

**Preliminary data on the Orthoptera fauna
of the Velyka Dobron Wildlife Reserve (Western Ukraine)**

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Abstract

Bereg Plain, which is divided in two by the Hungarian-Ukrainian border, has a unique fauna with a strong Carpathian influence. The most vulnerable areas in the Hungarian part are protected and well studied, while the Ukrainian ones are generally less known. In 2010 orthopterological samplings were made in eight sites near Velyka Dobron (Nagydobrony), to collect distribution data that serve as a basis for further investigations.

During the study, 19 Orthoptera (10 Ensifera and 9 Caelifera) and one Mantodea species (*Mantis religiosa*) were found. This represents only about 54% of the Orthopteran fauna of the Hungarian part. The grasshopper assemblages of humid and mesic sites showed differences, both in species richness and diversity. The most vulnerable species known from the larger region (*Isophya stysi*, *Pholidoptera transsylvanica* and *Odontopodisma rubripes*) were not found in our present study. On the basis of our preliminary data the humid grasslands are potentially suitable habitats for these species. Further studies should therefore have a focus on the humid habitat types.

Zusammenfassung

Die Bereg-Ebene ist durch eine einzigartige Fauna mit einem starken biogeographischen Einfluss aus den Karpaten gekennzeichnet. Sie wird von der Grenze zwischen Ungarn und der Ukraine durchschnitten. Während der ungarische Teil des Gebietes gut untersucht und zum großen Teil geschützt ist, liegen über den ukrainischen Teil nur wenig Informationen vor. Im Jahr 2010 wurde deshalb im Wildschutzreservat von Nagydobrony (Ukraine) auf acht Untersuchungsflächen mit der Erfassung der Orthopterenfauna begonnen. Unser Ziel war die Sammlung faunistischer Daten als Grundlage für weitere Untersuchungen.

Insgesamt wurden 19 Heuschreckenarten und mit *Mantis religiosa* auch ein Vertreter der Mantodea gefunden. Die geschützten Arten der Region (*Isophya stysi*, *Pholidoptera transsylvanica* und *Odontopodisma rubripes*) konnten nicht nachgewiesen werden. Es kommen dort aber potenziell geeignete Habitate vor, so dass bei weiteren Untersuchungen von Feuchtwiesen mit dem Nachweis der Arten gerechnet werden kann.

Introduction

Considering its biogeographical feature, the Bereg Plain located at the north-eastern part of the Great Hungarian Plain (Alföld), is quite unique. The strong Carpathian biogeographic influence on the flora and fauna can be detected in different taxa e.g. Chiroptera (BATHSTA 2004), Coleoptera (MAGURA et al. 1997, JORDÁN et al. 2007), Lepidoptera (SZANYI 2011a, 2011b, 2011c) and Mollusca (DELI & SÜMEGI 1999). The Bereg plain is divided by the Hungarian-Ukrainian border. The natural and semi natural habitats of the Hungarian part mostly belong to the Szatmár-Bereg Protected Area and the Hungarian Natura 2000 network. Their Orthoptera fauna is well studied. The most vulnerable orthopterans of the region – *Odontopodisma rubripes*, *Isophya stysi* and *Pholidoptera transsylvanica* – are protected on the national and international level by the Habitat Directive of the EU, and are listed on the IUCN Red list (IUCN, 2010). Distribution, habitat preferences and assemblages of these species are well studied and their population changes are continuously being monitored (NAGY & KISFALI 2007, NAGY et al. 2010).

The ratio of protected areas in the Ukrainian part is low compared to Hungary. The Velyka Dobron Wildlife Reserve has been protected since 1974. Due to its early protection, different kinds of natural and semi natural habitats (e.g. wet meadows, mesic and xeric grasslands and floodplain woodlands) have remained in this area (KOHUT et al. 2006). The high level of habitat diversity results in a species rich flora and fauna which have not been well studied up till now.

In order to collect first orthopterological data as a basis for further investigations, a preliminary study on the Orthoptera assemblages was carried out in the surroundings of Velyka Dobron in 2010.

Study area and methods

The Velyka Dobron Wildlife Reserve was established in order to protect especially game such as wild boar and deer. This lowland area is situated in the surroundings of the village Velyka Dobron (Nagydobrony). The area is covered by a colourful mosaic of oak forests, wet meadows and mesic and xeric pastures. The traditional extensive land use (mowing and grazing) was abandoned during the last decades thus the species rich natural and semi natural secondary grasslands are now endangered by fragmentation, degradation and secondary succession such as in the other parts of Europe (BAKKER & BERENDSE 1999).

In this study Orthoptera assemblages of eight sampling sites with different vegetation (Fig 1. and Table 1) were sampled by sweep-net (400 net strokes per site), completed with direct search, which is sensitive to rare species and effective also in dense vegetation (NAGY et al. 2007c). On the basis of their vegetation structure, humidity and land use the sites can be grouped into 'humid' (undisturbed humid grasslands with tall and dense vegetation) and 'mesic' types (grazed and disturbed mesic grasslands with shrubs and forest edges). The samplings were conducted from 23rd to 27th of August 2010.

HARZ (1957, 1969, 1975) was used for the identification, and nomenclature follows HELLER et al. (1998). The collected material was placed in the Department of Evolutionary Zoology and Human Biology, University of Debrecen. The classification into faunal types, life forms, and rarity categories follows RÁCZ (1998) and NAGY & RÁCZ (2007). For the characterisation and comparison of assemblages species richness, abundance rank structure, diversity indices (Shannon H' and J') and two types of Whittaker's index (S/α and its variant $S/\alpha_{\max}$, where S is the total number of species, α is the mean number of species per site and $\alpha_{\max}$ is the maximum number of species per site; WHITTAKER 1960) were used.

Fig. 1: Location of the sampling sites in the Velyka Dobron Wildlife Reserve (Western Ukraine) in 2010. Sites 1-4: 'humid' type grasslands, sites 5-8: 'mesic' type grasslands; Black: sampled habitats, light grey: built-up area, dark grey: woodlands, black line: main roads.



Results and discussion

During the study, 19 species of Orthoptera (Ensifera: 9 Tettigoniioidea, 1 Grylloidea; Caelifera: Acrididae: 7, Tetrigidae: 2) and one Mantodea species (*Mantis religiosa* LINNAEUS 1958) were found. This is about half (54%) of the Orthoptera species recorded in the Hungarian part of the area (35 species, Nagy. A., unpublished data). The total number of collected individuals was 309 and the proportion of unidentified larvae of 4.5% (Table 1, 2 and 3).

Table 1: List of Orthoptera species sampled in the Velyka Dobron Wildlife Reserve Area (Western Ukraine) in 2010 with their life form, faunal type and rarity category (on the basis of 10 km UTM distribution data in Hungary) according to RÁCZ 1998 and NAGY & RÁCZ 2007. Rarity categories: 1 – rare, 2 – scattered, 3 – low frequent, 4 – frequent, 5 – common; Faunal types: Af – African, An – Angarian, Ba – Balcanic, Eu – European, Ma – Manchurian, Med – Mediterranean, N – North, Pc – polycentric, Po – pontic, Si – Siberian; *: according to Nagy A. & RácZ I.A.

Species	Life forms	Faunal types	Rarity
Ordo: Ensifera			
Superfamilia: Tettigonioidea			
<i>Phaneroptera falcata</i> (Poda, 1761)	Th	Si-Pc	4
<i>Leptophyes albobittata</i> (Kollar, 1833)	Th	Po-Med	4
<i>Conocephalus discolor</i> (Thunberg, 1815)	Th	Si-Pc	4
<i>Ruspolia nitidula</i> (Scopoli, 1786)	Th	Af	2
<i>Decticus verrucivorus</i> (Linnaeus, 1785)	Ch-Th	An	3
<i>Metrioptera roeselii</i> (Hagenbach, 1822)	Ch	Po-Ca	4
<i>Pholidoptera griseoaptera</i> (DeGeer, 1773)	Th	Po-Ca	3
Superfamilia: Grylloidea			
<i>Oecanthus pellucens</i> (Scopoli, 1763)	Ch-Th	Po-Med	3
Ordo: Caelifera			
Superfamilia: Acridoidea			
<i>Aiolopus thalassinus</i> (Fabricius, 1781)	Geo-Ch	Af	3
<i>Mecostethus parapleurus</i> (Hagenbach, 1822)	Ch	Ma	2
<i>Chrysochraon dispar</i> (Germar, 1834)	Ch	An	3
<i>Omocestus rufipes</i> (Zetterstedt, 1821)	Ch	An	4
<i>Chorthippus dorsatus</i> (Zetterstedt, 1821)	Ch	Si-Pc	4
<i>Chorthippus dichrous</i> (Eversmann, 1895)	Ch	An	1
<i>Chorthippus parallelus</i> (Zetterstedt, 1821)	Ch	An	4
<i>Chorthippus oschei</i> (Helfersen, 1986)	Ch*	Ba*	4
<i>Euchorthippus declivus</i> (Brisout de B., 1849)	Ch	N-Med-Pc	4
Superfamilia: Tetrigoidea			
<i>Tetrix subulata</i> (Linnaeus, 1758)	Ch	Eu-Pc	3
<i>Tetrix bipunctata</i> (Linnaeus, 1758)	Ch	Si-Pc	3

Species of the Habitat Directive were not found. *Chorthippus dichrous* is a rare species, while *Ruspolia nitidula* and *Mecostethus parapleurus* have a sporadic distribution in the Pannonian region (on the basis of Hungarian distribution data which cover about 70% of the Pannonian region (NAGY & RÁCZ 2007, NAGY et al. 2007b) (Table 1). There were three Orthoptera species from the Habitat Directive found in the Hungarian part of Bereg Plain. Among these, the Carpathian endemic *Pholidoptera transsylvanica* lives only in Kaszonyi-hegy (Kaszony Hill) near Barabás village and *Isophya stysi* can be found also in Kaszonyi-hegy and some additional locations for example near Fülesd village. *Odontopodisma rubripes* shows a wider distribution in meadows, wet grasslands, shrubs and forest edges both in Bereg and Szamos-hát regions (NAGY & KISFALI 2007). This Dacian endemic species surely lives also in the Ukrainian territory as suggested by NAGY (1990, 2002). In order to find these species in the study area further investigations should be made.

The mean number of species per site (8.13 ± 2.10) was almost equal to the value found for similar Hungarian locations (Table 2), but the number of species often reached 14-16 species per site in undisturbed natural and semi natural habitats in Hungary. Consequently the studied assemblages cannot be considered as really species rich ones.

The studied assemblages contain only chorto- and thamnobiont species, while species with geophilous life forms were not found. *Ruspolia nitidula* and the geo-chortobiont *Aiolopus thalassinus* reach the north-eastern boundary of their range in this region. The occurrence of the former species is due to vagrant specimens of larger populations living in the surrounding areas. The ratio of the Siberian faunal elements was the same as in the Hungarian sites of Bereg Plain which is generally higher than in other parts of Alföld (Great Hungarian Plain) (Table 1).

The *a priori* types of sampled sites showed differences in their subdominant and rare species. The two most dominant species were *Chorthippus dorsatus* and *Chorthippus parallelus* in both groups (Table 3). In mesic grasslands (sites 5-8) the hygrophilous thamnobiont *Ruspolia nitidula* and *Omocestus rufipes* were less abundant than in the humid sites with tall and dense grasses (sites 1-4). The differential species of mesic type grasslands were *Leptophyes albobittata*, *Aiolopus thalassinus*, *Euchorthippus declivus* and *Tetrix subulata*. Each of them was found only in one of the four mesic sites, but they generally characterize mesic and xeric grasslands (NAGY et al. 2007a). The differential species of the humid sites were *Decticus verrucivorus*, *Chrysochraon dispar*, *Chorthippus dichrous* and *Oecanthus pellucens*, but only *Chrysochraon dispar* can be accepted as real character species of humid habitats because each of the other three species were sampled only in one site and with only one or two specimen (Table 3). The composition of assemblages shows high similarity to the formerly studied Hungarian ones, but some characteristic rare and less abundant species of both mesic (e.g. *Pholidoptera fallax*, *Chorthippus brunneus*, *C. biguttulus* etc.) and humid grassland (*Isophya kraussii*, *I. stysi*, *Leptophyes discoidalis*, *Pholidoptera transsylvanica*, *Odontopodisma rubripes* etc.) were absent.

The Whittaker's indices showed that the humid sites comprised a more uniform group than the disturbed and mesic ones. The overall heterogeneity was larger than within group differences. The total species number of assemblages living in different habitat types was equal, but average number of species and diversity of humid type assemblages was higher. Diversity indexes (Shannon H' and J') were also higher in the humid type habitats (Table 2). The less disturbed humid habitats can maintain most species rich Orthoptera assemblages. Additionally, the unique and most vulnerable species of this region prefer this type of habitat. In order to map their distribution in the Ukrainian part of Bereg Plain and to get detailed data on their assemblages, this type of habitat should be studied more intensively. On the basis of our preliminary data we expect that the number of species should increase and some rare species should be found in the Velyka Dobron Wildlife Reserve and its surrounding during further investigations.

Table 2: Characteristic variables of *a priori* groups (mesic and humid habitat types) of studied sampling sites of the Velyka Dobron Wildlife Reserve in 2010.

	Habitat type		Sum
	Humid	Mesic	
Number of sites	4	4	8
Total number of individuals (N)	143	147	290
Mean specimen/site ($\pm$ SD)	35.75 ($\pm$ 7.54)	36.75 ($\pm$ 11.30)	36.25 ($\pm$ 8.91)
Total number of species (S)	15	15	19
Mean species/site (α) ($\pm$ SD)	9.25 ($\pm$ 2.22)	7 ($\pm$ 1.41)	8.13 ($\pm$ 2.10)
Maximum species/site ($\alpha_{\max}$)	11	9	11
Whittaker's S/α	1.62	2.14	2.34
Whittaker's $S/\alpha_{\max}$	1.36	1.67	1.73
Shannon H'	1.9898	1.8395	
Shannon J'	0.7378	0.6793	

Table 3: Quantitative data of Orthoptera assemblages sampled in the Welika Dobron Wildlife Reserve in 2010. Total number of sampled individuals, the number of sampled orthopterans and the number of Orthoptera species by sites. The species are in the order of decreasing relative frequencies.

Species	Humid				Mesic				Sum
	1	2	3	4	5	6	7	8	
<i>Chorthippus dorsatus</i>	12	11	13	9	1	24	35	4	109
<i>Chorthippus parallelus</i>	6	6	11	20	23	3	3	5	77
<i>Metrioptera roeselii</i>	3	1	0	3	4	2	1	2	16
<i>Chorthippus oschei</i>	3	1	3	0	2	0	0	5	14
<i>Ruspolia nitidula</i>	2	3	1	4	0	0	1	0	11
<i>Omocestus rufipes</i>	0	1	4	3	0	2	1	0	11
<i>Conocephalus discolor</i>	1	2	0	2	2	2	1	0	10
<i>Phaneroptera falcata</i>	1	1	0	2	0	0	5	0	9
<i>Mecostethus parapleurus</i>	0	1	0	0	6	0	0	0	7
<i>Aiolopus thalassinus</i>	0	0	0	0	0	0	0	5	5
<i>Euchorthippus declivus</i>	0	0	0	0	0	0	0	1	1
<i>Oecanthus pellucens</i>	0	3	0	1	0	0	0	0	4
<i>Tetrix subulata</i>	0	0	0	0	4	0	0	0	4
<i>Tetrix bipunctata</i>	1	0	1	0	1	0	0	0	3
<i>Chrysocraon dispar</i>	2	0	0	1	0	0	0	0	3
<i>Pholidoptera griseoaptera</i>	0	0	0	2	0	1	0	0	3
<i>Chorthippus dichrous</i>	1	0	0	0	0	0	0	0	1
<i>Leptophyes albovittata</i>	0	0	0	0	1	0	0	0	1
<i>Decticus verrucivorus</i>	0	1	0	0	0	0	0	0	1
<i>Mantis religiosa</i>	0	0	1	2	0	2	0	0	5
Unidentified Acrididae larva	0	0	3	3	1	0	7	0	14
Number of Orth. individuals	32	31	33	47	44	34	47	22	290
Number of Orth. Species	10	11	6	10	9	6	7	6	19
Number of sampled individuals	32	31	37	52	45	36	54	22	309

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Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Articulata - Zeitschrift der Deutschen Gesellschaft für Orthopterologie e.V. DGfO](#)

Jahr/Year: 2011

Band/Volume: [26_2011](#)

Autor(en)/Author(s): Nagy Antal, Szanyi S., Molnar A., Racz Istvan A.

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