

Tropical spectrum of *Rana ridibunda* and its importance in tropical web in the Crişul Repede/Sebes-Körös¹ river ecosystems

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Abstract

65 *Rana ridibunda* specimens were collected from 3 sampling sites in Crişul Repede river, for stomach content analysis. It was found that *Rana ridibunda* consumes 11 insect orders (63.5%) and 5 other invertebrate orders (36.5%). The green frog participate in terrestrial tropical chains, consuming invertebrates from terrestrial habitats (89.08% of total food) and from aquatical habitats (10.92% of total food).

Keywords: *Rana ridibunda*, tropical spectrum, invertebrates, insects, and tropical chains

Introduction

The tropical needs of *Rana ridibunda* have been studied by several authors, so in generally this problem is known. The earlier papers enumerate the invertebrate and vertebrate species, which constitute the food of this ranid species.

The authors of the present paper make a taxonomical investigation on the invertebrate fauna in stomach contents of *Rana ridibunda*, and try to surprise the role of this species in aquatical and periaquatical ecosystems, by its participation in different tropical chains.

Material and method

Altogether 65 specimens (40 adults and 25 young) have been collected from different ecosystems in the hilly and plain zones, on the Crişul Repede river basin. The collected material was conserved in 5% formaldehyde solution.

1 The first name is Romanian, and the second Hungarian.

For the correct identification of the species, we used the following measurements: L=body length; T=tarsus; Dp=Digitus primus; Cintl=Calu internus length. These results were compared with the literature (Berger, 1966).

After weighting the animals, stomach contents and fat body were extracted, and were weighted. A taxonomical analysis of stomach content has been performed until order level and, where possible, until family level.

Results

Taxonomic position

The collected specimens belong to the *Rana ridibunda* species; of the 40 adults, at 6 specimens, the Dp/Cintl ratio correspond with *esculenta* form; in one individual, collected in Hungary, two ratios belong to *esculenta* form (Dp/Cintl and L/Cintl) and only one ratio to *ridibunda* form.

Trophical spectrum

Rana ridibunda is a poliphagous zoophag. Its trophical spectrum consists of 63.5% insects and 36.5% other invertebrates. It were identified 11 insect orders, but prevail Isopoda (25.18%), Coleoptera (24.48%), Diptera (11.44%), Hymenoptera (11.44%) and Araneae (6.16%). (Tab. 1-3.)

Table 1. Trophical spectrum in *Rana ridibunda*, in three zones of Crişul Repede river basin category of foodhillock zone

category of food	hillock zone 10 specimens	plain zone (Oradea) 39 specimens	plain zone (Hungary) 11 specimens
INSECTS	69% 50% Coleoptera 15% Diptera 15% Hymenoptera 10% Odonata 8% Heteroptera 2% Ortoptera	88% 40% Coleoptera 20% Hymenoptera 20% Diptera 7% Heteroptera 3% Odonata 2% Lepidoptera 2% Dermoptera 2% Homoptera 1% Neuroptera	25% 34% Odonata 19% Hymenoptera 19% Diptera 13% Coleoptera 9% Heteroptera 6% Ortoptera
OTHER INVERTEBRATES	31% 67% Gastropoda 28% Araneae 5% Acarina	12% 80% Araneae 10% Isopoda 10% Opiliones	75% 95% Isopoda 4% Gastropoda 1% Araneae
TOTAL	100%	100%	100%

Table 2: Participation of *Rana ridibunda* species in different tropical chain patterns

Categories of consumed invertebrates	in aquatic environment	in terrestrial environment
herbivorous	Gastropoda 4.25% TOTAL 4.25%	Dermoptera 0.53% Orthoptera 2.39% Coleoptera Melolontida 0.26% Cerambicidae 0.53% Crisomelidae 8.25% Elateridae 0.80% Curculionidae 4.00% Homoptera 0.53% Lepidoptera 1.06% Diptera Sifridae 1.06% Hymenoptera Tentredinidae 1.33% Apoideae 1.06% TOTAL 21.80%
carnivorous	Coleoptera Ditiscidae 0.53% Heteroptera Nepidae 1.33% Gerridae 0.82% Corixidae 1.33% Ephemeroptera 0.82% TOTAL 6.40%	Araneae 6.12% Odonata 5.58% Coleoptera Carabidae 8.51% Coccinellidae 1.33% Hymenoptera Braconidae 0.26% Vespidae 4.25% Neuroptera 0.26% TOTAL 26.31%
omnivorous	-----	Hymenoptera Formicidae 4.54%
detritivorous	-----	Isopoda 25.00% Diptera Muscidae 10.38% Coleoptera Stafilinidae 0.26% TOTAL 35.64%
accidentally consumed	-----	Acarians 0.26% Homoptera Aphidae 0.53% TOTAL 0.79%
	TOTAL 10.92%	TOTAL 89.08%

Table 3: Percentage of different invertebrate categories (h=herbivorous; c=carnivorous; o=omnivorous; d=detritivorous) in *Rana ridibunda* food, from different authors: 1=Niculescu and Fuhn, 1963; 2=Sin and colab, 1975; 3=our results. The percentage is calculated depending on the number of invertebrates.

Nr. crt.	Nr.of frogs	Nr.of invertebr. found	aquatical invertebrates					terrestrial invertebrates				
			h	c	o	d	total	h	c	o	d	total
1	250	3063	0.9	1.7	-	0.5	3.1	13.8	1.9	29.7	51.5	96.6
2	677	2804	3.2	4.8	-	0.6	8.6	48.7	22.7	1.7	18.3	91.4
3	60	376	4.5	6.4	-	-	10.9	21.8	26.3	4.6	35.7	88.4

Discussion

Concerning the trophical spectrum, one can assert that *Rana ridibunda* is an eurytroph carnivorous. Niculescu and Fuhn (1963) find 156 invertebrate taxa in green frogs from "1 Mai" natural reserve (Petea town, close to Oradea), while Sin and colab. (1975) find 124 invertebrates taxa in *Rana ridibunda* from Jijia complex (Danube Delta).

The former find that in Petea prevail as number Collembola, Hymenoptera and Diptera. The latter find that prevails Coleoptera, Hymenoptera and Gastropoda. Our results show that Coleoptera, Diptera and Hymenoptera are prevailing of insects and Isopoda and Araneae prevail of other invertebrates.

A difference between collecting sites is observed: in the first and second points prevail insects, while in Hungary prevails Isopoda that, together with Gastropoda and Araneae make up 75% of the food. We suppose that, concerning the trophical spectrum, *Rana ridibunda* consumes practically the most available food in each habitat, and probably has no preferences.

It is necessary to mention the cannibalism trend of *Rana ridibunda*. Many authors record it. Niculescu and Fuhn assert that cannibalism occurs only in large specimens, and that seems to be negatively correlated with diminution of other trophical element abundance's; similar, they find numerous records of fish eaten by *Rana ridibunda*. Popescu (1973) studying a *Rana ridibunda* population in Razelm lake (close to Black Sea Coast), find that vertebrates (fish and amphibians) make up 0.70% numerical and 26.6% gravimetrical of green frog food. Sin and colab. (1975) assert that *Rana ridibunda* adults feed selectively, preferring fish, as number and as weight, followed by ranids or other anuran species (*Bufo bufo* juveniles - 19 specimens found in a green frog stomach).

The green frogs participate in numerous trophical chains, both in aquatical and terrestrial habitats, by consuming different invertebrate and vertebrate categories. It is especially involved in terrestrial trophical chains, taking about 90% of food from these habitats. It consumes detritivorous (35.64%), carnivorous (26.31%) and herbivorous (21.8%) invertebrates. It is less involved in aquatical habitat, the percentage of consumed invertebrates being only 10%.

Our results are roughly similar to those of other authors. After Niculescu and Fuhn, the green frogs of Petea consume only 3.1% aquatical invertebrates, while Sin and colab. find a percentage of 8.6% aquatical invertebrates consumed, the majority of food being obtained in terrestrial habitats. It is necessary to specify that these results are numerical, being counted the number of consumed animals. In the first authors (Niculescu and Fuhn, 1963), of 3063 invertebrates, 1499 were Collembola, but they only weighed 0.17 grams, and they made up 51.5% of detritivorous. Similarly, in the second authors (Sin and colab.) of 2804 invertebrates, 902 were Homoptera. They didn't mention their weight, but the percentage of terrestrial herbivorous in the food of green frog was 48.5%. It should be found a formula to calculate together - number and weight, because these results are incomplete. The real problem is that small invertebrates or their fragments are difficult to weight.

Conclusion

- *Rana ridibunda* is a zoophagous poliphag.
- On basis of our study trophical spectrum contains 63.5% insects and 36.5% other invertebrates;
- 11 insect orders were identified, but prevail Isopoda (25.18%), Coleoptera (24.4%), Diptera (11.44%) and Hymenoptera (11.44%);
- of other invertebrates it prevail Isopoda and Araneae;
- concerning the trophical spectrum, there are differences between collecting points; *Rana ridibunda* consumes practically the most available food in each habitat;
- *Rana ridibunda* participate in terrestrial trophical chains consuming 89.08% of food from terrestrial habitats and only 10.92% of food from aquatical habitats.

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