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Mini Review

Larval Stages of Bivalve Mollusks Bivalvia (Barley, Pearl Oysters and Toothless) as Sources of Fish Glochidia in Pond Water Bodies

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Abstract

The paper presents indices of occurrence and abundance of pond fish glochidia caused by larvae of bivalve molluscs Bivalvia (barley, pearl oyster and toothless) in 5 pond reservoirs of the Kabardino-Balkarian Republic. Infection of the skin and gills in different fish species by larvae in pond water bodies of the Kabardino-Balkarian Republic ranges from 0-51%. In summer and autumn, the highest occurrence indices are recorded in the pond basin. invasion (IVI) and abundance of invasion (AI) of larvae of bivalve molluscs Bivalvia. For under yearlings and 2–5-year-olds of grass carp, the invasion of glochidia poses a minimal danger, in which the index of abundance of larvae of bivalve mollusks Bivalvia (BI) is at the level of 2.14 ± 0.10 ind./cm2 of skin and gills, and in black carp glochidia is practically not recorded, as they eat bivalve mollusks in all stages of their development. Indexes of occurrence of invasion (IVI) and abundance (II) of larvae of Bivalvia molluscs in silver carp, respectively, 40.0% and 5.44±0.23 ind./cm2 of skin and gills appear; in the motley - 47.0% and 5.99±0.31 ind./cm^2; in the hybrid - 44.0% and 5.63±0.26 specimens; in Buffallo - 51.0% and 6.18±0.41 ind. /cm^2 of skin and gills. The distribution levels of Bivalvia mollusk larvae in these fish species in 5 reservoirs of the Kabardino-Balkarian Republic meet the criteria of high epizootic danger.

Keywords: Kabardino-Balkarian Republic; Ponds; Fish; Species; Invasion; Glochidia; Larvae of Bivalvia mollusks; Skin; Gills; Indices of occurrence and abundance

Introduction

It is known that larvae of bivalve molluscs Bivalvia cause glochidiasis in fish species such as grass carp, black carp, bighead carp, silver carp, hybrid silver carp, buffalo in pond water bodies of the southern regions of the Russian Federation [1-5]. As an ectoparasite, the larvae of the bivalve mollusks Bivalvia invade the skin and gills of fish, causing severe irritation and extensive inflammation. Especially, infection of fish can be massive, which negatively affects their viability, especially juveniles [6]. As noted by many ichthypathologists, fish are parasitized by the larval stages of barley, pearl oyster and toothless mollusks. This parasitic stage of mollusks is necessary in the biological cycle of their development. Glochidia remain in the gills of mollusks for a long time after

development from the egg. In spring or until mid-summer, the larvae emerge from the molluscs and attach themselves to the skin and gills of the fish with their two valves. On the skin and gills of fish, larvae of Bivalvia molluscs parasitize from 11 to 78 days [7-9]. It is known that in areas of the skin and gills, where glochidia are localized and attached, proliferative inflammation is noted with the formation of epithelial, connective tissues and whitish nodules. In cases where the glochidium leaves the fish, the tissues of the skin and gills regenerate. With a massive primary infection with mollusk larvae, fish develop immunity, which limits the abundance index during subsequent invasion. In the water bodies of the southern regions of the Russian Federation, an increase in the number of mollusks is noted [10-12]. For example, it is even allowed to bring them from outside into the water bodies of the subjects of the North Caucasus Federal District [13-15]. In the Russian Federation and in the world, most authors have sufficiently studied the issues of epizootology of glochidia in pond fish, especially silver carp and buffalo, but there is little information about the infection of these and other species of pond fish in Kabardino-Balkaria [16].

The purpose of the work is to study the levels of prevalence of larval stages of bivalve mollusks Bivalvia (barley, pearl oysters and toothless) and, as sources of glochidia disease of pond fish, in artificial pond reservoirs of the Kabardino-Balkarian Republic.

Materials and Research Methods

Studies to determine the presence of larvae of Bivalvia bivalve mollusks (barley, pearl oysters and toothless) on the skin and gills and for the epizootic assessment of invasion in fish species in 5 pond reservoirs of the Kabardino-Balkarian Republic were studied in 2018-2021. in the laboratory of parasitology of the Caspian zonal NIVI. The object of the study were 100 copies. carcasses of 1-5-year-old fish species and hybrids: grass carp, black carp, bighead carp, silver carp, silver carp hybrid, buffalo. Material for the study was collected in pond water bodies of the Kabardino-Balkarian Republic in different seasons of the year. skin research and gills of fish for infection with larvae of bivalve mollusks Bivalvia (barley, pearl oysters and toothless) were examined under a magnifying glass at a magnification of 50 times according to the method of Dogel (1964). To assess the infestation of the studied fish, the following indices were used: the infection occurrence index (IVI) and the invasion abundance index (IAI) [1,...,16]. The invasion occurrence index (IVI) was calculated using the formula IVI = n / N × 100%, where n is the number or number of fish individuals of each studied species infected with ectoparasites by larvae of Bivalvia bivalve mollusks (barley, pearl oyster and toothless); N is the total number of studied fish specimens of each species. Abundance index of invasion (AI) by ectoparasites of larvae of Bivalvia mollusks (barley, pearl oyster and toothless) in fish of each studied species were calculated by the formula M = m / N, where m is the number on the skin and gills of individuals of larvae of bivalve mollusks Bivalvia (barley, pearl oysters and toothless) in fish of each species in the studied sample; N is the number of studied fish specimens of each species. Studies on the presence of larvae of Bivalvia mollusks on the skin and gills of fish were carried out by ichthyoparasitological and pathomorphological methods generally accepted in veterinary medicine [1,5-16]. Statistical processing was carried out using the computer program "Biometrics".

Results and Discussion

Parasitological studies have established the presence on the skin and gills of fish of larvae of bivalve mollusks Bivalvia (barley, pearl oyster, toothless) (Table 1). Infection of the skin and gills of different fish by larvae of Bivalvia mollusks in pond water bodies of the Kabardino-Balkarian Republic ranges from 0 to 51% (Table 1).

In the pond basin of the Kabardino-Balkarian Republic in summer and autumn, the highest indices of invasion occurrence (IVI) and abundance are recorded annually. invasions (II) of larvae of bivalve mollusks Bivalvia. For under yearlings and 2–5-year-olds of grass carp, the invasion of glochidia poses a minimal danger, in which the index of abundance of larvae of bivalve mollusks Bivalvia (BI) is at the level of 2.14 ± 0.10 ind./cm2 of skin and gills, and in black carp glochidia is practically not recorded, since they eat mollusks in all stages of their development (Table 1).

The incidence indices of invasion (IVI) and abundance (AI) of larvae of Bivalvia mollusks in silver carp in 5 pond water bodies are 40.0% and 5.44±0.23 ind./cm2 of skin and gills, respectively; in the motley - 47.0% and 5.99±0.31 ind./cm2; in the hybrid - 44.0% and 5.63±0.26 specimens; in Buffallo - 51.0% and 6.18±0.41 ind. / cm2 of skin and gills. The degree of distribution of larvae of Bivalvia mollusks in these fish species in water bodies of the Kabardino-Balkarian Republic allows us to consider them a threat to the ichthyofauna of ponds (Table 1).

Table 1: Values of indices of occurrence and abundance of larvae of Bivalvia mollusks (barley, pearl oysters and toothless) on the skin and gills of fish in 5 pond water bodies of the Kabardino-Balkarian Republic (according to research data, n = 100 individuals each).

Indicators	Species or Hybrid					
	Cupids		Tolstolobiki			Buffalo
	White	Black	White	Motley	Hybrid	
Examined specimens / Infested specimens	100/12	100/0	100/40	100/47	100/44	100/51
Occurrence index (IVI), %	12,00	0,00	40,00	47,00	44,00	51,00
Abundance index (AI), ind./cm^2 of skin and gills	4,43±0,22	0,00±0,00	5,44±0,23	5,99±0,31	5,63±0,26	6,18±0,41

Conclusion

In 6 species and hybrids of fish in 5 pond reservoirs of the Kabardino-Balkarian Republic, the formation of diffuse fociof glochidia invasion was established. Infection of the skin and gills of different fish species by larvae of bivalve mollusks Bivalvia (barley, pearl oyster, toothless) in the reservoirs of the Kabardino-Balkarian Republic ranges from 0 to 51%. The highest occurrence indices (IVI) and abundance of invasion (AII) appear in the summer and autumn seasons, which leads to intense infection of fish. In 5 ponds of the Kabardino-Balkarian Republic, the nature of the spread of glochidia in different fish species allows us to consider this invasion as a growing epizootic risk that requires programmatic monitoring of a dangerous invasion.

Acknowledgement

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Conflicts of Interest

No conflicts of interest.

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