

# First Report of *Lernaea cyprinacea* (Copepoda: Lernaeidae) on Rainbow Trout (*Oncorhynchus mykiss*) from the Sari Mehmet Dam Lake in Van-Turkey

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## ABSTRACT

**Objective:** This report focuses on the diagnosis of rainbow trout mortality in the Sari Mehmet Dam Lake.

**Materials and Methods:** The ten rainbow trout (*Oncorhynchus mykiss*) (300 - 350 g) examined were infested with numerous copepod parasites which were attached to body muscles especially in the caudal and abdominal area.

**Results:** According to morphological results, this parasite was identified as *L. cyprinacea*. Histopathological examination of lesions revealed inflammatory response in the dermis and skeletal muscles and infectious granuloma.

**Conclusion:** This paper is the first to describe cases of lernaecosis on the rainbow trout (*O. mykiss*) from the Sari Mehmet Dam Lake in Van-Turkey.

**Keywords:** Anchor worm, *Lernaea cyprinacea*, Rainbow trout, histopathology

## INTRODUCTION

*Lernaea cyprinacea*, is a common parasite and appears almost all over the world in freshwater fish (1-3), and has been isolated from 46 species of *Cyprinidae*. *Lernaea* (*Cyclopoida*: *Lernaeidae*), or anchor worms, cause lernaecosis and are parasitic copepod found on the skin and gills of freshwater fish (3,4). There are various *Lernaea* species but the most common species, *Lernaea cyprinacea* is known as an opportunistic ectoparasite of fresh water fish species, especially crucian carp (*Carassius carassius*) and occasionally on tadpoles of amphibians (4-6). According to Grabda (7), the rainbow trout (*O. mykiss*) is very sensitive to *L. cyprinacea*. This parasite is known to parasitize more than 100 hosts (8). It is thought to have spread with cyprinid hosts (9). During a recent survey, *L. cyprinacea* was recorded on various native fish species (3,10,11).

The parasite attaches itself to fish with an anchor, feeding on fish blood and tissue debris in this way, and macroscopically, causing the loss of scales, oedema on the skin, haemorrhages and deep ulcers and, thus, the parasite forms routes of entry for other pathogen such as fungi and bacteria causing secondary infection

(8,12). This parasite can cause the mass death of infected fish but Abbas et al. (13) reported that young fish are more sensitive to infestation. Specifically, in salmonids, *L. cyprinacea* was observed in stocked rainbow trout (*O. mykiss*) (12) and *Salmo* spp. (8).

Histopathologically, significant pathological lesions were reported in the skin, gills and eyes but pathological lesions have been observed in the visceral organs of the small fish such as the liver and kidney (14). Generally, this parasite causes granulomatous reactions, degeneration and necrosis in the skeletal muscle; inflammatory reactions in the subcutaneous tissue; hyperplasia and necrosis of gill epithelium; oedema and congestion and haemorrhages in the affected areas such as skeletal muscle and skin (11,12,14-16).

There are many studies about lernaecosis in Turkey (10,17-23). However, there is no report about lernaecosis on the rainbow trout from the Sari Mehmet Dam Lake-Van. The aim of the study was the diagnosis of *L. cyprinacea* infestation in rainbow trout and describes the histopathology of infected tissue such as skin, eyes, gills and other tissues.



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## MATERIAL AND METHODS

### Fish Sampling and Parasitological Analysis

The fish samples were collected from the Sarı Mehmet Dam Lake in the province of Özalp / Van (38°48'15 "N and 43°48'37" E in October (Figure 1). Ten moribund rainbow trout (300-350 g) were examined micro- and macroscopically for the detection of the parasite. For this purpose, the parasites were carefully removed from the skin (24). Anchor worms were examined under a light microscope for diagnosis. The parasite was identified following the Bauer Method (25).

### Histopathology

All infected fish were subjected to necropsy and preserved in 10% buffered formalin solution for histopathological examination. Fixed tissue samples were embedded in paraffin, dehydrated, sectioned at 4-5 µm, stained with haematoxylin and eosin (H&E) and examined with a light microscope (26).

## RESULTS

### Clinical Findings

At the time of the fish sampling, the water temperature was measured as 23°C, pH 8.6. During sampling, ten rainbow trout were collected. All fish clearly showed haemorrhagic and ulcerative skin lesions (Figure 2a), loss of scales and also oedema (Figure 2b) especially on the attachment areas of the parasites. The parasites attached to infected fish with anchors were determined macroscopically on various parts of the body. The attachment area of the parasite was mainly in the caudal and abdominal regions.

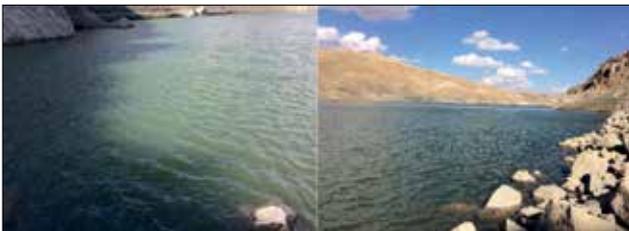


Figure 1: Sampling area in the Sarı Mehmet Dam Lake-Van

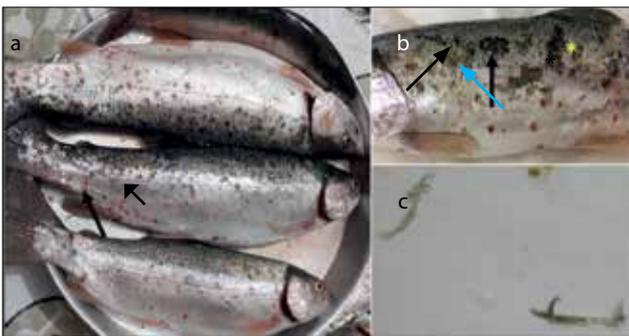


Figure 2. Rainbow trout infected with *L. cyprinacea*. Haemorrhages and ulcerative skin lesions on the attachment areas of the parasites (arrowed) (a), loss of scales (arrowed) and oedema (\*) (b), macroscopically two female parasites (c).

### Parasitological Findings

In the parasitological examination, a large number of female parasites were found macroscopically and microscopically, the parasite was identified as female *L. cyprinacea*, with two egg sacs and a length range of 15-17mm (Figure 2c).

### Histopathological Findings

Histopathologically, significant pathological lesions were reported in the skin, gills, eyes, and, most surprisingly, in the intestine. In the histopathologic examination of the tissues of rainbow trout infected with *L. cyprinacea*, hyperplasia, an increase in mucous cells in the distal end of primary lamella, vacuolization in secondary lamella, necrosis of gill epithelium, distortion in cartilaginous tissue (Figure 3a), haemorrhages and hyper-

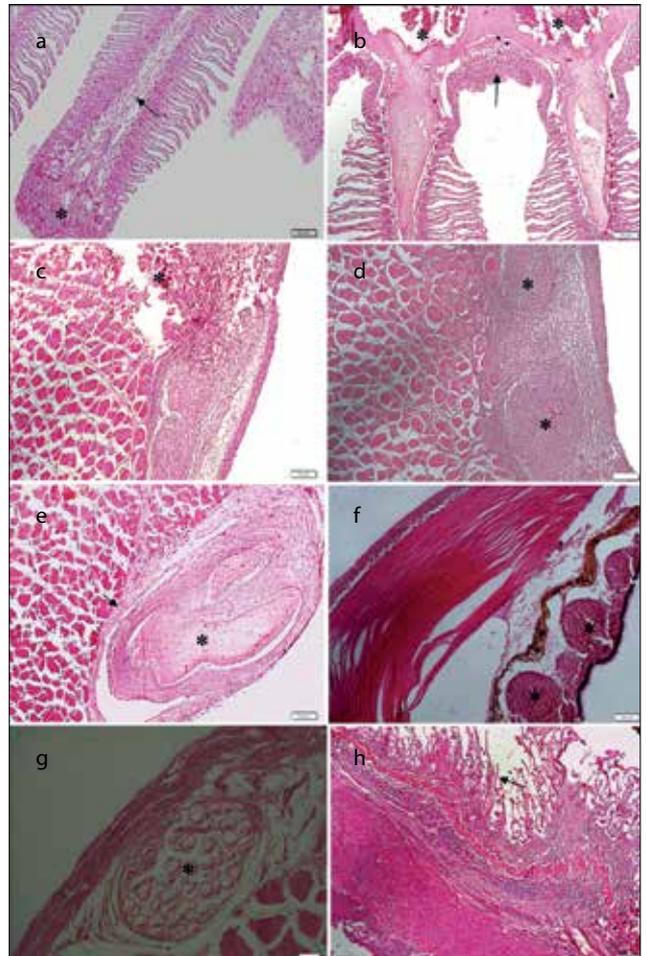


Figure 3. a-h. In the histopathologic examination of the tissues of rainbow trout infected with *L. cyprinacea*. Hyperplasia (\*), distortion in cartilaginous tissue (arrowed) (a); haemorrhages (\*) and hyperplasia at the base of the gills (arrowed) (b); degeneration and necrosis in the skeletal muscle, infiltration of inflammatory cells in the dermis (\*) (c); skeletal muscle granuloma like growths formed by collagen fibrils of dermis (\*) (d); parasitic sections (\*) surrounded by fibrous connective tissue (arrowed) in the necrotic muscle tissue (e); haemorrhages (\*) in the eyes (f); the cystic structure (\*) in the skeletal muscle (g); desquamation of mucosal epithelium in the intestine (arrowed) (h).

plasia at the base of the gills (Figure 3b); thickening of dermis, degeneration and necrosis in the skeletal muscle, infiltration of a massive number of inflammatory cells in the dermis and skeletal muscle (Figure 3c); granuloma like growths formed by collagen fibrils of dermis (Figure 3d) and also parasitic sections surrounded by fibrous connective tissue in the muscle tissue were observed (Figure 3e). Despite the fact that, macroscopically, *L. cyprinacea* was not detected in the eyes; haemorrhages and mild inflammatory infiltrations in the eyes were observed (Figure 3f). Surprisingly, in the skeletal muscle the cystic structure surrounded by fibrous connective tissue (Figure 3g) and desquamation of mucosa epithelium in the intestine was observed (Figure 3h).

## DISCUSSION

Sari Mehmet Dam Lake is the largest dam in the province covering an area of 1020 hectares and the pearl mullet is present (27). In recent years, cages have been placed on the dam reservoir for trout farming. For this reason, fish diseases in this region are important.

*L. cyprinacea* is an extremely harmful copepod ectoparasite found on the skin and gills of fresh water fish species and is known to be a causative agent of lernaecosis. This parasite is known as an opportunistic ectoparasite of crucian carp (6). In Turkey, many studies have been conducted on lernaecosis (10,17-22) but none were based in the Sari Mehmet Dam Lake/Van. Koyun and Atıcı (23) reported detection of *L. cyprinacea* on siraz fish (*Capoeta capoeta*) in Karasu Creek/Van. The study found that carp fish carry this parasite because the Karasu Creek feeds from the Sari Mehmet Dam Lake. As reported by Grabda (7) this study shows that rainbow trout is extremely sensitive to *L. cyprinacea*.

The gross pathology observed in our findings bears similarities to lernaecosis in various freshwater fish species (5,10,12,15,22). Especially, haemorrhagic and ulcerative skin lesions, loss of scales and oedema were similar to those in the findings of Berry et al. (12) in rainbow trout infected with *L. cyprinacea*.

The most significant factor in the spread of the disease is water temperature and water supply. From this point of view, the water source to which the event reported by Koyun and Atıcı (23) occurred is the water passage to the region where this work is carried out. Therefore, this parasitic infestation, which is more common in carp species, was transmitted by the water source and caused the same infestation in the trout. The water temperature measured during the collection of samples was calculated as 23 C°. The optimum water temperature for infestation is 24-25 C°.

Although mass mortalities have been reported in small fish, in this study mass deaths were detected because of the intense prevalence of rainbow trout (300-350 g) (13). Attachment was most commonly found in the caudal and abdominal regions. In this study, the parasite was not detected microscopically and histopathologically in the fish gills and head region. However,

studies carried out by other researchers have shown that parasites have also been found in the gills (11,12,23). It is worth noting that in this study, histopathologically, hyperplasia, an increase in mucous cells at the distal end of primary lamella, vacuolization in secondary lamella, necrosis of gill epithelium and distortion in cartilaginous tissue were observed.

Histopathologically, in this study significant pathological lesions were reported in the skin and skeletal muscle. Although Mirzaei (14) reported pathological lesions in the liver and kidney of infected fish, in this study desquamation of mucosa epithelium was observed in the intestine. This result may be due to secondary infection as reported by other researchers (8,12). Degeneration and necrosis in the skeletal muscle, infiltration of an extremely large number of inflammatory cells in the dermis and skeletal muscle, thickening of dermis, granuloma like growths formed by collagen fibrils of dermis and also parasitic sections surrounded by fibrous connective tissue in the muscle tissue were observed in the present study as in the other described reports (11,12,15,16). In addition to these findings, distinct cystic structures surrounded by fibrous connective tissue were observed in the skeletal muscle.

## CONCLUSION

In conclusion, our paper is the first to describe cases of lernaecosis on rainbow trout from the Sari Mehmet Dam Lake in Van-Turkey. Especially in parasitic infestations, prevention of disease is more important than treatment. For this reason, water temperature change times and stock intensity is of great significance as a precaution in aquaculture. In the case report, slow water flow and relatively high water temperature provide a suitable environment for *L. cyprinacea*. Exposure to these factors together with heavy parasitosis caused mass mortality on rainbow trout from the Sari Mehmet Dam Lake/Van.

**Conflict of Interest:** The authors have no conflict of interest to declare.

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