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## **Orthoptera and Mantodea in foraging territories of the Scops Owl *Otus scops* in Central Romania**

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**A b s t r a c t :** Orthoptera in foraging territories of the Scops Owl *Otus scops* in Central Romania.

Altogether 36 Orthoptera species (15 Tettigoniodea, 5 Grylloidea, 1 Tetrigoidea and 15 Acridoidea) and one Mantodea species were found in nine foraging territories of orthopterophagous Scops Owl *Otus scops* during a chick feeding period (July 5-21, 2009). The total number of species ranged between 13 and 24 species per locality, showing an appropriate diversity of potential food supply for investigated owl species during such a short period. Furthermore, another three big (> 25 mm) Orthoptera species were found in the food remnants of local population of the Scops Owl (*Polysarcus denticauda*, *Tettigonia caudata* and *Gryllus campestris*).

**K e y w o r d s :** Orthoptera, owls, food supply, foraging.

### **Introduction**

Romania belongs to strongholds of the Scops Owl in Europe, with a high population density and positive population trend (BirdLife International 2004). The diet of this owl is dominated by big Orthoptera species (bigger than 25 mm) (STREIT & KALOTÁS 1987, KELLER & PARRAG 1996, MARCHESI & SERGIO 2005, ŠOTNÁR et al. 2009, LATKOVÁ et al. submitted). Their lack, in countries showing negative population trends, may pose a risk for the Scops Owl (HAGEMEIER & BLAIR 1997).

Orthoptera in Romania are presented by 182 species, however, there are still assumed certain gaps in the knowledge concerning the issue (KNECHTEL & POPOVICI-BÎZNOSANU 1959, IORGU et al. 2008).

The aim of this study was: i/ to contribute to the knowledge of Orthoptera and Mantodea assemblages and species as an important food supply in the Scops Owl territories in the central part of its range, ii/ to compare the Orthoptera in food supply and in the diet of the Scops Owl in the same chick feeding period.

### **Methods and material**

Orthoptera and Mantodea were studied as a potential food supply for the Scops Owl (*Otus scops*) in its nine foraging territories (46°27'-32'N, 24°35'-46'E, Fig. 1.) of Cen-

tral Romania in July 5-21, 2009. The territory was considered as a convex polygon of the outermost perches and registrations of foraging birds. Each sampled locality occurred within the territory and its minimum size was 2 ha. The material was primarily collected using the method of sweeping of herbal and partially shrub vegetation (min. 500 sweeps / check). This method was supplemented with beating from trees and shrubs and individual collection of specimens. The time reserved for the active collection was three hours per plot and control.

The relative abundance of the individual species on the studied plots was expressed using the following semiquantitative classification scale: 1 – very rare species (less than three adult exemplars), 2 – rare (3-10 exemplars), 3 – abundant (11-100 exemplars), 4 – very abundant (101 and more exemplars, Table 1). Relative semiquantitative values of abundance listed in the results represent the highest recorded values in the adults corresponding to one locality and one control event (Table 1). Frequency (f%) of occurrence in each species was calculated from 9 localities.

The material was identified using identification keys (HARZ 1969, 1975), the geographical data about the origin and distribution followed the works (HARZ 1969, 1975, INGRISCH & KÖHLER 1998).

### Short description of the studied plots

The study area is located near Târgu Mureş city in central Transylvania (Central Romania, Fig. 1). It represents a rural mosaic landscape with traditional farming grasslands, small agricultural fields, bushes and groups of trees. The Scops Owl density reached there 37-46.3 breeding pairs/ 100 km<sup>2</sup> (own unpublished data). Following nine localities/ foraging territories were studied:

- (1) **Gălăţeni 1** (370-468 m a.s.l., 46°27'54.29"N, 24°43'40.36"E) – traditional managed pasture with irregular grazing on a southern exposed slope with mostly xerophilous vegetation (70%), with scattered hedges, fruit trees, vineyard and fallow (10%) and agricultural fields (alfalfa, barley) (20%).
- (2) **Gălăţeni 2** (400-420 m a.s.l., 46°27'48.42"N, 24°44'15.11"E) – south-western exposed slope with extensively managed or abandoned vineyard patches, frequent fallows, alfalfa plots (15%), mown and grazed grasslands (65%). The plot is partly covered with shrub and tree vegetation (20%), mesophilous patches are sporadic. On the plot were found min. 2 territories of the Scops Owl.
- (3) **Gălăţeni 3** (370 m a.s.l., 46°27'10.17"N, 24°43'44.41"E) – south-western exposed plot nearby a forest edge, consisting mostly of patches of arable land (wheat, maize, alfalfa) (60%), a grazed, less mown grasslands (30%), shrubbery, mesophilous and hygrophilous vegetation on stream banks (10%).
- (4) **Bozeni** (350-425 m a.s.l., 46°31'49.43"N, 24°38'36.99"E) – south-eastern exposed slope with grassland (60%) burnt out regularly in the spring, remnants of fruit trees, mostly over-grown by shrubs (20 %). On the plot's border is a water channel with mesophilous bank vegetation (20%).
- (5) **Bedeni** (355-380 m a.s.l., 46°28'32.89"N, 24°46'42.29"E) – southern exposed xerophilous pasture (40%) and shrubs, trees and mesophilous vegetation along stream banks (10%). There are also several small patches of mown meadows (30%), fallow and arable land (alfalfa, maize) (20%).

- (6) **Corunca** (410 m a.s.l., 46°31'38.45"N, 24°36'59.17"E) – plot situated in a cemetery, on a moderate southern-exposed slope with mown, irregularly grazed grassland (80%), surrounded with shrub and tree vegetation (20%).
- (7) **Maiad** (460 m a.s.l., 46°31'50.44"N, 24°42'52.39"E) – open oak grove (70%) situated on the top of a hill with grazed grass plots and shrubberies on the southern exposed slope (30%).
- (8) **Ivănești** (365-420 m a.s.l., 46°32'16.48"N, 24°40'54.51"E) – western and northern oriented slope with a pasture overgrown in the major part (60%), shrubby vegetation and solitary wild pears (20%). Along the plot's border, at the bottom of the valley, flows a stream with mesophilous and hygrophilous, grazed bank vegetation (20%).
- (9) **Budiu Mic** (390-455 m a.s.l., 46°30'7.39"N, 24°35'0.20"E) – mown (25%) but also abandoned grassland (25%) with shrubs and fruit trees at a forest edge (10%). Moreover, there are large areas of fallow (40%). At the bottom of the valley, the plot is bordered with a periodic water stream with mesophilous vegetation on the banks.

## Results and Discussion

### Orthoptera and Mantodea assemblages in foraging territories of the Scops Owl

Altogether 36 Orthoptera species (almost 20% of Romanian Orthoptera) and one mantid species were identified in nine foraging territories of the Scops Owl in Central Romania, in the range centre of this owl species (Table 1). Within these species, in total 15 Tettigonioidea, 5 Grylloidea, 1 Tetrigoidea and 15 Acridoidea species were identified there. Total number of species ranged between 13 and 24 species per locality. It shows the appropriate diversity of a potential food supply for investigated owl species during such a short period in July, when more species have not identifiable nymphs or adults yet, to be identified to the species level. In such a way, we could expect more species there.

Euryoekous and xerophilous species such as *Chorthippus parallelus*, *Leptophyes albiovittata*, *Caliptamus italicus*, *Chorthippus biguttulus*, *Euthystira brachyptera* and *Metrioptera roeselii* and unidentified nymphs of Acrididae as well, belonged to the most abundant and frequent in the food supply of all territories. The hygrophilous species *Conocephalus fuscus*, *Ruspolia nitidula*, *Chorthippus oschei*, *Chrysochraon dispar* were also abundant and frequent, what reflects wet habitats in the Scops Owl territories.

Some rare and zoogeographic important species were also found, such as *Isophya modesta*, ssp. *longicauda*, *Poecilimon fussi* (>50 % localities), *Odontopodisma rubripes* (Natura 2000, Anex II species and East Carpathian endemit) and *Stethophyma grossum* (c.f. KNECHTEL & POPOVICI-BÎZNOSANU 1959, IORGU et al. 2008).

In all nine studied territories we found also *Tettigonia viridissima*, the well known prey of the Scops Owl from all part of its breeding range (CRAMP 1985). However, its abundance in sweeping samples was lower than in the food of the Scops Owl, because this bushcricket species inhabits mostly shrubs and trees in July and the owls are more effective in catching its adults than man. On the other hand, the most frequent, abundant and small orthopterans (less than 15 mm) are not considered in the food of owl (Table 1).

Considering the Orthoptera species diversity in study localities, the most species (23) and individuals of Orthoptera (372/ visit) were found at locality Bedeni (mosaic of xerophilous and mesophilous grasslands with shrubs, trees and stream), and at least (13) at locality Bozeni (frequently burnt out grassland).

### **Orthoptera in the food and in the food supply of the Scops Owl in the same territories**

Only ten of 36 Orthoptera species (bigger than 20 mm) from the food supply were found also in the food of the Scops Owl at the same time and same area (LATKOVÁ et al. submitted). Mainly big Orthoptera species were preyed by Scops Owl (mainly *T. viridissima*, *D. verrucivorus*, *Ph. griseoptera*, Table 1). However, the Scops Owl was even more successful in the catching of some more species (e.g. *Polysarcus denticauda*, *Tettigonia caudata* and *Gryllus campestris*), because we did not find them in the field (food supply) by sweeping and individual sampling. All of these species are so called "early species", rarely occurring in July in the studied localities in Romania and we could not get them by the sampling in July 5-21.

### **Orthoptera in the food and food supply of the Scops Owl in various parts of its range**

Orthoptera is high dominant prey group of the Scops Owl in Western Palearctic, ranging from 46.8 % (BAVOUX et al. 1993) to 90 % (ŠOTNÁR et al. 2008).

In the food and food supply of the Scops Owl in Europe were found mainly big Orthoptera species (body length >20 mm), such as *Tettigonia viridissima*, *Platycleis albopunctata*, *Decticus verrucivorus*, *Gryllus campestris*, *Gryllotalpa gryllotalpa*, *Metrioptera* sp., *Meconema thalassinum*, *Pholidoptera griseoptera*, *Barbitistes* sp. (HELLER & ARLETTAZ 1994, KELLER & PARRAG 1996, ŠOTNÁR et al. 2008), less *Phaneroptera falcata* and *Leptophyes albobittata*, *Oedipoda coerulescens*, *Stenobothrus* sp. (see KRIŠTÍN & SÁROSSY 2002).

The food supply of the Scops Owl was studied also at the northern limit of its distribution range (Slovakia), where altogether 39 Orthoptera species were found in seven Scops Owl territories (KRIŠTÍN & SÁROSSY 2002). One would expect, there will be more species in southern Romanian territories, but there were some methodical differences between these two studies. Orthopterans in Slovak territories were studied during three months (July – September), whereas in Romania only during a 16 day period of July, when some species are not active or are in unrecognizable nymph stage.

### **Acknowledgement**

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### **Zusammenfassung**

36 Orthopteren-Arten (15 Tettigonioidea, 5 Grylloidea, 1 Tetrigoidea und 15 Acridoidea) sowie eine Mantodea-Art wurden in neun Jagdgebieten der auf Orthopteren spezialisierten Zwergohreule (*Otus scops*) während der Zeit der Aufzucht der Jungen (5.-21. Juli 2009) nachgewiesen. Zwischen 13 und 24 Arten je Fundort konnten festgestellt werden. Es stellt eine ausreichende Vielfalt zur

Verfütterung für diese Eulenart unter Beweis. Drei Arten mit einer Größe über 25 mm sollen hier namentlich Erwähnung finden (*Polysarcus denticauda*, *Tettigonia caudata* and *Gryllus campestris*).

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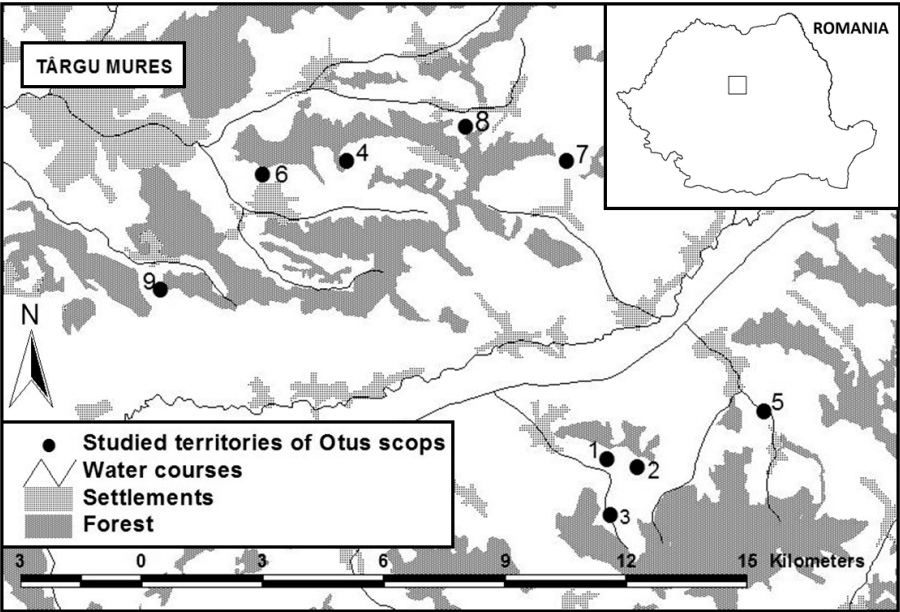
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**Fig. 1:** Studied localities/ foraging territories of the Scops Owl (black dots) and their localisation within Romania. Localities No. 1-9, see chapter Methods).

**Tab. 1.** Orthoptera und Mantodea in foraging territories of the Scops Owl *Otus scops* in Central Romania (localities 1-9, relative abundance 1-4, see Methods; n – absolute abundance in all localities/ visit; n% - relative abundance in all localities; f% – frequency of occurrence in 9 studied localities; P – the species was found in the diet of local Scops Owl population at the same period as: \*\*\* eudominant, \*\* dominant and \* subdominant).

Locality	1	2	3	4	5	6	7	8	9	n	n%	f%	P
<b>ORTHOPTERA</b>													
<b>T e t t i g o n i i d a e</b>													
<i>Barbitistes constrictus</i> BR. v. WATTENWYL 1878						1				1	0,1	11,1	*
<i>Isophya camploxypha</i> (FIEBER 1854)							1			1	0,1	11,1	*
<i>Isophya modesta longicauda</i> RAMME 1951		1								1	0,1	11,1	
<i>Leptophyes albovitata</i> (KOLLAR 1833)	3	3	3	3	3	2	3	2	3	228	13,3	100	
<i>Phaneroptera</i> sp. nymphs	2	2			2	2		2		31	1,8	55,6	
<i>Poecilimon fussi</i> BRUNNER von WATTENWYL 1878	3	3		1		1			1	49	2,9	55,6	
<i>Meconema thalassinum</i> (DEGEER 1773)									1	1	0,1	11,1	
<i>Conocephalus fuscus</i> (FABRICIUS 1793)	3	2	2	2	2		2	3	2	82	4,8	88,9	
<i>Ruspolia nitidula</i> (SCOPOLI 1786)	3	2			3	2	1	2	3	41	2,4	77,8	*
<i>Decticus verrucivorus</i> (LINNAEUS 1958)		2			3	1				7	0,4	33,3	**
<i>Metrioptera bicolor</i> (PHILIPPI 1830)	2	2	1		2	2	1	2	1	33	1,9	88,9	**
<i>Metrioptera roeselii</i> (HAGENBACH 1822)		2	3	2	2		2	2	2	47	2,8	77,8	*
<i>Pholidoptera griseoaptera</i> (DEGEER 1773)							2			8	0,5	11,1	**
<i>Platycleis albopunctata grisea</i> (FABRICIUS 1781)	2				3	1	1	1	1	28	1,6	55,6	
<i>Tettigonia viridissima</i> LINNAEUS 1758	1	1	1	1	2	1	1	1	1	13	0,8	100	***
<b>G r y l l i d a e</b>													
<i>Pteronemobius heydenii</i> (FISCHER 1853)								2		6	0,4	11,1	
<i>Melanogryllus desertus</i> (PALLAS 1771)	1	2	1		2					14	0,8	44,4	*
<i>Modicogryllus frontalis</i> (FIEBER 1844)					1					1	0,1	11,1	
<i>Oecanthus pellucens</i> (SCOPOLI 1763)	2	1		1		3	2	2	2	29	1,7	66,7	

Locality	1	2	3	4	5	6	7	8	9	n	n°	°%	P
<b>G r y l l o t a l p i d a e</b>													
<i>Gryllotalpa gryllotalpa</i> (LINNAEUS 1758)								2		6	0,4	11,1	*
<b>T e t r i g i d a e</b>													
<i>Tetrix tenuicornis</i> SAHLBERG 1893		1		1	1			1		6	0,4	44,4	
<b>A c r i d i d a e</b>													
<i>Calliptamus italicus</i> (LINNAEUS 1758)	3	2			3	1	1		1	105	6,1	66,7	
<i>Odontopodisma rubripes</i> RAMME 1931	1	3	3							33	1,9	33,3	
<i>Oedipoda caerulescens</i> (LINNAEUS 1758)				1						2	0,1	11,1	
<i>Stethophyma grossum</i> (LINNAEUS 1758)								1		1	0,1	11,1	
<i>Euchorthippus declivus</i> (BRISOUT de BARNEVILLE 1849)	1							1		5	0,3	22,2	
<i>Euthystira brachyptera</i> (OCSKAY 1826)	1			3	3	3		1	2	51	3,0	66,7	
<i>Gomphocerippus rufus</i> (LINNAEUS 1758)								1		2	0,1	11,1	
<i>Chorthippus biguttulus hedickae</i> RAMME 1942	2	2	3		3	1	3	1	1	85	5,0	88,9	
<i>Chorthippus oschei</i> HELVERSEN 1985	1	2	2	1	3		3		2	70	4,1	77,8	
<i>Chorthippus parallelus</i> (ZETTERSTEDT 1821)	3	3	3	4	3	3	3	3	3	406	23,8	100	
<i>Chrysochaon dispar</i> (GERMAR 1834)	2	2	3	1	3			2	2	52	3,0	77,8	
<i>Omocestus rufipes</i> (ZETTERSTEDT 1821)	1	2	1	2	2	1	2	1		33	1,9	88,9	
<i>Omocestus haemorrhoidalis</i> (CHARPENTIER 1825)							2	2		11	0,6	22,2	
<i>Stenobothrus lineatus</i> (PANZER 1796)		1	2		2	2		1		19	1,1	55,6	
<i>Stenobothrus stigmaticus</i> (RAMBUR 1838)					2					8	0,5	11,1	
Acrididae g.sp. nymphs	3	3	3	2	3	2	3	3	3	192	11,2	100	
<b>Total individuals/ visit</b>	253	203	208	175	372	93	159	141	104	1708	100		
<b>Total species</b>													
<b>MANTODEA</b>	20	22	14	13	23	17	17	22	16	36			
<i>Mantis religiosa</i> (LINNAEUS 1758)	2	1			2	1		1	1	12			*



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