



FEEDING ACTIVITY OF THREE BAT SPECIES (*MAMMALIA: CHIROPTERA*) IN URBAN HABITATS OF UPPER THRACIAN VALLEY (BULGARIA)

Slaveya Stoycheva, Dilian Georgiev**, Iliana Velcheva***

*NGO Green Balkans, Shesti septemvri Str. 160,

BG-4000 Plovdiv, Bulgaria, e-mail: slaveyastoycheva@abv.bg

**Department of Ecology and Environmental Conservation, University of Plovdiv,
Tzar Assen Str. 24, BG-4000 Plovdiv, Bulgaria,
e-mail: anivel@abv.bg, diliangeorgiev@abv.bg

Abstract. Bat ultrasounds were detected by Time Expansion detectors and recorded by a digital recorder. Feeding activity was evaluated counting the number and percentage of the feeding buzzes recorded in each habitat respectively. The study was carried out in the two largest towns of Upper Thracian Valley – Plovdiv and Stara Zagora, and a few villages in the radius of 40 km from the town centers, in fourteen habitat types. It was the first study on the bat activity in urban areas on the Balkans. We found that the three studied species of *Chiroptera* (*N. noctula*, *P. pipistrellus* and *P. pygmaeus*) were feeding in most of the habitats in the urban regions investigated. The most intense feeding for all three species were the areas around street lamps, which are well known as attractive to the bats main prey – the insects.

Key words: feeding buzzes, *Pipistrellus*, *Nyctalus*, Balkans

INTRODUCTION

The urban areas are preferred by many bat species (*Mammalia: Chiroptera*) in which they occupy new roosts, feeding and breeding sites. Despite that the bat surveys in anthropogenic habitats in now underway in Europe (GAISLER *et al.*, 1998; SCHMIDT, 2002; BARTONIČKA & ZUKAL, 2003), till now there were no any detailed studies on this problem on the Balkans. Our work represents information on the habitat importance for feeding of three bat species in Bulgaria: *Nyctalus noctula*, *Pipistrellus pipistrellus* and *Pipistrellus pygmaeus*.

MATERIALS AND METHODS

Present study was carried out in the two largest towns of Upper Thracian Valley – Plovdiv and Stara Zagora, and a few villages in the radius of 40 km from the town centers.

Bat ultrasounds were detected in the following habitats and localities:

1. Open grass terrains between blocks of flats (Plovdiv and Stara Zagora)
2. Terrains between blocks of flats occupied by tree vegetation (Plovdiv and Stara Zagora)
3. Dams with banks of dense park forests (micro dam Zagorka in stara zagora, Greben canal in Plovdiv)
4. Small concrete pond (Stara Zagora)
5. Canals with banks occupied by tree or bush vegetation (in the north-west of Plovdiv and in south Stara Zagora)
6. Small river stretches with tree bank vegetation (Bedeckha River, industrial zone, Stara Zagora)
7. Small river stretches with tree bank vegetation (Bedeckha River, forest area, Stara Zagora)
8. Large river (Maritza River in Plovdiv which has sand banks with small patches of tree vegetation)
9. River floods (Maritza River in Plovdiv)
10. Urbanized park forests with a lot of street lamps (parks near the railway station and the Natural History Museum in Plovdiv and near Alana area in Stara Zagora)
11. Dense park forests with lower anthropogenic pressure (Greben canal park in Plovdiv and Ayazmoto in Stara Zagora)
12. Rocky terrains on the hills of Plovdiv
13. Rocky terrains on the hills of Plovdiv with lamps
14. House yards with street lamps on the hills of Plovdiv, Stara Zagora and some villages in their areas.

Bat ultrasounds were detected by Time Expansion detectors models Petterson Ultrasound Detector D240x and Tranquility Transect, and recorded by a digital recorder. The records were made in mp3 and asf format, and after they were revert into wave format. The ultrasounds were analyzed with the program Bat Sound. The species determination was made by key of BARATAUD (2002) and PFALZER & KUSCH (2003).

In a given habitat detecting was carried out with duration of 30 to 120 minutes in spring-summer season, after sunset only in favorable for the bats climate conditions. There were made also records in some habitats during the autumn-winter period with duration of 10 to 70 minutes.

Bat activity was surveyed by separate time samples, consisted of number of sounds per 10 min, as the air temperature was measured for each interval (method of SHIEL & FAIRLEY (1998) with some modifications). Feeding activity was evaluated counting the number and percentage of the feeding buzzes recorded in each habitat respectively.

RESULTS AND DISCUSSION

We registered bat feeding in all the habitats under study with an exception of the terrains between blocks of flats occupied by tree vegetation, and canals with banks occupied by tree or bush vegetation.

Feeding buzzes of noctule bats (*N. noctula*) (n = 17) were recorded in a few habitats. The feeding around artificial light bodies dominated and also in park forests the level of feeding buzzes recorded was high (Tab. 1, Fig. 1). The lowest temperature in which the noctules fed recorded was 5° C around the Zagorka micro dam in Stara Zagora during autumn.

The feeding buzzes of common pipistrelle (*P. pipistrellus*) (n = 49) we recorded in a variety of habitats (Tab. 1, Fig. 1). The feeding in areas with street lamps had higher percentage - urbanized park forests and house yards (n = 21, 42.9%). Impressive was the difference between the two types of city parks. In dense park forests with lower anthropogenic pressure we recorded only one buzz of this species (2.0%), while in urbanized park forests with a lot of street lamps these cases were 10 (20.4%). Significant number of buzzes we registered and over standing waters: dams and river floods (total n=17, 34.7%). There was a difference in the feeding intensity of the common pipistrelle in the various stretches of small rivers. In one and a same river (Bedechka River, Stara Zagora) the feeding was about three times intensive in a park forest area, than in industrial zone (respectively: n=7, 14.3% and n=2, 4.1%). One case of feeding buzz was recorded around large river (n=1, 2.0%). The lowest temperature in which the common pipistrelles were feeding was 11.6° C (late winter, small river of Bedechka with park forest, Stara Zagora).

Table 1. Feeding activity of three bat species studied in urban habitats of Upper Thracian Valley (Bulgaria). The habitat numbers correspond with those in the text.

Табл. 1. Хранителна активност на три вида прилепи, изследвана в градски местообитания от Гронотракийската низина (България). Номерата на хабитатите съответстват на посочените в текста.

Habitat №	<i>N. noctula</i>		<i>P. pipistrellus</i>		<i>P. pygmaeus</i>	
	n	%	n	%	n	%
1	2	11,8	0	0,0	0	0,0
3	2	11,8	5	10,2	0	0,0
4	0	0,0	9	18,4	0	0,0
6	0	0,0	2	4,1	17	44,7
7	0	0,0	7	14,3	0	0,0
8	0	0,0	1	2,0	1	2,6
9	0	0,0	3	6,1	2	5,3
10	1	5,9	10	20,4	1	2,6
11	4	23,5	1	2,0	0	0,0
12	0	0,0	0	0,0	5	13,2
13	8	47,1	0	0,0	0	0,0
14	0	0,0	11	22,4	12	31,6
Total	17	100,0	49	100,0	38	100

Buzzes of soprano pipistrelle (*P. pygmaeus*) (n = 38) we recorded in some habitats under study (Tab. 1, Fig. 1). The feeding dominated in two areas. One was the small river with bank forest (Bedechka River, industrial zone, Stara Zagora)

(n=17, 44.7%), where in contrast the closely related species *P. pipistrellus* avoided feeding. The second were the most preferred areas and by the rest of the studied species: areas around the street lamps (n=12, 31.6%). Relatively high intensity of feeding we found above rocky terrains of hills (Dzendem tepe hill, Plovdiv) (n=5, 13.2%). Very few feeding buzzes were recorded also near a large river, its floods and in urbanized park forests. The lowest temperature in which the soprano pipistrelles were feeding was 14.4° C (spring, Bedechka River, industrial zone, Stara Zagora).

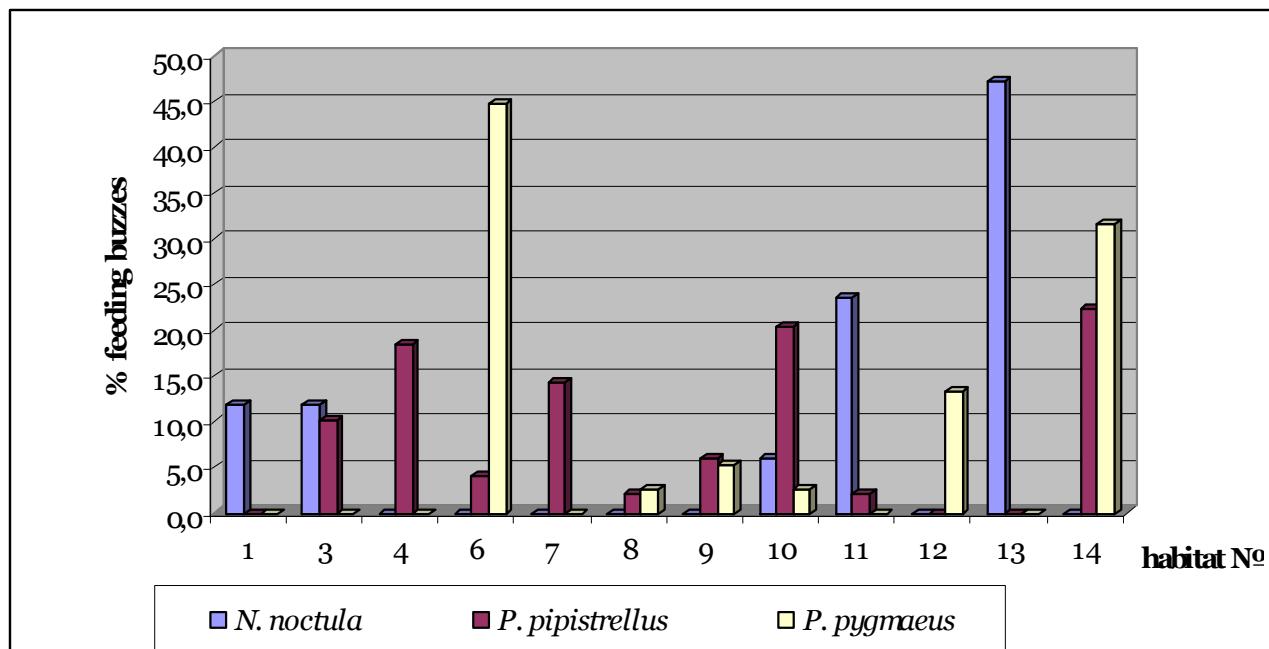


Fig. 1. Diagram showing the feeding activity of three bat species studied in urban habitats of Upper Thracian Valley(Bulgaria). The habitat numbers correspond with those in the text.

CONCLUSIONS

It was the first study on the bat activity in urban areas on the Balkans.

We found that the three studied species of *Chiroptera* (*N. noctula*, *P. pipistrellus* and *P. pygmaeus*) were feeding in most of the habitats in the urban regions investigated.

The most intense feeding for all three species were the areas around street lamps, which are well known as attractive to the bats main prey – the insects.

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ХРАНИТЕЛНА АКТИВНОСТ НА ТРИ ВИДА ПРИЛЕПИ (*MAMMALIA: CHIROPTERA*) В ГРАДСКА СРЕДА ОТ ГОРНОТРАКИЙСКАТА НИЗИНА (БЪЛГАРИЯ)

Slaveya Stoycheva*, Dilian Georgiev**, Iliana Velcheva**

* СНЦ Зелени Балкани, Пловдив, ул. „Шести Септември“ 160,
e-mail: slaveyastoycheva@abv.bg

** Катедра „Екология и ООС“, Факултет по Биология,
ПУ „Паисий Хиландарски“, ул., Цар Асен“ 24, Пловдив 4000,
e-mail: anivel@abv.bg, diliangeorgiev@abv.bg

(Резюме)

Ултразвуците от прилепи бяха записани с помощта на Time Expansion детектори чрез дигитално записващо устройство. Хранителната активност беше проучена на базата на броя и процента на записаните хранителни „бъзове“ във всеки хабitat. Изследването обхваща двата най-големи града в Горнотракийската низина – Пловдив и Стара Загора и някои села от прилежащите им околности в радиус от 40 km, включващи в 14 хабитата. Това е първото проучване на активност на прилепите в градска среда за Балканите. Ние установихме, че трите изследвани вида прилепи (*N. noctula*, *P. pipistrellus* и *P. ruftaetus*) се хранят в повечето от проучваните градски местообитания. Най-интензивно хранене и за трите вида беше установено около улични лампи, които са известни с това, че привличат основната храна на прилепите – насекомите.