Ecological Life Sciences
ISSN: 1308 7258
Article ID: 5A0171

Status : Research Article
Received: 09.02.2022
Accepted: 25.07.2022

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DOI	http://dx.doi.org/10.12739/NWSA.2022.17.3.5A0171	
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INVESTIGATION OF THE MORPHOLOGICAL CHARACTERISTICS OF *NEOECHINORHYNCHUS RUTILI* PARASITES ISOLATED FROM *CAPOETA TRUTTA*, AND THEIR LIFESTYLE AT DIFFERENT TEMPERATURES

ABSTRACT

The most important problem encountered in fish farming is fish diseases. One of these diseases is parasitic diseases that cause very harmful results on the host such as peeling-exploiting, mechanical functional, and toxic effects in fish. Parasitic diseases cause great economic losses by causing the death of fish from time to time. In this study, the survival times of the *N. rutili* parasite obtained from the intestines of *Capoeta trutta* fish after catching fish, after an autopsy, and after freezing were investigated. An autopsy was performed 51 hours after the fish was caught, and it was observed that the live parasites were collected and kept alive for 15 hours by keeping them in physiological saline. Some parasites, on the other hand, were frozen and kept at -20°C after being taken from the host, and after 19 days, they were taken from the cabinet and kept in room conditions, and it was observed that they continued to live. Since parasites, which can survive even after leaving their host, cause extremely harmful effects on fish during their stay, studies to combat parasites should be carried out; The consumption of fish, which contains valuable nutrients for human health, is important for the economy of the country.

Keywords: Fish Diseases, *Capoeta trutta*, *Neoechinorhynchus rutili*, Fish Parasites, Vitality

1. INTRODUCTION

Fisheries is an important sector with a high-income revenue because it is a good source of food, provides significant employment, and has a vital export product status. Due to its climatic and geographical structure, Turkiye has the appropriate facilities for the cultivation of many aquaculture products in seas and freshwaters [1]. *Capoeta trutta* (Heckel, 1843) (Family: Cyprinidae) is a dominant fish species in the Fırat and Dicle River systems. The body is flattened from the sides and high, covered with medium-sized scales. Head length is always less than maximal body height. The mouth is small and centrally located, with a pair of short whiskers at the corners. The very development of the last bone ray of the dorsal fin easily distinguishes this species from the others. While the color is dark on the back, it turns gray-brown on the sides and under the abdomen. On the dorsal half of the body, that is, on the upper zone of the Lateral, there are irregularly distributed small and black spots [2].

One of the most important problems encountered in fish farming is reported as parasitic diseases and the effects of parasites directly on the host organism, the damage of which is not noticed or detected in

How to Cite:
Doğan Barata, S. and Önalan, Ş., (2022). Investigation if The Morphological Characteristics of *Neoechinorhynchus rutili* Parasites Isolated from *Capoeta Trutta*, and Their Lifestyle at Different Temperatures. Ecological Life Sciences, 17(3):124-130, DOI: 10.12739/NWSA.2022.17.3.5A0171.

natural environments [3]. Parasites have harmful effects on fish such as peeling, exploitative effects, mechanical and functional effects, and toxic effects [4]. With these effects, parasites can cause death in fish from time to time, and in cases where the hosts do not die, they are responsible for significant financial losses with their pathological effects [5]. There are approximately 10000 parasite species in fish and 4% of these parasite species are included in the Acanthocephala group [6]. All members of the Acanthocephala phylum live as parasites in the intestines of vertebrate animals. There are hooks on the front of their bodies that allow them to hold on to the intestinal wall. Their bodies are divided into three parts: proboscis, neck, and trunk. They are hermaphrodite. These creatures do not always have to live in the same kind of host [4, 7, 8, 9, 10, 11 and 12].

Fish samples of *Capoeta trutta* in the Fırat River system *N. rutili* (Acanthocephala) parasite were morphologically diagnosed in its intestines [13, 14 and 15].

N. rutili, an acanthocephalan worm, lives in the small intestine of freshwater fish [12]. *N. rutili;* The body is small and cylindrical. The proboscis is short and there are 6 rows of hooks on the proboscis, each with 3 hooks. The anterior hook is longer [14]. *N. rutili* can survive in several intermediate hosts in its life cycle. They do not always have to live in the same kind of intermediate host [16]. Mature parasites live in the intestines of fish. The eggs, which reach sufficient maturity, are released into the water with the stool of the fish and thus they have a chance to pass to the intermediate host. The intermediate host is *Asellus aquaticus* [8 and 17]. Parasites affect the host fish during their development, causing loss of appetite, weakening, deformation or death, causing great economic losses [18 and 19]. This study was carried out to determine the residence time of the parasite *N. rutili*, which was detected in the intestines of *Capeta trutta* after it was caught by the fisherman, and the survival time after leaving the host.

2. RESEARCH SIGNIFICANCE

Today, fresh waters and seas in many countries have become inefficient in terms of aquaculture due to industrial wastes. Chemical-based pollution in the aquatic environment can leave fish and other intermediate hosts immune to diseases, and as a result, some parasites can come to the fore as the dominant population [20]. Helminths are one of the most important parasite groups found in fish. These are round, long, flat or ribbon-shaped worms that live on both the internal and external organs of the fish. They become mature parasites by completing their development in one or more intermediate hosts. These parasites affect the host fish during their development, causing loss of appetite, weakening, deformation or death, causing great economic losses [18 and 19]. For this reason, studies to determine the parasitic fauna of fish in natural environments are of great importance in terms of taking control and protection measures [20]. Parasites affect human health both directly by causing diseases and indirectly by causing yield losses in animals, which are an important food source for humans [21].

Highlights:

- In this study, especially growth retardation, reproductive problems and intensive endoparasites, which cause death when found, were investigated in fish;
- Parasites control studies should be carried out by informing the fishermen who hunt in the natural population and the aquaculture enterprises.

- In particular, producers clean the cage, tools-equipment used and feed should be careful about the appropriate storage conditions.
- In addition, without operating the intermediate hosts of the parasites and the main hosts, waterfowls should keep away.

3. MATERIAL AND METHODS

In this study, 10 total *Capoeta trutta* fish caught by fishermen from the Karakaya Dam Lake region of the Firat River were used. The fish taken from the fishermen at 10 o'clock were kept in the refrigerator at +4°C. The fish were removed from the refrigerator at 51 hours. The fish was weighed on the scales and their lengths were measured on the measuring board. Autopsies of the fish were performed according to [22] Arda et al., 2005. The intestines of the fish were removed and left in petri dishes. The intestines of the fish were opened with the help of fine scissors and the contents were allowed to come out, and they were taken into a petri dish containing physiological saline (0.9%). The parasites found were placed in another petri dish containing physiological saline. The parasites in this saline were cleaned from fecal residues and similar foreign particles adhered to the outer surface with the help of a brush. It was observed that the parasites left in separate petri dishes continued to live. Parasites were examined morphologically under the microscope and photographed. Diagnosis of the parasites was made according to [4, 8, 11, 23 and 24].

4. RESULTS AND DISCUSSION

More parasites were obtained in fish with longer length (average 39-47cm) and weight (average 600-976 grams). No parasites were observed in fish with an average weight of 200-400 grams and a length of 29-32cm.

Figure 1. *Capoeta trutta* infected with *N. rutili*

The fish were taken out of the refrigerator at the 51st hour (Time:13.00), an autopsy was performed and the parasites were taken into petri dishes. It was observed that the parasites continued their vitality. When the parasites were first deposited in petri dishes containing saline, their movement accelerated due to excessive stress. It was determined that 7 out of 10 fish that were autopsied were infected with the parasite. The living parasites were white in color, exhibited elongated and shortened body movements, and struggled to hold on with their hooks. The parasites continued their normal motility for 3 hours.

Figure 2. *N. rutili* agents isolated from *Capoeta trutta* fish in this study

After 3 hours (Time:16.00), a slight decrease in movements was observed in about 15% of the parasites, and after 4 hours (Time:17.00) it became more pronounced. After 4 hours and 20 minutes (Time:17.20), the decrease in movement of the parasites increased. The elongation and shortening movements of the parasites were indistinct after 6 hours (Time:19.00) and they seemed to be motionless. As the hours passed, only slight movements were observed when observed very carefully. The parasites, whose movements were completely reduced, remained motionless after 7-8 hours. It was determined that the parasites continued to live in physiological saline for about 15 hours after they were taken from the fish. However, it was observed that parasite samples stored at -20 and -80 degrees on 25 March 2022 remained alive when they were thawed on 12 April 2022. Therefore, it has been observed that even at -80 degrees Celsius, they can stay alive for 17-18 days.

As a result; It was determined that while the parasites can survive for 50 hours in their host at +4°C, they can survive for about 15 hours after leaving their host. Even if their hosts do not survive, parasites can survive if optimum conditions are available for them. After leaving the host, even if they try to survive for a certain period, they eventually die because they stay in an environment that is not suitable for them. When Acanthocephala taken from the intestines of *Capoeta trutta* fish were examined under a microscope, it was morphologically diagnosed as *N. rutili* [4, 8, 11, 23 and 24]. It was determined that the parasites had an off-white, cylindrical short body structure. There was a short proboscis and a hook on it. The average size of the parasites was between 0.2 and 10mm.

N. rutili is a type of endoparasite that causes death in fish. This species is commonly seen in the species belonging to the Cyprinidae and Salmonidae families [12]. Parasites are transmitted to the final host fish if the intermediate host is swallowed by the fish. The infective larvae that pass into the fish enter the fish's intestine and can cause disease in the fish without any maturation [8 and 17].

The distribution of *N. rutili*, redefined by is described in Canada, Northwestern lands, Alaska and Washington coasts, the polar circle, Central Europe, Sweden, Russia, Finland, and continues along the North Holarctic region [25 and 26]. Fish species *Coregonus nosus* in the Baltic Sea [27]; *Salma trutta* and *Oncorhynchus mykiss* fish species in Scotland [28]; in Lake Iznik, *Cyprinus carpio* [29]; *Esox lucius* fish in Işıklı Dam Lake; found that *Barbus capito pectoralis* fish in Keban Dam Lake [30]; found that *Capoeta trutta* fish in Keban Dam Lake [14]; *Capoeta trutta* fish [13]; *Capoeta trutta* fish in Keban Dam Lake [31]; *Capoeta trutta* fish in Murat River [32]; *Capoeta umbla* fish in Pülümür Stream [33]; *L. barbus mystaceus* and *Capoeta trutta* fishes in Keban Dam Lake; identified the *N.rutili* parasite in their intestines. In this study, the morphological diagnosis of *N. rutili* parasite in the intestine of *Capoeta*

trutta fish species is similar to other studies. With these studies, we can say that the parasite *N. rutili* is commonly found in the intestine of Cyprinidae [34].

In some previous studies [35] it was stated that the isolation and morphological identification of *N. rutili* and *L. intestinalis* from lakes was carried out. In another study [36], it was reported that the isolation and DNA isolation of *N. rutili* was performed, and then PCR identification was performed with universal primers. These and similar studies reveal that identification with molecular-based studies to be carried out after the isolation of parasites gives more reliable results. It is obvious that genetic similarity rates will be obtained more reliably with molecular-based studies including sequence studies. In their study [37]; *Ligula intestinalis* parasite, which they obtained live from *Barbus ercisianus* fish species, was placed in the same aquarium with different *Barbus ercisianus* fish, for which they provided optimum living conditions, and the fish were infested. This study is similar to this study in terms of maintaining its vitality for a certain period after the fish is killed. As it can be understood from here, parasites that can maintain their vitality for a certain period will continue to live if they are infested with a different fish under suitable conditions.

5. CONCLUSION

Parasites weren't found in fish of low height and weight. However, parasites were detected intensively in fish with a large size and weight. Therefore, it is understood that the presence and density of the parasite are directly proportional to the size and weight of the host. Although did not find much difference in the infestation rate according to height and weight in her study, it was determined that the rate of infestation was high depending on weight and height in this study [32]. As a result, fish parasites can maintain their vitality until and after the death of the fish, as well as the damage they cause to the fish. To eliminate parasites, which are one of the harmful effects of fish, which is becoming more and more valuable in terms of the nutritional elements they contain and placed in the upper ranks in human nutrition, it is necessary to carry out struggle studies. In this study, the survival times of parasites that cause the death of fish, which are important for human health and economy, were investigated, and the importance of fighting and protection measures against parasites was revealed by revealing the excess of their resistance.

CONFLICT OF INTEREST

The authors declared no conflict of interest.

FINANCIAL DISCLOSURE

The authors declare that this study has received no financial support.

DECLARATION OF ETHICAL STANDARTS

The authors of this article declare that the materials and methods used in this study do not require ethical committee permission and/or legal-special permission.

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