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Records of Bats (Mammalia: Chiroptera) from Vasilyovska Planina Mountain, Northern Bulgaria

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Abstract: Twelve species of bat were identified at higher altitudes in the karstic area of Vasilyovska Planina Mountain, Northern Bulgaria, based on 130 ultrasound recordings and two visits to cave. An instance of a ninety-kilometer migration between a reproductive colony and a possible hibernation roost was discovered in the case of a female Greater horseshoe bat. The European free-tailed bat *Tadarida teniotis* (Rafinesque, 1814) was identified in high free flight. The main characteristics of the echolocation calls of the species are provided and compared with data available in the literature.

Keywords: chiropteran community, sound analysis, *Tadarida*

Introduction

The European free-tailed bat, *Tadarida teniotis* (Rafinesque, 1814), was reported for the first time in Bulgaria by Kalčev, Beshkov (1963) when one male specimen was captured south of the town of Plovdiv. Thirty years later, Pandurska (1992) recorded a second male specimen emerging from its day roost in the surroundings of Ploski village in Southern Bulgaria. Benda *et al*. (2003) summarized our recent knowledge about the distribution of the species in Bulgaria and they concluded that, until the beginning of the 21st century, the European free-tailed bat has been recorded in 10 localities in Bulgaria and the Maritsa river valley, which is considered to be on the northern border of the distribution of *T. teniotis* in the Eastern Balkans.

A rich bat community has been discovered during the intensive monitoring of bats using ultrasound detectors in the mountain areas of Bulgaria. In the present article we report the species composition of bats near the peak of Vasilyov (1490 m a.s.l.), which is the northernmost location of the European free-tailed bat known in Bulgaria to date.

Material and Methods

A total of 130 recordings were made during the periods 27-29 July and 20-21 October 2006 using a Pettersson D 240 bat detector. The site of the recordings (42° 35' 32" N and 24° 28' 50" E) was an open mountain grassland ridge 100-150 m above a beech forest (Fig. 1). A small pond with a surface area of about 250 m^2, and a maximum depth of 0.5 m at 1395 m a.s.l., is situated in the site (Fig. 2).

We began monitoring ultrasound 30 minutes before sunset and finished at midnight. The echolocation bat calls were recorded using a portable Pettersson D 240 detector and a Sony VM-D6C audio

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Fig. 1. The ridge of Vasilyovska Planina Mountain.

Fig. 2. The small pond near the peak of Vasilyov.

recorder. We analyzed the calls using BatSound 3.1 software for Windows with time expansion (x10). The frequency components were measured from the Fast Fourier Transform (FFT) power spectrum, size 256 and 512, hanning window. We measured the following call parameters: duration of separated pulses (ms), time intervals between consecutive pulses (ms), frequency with the highest energy – Freq (kHz), highest and lowest frequencies– Fmin and Fmax (kHz).

We also visited the nearest karstic cave (Mecha dupka cave, 1380 m a.s.l.) twice: on 28th July and 21st October 2006.

Results

A total of 12 species of bats have been identified.

Rhinolophidae

Greater horseshoe bat – *Rhinolophus ferrumequinum* (Schreber, 1774).

Thirteen bat specimens were found in Mecha dupka cave, probably in the initial stages of hibernation, on the 21st October. One female was found ringed (ring No 01121). The animal was ringed as an adult on 29th May 2002 near Muselievo village in the Pleven district and caught later four times, in Nanin kamak cave, during 2002 and 2003, (Dietz *et al*., in press). The distance between two localities is about 90 km.

Lesser horseshoe bat – *Rhinolophus hipposideros* (Bechstein, 1800)

Three individuals were found together with Greater horseshoe bats in the same cave (21st October 2006).

Vespertilionidae

Greater mouse-eared/lesser mouse-eared bat *Myotis myotis/blythii*

Only a single recording (27th July 2006) was identified to have the ultrasound characteristics of both above-mentioned species. In October we observed three specimens attached high on the ceiling of the cave galleries.

Myotis sp.

A small number of frequency modulated echolocation calls with a maximum energy of about 45 kHz (recorded during two nights in July) were not determined at species level because of limitations in the methods of study used in the field. The characteristics of these calls are typical of small-sized *Myotis sp*.

Noctule – *Nyctalus noctula* (Schreber, 1774)

The Noctule is one of the most common bat species in Bulgaria. Intensive feeding activity of the species in the high part of Vasilyovska Planina Mountain and near the pond was registered during the whole period of study in July.

Leisler's bat – *Nyctalus leisleri* (Kuhl, 1817)

High activity of the species has been registered in July not only above the water surfaces, but also above large areas of open grasslands. The neighbouring forest area supply many good potential daily roosts and we consider that *N. leisleri* is a permanent faunistic element of this mountain.

Common pipistrelle – *Pipistrellus pipistrellus* (Schreber, 1774)

Exceptionally high activity of the common pipistrelle in all studied transects and points was registered between 27th and 29th July. Typical display behaviour, accompanied with corresponding social calls of males, was observed near the pond at that time. Undoubtedly, this species is a typical faunistic element here.

Nathusius' pipistrelle – *Pipistrellus nathusii* (Keyserling et Blasius, 1839)

Migratory species. It is exceptionally numerous in Bulgaria during the autumn. We think that the small number of observed individuals in Vasilyovska Planina Mountain in late July belongs to a migrating group of animals that can be occasionally registered here.

Savi's pipistrelle – *Hypsugo savii* (Bonaparte, 1837)

The Savi's pipistrelle demonstrates high feeding activity above the water surface of the pond (27th

– 29th July). The large karstic areas of the mountain offer very good daily roosts for this species.

Serotine – *Eptesicus serotinus* (Schreber, 1774)

The Serotine was established above the open grassland areas performing relatively constant feeding activities (27th – 29th July).

Shreiber's bat – *Miniopterus schreibersii* (Kuhl, 1817)

A small number of this typical cave-dwelling species was registered in July in the open areas near the peak of Vasilyov. The species is a typical element of the chiropteran community of the mountain and its important cave colonies are known.

Mollossidae

European free-tailed bat – *Tadarida teniotis* (Rafinesque, 1814)

One individual was detected in high free flight on 27. 07. 2006 at 22 h 15 min. The total duration of the recording, consisting of three calls, was 1574 ms.

The main frequency characteristics of the calls are given in Table 1.

The time intervals between the consecutive pulses are 393 ms and 420 ms respectively. Fig. 3 illustrates the specific parameters of the echolocation call.

Discussion

Vasilyovska Planina Mountain belongs to the Central Balkan and Predbalkan Mountain's biogeographical unit (Hubenov, 1997). According to the results of the cluster analysis of correlations among bat communities in biogeographical units of Bulgaria,

Table 1. Frequency characteristics of the calls of *Tadarida teniotis* in free flight near peak of Vasilyov, Northern Bulgaria.

No of the call	Duration (ms)	Freq (kHz)	Fmin (kHz)	Fmax (kHz)
I	15.0	11.1	10.2	12.4
II	15.3	11.4	10.4	13.2
III	11.5	11.5	10.1	12.7

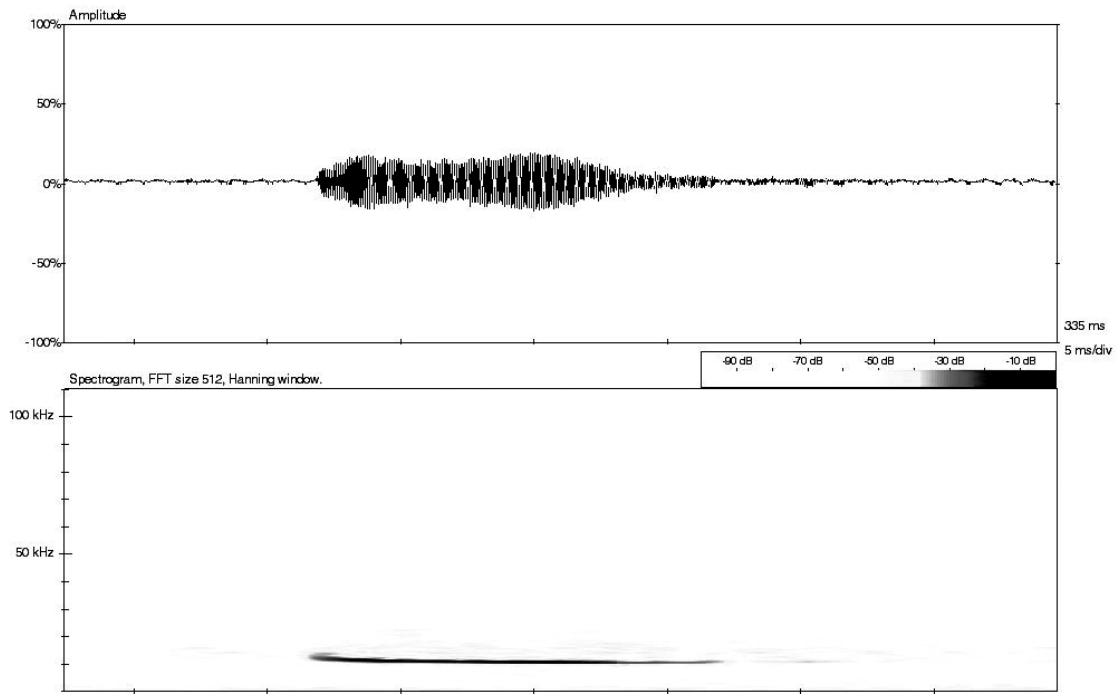

Fig. 3. Sonogram and wave presentation of a single echolocation call of *Tadarida teniotis*. (Rafinesque).

Benda et al. (2003) clearly defined the similarity between the Central Balkan and Predbalkan mountains with the South-western Bulgarian high mountains, including the Western Rhodopes, where the European free-tailed bat is a typical faunistic element. These two areas are characterized by the predominance of central European boreal bat species and the accessory component of cave-dwelling Mediterranean bats.

The newly established locality of *Tadarida teniotis* in Northern Bulgaria confirms the correlation between the chiropteran communities in both biogeographical regions and removes the limit of distribution of the species in the Eastern Balkans with more than 75 km to the north.

Zbinden & Zingg (1986) described for the first time the echolocation calls of hunting European free-tailed bats *Tadarida teniotis* in open spaces. The animals from the Swiss Alps emitted single harmonic, narrow band frequency modulated search pulses audible to the human ear. The signals covered a frequency band from 15 kHz to 9 kHz (mean value = 11.4 kHz) with signal duration from 8 to 27 ms (mean = 15 ms). The inter pulse intervals varied between 200 and 1400 ms (mean = 740 ms). The authors consider that the frequency of the amplitude maximum with mean value of 11.4 kHz and the end frequency of the sweep with mean value of 10.7 kHz can be used for the species identification in the field.

The registered values of the main frequency features of echolocation calls of *T. teniotis* in the Vasilyovska Planina Mountain are very close to those emitted by the animals from Alps. Similar are the values of the echolocation call parameters in Obrist *et al*. (2004) also for the Swiss populations and Russo & Jones (2002) for the Italian animals. According to Obrist *et al*. (2004) the precise determination percentage using echolocation call parameters can reach 100 % for *T. teniotis*. In some cases only 2 % error are probably result of a higher frequency emission of *T. teniotis* (confusion with *Nyctalus noctula*).

The ultrasound detectors are used to identify the European free-tailed bat in some adjacent to Bulgaria territories, the Eastern Black Sea region for example (Helversen, 1989).

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Съобщения за прилепи (Mammalia: Chiroptera) от Васильовска планина, Северна България

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(Резюме)

Дванадесет вида прилепи са идентифицирани във високата карстова зона на Васильовска планина, Северна България, на базата на 130 ултразвукови записа и две посещения на пещера. Установена е миграция от около 90 км на женски голям подковонос между размножителна колония и потенциално зимно убежище. Булдоговият прилеп *Tadarida teniotis* (Rafinesque, 1814) е идентифициран по време на свободен висок полет. Представени са главните ехолокационни характеристики на вида и са сравнени с наличните литературни данни.