

OCCURRENCE, THREATS AND SUGGESTION FOR THE PROTECTION  
OF AMPHIBIANS, REPTILES AND BIRDS ON THE TERRITORY  
OF THE SOLSKA FOREST (SANDOMIERSKA VALLEY)

*Przemysław Stachyra*<sup>1</sup>, *Mirosław Tchórzewski*<sup>2</sup>, *Tomasz Kobylas*<sup>3</sup>,  
*Paweł Marczałkowski*<sup>2</sup>

<sup>1</sup> Department of Zoology, University of Agriculture

Akademicka 13 str., 20-950 Lublin, e-mail: przemekstachyra@wp.pl

<sup>2</sup> Roztocze National Park, Plażowa 2 str., 22-470 Zwierzyniec, e-mail: mirtch@wp.pl

<sup>3</sup> Oboźna 19/8 str., 22-400 Zamość, e-mail: tomaszkobylas@wp.pl

<sup>2</sup> Roztocze National Park, Plażowa 3 str., 22-470 Zwierzyniec, e-mail: pawelmarcz@wp.pl

**Summary:** The present paper describes results of observations on amphibians, reptiles and birds from the Solska Forest (located in the voivodeships of Lublin and Podkarpacie, SE Poland) in 1993-2002. Fourteen species of amphibians (e.g., Spotted Salamander, Crested Newt, Natterjack), 7 species of reptiles (e.g., European Pond Turtle and Smooth Snake) and 209 species of birds (e.g., Black Stork, Ferruginous Duck, White-tailed Eagle, Short Toed Eagle, Lesser Spotted Eagle, Corn-crake, Eagle Owl, Ural Owl, Tengmalm's Owl, Nightjar, Roller, Bluethroat) were found in the territory of the Solska Forest. This paper presents possible threats to the above groups of vertebrates. Suggestions for their protection are also given. The Solska Forest is one of the most important areas for the amphibians, reptiles and birds in Poland and should be protected as a national park.

**Key words:** Solska Forest, amphibians, reptiles, birds, national park

## INTRODUCTION

The first, fragmentary information on the Solska Forest, mainly on amphibians, reptiles and birds, dates from the first half of the twentieth century [5, 6, 23, 20]. Another report [19], scientific documentation used as a basis for the creating of the Solska Forest Landscape Park, also gives a general description of fauna in this area. The avifauna of the Solska Forest as well as its amphibian and reptile fauna were most precisely described in the 1990's [15, 12, 21, 22, unpublished materials]. This last research documented a wealth of vertebrate species, and in

particular, the occurrence of rare, endangered and vanishing species. Furthermore, Amphibians, Reptiles and Birds are good bio-indicators of the value of the natural environment and changes taking place in it.

#### SITE OF THE RESEARCH

The Solska Forest is a vast forest complex with an area of about 70 hectares in the macro-region of the Sandomierska Valley (located in the voivodeships of Lublin and Podkarpacie) [13]. It borders Janów Forests, in the north and the Roztocze in the east, while its southern border is formed by the valleys of the Wirowa and Tanew rivers. Most of the area consists of pine forests with a wide variety of habitats, including transitional and high peat-bogs characteristic of this area. Fir and spruce forests, alder swamps and beech woods constitute a smaller portion of the tree stand. The main rivers are the Tanew, Wirowa, Sopot and Łada and their tributaries, by which several fish pond complexes are located (in Ruda Różaniecka, Chmielek and Podlas, among others).

#### RESEARCH METHODS

Ornithological research was done in the Solska Forest from 1993 to 2002. Field observations lasting from one to three days were taken at various times over an entire year (mainly from March to October). During the research, all species of birds found were recorded. To estimate population size of some species the methods presented in the literature were used [2, 7, 8] as well as those described in instructions by Zieliński [24] and Konieczny [14].

Observations of herpetofauna were taken from 1997 to 2002 and supplemented with some information from previous years. All rare and endangered species of amphibians were noted, as well as larger populations of more numerous species. In the case of reptiles, all sightings of each encountered species were noted.

#### RESULTS

A considerable variety of the environment in the Solska Forest and its large area make it one of the most valuable fauna refuges in Poland.

Up to now, 14 species of amphibians (78% of Poland's amphibian fauna) have been found in the Forest (Tab. 1). Among the most valuable species there are *Salamandra salamandra* (1 site), *Triturus cristatus*, *Bufo calamita* (4 sites)

and *Pelobates fuscus*. Among the nine species of the reptiles occurring in Poland, seven were found in the Solska Forest (78% of Poland's herpetofauna) (Tab. 1). The most valuable of these are *Emys orbicularis* (2 sites), *Coronella austriaca* (2 sites) and *Vipera berus*. This places the Solska Forest among the most important refuges of amphibians and reptiles in Poland, with greater variety of herpetofauna than in the Janów Forests and the Roztocze National Park and others [3, 17].

Table 1. Amphibians and Reptiles of the Solska Forest

Species	Occurrence status	Protection status
<i>AMPHIBIA</i>		
<i>S. salamandra</i> Linnaeus, 1758 Spotted Salamandra	+	
<i>T. cristatus</i> (Laurenti, 1768) Crested Newt	+	II, IV/NT
<i>T. vulgaris</i> (Linnaeus, 1758) Smooth Newt	++	
<i>B. bombina</i> (Linnaeus, 1758) Fire Bellied Toad	+++	II, IV
<i>P. fuscus</i> (Laurenti, 1768) Common Spade Foot	++	IV
<i>B. bufo</i> (Linnaeus, 1758) Common European Toad	+++	
<i>B. viridis</i> (Laurenti, 1768) Green Toad	+	IV
<i>B. calamita</i> (Laurenti, 1768) Natterjack	+	IV
<i>H. arborea</i> (Linnaeus, 1758) European Tree Frog	+++	IV
<i>R. lessonae</i> Camerano, 1882 Pond Frog	+++	IV
<i>R. ridibunda</i> Pallas, 1771 Marsh Frog	+	
<i>R. esculenta</i> Linnaeus, 1758 Edible Frog	+++	
<i>R. temporaria</i> Linnaeus, 1758 Grass Frog	+++	
<i>R. arvalis</i> Nilsson, 1842 Field Frog	+++	IV
<i>REPTILIA</i>		
<i>E. orbicularis</i> (Linnaeus, 1758) European Pond Turtle	+	II, IV/EN
<i>A. fragilis</i> Linnaeus, 1758 Slow Worm	++	
<i>L. agilis</i> Linnaeus, 1758 Sand Lizard	++	IV
<i>L. vivipara</i> Jaquin, 1787 Viviparous Lizard	+++	
<i>N. natrix</i> (Linnaeus, 1758) Ringed Snake	++	
<i>C. austriaca</i> Laurenti, 1768 Smooth Snake	+	IV/VU
<i>V. berus</i> (Linnaeus, 1758) Common Viper	++	

Occurrence status:

- +++ – numerous species,
- ++ – not numerous species,
- +

– rare species.

Protection status: – according to European Ecological Network NATURA 2000 [16]

II, IV – species from II and IV of Habitat Directive, – according to the Polish Red Data Book of Animals [9] EN – endangered species, VU – vulnerable species, NT – near threatened species

The avifauna of the Solska Forest amounts to 209 species (about 50% of Poland's avifauna), including 158 breeding species and probable breeding species. Three globally endangered species (*Aythya nyroca*, *Crex crex*, *Acrocephalus paludicola*), one species close to endangerment (*Haliaeetus albicilla*) and 107 with a lower protection status (Tab. 2) (endangered in Europe, on the SPEC List and in the Polish Red Data Book of Animals) were noted [1, 9, 10].

**Table 2.** Number of some species of breeding birds on Solska Forest

Species	Number (pairs/territories)	Protection status
<i>P. cristatus</i> (Linnaeus, 1758) Great Crested Grebe	20-22	
<i>P. griseogena</i> (Boddaert, 1783) Red-necked Grebe	4-5	
<i>B. stellaris</i> (Linnaeus, 1758) Bittern	6-7	PCKZ/DP/SPEC
<i>I. minutus</i> (Linnaeus, 1766) Little Bittern	2	PCKZ/DP/SPEC
<i>C. nigra</i> (Linnaeus, 1758) Black Stork	c. 15	DP/SPEC
<i>P. apivorus</i> (Linnaeus, 1758) Honey Buzzard	c. 20	DP/SPEC
<i>M. migrans</i> (Bodd., 1783) Black Kite	1-2	PCKZ/DP/SPEC
<i>H. albicilla</i> (Linnaeus, 1758) White-tailed Eagle	2	GT/PCKZ/DP/SPEC
<i>C. gallicus</i> (Gmellin, 1788) Short-toed Eagle	1	PCKZ/DP/SPEC
<i>C. aeruginosus</i> (Linnaeus, 1758) Marsh Harrier	c. 15	DP/SPEC
<i>C. pygargus</i> (Linnaeus, 1758) Montagu's Harrier	1-2	DP/SPEC
<i>A. pomarina</i> C.L. Brehm, 1831 Lesser Spotted Eagle	20-25	PCKZ/DP/SPEC
<i>F. tinnunculus</i> Linnaeus, 1758 Kestrel	c. 15	SPEC
<i>F. subbuteo</i> Linnaeus, 1758 Hobby	c. 15	
<i>B. bonasia</i> (Linnaeus, 1758) Hazel Grouse	c. 5-6	DP
<i>T. tetrix</i> (Linnaeus, 1758) Black Grouse	c. 10	PCKZ/DP/SPEC
<i>T. urogallus</i> (Linnaeus, 1758) Capercaillie	c. 50	PCKZ/DP
<i>C. coturnix</i> (Linnaeus, 1758) Quail	30-40	SPEC
<i>P. porzana</i> (Linnaeus, 1766) Spotted Crake	c. 10	DP/SPEC
<i>C. crex</i> (Linnaeus, 1758) Corncrake	80-100	GT/DP/SPEC
<i>G. grus</i> (Linnaeus, 1758) Common Crane	c. 30	DP
<i>G. gallinago</i> (Linnaeus, 1758) Common Snipe	35-40	
<i>T. ochropus</i> Linnaeus, 1758 Green Sandpiper	30-40	
<i>C. oenas</i> Linnaeus, 1758 Stock Dove	10-20	SPEC
<i>T. alba</i> (Scopoli, 1769) Barn Owl	1	SPEC
<i>B. bubo</i> (Linnaeus, 1758) Eagle Owl	1	PCKZ/DP/SPEC
<i>S. uralensis</i> Pallas, 1771 Ural Owl	5	PCKZ
<i>A. funereus</i> (Linnaeus, 1758) Tengmalm's Owl	7	PCKZ/DP
<i>A. alpestris</i> (Linnaeus, 1758) Kingfisher	10-20	DP/SPEC
<i>C. garrulus</i> Linnaeus, 1758 Roller	1?	PCKZ/DP/SPEC
<i>P. viridis</i> Linnaeus, 1758 Green Woodpecker	c. 20	SPEC
<i>P. canus</i> Gmellin, 1788 Grey-headed Woodpecker	4-5	DP/SPEC
<i>D. martius</i> (Linnaeus, 1758) Black Woodpecker	c. 30	DP
<i>R. riparia</i> (Linnaeus, 1758) Sand Martin	129	SPEC
<i>A. campestris</i> (Linnaeus, 1758) Tawny Pipit	5	DP/SPEC
<i>M. cinerea</i> (Tunstad, 1771) Grey Wagtail	16-18	
<i>L. svecica</i> (Linnaeus, 1758)	1	PCKZ/DP
<i>S. torquata</i> (Linnaeus, 1766) Bluethroat Stonechat	10-15	SPEC
<i>S. nisoria</i> (Bechstein, 1785) Barred Warbler	c. 20	DP/SPEC
<i>F. parva</i> (Bechstein, 1794) Red-breasted Flycatcher	min. 1	DP
<i>L. excubitor</i> Linnaeus, 1758 Great Grey Shrike	c. 20	SPEC
<i>N. caryocatactes</i> (Linnaeus, 1758) Nutcracker	6-7	
<i>E. hortulana</i> Linnaeus, 1758 Ortolan Bunting	c. 10	DP/SPEC

Protection status: – GT – globally threatened species [10], – PCKZ – species from Polish Red Data Book of Animals [9], – DP – species from First Encluse of Birds Directive [18], – SPEC – species from SPEC List [1].

Hence, the Forest studied is one of the most important bird refuges in the country included in the NATURA 2000 register and with a status of an European refuge [11]. Breeding species such as *Cicinia nigra*, *Milvus migrans*, *Haliaeetus albicilla*, *Aquila pomarina*, *Circaetus gallicus*, *Tetrao urogallus*, *Tetrao tetrix*, *Bonasa bonasia*, *Grus grus*, *Porzana parva*, *Porzana porzana*, *Crex crex*, *Bubo bubo*, *Strix uralensis*, *Aegolius funereus*, *Caprimulgus europaeus*, *Anthus campestris*, *Motacilla cinerea* and *Nucifraga caryocatactes* are particularly worth noting.

The main threats to groups of animals are as follows: a planned decrease of the area of over 80-years-old forests; improvement of the infrastructure making logging and transportation of wood from the forest more efficient (including drainage of the forest land); intensive farming on the land adjacent to the Forest (drainage, fertilization, pesticide use, haymaking). Other threats to the fauna of the Solska Forest include intensive fish farming (mowing and burning of rushes); wildlife management; poaching; increasing road traffic and tourism. For this reason it is necessary to work out the best means of protecting species and their habitats in cooperation with administrative authorities of this area to limit harvesting of old growth forests; maintaining water retention in humid and marshy coniferous forests and alder swamps, to leave land not used for agriculture to the natural process of succession, to conduct extensive, rather than intensive, haymaking and to limit the use of plant protection substances.

#### CONCLUSION

The abundance of flora and fauna of the Solska Forest and diversity of its environment (in many ways exceeding the richness of the fauna in the Roztocze National Park) are arguments for the protection of the most valuable areas (currently located within the Solska Forest Landscape Park) by the creation of a national park. It should also be emphasized that the *Development Plan for the Lublin Voivodeship* [4] suggests that the Solska Forest together with the Roztocze Region should be a biosphere reserve.

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WYSTĘPOWANIE, ZAGROŻENIA ORAZ PROPOZYCJE OCHRONY  
PŁAZÓW, GADÓW I PTAKÓW PUSZCZY SOLSKIEJ  
(KOTLINA SANDOMIERSKA)

*Przemysław Stachyra<sup>1</sup>, Mirosław Tchórzewski<sup>2</sup>, Tomasz Kobylas<sup>3</sup>,  
Paweł Marczakowski<sup>2</sup>*

<sup>1</sup>Katedra Zoologii, Akademia Rolnicza

ul. Akademicka 13, 20-950 Lublin, e-mail: przemekstachyra@wp.pl

<sup>2</sup>Roztoczański Park Narodowy, ul. Płażowa 2, 22-470 Zwierzyniec, e-mail: mirtch@wp.pl

<sup>3</sup>ul. Oboźna 19/8, 22-400 Zamość, e-mail: tomaszkobylas@wp.pl

<sup>2</sup>Roztoczański Park Narodowy, ul. Płażowa 3, 22-470 Zwierzyniec, e-mail: pawelmarcz@wp.pl

**Streszczenie:** W pracy przedstawiono ogólną charakterystykę występowania oraz zagrożenia i wstępne postulaty ochrony płazów, gadów i ptaków Puszczy Solskiej (Kotlina Sandomierska). Na badanym terenie stwierdzono 14 gatunków płazów, 9 gatunków gadów oraz 209 gatunków ptaków – w tym wiele gatunków rzadkich, zagrożonych i ginących. Puszcza Solska jest przeto jedną z najważniejszych polskich ostoi tych zwierząt, co jest ważnym argumentem za utworzeniem na tym terenie parku narodowego. Głównymi zagrożeniami dla wymienionych grup zwierząt są m.in.: intensywna gospodarka leśna, odwadnianie terenów podmokłych, gospodarka łowiecka, kłusownictwo, nasilający się ruch motoryzacyjny i turystyczny oraz intensywna gospodarka rolna na terenach przylegających do Puszczy.

**Słowa kluczowe:** Puszcza Solska, płazy, gady, ptaki, park narodowy

