

# SEASONAL CHANGES IN FEEDING OF *RANA RIDIBUNDA* PALLAS (*AMPHIBIA: ANURA*) FROM BACKWATER TISZA

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**Abstract.** *Rana ridibunda* Pallas is dominant frog species in the area of Biser island. Qualitative and quantitative composition of food of this species was investigated during 1990. Insects far outweighed other present groups (*Gastropoda*, *Crustacea*, *Aranea* and *Chilopoda*) with 74.9%. Among insects, dominant species were from orders *Diptera* and *Coleoptera*.

**Keywords:** Backwater Tisza (Yugoslavia), food, *Rana ridibunda*

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## Introduction

It is known that the food of *Anura* includes large number of invertebrates and sometimes also smaller vertebrate species. This fact points to importance of frogs in food chains - as regulators of density of species which they eat, as well as hosts and carriers of different worms. Namely, molluscs and insects are second intermediate hosts in the growth cycle of flukes. Because of that, data about food of *Anura* have exceptional importance for explanation of invasion ways. Also, investigation of *Anura* food gives insight in condition and characteristics of habitat, species living there, seasonal changes and other important components of particular biocenoses.

This paper presents results of quantitative and qualitative investigations of *Rana ridibunda* Pallas feeding on Biser island. Paper presents details of complex investigations, which are part of international Tisza research program.

## Methods

Material was collected in the Biser island area in 1990. Total of 62 specimens of *Rana ridibunda* (27 individuals in spring, 25 in summer and 10 individuals in autumn) was collected. Determination was made according to keys by Engelmann (1985), and Arnold and Burton (1978). Collected material was used for parasitological and food composition investigations of this species.

Stomach content was found in 40 individuals (12 in spring, 18 in summer and 10 in autumn). Contents were fixed in 70% ethanol, and afterwards analyzed and determined to class, order and in some cases to family or even species (Kerovec, 1986; Schmidt, 1970).

## Description of study sites

Biser island is situated in middle part of eastern Backa, between settlements of Novi Becej, Becej, Backo Gradiste and Curug. It is an island, surrounded on north, west and south by Backwater Tisza or Old Tisza. Total area is 2678 ha, with altitude of approximately 75 m. Since there are dams along new and old River Tiszaflow, possibility of larger influences on further relief formations is excluded.

Biser island is characterized by high temperature amplitudes (10-15 °C during the same day), strong northeast wind ("kosava") and annual average precipitation under 600 mm. Backwater Tisza is partly channelled (in northern part), partly morassed (closer to river Tisza), and mostly consist of an oxbow lake (Bukurov, 1948).

These habitat conditions caused presence of characteristic plant and animal life forms. Although part of this area is used in agriculture, autochthonous flora and fauna still exists closer to dams, and somewhere even deeper. Narrow zone of silky willow (*Salix alba*) is spread along the riverbank, and marsh vegetation is represented by

associations *Scirpo-Phragmitetum communis* and *Hydrochari-Nymphoidetum peltatae* (Slavnic, 1956). *R. ridibunda* dominates this area from *Rana* genus. Though not typically plain species, Marsh frog prefers stagnant waters, backwaters and fishponds, which is major cause of its frequency and individual number in this area.

## Results and discussion

Marsh frog is wide-spread species, often seen on fields near stagnant and flow waters, overgrown by dense vegetation. It is very voracious, and apart from insects and other invertebrates consumes young fish, frogs, birds and mammals (Arnold and Burton, 1978; Engelmann et al., 1985). It has been found in all investigated localities in Tisza valley, but had fewer individuals in samples than other *Rana* species (*R. kl. esculenta*, *R. lessonae*).

Nevertheless, it is dominant species in Biser island area, which certainly is the result of favourable survival conditions.

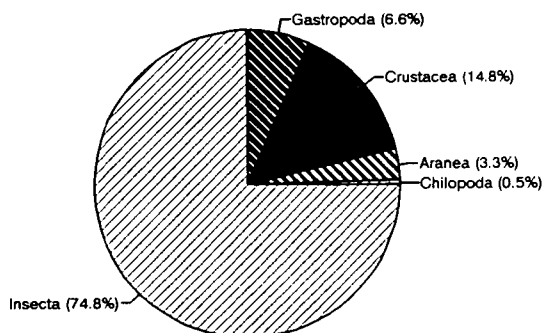


Fig. 1. Food contents of *Rana ridibunda* Pallas from Backwater Tisza - Biser island.

According to literature (Angelov and Bacvarov, 1972; Popovic and Mikes, 1989) the species group composition of food were the same in all studied area, but their proportion varied. It shows as a rule that insects are the basic food (in number of species and specimens), and other invertebrate groups are subordinate. Similar relations were established in samples from Biser island (Fig. 1) - *Insecta* 74.9%, *Crustacea* 14.8%, *Gastropoda* 6.6%, *Aranea* 3.3% and *Chilopoda* 0.5%. (Tab. 1) Dominant insect species were from order *Diptera* (total number of adults and larvae), then followed *Coleoptera*, *Hymenoptera*, *Odonata*, *Lepidoptera*, *Heteroptera*, *Homoptera* and *Orthoptera*. Qualitative analysis showed that order *Coleoptera* was represented in nutriment with the highest number of families - *Scarabeidae*,

*Carabidae*, *Cantharidae*, *Elateridae*, *Chrysomelidae*, *Hydrophilidae*, *Curculionidae*, *Silphidae*, *Coccinellidae*. Members of only three families were established from *Diptera* order which dominated in food during summer, (*Syrphidae*, and only one specimen from both *Tipulidae* and *Culicidae*). Other *Diptera*, because of poor condition of material, could not be determined more precisely, though presence of larger heterogeneity was expected. Ants were most dominant among *Hymenoptera* also in this case. According to our results and those obtained by Angelov and Bacvarov (1972), it could be expected that food composition would be similar to the other *Rana* species (*R. kl. esculenta*, *R. lessonae*). The above mentioned authors also reported the presence of *Cyprinidae* (*Pisces*) - 12 specimens in 10 stomach. The most frequent insect species were from *Coleoptera* order. It is quite probable that such differences in food contents of the same species are the results of differences in habitat conditions.

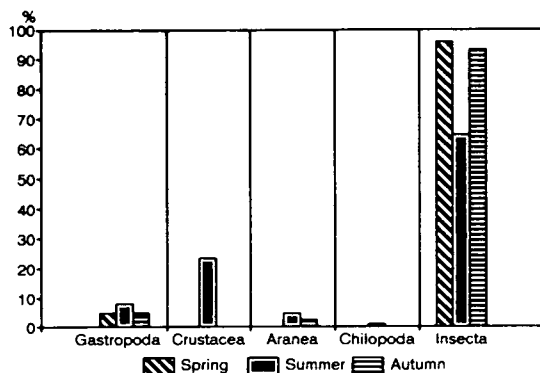


Fig. 2. Seasonal variations in feeding of *Rana ridibunda* Pallas from Backwater Tisza.

Differences in nutriment of *R. ridibunda* are expressed also during seasonal activities (Fig. 2). It is the fact that insects dominated in all seasons. However, basic food were *Coleoptera* and *Hymenoptera* in spring, *Diptera* in summer, and *Coleoptera* in autumn (Tab. 1). Other invertebrate groups were considerable part in food, such as snails in spring and autumn, and some crustacean species in summer. Largest diversity in food was found during summer. This was caused by favourable conditions for development of large number of invertebrate species which prefer these types of habitat. Members of *Cantharidae* and *Hymenoptera* were most frequent in spring sample, while members of *Carabidae* and *Formicidae* families dominated in autumn sample.

Investigations on Carska bara established (Popovic et al., 1992) that frogs from genus *Rana* feed mostly with land insects, much less with water ones. Same result was found in area of Backwater Tisza as well. Because of relatively good state of material, species were found in stomach contents from genera *Harpalus* and *Zabrus* (*Carabidae*), *Otiorrhynchus* (*Curculionidae*), *Agriotes* (*Elateri-*

*dae*) and other pests in plant production.

At last, having in mind all presented results gives insight in presence and number of species which are frog's food, changes of nutriment in different seasons, species which dominate in feeding, which leads to data on habitat and species for which man is interested in positive or negative sense ("Harmful" and "useful" species).

Tab. 1. Percentage proportion of insect individuals in the stomach contents of *Rana ridibunda* Pallas according to different seasons (Backwater Tisza area)

INSECTS	SPRING	SUMMER	AUTUMN	Σ
COLEOPTERA	41.2	12.7	46.3	27.1
HOMOPTERA	5.9	8.4		5.4
HETEROPTERA	11.8	4.2	4.9	5.4
HYMENOPTERA	35.3	7.0	29.3	17.8
LEPIDOPTERA		5.6		3.1
DIPTERA		33.8	12.2	22.5
ODONATA		11.3		6.2
ORTHOPTERA		2.8		1.5
LEPIDOPTERA - larvae	5.9		7.3	3.1
DIPTERA - larvae		11.3		6.2
ODONATA - larvae		2.8		1.5
Σ	13.2	55.0	31.8	100.0

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