



Article

Correlation Between The Development of Saprolegniosis in Cyprinid Fish and The Bio-Ecological Status of Reservoirs (A Case Study of The Samarkand Region)

U.M. Asomiddinov¹, Kh.B. Yunusov², F.E. Kurbanov³, U.I. Mukhammadiyev⁴, M.J. Xayriddinov⁵

1. Independent Researcher, Assistant Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnologies
 2. Scientific Advisor, Doctor of Biological Sciences, Professor Samarkand State University of Veterinary Medicine
 3. Doctor of Veterinary Sciences, Associate Professor Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnologies
 4. Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnologies
 5. Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnologies
- * Correspondence: umidjonasomiddinov_9506@gmail.com, hudaynazarunusov@gmail.com, feruzinatillayevich@gmail.com, utkirxonmukhammadiyev081@gmail.com, xayritdinovmirjahon84@gmail.com

Abstract: This article presents the findings of a research study conducted between 2024 and 2025 on the etiology and prevention of saprolegniosis in cyprinid fish within fish farms of the Kattakurgan district, Samarkand region. The authors of the study single out the following environmental stress factors as the major ecological factors that cause the onset of the Energy Deficiency Syndrome and the following occurrence of saprolegniosis in fish: water acidity (pH 5.5–6.3) and deficiency of dissolved oxygen (5.23–6.3 mg/L). Moreover, the paper elaborates bioassay techniques applied to test stress resistance of fish population. The guidelines on the optimization of fertilization processes and feeding systems in reservoirs are offered scientifically, being effective preventative measures of curbing disease outbreaks.

Keywords: saprolegniosis, cyprinid fish, pH level, deficiency of oxygen, etiology, bioassay, Energy Deficiency Syndrome.

Citation: U.M. Asomiddinov, Kh. B. Yunusov, F.E. Kurbanov, U.I. & Mukhammadiyev, M.J. Xayriddinov. Correlation Between The Development of Saprolegniosis in Cyprinid Fish and The Bio-Ecological Status of Reservoirs (A Case Study of The Samarkand Region). Central Asian Journal of Medical and Natural Science 2026, 7(2), 629-634

Received: 10th Jan 2026
Revised: 21th Feb 2026
Accepted: 08th Mar 2026
Published: 15th Apr 2026



Copyright: © 2026 by the authors. Submitted for open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>)

1. Introduction

Importance of the Study. The study of aquaculture has become a significant area of the Uzbek economy and a key provider of productive development and the company with high-quality and diet products high in protein. But, issues of intensive fish farming are increasingly posing a hindrance to the sustainable growth of this industry. Specifically, the deterioration of water quality and the impact of adverse ecological factors have led to a higher incidence of infectious diseases among fish populations. Among these, saprolegniosis remains a critical threat, as it directly impacts fish survival rates and overall yield, necessitating a deeper understanding of the environmental triggers that facilitate fungal outbreaks in intensive production systems [1].

2. Materials and Methods

The study was conducted in 2024/2025, on fish farms in the Kattakurgan district of the Samarkand region, the Republic of Uzbekistan, with a bearing on the enterprises of the Kattaqo'rgaboutayjoychichi at the farms Po'lat Baliq Xavzasi and Kattaqo'rg suddaychichi. The sites are typical cyprinid intensive aquaculture in the area. The research proposed a multifaceted method and utilized by using hydrochemical monitoring, clinical and pathomorphological examination, bio-assay test of stress resistance and controlled experimental trials to study growth and prevention of diseases in fish.

The main objects of investigation were common carp (*Cyprinus carpio*) fingerlings (segoletkas) with an average body weight of 200–350 g. For the experimental part, five-to-six-month-old carp fingerlings were selected and divided into four experimental groups and one control group, each consisting of 200 individuals stocked in earthen ponds of comparable size and depth. Throughout the 90–120-day experimental period, pond water was fertilized every 30–40 days with mineral and organic fertilizers to maintain the nutrient base. The experimental and control feeds were standardized at around 2.5 percent of the total fish biomass per day.

Hydrochemical parameters of the pond water were followed two or three times a month between April and July. The surface and deeper layers of water were sampled. The critical parameters of pH (measured with a digital pH meter) and dissolved oxygen (DO, measured with oxygen meter or Winkler method) were measured on-site and in the laboratory. Other tests were organoleptic appraisal of fish (odor, consistency, coloration), and pathomorphology analysis of tissues affected. One of the key aspects of the methodology was the bioassay of Energy Deficiency Syndrome (EDS) that measured the physiological stress resistance of fish especially to thermal stress.

The tests were done in 20-40 liter aquariums where the water was still and constant oxygen supply was made. The temperature of the water was also slowly increased to 27-30°C at 0.5-2.0°C in a span of one hour. Clinical responses (circular swimming, loss of coordination) and mortality were recorded when temperature exceeded 25–26°C. Each bioassay used 25–50 fish per sample.

Clinical observations included monitoring motor activity, response to stimuli, fin condition, body coloration, skeletal muscle status, scales, and gill integrity. Growth dynamics were assessed by weighing fish at the start and every 70 days using a "HERMES NEC 5" electronic scale. Every 15-20 days, a sample of not more than 30 fish per group was analyzed regarding feed application, clinical observation and chosen biochemical blood parameters. The death rates were documented.

Laboratory experiments at three stages were conducted to compare preventive agents with saprolegniosis and other protozoal infections, and the effect on fish growth, development and economy. Veterinary-sanitary and reclamation was practiced in all test ponds. Data were processed using standard statistical methods to determine mean values, variations, and significance of differences.

All procedures adhered to ethical standards for aquaculture research and veterinary regulations in Uzbekistan. This methodology allowed a comprehensive assessment of the correlation between bio-ecological water status and saprolegniosis development while testing practical preventive strategies.

3. Results and Discussion

The researches concerned the definition of the etiology, clinical and pathomorphological alterations of Saprolegniasis in fish, or the establishment of effective preventive measures. They were studied in the course of 2024/2025 in different fish farms in Samarkand [2].

Our experiments were specifically on Saprolegniasis in cyprinid fish (*Cyprinidae*). It was determined that the chronic effects of unfavorable environmental influences was the

major cause of the disease in such facilities. In the course of the experiment carried out in a fish farm located in the Kattakurgan district, the worsening of the quality of water resulted in major changes in hydrochemical parameters. This was mainly caused by the release of final water products (manure) and organic acids into the water bodies [3].

This contamination led to acidic environment and the pH of water dropped to 5.5-6.3 range. The chemical parameters of the water in the fish farms where the research took place, as well as the veterinary-sanitary testing on the fish meat was performed, in order to identify the causes of Saprolegniasis. Water samples were collected from the aquaculture ponds; the dissolved oxygen (DO) levels were measured using an Oxygen Meter, and the water pH was determined using a pH meter [4]. Additionally, organoleptic and pathomorphological examinations of the fish were performed. The organoleptic assessment included the evaluation of odor, consistency, and coloration [5].

Experimental Biosensory Testing The core of this method involves conducting a physiological status test on the fish to identify Energy Deficiency Syndrome (EDS). Specifically, the resistance of the fish to stress factors, particularly thermal stress, was evaluated. These experiments were carried out in 20–40 liter tanks (aquariums) containing stagnant water with a continuous supply of dissolved O₂ [6].

At the start of the test, the water temperature was gradually increased from 0.5–2°C to 27–30°C over a period of one hour. In infected fish, clinical manifestations, such as circular swimming movements, were observed when the temperature exceeded 25°C. Deaths in the sick fish were noted when temperature exceeded 26 o C. A sample size of 25-50 fish was used when carrying out each bioassay. Carp (*Cyprinus carpio*) fingerlings in fish farms (segoletkas) were examined and observed clinically, the body weight being on average between 200 and 350 grams. The clinical tests measured motor coordination, sensitivity to environmental stimuli, and fin brittleness crippling. Measuring body weight was done at the start of the study and then at 70 days intervals, with the help of a scale called HERMES NEC 5. Moreover, the coloration of the body, state of skeletal muscles, scales, and gills were carefully observed over one season [7].

A series of scientific and practical laboratory tests in three stages were conducted to be able to select effective agents in the prevention of saprolegnoses and protozoal infections. The objectives of these experiments were to examine the effect of the chosen agents on fish organism, its growth and development, and assess the economical efficiency of the preventive strategies. For the experimental trials, five-to-six-month-old carp (*Cyprinus carpio*) fingerlings were selected from the "Kattaqo'rg'on" fish farm, located in the Kattaqo'rg'on district of the Samarkand region. The fish were divided into four experimental groups, each consisting of 200 individuals.

Throughout the experimental period, pond water fertilization was carried out every 30–40 days across all experimental and control groups to enrich the water composition [8].

The daily food given to the control groups of fish was kept at about 2.5 percent of the total weight of the fish. To see how the fish were growing. If they were healthy we took samples of up to 30 fish every 15 to 20 days. We looked at how food the fish were eating and we also took blood samples to check if the fish were healthy. During the experiment we kept track of how many fish died in each group. The experiment lasted for 90 to 120 days. At the end of the experiment we took fish from both the control groups to compare how they grew and if they had any health problems. We also made sure to follow the rules to keep the fish healthy and safe [9].

We checked the water quality two to three times a month from April to July. We took water samples from the Kattaqo'rg'on Jaykhuni farm. We found out that the water was a little acidic at the beginning of April with a pH of 6.5. The pH went up to 6.7 later in April. In May the pH was 6.9. Then it went down to 6.8. In June the pH was 7.0. Then it went down to 6.7. In July the pH was 6.9 and then 6.8 [10].

We also took water samples, from the Po'lat Baliq Xavzasi fish farm. In April the pH was 6.8. Then it went up to 6.9. In May the pH was 6.6. Then it went up to 7.0. Observations in June yielded values of 6.8 and 6.6, respectively. During July, the pH levels were recorded at 6.9 in the first sampling and 6.5 in the second [11].

Such fluctuations in the aquatic environment lead to an increase in water acidity. A shift in the pH toward acidic conditions adversely affects the fish organism, primarily by reducing feed intake. This, in turn, is characterized by disruptions in protein metabolism [12].

Table 1. Hydrochemical analysis results conducted in fish farms from April to July.

Monitoring Period		"Kattaqo'rg'on Jaykhuni"		"Po'lat Baliq Xavzasi"	
		pH	Dissolved Oxygen (mg/l)	pH	Dissolved Oxygen (mg/l)
April	1st examination	6,5	5,2	6,8	5,5
	2nd examination	6,7	6,2	6,9	5,5
May	1st examination	6,9	6,0	6,7	5,7
	2nd examination	6,8	5,7	7,0	5,4
June	1st examination	7,0	5,5	6,8	5,6
	2nd examination	6,7	5,9	6,6	5,2
July	1st examination	6,9	6,1	6,9	5,9
	2nd examination	6,8	6,3	6,5	5,8

The analysis of dissolved oxygen (DO) levels in the fish ponds of the "Kattaqo'rg'on Jaykhuni" farm showed an average of 5.2 mg/l during the initial April assessment, which increased to 6.2 mg/l upon the second examination. In May, the recorded values were 6.0 mg/l and 5.7 mg/l for the first and second samplings, respectively. Observations in June indicated an initial average of 5.5 mg/l, followed by 5.9 mg/l in the subsequent test. Lastly, in July, the dissolved. The oxygen levels were recorded (on average) as 6.1mg/l and 6.3 mg/l through the. two separate timeframes to monitoring [9]. At the "Po'lat Baliq Xavzasi" farm, the dissolved oxygen levels in April were this recorded an average of 5.5mg/l at the very beginning and secondly. examinations. The initial monitoring session found the average of 5.7 in May. mg/l with a slight drop in the second session to 5.4 mg/l. The measurements for June were 5.6 mg/l in the first assessment and 5.2 mg/l in the second. Finally, during the July monitoring period, the oxygen concentration was 5.9 mg/l in the initial test and 5.8 mg/l in the follow-up examination [13].

The results of these analyses indicate that a decrease in dissolved oxygen concentration in pond water leads to reduced appetite, growth retardation, and increased susceptibility to diseases in fish.

In both fish farms where the research was conducted, improper fertilization of the ponds, violations of the feeding regime, and fluctuations in the aquatic environment and oxygen levels contributed to the development of saprolegniosis in the fish population [14].

Studies on saprolegnoses and protozoal infections in these fish farms led to the conclusion that inadequate pond fertilization results in a deficiency of the natural food base. Furthermore, a shift in the water pH toward acidity causes a reduction in appetite and lowers the feed conversion efficiency. The insufficient protein content in the feed rations, which fails to meet the physiological requirements of the fish, serves as a primary factor in the development of saprolegnoses [15].

4. Conclusion

The conducted studies clearly demonstrate a strong correlation between the deterioration of the bio-ecological status of reservoirs and the increased incidence of saprolegniosis in cyprinid fish. The introduction of organic waste (manure) and improper fertilization practices led to significant acidification of pond water (pH dropping to 5.5–6.3) and chronic hypoxia (dissolved oxygen levels decreasing to 5.2–6.3 mg/L). These unfavorable hydrochemical factors were major causes of Energy Deficiency Syndrome which hinder the immune capacity of fish causing a decrease in feed consumption and efficiency, allowing Saprolegnia pathogen infections to occur frequently which in some cases are associated with protozoan infections.

Change in pH and low oxygen levels disturbed protein metabolism and the general physiological equilibrium leading to retarded growth, deformed behavior, and increased vulnerability to fungal epidemics. Bioassay tests reported that fish in affected ponds had a significantly lower resistance to stress, and that clinical symptoms were rapidly developed (through the appearance of circular swimming and increased mortality) following the exposure to thermal challenges.

The constant monitoring of the hydrochemical parameters, the following of the best fertilization regimes, and prompt adjustment of feeding regimes showed to be crucial in mitigating the diseases. Keeping the pH between the normal and slightly alkaline (7.07.4) range and making sure that there is enough dissolved oxygen in the solution had a significant effect in reducing the chances of saprolegniosis. Integrated preventive strategies aimed at achieving optimal pond management, frequent veterinary-sanitary testing, and controlled experimental verification of agents can greatly decrease the mortality and economic losses with intensive cyprinid aquaculture.

These results highlight the urgent need to adopt an ecosystem mode of fish farming in the area of Samarkand. Aquaculture enterprises by focusing on water quality management and minimization of stress can help improve the welfare of fish, increase productivity and lead to sustainable development of this industry in Uzbekistan. Further research into biologically safe preventive additives remains promising for long-term disease control.

REFERENCES

- [1] F. E. Kurbanov, "Epizootiology of fish saprolegniosis and control measures," *Educational Research in Universal Sciences*, vol. 1, no. 7, pp. 152–158, 2022.
- [2] F. Kurbanov et al., "The number of pathological samples and results obtained by mycologically examined fish Saprolegniosis in Samarkand and Jizzak regions," *BIO Web Conf.*, vol. 160, p. 02007, 2025, doi: 10.1051/bioconf/202516002007.
- [3] K. Yunusov et al., "Distribution of hydrobionts in aquatic ecosystems in different parts of the Akdaryo river," *E3S Web Conf.*, vol. 539, p. 01012, 2024, doi: 10.1051/e3sconf/202453901012.
- [4] U. M. Asomiddinov et al., "Baliqlar Saprolegniozining Kechish Xususiyatlari Va Laborator Tashxisi," *Miasto Przyszłości*, vol. 58, pp. 128–137, 2025.
- [5] P. C. Lindholm-Lehto, "Saprolegniosis in aquaculture and how to control it?," *Aquaculture, Fish and Fisheries*, vol. 4, no. 3, pp. 1–15, 2024, doi: 10.1002/aff2.200.
- [6] S. Kumar et al., "Identification of growth inhibitors of the fish pathogen Saprolegnia parasitica using in silico and in vitro approaches," *Frontiers in Microbiology*, vol. 11, Art. no. 571093, 2020, doi: 10.3389/fmicb.2020.571093.

- [7] E. Matthews et al., "Environmental factors impacting Saprolegnia infections in wild salmonid populations," Ph.D. dissertation, Cardiff Univ., Cardiff, U.K., 2019. [Online]. Available: <https://orca.cardiff.ac.uk/id/eprint/130012>
- [8] S. K. Das et al., "Studies on the identification and control of pathogen Saprolegnia in Indian major carp fingerlings," *Aquaculture Research*, vol. 43, no. 12, pp. 1785–1795, 2012, doi: 10.1111/j.1365-2109.2011.03012.x.
- [9] M. S. Qadir et al., "Seasonal impacts of physical and chemical factors on aquatic fungi and common carp," *Passer Journal of Basic and Applied Sciences*, vol. 7, no. 1, pp. 1–16, 2025.
- [10] R. S. Ovchinnikov, M. G. Manoyan, and A. G. Gaynullina, "Etiological role of non-dermatophyte fungi in superficial mycoses of animals," *Collection of Scientific Works of VGNKI*, vol. 68, pp. 148–153, 2007.
- [11] S. A. El Gamal et al., "Prevalence and genetic analyses of Saprolegnia strains associated with saprolegniasis outbreaks in Nile tilapia farms at northern Egypt and its linkage to the water quality parameters," *Aquaculture*, vol. 563, Art. no. 739000, 2023, doi: 10.1016/j.aquaculture.2022.739000.
- [12] R. Kumar et al., "Mortalities in cultured Pangasianodon hypophthalmus due to oomycete Saprolegnia parasitica infection in Uttar Pradesh, India," *Aquaculture Reports*, vol. 24, Art. no. 101166, 2022, doi: 10.1016/j.aqrep.2022.101166.
- [13] F. F. Ali et al., "Isolation, molecular identification, and pathological lesions of Saprolegnia spp. in cultured common carp (Cyprinus carpio)," *Journal of Advanced Veterinary Research*, vol. 11, no. 1, pp. 1–6, 2021. [Online]. Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7811552/>
- [14] Kh. B. Yunusov, "Diagnosis of saprolegniosis and protozoa of fish and veterinary and sanitary assessment of their meat (Uzbekistan)," *BIO Web Conf.*, vol. 95, p. 01002, 2024, doi: 10.1051/bioconf/20249501002.
- [15] M. I. Khushnazarova et al., "Measures to prevent the spread of non-infected bronchionecrosis, protozoan and lerniosis in fish," *BIO Web Conf.*, vol. 160, p. 01002, 2025..