

# VETERINARY SCIENCES

## MONITORING OF FISH HELMINTHIASIS OF WATER SOURCES IN AKMOLA REGION

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### Abstract

Based on the data obtained, it should be noted that the epidemiological situation in the water sources of Akmola region is poor for zoonotic helminthiasis, such as opisthorchiasis, diplostomosis. The worst situation with opisthorchs turned out to be the Sholak reservoir in the Korgalzhyn district, where it turned out that all the studied fish were infested.

**Keywords:** opisthorchiasis, diplostomiasis.

**Introduction.** The parasitological situation in a reservoir is an integral part of its environmental situation. Due to the duality of the habitat (external environment and host organism), parasites are a natural component of the biocenosis of the reservoir and its species diversity, forming a special structural level of ecosystems.

The most common are helminth diseases caused by various parasitic worms (monogenes, flukes, tapeworms and roundworms). These parasites are found in fish both in natural reservoirs and when they are bred in ponds and spawning farms. Some helminths live in various organs and tissues of fish at the juvenile stage, improving their development in humans and carnivores, causing their very dangerous diseases.

Helminthiasis of carnivores, waterfowl and fish with two and three owners is widespread in the natural conditions of the Akmola region, on the territory of which there are the main foci of natural diseases (opisthocosis, metorchosis, diphyllobotriosis). Some of the helminthiasis we have considered are zoonoanthroposes and pose a great danger to humans.

In Kazakhstan, helminthiasis has its own epizootological characteristics, depending on specific natural and climatic and socio – economic conditions. Almost the entire territory is favorable for the mass spread of helminths, including those confined to natural foci. Data on the nature of the natural foci of a particular helminthiasis, in particular opisthorchiasis, its components are an important parameter for assessing, explaining the manifestation of the epizootic process, the epidemiological situation, and planning veterinary and sanitary measures.

In Akmola region, which is not affected by opisthorchiasis, studies have been conducted on the degree of infection with metacercaria of fish opisthorchiasis, which is a source of infection of animals and humans.

Pathogens of helminthiasis of various fish are mature helminths that parasitize the body of owners (wild and domestic animals, humans, fish – eating birds), contributing to the further spread of diseases that pollute the aquatic environment.

The purpose of the work is to monitor fish helminthiasis of water sources in Akmola region.

To achieve this goal, the following tasks were set:

- Description of the epidemiological situation of zoonotic helminthiasis in water sources of Akmola region.

- Research and its results in the detection of helminthiasis of fish.

- Study of helminthofauna of pond farms of Akmola region.

**Materials and methods.** The study was conducted on the basis of the procedure for conducting special works.

In the period from 2021 to 2022, this work was carried out in the Veterinary Laboratory of the Republican Veterinary Laboratory of the Ministry of Agriculture of the Republic of Kazakhstan in Nur-Sultan, as well as at the Department of Veterinary sanitation of the Veterinary Faculty of the Kazakh agrotechnical university named after S. Seifullin.

Fish samples were taken from certain reservoirs of Akmola region: lakes Zharlykol, Koyanda reservoir (tselinograd region); Lakes Balyktykol, Maly Sary - Oba and Zhaltyrkol (Arshaly district); Lakes Shortandy, Burabay, Shabakty, Maybalyk, Katarkol (Burabay District), Lake Zerenda (Zerendinsky district); Lakes Shalkar, Birtaban, Yesey, Sultankeldy (Korgalzhyn district), Zerendinsky fish plant LLP, Maybalyk fish the nursery.

The study of the quality and safety of fish was carried out by determining total quality indicators, studying helminthiasis infection. Total Quality indicators were carried out according to GOST 7631 - 2008 by methods of organoleptic and biochemical studies of fish. According to GOST 7631-85, fish sampling was carried out directly. Damage to fish by helminthiasis was determined by the method of a complete helminthological study on Scriabin, which includes the study of scales, fins, eyes, internal organs and muscles by visual and compressive methods.

Since 3 hosts are involved in the cycle of development of opisthorchiasis and the epizootic chain of this disease: determinant (predators and humans),

intermediate (aquatic mollusks) and Additional, the degree of infection of all three hosts was high. Monitoring of carnivorous infestations, which are the main sources of infestation, was carried out on the basis of analysis of statistical data of the Parasitology Department of the Republican Veterinary Laboratory in Astana for 2016-2018.[9]

Since the main source of infection of humans and carnivores is fish, we believe that the identification of fish damage by opisthorchiasis larvae makes a certain contribution to the clarification of the epizootological and epidemiological situation in the region. The study of infection of fish with opisthorchiasis larvae was carried out in the unfavorable region – Akmola region.

When conducting monitoring studies of fishery reservoirs and fish farms in Akmola region, it was found that the total number of reservoirs of local significance in the region is 583 (337 of them are permanent and 246 are reserve). Of the 337 approved reservoirs, 291 are in operation, which is 86.3%. The Nura river belongs to a reservoir of international and national significance. There are two fish plants in Akmola region (Zerenda fish plant LLP, Altyn invest Corporation LLP).

During the sensory examination of the fish, I began to examine the appearance: the skin, fins, mouth area, fins were examined very carefully.

For an accurate diagnosis of diplostomosis, we examined the fish's eyes: I looked at them by the compressor method (squeezing between two glasses of the compressor), removed the eye crystal from the eye sockets and placed it in the compressor. Then I examined the material under a microscope.[10]

The muscles were also examined by the compressor method: along the spine of the fish, the fins were removed from both sides, and then the skin was removed in both directions.

The first incision was made on the lateral line perpendicular to the longitudinal axis of the body from the front of the back wing, the second - from the end of the first incision along the lateral line to the tail wing. The edge of the skin was raised with tweezers, and the subcutaneous tissue was cut so that the muscles remained on the surface. After that, the surface layer of muscles with a thickness of 0.2 - 0.5 cm is cut off, cut into small pieces and placed over the entire surface of the lower part of the compressorium, covered with glass and compressed with screws. At low magnification under the microscope, all the parts obtained from one fish were examined.

After an external examination, the internal organs were examined: the liver, gallbladder, urinary and swim bladder were divided into parts and examined by the compressor method. I straightened the esophagus, stomach, intestines freed from fat, liver, opened the esophagus with scissors and conducted a study for the presence of large helminths.

#### **Results obtained.**

Results of organoleptic studies of fish. Organoleptic parameters of fish obtained from reservoirs of Akmola region were within normal limits. The scales are shiny, the eyes are domed, the mucus is clean, with a characteristic smell. The fins of the gills

are densely arranged, and from red to dark red. When determining the specific gravity, all samples sink. Internal organs are not damaged, clearly visible, the abdomen is not swollen. Individual fish specimens from Lake zharlykol (Tselinograd District), Lake Balyktykol (Arshaly district) were distinguished, where red spots were found on the body of fish, characteristic mainly of carp aeromonosis. In the fish selected at the Nur-Sultan market – fish with a high content of mucus, turbidity, with a weak consistency of elasticity, the freshness of which is questionable, was characteristic.

Physico - chemical indicators of fish in the lakes were normal – smears were poorly colored, microbial bodies were not detected in microscopy, with the exception of fish samples taken from markets, smears were well colored and 30 - 40 microbial bodies were found in microscopy, in all fish samples the PH was normal and ranged from 6.3 to 6.6, in fish taken from markets the PH was 6.9, The peroxidase reaction is positive in samples taken from reservoirs and weakly positive in seven samples taken from markets. In all samples, reactions to ammonia and hydrogen sulfide gave negative results.[11]

Thus, it was found that the quality indicators of fish from reservoirs of Akmola region correspond to the norm (6.6%), with the exception of fish from certain reservoirs of tselinograd and Arshaly regions, where clinical signs of aeromonosis are observed. In seven cases, the organoleptic and biochemical parameters of fish taken from the shelves of food markets in Nur-Sultan are questionable (9.1%).

When detecting fish damage by helminthiasis in reservoirs, a low degree of fish infestation in reservoirs of Akmola region was revealed.[12]

When determining the quality indicators of fish extracted from reservoirs of Akmola region, clinical signs characteristic of aeromonosis were found, which correspond to the norm (6.6%). Organoleptic and biochemical parameters of fish taken from the shelves of food markets in Nur-Sultan are questionable (9.1%), mainly due to non - compliance with sanitary and hygienic standards for the sale, transportation and storage of fish.

When examining perch on Lake zharlykol (Tselinograd region), *Dirlostomum cercariae* was found in the source. Helminthiasis is the most common disease of pond fish in Kazakhstan. Most natural reservoirs are mainly foci of helminth infestations. The main transmitters of diplostomosis pathogens are birds that feed on fish, introducing an invasive start to the reservoirs of Fisheries.

Fish from some water sources of the region were studied by compression method with the help of a trichinelloscope for infestation of opisthorchs with an invasive metacercarium.[13]

Studies of the presence of opisthorchiasis larvae in fish caught from reservoirs have shown a poor situation with opisthorchiasis.

In total, 879 different fish were tested for the presence of metacercariae of opisthorchiasis in the back muscles by compressor method, including 79 units or 8.99% of positive samples. Of all the fish species

studied, and with a significant range of up to 61.1%, Whitefish is affected.

The worst situation with opisthorchs turned out to be the Sholak reservoir in the Korgalzhyn district, where it turned out that all the studied fish were infested.

In particular, the IE of akkayran was 61.1%; in tortillas - 14.5%; in fish – 4.8%. It was found that only akkayran is infested in the yesey, Shalkar and Sholak reservoirs, the share of which ranges from 2.6% to 20.0%. When conducting a compressor study of fish in all other reservoirs, no larvae (metacercariae) of opisthorchs were found.

Helminthofauna of the main commercial fish species in the water sources of Akmola region

Questions about the ecological state of the environment and their impact on fish quality are becoming very relevant. There are such issues in the Republic of Kazakhstan and insufficient research is not carried out. On the basis of this, the most pressing problem is the contamination of fish with toxic substances of man-made and biogenic nature in fish reservoirs and fish farms of Akmola region. The purpose of our research work was to monitor the quality indicators of fish, their infection with helminthiasis in reservoirs of Fisheries importance in Akmola region.

A lot of work was devoted to the ichthyofauna of the lakes of the modern Korgalzhyn Reserve. The most famous of them in the article by N. P. Serov describes 9 species of fish that inhabit the Korgalzhyn lakes and catch fish in them.

There is no complete list of ichthyofauna of Akmola region. The 30 species listed in the collection cause serious doubts in some cases. The fish population of the studied Lakes is formed mainly at the expense of populations living in the reservoirs of the Nura Basin in this territory.

In the studied Lakes, the ichthyofauna is based on a somewhat modified Aboriginal complex. Other invasive forms (carp, sole) do not play an important role in the fish community. The main factor affecting the ichthyofauna is the abundance of bird species that feed on fish. Another important factor is the risk of freezing in both winter and summer. The studied lakes are shallow in hydromorphology. And if for the Sultankeldy and Kokay lakes such a danger is partially equated with the flow of the Nura river, then for Lake Yesey it is the most significant. It is necessary to strictly monitor the number of massive species (roe deer, perch) and predatory fish (Pike).

When determining the overall quality indicators, it was determined that fish from water sources meet the requirements.

But the fish sold in the markets were studied and did not meet the requirements.

As a result of sensory research, a Red Spot was found in a sample of carp in Lake Shnet. [14]

In case of doubt, we tried 2 methods to determine the freshness of the fish as soon as possible. These methods were developed at the Kazakh Agrotechnical university named after S. Seifullin and made it possible to conduct research quickly.

There was a good situation when the residual content of toxic elements in fish meat obtained from water sources in Akmola region did not exceed the requirements.

Carp and crucian carp were the most susceptible to contamination, and Pike was the purest fish.

Spread of pathogens of helminthiasis of commercial fish

Diplostomic diseases of pond fish are common in Kazakhstan. This is facilitated, first of all, by the creation of ponds and spawning farms in the immediate vicinity of natural reservoirs with permanent foci of diplostomosis. Most natural reservoirs are mainly hotbeds of diplostomic invasion.[15]

The main transmitters of diplostomosis pathogens are fish-feeding birds that bring an invasive initiative to fisheries ponds. In the presence of a high density of shellfish-pond snails, a high voltage of the epizootic state of farm ponds is generated by diplostomoses, which has a very negative impact on the productivity of fish stocks and commercial fish production. In fish of Kazakhstan, 14 species of flukes of the genus *Dirlostomum* have been registered, each of which causes an independent form of the disease in them. They are widely used in pond farms located in different regions of Kazakhstan. Fish are infected with the pathogens of diplostomosis from the second half of May to the end of October. In autumn, the damage to fish is somewhat weakened, but it continues in October, when the water temperature is 12 - 14°C. Consequently, the presence of favorable environmental conditions of the aquatic environment contributes to the intensive functioning of pond foci of fish diplostomosis in the conditions of Fisheries.

Diplostomosis is widespread everywhere, in various reservoirs. This disease affects carp, perch, perch, walleye, crucian carp, etc. An important role in the spread of the pathogen is played by birds that feed on fish, which are able to carry the pathogen over long distances, making daily and seasonal migrations. Fish infection and the manifestation of diplostomosis are most often observed in the spring and summer period.

The most sick fish in the reservoirs of Akmola region is the carp family. Of the industrial fish, to a lesser extent, carp and carp are susceptible to diseases. The dominant species of helminthofauna of the reservoir are flukes *Dirlostomum sathaceum* in the eye, *Rosthodirlostomum cuticola* in the skin and subcutaneous tissues, *Arorhallus muehlingi*.

It was found that fish pseudomphistomy is much more common and more common than opisthorchiasis (the absence of esophageal pseudomphistomy in excited metacercaria is differentiated according to morphological characteristics). The intensity of infection of fish with the opisthorchid family is low, because in spring and summer, when the water temperature in the reservoir increases, the life span of fluke eggs and cercariae is significantly reduced.

Harm to fisheries of the main helminthiasis of pond fish, preventive measures

Preventive measures:

- treatment of fish from helminth pathogens;

- conducting research in accordance with the requirements, etc.

- it is necessary to carry out conservation measures for water exchange between the lands of the reservoir. It is necessary to deepen shallow areas of water sources, reduce the accumulation of silt, improve the network of water sources, clean Springs and channels. It is mandatory to conduct a hydrochemical study and take conservation measures. Mandatory implementation of measures to reduce and prevent water pollution.

- it is necessary to prevent excessive growth of plants, in which there is a lot of reproduction of helminthiasis pathogens of birds and aquatic arthropods that feed on fish. In overgrown areas of water sources, it is necessary to regularly mow. Overgrowth of the reservoir also increases in intensity due to the release of larvae of highly herbivorous fish.

- it is necessary to reduce the population density of unfavorable reservoirs by biological methods, intermediate hosts of crustaceans. Grown in ponds and puddles in certain regions, water purification from invasive origin.

For the fight against carp, the number of catfish, pike, walleye and perch fish increases in the unfavorable area of the reservoir (fish barriers are installed to prevent them from swimming). After that, predatory fish should be caught, and the introduction of new fish into the reservoir is allowed no earlier than one year.

-when transporting fish from one reservoir to another, it is necessary to observe veterinary and sanitary rules. Transportation of fish is carried out mainly in autumn or winter, when their damage by parasites is sharply reduced.

- before each shipment of fish, it is necessary to carefully check the presence or absence of larvae of dangerous helminths. If an infected person is found, it is not allowed to transport fish to safe reservoirs.

In order to prevent the settlement and animals from opisthorchiasis, it is allowed to purchase fish products only from water flows of Fisheries and fish production that have a veterinary and sanitary passport.[16]

The veterinary and sanitary passport is an accounting document that reflects the epidemiological situation of the water flow and all fish species living in it, as well as hydrochemical and toxicological analyses of water.

The sale of fish to the locality is allowed after conducting laboratory and ichthyopotologic studies.

Prevention of diseases in unfavorable territories.

Preventive measures should be carried out mainly by veterinary services. In the study of fish by laboratory tests, water sources in unfavorable territories are determined.

In case of detection of pathogens of opisthorchiasis in laboratory tests, it is not allowed to sell fish and fish products.

Fish containing pathogens that are dangerous to the animal are divided into suitable or unsuitable for sale.

Suitable fish are sent for use in food, for sale with mandatory sterilization and use.

Compensates for unsuitable fish.

The easiest way to disinfect fish products is to treat it at high temperatures.

Hot and cold smoking, smoking, canning, which is carried out in accordance with the technological instructions, disinfect fish from opisthorchiasis larvae, with the exception of akkairan. Chilled akkairan fish is not used for the production of smoked and cold-smoked fish products, as such processing does not disinfect the larvae of opisthorchiasis.[17]

Fish products intended for animal feeding are decontaminated in accordance with the technological processes specified in paragraphs of this Veterinary regulation.

Waste obtained during the processing of conditionally suitable fish products, as well as fish products that have been declared unfit, is sent for the production of fish flour for animal husbandry. Fish flour is boiled for thirty minutes in the absence of industrial premises. Burial in BioThermal pits is allowed. It is strictly forbidden to dispose of fish processing waste in reservoirs and landfills without prior decontamination, as well as feed animals with them.

Measures are taken to prevent the accumulation of waterfowl and cut down aquatic vegetation in reservoirs that are not suitable for them, scare away birds and periodically deworming them. Domestic and wild animals should not be allowed to go fishing and slaughterhouses, they should not be given raw fish without prior sterilization (freezing, boiling). It is forbidden to discharge conditionally dead, abandoned and destroyed fish, their internal organs, raw waste from processing into reservoirs and landfills.

Special places should be allocated for waste in fishing areas. They must be regularly collected and recycled in accordance with the current regulations. The place, procedure and conditions for the disposal of fish with live helminths that are dangerous to human health are determined by the owner of fish products in agreement with the territorial institutions of the state sanitary and veterinary service.

### **Conclusion.**

Based on the obtained data, it should be noted that the epidemiological situation in the water sources of Akmola region is poor for zoonotic helminthiasis, such as opisthorchiasis, diplostomosis. The worst situation with opisthorchs turned out to be the Sholak reservoir in the Korgalzhyn district, where it turned out that all the studied fish were infested.

Most natural water sources are mainly foci of diplostomial infestations. When determining the damage of fish to water sources by helminthiasis and bacteriosis, a low degree of fish infestation in reservoirs of Akmola region was revealed.

When determining the overall quality indicators, scientists determined that fish in the reservoirs of Akmola region meet regulatory requirements. However, during the study of selected fish in the markets of Nur-Sultan, deviations from the norm were

observed in some cases. One of the reasons is violations of sanitary rules during transportation, storage and sale.

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