TERRESTRIAL VERTEBRATE FAUNA OF THE LANDSCAPE RESERVE „LA CASTEL” FROM THE NORTHERN PART OF THE REPUBLIC OF MOLDOVA

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Abstract. The studies were performed in the period 2015-2021 in various ecosystems of the Landscape Reserve „La Castel” from the northern part of the Republic of Moldova. The amphibian are represented by 11 species of the orders Urodela and Anura. Among reptiles 8 species from two orders have been identified: Testudines with one species and Squamata with 7 species. 11 species of herpetofauna are listed in the Red Book of Moldova. The ornithofauna was represented by over 120 species and is dominated by the silvicolous species. Four bird species are listed in the Red Book of Moldova. The mammal fauna includes 45 species, of which 13 are listed in the Red Book of Moldova. A large maternity colony of *Myotis blythii* was monitored during the last years. The Reserve „La Castel” represent an important scientific site and the studies will continue.

Introduction

The Landscape reserve „La Castel” is located in Edineț district from the northern part of the Republic of Moldova, at 75 km north-west from Bălți city within the limits of northern Moldavian plateau. The La Castel gorge is placed above the Racovăț river valley, near the village of Gordinești and is represented by a wide variety of ecosystems of exceptional beauty. On the territory, the emergence of the Toltric calcar with the fossil remains of the fauna was noted and it is a monument of the culture of primitive man. This wonder of nature was formed due to the multimillion years deposits from ancient times. There are only few data on fauna from this spectacular area, where the presence of 17 species of herpetofauna, 126 bird species and 26 mammal species are mentioned [1]. In addition, information about some mammal species (shrews, bats, rodents) occurring in the area can be found in several publications [2, 3].

The aim of the work was the study of terrestrial vertebrate diversity in the area, the biotopic distribution of the species and revealing of status of the species occurring in the reserve.

Materials and methods

The studies were performed in the period 2015-2021 in various ecosystems of the Landscape Reserve „La Castel” from the northern part of the Republic of Moldova. The reserve has a surface of 746 ha, is located in the landscape region of plateaus and forest-steppe plateau of northern Moldova and belong to the lower course of the Racovăț river basin. The area is situated along Racovăț river valley, is 200 m wide strip with a length of 5 km on the left bank of the river. The main types of ecosystems are the forests, dominated by oak and European hornbeam, steppes, meadows, rocky and river ecosystems. The maximum altitude is 261 m a.s.l., mean altitudes 150-200 m and the slope incline limits vary between 5°-30° [1].

The diversity and distribution of the herpetofauna in the studied ecosystems were estimated

by the method of counting routes and fixed plots. The surface of the fixed plots was of 100-2500 m², the length of the counting routes varied from 0.1 - 3 km. The qualitative and quantitative structure of the bird communities during nesting and migration was elucidated by counting on routes with a length of 2-10 km. In the mammal fauna research the following methods were used: visual observation, trapping and identification from prey bird pellets (small mammals), counting in underground shelters and identification with the ultrasound detector (bats), counting on routes with a length of 1-10 km for large and medium-sized mammals (lagomorphs, carnivores, ungulates).

Results and discussions

The high diversity of biotopes and of the vegetation favored the existence of a rich fauna of terrestrial vertebrate species. The amphibian are represented by 11 species of the orders Urodela and Anura, of which 8 are included in the Red Book of Moldova [4] (tab. 1). Amphibian species have been observed in humid biotopes and near Racovăț river, where they find favorable trophic and reproductive conditions. Among 11 species registered in the area, 8 are included in the Red Book of Moldova [4], and at European level all species are protected, being listed in Annex II (strictly protected animal species) and Annex III (protected animal species) of the Bern Convention (tab. 1).

Table 1. Diversity and distribution of amphibian and reptile species in the ecosystems of the reserve

No	Species	Ecosystem					Status	
		Forest	Forest edge	Riparian	Meadow	Rocky	RBM	Bern Conv.
Amphibia								
1	Triturus cristatus	+	-	+	-	-	VU	Ann. II
2	Triturus vulgaris	+	-	+	-	-	VU	Ann. II
3	Bufo bufo	+	+	+	-	-	VU	Ann. III
4	Bufo viridis	-	+	+	+	+	-	Ann. II
5	Bombina bombina	-	-	+	-	-	VU	Ann. III
6	Rana dalmatina	+	+	+	-	-	VU	Ann. II
7	Rana temporaria	+	-	-	-	-	VU	Ann. II
8	Pelophylax ridibundus	-	-	+	-	-	-	Ann. III
9	Pelophylax esculentus	+	-	+	-	-	-	Ann. III
10	Hyla arborea	+	+	+	+	-	VU	Ann. II
11	Pelobates fuscus	-	+	+	-	+	CR	Ann. II
Reptilia								
12	Emys orbicularis	-	-	+	-	-	EN	Ann. II
13	Anguis fragilis	+	+	+	-	-	-	Ann. III
14	Lacerta viridis	+	+	+	-	+	-	Ann. II

15	<i>Lacerta agilis</i>	-	+	+	+	+	-	Ann. II
16	<i>Natrix natrix</i>	+	+	+	-	+	-	Ann. III
17	<i>Natrix tessellata</i>	-	-	+	-	-	-	Ann. II
18	<i>Coronella austriaca</i>	-	+	-	+	-	EN	Ann. II
19	<i>Vipera berus</i>	+	+	-	-	-	EN	Ann. III

RBM – Red Book of R.Moldova, VU – vulnerable, EN – endangered, CR – critically endangered

Among reptiles 8 species from two orders have been identified: Testudines with one species and Squamata with 7 species (tab. 1). The rare species of snakes *C. austriaca* and *V. berus* are forest species and have been observed mainly in the forest glades and at forest edge. In the Red Book of Moldova 3 species of reptiles out of the 8 reported in the area are listed and at European level all species are listed in Annex II and Annex III of the Bern Convention.

The ornithofauna from the area was represented by over 120 species and is dominated by the silvicolous species, due to the presence of natural forest ecosystems, formed by trees of 60-100 years old [1]. Among the forest nesting passerine bird species there can be mentioned *Cuculus canorus*, *Caprimulgus europaeus*, *Dendrocopos major*, *D. minor*, *D. medius*, *D. syriacus*, *Dryocopus martius*, *Picus canus*, *Jynx torquilla*, *Lullula arborea*, *Anthus trivialis*, *Oriolus oriolus*, *Garrulus glandarius*, *Hippolais icterina*, *S. borin*, *Phylloscopus trochilus*, *Ph. collybita*, *Ph. sibilatrix*, *Ficedula hipoleuca*, *Phoenicurus phoenicurus*, *Erithacus rubecula*, *Luscinia luscinia*, *Turdus merula*, *T. philomelos*, *Cyanistes caeruleus*, *Parus major*, *Aegialos caudatus*, *Sitta europaea*, *Certhia familiaris*, *Fringilla coelebs*, *Coccothraustes coccothraustes*, *Carduelis chloris*, *C. carduelis* etc.

At forest edge and in open type biotopes with shrub vegetation the following species were registered: *Phasianus colchicus*, *Columba palumbus*, *Streptopelia turtur*, *Merops apiaster*, *Upupa epops*, *Galerida cristata*, *Alauda arvensis*, *Hirundo rustica*, *Delicon urbica*, *Anthus campestris*, *Lanius collurio*, *L. excubitor*, *Sturnus vulgaris*, *Pica pica*, *Corvus frugilegus*, *C. corone cornix*, *C. corax*, *Sylvia nisoria*, *S. communis*, *Phoenicurus ochruros*, *Passer domesticus*, *P. montanus*, *Miliaria calandra*, *Emberiza citrinella*, *E. calandra*, *E. hortulana*, *Motacilla alba* etc.

In a cavity of the rocky slope in May-June period, a nest of *C. corax* was observed and the birds became very anxious when we approached nearby. In the same rocky habitat two pairs of *Oenanthe oenanthe* were registered. Near the river two individuals of *Ciconia ciconia* were observed, the nest of which was recorded in the nearest Hordinești village (fig. 1). In the riverine biotopes after the nesting period, in July, the species *Ardea alba* and *Ardea cinerea* were registered.

Figure 1. Nest of *Ciconia ciconia* with two baby birds in Hordinești village, June, 2020

The prey bird species observed during the study years were *Milvus migrans*, *Accipiter gentilis*, *A. nisus*, *Buteo buteo*, *Falco tinnunculus*, *Otus scops*, *Athene noctua*, *Strix aluco*, *Asio otus*. A nest of *A. noctua* was found in a cavity of the rocky slope above the entrance in the stone mine. Four bird species are listed in the Red Book of Moldova – *A. alba* [EN], *C. ciconia* [VU], *M. migrans* [VU], *D. medius* [VU] [4].

The mammal fauna is rather diverse in the reserve and includes 45 species – one hedgehog species, 5 species of Soricomorpha, 11 bat species, 17 rodent species, one hare species, 8 carnivorous species and 2 artiodactyl species (tab. 2).

The common and eurytopic species such as the hedgehog, the mole, the mole-rat, the wood mouse, the yellow-necked mouse, the fox are rather frequent and widespread in the reserve with a frequency of 43%-100% and characteristic or constant ecological significance ($W_a = 7,4\% - 38\%$) in the studied ecosystems. The shrew fauna is represented by 4 species (*Sorex araneus*, *S. minutus*, *Crocidura leucodon* and *C. suaveolens*) of which the white-toothed shrew is a vulnerable species, listed in the Red Book of Moldova [4].

Table 1. Diversity and distribution of amphibian and reptile species in the ecosystems of the reserve

No	Species	Ecosystem					Status	
		Forest	Forest edge	Riparian	Meadow	Rocky	RBM	Bern Conv.
1	Erinaceomorpha							
2	Erinaceus roumanicus	+	+	-	+	+	-	-
3	Soricomorpha							
4	Talpa europaea	+	+	+	+	+	-	Ann. III
5	Sorex araneus	+	+	+	-	-	-	Ann. III
6	Sorex minutus	+	+	+	-	-	-	Ann. III
7	Crocidura leucodon	-	+	+	+	+	VU	Ann. III

8	<i>Crocidura suaveolens</i>	-	+	+	+	+	-	Ann. III
9	Chiroptera							
10	<i>Rhinolophus hipposideros</i>	+	+	-	+	-	EN	Ann. II
11	<i>Myotis blythii</i>	-	+	-	+	+	VU	Ann. II
12	<i>Myotis daubentonii</i>	-	+	+	-	-	VU	Ann. II
13	<i>M. dasycneme</i>	-	-	+	-	-	EN	Ann. II
14	<i>M. mystacinus</i>	-	-	-	-	+	EN	Ann. II
15	<i>Nyctalus noctula</i>	+	+	+	+	+	-	Ann. II
16	<i>Pipistrellus pipistrellus</i>	-	+	-	+	+	-	Ann. III
17	<i>Pipistrellus pygmaeus</i>	+	+	-	+	-	-	Ann. II
18	<i>Eptesicus serotinus</i>	-	+	+	+	+	-	Ann. II
19	<i>Plecotus austriacus</i>	-	+	-	+	+	VU	Ann. II
20	<i>Plecotus auritus</i>	+	+	-	-	-	EN	Ann. II
21	Rodentia							
22	<i>Sciurus vulgaris</i>	+	+	-	-	-	-	Ann. III
23	<i>Spermophilus suslicus</i>	-	-	-	+	-	VU	Ann. II
24	<i>Myoxus glis</i>	+	-	-	-	-	VU	Ann. III
25	<i>Dryomys nitedula</i>	+	+	-	-	-	-	Ann. III
26	<i>Muscardinus avellanarius</i>	+	+	-	-	-	-	Ann. III
27	<i>Nannospalax leucodon</i>	-	+	+	+	+	-	-
28	<i>Ondatra zibethicus</i>	-	-	+	-	-	-	-
29	<i>Arvicola terrestris</i>	-	-	+	-	-	-	-
30	<i>M. spicilegus</i>	-	+	-	+	+	-	-
31	<i>Apodemus sylvaticus</i>	+	+	+	+	+	-	-
32	<i>Apodemus uralensis</i>	-	+	-	+	+	-	-
33	<i>Apodemus flavicollis</i>	+	+	-	-	+	-	-
34	<i>Apodemus agrarius</i>	-	+	+	-	+	-	-
35	<i>Microtus arvalis</i>	-	-	-	+	+	-	-
36	<i>M. rossiaemeridionalis</i>	-	+	+	-	+	-	-
37	<i>Microtus subterraneus</i>	+	-	-	-	-	-	-
38	<i>Clethrionomys glareolus</i>	+	+	-	-	-	-	-
39	Lagomorpha							
40	<i>Lepus europaeus</i>	-	+	-	-	+	-	Ann. III
41	Carnivora							
42	<i>Felis sylvestris</i>	+	+	-	-	-	VU	Ann. II
43	<i>Lutra lutra</i>	-	-	+	-	-	VU	Ann. II
44	<i>Mustela nivalis</i>	+	+	-	-	-	-	Ann. III
45	<i>Mustela putorius</i>	+	+	-	+	+	-	Ann. III
46	<i>Martes martes</i>	+	-	-	-	-	VU	Ann. III

47	<i>Martes foina</i>	+	-	-	-	-	-	Ann. III
48	<i>Meles meles</i>	+	-	-	-	-	-	Ann. III
49	<i>Vulpes vulpes</i>	+	+	-	+	+	-	-
50	<i>Artiodactyla</i>							
51	<i>Capreolus capreolus</i>	+	+	-	-	-	-	Ann. III
52	<i>Sus scofa</i>	+	-	-	-	+	-	-

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The bat fauna is represented by 11 species, of which 7 species (*Rhinolophus hipposideros*, *M. blythii*, *M. daubentonii*, *M. dasycneme*, *M. mystacinus*, *Plecotus austriacus*, *P. auritus*) were registered in Hordinești limestone mines and 4 species (*Nyctalus noctula*, *Pipistrellus pipistrellus*, *P. pygmaeus*, *Eptesicus serotinus*) were reregistered with the ultrasound detector in the evening period.

In the hibernation period in the mines all 7 species of bats were observed, but their diversity varied in different years. Thus, in February 2015 and in April 2018 five species were registered, in April 2021 – four species and in summer period 3-4 species were registered.

In the study years the abundance of the species *M. blythii* was the highest and varied between 88,58% și 98,45%, except 2015, when the species *M. daubentoni* was dominant with 84,62%. For the whole period the most abundant was *M. blythii* with almost 90%, followed by *M. daubentoni* with about 10%, while other species had less than 1%.

In the reproductive period, a large maternity colony of *M. blythii* was found and monitored since 2017 (fig. 2). Each year the number of individuals in colony was growing and this is the largest known colony of this species in the Republic of Moldova. This site is of particular interest and importance for bat conservation.

Figure 2. Maternity colony of *M. blythii* with about 400 pregnant females, may 2019

The arboreal rodents – the dormouse species and the squirrel were recorded in the forest habitats and at forest edge. A colony of *S. siuslicus* was recorded in the pasture situated at the northern limit of the reserve with the coordinates 48.165 N, 28.148 E. The colony number was estimated at about 40-50 individuals.

The semiaquatic species *Arvicola terrestris* and *Ondatra zibethicus* were registered only near the Racovăț river. The small rodent fauna was represented by 9 species of genera *Mus*, *Apodemus*, *Microtus*, *Clethrionomys* with characteristic and constant ecological significance ($W_a = 6.8-32\%$), except *M. subterraneus* which is more rare than other rodent species.

The diversity of biotopes and the abundant trophic resources (rodents, birds) create favorable conditions for the existence and prosperity of many species of carnivorous mammals, which are represented in the area of 8 species (tab. 2). The wild cat (*F. silvestris*), the otter (*L. lutra*) and the wood marten (*M. martes*) are included in the Red Book of Moldova as vulnerable species [4].

The artiodactyl mammals are represented by two species: the roe deer (*C. capreolus*) and the wild boar (*S. scrofa*), which mainly populate forest ecosystems, but can be observed in the adjacent sectors in search for food, especially in the second half of the year.

The picturesque landscape, the specific rocky relief, the variety of natural ecosystems, the abundance and diversity of flora and fauna of the Landscape Reserve “La Castel” represent an important tourist attraction and an area of great significance for scientific research.

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Bibliography

1. Andreev A., Bezman-Moseiko O., Bondarenco A., Budzhak V., Cherevatov V., Chiornei I., Derjanschi V., Ghendov V., Jurminschi S., Izverskaia T., Kotomina L., Kovalenco D., Mantorov O., Medvedenco D., Munteanu A., Redcozubov O., Romanciuc A., Rusciuc A., Rusciuc V., Sîrodoev Gh., Şabanova G., Skilskyi I., Sotnikov V., Şubernetki O., Talmaci I., Tişenkov A., Tişenkova V., Ţurcan V. Registrul zonelor nucleu ale Reţelei Ecologice Naţionale a Republicii Moldova. BIOTICA, 2012, p. 89-91.
2. Nistoreanu V., Caldari V., Larion A., Postolachi V. Preliminary data on bat species hibernating in Cupcini and Hordineşti stone quarries from the northern zone of the Republic of Moldova. Marisia. Studii şi Materiale, Ştiinţele Naturii. 2016, Vol. XXXVI, 77-83.
3. Nistoreanu V., Larion A., Postolachi V. Date preliminare privind dieta unor păsări răpitoare nocturne (Aves: Strigidae) în zona de nord a Republicii Moldova. Agricultura durabilă în Republica Moldova: provocări actuale şi perspective : Culegere de articole ştiinţifice, Filiala Bălţi a Acad. de Ştiinţe a Moldovei. Bălţi: Indigou Color, 2017, p. 356-360.
4. Red Book of the Republic of Moldova, IIIrd ed. Chişinău „Ştiinţa”, 2015, p. 235-350.