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LONG-EARED BATS OF *PLECOTUS* GENUS IN LUHANSK REGION

Serhiy Rebrov

Taras Shevchenko National University of Luhansk, 2, Oboronna St., Luhansk 91000, Ukraine
e-mail: rebrov91@ukr.net

The bats fauna of Luhansk region is poorly studied. *Plecotus auritus* is the only species expected to be found on the East of Ukraine, according to last revision of variability and biogeography of this genus in Ukraine. The aim of this study was to expand the information about the brown long-eared bats in Luhansk region, to consider the prevalence, typical habitats and analyze morphometric peculiarities of the species. It was confirmed that for Luhansk region only one species of *Plecotus* genus is known: all specimens investigated were identified as *P. auritus* species by the morphological characteristics. In general, the investigated sample includes 35 specimens. The females are 2.7 % bigger than the males in terms of the morphometric characters. Further study defined the details of species' distribution in the region; a cadastre of known records is ordered and includes 9 localities. Two colonies of *P. auritus* were found in the region: one of the natural and the other in anthropogenic landscape. All characteristics (age and sex structure, presence of colonies, different locations) indicate the presence of a stable local population of the Brown long-eared bats in Luhansk region.

Keywords: long-eared bat, *Plecotus*, morphological peculiarities, state of population, Luhansk region.

INTRODUCTION

It is well-known that both *P. auritus* and *P. austriacus* are widely sympatric species in Ukraine [17]. The problem of heterogeneity of the eastern populations of long-eared bats was first addressed in the late 1980s [12]. However, in fact, it was only at the beginning of the 21st century that genus *Plecotus* was described as two different species in Ukraine [15].

P. auritus is the species which was expected to be found on the East of Ukraine, according to the maps presented in the *Guide for field investigations of bats in Ukraine* [15] as well as last revision of variability and biogeography of this genus in Ukraine [17]. However, no data on long-eared bats in Luhansk region were available for a long time [1, 9]. It is possible to explain by the general low level of bat research efforts and (or) the natural scarcity of these bats. The first mention of *Plecotus* genus for the region was given without species identification in 1973 [6]. The first case of reliable identification of *Plecotus* in Luhansk region concerns two specimens of *P. auritus*, captured with mist-nets in the vicinity of Luhansk in 2008 [18].

The aim of the research is to investigate the occurrence of the genus *Plecotus* in Lugansk region and to characterize the features of long-eared bats here.

MATERIALS AND METHODS

The data were obtained due to: 1) analysing catalogues of zoological museums of Ukraine [14] and specimens preserved in the collection of the Laboratory of Animal Ecology and Biogeography (LAEB, Luhansk National University) [8]; 2) calls from public about found bats to the contact-centre kept in Luhansk (in borders of the initiative of the Ukrainian Centre for Bat Protection); 3) personal communications of colleagues; 4) field research of bats (vil. Verhniobohdanivka, vil. Ivanivka, suburb of Luhansk city). For capturing bats we used mistnets of 9 and 12 meters. The research was carried out in 2012–2014. The material was identified by *Key to the Bats of Europe* [3]. The standard measurements (length of forearm) were conducted. The material was studied *in vivo*. All photos in this work from the Luhansk region.

THE SPECIFIC IDENTIFICATION AND VARIABILITY

In total, 35 long-eared bats from 4 localities were contactly examined. The color of fur and *tragus*, morphology of protuberance above eyes, the thumb length, and morphology of *glans penis* in males unequivocally indicate that the examined specimens belong to the species of *P. auritus* *sensu stricto*. In particular, the color of fur on the back is brown, and the belly has a distinct yellow tinge. The length of the thumb was 6 mm or more, and the tops of the *tragus* were light. The protuberances above the eyes were larger than the eyes themselves (Fig. 1, A). The *glans penis* was narrow in all the studied males ($n = 14$) (Fig. 1, B).



Fig. 1. Morphological details in *Plecotus auritus* from Luhansk region: (A) view of the head from above with a well-marked protuberance above the eyes (photo by S. Rebrov), (B) penis tapered continuously from the base towards the tip (photo by S. Rebrov); (C) bright tips of the *tragus* (photo by I. Zagorodniuk)

Рис. 1. Деталі морфології *Plecotus auritus* з Луганщини: А – голова зверху з добре вираженими надочними горбками (фото С. Реброва); В – геніталії самця з виразним звуженням *glans penis* (фото С. Реброва); С – світлі вершини козелків (фото І. Загороднюка)

The variation of forearm length (Ra) was also studied. The data is summarized in Table 1. The variation is very small, and coefficient of variation for this character in the combined sample (both sexes) is just 2.69 %, and within each of the sexes it amounts to even less: 2.34 % for the males and 2.33 % for the females.

The comparison of the distribution for values of Ra in males and females is shown in Fig. 2. By forearm length, examined males are smaller than females for 2.7 %. The difference between the values for males and females is significant ($T_{st} = 3.55$; $P < 0.01$; $U = 55.5$; $P < 0.01$). Additionally, on one other occasion 7 other specimens in loc. Verkhniobohdanivka (5/4/2014) were captured but their dimensions were not included in the graph due to possibility that these specimens had been captured and measured before.

Table 1. The length of the forearm in total sample and in each sex (measurements in mm)

Таблиця 1. Довжина передпліччя в загальній вибірці та за статями (виміри в мм)

Sample	N	Mean	Std. deviation	CV, %	min	max	Diapason
Total sample	35	39.7	1.07	2.69	37.7	42.2	3.5
Females	21	40.0	0.93	2.33	38.3	42.2	3.9
Males	14	38.9	0.91	2.34	37.7	40.7	3

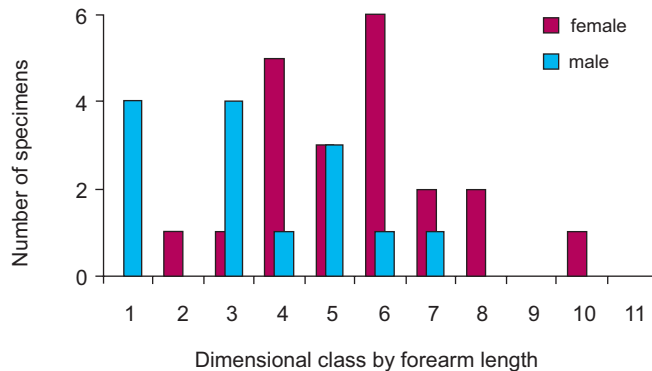


Fig. 2. Distribution of the forearm length in males and females. Scale values: 1 – 37.5 to 37.9; 2 – 38.0 to 38.4; 3 – 38.5 to 39.9, etc.

Рис. 2. Розподіл довжини передпліччя у самців і самок. Шкала значень: 1 – від 37,5 до 37,9; 2 – від 38,0 до 38,4; 3 – від 38,5 до 38,9 і т. д.

Plecotus auritus from the Luhansk region is characterized by similar forearm length with *P. auritus* from other regions (Table 2). However, the brown long-eared bats from Luhansk region are smaller than *P. auritus* from most other regions, especially in comparison with the sample from the Balkans (Croatia) and Asia Minor (Turkey) (for 0.3–0.5 mm).

The list of locations and records of *Plecotus* in Luhansk region

1. “Verhniobohdanivka 1” – Stanytsia-Luhanska region, Verhniobohdanivka Vil., in a building of abandoned pig-farm, netted in rooms: 7/27/2013 – 2Fad, 2Fjuv, 1Mad, 1Mjuv; 4/19/2014 – 5 Fad, 2 Mad; 5/4/2014 – 4 Fad, 3 Mad. The regular netting of *P. auritus* in a building, presence of both young and adult specimens among captured animals may testify the existence of the species colony in the building.

Table 2. Forearm length in Luhansk sample of *Plecotus auritus* in comparison with other regions*

Таблиця 2. Порівняння довжини передпліччя *Plecotus auritus* Луганщини та інших регіонів*

Sampling	Both sexes	n	Males	n	Females	n	Reference
Luhansk	39.6±1.03 37.7–42.2	42	39.0±0.89 37.7–40.7	17	40.1±0.87 38.3–42.2	25	This article
Ukraine	36–41 –	–	–	–	–	–	[15]
Eastern Europe	–	–	38.7 35.0–40.6	20	39.4 38.0–41.4	18	[12]
Central Europe	40.01±1.08 37.7–43.5	49	–	–	–	–	[2]
Southern Ural (Russia)	39.54 33.8–42.2	25	–	–	–	–	[11]
Caucasus and Transcaucasia	–	–	38.6 35.8–40.4	13	40.1 38.5–41.9	5	[12]
Turkey	40 35.2–42.9	12	–	–	–	–	[4]
Croatia	–	–	39.63±1.39 37.5–42	12	40.28±1.15 37.6–42	26	[13]
Bulgaria	39.69±1.13 36.5–41.8	55	–	–	–	–	[2]
Europe	35.5–42.5	–	–	–	–	–	[3]

Comment: * First row includes the average value, second row includes the limits.

Примітка: * Перший ряд включає в себе середні значення, другий ряд – межі розподілу.

2. “**Verhnio-Bohdanivka 2**” – *ibid.*, near a building of the local school, netted: 8/3/3013 – 1 Mjuv. One more specimen was observed in a cellar of the building.
3. “**Bobrove**” – Popasna Raion, Bobrove Vil., in the vicinity of Bobrove Lake, bat detector data: 6/26–7/7/2001 [7].
4. “**Floodplain Pridintsivska**” – Stanytsia-Luhanska Raion, Stanychno-Luhansky Department of LNR: the species was pointed in the Catalogue of observations of vertebrates in LNR, without details [5].
5. “**Ivanivka**” – Anratsyt Raion, Ivanivka Vil., a small slate mine, netted at the mine’s entrance: 9/18/2013 – 9Fad, 3F juv, 7Mad, 1Mjuv. The mine is located in a forest in the ravine of Olkhovka River, at the distance of 50 m from the water (L = ca. 7 m, H = ca. 2 m). Bats were observed both flying and placing in crevices and the surface of the walls and ceiling. The general number may be estimated in 50–60 individuals.
6. “**Novo-Illienko**” – Stanytsia-Luhanska Raion, near Novo-Illienko Biostation, in a bird-box in a pine forest: before 1990, without details (M. Samchuk, pers. comm. in: [10, 16]).

7. **“Balka Sucha”** – in the vicinity of Luhansk City, a ravine with chalk outcrops, netted near one of the outcrops: 10/16/2008 – 1F, 1M [18].
8. **“Campus Luhansk National University”** – Luhansk City, near a hostel of the Luhansk National University, visual observations: late autumn 2009 – 2 times; spring 2010 – 1 time (M. Korobchenko, pers. comm.).
9. **“Administrative center of Luhansk”** – Luhansk City, center, in a flat in a high-rise building: 8/30/2013, 1Mad, leg. Yu. Yakovenko, the specimen in the collection of the LAEB.

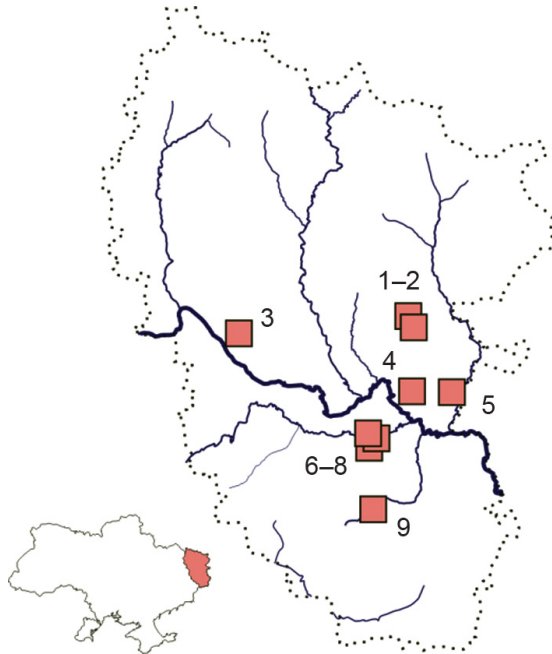


Fig. 3. Geographical distribution of *Plecotus auritus* in Luhansk region. Details are presented in the text. Location N 1–2 and 6–9 after original records, the location N 3–5 after different publications [7, 10, 16]

Рис. 3. Географічне поширення *Plecotus auritus* у Луганській області. Детали в тексті. Місцезнаходження № 1–2, 6–9 – за даними автора, № 3–5 – за даними з літератури [7, 10, 16]

CONCLUSIONS

1. The list of records of long-eared bats in Luhansk region includes 9 localities. In five of them long-eared bats were contactly examined and identified to species ($n = 42+3$). All of them were identified as *Plecotus auritus*.
2. Males of *P. auritus* in the investigated sample are smaller than females by 2.7%. *Plecotus auritus* from the Luhansk region is characterized by similar forearm length with *P. auritus* from other regions
3. All characteristics (age, sex ratio, presence of colonies, different locations) indicate the presence of the local population of the brown long-eared bats in Luhansk region.

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КАЖАНИ РОДУ ВУХАНЬ (*PLECOTUS*) У ЛУГАНСЬКІЙ ОБЛАСТІ

Сергій Ребров

Луганський національний університет імені Тараса Шевченка
вул. Оборонна, 2, Луганськ 91000, Україна
e-mail: rebrov91@ukr.net

Луганська область є маловивченим регіоном щодо фауни рукокрилих. Рід *Plecotus* був відомий для Луганщини лише за літературними даними та поодинокими відловами. За даними ревізії щодо біогеографії та мінливості роду *Plecotus*, на сході України очікувався тільки один вид – *Plecotus auritus*. Метою дослідження було розширити відомості про вуханя звичайного на Луганщині, розглянути поширеність, типові біотопи та проаналізувати морфометричні особливості виду. Підтверджено, що для Луганщини відомий тільки один вид роду *Plecotus*: за всіма морфологічними ознаками досліджені тварини належать до типових *Plecotus auritus*. Загалом вибірка становила 35 особин. Впорядковано кадастр відомих знахідок виду, який включає 9 місцезнаходжень. За морфометричними показниками самки на 2,7 % більші від самців. На території області виявлено 2 колонії вуханя звичайного: одна з них у природному, а інша в антропогенному ландшафті. Всі особливості (віко-статева структура, наявність колоній, різні місцезнаходження) свідчать про наявність стабільної місцевої популяції *Plecotus auritus* на Луганщині.

Ключові слова: вухань, *Plecotus*, морфологічні особливості, стан популяції, Луганщина.

ЛЕТУЧИЕ МЫШИ РОДА УШАН (*PLECOTUS*) В ЛУГАНСКОЙ ОБЛАСТИ

Сергей Ребров

Луганский национальный университет имени Тараса Шевченко
вул. Оборонная, 2, Луганск 91000, Украина
e-mail: rebrov91@ukr.net

Луганская область является малоизученным регионом касательно фауны рукокрылых. Род *Plecotus* был известен для Луганщины только по литературным данным и единичным отловам. Согласно данным ревизии по симпатрии и изменчивости рода *Plecotus*, на востоке Украины ожидался только один вид – *Plecotus auritus*. Целью исследования было расширить сведения об ушане обыкновенном на Луганщине, проанализировать распространенность, типичные биотопы и рассмотреть морфометрические особенности вида. Подтверждено, что для Луганщины известен только один вид рода *Plecotus*: по всем морфологическим

признакам исследованные животные относятся к типичным *Plecotus auritus*. В целом выборка составила 35 особей. Упорядочено кадастр известных находок вида, который включает 9 местонахождений. По морфометрических показателями самки на 2,7 % больше самцов. На территории области выявлено 2 колонии ушана обыкновенного: одна из них в природном, а другая в антропогенном ландшафте. Все особенности (половозрастная структура, наличие колоний, различные местонахождения) свидетельствуют о наличии стабильной местной популяции *Plecotus auritus* на Луганщине.

Ключевые слова: ушан, *Plecotus*, морфологические особенности, состояние популяции, Луганщина.

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