

## DATA REGARDING THE TROPHIC SPECTRUM OF ONE POPULATION OF *BOMBINA VARIEGATA* FROM PIATRA NEAMŢ (NEAMŢ COUNTY)

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**Cuvinte – cheie:** amphibians, *Bombina variegata*, trophic spectrum

### INTRODUCTION

The species *Bombina variegata* belongs to the family Discoglossidae from Anura order, being a common species in Romania spread at altitudes between 200-1500 m (Cogălniceanu et al., 2000).

The studies regarding the stomach content of *Bombina variegata* are poor in Romania (Sas et al 2004, Ghiurcă et al 2005). From this point of view we aim to bring new data regarding the food of this species.

The study was undertaken in an ecosystem from the neighborhoods of Piatra Neamţ town (Neamţ County). The research was focused on the taxonomic groups which represent the prey of yellow-bellied toad (both the number of species and specimens), and, also, on the occurrence frequency of different categories of organisms.

### MATERIAL AND METHODS

We analyzed a number of 27 samples of stomach contents belonging to the species *Bombina variegata*, out of which only 4 were found empty.

The samples collected by the means of the stomach flushing method (Cogălniceanu 1997), thus were used a syringe with a tube attached. The time between capture and stomach content collecting was shorten due to the rapid digestion which occurs in frogs. The water was introduced gradually and very slowly to avoid hurting these small size animals. This method allows sample to be collected from frogs' natural environment without affecting the size of population.

The stomach content were preserved in technical alcohol, being identified with stereomicroscope and specific key (Reitter, Paulian, Jeuniaux, Chinery, Coch etc.).

### RESULTS AND DISCUSSIONS

The amphibian diet is mainly made up by invertebrates (Das 1996). Also, the adults are thought as carnivorous animals and only their larvae eat vegetal food.

The studied literature mention that the vegetal food found in adults stomach were ingested accidentally along with their prey. Vegetal debris were identified in the other amphibian species stomach content - *Rana ridibunda* (Covaciu-Marcov et al 2000), *Rana arvalis* (Covaciu-Marcov et al 2001) și *Bombina bombina* (Sas et al 2003).

Concerning that amphibians are predators (Cogălniceanu et al 2000), the most part of analyzed stomachs contained, with 4 exceptions, animal food.

The prey from the stomach contents was identified at family level, and for some specimens the identification was possible at genus and species level. We separated the immature stages (larvae) from adults for the orders Coleoptera, Diptera, Lepidoptera. Also, there was made a distinction between the prey from terrestrial and aquatic environment.

In the analyzed stomach contents class Clitellata is represented by orders: Oligochaeta și Hirudinea. The specimens were identified at genera level: *Lumbricus* sp and *Hirudo* sp.

We identified one order (Isopoda) from class Crustacea, being low represented in the analyzed stomach contents, due to the life environment of the organism belonging to these groups which live in the superficial horizons of the soil under the litter, usual an inaccessible prey.

The arachnids are present in the diet of *Bombina variegata* but in small amounts, belonging to this class were identified specimens from three orders: Acarina, Aranea and Opiliones; out of which the highest number of specimens belong to Aranea.

The major part of the preys identified in stomach content of yellow-bellied toad of belongs to the class Insecta.

The orders Heteroptera and Colembola are low represented in the diet of *Bombina variegata*

The coleopterans identified in the samples were both adults and larvae, representing the most part of the ingested food. In the stomachs were identified specimens belonging to 7 families Carabidae, Bostrychidae, Crysomelidae, Staphylinidae, Curculionidae, Coccinellidae and Cantharidae. In some cases the identification was possible at genus level: *Harpalus* sp. And even species : *Harpalus aeneus*, *Adalia 10-punctata*, *Notiophilus bigutatus*.

Out of the hymenopterans we identified the families Formicidae and Ichneumonidae. The high number of specimens belonging to small gregarious species (Formicidae – Hymenoptera), emphasizes the opportunistic prey behavior of this frog called sit and wait method (Perry & Pianka, 1997).

In prevailed sample were identified both adults and larvae from the following families: Ephydriidae, Culicidae, Sirphidae, Tipulidae, Phoridae and Stratiomyidae belonging to Diptera order.

We also identified mature and immature stages of some specimens belonging to the orders: Dermoptera, Lepidoptera and Homoptera.

The number of prey taxon identified in the stomach content of analyzed population reached 125 specimens.

The highest number of specimens identified in the stomach content belong to the order Hymenoptera 53 specimens (42,4% out of the total number). The specimens of this order, especially from Formicidae family, represents important source of food for the analyzed population of *Bombina variegata* (fig. 1).

From the specimens number point of view the second group includes species from order Diptera – 27 individuals, representing 21,6% (fig. 1).

Another prey taxon ingested in high amounts by the analyzed population of *Bombina variegata* is made of specimens from Coleoptera order with percent of 16 (fig. 1). With respect to the literature the coleopterans represents an important element in the diet of yellow-bellied toads (Kuzmin 1990).

The high number of specimens belonging to these taxonomic groups is related to the abundance of the prey specimens at soil level in forest ecosystem (for coleopterans and hymenopterans) and the preference towards moist habitats (for dipterans).

An important element consist in the life environment of the prey taxons ingested by *Bombina variegata* which is permanently related to aquatic environment (Fuhn 1960). We identified both preys from aquatic and terrestrial environment in studied sample. Due to the higher accessibility, in the stomach content of sampled population, the amount of the terrestrial organism is higher than the abundance of aquatic species (fig. 2).

## CONCLUSIONS

Out of the total number of sampled stomach, only 4 were empty. This led to the conclusion that the environment and life conditions from the researched area are favorable for feeding in studied population of *Bombina variegata*.

The major part of yellow-bellied toad consists in specimens belonging to order Hymenoptera, followed by Diptera and Coleoptera.

The high numbers of specimens of small gregarious species (Formicidae) is conditioned by the opportunistic prey sit and wait behavior of the species *Bombina variegata* (Perry & Pianka 1997).

In collected stomach contents the amount of terrestrial prey was much higher than that of aquatic organism. This can be explained by the accessibility of terrestrial prey in comparison with aquatic ones.

As other species of amphibians, *Bombina variegata* is zoophagous – poliphagous. The yellow-bellied toads eat all moving objects in their sight range with correct sizes for being ingested. This species shows no preference towards the prey condition of being observed and at small distance in order to be swallowed.

## REZUMAT

Am analizat spectrul trofic la o populație de *Bombina variegata* din Piatra Neamț, județul Neamț. Cei mai abundenți taxoni pradă din hrana populației de *Bombina variegata* analizată sunt reprezentați de specii aparținând ordinului Hymenoptera, urmat de cele ale ordinului Diptera și Coleoptera. Numărul foarte mare de exemplare aparținând speciilor mici și gregare (Formicidae – Hymenoptera), indică faptul că aceste broaște sunt prădători oportuniști, ce procură hrana după metoda *sit and wait*. Prada cu proveniență din mediu terestrial a fost găsită în cantități mult mai mari în comparație cu cea din mediul aquatic. Ca toate speciile de amfibieni, *Bombina variegata* este o specie zoofagă-polifagă. Aceste broaște consumă prada fără preferințe, însă condiția este ca animalele să treacă prin perimetrul lor și să aibă mărimea corespunzătoare pentru a fi înghițite.

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**Table 1** The amount and frequency of prey taxons

Group	Specimens number	Frequency (%)	Life environment
<b>Clitellata – total</b>	<b>2</b>	<b>1,6</b>	
Oligochaeta	1	0,8	Terrestrial
Hirudinea	1	0,8	Aquatic
<b>Crustacea – total</b>	<b>5</b>	<b>4</b>	
Isopoda	5	4	Terrestrial
<b>Arahnida – total</b>	<b>5</b>	<b>4</b>	
Acarina	1	0,8	Terrestrial
Araneae	3	2,4	Terrestrial
Opiliones	1	0,8	Terrestrial
<b>Insecta – total</b>	<b>113</b>	<b>90,4</b>	
<b>Heteroptera – total</b>	<b>2</b>	<b>1,6</b>	
Heteroptera – unid.	2	1,6	Terrestrial
<b>Colembola – total</b>	<b>2</b>	<b>1,6</b>	
Colembola – unid.	2	1,6	Terrestrial
<b>Coleoptera – total</b>	<b>20</b>	<b>16</b>	
Coleoptera – unid.	3	2,4	Terrestrial
Carabidae	3	2,4	Terrestrial
Carabidae – larvae	1	0,8	Terrestrial
Curculionidae	5	4	Terrestrial
Bostrychidae	1	0,8	Terrestrial
Crysmelidae – unid.	1	0,8	Terrestrial
Halticinae	2	1,6	Terrestrial
Coccinellidae	1	0,8	Terrestrial
Staphylinidae – unid.	1	0,8	Terrestrial
Staphylinidae – larvae	1	0,8	Terrestrial
Cantharidae	1	0,8	Terrestrial
<b>Hymenoptera – total</b>	<b>53</b>	<b>42,4</b>	
Hymenoptera – unid.	2	1,6	Terrestrial
Formicidae	50	40	Terrestrial
Ichneumonidae	1	0,8	Terrestrial
<b>Diptera – total</b>	<b>27</b>	<b>21,6</b>	
Diptera – unid.	3	2,4	Terrestrial
Diptera – larvae	15	12	Terrestrial
Ephydriidae	1	0,8	Terrestrial
Culicidae	1	0,8	Aquatic
Culicidae – larvae	1	0,8	Aquatic
Sirphidae – larvae	2	1,6	Terrestrial
Tipulidae	1	0,8	Aquatic
Phoridae	1	0,8	Terrestrial
Stratiomyidae	2	1,6	Terrestrial
<b>Dermaptera – total</b>	<b>1</b>	<b>0,8</b>	
Forficulidae – unid.	1	0,8	Terrestrial
<b>Lepidoptera – total</b>	<b>3</b>	<b>2,4</b>	
Geometridae	1	0,8	Terrestrial
Noctuidae – larvae	2	1,6	Terrestrial
<b>Homoptera – total</b>	<b>5</b>	<b>4</b>	
Cicadellidae	2	1,6	Terrestrial
Aphidae	2	1,6	Terrestrial
Aphrophoridae	1	0,8	Terrestrial

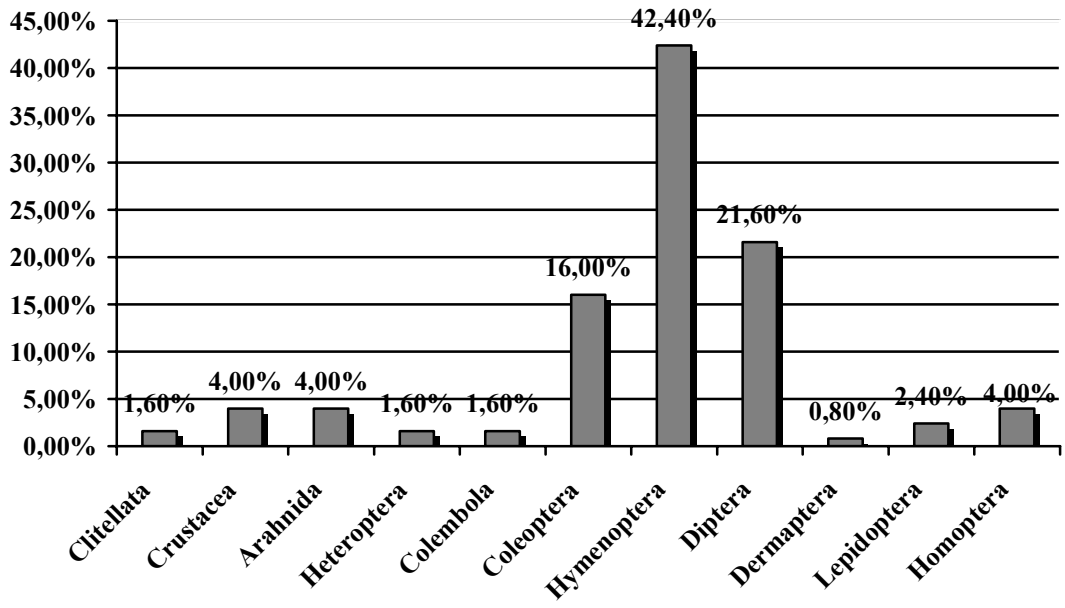


Figure 1 Quantitative variations of the prey taxa

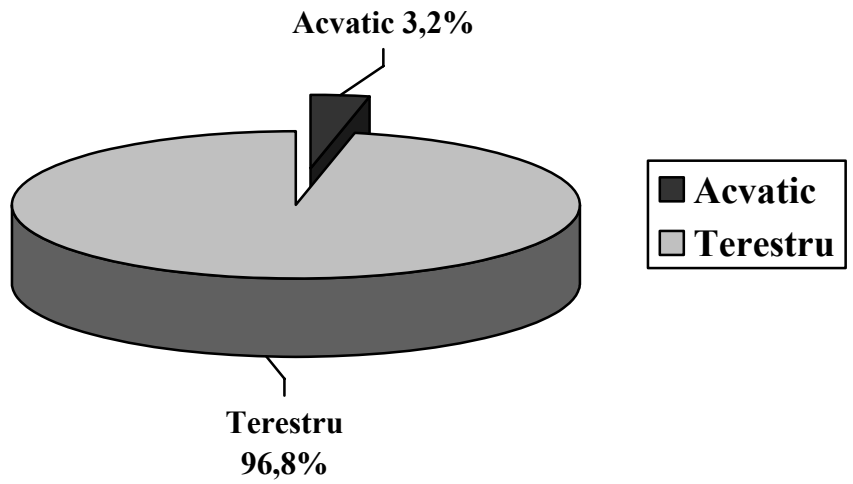


Figure 2 Numerical variation of terrestrial and aquatic prey