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## THE BAT FAUNA (MAMMALIA, CHIROPTERA) OF STARY ZHADEN ZAKAZNIK, SOUTHERN BELARUS

Valery Dombrovski<sup>1</sup>, Viktor Fenchuk<sup>2</sup>, Dzmitry Zhurauliou<sup>1</sup>

<sup>1</sup> Institute of Zoology, National Academy of Sciences of Belarus, Akademichnaia St. 27, 220072, Minsk, Belarus; valdombr@rambler.ru

<sup>2</sup> APB-BirdLife Belarus, Parnikovaya St. 11, office 4, 220114 Minsk, Belarus

**The bat fauna (Mammalia, Chiroptera) of Stary Zhaden Zakaznik, Southern Belarus.** — Dombrovski, V., Fenchuk, V., Zhurauliou, D. — The results of bat research conducted in Stary Zhaden Zakaznik (area 170 km<sup>2</sup>, 51.9 N 27.6 E, central part of the Pripyat Polesia region, Southern Belarus) during 2015–2016 confirmed the occurrence of 12 species of bats (listed in descending order of occurrence): *Pipistrellus pygmaeus*, *Nyctalus noctula*, *Vespertilio murinus*, *Plecotus auritus*, *Barbastella barbastellus*, *Myotis brandtii*, *Nyctalus lasiopterus*, *Pipistrellus nathusii*, *Nyctalus leisleri*, *Myotis nattereri*, *Eptesicus nilssonii*, *Myotis daubentonii*. The breeding of five bat species in this region, such as *B. barbastellus*, *M. brandthii*, *M. nattereri*, *E. nilssonii*, and *N. lasiopterus*, is confirmed for the first time. Research results show the high significance of the Pripyat Polesia region in conservation of bats and biological diversity on both national and European scales.

Key words: bats, fauna, Stary Zhaden Zakaznik, Pripyat Polesia, Belarus.

**Фауна кажанів (Mammalia, Chiroptera) заказника Старий Жаден, Південна Білорусь.** — Домбровський, В., Фенчук, В., Журавльов, Д. — Дослідження рукокрилих проводили в республіканському заказнику «Старий Жаден» (площа 170 км<sup>2</sup>, 51.9 N 27.6 E, центральна частина Прип'ятського Полісся, Південна Білорусь) у 2015–2016 рр. Виявлено 12 видів кажанів (в порядку убубання зустрічальності): *Pipistrellus pygmaeus*, *Nyctalus noctula*, *Vespertilio murinus*, *Plecotus auritus*, *Barbastella barbastellus*, *Myotis brandtii*, *Nyctalus lasiopterus*, *Pipistrellus nathusii*, *Nyctalus leisleri*, *Myotis nattereri*, *Eptesicus nilssonii*, *Myotis daubentonii*. Вперше для дослідженого регіону підтверджено розмноження 5 видів кажанів: *B. barbastellus*, *M. brandthii*, *M. nattereri*, *E. nilssonii* та *N. lasiopterus*. Результати дослідження свідчать про високу значимість регіону Прип'ятського Полісся для збереження рідкісних видів рукокрилих на національному та європейському рівнях.

Ключові слова: кажани, фауна, заказник «Старий Жаден», Прип'ятське Полісся, Білорусь.

### Introduction

Large mires and swamp-forest complexes of Belarus have retained their character better than other elements of natural landscape. The majority of such mires are currently protected with detailed studies on rare mammals and birds conducted as a background for nomination process. However, the bat fauna has been largely omitted from research for a long time due to impenetrability of such areas and lack of qualified chiropterologists in Belarus. This resulted in insufficient knowledge on the composition and structure of bat fauna in such habitats, as well as on the significance of large natural mire complexes for conservation of bats. The present research was conducted within Stary Zhaden Zakaznik located in the middle of a large wetland region, which was nominated as biosphere reserve in 2016. Previously, bat research were not conducted on the territory of Stary Zhaden Zakaznik and adjacent from the west Almany Mires Nature Reserve. Preliminary inventorization of the bat fauna of Pripyatsky National Park, which adjoins Stary Zhaden from the east, was performed in 2012, when 26 bats belonging to nine species were mistnetted and four more species identified during detector surveys (Dombrovski et al., 2012, Kusnezh et al., 2012). In Rivne Nature Reserve (Ukraine), which adjoins Almany Mires Nature Reserve from the south, 54 bats representing 9 species were mistnetted in 2012 (Kusnezh, Dombrovski, 2013).

Hereby, the aim of the present research was to study the species composition and structure of communities of bats of a large natural forest-mire complex, typical for the region of Pripjat Polesia in the south of Belarus.

## Material and methods

Stary Zhaden Zakaznik (central part of the Pripjat Polesia region, Southern Belarus, 51.9 N; 27.6 E, area 170 km<sup>2</sup>) is located within the area of the Pripjat water-glacial alluvial plain (Pripjat Polesia) with large mires and numerous dunes, islands of terminal moraines and kames (fig. 1). Wetlands located on the wavy waterlogged lowland with extensive development of aeolian relief forms are covered predominantly by pine forests. Mires consist of a number of separate elongated mire-tracts extending to tens of kilometres. Stary Zhaden wetland represents a complex of nemoral fens typical for the Belarusian Polesia, combined with boreal type sphagnum transitional mires and sphagnum bogs (Grummo et al., 2012). The mires are traversed by several seasonal watercourses without clearly defined riverbeds, dissolved in sedge-reed mats.

The territory of Stary Zhaden is characterized by a very low level of anthropogenic transformation, with the main impact coming from forestry. There are no human settlements or buildings on the territory of Stary Zhaden.

Two more protected areas adjoin Stary Zhaden directly: Almany Mires from the west and Pripjatsky National Park from the east. These three protected areas combined form a continuous forest and mire complex preserved in a relatively natural state. It covers an area of 2000 km<sup>2</sup> and it is a typical example of undisturbed landscape of Pripjat Polesia.

Bat surveys on the territory of Stary Zhaden were conducted in several stages: May 6–13, 2015 — preliminary inspection of the area and detector surveys; June 23–28 and July 17–20, 2015 — mistnetting at identified sites with high bat activity and search for new mistnetting sites; June 16–20, June 30–July 2, 2016 — mistnetting focusing on the greater noctule bat *Nyctalus lasiopterus*. In total, nine sites were surveyed during 1–6 nights each. Bats were mistnetted at their hunting and drinking places. In most cases, mistnetting was conducted until midnight (until 24.00–01.00), after which bat activity significantly decreased. Acoustic surveys were done using Pettersson D240 ultrasound time expansion detector and real time system Batlogger M. Sonogram analysis was conducted with BatSound and BatExplorer software. Criteria for computer-assisted identification of bat species were taken from M. Barataud's handbook (Barataud, 2015). Mistnetted bats were weighted, and the following parameters were recorded: forearm length, length of the 3<sup>rd</sup> and 5<sup>th</sup> figure, sex, age, reproductive status of females. Measured bats were released near the catching sites.

Mistnetted *N. lasiopterus* were fitted with LB-2X Transmitters for Bats (Holohil Systems Ltd.). The transmitters were glued onto the back of the bats between the scapulae using medical glue BF-6. Roost search was done using Alinco DJ-X11 receiver equipped with three element Yagi antennae.



Fig. 1. Location of Stary Zhaden Zakaznik (black mark) in Belarus (gray color).

Рис. 1. Розташування заказника «Старий Жаден» (чорний знак) в Білорусі (сірий колір).

## Results and discussion

During June and July of 2015–2016, we caught 297 bats at Stary Zhaden belonging to 12 species (tab. 1, 2). As it is shown in Table 2, females predominated among all adult bats in the sample. No adult males of seven species were caught. The highest percentage of adult males was recorded for *N. noctula* (34 %), *M. nattereri* (33 %), and *V. murinus* (22 %). The sex ratio among subadult bats was nearly 1:1, which is common for European bats (Strelkov, 1999).

***Myotis nattereri***. Three bats (two lactating females and one male) were mistnetted at two sites. Acoustic survey confirmed the presence of the species at one more site. *M. nattereri* is not an abundant species in the zakaznik. It is recorded in forests and at small forest waterbodies. Our data for the first time confirm the breeding of Natterer's bat in the Pripyat Polesia region. Previously known breeding sites are located notably westward — in Drahichyn district, Brest region (Demianchik, Demianchik, 2001) and in Belovezhskaya Pushcha National Park (Kurskov, 1981). Natterer's bat is common or even dominating among other *Myotis* species in wintering congregations of bats in northern districts of Zhytomir and Rivne regions of Ukraine (Godlevska et al., 2016 a).

***Myotis brandtii***. Twelve bats were mistnetted at two sites, including seven lactating and one pregnant female. In both cases, mistnetting sites were located near ponds, one at an open sedge mire, and another one at the edge of an open sphagnum mire and pine forest. Five adult Brandt's bats were mistnetted in August 2012 in similar habitats in the neighbouring Pripyatsky National Park (Kusnezh et al., 2012). One adult male of Brandt's bat was caught in July 2010 in Pietrykaŭ district, Homiel region (Shpak, 2010). These records suggest that the species regularly occurs in the Pripyat Polesia region. Our records of lactating females is the first proof of breeding of Brant's bat not only in the region, but also in the entire Belarus.

***Myotis daubentonii***. One subadult bat was mistnetted at a seasonal paddle in a forest near Scviha floodplain. Our data show that Daubenton's bat clearly avoids mire landscapes, probably due to absence of large stable water bodies.

***Plecotus auritus***. Twenty bats were mistnetted at four localities, including 19 lactating females. Acoustic signals were recorded at two more localities. The species is widespread in the zakaznik.

***Barbastella barbastellus***. Thirteen bats were mistnetted at four localities, their presence also confirmed at 3 more localities by acoustic signals. It is a common species in Stary Zhaden occurring at small forest islands in fen mires. Barbastelle bats were mistnetted only under the forest canopy. At one locality (forest compartment line in mixed pine-broadleaved forest 2 km away from the nearest waterbody), the barbastelle was the only mistnetted species. All barbastelles were adult lactating females. Our data for the first time confirm the breeding of the species in the Pripyat Polesia region. The nearest records of the barbastelle bat are known from Pripyatsky National Park (Kusnezh et al., 2012), Rivne Nature Reserve, Ukraine (Kusnezh, Dombrovski, 2013), and from the Ukrainian part of the Chernobyl Exclusion Zone (Gashchak et al., 2013). In all above-mentioned cases, single specimens were recorded and their status was not identified. Breeding females of the Barbastelle were recently mistnetted in Rivne region, Ukraine (Godlevska et al., 2016 b), where it is also one of the dominating bat species in wintering congregations (Bashta, 2012).

***Pipistrellus nathusii***. Seven specimens were mistnetted at two localities; its breeding in the zakaznik was confirmed by catching five lactating females. Acoustic registrations showed the presence of the species at two more localities in early May, but consecutive acoustic surveys in late July showed its presence only at one locality. Nathusius' pipistrelle is a rare bat species in Stary Zhaden Zakaznik. At the same time, it is common or abundant at all neighbouring areas in Polesia that have more diverse habitat structure (Dombrovski et al., 2012; Gashchak et al., 2013).

***Pipistrellus pygmaeus***. There were 115 bats (including 83 lactating and 3 pregnant females) mistnetted at five localities. Acoustic signals were registered at one more locality. The species is the most abundant in Stary Zhaden Zakaznik. According to detector surveys conducted in 2012–2013 in Pripyatsky National Park, about 70 % of the species' records were in natural waterlogged habitats (Dombrovski, 2013). On the territory of the Belarusian Polesia, the breeding of the species confirmed also at two settlements in the Pripyat River's floodplain (Demianchik, 2013).

Table 1. Bat censuses in Stary Zhaden in 2015–2016

Таблиця 1. Обліки кажанів у Старому Жадені у 2015–2016 рр.

Biotopes	Dates	Methods	Species
Bank of drainage channel in sedge mire — wet pine stand ecotone	6/7.05 7/8.05.2015	D	BBAR, ENIL, NLEI, NNOC, MNAT, M. sp., PNAT, PPYG, Pl. sp, VMUR
Forest road in dry pine stand at the edge of a fen mire	12/13.05.2015	D	BBAR, MBRA/MMYS
Small river at open sedge mire	9/10.05, 10/11.05.2015	D	BBAR, ENIL, NNOC, MBRA/MMYS, M.sp, PNAT, PPYG, Pl.sp, VMUR
	19/20.07.2015	D	NLAS, NNOC, PPYG, VMUR
		M	MBRA: 3F, NLAS: 1m1f, NNOC: 1M3F5m4f, PPYG: 1M1F3m6f, VMUR: 1M5F1m2f
	16/17.06, 18/19.06, 19/20.06.2016	M	MBRA: 4F, NNOC: 3M3F, PPYG: 4F, PLAUR: 3F, VMUR: 1M2F
Small pond at transitional mire — pine forest ecotone	30.06/1.07, 1/2.07.2016	M	ENIL: 1F, MBRA: 1F, NLAS: 4F, NNOC: 5M15F3m1f, PPYG: 2F, PLAUR: 2F, VMUR: 4M12F
	11/12.05.2015	D	BBAR, NNOC, PNAT, PPYG
	23/24.06.2015	D	BBAR, E. sp., NLAS, NLEI, NNOC, PNAT, P. sp., PPYG, VMUR
		M	MBRA: 2M, NLAS: 1m1f, NNOC: 3M3F, PNAT: 1F, PPYG: 8F, PLAUR: 4F, VMUR: 1M2F
	18/19.07.2015	M	MNAT: 1M1F, NLEI: 1F, NNOC: 1M1m1f, PNAT: 1m, PPYG: 7F5m7f, PLAUR: 2F, VMUR: 1F1f
Country road in wet pine-birch forest, next to a seasonal pond	17/18.06.2016	M	BBAR: 1F, MBRA: 1F, NNOC: 3M3F, PNAT: 4F, PPYG: 6F, VMUR: 1F
	19/20.06.2016	M	MBRA: 1F, NNOC: 2M, PPYG: 5F
	24/25.06.2015	D	BBAR, M. sp., P. sp., PPYG, Pl. sp.
Waterlogged area with black alder in between mineral islands covered by mixed pine-broadleaved forest		M	BBAR: 4F, ENIL: 1F, MNAT: 1F, PPYG: 4F, PLAUR: 3F
	25/26.06.2015	D	BBAR, PPYG
Mutvica River floodplain overgrown with 20–30 year old alder stand		M	BBAR: 4F, NNOC: 2F, PPYG: 49F, PLAUR: 3F, VMUR: 2F
	26/27.06.2015	D	M. sp.
Forest compartment clearance in mixed pine-broadleaved forest		M	—
	27/28.06.2015	D	BBAR, E. sp.
Temporary paddle on a sand road in pine forest, 400 m away from the Seviha river		M	BBAR: 4F
	17/18.07.2015	D	NLEI, NNOC, PNAT, PPYG, Pl. sp., VMUR
		M	MDAU: 1m, NLEI: 4F, NNOC: 6F1m1f, PNAT: 1m, PPYG: 1M4m2f, PLAUR: 2F1f, VMUR: 1M3F1m

Abbreviations: MNAT = *Myotis nattereri*, MBRA = *Myotis brandtii*, MMYS = *Myotis mystacinus*, MDAU = *Myotis daubentonii*, M. sp. = *Myotis* sp., PLAUR = *Plecotus auritus*, BBAR = *Barbastellus barbastellus*, PNAT = *Pipistrellus nathusii*, PPYG = *Pipistrellus pygmaeus*, P. sp. = *Pipistrellus* sp., NNOC = *Nyctalus noctula*, NLEI = *Nyctalus leisleri*, NLAS = *Nyctalus lasiopterus*, ENIL = *Eptesicus nilssonii*, E. sp. = *Eptesicus* sp., VMUR = *Vespertilio murinus*, M = male adult, F = female adult, m = male subadult, f = female subadult.

Methods: D — detector survey, M — mistnetting.

Table 2. Bat species composition of Stary Zhaden in June-July 2015–2016 based on mistnettings. Species included into the National Red Data Book of Belarus (2015) are given with asterisk

Таблиця 2. Видовий склад кажанів Старого Жаденя у червні–липні 2015–2016 рр. за результатами ловів тенетами. Види, що включені до Червоної книги Білорусі (2015), позначено зірочками

Species	Males		Females		Total
	Ad	Sad	Ad	Sad	
<i>Pipistrellus pygmaeus</i>	2	12	86	15	115
<i>Nyctalus noctula</i>	18	10	35	7	70
<i>Vespertilio murinus</i>	8	2	28	3	41
<i>Plecotus auritus</i>			19	1	20
<i>Barbastella barbastellus</i> *			13		13
<i>Myotis brandtii</i> *	2		10		12
<i>Nyctalus lasiopterus</i>		1	6	1	8
<i>Pipistrellus nathusii</i>		2	5		7
<i>Nyctalus leisleri</i> *			5		5
<i>Myotis nattereri</i> *	1		2		3
<i>Eptesicus nilssonii</i> *			2		2
<i>Myotis daubentonii</i>		1			1
Total	27	33	211	27	297

***Nyctalus lasiopterus*.** Eight bats were mistnetted at two localities, including 6 lactating females and 2 subadults. Both subadults were radiotagged in 2015, and four females were radiotagged in 2016. Tracking in 2015 revealed two colonies of the greater noctule located in tree hollows on forest islands, surrounded by mires (Dombrovski et al., 2016). This is the first proof of breeding of the species in the region. Data from 2016 confirmed the breeding of the greater noctule bat in the same area, 7 new maternity roosts were found. The only registration of the greater noctule bat in Belarus occurred 85 years ago, August 3, 1930, in Brahlin district, Homiel region (Serzhanin, 1961). Records of the species in neighbouring regions were very rare and represented by non-breeding animals (Vlaschenko et al., 2012). The nearest places of regular breeding of the species are located in Hungary and Slovakia (Uhrin et al. 2006, Estók, 2011).

***Nyctalus noctula*.** Seventy individuals were mistnetted at 4 localities, including 35 lactating females. It is a common species in the zakaznik.

***Nyctalus leisleri*.** Five specimens were mistnetted at two localities, 2 of them were lactating females. Detector surveys showed the presence of the species at one more locality in early May, probably during migration. It is not an abundant species in Stary Zhaden. Breeding bats were found only on the periphery of the zakaznik, near the Scviha River's floodplain. Data on occurrence of the lesser noctule bat in Pripjat Polesia are very scarce: one maternity colony was found in the late 1990s in Luniniec district, the presence of the species was also confirmed by detector surveys in Ivacevichy district (Demianchik, Demianchik, 2001), and one more subadult bat was mistnetted in August 2012 in Pripjatsky National Park (Dombrovski et al., 2012). One lesser noctule was mistnetted in Rivne Natural Reserve, Ukraine (Kusnezh, Dombrovski, 2013). The species seems to be more common to the east and west of the Pripjat Polesia region (Kurskov, 1981; Gashchak et al., 2013; Demianchik, Demianchik, 2001).

***Eptesicus nilssonii*.** Two adult females were mistnetted at two localities, including a lactating one. Thus, the breeding of the species in the territory was confirmed. Numerous acoustic registrations of the northern bat in two localities in early May probably should be attributed to migrating individuals. One detector record was reported from Turov, Zhytkavichy district, Homel region (Dombrovski et al., 2012). The nearest known breeding place of the species is located 260 km NW in Belovezhskaya Pushcha National Park (Kurskov, 1981).

***Vespertilio murinus*.** Forty-one individuals were mistnetted at 4 localities, including 28 lactating females. The species was registered acoustically in another locality. The parti-coloured bat is a

common breeding species of the zakaznik. It was mistnetted near waterbodies located at open mires. Records of lactating females at a considerable distance (9 km) from the nearest buildings indicate the location of maternity colonies in hollow trees. This is quite rare for this species. According to Belarusian references, *V. murinus* considered obligatory synanthropic species (Kurskov, 1981; Demianchik, Demianchik, 2001).

## Totals

According to distribution ranges, the occurrence of four more bat species is also possible in the territory of Stary Zhaden Zakaznik: *M. dasycneme*, *M. mystacinus*, *P. pipistrellus*, and *E. serotinus* (Dietz et al., 2009). The most likely synanthropic *E. serotinus* was not recorded during the survey probably due to remoteness of studied areas from the nearest settlements. The absence of *M. dasycneme* as well as the rarity of *M. daubentonii* could be explained by the lack of large water bodies. Another species — *Pipistrellus kuhlii*, was recently registered in the Pripyat Polesia region (Demianchik, 2013). The propensity of this species to synanthropy and its preference to occupy settlements with modern buildings makes questionable its presence in Stary Zhaden Zakaznik.

## Conclusions

Results of research conducted in Stary Zhaden Zakaznik confirmed the occurrence of 12 bat species, including 11 breeding ones. Five species are listed in the National Red Data Book of Belarus, all of them with confirmed breeding.

The breeding of five bat species in the Pripyat Polesia region is confirmed for the first time: *B. barbastellus*, *M. brandtii*, *M. nattereri*, *N. lasiopterus*, and *E. nilssonii*. Four of these species (apart from *E. nilssonii*) are quite common for Stary Zhaden and they form sustainable breeding populations in this area.

The presence of stable breeding populations of bats with high international conservation status, the greater noctule (IUCN status VU) and the barbastelle bat (NT), confirm the high international significance of the territory of this protected area.

Summing it up, bats of natural forest-mire complexes of Stary Zhaden Zakaznik are represented by a unique species composition with high occurrence of rare species. Research results show the high significance of the Pripyat Polesia region in conservation of bats and biological diversity on both national and European scales.

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