

Научни трудове на ПУ, <i>Animalia</i>	Год./An.	Том/Vol.	Кн./Fasc.	с./pp.
Trav. Sci. Univ. Plovdiv, <i>Animalia</i>	2004	40	6	153–164

CONSERVATION STATUS OF THE SMALL MAMMALS (*MAMMALIA: INSECTIVORA, LAGOMORPHA, RODENTIA*) OF SAKAR MOUNTAIN (SOUTH-EASTERN BULGARIA)

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ABSTRACT. The small mammal species diversity in the region of the Sakar Mountains (South-Eastern Bulgaria) was studied between 1999-2004. Mainly food remains from birds of prey were collected and analyzed. The most abundant material were pellets of *Tyto alba*. There were 24 species of small mammals in the Sakar Mountains registered and 11 of them were reported for the first time in the region by this study. Most of the species registered (46%) are included in the Bern Convention, with 31% included in the IUCN Red List 2004. The Bulgarian Biodiversity Act included 27% of the mammals recorded, 12% are included in Directive 92/43/EEC, and 8% are included in the Red Book of Bulgaria. Thirty-nine percent of the mammals recorded are without conservation status.

KEY WORDS. Rare and threatened species, small mammals, Rodentia, Insectivora, Sakar Mountains, South-Eastern Bulgaria.

INTRODUCTION

The small mammal species diversity in the Sakar Mountain region (South-Eastern Bulgaria) is not well known.

The following 12 species were reported for the region: *Myomimus roachi* (Batte, 1937), *Cricetulus migratorius* (Pallas, 1773) (ПЕШЕВ, АНГЕЛОВА, ДИНЕВ, 1960a; 1960b); *Talpa europaea* Linnaeus, 1758, *Crocidura suaveolens* (Pallas, 1811); *Spermophilus citellus* (Linnaeus, 1766), *Dryomys nitedula* (Pallas, 1778), *Sylvaemys sylvaticus* (Linnaeus, 1758), *Sylvaemys flavicollis* (Melchior, 1834), *Mus musculus*

Linnaeus, 1758, *Arvicola terrestris* (Linnaeus, 1758); *Microtus arvalis* (Pallas, 1778) (ПЕШЕВ, АНГЕЛОВА, 1962/1963; МАРКОВ, 1964); *Glis glis* (Linnaeus, 1766) (ПЕШЕВ, МИТЕВ, ДЕЛОВ, СТОЙКОВ, 1990); *Erinaceus concolor* (Martin 1838) (MARIN, IVANOV, GEORGIEV, BOEV, 2004).

The following mammals were reported for the subregions of lower parts of the Maritsa and Tundzha River valleys Biogeographic areas: *Sorex araneus* Linnaeus, 1758, *Neomys anomalus* Cabrera, 1907, *Crocidura leucodon* (Hermann, 1780), *Mycromis minutus* (Pallas, 1771), *Mus macedonicus* Petrov and Ruzic, 1983, *Microtus guentheri* (Danford and Alston, 1880) (ПОПОВ, 1993).

Our aim was to study the species diversity and conservation status of the small mammals in the region, and to get information about their distribution.

ACKNOWLEDGEMENTS

I deeply thank Dr. VASSIL POPOV (Institute of Zoology, BAS) and Dr. ILIANA VELCHEVA (University of Plovdiv) for the kind co-operation and for the critical notes and advices about this material. My thanks also go to all the members of NGO „Green Balkans“ for their technical support, especially to SLAVEJA STOICHEVA, MLADEN ANGELOV, ELENA KMETOVA, ADAM BRAMM, ELENA TILOVA and EUGENIA DOBREVA.

STUDY AREA

Sakar Mountains are situated in the southern part of Bulgaria, near the Turkish border, between the Rhodopes Mountains (from west), the Derventski Heights (from east), and the Upper Tracia Valley (from north).

The region incorporates the sub regions of lower parts of the Maritsa and Tundzha River valleys (ГРУЕВ, КУЗМАНОВ, 1994).

The geography of the Sakar Mountains includes rounded hills and relatively deep valleys of small rivers with large open grasslands and small patches of forests.

The bush in the grasslands is formed by xerotherm species such as *Paliurus spina-christi* Mill., *Jasminum fruticans* L. and *Carpinus orientalis* Mill. The dominant three species in the forests are: *Quercus pubescens* (Willd.) and *Quercus virgiliana* (Ten.) (БОНДЕВ, 1991).

The highest point of Sakar Mountains is Vishegrad Peak (856 meters).

The climate is Sub Mediterranean, characterized by warm and mild winters, and hot and dry summer. The mean annual temperature is 12° C (СТАХКОВ, 1991).

The study was generally carried out in the following UTM-quadrants:

1. Levka Village (UTM: MG33 – about 60% agricultural and pasture lands, and 40% deciduous forest).
2. Raikova Mogila and Shtit villages (UTM: MG43 - about 80% agricultural and pasture grasslands, and 20% coniferous, and mixed forest). Sladun village (UTM: MG53 – about 70% pasture grasslands, 10% bushy terrains, 10% deciduous forest).

3. Sladun Village (UTM: MG53 – about 70% pasture grasslands, 10% bushy terrains, 10% deciduous forest).
4. Mladinovo Village (UTM: MG34 – about 35% pasture grasslands, 35% agricultural lands, 15% deciduous forest, 10% coniferous forest, 5% mixed forest).
5. Dervishka Mogila Village (UTM: MG44 – about 25% mixed and deciduous forest, 25% coniferous forest, 10% fruit-culture gardens, 30% pasture grasslands, and 10% agricultural lands).
6. Studena Village (UTM: MG54 – about 60% agricultural and pasture lands, 30% deciduous forest, 10% mixed, coniferous forests, and pasture grasslands).
7. Ovcharovo and Svirkovo villages (UTM: MG15 - about 70% agricultural and pasture lands, 30% mixed, deciduous, coniferous forest, and bushy terrains).
8. Glavan Village (UTM: MG25 – about 50% pasture grasslands, 40% coniferous and mixed forests, 10 % agricultural and fruit-culture lands).
9. Bulgarska Poliana Village (UTM: MG35 - about 60 % pasture, agricultural and fruit-culture lands, 40% deciduous, coniferous and mixed forests).
10. Mramor and Kapitan Petko Voivoda villages (UTM: MG55 - about 35% pasture grasslands, 35% agricultural lands, 5% deciduous forest, 5% coniferous forest and mixed forests, 20% agricultural and fruit-culture lands).
11. Orlov dol Village (UTM: MG36 – about 70% agricultural and pasture lands, 30% coniferous and mixed forests).

MATERIAL AND METHODS

Most of the expeditions were realized by the kind co-operation of the NGO, „Green Balkans,“ and by the team working on Natura 2000 project from the same organization. During the study time (1999-2004), their map material also was used.

To investigate the species diversity of the small mammals we have used one basic method. Food remains and pellets from birds of prey were collected and analyzed. Also some animal remains from car-kills on the road were investigated. Only a few rodents were captured with live-traps, and after identification, were released.

The most abundant materials were pellets of *Tyto alba* (Scopoli, 1769) (over 1300 pellets, bone remains and dead uneaten animals), which provide most of the small mammals species in study area (CRAMP, 1985; TORRE et al., 2004). The data used for this study was original material. The team also relied on data gathered through food-spectrum studies of the following species: *Aquila heliaca* (Savigny, 1809), *Buteo rufinus* (Cretzschmar, 1827), and *Athene noctua* (Scopoli, 1769) in the area studied. Over 5000 small mammal specimens, bone and body remains were collected.

The material from the rarest species was deposited in the collection of Dr. VASSIL POPOV (Institute of Zoology, BAS).

Observations and car-kills searching in the whole area investigated were carried out.

The pellets were softened in water to separate the faunal material, and were subsequently conserved and classified.

The small mammal species remains were determined by the morphology of the skull and the pelvis using keys by ПОПОВ, 2003; ГРОМОВ et al., 1963; MACDONALD, BARRET, 1993; СЕРГЕЕВ, ХАРИТОНОВА, 1987; МИНКОВ, КОВАЧЕВ, 1976; ПЕШЕВ, СИМЕОНОВ, КОВАЧЕВ, МИНКОВ, 1970.

The conservation status of the small mammals is considered according to the Bulgarian Biodiversity Act, Bulgarian Red Book, Bern Convention, Directive 92/43/EEC and IUCN Red List 2004.

RESULTS AND DISCUSSION

There were 24 species of small mammals in the Sakar Mountains registered. This species represent a total of 53 % from all the species of small mammals in Bulgaria.

Eleven species Sakar Mountains were recorded for the first time.

Most of the species registered (12 species, 46% from all registered) are included in the Bern Convention, followed by those included in the IUCN Red List (8 species, 31% from all registered). The species protected by the Biodiversity Act in Bulgaria are 7 (27%), 3 of the species are included in Directive 92/43/EEC (12%), and 2 are in the Red Data Book of Bulgaria (8%).

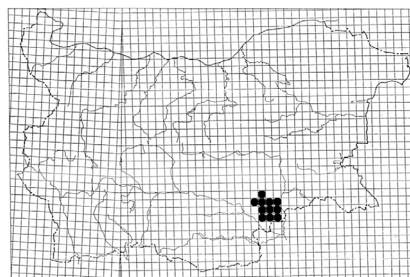
The following 10 species of small mammals registered are without any conservation statute (except *Lepus capensis* Linnaeus, 1758, in the Hunting Act included): *Talpa europaea* Linnaeus, 1758, *Lepus capensis* Linnaeus, 1758, *Apodemus agrarius* (Pallas, 1771), *Sylvaemys sylvaticus* (Linnaeus, 1758), *Sylvaemys flavicollis* (Melchior, 1834), *Rattus norvegicus* (Berkenhout, 1769), *Mus macedonicus* Petrov and Ruzic, 1983, *Mus musculus* Linnaeus, 1758, *Arvicola terrestris* (Linnaeus, 1758), *Microtus arvalis* (Pallas, 1778), – *rossaemeridionalis* Ognev, 1924.

Fourteen rare and threatened species of small mammals were registered, as follows:

1. *Erinaceus concolor* (Martin, 1838)

Conservation status: Biodiversity Act, appl. 3.

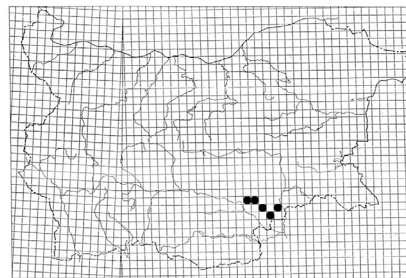
Localities: Levka village (UTM: MG33), Shtit village (UTM: MG43), Sladun village (UTM: MG53), Mladinovo village (UTM: MG34), Dervishka Mogila village (UTM: MG44), Studena village (UTM: MG54), Glavan village (UTM: MG25), Bulgarska Poliana village (UTM: MG35), Mramor village (UTM: MG45), Kapitan Petko Voivoda village (UTM: MG55), Orlov dol village (UTM: MG36).



2. *Sorex minutus* Linnaeus, 1766

Conservation status: Bern Convention, appl. 3.

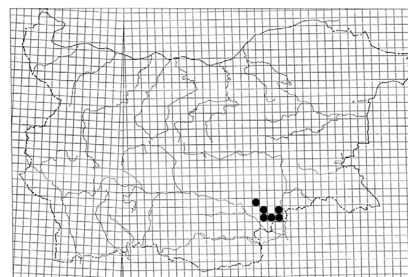
Localities: Ovcharovo village (UTM: MG15), Dripchevo village (UTM: MG34), Studena village (UTM: MG54), Raikova Mogila and Shtit villages (UTM: MG43), Pomoshtnik village (UTM: MG25).



3. *Neomys anomalus* Cabrera, 1907

Conservation status: Bern Convention, appl. 3.

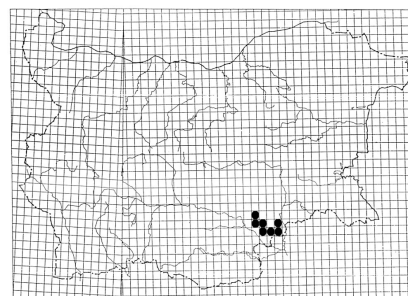
Localities: Pastrogor and Levka villages (UTM: MG33), Sladun village (UTM: MG53), Mladinovo village (UTM: MG34), Studena village (UTM: MG54), Raikova Mogila and Shtit villages (UTM: MG43), Pomoshtnik village (UTM: MG25).



4. *Crocidura leucodon* (Hermann, 1780)

Conservation status: Bern Convention, appl. 3.

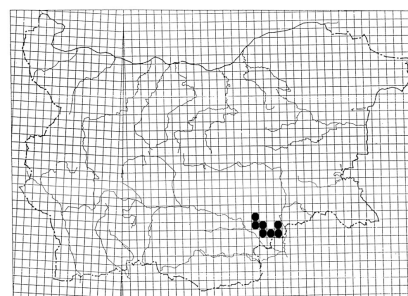
Localities: Levka village (UTM: MG33), Raikova Mogila and Shtit villages (UTM: 43), Sladun village (UTM: MG53), Branica village (UTM: MG24), Mladinovo village (UTM: MG34), Studena village (UTM: MG54), Ovcharovo village (UTM: MG15), Glavan and Pomoshtnik villages (UTM: MG25).



5. *Crocidura suaveolens* (Pallas, 1811)

Conservation status: Bern Convention, appl. 3.

Localities: Levka village (UTM: MG33), Raikova Mogila ad Shtit villages (UTM: 43), Sladun village (UTM: MG53), Branica village (UTM: MG24), Mladinovo village (UTM: MG34), Studena village (UTM: MG54), Ovcharovo village (UTM: MG15), Glavan and Pomoshtnik villages (UTM: MG25).

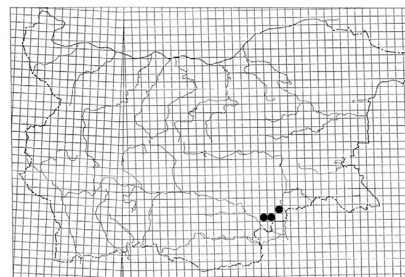


6. *Suncus etruscus* (Savi, 1822)

Conservation status: Biodiversity Act, appl. 3; Bern Convention, appl. 3.

Localities: Pastrogor village (UTM: MG33), Raikova Mogila village (UTM: 43), Studena village (UTM: MG54).

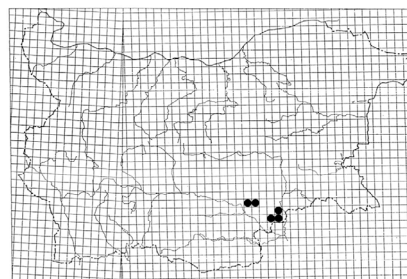
Remark: We also found this species in *Tyto alba*'s pellets in: Dabovo village (Derwent Heights, UTM: MG 87); Trankovo village (Upper Tracia valley, UTM: MG08); Kolena village (Surnena Sredna Gora Mnt., UTM: LH90); West from Pomorie Lake (UTM: NH41).



7. *Spemophilus citellus* (Linnaeus, 1766)

Conservation status: Biodiversity Act, appl. 2; Bern Convention, appl. 2; Directive 92/43/EEC, appl. 2 and 4; IUCN 2004 - vulnerable: A1c.

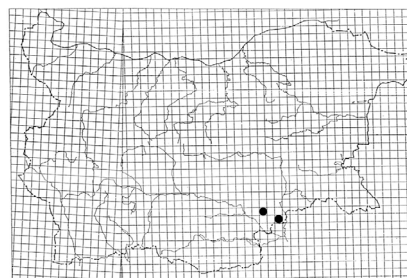
Localities: Svirkovo and Ovcharovo villages (UTM: MG15), Glavan and Pomoshtnik villages (UTM: MG25), Studena village (UTM: MG54), Sladun village (UTM: MG53), Raikova Mogila and Shtit villages (UTM: MG43).



8. *Dryomys nitedula* (Pallas, 1778)

Conservation status: Biodiversity Act, appl. 2; Bern Convention, appl. 3; Directive 92/43/EEC, appl. 4; IUCN 2004 – lower risk, near threatened.

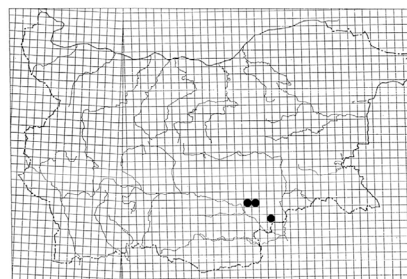
Localities: Sladun village (UTM: MG53), Mladinovo village (UTM: MG34).



9. *Myomimus roachi* (Bate, 1937)

Conservation status: Biodiversity Act, appl. 2 and 3; Bern Convention, appl. 2; Directive 92/43/EEC, appl. 4; IUCN 2004 - vulnerable: D2; Red data Book of Bulgaria-rare.

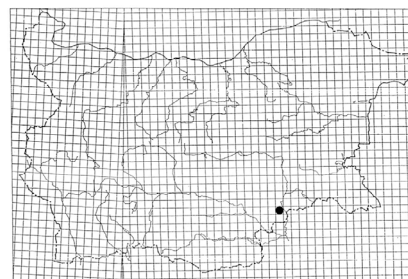
Localities: Ovcharovo village (UTM: MG15), Raikova Mogila village (UTM: MG43), Pomoshtnik village (UTM: MG25).



10. *Glis glis* (Linnaeus, 1766)

Conservation status: Bern Convention, appl. 3; IUCN 2004 - lower risk, near threatened.

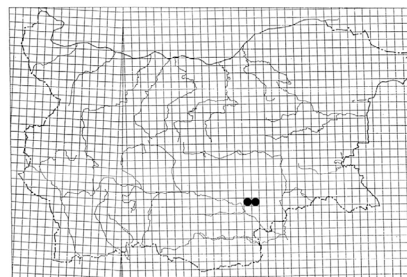
Localities: Studena village (UTM: MG54).



11. *Muscardinus avellanarius* (Linnaeus, 1758)

Conservation status: Biodiversity Act, appl. 2 and 3; Bern Convention, appl. 3; Directive 92/43/EEC, appl. 4; IUCN 2004 - lower risk, near threatened.

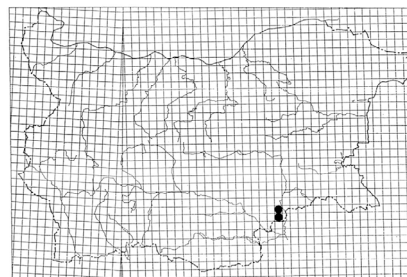
Localities: Ovcharovo village (UTM: MG15), Pomoshtnik village (UTM: MG25).



12. *Micromys minutus* (Pallas, 1771)

Conservation status: IUCN 2004 - lower risk, near threatened.

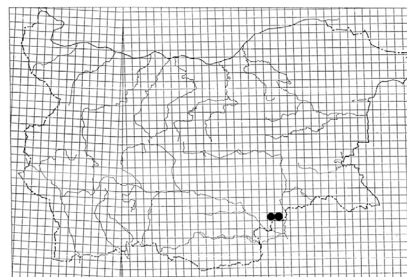
Localities: Sladun village (UTM: MG53), Studena village (UTM: MG54).



13. *Cricetulus migratorius* (Pallas, 1773)

Conservation status: Biodiversity Act, appl. 2 and 3; IUCN 2004 - lower risk, near threatened.; Red data Book of Bulgaria-rare.

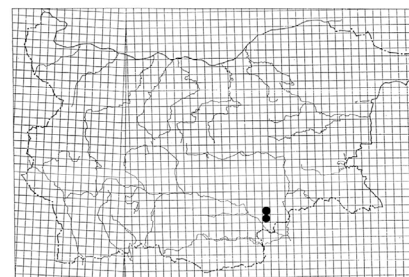
Localities: Sladun village (UTM: MG53), Raikova Mogila and Shtit villages (UTM: MG43).



14. *Nannospalax leucodon* (Nordmann, 1840)

Conservation status: IUCN 2004-vulnerable: D2.

Localities: Levka village (UTM: MG33), Mladinovo village (UTM: MG34).



The high percent of rare and threatened small mammal species (which are extremely sensitive on presence of bio-corridors) is determining the whole Sakar Mountain region as a priority one for a future protection. Migration between Sakar and northern small mammals populations will be ensured using the Tundja and

Maritza rivers as bio-corridors. This is especially important for the rarest species, such as *Suncus etruscus*, *Cricetulus migratorius* and *Myomimus roachi*, occurring in Sredna Gora and Stara Planina Mountains (СИМЕОНОВ, 1962/1963; МАПКОВ, 1974; present publication). According to this data we consider including the studied region in the Natura 2000 network as very important.

CONCLUSIONS

There were 24 species of small mammals in the Sakar Mountains registered. They are 53 % of all the species of small mammals in Bulgaria.

Eleven species are reported for the first time for Sakar Mountain region: *Crocidura leucodon*, *Sorex minutus*, *Neomys anomalus*, *Suncus etruscus*, *Lepus capensis*, *Rattus norvegicus*, *Mus macedonicus*, *Apodemus agrarius*, *Muscardinus avellanarius*, *Micromys minutus*, *Nannospalax leucodon*.

Four species are reported for the first time for the biogeographic sub regions of lower parts of the Maritsa and Tundzha River valleys: *Sorex minutus*, *Suncus etruscus*, *Muscardinus avellanarius*, *Nannospalax leucodon*.

Thirteen of the species were of conservation status. The most of the species registered (46% from all registered) were included in the Bern Convention, followed by these included in the IUCN Red List 2004 (31% from all registered). The species protected by the Law for the Biodiversity in Bulgaria were 27 %, and the species included in Directive 92/43/EEC were 12%, 8% in the Red Book of Bulgaria, and 39% of the species registered were without any conservation status.

The high percentage of rare and threatened small mammal species (which are extremely sensitive on presence of bio-corridors) makes the whole Sakar Mountain region a high priority for future protection and inclusion in the Natura 2000 network.

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**КОНСЕРВАЦИОНЕН СТАТУС НА ДРЕБНИТЕ БОЗАЙНИЦИ
(MAMMALIA: INSECTIVORA, LAGOMORPHA, RODENTIA)
В САКАР ПЛАНИНА (ЮГОИЗТОЧНА БЪЛГАРИЯ)**

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Видовото разнообразие на дребните бозайници в Сакар планина (Югоизточна България) е недостатъчно изучен. До настоящия момент за района са съобщени 12 вида.

Изследването е проведено в следните 11 UTM квадрата: MG33, MG43, MG53, MG34, MG44, MG54, MG15, MG25, MG35, MG55, MG36, през периода 1999-2004 година.

Експедициите са финансирани главно от проекти изпълнявани от СНЦ „Зелени Балкани“, като финалните проучвания са част от инвентаризирането на биоразнообразието във връзка с изготвяне на Европейската екологична мрежа Natura 2000 в България.

Основно видовете дребни бозайници са установявани чрез анализ съдържанието на погадки от *Tyto alba* (Scopoli, 1769) – над 1300 броя. Изследван е хранителният спектър и на други видове дневни и нощни грабливи птици, събирани са убити от автомобили по пътищата екземпляри, а малко на брой са улавяни с живоловни капани и след определяне, са връщани в природата.

Материалът от най-редките видове е предоставен за съхранение на Д-р ВАСИЛ ПОПОВ (Институт по Зоология, БАН). Видовете са определяни по морфологията на тялото, а при наличие на костни хранителни остатъци, по тази на черепа и тазовата кост.

Установени са общо 24 вида дребни бозайници. Те са 53% от всички установени дребни бозайници в България.

За пръв път за Сакар планина се съобщават 11 вида, а за Долномаришко-Долнотунджанския подрайон на Южнобългарския биогеографски район 4 вида.

Най голям процент от установените видове са тези, включени в Бернската конвенция (46% от всички установени), следвани от тези в списъка на IUCN 2004 (31%), Закон за Биологичното Разнообразие (27%), Директива 92/43/ЕЕС (12%) и Червена кника на България (8%). Регистрираните видове без консервационен статус са 39% от всички установени в района.

Високият процент на редки и застрашени видове дребни бозайници, които са особено чувствителни към наличието на биокоридори, обуславя целия район на Сакар планина като приоритетен за защита и неговото включване в мрежата Natura 2000 е наложително.

