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THE ROLE OF WEED FISHES AS VECTORS OF PARASITIC DISEASES IN FISH FARMS IN THE TERRITORY OF AZERBAIJAN REPUBLIC

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Abstract. The role of weed fish species as vectors of diseases of the marketable fish farmed is studied in fisheries in various regions of the republic in the period of 2013-2021. Parasitic infections of weed fish in cyprinid fish farming ponds are revealed. More than 20 species of parasites have been recorded in these two studied fish species. Most of the parasites have a broad specificity and have been found in other fish species. The emergence and re-emergence of fish diseases is often associated with the invasion of disseminators of parasitic diseases in aquaculture. Usually, weed fish play role as propagators of these diseases. Pathogenic infusorians species (*Ichthyophthirius multifiliis*, *Chilodonella piscicola*), helminthes (*Gyrodactylus elegans*, *Botriocephalus acheilognathi*), and parasitic crustacean (*Lernaea cyprinacea*) are considered a major cause of high level of morbidity and mortality of the farmed fish in Azerbaijan.

Keywords: *Infectious agent, invasion, fish farms, parasites, weed fishes.*

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1. Introduction

It is known that fish in all natural fresh and brackish water basins are infected with parasites from different systematic groups. Parasites in these basins would not cause severe disease outbreaks due to scarce occurrence. Usually, infected fish remain only carriers of the alien organism. However, when the necessary conditions arise, these parasites cause diseases and create a severe epizootic, causing mass death of fish in natural reservoirs. We can cite a classic example, the acclimatization of the starry sturgeon (*Acipenser stellatus*) in the Aral Sea in the 1930s. This rash step led to unfortunate results. The spread of the *Nitzschia sturionis*, sturgeon-specific monogenean species entailed serious consequences for the local fish species. In the Aral Sea the single representative of Acipenseridae, the bastard sturgeon (*Acipenser nudiventris*) was recorded. During the period of acclimatization, the transmission of *N. sturionis* to a new host caused acute epizooty in the local population of bastard sturgeon and dramatically reduced the stocks of this valuable fish. Obviously, the high or low specificity of the parasite is one of the main factors in its spread and possible harmful effect that it can cause in a new habitat (Strauss *et al*., 2012).

Unlike natural basins, man-made reservoirs play an important role as a source of the spread of pathogenic agents of various diseases in wild and farmed fish in the fisheries. In this regard, some wild fish species have great importance as the main source of the invasion caused by parasites with a low host specificity (Iyaji *et al*., 2009). The weed and trash fish species are small sized, naturally occurring or introduced

accidentally in ponds along with spawn. They compete with marketable fish for food and resources and have high fecundity and breed well before breeding commercially important fish species.

2. Material and Methods

During 2013-2021 parasitological material from Shirvan Okean-S LLC and Masally fish farms were collected. In total, 118 fish belonged to two varieties of Eurasian carp and three species of wild fish were examined (Table 1).

Table 1. Examined fishes and recorded parasites

Fish species	Number of fish specimens
Sazan (*Cyprinus carpio*)*	38
Eurasian carp (*Cyprinus carpio*)	40
Bleak (*Alburnus charusini*)	19
Western Mosquitofish (*Gambusia affinis*)	8
Schneider	11
Total:	116

Notes: This variety of Eurasian carp is native to Sea of Azov, Black Sea, Caspian Sea, Aral Sea, Balkhash Lake, and Amour River.

The collected material was caught with gillnets and transported to the laboratory of the Azerbaijan Scientific Research Institute of Veterinary. Specimens of fishes were studied by complete parasitological method (Bykhovskaya-Pavlovskaya, 1969). The body cavity, internal organs, gills, eye lens, vitreous humor, skin, and fins of collected specimens were examined. Specimens parasites were placed in Canadian balsam (CDH®) and examined using a stereomicroscope Phenix and biological microscope BEL SOLARIS.

During the process of dissection one little drop of fresh blood from the heart and other blood-producing organs was taken by plastic Paster pipette. Thin blood smears fixed in Absolute methyl alcohol (HoneyWell/Riedel-de Heen™) and stained in phosphate buffered Romanovsky-Giemsa solution, pH=7.2. Monogeneans were isolated from the gills using the dissecting needle (Gusev, 1983). Cestodes were collected from the cutting intestines. The larvae and adult worms in muscles were isolated by cutting intestines (Shigin, 1996). The larvae and adult worms in muscles were kept in 70% ethyl alcohol and then stained with alum carmine (Lillie, Fullmer, 1976). Nematodes were enlightened for up to three days in lactic acid and stored in Barbagallo liquid (Bauer, 1981).

The similarities in the species of composition of parasites in carp (*Cyprinus carpio*) and crucian carp (*Carassius carassius*) in the territory of Shirvan and Masally fish farms were estimated using the Chekanovsky-Sørensen index of similarity (Breev, 1972; Sørensen, 1948):

$$I_{cs} = \frac{2C}{A+B} \times 100.$$

3. Results and Discussion

A parasitological examination of wild-caught species of fishes, Caucasian bleak, schneider, and Western mosquitofish living in the lakes of the fish farms was carried out.

Western mosquitofish is one of the fish species native to North America, acclimatized in the 30s of the XX-th century. It was introduced in the freshwater basins of the South Caucasus for biological control of the mosquito larvae (Mumladze *et al*., 2022). At present, this species is widespread in the above-mentioned territory. During the process of acclimatization, the Western mosquitofish lost all the native parasites species. At the same time, this fish can be infected in new habitat with widespread local species of parasites rarely. It should be noted that in Azerbaijan the parasites of Western mosquitofish have not been studied in detail. This species does not matter as a host and vector/carrier of parasites and cannot serve as a source of invasion for farmed fish. During this investigation, 2 specimens of *Diplostomum chromatophorum* were found in the eyes of one of the 8 examined Western mosquitofish. In 11 carp fish, 10 species of parasites were found. In fish breed with bleaks. Also 6 species of parasites were recorded in this fish (Table 2).

The North Caucasian bleak is the common wild species in fish farms of Azerbaijan (Suleymanova, 2023). This fish has a relatively rich parasite fauna. Thus, 17 species of parasites were noted in the 19 studied bleaks, 10 parasite species have been found in other fish species (including farmed fish) (Table 2).

The role of wild fish in the spread of various invasions and infectious diseases in fish farms is widely covered in the literature (Mammadov et al., 1993; Yaremenko *et al*., 1997; Suleymanova, 2008; Suleymanova, 2008; Suleymanova, 2007). In the lakes of the fish farms, other species of fish are probably found in addition to bleak and schneider, and in the future it is very important to study this issue separately.

Table 2. The parasite species of fish in Shirvan and Masally fish pond farms

Fish species	Parasites species
Bleak (*Alburnus charusini*)	*Zschokkella nova, Myxobolus bramae, Ichthyophthirius multifiliis, Chilodonella piscicola, Trichodinella epizootica, Dactylogyrus fraternus, D. parvus, Gyrodactylus gracilihamatus, G. elegans, Bothriocephalus acheilognathi, Ligula intestinalis, Allocreadium isoporum, Diplostomum paraspathaceum, Posthodiplostomum cuticola, Hysteromorphat riloba, Rhabdochona denudata, Pomphorinchus laevis*
Schneider (*Alburnoides bipunctatus*)	*Cryptobia branchialis, Myxobolus bramae, Chilodonella piscicola, Dactylogyrus sphyrna, Dactylogyrus caucasicus, Gyrodactylus elegans, Diplozoon sp., Ligula intestinalis, Rhabdochona gnedini, Lamproglena pulchella*
Sazan (*Cyprinus carpio*)	*Cryptobia branchialis, Zschokkella nova, Myxobolus bramae, Ichthyophthirius multifiliis, Chilodonella piscicola, Trichodinella epizootica, Gyrodactylus elegans, Bothriocephalus acheilognathi, Posthodiplostomum cuticola*
Eurasian carp (*Cyprinus carpio*)	*Cryptobia branchialis, Myxobolus bramae, Ichthyophthirius multifiliis, Chilodonella piscicola, Trichodinella epizootica, Gyrodactylus elegans, Bothriocephalus acheilognathi, Diplostomum paraspathaceum*

During the period of investigation more than 20 species of parasites have been found. Most parasitic species have a broad host specificity. Due to their pathogenicity, they can

cause great damage to fisheries. Unicellular and multicellular species (*Ichthyophthirius multifiliis*, *Chilodonella piscicola*, *Gyrodactylus elegans*, *Botriocephalus acheilognathi*, *Lernaea cyprinacea*) are the causative agents of dangerous invasions, such as ichthyophthiriasis, chilodonellosis, gyrodactylosis, bothricephalosis, lernaeosis. A comparative analysis of parasitic pathogenic agents is given in Table 3.

Table 3. Some peculiarities of invasion of cyprinidae by parasites in fish farms

Parasites	Fish Farm					
	Shirvan			Masally		
	Sazan	Carp	Crucian	Sazan	Carp	Crucian
PROTOZOA						
Trypanosoma carassii	-	-	-	+	-	-
Crybtobia branchialis	+	+	-	-	-	-
C. cyprini	-	-	-	+	-	-
Zschokkella nova	+	+	+	-	-	-
Myxobolus bramae	+	+	-	-	-	-
M. cyprini	+	+	+	-	-	+
M. muelleri	-	+	-	-	-	-
Chilodonella piscicola	+	+	-	+	+	+
Ichthyophthirius multifiliis	+	+	-	-	+	-
Trichodinella epizootika	+	+	-	-	-	-
METAZOA **Platyhelminthes** **Monogenea**						
Dactylogyrus anchoratus	+	+	+	+	+	+
Dact. extensus	+	+	-	+	-	-
Dact. vastator	+	+	-	+	+	-
Gyrodactylus elegans	+	+	-	-	-	-
G. medius	-	+	-	+	+	+
Cestoda						
Caryophillaeus latiseps	+	+	-	-	-	-
C. fimbriceps	+	-	-	-	-	-
Bothriosephalus acheilognathi	+	+	-	-	+	-
Ligula intestinalis	-	-	-	-	-	+
Ligula columbi	-	-	-	-	-	+
Digramma interrupta	-	-	+	-	-	+
Paradilepis scolecina	-	+	+	-	-	-
Proteocephalus torulosus	-	-	-	+	-	-
Trematoda						
Sanguinicola inermis	-	-	-	-	-	+
Asymphylodora kubanica	+	-	-	-	-	-
A. demeli	+	+	-	-	-	-
Allocreadium isoporum	-	-	+	-	-	-
Diplostomum chromatophorum	+	+	-	-	-	-
D. paraspathaceum	-	+	+	-	-	-
D. spathaceum	-	-	-	-	+	-
Posthodiplostomum cuticola	+	-	-	-	-	-
Hysteromorpha triloba	-	-	+	-	-	+
Echinostomatidae gen. sp.	+	+	+	-	-	-
Nematoda						
Contracaecum microcephalum	+	+	-	-	-	-
Porrocoaecum reticulatum	+	+	+	-	-	-
Capillaria tomentosa	+	-	-	-	-	-
Eustrongylides excisus	+	-	+	+	-	-
Crustacea						
Ergasilus sieboldi	-	+	-	-	-	-
Lernaea cyprinacea	+	+	-	-	-	-
Piscicola geometra	-	-	-	-	+	-
Argulus foliaceus	+	+	-	-	+	+

As shown in the above-mentioned table, a comparative study of the invasion of these fish by parasites shows that some of these parasites (especially, host-specific species) are introduced into the lakes of fish farms by one-year-old fish. Invasion of new hosts is most likely carried out through wild fish inhabiting ponds. The index of similarity for parasites of sazan is equal to 40, for carp and crucian carp this index is equal to 20 and 60, respectively.

In the Shirvan and Masally fish farms, the greatest similarity of parasites of these fish was found in crucian carp (60%), the least index of similarity in carp was equal to 20%, and in general, index of similarity of the parasites of these three subspecies of fish was on average (41%).

4. Conclusion

In summary, 20 parasitic species have been registered in wild fish. So, the six recorded species belonged to the protozoa. Seven species belonged to the monogenean and three each to cestodes, trematodes, and roundworms. One species belonged to acanthocephalans and one species was defined as parasitic crustaceans. The recorded species of parasites (*Ichthyophthirius multifiliis*, *Chilodonella piscicola*, *Gyrodactylus elegans*, *Botriocephalus acheilognathi*, *Lernaea cyprinacea*) differ in their pathogenicity and may pose a danger to marketable fish species.

At the same time, it is necessary to note the important role of weed fish in the spread and transmission of the above-mentioned parasites in the pond fish farms of Azerbaijan. In order to control the invasion of commercially important fish species and suppress the active competition of weed and trash fish species with marketable fish for resources and food single-minded activities to prevent the entry of invasive and weed fish species into ponds in fish farms is required.

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