Diet composition and feeding habits of common bleak (*Alburnus alburnus* L.) in the Gruža and Gazivode reservoirs

Milena D. Radenković[1], Aleksandra M. Milošković[2]*, Nataša M. Kojadinović[1], Simona R. Đuretanović[1], Tijana Z. Veličković[1], Marija M. Jakovljević[1], Vladica M. Simić[1]

[1] University of Kragujevac, Faculty of Science, Department of Biology and Ecology, Radoja Domanovića 12, 34000 Kragujevac, Serbia, e-mail: milena.radenkovic@pmf.kg.ac.rs
[2] University of Kragujevac, Institute for Information Technologies Kragujevac, Department of Sciences, Jovana Cvijića bb, 34000 Kragujevac, Serbia, e-mail: aleksandra@uni.kg.ac.rs

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* *Corresponding author*

Abstract: This paper presents the feeding habits of specimens of the fish *Alburnus alburnus* (L.) that inhabit the Gruža and Gazivode reservoirs. The diets of 37 specimens from Gruža reservoir and 44 specimens from Gazivode reservoir were analyzed. The common bleak from Gazivode reservoir fed more diversely on eight different prey items, while six different prey items were identified in specimens from Gruža reservoir. The most common prey in the diet of specimens from both reservoirs is *Bosmina* sp., which was present in every digestive tract studied. Very common prey items are also *Daphnia* sp. and Cladocera. In contrast to the specimens from Gruža reservoir, the specimens from Gazivode reservoir feed on both *Leptodora kindtii* and insects. The specimens from Gazivode reservoir also feed on Ostracoda at a much higher percentage than the specimens from Gruža reservoir. Numerous reports in the literature have confirmed that common bleak feed mainly on zooplankton and often on insects, as shown by our results.

Keywords: planktivorous fish, natural diet, zooplankton

1. Introduction

Knowledge of fish diet is necessary to determine the trophic status of the ecosystem and the ecological niche of fish within that ecosystem [1]. It is also useful in understanding the ecology of species so that they can be managed sustainably, and measures can be developed to conserve and protect specific species [2]. Fish diet analysis based on digestive tract content analysis is a common practice [3, 4]. Detailed analysis of fish diet contributes to the understanding of trophic interactions in aquatic ecosystems and food chains of aquatic organisms. In addition, fish diet includes very important ecological components such as behaviour, fitness, habitat characteristics, energy consumption, and inter- and intra-species relationships [5].

The common bleak *Alburnus alburnus* (Linnaeus, 1758), inhabiting the rivers, lakes and estuaries of the Danube and the Aegean Basin [6], is common in the waters of Serbia. It lives in shoals near the water surface and feeds mainly on zooplankton, but also frequently ingests insects from the surface [7].

The objective of this study was to investigate the diet of common bleak, which is an important link in the food chains of the reservoirs studied.

2. Material and methods

Field studies were conducted in the summer of 2011 at the Gruža and Gazivode reservoirs. Gruža reservoir is located in central Serbia, near the town of Kragujevac, and was created by building a dam on the Gruža river. Its main purpose is water supply. Gazivode reservoir is located on the upper reaches of the Ibar river near the village of Ribariće. It is a multipurpose reservoir.

Fish samples were collected using nets with a mesh size of 10 x 10 mm. After capture, the total length (TL, to the nearest cm) and weight (W, to the nearest g) of the specimens were measured. Fish were then dissected, and their digestive tract was removed, which was immediately preserved with 4% formaldehyde to stop the digestion process. The material was bagged, labeled and transported to the laboratory, where the contents of the digestive tract were examined under a binocular microscope (Nikon SMZ800). Depending on the level of digestion reached, the prey was identified to the lowest possible taxonomic level.

Frequency of occurrence (%FO) is numerical method that represents the number of digestive tracts containing particular food relative to the total number of digestive tracts containing any food [4]. It is determined separately for each category of prey.

3. Results and discussion

Although common bleak has no economic importance today due to its small size, it remains an important link in the trophic webs of aquatic ecosystems. It feeds on zooplankton, insect larvae, and imagoes captured from the water surface, and is a food competitor for adult and juvenile forms of many valuable fishes [8]. The composition of the diet of 37 specimens from Gruža reservoir and 44 specimens from Gazivode reservoir is shown in Table 1.

Table 1. Assessment of diet composition of common bleak expressed as frequency of occurrence (%FO).

	Gruža reservoir	Gazivode reservoir
Ostracoda	26.66	92.68
Cladocera	100.00	85.36
Daphnia sp.	100.00	95.12
Bosmina sp.	100.00	100.00
Leptodora kindtii	-	24.39
Calanoida (Copepoda)	66.66	85.36
Cyclopoida (Copepoda)	73.33	48.78

Insecta	-	19.51

The common bleak is an obligate planktivore and a specialized open-water feeder [9, 10], feeding on small planktonic crustaceans and insects from the water surface [11]. The diet of common bleak described in this paper is largely consistent with other studies on this species. Eight different categories of prey have been identified in their diet from these two reservoirs. The common bleak from Gazivode reservoir fed more diversely on eight different prey items, while six different prey items were identified for those from Gruža reservoir. *Bosmina* sp. were present in every examined digestive tract of specimens from both reservoirs (%FO = 100), while in specimens from Gruža reservoir this is also the case for Cladocera and *Daphnia* sp. Although present in the diet of specimens from both reservoirs, Copepoda are less represented in the diet than Cladocera. This is due to the ability of copepods to develop strategies against predators to avoid becoming prey [12]. The results also show that the common bleak from Gazivode reservoir use much more Ostracoda in their diet than the specimens from Gruža reservoir. Specimens from Gazivode reservoir, unlike specimens from Gruža reservoir, also consume insects and large Cladocera *Lepotodora kindtii*. The low proportion of *Leptodora kindtii* in the diet is a consequence of its pronounced transparency, which is why planktivorous fish, visual predators, have difficulty hunting it [13]. Mehner et al. [7] noted that the main component of the diet of the common bleak is zooplankton, but they also make extensive use of insects in their diet. Although most claim that the common bleak is an obligate planktivore, there are also (fewer in number) those who claim that the main component of the common bleak diet is zoobenthos [14], but our results do not confirm this.

4. Conclusions

In summary, this study offers valuable insights into the dietary strategies of common bleak. Numerous reports in the literature have confirmed, and our results are consistent with the fact that common bleak feeds primarily on zooplankton and often on insects.

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