms are nonspecific, weakly parasitized fish show no signs of disease. In infestations with a large number of parasites, the symptoms become obvious (weakened fish, exhausted lack of reactivity, mortality) as is the case of the studied fishery arrangement. As prophylactic measures, the literature (VULPE, 1995, 2007) recommends fishing and destroying infected fish, and aquatic crustaceans (*Rivulogammarus, Gammarus*), by treating the pools with lime chloride, but also the administration of anthelmintics in fish feed. No human data have been found on acanthocephalic infections in humans, but there may be speculation of accidental infections with the ingestion of raw fish or infected crabs.

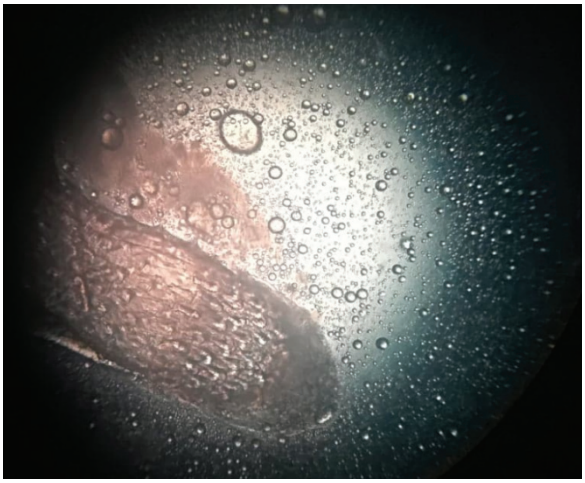

Figure 9. Proboscis 40x microscopic view.

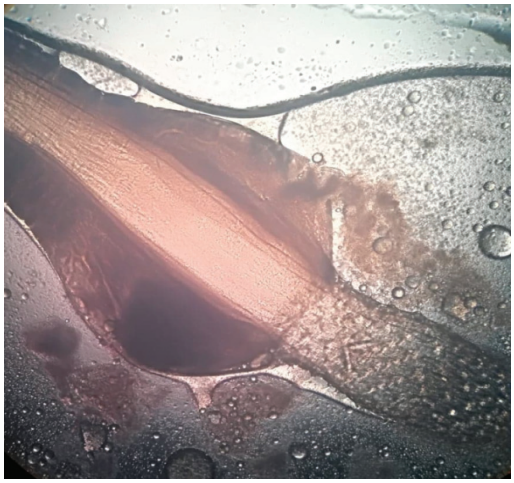

Figure 10. Proboscis pocket 40x microscopic view.

CONCLUSIONS

- *P. laevis* was examined and identified for the first time in the Sanitary Veterinary and Food Safety Laboratory for rainbow trout in a fish farm in Dolj County.
- The confirmation of the existence of this species of acanthocephalan *P. laevis* in the fish species *O. mykiss* was confirmed by the Institute of Diagnosis and Animal Health of Bucharest, the national reference laboratory for the pathology of aquatic animals.
- The effects of the presence of this acanthocephalan have reduced substantially the productivity for this fish farm.
- The intensive development of this parasite has led to significant losses in the fish population.
- Measures to prevent and treat this disease are quite expensive and cumbersome to implement.
- The recovery of the mature trout has been affected, since it has prolonged the recovery time of fish production.
- The effectiveness of the therapy has been shown to be positive in specimens with reduced infection of this parasite.
- As prophylactic measures, the literature recommends fishing and destroying infected fish, destroying aquatic crustaceans (*Rivulogammarus, Gammarus*), by treating the pools with lime chloride, but also the administration of anthelmintics in fish feed.
- No bibliographic data were found on the transmissibility of this acanthocephalan to humans.

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