Control of fish parasites in aquaculture

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Abstract. This paper describes the results of parasitological monitoring of pond farms in the Krasnodar region. It was found that in the warm-water aquaculture of various systems, 25 species of fish parasites were invaded, and the fauna of parasites was determined. The obtained results are the basis for the analysis of the system of medical and preventive measures and actualize the development of new means and methods of treatment and prevention of diseases. It is established that the complex anthelmintic drug, according to the generally accepted classification of chemical compounds in accordance with the degree of danger, can be attributed to moderately hazardous compounds, and by cumulative properties - to the group of substances with weakly expressed cumulation. With repeated administration of the new drug to fish, there were no significant changes in the clinical status, some hematological and biochemical parameters, which is one of the necessary conditions for the possibility of using anthelmintic in clinical studies. As a result of a single therapeutic feeding with the use of a combined anthelmintic at a dose of 50 mg/kg, the 100% extensive and intensive efficiency of the deworming of carps invaded by Philometroides lusiana and Bothriocephalus acheilognathi was obtained.

1. Introduction

World fish production continues to outpace global population growth, with aquaculture remaining one of the fastest growing food-producing industries. Aquaculture can make a sustainable contribution to food security and economic growth worldwide with responsible development and practices. The pace of development of aquaculture - as before, ahead of other sectors of the fishing industry, although in comparison with 1980-years (11.3%) and 1990-years (10.0%) the growth has slowed. The average annual growth rate for the period 2000-2016 was 5.8%, while in a number of countries, particularly in Africa, it remained double-digit in 2006-2010. According to FAO [1] in 2016, the world aquaculture produced 80.0 million tons of food fish, 30.1 million tons of aquatic plants and 37 900 tons of non-food products. 54.1 million tons of fish, 17.1 million tons of shellfish, 7.9 million tons of crustaceans and 938 500 tons of other aquatic animals were grown.

Aquaculture production is expected to continue growing to meet future demand for human consumption (as example, fish, crustaceans and shellfish) [2].
Superiority in the World Aquaculture unconditionally belongs to China: it is not only ahead of other countries in 2016, but since 1991, it has been growing more fish than all the other countries of the world together. In 2016, the largest producers included Bangladesh, Vietnam, Egypt, India, Indonesia, and Norway. [1].

The volume of commercial fish production Russia is among the top ten countries in the world, but the production of aquaculture Russia is on the 78th place. At the same time, natural and climatic conditions allow us to develop different areas of aquaculture: warm-water, cold-water, freshwater and marine.

The diversity of water bodies in the Russian Federation, regional features determine the specifics of the development of domestic aquaculture in areas and objects of cultivation. The favorable geographical location of the Krasnodar region, a large water fund, environmentally friendly water biological resources provide strategic competitive advantages to the development of the aquaculture sector.

Aquaculture occupies an important place in the structure of the fisheries complex of Krasnodar region, ensuring the rational use of available aquatic biological resources to meet domestic demand for fish products.

Analysis of the current state of fisheries in the Krasnodar region allows us to determine that one of the main problems hampering its effective development is the increasing anthropogenic impact on all water bodies, and as a consequence – on the habitat and the state of aquatic biological resources and cultivated aquaculture objects, which contributes to the development of infectious and invasive diseases of pond fish.

There has been a deterioration in the situation of water-related infestations in aquaculture in the Krasnodar region, where parasites are one of the most serious factors limiting aquaculture. In the study of 13 species of fish of natural reservoirs and pond fish farms of the Krasnodar region identified 52 species of parasites belonging to different systematic groups: protozoa — 26 species (including mixosporidia 11 species), monogenetic flukes — 11, cestodes — 4, trematodes — 2 species; nematodes - 2 species and parasitic crustaceans — 7 species. Herbivorous fish was imported from China and the Far East 8 species of parasites in the pond economy of the Kuban.

Parasitic diseases of pond fish in the Kuban, the most dangerous are the ICH, dactylogyrus, microsporidiosis; from infectious aeromonosis, pseudomonosis. Nematodosis disease threat the carp – philometroides was appeared more recently in fish farms. Most sensitive in conditions of Krasnodar region to philometroides are two- and three-year carp. The greatest extent of infection (up to 80 %) at high intensity (up to 50 helminths) is observed in July — August at a water temperature of 23 °C.

According to many researchers, in many countries, including Russia, there is a deterioration in the situation with regard to water-related infestations, when parasites are one of the most serious factors limiting aquaculture [3,4,5,6].

Uncontrolled movement and introduction of fish into aquaculture facilities can cause the introduction of new parasitic pathogens into their ecosystem. The global spread of fish parasites on all continents leads to serious economic losses in aquaculture [7,8,9,10,11].

A large number of parasites infect fish, but only some of them cause disease in humans. Because of their high incidence, the following helminth families deserve special attention: Opisthorchiidae and Heterophyidae (Trematode class, Digenea subclass), Anisakidae and Gnathostomidae (PhylumNematoda) and Diphyllobothriidae (ClassCestoda) [12,13,14].

Treatment for fish parasites in aquaculture, involves the use of chemotherapeutic agents to control and prevent disease. Up to the present time received quite a large number of results of study in vitro and invivo anthelmintic effectiveness of drugs of different pharmaceutical groups. One of the most commonly used in veterinary medicine, active substances with activity against cestode is praziquantel [15,16]. Veterinarians can use drugs praziquantel, is approved for other types of vertebrates in accordance with the Law on clarification of the use of medicines for animals (AMDUCA). However, such use of additional labels should be based on scientific data, including studies of efficiency and residues in the resulting products [17,18]. Good results in terms of control of invasive diseases and
physiological response of fish were obtained with the use of mebendazole. Parasitological analysis within 7 and 14 days after the use of mebendazole at a dose of 1.0 g of the active substance per 1 kg of dry diet for 14 days, showed the effectiveness of 89.2% [19].

In vitro analyses showed that albendazole (500, 100, 1500 and 2000 mg/l), ivermectin (200, 250, 300 and 350 mg/l) and levamizole (50, 75, 100 and 125 mg/l) were 100% effective against Anacanthorus spatulatus, Notozothecium janauachensis, Mymarothecium boegeri and Linguadactyloides brinkmanni, while mebendazole (125, 150, 175, and 200 mg/l) and praziquantel (5, 10, 15, and 20 mg/l) were ineffective. Mortality of fish in 24 hours therapeutic baths with 500 mg/l of albendazole was 6.6%, but the behavior remained unchanged, while 200 mg/l of ivermectin caused lethargy, signs of hypoxia and 100% mortality within 2 hours, and 125 mg/l of levamizole did not cause mortality. The efficacy of 500 mg/l albendazole was 48.6% in 24-hours baths, while the efficacy of 125 mg/l levamizole was 88.2%. Although ivermectin was shown to be effective in vitro, the lowest concentration used in baths was very toxic for the fish [20].

In a comparative study, the efficacy of praziquantel and a combined anthelmintic agent having in its composition praziquantel, ivermectin, pyrantel pamoate and fenbendazole in relation to parasites of the family Diclidophoridae and Capsalidae was established. A dose of 2.5 mg/l praziquantel was found to be 100% effective against adult T. ecuadori after 20 hours, and 3 mg/l was detrimental for 87% N. melleni after 12 hours. The combined anthelmintic had a concentration-dependent effect. The concentration required for the destruction of all parasites in the minimum time was 20 mg/l of the drug (12 hours for T. ecuadori and 16 hours for N. melleni) [21]. The results of the studies show that combined anthelmintics can kill all parasites in less time; however, alternative new combinations of active substances should be investigated to find a combination that is effective at low concentrations providing high therapeutic efficacy.

Oral administration of chinachin leads to a decrease in the average prevalence of infection of M. sebastis in all groups receiving chinacrin, and fish groups, which were introduced chinacan in doses of 50, 100 and 200 mg/kg for 3 consecutive days, it was observed a parasite. The average number was 50-30% lower than in the control group, which suggests that chinacren has therapeutic potential against M. sebastis. Although oxyclozanide showed very high In vitro anthelmintic activity, in oral administration experiments only groups of fish administered 200 mg/kg showed an average M. sebastis content of less than 50% compared to the control groups, suggesting that the effectiveness of oral absorption of administered oxyclozanide may be weak and/or that M. sebastis may be less sensitive to orally taken oxyclozanide [22].

It should be borne in mind when carrying out chemotherapy, that veterinary drugs used for the treatment and prevention of animal diseases are an important source of environmental pollution as a result of intensive agricultural and aquaculture production. Drugs can enter the environment through treatment processes, improper disposal of used containers, unused drugs or animal feed, and manufacturing processes. A wide range of veterinary drugs, such as antibiotics, anti-parasitic and antifungal drugs, hormones, anti-inflammatory drugs, anaesthetics, sedatives, etc. enter the environment and can affect non-target organisms, including plants, zooplankton, colonies of living microorganisms. It has been shown a significant effect of many antibiotics and hormones on the development and physiological processes of plants. However, the potential phytotoxicity of other veterinary drugs has rarely been studied, although knowledge of the phytotoxicity of veterinary drugs can help predict their impact on biodiversity and improve phytoremediation strategies. In addition, additional topics, such as the long-term effects of low doses of drugs and their metabolites, the behavior of a mixture of veterinary drugs and other chemicals in ecosystems, should be more thoroughly investigated to obtain comprehensive information on the impact of veterinary drugs on the environment [23]. Therefore, there is a need to have available analytical procedures to regulate the safe use of chemicals and veterinary drugs in aquaculture [24].

In this regard, researchers continue a search for anti-parasitic agents of natural origin. Reported about anthelmintic efficiency arctigenin invitro and invivo against Gyrodactylus kobayashii for the models Carassius auratus. In invitro tests, the effects of arctigenin caused a rapid decrease in mobility.
and the ultimate death of helminths. A positive correlation was found between the concentrations of arctigenin and the time to death of the parasite, which at the highest concentration of 8 mg/l occurred after 33 minutes. Exposure of the infected G. kobayashii fish in arctigenin significantly reduced the prevalence and intensity of infection compared to control, with ES values of 50 1.85 and 1.58 mg/l after 24 and 48-hours exposure, respectively, with 100% efficacy against G. kobayashii at 4.0 mg/l in just 4 hours. An analysis of acute toxicity showed that the LC50 arctigenin models of fish after 96-hour exposure was of 11.63 mg/l, which was 6.29 times higher than the 24-hours ES 50. Together, these results demonstrate the potential of arctigenin as an alternative natural compound to fight Gyrodactylus infections. With further optimization of drug chemistry, more powerful analogues of arctigenin promise further combinatorial or substituting anthelmintic control [25].

M. Tavares-Dias (2018) used methodological approaches to describe the anthelmintic properties of essential oils are demonstrated. The sequence of their activity and therefore their potential use for fight with fish ectoparasites (invitro and invivo) and endoparasites (invitro) was considered. There is a clear need to search for essential oils and their active ingredients to treat invivo against fish endoparasites. Therefore, essential oils are viable alternative sources of therapeutic products against fish parasites. On the other hand, the use of chemotherapeutic agents is increasingly being questioned, so there are ongoing concerns about the environment and consumers [26]. Due to environmental problems, the risk of residues, toxicity to fish and the possibility of resistance to anthelmintics, the search for an alternative drug is becoming increasingly important. A study to assess the invivo anthelmintic efficiency of total saponin (TS), saikosaponin a (SSa) and saikosaponin d (SSd) from Radixbupleuri (that is, the dried root Bupleurumsp.) The results showed that the average values of effective concentration (ES50) for TS, SSa, and SSd were 2.01, 1.46 and 0.74 mg/l, respectively. Acute toxicity has also been determined for Carassiusauratus goldfish for TS, SSa and SSd with an average lethal concentration (LC50) of 8.99, 11.20 and 1.54 mg / l, respectively. The obtained therapeutic indices (TIs) indicate that SSa (TI = 7.67) is a potential therapeutic agent for the treatment of Dactylogyrusspp infection. [27].

Given the wide spread, intensity of fish contamination and economic damage, continuous parasitological monitoring of aquatic biological resources is the basis for the development and correction of programs to control diseases of aquaculture facilities, harmonized with documents of the International organization for animal health (OIE), the Code of health of aquatic animals and Guidelines for the diagnosis of diseases of aquatic animals.

2. Purpose and task
The purpose of this work was to study the invasiveness in the population of pond fish of the Krasnodar region, to identify the most common nosological forms and to determine the effectiveness of a new combined drug for carp helminthiasis. To achieve this goal, we have completed the following tasks:
– To hold ihtiopatologice study of six species of pond fishes - silver carp mottled, white silver carp, crucian, European carp, grass carp, carp.
– To determine the species composition of parasites and to find out the infection of pond fish.
– Determination of the effective therapeutic dose of a new combined drug for carp helminthiasis.

3. Materials and methods of the research
Work was carried out at the Department of Parasitology, of veterinary sanitary expertise and zoo hygiene of Kubanskiy State agrarian University and the "Krasnodarskaya interregional veterinary laboratory".

The main object of research was pond fish of fish farms of Krasnodar region of 6 species (silver carp mottled, white silver carp, crucian, European carp, grass carp, carp). Fish autopsy was performed by the method of complete ichthyopathological autopsy [12]. Collection and treatment of parasites was carried out by conventional methods. The species composition of parasites was determined before the species with the help of “Determinant of parasites of freshwater fish parasites” edited by Bauer (1987) at the Department of Parasitology of Kubanskiy State agrarian University.
4. Results and discussion

Held in conditions of Krasnodar region of a systematic study of 6 types of pond fish showed that the fish in piscicultural farms of different ownership forms are invaded by 25 types of parasites: silver white carp - 11 types: Myxoboluspavlowskii,Achmerov, 1954; M. dijagina,Achmerov, 1954; M. haemophilus, Garcaawi, Zverzhanskyi, Lysenko 1989; Ichthyophthirius multifiliis,Fouquet, 1876; Trichodinaacuta, Lorn, 1966; T. Nigra,Lorn, 1960; Diplostomumspataceum, Rudolfi, 1819; Sinergasiluslieni, Yin, 1949; Lemaeaelegansmorphactenopharingodontis, Yin, 1960;Ligulaintestinalis, Linnaeus, 1758;Poslhocliplostomumcuticola,Xorilmann, 1832; silver mottled carp - 12 types: М. pavlowskii, Achmerov, 1954; M. drjagini, Achmerov, 1954; M. Haemophilus, Garcaawi, Zverzhanskyi, Lysenko 1989; М. multifiliis,Fouquet, 1876; T. acuta,Lorn, 1966; T. nigra,Lorn, 1960; Dactylogyusvastator,Nybelin, 1924; Dac. nobilus, LongetYu, 1958; D. spataceum, Rudolfi, 1819; Poslhocliplostomumcuticola,Xorilmann, 1832, Ligulaintestinalis, Linnaeus, 1758, Sinergasiluslieni, Yin, 1949; L. elegansmorphactenopharingodontis, Yin, 1960; crucian – 7 types: I. multifiliis,Fouquet, 1876; L. cypinacea, Linnaeus, 1758; Argulusfoliaceus, Linnaeus, 1758; S. lienii,Yin, 1949; D. spataceum, Rudolfi, 1819; D. Spataceum, Rudolfi, 1819, Ph. sanguinea, Rudolfi, 1819; European carp - 5 types: Dac. extensus, MuelleretVanCleave, 1932; A. foliaceus, Linnaeus, 1758; D. spataceum, Rudolfi, 1819; Khawiasinensis,Hsu, 1935,Poslhocliplostomumcuticola, Xorilmann, 1832, grass carp - 7 types: Dactylopharyngodonidion,Achmerov, 1952; Kh. Sinensis, Hsu, 1935; Bothriocephalosparsichthydis,Yamaguti, 1934; D. Spataceum, Rudolfi, 1819; L. elegansmorphactenopharingodontis,Yin, 1960; A. foliaceus,Linnaeus, 1758; S. major, Marczewski, 1940, carp – 14 types: Dac. vastator, Nybelin, 1924; Dac. extensus, MuelleretVanCleave, 1932; Kh. Sinensis,Hsu, 1935; D. spataceum, Poidolphi, 1819; Poslhocliplostomumcuticola, Xorilmann, 1832, L. elegansmorphactenopharingodontis, Yin, 1960; A. foliaceus, Linnaeus, 1758; M. dogiei,J. etB. Bychowski, 1940; I. multifiliis,Fouquet, 1876; T. nigra, Lom, 1960; T. acuta, Lom, 1966; Ergasilussieboldin, Nordmann, 1832; Botriocephalosparsichthydis, Yamaguti, 1934; Philometroideslusiana, Vismanis, 1966.

Infection of fish in case of Myxoboluspavlowskii ranged from 2.62-of 6.28% in carp, silver carp white and mottled; ichthyophthiriasis – 7.82-16.54% in silver carp, crucian, grass carp; trichodina – 3.92-21.42% in carp and silver carp; dactylogyrus – 5.25 to 18.6% in silver carp, European carp, grass carp and carp; cavios – 3.15-24.6% in grass carp, carp and European carp; bothriocephalus – of 1.52-2.68% in the carp and grass carp; diplostomosis 11.14-5-67.22% in all species of studied fishes; post-diplostomosis is 8.9-12.3% of the white and mottled silver carp; argules – 3.25-12.4% in crucian, European carp, grass carp and carp; lernes 1.25-8.46% in silver carp, crucian, grass carp and carp; philometroides – 7.25- 46.72% in crucian and carp; ergasilussieboldin - 6.5-8.6% in silver carp and carp.

Given the high invasiveness of fish in aquaculture, we carried out pharmacological and therapeutic evaluation of the combined invivo anthelmintic in the form of encapsulated praziquantel and albendazole.

In the study of acute toxicity determined tolerated, toxic and lethal doses of a new dosage form of anthelmintic, the causes of death of fish.

The drug was administered peros using a probe into the esophagus of carp. Within 14 days after the introduction of drugs, the state of the fish was monitored. Surviving animals at the end of the experiment were killed and subjected to pathoanatomical studies.

To conduct the experiment, an experimental group was formed, fish in which received the tested drug and a control group of carp. In each group of 10 fish weigh 52.4±5.16 g. The drug was administered to animals daily, individually, in the esophagus in the form of an aqueous emulsion. For 30 days, all the fish were observed. During the first four days of the experimental group the carp received the drug at a dose of 0.1 LD50 (lethal dose). Every four days, on the fifth day the dose was increased by 1.5 times.
It was found that the pattern of poisoning in fish was characterized by chaotic swimming movements, progressive imbalance and death within 15 minutes - 1 hour. In carp survivors, motor activity was restored within 24 hours, and regression of clinical signs of poisoning occurred within 36 hours.

At pathoanatomical autopsy of the fallen fish in the abdominal cavity, transparent transudate, peritoneum and serous covers of the edematous organs were found. Liver and kidneys are blood-filled, dark red, flabby consistency, spleen is not enlarged. The intestine is hyperemic, has swellings.

In determining the acute toxicity of the fish in the experimental group, the drug was administered in doses of 2420, 2630, 2990, 3320 and 3650 mg/kg of ichtyomass. The average lethal dose of LD50 of the studied preparation for fish was 2990 mg/kg.

The total dose of LD50 – multiple, which caused 50% of fish death was 17.7 g/kg. The cumulation coefficient of the studied drug was 7.14.

Thus, a complex anthelmintic drug, according to the generally accepted classification of chemical compounds according to the degree of danger, can be attributed to moderately hazardous compounds, and by cumulative properties - to a group of substances with a weakly expressed cumulation.

In addition, the effect of the drug on hematological and biochemical parameters of carp blood (Cyprinus carpio) was studied. The experiment involved three groups of studied fish with an average weight of 119.2±0.21 g: two experimental and one control (n=20). Fish in the control group received starch suspension without drug. Carps of the second and third groups were administered the developed drug at doses of 50 and 500 mg/kg of ichtyomass by active substance (AS) for 10 days. The drug was administered by peros using a probe into the esophagus. Blood from fish was taken from the caudal artery with a syringe before the drug and on the 30th day of observation. Registration of indicators was carried out with the help of hematological analyzer automatic PSE 90 VET. Determination of biochemical parameters in blood serum was carried out on an automatic biochemical analyzer ChemWell® 2902V (Chemistry) using commercial kits of company Randox (UK).

Fish after the drug administration were under observation for another 30 days, during which no significant signs of changes in the clinical condition and behavior of the experimental signs of toxicosis or other deviations from the norm were noted. During the whole period of observation, no cases of fish death were recorded. Carps actively ate, and their behavior corresponded to specific features. Under autopsy of the fish, there was no inflammation of the intestinal mucosa, as well as visible changes in internal organs and tissues.

Hematological parameters of the blood of experimental fish with repeated use of the studied anthelmintic at a dose of 50 mg/kg of ichtyomass on the 30th day of the study did not differ significantly from those of the control group. With repeated use of the drug at a dose of 500 mg/kg of ichtyomass, remaining within the physiological norm, there was a decrease in hemoglobin levels till 77.6±3.5 g/l (p<0.05) and the number of erythrocytes till 1,63±0.3 million/µl (р˃0.05) in the blood of experimental carp compared with the control in which the corresponding indicators were 85.8±4.1 g/l and 1.76±0.2 million/µl. The decrease in the number of leukocytes in the blood of the test group craps by 7.8 – 8.3 % was unreliable (p > 0.05).

According to the results of biochemical analysis it was noted that the concentrations of cholesterol, glucose and urea, after repeated administration of the drug, did not differ significantly (p>0.05) from the control group. There was a slight decrease in the total protein content by 2.65 % (p>0.05) in the blood serum of carp of the third group in relation to the data of the control group.

Some changes in the activity of liver enzymes of carps of the third group were noted. The activity of aspartate aminotransferase and alanine aminotransferase in fish of the third group after the 30th day of the study was higher in relation to the control, respectively, by 2.1% and 6.4%, remaining within the refractive values.

As a result of the study, with repeated administration of a new drug to fish, no significant changes in the clinical status, some hematological and biochemical parameters, which is one of the necessary conditions for the possibility of using anthelmintic in clinical trials.
Further, a number of experiments were conducted to determine the anthelmintic efficacy of the developed drug.

In the first study to determine the contamination of fish before treatment by random sampling, 50 carps were selected and their helminthological examination was carried out. Females of Philometroides lusiana were found under fish scales. The infection of carp fingerlings amounted to 32% with intensity of infestation of 4.25 of the parasites in one fish. The water temperature during the experiment was in the range of 22-23°C.

Deworming was preparing a medical-feed mixture. To do this, 1 kg of granulated preparation was thoroughly mixed with 99 kg of feed. Deworming was carried out on the basis of the calculation of compliance of the daily dose of therapeutic feed to the rate of feeding fish with combined feed. The drug as part of the feed mixture was fed to fish without a pre-hungry diet, according to the technology of feeding used in the economy. Therapeutic feeding was carried out twice at a dose of 40 mg of AS/kg of ichtyomass. In the next day, the fish was fed with a compound feed that does not contain the drug according to the technology adopted in the economy.

Six days after the therapeutic feeding of fish, a helminthological study of 25 specimens of carp was conducted in order to establish the effectiveness of deworming. No invasive fish were recorded after treatment. For the duration of the test fish kills and abnormalities in their behavior was not observed. At the autopsy of the fish changes in the internal organs and tissues was not found.

Thus, as a result of two-time therapeutic feeding with the use of combined anthelmintic at a dose of 40 mg/kg of AS, the 100% of extensive and intensive efficiency of the deworming of carp phylometroidism was obtained.

The second study determined the therapeutic efficacy of the new combined anthelmintica of the drug when bothriocephalus in carps.

Before therapeutic feeding, a selective autopsy of fish was performed to determine the extent and intensity of invasion.

To determine the contamination of fish before treatment by random sampling, 50 fingerlings of carp were selected and their helminthological autopsy was performed. In a study in the lumen of the intestine found cestode species Bothriocephalus acheilognathi. The infection of fingerlings of carp was 34%, with the intensity of invasion of 3.28 parasites on one fish. The water temperature during the experiment was within 24-25°C.

For deworming, a therapeutic feed mixture was prepared similar to the previous study. The dose was divided into 4 equal portions, which during the day, with a two-hour interval, made in certain places of feeding. In the next day, the fish was fed with a compound feed that does not contain the drug according to the technology adopted in the economy.

Seven days after therapeutic feeding of fish, held helminthological autopsy of 25 specimens of carp with the aim of establishing the effectiveness of deworming. No invasive fish were recorded after treatment.

For the duration of the test fish kills and abnormalities in their behavior was not observed. At the autopsy of the fish changes in the internal organs and tissues was not found.

Thus, as a result of a single therapeutic feeding with the use of combined anthelmintic at a dose of 50 mg/kg of AS, the 100% of extensive and intensive efficiency of the deworming of carp was obtained.

5. Conclusion
The results of parasitological monitoring of pond farms in the Krasnodar region are consistent with the results of parasitological studies of other authors and complement them on the fauna of parasites of certain species of fish and extens-invasion.

Thus, the result of the conducted researches of fauna of parasites and extens-invasion of six species of fish in pond farms of the Kuban, which is the study of the analysis of the system of preventive measures, the development of new means and methods of treatment and prevention of diseases. It is established that the complex anthelmintic preparation, according to the generally accepted
classification of chemical compounds according to the degree of danger, can be attributed to moderately hazardous compounds, and cumulative properties - to the group of substances with weakly expressed cumulation. With repeated administration of the new drug to fish, no significant changes in the clinical status, some hematological and biochemical parameters, which is one of the necessary conditions for the possibility of using anthelmintics in clinical studies. Single therapeutic feeding with the use of combination anthelmintics at the dose of 50 mg/kg by AS, the 100% of extensive and intensive efficiency of the deworming of carps invaded by Philometroides lusiana and Bothriocephalus acheilognathi was obtained.

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