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Parasitic Fauna of Rainbow Trout Infected with Glugeosis in the Fish Farms of the Ararat Valley

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ABSTRACT

Upon the researches of the contemporary pisciculture it has been found out that fish species especially those of trout family, are susceptible to the widespread invasive - parasitic diseases. The high concentration of fish in ponds, violation of sanitary standards in the pond farms, lack of treatment of some invasions contribute to the widespread occurrence of these diseases and the mass fish mortality.

For the period of 2017 - 2019 mass infection of rainbow trout with glugeosis was detected in the five pond farms of the Ararat valley, while ichthyophthirius, chilodonella, and trichodinosis were fixed as secondary invasions. Therefore, for the prevention of individual and mixed invasive diseases it is recommended to take timely fish-breeding, reclamative and veterinary - sanitary measures in the mentioned pond farms.

Introduction

Fish farming is one of the promising agricultural sectors in Armenia and fish is mainly bred in artificial pond farms of the Ararat valley. In the contemporary fish farming some species of trout family in particular, can get infected with widespread invasive - parasitic diseases, which is a consequence of the high rate of fish concentration in ponds, as well as violations of sanitary standards.

Invasive diseases often occur in fish in an associated form, which leads to the decrease in the profitability of pond farms and complicates the differential diagnosis and treatment of diseases manifested by similar clinical symptoms.

The invasive disease of glugeosis, discovered by the employees

of the Department of Epidemiology and Parasitology of the National Agrarian University of Armenia in 2008, is of particular concern.

For the period of 2017- 2018, 781 fish belonging to different age groups were studied. Glugeosis infection in the pond fish belonging to three different age groups made 33 % - 35 % without any further decreasing tendencies. The same fish were simultaneously infected with ichthyophthirius, chilodonella and trichodinosis, due to which the rate of fish disease reached up to 15 % - 27 %.

In order to prevent fish infection it is necessary to organize and take some fish-breeding, land reclamation and veterinary-sanitary measures.

Mixed fish invasions were also observed in the pond farms of several countries, for example, in the Russian Federation (Akisheva, 2003, Garkavi, et. al, 1988, Lysenko, 1994, Lysenko, 2001, Lysenko, Yarovaya, 2003, Naghashyan, et. al, 2015, Csaba, 1984, Hristovski, 2001, Lom & Dykova, 1992, Molnar, 1971).

Thus, the aim of our work is to study the associated invasive diseases developed against the background of glugeosis in the rainbow trout bred in the pond farms of the Ararat valley.

Materials and methods

The studies were conducted during 2017 - 2019 in the parasitological laboratory of the Department of Epidemiology and Parasitology of the National Agrarian University of Armenia. Samples of fish were taken from the pond farms of “Emifish”, “Rapeseed”, “Fishka”, “Bigamafruit” and “Ecofish” located in the Ararat valley. The fish were examined through the method of complete ichthyo-parasitological autopsy developed by V.A. Dogel (1933), modified by I.E. Bihovskoy (Naghashyan, 2005, Bykhovskaya, 1989). Fish up to one, two and three years old were investigated.

Parasites were collected and processed by parasitological methods used in ichthyo-pathology (Dogel, 1933).

In 2017, 781 trout from different age groups were studied, among them 74 trout were under one year, 102 - two years, and 97 - three years old. In 2018 the studies were conducted on 75 trout below one year old, 102 - two years old and 76 - three years old. In 2019, 98 investigated trout were under one year old, 105 - two years and 52 - three years old.

In the five experimental pond farms feeding and breeding conditions were identical, and the ponds were filled with running artesian water.

Results and discussions

As a result of parasitological autopsy and studies of different fish age groups, the following data were obtained for different years.

In the fish under one year old brought from the above mentioned five pond farms investigated in 2017, specimens with 26% glugeosis, 39% ichthyophthirius, 15 % chilodonella and 20% trichodinosis infections were found. In the indicated age group, mixed invasion, with the simultaneous detection of glugeosis, chilodonella and ichthyophthirius, made 15 %.

In two-year-old fish, 34 % glugeosis, 27 % ichthyophthirius, 20 % chilodonella and 18 % trichodinosis infections were detected. Among the fish of this age, mixed invasion with the simultaneous course of glugeosis, chilodonella and trichodinosis was 23 %.

In the fish up to the age of three, the following picture was observed: out of investigated samples 32 % were infected with glugeosis, 25 % with ichthyophthirius, 23 % with chilodonella and 21 % with trichodinosis. Mixed invasion rate made up to 18 % (Table 1).

In the investigations for 2018 the following data were obtained: among fish under the age of one year 32 % of glugeosis, 19 % of ichthyophthirius, 28 % of chilodonella, and 21% of trichodinosis infections were found. Mixed invasion in the indicated fish group with the simultaneous course of glugeosis, chilodonella, ichthyophthirius and trichodinosis amounted to 12 %. Among fish under the age of two 36 % of glugeosis, 19 % of ichthyophthirius, 27 % of chilodonella and 17 % of trichodinosis were recorded. Mixed invasion in the indicated group of fish, with the simultaneous course of glugeosis, chilodonella, ichthyophthirius and trichodinosis amounted to 24 %.

The following situation was observed in the samples of three-year-old fish: 35 % were infected with glugeosis, 26 % with ichthyophthirius, 22 % with chilodonella and 18 % with trichodinosis. Mixed invasion rate amounted to 22% (Table 2).

In 2019, the one-year-old fish brought from the pond farms of the Ararat valley “Emifish”, “Raps”, “Fishka”, “Bigamafruit” and “Ecofish” demonstrated the following invasions: 33% glugeosis, 23% ichthyophthirius, 21% chilodonella and 22% trichodinosis. In the indicated fish age group the mixed invasion with the simultaneous course of glugeosis, chilodonella, ichthyophthirius and trichodinosis made 11% .

Table 1. The degree of infection with protozoa in different age groups of fish for 2017, expressed in absolute numbers*

Age groups	Total number of fish examined	The number of fish infected with glugeosis	The number of fish infected with ichthyophthirius	The number of fish infected with chilodonella	The number of fish infected with trichodinosis	The number of fish infected with mixed invasion
Under one year old	74	19	29	11	15	11
Two years old	102	35	28	21	18	23
Three years old	97	31	24	22	20	18

*Composed by the authors.

Table 2. The degree of infection with protozoa in different age groups of fish for 2018, expressed in absolute numbers*

Age groups	Total number of fish examined	The number of fish infected with glugeosis	The number of fish infected with ichthyophthirius	The number of fish infected with chilodonella	The number of fish infected with trichodinosis	The number of fish infected with mixed invasion
Under one year old	75	24	14	21	16	9
Two years old	92	33	18	25	16	22
Three years old	78	27	20	17	14	17

Table 3. The degree of infection with protozoa in different age groups of fish for 2019, expressed in absolute numbers*

Age groups	Total number of fish examined	The number of fish infected with glugeosis	The number of fish infected with ichthyophthirius	The number of fish infected with chilodonella	The number of fish infected with trichodinosis	The number of fish infected with mixed invasion
Under one year old	98	32	23	21	22	11
Two years old	105	33	27	29	16	24
Three years old	52	14	11	18	9	7

*Composed by the authors.

In two-year-old fish, 31 % glugeosis, 26 % ichthyophthirius, 28% chilodonella and 15 % trichodinosis infections were recorded. Mixed invasion rate detected in the indicated fish age group with combined glugeosis, chilodonella, ichthyophthirius and trichodinosis infections was 23 %.

In the three-year-old fish, the state of infection was as follows: out of investigated fish, 27 % were infected with glugeosis, 21 % with ichthyophthirius, 35 % with chilodonella and 17 % with trichodinosis. Mixed invasion rate made 13% (Table 3).

Thus, in the pond farms examined over three years the average infection rate with glugeosis in the three age groups was 33 % - 35 % without any further decreasing tendency. Almost the same infection rate was fixed related to mixed invasion. The

causative agents of glugeosis are known to have a pronounced tropism for certain organs and tissues of the host. The most pathogenic are parasite species that infect the intestines and gills of fish. We have found cysts of the causative agent of glugeosis in all tissues of infected fish; anyhow they were dominant in the abdominal cavity, muscles and in the eyes (Figure 1).

Ichthyophthirius fish infection demonstrated the following dynamics: in 2017 the infection in all examined age groups ranged from 19%-39%, while the highest infection rate was observed in the fish under one year old, which was expressed upon the lesion caused to the subcutaneous tissue, fins and gills (Figure 2).

**Figure 1.** Clinical signs and microscopic pattern of fish Glugea infection.

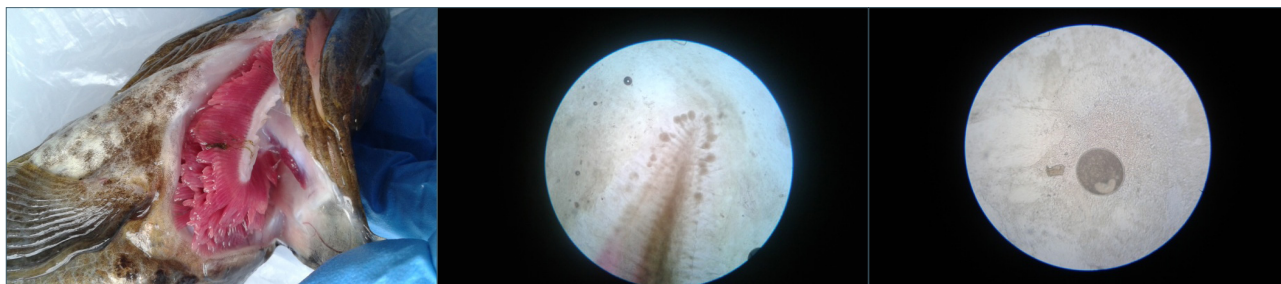


Figure 2. Gills infected with *Ichthyophthirius* and its microscopic pattern.

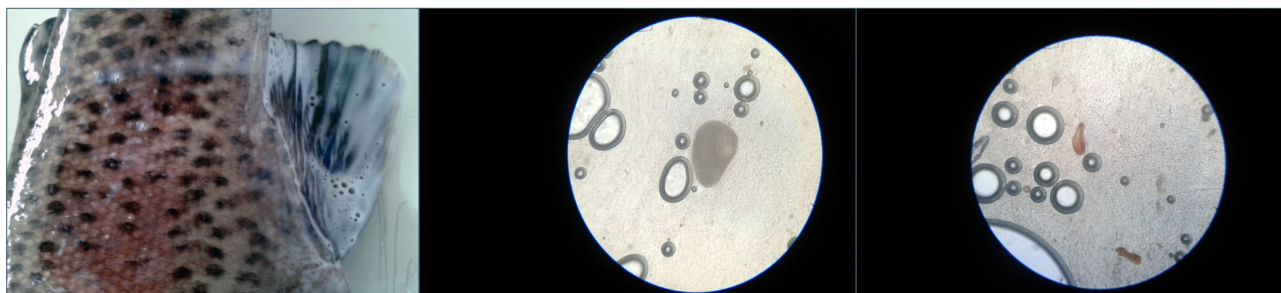


Figure 3. Clinical signs and microscopic pattern of fish *Chilodonella* infection.



Figure 4. *Trichodina* infection and its microscopic pattern

According to the studies in the pond farms of the Ararat valley the *chilodonella* infection rate ranged within 11 %-29 %. The disease was recorded from early spring. Pathoanatomical changes in *chilodonella* were expressed in the skin and gills of fish at the age of two and even older (Figure 3).

Trichodinosis has been clinically manifested by lesion of gills and skin in various parts of the fish body. In the fish of different age groups *trichodinosis* infection varied within the range of 9 %-22 % and held constant throughout the three years of investigation (Figure 4).

Conclusion

Summing up we can say that due to the use of artesian waters there are favorable conditions for the emergence and survival

of parasitic systems in the pond farms of the Ararat valley which is greatly promoted by the infection of fish glugeosis. It should be noted that during the three years of investigation, fluctuations in dynamics of individual invasions were not observed. Therefore, for the prevention of individual and mixed invasive diseases it is recommended to take timely fish-breeding, reclamative and veterinary - sanitary measures in the mentioned pond farms.

The quarantine of the newly imported fish species is of paramount significance in the system of veterinary- sanitary preventive measures, since very often both infection and invasion diseases penetrate into the farms together with the imported new stocks.

The sufficient sanitary conditions of the reservoirs, water temperature, its saturation with oxygen are among the primary preventive measures against the fish diseases.

The drainage and disinfection of the reservoirs with chlorinated lime, quick lime, copper sulphate and with other disinfectants are also involved in the preventive measures.

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