Activity pattern of the soprano pipistrelle *Pipistrellus pygmaeus* revealed by radio-tracking

Tomáš Bartoníčka and Zdeněk Řehák

Department of Zoology and Ecology, Masaryk University, Kotlářská 2, 611 37 Brno, Czech Republic

bartonic@scl.muni.cz, rehak@scl.muni.cz

**Introduction**

The two phonic types identified in Europe, emit echolocation calls peaking at 45 and 55 kHz, respectively. Their reproduction isolation proven on segment differences of the cytochrome b gene was the main reason to distinguish the two species of pipistrelle bats, *Pipistrellus pipistrellus* and *Pipistrellus pygmaeus*. In spite of the interest in the systematic situation of the newly described species *Pipistrellus pygmaeus*, little is known of its ecology, mainly about the patterns of activity and localization. Field observations suggest that species of bats deviating in holes and crevices switch their roosts several times during a season. However, several studies imply that the roost switching was registered even in the hemisynanthropic *Pipistrellus pipistrellus* s.s. Nursery colonies of *Pipistrellus pygmaeus* were also found in buildings. Therefore we posed the following questions: How many night/day roost lactating females of *P. pygmaeus* use? Is *P. pygmaeus* bound to a specific roost with the year or switches the roosts as *P. pipistrellus*?

**Material and methods**

Fieldwork was conducted in south-eastern Moravia (Czech Republic), close to Vranovice village, in cultivated oak-ash wood forest along Svratka river. Surrounding landscape is characterized by wood patches, linear vegetation and fields. Nursery colony of *pipistrelles* roosted under roof of a physiotherapy building. Between June and July, 2004 to 2006, lactating females were captured individually in mist net from their colony roost. Only visibly lactating females, identified by the presence of bare patches around their nipples and the expression of milk, were tagged by transmitters.

Eleven females were equipped with 0.39g radio-transmitters (LBON, Holohed Systems). Transmitters were glued to the back of each bat with liquid adhesive. Transmitter mass represented less than 6% of body mass. Bats were released and were located using AR8000 hand held receivers (AOR, UK) and five-element Yagi antennas continuously from sunset to sunrise.

Two nights, when females were located under 600m of the night duration only were excluded. Bats carried active transmitters for an average of 2.1 ± 1.0 (S.D.) days (range 1 – 7 nights). We recorded and analysed a total of 25 nights for 11 females.

Non-parametric analyses were used where data violated normally, equal variance or equal sample size. Significance was assessed at an alpha of 0.05.

**Results**

**Overnight changes**

Significant differences in roosting \[H (2, N= 61) = 10.62, p = 0.005\] and foraging activity \[H (2, N= 61) = 13.27, p = 0.001\] were found. The highest foraging activity was recorded at the beginning of the night (1st third), whereas during the following thirds of the night it decreased. An increase of roosting activity was recorded during the 3rd third. No difference in commuting activity was found (Fig. 1).

**Roost switching**

Each female visited at least one roost per night, but five females visited two roosts during several nights, i.e. on 26% of nights. Night roosts were visited in average 3.7 times (range 1 - 7) per night and female. Quadratic polynom describes significantly the increase of roost visits at the beginning of lactation and the decrease at the end of lactation as well (F = 6.07, p = 0.008, Fig. 2). In total, five females (45%) changed day roosts on the following night (in total, 32% of nights).

Night roosts were distant over 1 km only in 36% of all events (maximum 1.4 km). Two trends were obvious towards the time of weaning, 1) decrease in number of roosts visited per night and 2) increase in distance between the night and day roosts. Time, which females spent in these roosts, was constant (ANOVA, F = 1.17, ns). Foraging sites were distant over 1 km in 55% of females (maximum 1.75 km).

Some females transported their offspring into roosts at night, which was evidenced by records of flightless youngs. For lactating females, the transport of youngs and their depositing in a temporary roost within the hunting ground can be less costly than flying back and suckle the young in a distant nursery.

**Summary**

It was found that suckling female *P. pygmaeus* similarly to *P. pipistrellus*, use several daily roosts during the same reproduction season. Three of these roosts were occupied by large number of bats, usually more than 50 individuals. The rate of movements between these shelters was very high. Low philopatry recorded in reproducing females makes it difficult to estimate the total number of members of one and the same nursery colony. Roost switching can be explained by the fission-fusion model demonstrated in some other tree dwelling bat species. Its reasons are probably transitory and can include variable microclimatic conditions, insufficient inner space of certain roosts and the impact of parasites.

**Fig. 1** - Foraging, commuting and roosting activity of *Pipistrellus pygmaeus* in minutes in three thirds of night. * p<0.01; ** p<0.001; Median box: 25% - 75%, Whisker minimum - maximum.

**Fig. 2** - Number of roost visits per night during whole lactation period.

The study was supported by the grant No. 205/02/0961 of the Czech Science Foundation “Situation of *Pipistrellus pipistrellus* superspecies in the Czech Republic”. We also thank to Prof. J. Gailer for all comments and A. Bok for help.