

<https://doi.org/10.30546/300045.2026.03.1.538>

PREVENTIVE MEASURES FOR CONTROLLING ICHTHYOPHTHIRIASIS OF SALMONIDS IN FISH FARMS OF AZERBAIJAN

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Received 12 october 2025; accepted 01 december 2025

Abstract

Between 2022 and 2025, parasitological studies were conducted to investigate the prevalence of protozoan diseases in fish farms across Azerbaijan. One of the most significant pathogens identified was *Ichthyophthirius multifiliis*, a ciliated protozoan that causes ichthyophthiriasis. This parasite mainly infects the skin, fins, gills, eyes, and oral cavity of fish, leading to characteristic clinical signs such as restless behaviour, congregation near water inlets, and the appearance of a distinctive “semolina-like” coating on the body surface. According to our observations, the disease was most severe among juveniles, with mortality rates reaching up to 40%. Epizootics of ichthyophthiriasis were recorded throughout the year, but they occurred most frequently in spring and summer, when water temperatures ranged between 17 °C and 27 °C and stocking densities were high. The average infection rate reached 26.5%. The parasite was detected in various fish species across nearly all rivers and fish farms in Azerbaijan. To prevent the spread of the disease, comprehensive prophylactic measures were implemented, including the use of salt baths. It was recommended to add table salt at a concentration of 0.01% (100 mg/L) until the water density reached 1.002 g/cm³, as well as to use short-term baths in a 3% solution (30 g/L) for 30 seconds to several minutes, or to maintain fish in water with a constant low salt concentration (0.05% = 500 mg/L).

Keywords: Parasite; Ciliate; Disease; Protozoa; Gills; Cavity; Fish; Farms; Aquaculture; Prevention

1. Introduction

Fish farming is one of the most promising branches of agricultural production, based on the cultivation of various commercial fish species, such as carp, silver carp, and grass carp, in both natural and artificial reservoirs [6].

Modern forms of pond fish farming involve dense stocking of fish in ponds, which results in close contact among reared fish and thereby creates favourable conditions for the spread of various diseases [1].

Among the protozoan parasitic diseases most dangerous for pond fish farms in Azerbaijan, ichthyophthiriasis, caused by the ciliate *Ichthyophthirius multifiliis*, should be particularly noted [4]. After one week of parasitism, the mature trophont leaves the host, settles on the bottom, and transforms into a cyst. Once they mature, they emerge from the cyst and develop into theronts (free-swimming stages), which are highly motile. The theronts then infect new fish by penetrating the outer tissues—under the scales or, most commonly, into the gill lamellae. The complete life cycle takes from 7 to 10 days [5, 2, 7, 6, 8, 11].

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At present, this round-ciliated protozoan is found in all fish farms across Azerbaijan. All species of freshwater fish, regardless of age, are susceptible to the disease. Almost all freshwater fish species can serve as carriers of the pathogen [10].

2. Materials and Methods

Using the method of routine parasitological dissection, 250 specimens of fish were examined, representing two species — rainbow trout (*Salmo gairdneri*) and brown trout (*Salmo fario*).

All examined fish species were infected with *Ichthyophthirius*, although the infection rate was not particularly high — only 1–2 cases per fish.

The diagnosis of ichthyophthiriasis was made based on the examination of skin scrapings from the fish surface and the detection of ciliates under low magnification of the microscope (8×). Adult ciliates varied in shape from oval to circular, measuring between 0.5 and 1 mm.

3. Results

In the fish farms of Azerbaijan, the parasite was found on the gills and skin of the examined fish. According to our studies, the disease was most acute among juvenile fish, showing a high mortality rate (up to 40%). Epizootics of ichthyophthiriasis were observed throughout the year, but they occurred most frequently in spring and summer, when water temperatures ranged from 17 to 27°C and fish density in ponds was high.

Regardless of the stage of development, *Ichthyophthirius* leaves the body of the dead host within 3–4 hours and enters the water. Small trophonts die without infecting new hosts, while large ones encyst and divide (Fig.).

Our research has shown that among external factors, water temperature and lack of flow in ponds play the most significant roles in the occurrence of ichthyophthiriasis. *Ichthyophthirius* is resistant to cold, and most individuals retain their ability to reproduce after being kept for up to six months at temperatures of 1–2°C, once returned to favourable thermal conditions.

Among wild fish, the main reservoirs of the *Ichthyophthirius* pathogen in fish farm conditions were bleak (*Alburnus* spp.) inhabiting water supply sources. The infection rate among them reached 26.5%. This parasite has been recorded in various fish species in almost all rivers and fish farms of Azerbaijan [1, 2].

At present, the prevalence of ichthyophthiriasis is low, indicating a favourable parasitological situation in fish farms. However, given the persistence of the parasite, preventive measures against ichthyophthiriasis were implemented.

Clinically, infected fish exhibited signs of distress, gathering near the water inflow, and developing a characteristic “semolina-like” coating on the skin surface. The infection appeared as white spots on the sides of the fish. The affected fish exhibited abnormal behaviour, rubbing against various objects, swimming near the surface, refusing to feed, and showing no response to external stimuli, while gasping for air. The white spots contained *Ichthyophthirius* cells — trophonts feeding on host tissues.

To improve fish health and control ichthyophthiriasis in fish farms, several disinfectant dyes were tested, with methylene blue proving to be the most effective.

4. Recommendations

For the treatment of infected fish, various oxidising agents are used: methylene blue, malachite green, brilliant green, gentian violet, and potassium permanganate solution. During treatment in ponds, the concentration of the chemical was maintained at 0.1–0.2 mg/m³.

Preventive measures in fish farms include age-separated rearing of fish, disinfection of ponds with freshly slaked lime at a rate of 100–150 kg/ha, monitoring of hydrochemical water parameters, and maintaining high sanitary standards in aquaculture practices.

The implementation of a whole complex of fish-breeding, reclamation, and veterinary–sanitary measures during fish cultivation contributes to the prevention of parasitic diseases. Only the free-swimming forms of the parasite (theronts) are susceptible to chemical treatment; trophonts, which reside beneath the epithelium, and encysted tomites cannot be destroyed.

The water temperature should be increased to 28–30°C to shorten the ciliate’s life cycle. The most recommended treatment for ichthyophthiriasis (in small volumes of water) is the addition of table salt at a concentration of 0.01% (100 mg/L) until the water density reaches 1.002 g/cm³. Fish may be placed in a 3%

(30 g/L) salt solution for 30 seconds to several minutes, or kept in water with a low, continuous concentration (0.05% = 500 mg/L).

All treatment methods aim to eliminate the free-living theronts and tomonts, which can survive only for two to three days in the absence of a host fish; therefore, treatment should be continued for several days after the white spots have disappeared from the fish.

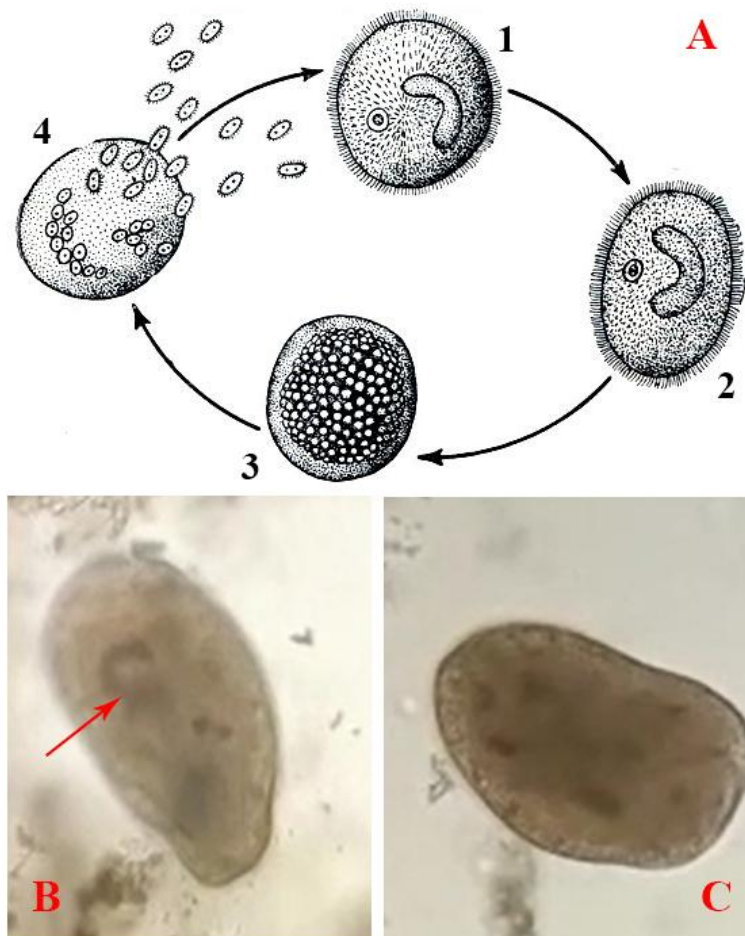


Fig. *Ichthyophthirius multifiliis*. A. Life cycle (after Bauyer et al., 1984): 1 – Trophont leaving the fish skin; 2 – Mature parasite leaving the fish; 3 – Cyst; 4 – Emergence of theronts from the cyst. B. Mature parasite. C. General view of the trophont

5. Conclusion

In the fish farms of Azerbaijan, the parasite was found on the gills and skin of the examined fish. According to our research, the disease was most acute among juvenile fish, with a high mortality rate of up to 40%. Epizootics of ichthyophthiriasis were observed throughout the year, but they occurred most frequently in spring and summer, when water temperatures ranged from 17 to 27°C and fish density in ponds was high. The infection rate reached 26.5%. This parasite has been recorded in various fish species in almost all rivers and fish farms of Azerbaijan.

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