

5. Preliminary aspects about the study of bats from Letea Forest – Danube Delta

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ABSTRACT. The study was carried out in Letea Forest, in June-September 2006 period. In this area the bats fauna hasn't been studied until present. Based on the captures with the net help and the bats identification, with the help of two types of ultrasound detectors (heterodyne and with time expansion), in fixed position and on transect, there were 11 bat species identified: *Nyctalus noctula*, *Nyctalus leisleri*, *Pipistrellus pipistrellus*, *Pipistrellus pygmaeus*, *Pipistrellus nathusii*, *Myotis daubentonii*, *Myotis mystacinus/Myotis brandtii*, *Myotis nattereri*, *Myotis bechsteinii?*, *Eptesicus serotinus* and *Barbastella barbastellus*. The most abundant species from the forest are: *Nyctalus noctula* and *Nyctalus leisleri*, followed by *Pipistrellus pipistrellus* and *Pipistrellus pygmaeus*.

Key words: Chiroptera, summer period, habitat use, Letea Forest, Danube Delta, Romania

INTRODUCTION

The bats are innate elements of forest ecosystems. Most of the European species are using the forests as habitats for at least one period of the year.

Letea Forest has a total surface of 5,246.8 ha out of which 2,825 ha is a core area. The core area from Letea Forest has been protected since 1930 becoming "natural reservation" in 1938. The partially protected area from Letea is located on one of the oldest delta marine levee ("grind"), which has a surface of 11,660 ha, having lake Nebunu as northern border, eastward is limited by the communal road Periprava – C. A. Rosetti, at southward by the communal road Letea – C. A. Rosetti, westward by the western border of the forest formations of Letea Grind [12].

The forest expands in the inter-dunes area (as stripes of trees having 10 - 250 m width, called "hasmac") and on the dunes edges. Mainly it contains: *Quercus robur*, *Quercus pedunculiflora*, *Populus alba*, *Populus nigra*, *Fraxinus angustifolia*, *Fraxinus pallisae*, *Pyrus pyraeaster*, *Tilia tomentosa*, *Ulmus foliacea* and very rarely *Alnus glutinosa*, completed by a richly underbrush: *Crataegus monogyna*, *Ligustrum vulgare*, *Euonymus europaeus*, *Cornus mas*, *Cornus sanguinea*, *Rhamnus frangula*, *Rhamnus cathartica*, *Viburnum opulus*, *Berberis vulgaris* etc. One of specific feature of the area is the abundance of hanging plants: *Periploca graeca*, *Vitis silvestris*, *Humulus lupulus*, *Clematis vitalba*, which ensures a subtropical aspect to the forest. The forest spreads naturally through the underbrush species such as: *Prunus spinosa*, *Tamarix ramosissima*, *Hippophae rhamnoides*, which in some of the portions, towards seaside, lushly expands, creating real impenetrable blocks. In the vegetal carpet there are present some rare species: *Convolvulus persicus*, *Ephedra dystachia*, *Merendera sobolifera* etc. [12].

The forest is surrounded by big surfaces water, that ensure a high level of humidity in the air [13].

In the Danube Delta, studies about the bats fauna are rare, partially and heterogeneous. In 1968, Barbu publishes data on a summer colony of *Pipistrellus nathusii* in the lighthouse from Sf. Gheorghe – Dobrogea, and also in 1968, Barbu and Sin, publishes observations on the hibernating of the *Nyctalus noctula* species in the cliff of Razelm Lake – Capul Doloșman – Dobrogea. In 1975, Barbu indicated again the *Pipistrellus nathusii* species – a female found at the school from Jurilovca (Tulcea) and a male at Chilia Veche (Tulcea) [1, 2, 3].

After a study developed between July 1990 and December 1993, Răduleț published in 1994 data about the biology of *Nyctalus*: 35 specimens were collected and 40 ringed. Among them there were some specimens collected from the Danube Delta. *Nyctalus noctula*: one specimen collected on 21.08.1992 in Maliuc – Gorgova (Tulcea) and one specimen collected on 24.08.1992 at Crișan (Tulcea). The author specifies that in the migrating period (August-October), the preferred shelters by *Nyctalus noctula* are the nests abandoned by woodpeckers. *Nyctalus leisleri*: one specimen collected on 27.05.1968 at Jurilovca (Tulcea) (number 3560 in Gr. Antipa museum collection, donated by Barbu P.) [14].

Murariu et al. (2003), recorded in Periprava area the *Pipistrellus pygmaeus* species [11].

Up to now, there have not been carried out studies on bats of Letea Forest.

MATERIALS AND METHODS

The study was carried out in Letea Forest, in June – September 2006 period. Three visits were made. The nets were placed 4 sites, during 6 evenings, between 21.00 - 01.00 hours. A single point was taken in consideration, in which bats were captured – the hasmac called “Dunele Grădina lui Omer”. In this point the net was placed during 3 nights, from June to September.

Description of the net placement area. The net was anchored on the forestry line, at the intersection of 2 flight ways: a flight way on the forestry line (flight way for the species: *Nyctalus noctula*, *Pipistrellus* sp), and the second flight way, towards a glade (*Nyctalus leisleri* and *Myotis daubentonii*). The interior branches of the trees were lowered at about 1.5 m above the ground. In June, on the forest line water was present (at 50m of the net), left after the spring waters retreat. The net was anchored right after a road curve. The place where the net was placed is called Dunele Grădina lui Omer, being the hasmac with most rich vegetation and it's located at the north of the forest [13].

The bat species were determined based on determination keys [10, 15, 11, 8] and after the morphometrical measures (mostly the length of the arm) or, for confirmation, based on photos.

There were used 2 types of ultrasound detectors (the heterodyne detector and the time expansion detector). Eight transects were made and 2 observations from fixed point (Dunele Grădina lui Omer). The transects had a length of 1 – 2 km, in semi-open habitats (forest border, forest road) and open habitats (glades, outside the forest).

The number of passes doesn't tell the number of bats, but the activity and abundance of the bats species in certain habitats. Based on transects and the ultrasound detectors results, the bat fauna from a certain habitat can be catalogued, especially in the forestry and humid zones, where the bats can hardly be captured. 125 minutes of recordings were made which were ulterior analyzed with the help of Wavesurfer program.

Working material: Tranquility time expansion detector, Sony minidisk for recordings, headphones, GPS/PDA, frontal, thermo-hygrometer, heterodyne detector (Bat detector MKII – Magenta Electronics), magnifying glass (x10), sliding calipers, weighing machine, 12 and 3 meters nets.

RESULTS AND DISCUSSIONS

The bats echolocation system is very complex, because of which they are very hard to be captured in open, semi-open or closed habitats where they emit ultrasound for orienting or for feeding. Only on the flight way from the shelter to the feeding place or at the shelter exit, the bats are emitting less ultrasounds because this is partially memorized, this can assure the capturing success.

At “Dunele Grădina lui Omer”, there were captured in about 6 hours a total number of 13 bats belonging to 6 species. The capturing success was of about 4 bats per night. The capturing rate was the lowest in September, of 0 bats/trap/night, and the highest capturing rate of 10 bats/trap/night, in June.

Table 1 shows the number of specimens belonging to various bat-species, captured by the use of nets.

Table 1

The specific composition of the bats captured with net at Dunele Grădina lui Omer (Letea Forest) in June –
September 2006 period

Date	<i>Pipistrellus pipistrellus</i>	<i>Pipistrellus pygmaeus</i>	<i>Pipistrellus nathusii</i>	<i>Nyctalus noctula</i>	<i>Nyctalus leisleri</i>	<i>Myotis daubentonii</i>	T
17.06	1	3	1	2	2	1	10
10.08	1	-	2	-	-	-	3
3.09	-	-	-	-	-	-	-
Total	2	3	3	2	2	1	13

Bat species netted:

1. ***Pipistrellus pygmaeus*** (Leach, 1825). There were 3 specimens netted in June, between 21 and 22.10 hours. With the help heterodyne detector it could be noticed that the species was the most abundant in this area. If the cryptic species *P. pipistrellus* lives in the same habitat, *P. pygmaeus* retreats to the forest, for hunting [6]. They fly at low height, in the net they were captured at 0.5 – 1.5 m height. The specimens were flying from the forest towards the dunes. There were 2 nursing females netted and a male, adult (**Fig. 1**). The length of the arm at the captured individuals ranged between 29.3 and 31 mm, and its weight was 5g.



Fig. 1. *Pipistrellus pygmaeus*, male (foto: Irina IFRIM)

Recent studies have shown that there are two reproductively isolated, although often sympatric, cryptic species of pipistrelle bat distributed within Europe. The two species have now been classified as *P. pipistrellus* and *P. pygmaeus*. Studies are showing that *P. pygmaeus* is more rare than *P. pipistrellus* [7].

The two phonic types identified in Europe emit echolocation calls peaking at 45 and 55 kHz respectively. Genetic analyses at mitochondrial DNA have shown that these belong to two different species. Further research has found differences between the two species: in morphology, social calls, diet, size of summer colonies [4].

Feyerabend and Simon (2000) have found a mean distance between hunting grounds and roosts of 170 m (420 m maximum), using telemetry, regarding nursing females [9].

A relatively high foraging activity inside the forest can be caused by an opportunistic behavior of pipistrelles, foraging unselectively on the most abundant flying insects (*Nematocera*) during periods of pregnancy and lactation [4].

2. ***Pipistrellus pipistrellus*** (Schreber, 1774). The species activity was lower in the net area, being higher in the open space. We identified it with the help of the heterodyne detector, in the open space at 300 m. Here the feeding activity was intense. The species specimens were netted at 0,5 – 1,5 m height. The individuals were flying from the forest towards the dunes. The specimen netted in August was a male, adult. The length of the arm was of 30,2 mm and its weight was 5g.

3. *Pipistrellus nathusii* (Keyserling & Blasius, 1839). In June there was netted a single specimen, at 0,5 m height (at 22.20) and in august 2 males, adults (between 20.55 and 21.10), at 1m height (in 2nd and 3rd pocket of the net). The specimens were flying from the forest towards the dunes.

P. nathusii has the biggest dimensions among the species of genus *Pipistrellus*. The length of the arm at the captured specimens was between 32.4 and 35.3 mm, and its weight was ranging between 7.5 and 7.7 g. The main characters that we kept in evidence when determining the species are the paradigm of the capillary network from the level of the wing and the shape of the superior incisors (**Fig. 2**) [8].

It is a species which prefers the humid areas. Due to this, the specie is quite frequent in the delta, although in Romania is generally a rare species.

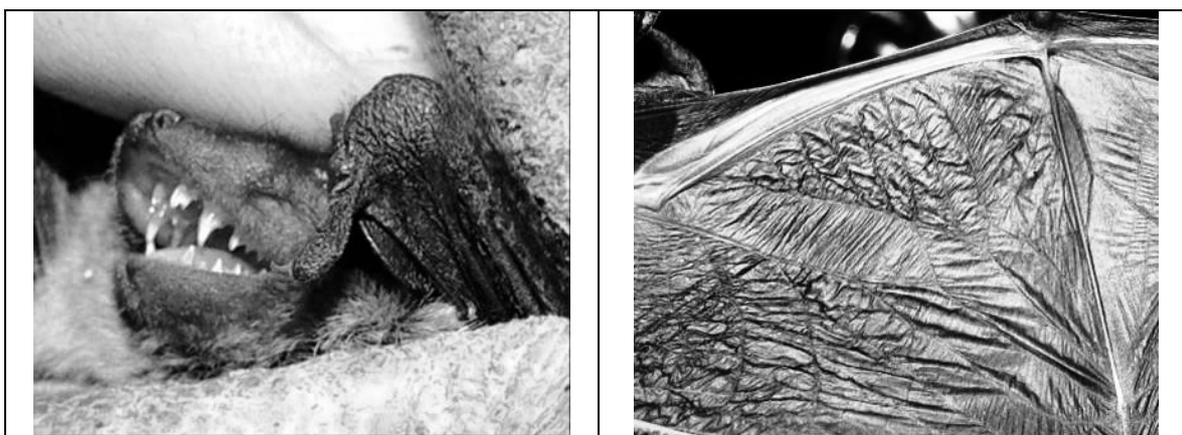


Fig. 2. *Pipistrellus nathusii*, shape of the superior incisors (left) and capillary network of the wing membrane (right).
(foto: Viorel POCORA)

4. *Myotis daubentonii* (Kuhl, 1817). A single specimen was netted in June, a male, juvenile (**Fig. 3**), at 22.45. The specimen stuck in the net at 1m height, on the way to the glade. The length of the arm at the captured individual was of 36.6 mm, the weight – 6g. The species hasn't been identified before in the Danube Delta, even if it's a forest species, specific to humid areas.



Fig. 3. *Myotis daubentonii*, juvenile (foto: Viorel POCORA)

5. *Nyctalus noctula* (Schreber, 1774). In June there were captured 2 males, adults (**Fig. 4**), on the flight way from the forest, at 22.50. The specimens were flying from the dunes towards the forest. They were caught in the net at 1.6 – 2 m height. The length of the arms was between 48.8 and 55.5 mm, and the weight: 31.5 and 33g. It is a commune species in this kind of habitats.



Fig. 4. *Nyctalus noctula*, male. (foto: Viorel POCORA)

6. *Nyctalus leisleri* (Kuhl, 1817). There were 2 nursing females netted (Fig. 5). The specimens were flying from the dunes towards the forest, on the flight way to the glade, and were caught in the net at 1.6 m height. The females were captured at 21.40. The length of the arm was between 42 and 44.9 mm, and the weight between 16 and 20g. This species has smaller dimensions than the previous species.



Fig. 5. *Nyctalus leisleri*, nursing female. (foto: Viorel POCORA)

At Hasmacul Ivancescu, on September 6th, 2006, on a poplar placed at 20 meters away from the hasmac, was noticed an entrance into a hollow, where a colony of about 20 individuals of *Nyctalus leisleri* took shelter. The entrance can be found at 5-6 m above the ground, with the diameter which allows a bat of medium or big size to get in. The poplars had the trunks diameter of about 50cm, and a height of 15 – 18 m.

In what concerns the specific composition of the species netted, in semi opened habitat the predominant species were: *Pipistrellus pygmaeus* și *Pipistrellus nathusii* (Fig. 6).

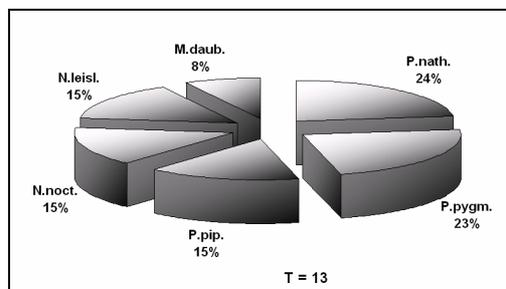


Fig. 6. The specific composition of bats netted at Dunele Grădina lui Omer.

The specific composition of the bats from Letea Forest, obtained based on the recordings with the ultrasound detector.

Netting is usually sufficient for the identification of the more commune species which are flying under canopy, in open and semi opened space. For the species that are flying high in the canopy or above it, the ultrasound recordings represent an important addition in the observations lead.

At Dunele Grădina lui Omer, in the place where the net was added, at the ground level, a time expansion detector has been placed, with which the recordings from August and September were made, for the identification of the ratio of the bats and their activity.

The data about the species of *Myotis* kind were cumulated, in case of identifying with the time expansion detector, because the sonograms of those species are alike, making a difficult identification (table 2).

Table 2

Bats activity, determined by the recordings with the time expansion detector, on transect (Letea Forest), pointed by number of passes

Date	<i>N. n.</i>	<i>N. l.</i>	<i>E. s.</i>	<i>P. p.</i>	<i>P. py.</i>	<i>P. na.</i>	<i>M. sp.</i>	T	U%	T °C
8.VIII.2006	19	1	2	8	8	3	7	48	64	23,7
10.VIII.2006	9	2	-	1	9	1	-	22	93	22,1

With the help of the heterodyne detector, of an anterior recordings library, some of the species of *Myotis*-kind can be determined, but with an error level given by the subjectivity of the observer (table 3).

Table 3

Bats activity, determined by the heterodyne detector recordings, on transect (Letea Forest), pointed by the number of passes

Date	<i>N. n.</i>	<i>E. s.</i>	<i>P. p.</i>	<i>P. py.</i>	<i>P. na.</i>	<i>P. sp.</i>	<i>M. sp.</i>	<i>M.my/ M.br.</i>	<i>M.da.</i>	<i>M.nat.</i>	<i>M.bech.</i>	Total
17.VI.2006	8	-	15	-	-	-	-	-	-	-	-	23
18.VI.2006	7	-	6	8	-	-	-	10	3	-	-	34
20.VI.2006	8	2	7	-	5	-	4	3	5	5	1	40
21.VI.2006	6	3	8	2	-	-	-	1	-	2	1	23
5.IX.2006	10	1	1	3	2	3	5	-	-	-	-	25
6.IX.2006	8	-	2	6	3	-	2	5	7	3	-	35

The data for *Nyctalus noctula* and *Nyctalus leisleri* species (Fig. 7) have been cumulated because with the heterodyne detector the species are hard to differentiate. Other species are: *Myotis sp.*, *Pipistrellus sp.*, *Myotis mystacinus/Myotis brandtii*, *Myotis nattereri*, *Myotis bechsteinii* and *Barbastella barbastellus*.

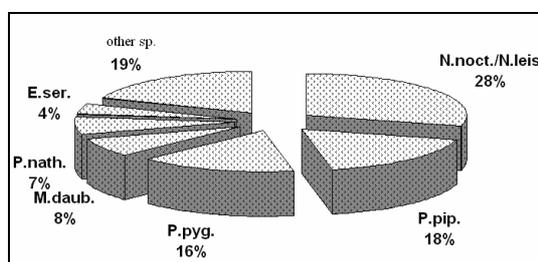


Fig. 7. The specific composition of bats from Letea Forest, determined by the recordings made with the detector.

The constancy is a structural indicator which shows in what proportion a certain species participates at the structure of population (Fig. 8).

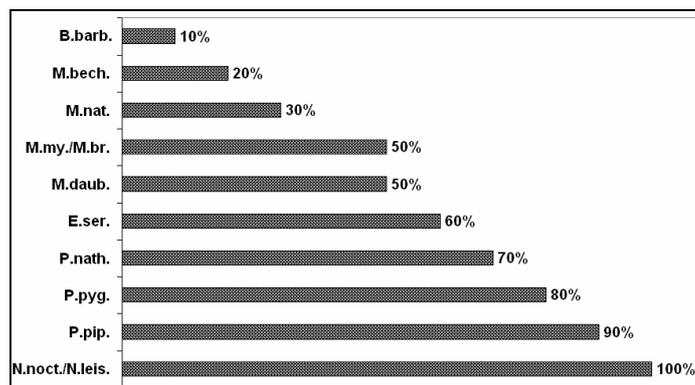


Fig. 8. Bat species frequency from Letea Forest.

The bats identified at Letea Forest can be included into 4 classes of constancy, taking into account the presence of different bat species in the identification made by detectors, from fixed position or on transect in Letea Forest:

- 3 euconstant species: *Nyctalus noctula/Nyctalus leisleri* (100%), *Pipistrellus pipistrellus* (90%) and *Pipistrellus pygmaeus* (80%);
- 2 constant species: *Pipistrellus nathusii* (70%) and *Eptesicus serotinus* (60%);
- 3 accessory species: *Myotis daubentonii* (50%), *Myotis mystacinus/Myotis brandtii* (50%) and *Myotis nattereri* (30%);
- 2 accidental species: *Myotis bechsteinii* (20%) and *Barbastella barbastellus* (10%).

The data gathered at Letea Forest are preliminary ones. A more complete inventory of bats distribution, assessment of their abundance, as well as studies on the seasonal and annual dynamics are necessary for a better understanding of the status of these species in the respective forest.

CONCLUSIONS

In Letea Forest the study took place in June – September 2006 period.

In this area the bat fauna hasn't been studied before.

Based on the captures with the help of the net and of bats identifying with two types of ultrasound detectors (heterodyne and with time expansion), in fixed point or on transect, there were 11 bat species identified: *Nyctalus noctula*, *Nyctalus leisleri*, *Pipistrellus pipistrellus*, *Pipistrellus pygmaeus*, *Pipistrellus nathusii*, *Eptesicus serotinus*, *Myotis daubentonii*, *Myotis mystacinus/Myotis brandtii*, *Myotis nattereri*, *Myotis bechsteinii* and *Barbastella barbastellus*. From those, 6 of the species are new for the Danube Delta: *Myotis daubentonii*, *Myotis nattereri*, *Myotis mystacinus/Myotis brandtii*, *Myotis bechsteinii*, *Eptesicus serotinus* and *Barbastella barbastellus*.

The most abundant species from the forest are: *Nyctalus noctula* and *Nyctalus leisleri*, followed by *Pipistrellus pipistrellus* and *Pipistrellus pygmaeus*.

Among the species identified in Letea Forest there are 2 species nominated in annex II of Habitats Directive: *Myotis bechsteinii* and *Barbastella barbastellus* and 8 species are present in The Red Book of the vertebrates from Romania [5]: *Pipistrellus nathusii* (endangered species), *Nyctalus leisleri* (endangered species), *Myotis daubentonii* (critically endangered species), *Myotis nattereri* (endangered species), *Myotis bechsteinii* (endangered species), *Myotis mystacinus/Myotis brandtii* (endangered species), *Eptesicus serotinus* (vulnerable species) and *Barbastella barbastellus* (vulnerable species).

Rezumat. În Pădurea Letea studiul a fost realizat în perioada iunie-septembrie 2006. În această zonă nu a mai fost studiată fauna de chiroptere până în prezent. Pe baza capturilor cu ajutorul plasei și a identificării chiropterelor, cu ajutorul a două tipuri de detectoare de ultrasunete (heterodină și cu expansiune de timp), în punct fix și pe transect, au fost identificate 11 specii de chiroptere: *Nyctalus noctula*, *Nyctalus leisleri*, *Pipistrellus pipistrellus*, *Pipistrellus pygmaeus*, *Pipistrellus nathusii*, *Myotis daubentonii*, *Myotis mystacinus/Myotis brandtii*, *Myotis nattereri*, *Myotis bechsteinii?*, *Eptesicus serotinus* și *Barbastella barbastellus*. Speciile cele mai abundente din pădure sunt: *Nyctalus noctula* și *Nyctalus leisleri*, urmate de *Pipistrellus pipistrellus* și *Pipistrellus pygmaeus*.

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