



ORIGINAL INVESTIGATION

Roost and hunting site fidelity of female and juvenile Daubenton's bat *Myotis daubentonii* (Kuhl, 1817) (Chiroptera: Vespertilionidae)

Géraldine Kapfer^{a,*}, Thibaud Rigot^a, Ludo Holsbeek^c, Serge Aron^b

^aConservation Biology Unit, Royal Belgian Institute of Natural Sciences, Rue Vautier, 29, 1000 Brussels, Belgium

^bDepartment of Behavioural and Evolutionary Ecology, Université Libre de Bruxelles, CP160/12, Avenue F.D. Roosevelt 50, 1050 Brussels, Belgium

^cDepartment of Biology, Vrije Universiteit Brussel, Brussels, Pleinlaan 2, 1050 Brussels, Belgium

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Abstract

We investigated roosting and hunting site fidelity of Daubenton's bats *Myotis daubentonii* (Kuhl, 1817) in the Forêt de Soignes, an old-stand forest dominated by 150–200-year-old beeches, during the summers of 2003 and 2004. Roosting behaviour and hunting activity over ponds of adult females and juveniles were monitored using radio-telemetry. Eighteen roosts were located, all in natural cavities. The bats occupied a limited number of trees located in a specific and small roosting area. This roost aggregation was not linked to the distribution of hollow trees. Furthermore, whereas all 11 ponds in the study area were exploited by Daubenton's bats, monitored individuals were limited to two ponds to which they showed high fidelity. These two ponds were not the closest to the roosting area. Overall, these results show that at least for the time we conducted our experiment, female and juvenile Daubenton's bats are highly faithful to specific roosting and hunting grounds.

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Introduction

Bat populations are probably limited by the availability of sites with high and constant insect productivity for foraging, sufficient suitable roosts and high connectivity (Limpens and Kapteyn 1991; De Jong 1995; Jenkins et al. 1998). This is particularly marked in temperate regions, where bats have only a limited time to give birth, raise their young and deposit fat reserves before winter (Ransome 1990). Site fidelity and territoriality may have been selected for increasing roosting and hunting efficiency. Site fidelity might indeed

facilitate prior access to resources and territorial behaviour might have evolved to defend it. Hunting site fidelity has been reported in some temperate bat species, with individual bats showing strong loyalty to foraging areas on consecutive nights, such as the common pipistrelle *Pipistrellus pipistrellus*, the large mouse-eared bat *Myotis myotis*, the notch-eared bat *Myotis emarginatus*, the brown long-eared bat *Plecotus auritus* or the Bechstein's bat *Myotis bechsteinii*, (Racey and Swift 1985; Audet 1990; Krull et al. 1991; Entwistle et al. 1996; Kerth et al. 2001). On the other hand, roost fidelity seems closely associated with site permanency and availability. Species roosting in relatively short-lived but abundant roosts (as trees) tend to switch roost more often than species selecting more stable, predictable but

*Corresponding author.

E-mail address: geraldine_kapfer@hotmail.com (G. Kapfer).

rarer structures like buildings or caves (Lewis 1995). Roost fidelity has been described in various bat species (Lewis 1995), including the common pipistrelle, the serotine bat *Eptesicus serotinus*, the brown long-eared bat, the Natterer's bat *Myotis nattereri*, or the yuma bats *Myotis yumanensis* (Gerell and Lundberg 1985; Catto et al. 1996; Park et al. 1998; Entwistle et al. 2000; Evelyn et al. 2004). In a few species, fidelity was closely associated with a territorial behaviour, whereby foreigners to the colony are chased through fights or repelled by agonistic advertisement calls emitted in flight or while perched (Gerell and Lundberg 1985; Leonard and Fenton 1984). Some studies suggested that tree-dwelling bat species might not exhibit roost fidelity and not form colonies in individual trees but remain loyal year after year to a definite area enclosing many potential roost trees (Vonhof and Barclay 1996; O'Donnell and Sedgeley 1999; Cryan et al. 2001; Willis and Brigham 2004; Russo et al. 2005). Colonies might then spread among those trees forming fission–fusion societies (Kerth and König 1999; Willis and Brigham 2004).

Daubenton's bat *Myotis daubentonii* (Kuhl, 1817) is among the most common bats in Europe (Mitchell-Jones et al. 1999). During the breeding season, it is a tree-dwelling species occupying hollow branches, woodpecker holes, crevices, or finding sometimes shelter behind loose bark (Ebenau 1995; Rieger 1996a,b; Kapfer et al. 2006). It hunts over water surfaces, feeding mainly on Chironomidae (Diptera, Nematocera) and Trichoptera, caught either by aerial hawking or by gaffing from the water (Jones and Rayner 1988; Sullivan et al. 1993; Flavin et al. 2001). Ponds are often very productive habitats, but are limited in number. The close dependence of Daubenton's bats on water bodies severely limits the habitat use and distribution of this species (Dietz et al. 2006). One should therefore expect populations of Daubenton's bats to show hunting site fidelity, and to defend sites against conspecifics. Chases over water bodies were documented (Wallin 1961; Rieger et al. 1992; Encarnaçao et al. 2005) and could reflect agonistic intentions. To date, most studies on roosting and/or hunting behaviour in the Daubenton's bat have explored roost selection (Rieger 1996a,b; Boonman 2000), activity patterns (Rieger 1996c; Encarnaçao et al. 2004), use of linear landscape elements (Rieger et al. 1990; Dietz and Fitzenräuter 1996), habitat use (Zahn and Maier 1997; Warren et al. 2000) or resource partitioning (Swift and Racey 1983). A limited diffusion in specific zones over several years of 'resident' males Daubenton's bats has been reported (Encarnaçao et al. 2002). Recently, two studies have documented an unequal distribution of adult female and male Daubenton's bats linked to the presence of water bodies, insect productivity, presence of roosting sites and climatic conditions (Encarnaçao et al. 2005; Dietz et al. 2006). It has been shown that energy demand and food intake is

higher during the reproductive period (Encarnaçao and Dietz 2006), which may explain why females use energy-rich hunting sites during pregnancy and lactation (Encarnaçao et al. 2005). Moreover, juvenile Daubenton's bats often experience high mortality during their first winter and they might need good feeding places to fatten up before hibernation (Boyd and Stebbings 1989; O'Donnell 2002). Therefore, whether female and juvenile Daubenton's bats exhibit roost and/or hunting site fidelity deserves further studies.

In this paper, we investigated both roost and hunting site fidelity in a population of female and juvenile Daubenton's bats in a sub-urban deciduous forest, using radio-tracking. More specifically, we assessed whether bats stay loyal to a defined roosting area, occupy several trees within this roosting area and/or switch roost frequently. We also investigated if bats focused their hunts over a few number of ponds or if they spread equally over the different ponds available around their roosts.

Material and methods

Study area

The study was carried out in the Forêt de Soignes, Belgium (50°48'N, 4°24'E). The forest is an even-aged system of 4380 ha enclosing mostly hardwoods, with beeches (*Fagus sylvatica*) and oaks (*Quercus* spp.) as dominant species. Sixty-five percent of the forest surface is covered with old (130–200 years) and tall beeches. This old forest has an overall low biodiversity but seems to shelter many species of bats (Devillers et al. 2004). Ponds are located in the north-western edge of the forest zone (Fig. 1). In three locations, closely contiguous ponds (P2, P10, and P11) were considered as single water bodies. All ponds were visited by various species of bats, including the Daubenton's bat (Devillers et al. 2004).

Capture and monitoring

Mist-netting was performed during summer 2003 and 2004 over pond P2 in the Silex Domain, a natural reserve that borders the forest on its north-eastern side (Fig. 1). Four mist-nets of 12 and 18 m long were placed over the pond. Nine bats were captured and were immediately tagged with radio-transmitters (Table 1). In spring 2004, tracking of marked individuals allowed identification of tree roosts where an additional sample of five bats was captured by using bag traps placed at roost exits, and equipped with transmitters. Individuals were sexed, aged (adult vs. juvenile) (Richardson 1994), weighed to the nearest 0.5 g (115 K, Pesola, Switzerland) and the length of their forearms was measured (± 1 mm) (Table 1). Females were separated into reproductive classes (non-reproductive, pregnant, lactating) by palpating abdomens and examining nipples.

Either BD-2N (0.39–0.51 g, Holohil Systems Ltd., Canada) or Ag317 (0.55 g, Biotrack Ltd., UK) transmitters were fixed on

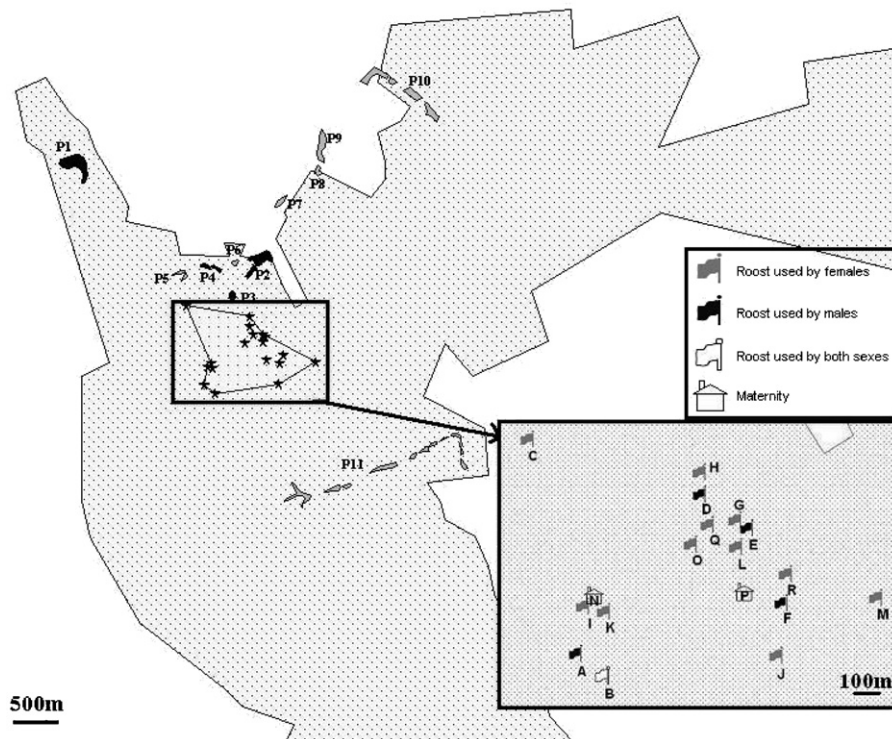


Fig. 1. Map of the Forêt de Soignes showing ponds (P1: Cambre, P2: Moulin/Silex, P3: Vuilbeek, P4: Enfants noyés, P5: Fer à cheval, P6: Tournay-Solvay, P7: Leybeek, P8: Royale belge, P9: Ten Reuken, P10: Rouge-Cloître and P11: Groenendael), the roosting area and roosts' location. Ponds exploited by the studied population are shown in black; ponds used by other populations are shown in grey.

Table 1. Daubentons' bats equipped with transmitters, data on tracking period and qualitative use of roosts and hunting sites

Nr	Capture location	Date of capture	Age class	Sex	Reproductive class	Tracking days	Tracking interruption	Ponds used	Roost used	Weight (g)	Forearms (mm)
<i>Mist netting over pond</i>											
1	P 2	28/07/2003	Juvenile	Male	–	8	Transmitter fall	P2, P3	A, B	–	–
2	P 2	9/08/2003	Juvenile	Female	Non-reproductive	2	Transmitter fall	P1, P2	C	9.5	–
3	P 2	12/08/2003	Juvenile	Male	–	14	Battery	P1, P2	D, E, F	8.5	–
4	P 2	9/09/2003	Juvenile	Female	Non-reproductive	10	Battery	P2	G	10.5	34
5	P 2	12/04/2004	Adult	Female	Non-reproductive	17	Battery	P1, P2	H, I, J, K	9	40
6	P 2	14/05/2004	Adult	Female	Pregnant	12	Battery	P1, P2	L, M, N, O	10	34
10	P 2	28/05/2004	Adult	Female	Pregnant	4	Battery	P1, P2, P3, P4	B, N	12	38
11	P 2	3/06/2004	Adult	Male	–	13	Battery	P2, P11	B	9	38
12	P 2	19/06/2004	Adult	Female	Lactating	7	Battery	P2	P	11	37
<i>Harp trapping at roost</i>											
7	N	20/05/2004	Adult	Female	Pregnant	9	Transmitter fall	P2, P3	N	11	37
8	N	20/05/2004	Adult	Female	Pregnant	7	Transmitter fall	P1, P4	N	12	37
9	N	20/05/2004	Adult	Female	Pregnant	7	Transmitter fall	P2	N	8.5	37
13	P	10/07/2004	Adult	Female	Lactating	7	Transmitter fall	P1, P2	P, Q	9.5	35
14	P	10/07/2004	Adult	Female	Lactating	13	Battery	P1, P2, P3	P, Q, R	11	39

the back of animals using surgical adhesive (Skinbond, Smith and Nephew, Largo, Florida) after clipping the fur. Transmitter weight was kept under 5% of the animal body weight

ranging in our study between 8.5 and 12g (Aldridge and Brigham 1988). Signals were detected using the 'homing in' method (White and Garrott 1990) by means of a TR-4 receiver

(Telonics, US) fitted either with a three-element Yagi antenna or with an omni-directional antenna fixed on a car roof. Bats were monitored from the first night following their capture until loss of tag or battery failure. We considered a loss of tag either when a transmitter was found on the ground, or when the tracked animal was no longer found to leave the roost for 2 consecutive nights and days, indicating that the transmitter fell inside the roost or on the way between roosting and hunting sites. At most, five bats were followed simultaneously. Radio-tracking was performed over nightly activity periods to localise roosts and hunting sites. Bat movements from and to roosts and hunting grounds were monitored for a total of 62 nights (from sunset to sunrise) and 33 half-nights (from sunset to 1 a.m.). Bats were tracked one at a time except during a week in May during which we monitored activity patterns of four bats roosting together to investigate if these females used the same hunting grounds. We measured the distance travelled by individuals between their roost and the middle of hunting grounds. We did not use the distance between roosts and minimum, innermost or outermost measurement point of the hunting area because animals hunted over the entire pond's surface but also because there were no large water bodies in our study area. To depict tracking data, in 2004, we measured contact time, here, reported as 'hunting activity', by counting the number of 20 min periods during which Daubenton's bats were detected over hunting grounds. In total, 714 periods of 20 min were recorded.

Statistica 6 was used for data analysis. With non-parametrical Kruskal–Wallis ANOVA by ranks test we estimated if the panel of ponds was distributed at even distance from roosts or not. Dunn Multiple Comparison test were used to determine which ponds were situated the closest or farthest from roosts. We compared bat activities over the different ponds using Kruskal–Wallis ANOVA by ranks test. Student *t*-test or Mann–Whitney *U*-test helped us to assess whether bats were more likely found over specific ponds or groups of ponds. We also tested whether bat activity was correlated to the distance from roosts to hunting grounds with Spearman Rank Correlation test.

MapInfo Professional 5.5 was used to draw maps, measure distances and areas.

Results

Fourteen Daubenton's bats were captured and fitted with transmitters. Nine individuals were caught over P2: four adult females (bats 5, 6, 10, 12), one adult male (bat 11) and two juveniles of each sex (bats 1–4) (Table 1). On May 2004, we captured by harp trap 33 adult females emerging from roost N and tagged three of them (bats 7–9). On July 2004, 19 adult females and 19 first season juveniles were caught from roost P; two adults were fitted with a transmitter (bats 13 and 14) (Table 1). The mean monitoring time \pm S.D. per individual was 9.3 ± 4.1 days (range: 2–17 days). About half the transmitters stopped functioning due to progressive battery failure; in all other cases, the tracking stopped due to transmitter loss.

Roost fidelity

Five females (bats 4, 12, 7, 8, 9) and the adult male (11) stayed loyal to the same roost during monitoring time (Table 2). The remaining seven bats changed roost using two to four roosts. On average, these bats (six females and one juvenile male) stayed on the same roost 3.18 ± 2.84 days (range: 1–10 days) before switching. Overall, individuals spent more than 50% of the monitoring time in a single roost (Table 2). Three females initially trapped in roost N were found in roost P. These individuals were recognised thanks to a short fur area on their back occasioned by previous equipment with a radio-tag.

Roost site fidelity

Tagged bats were found to roost in 18 trees located in a restricted area of 1.12 km², south of the majority of the ponds (Fig. 1). Juveniles and adults used roosts in the same limited forest area. Occupation of the roosts was not linked to the overall distribution of hollow trees. A survey carried out from 1999 to 2002 showed that trees with cavities or loose barks were equally distributed over the forest (Ben Van der Wijden, unpublished data).

Hunting site fidelity

Hunting grounds were located in the North, North-west (P1–P6), in the South (P11) or in the North-East (P7–P10) of the roosting area (Fig. 1). Adult females did not use ponds equally (Kruskal–Wallis ANOVA by ranks test, $H(df = 8, N = 99) = 48.4, p < 0.001$). They hunted over four ponds (P1, P2, P3 and P4) north of their roosts, out of the 11 ponds available. Hunting activity was significantly higher over ponds P1–P2 (Mann–Whitney *U*-test, $U = 6.5, df = 8, p < 0.003$) than any other, with overall 95% of total radio-tracking time registered over these ponds (Table 3). We did not find any significant difference between hunting activity over P1 and P2 (Student *t*-test, $t = 0.15, df = 16, p = 0.88$). The single adult male was the only bat that visited a different pond (P11) (Table 3).

Ponds were not localised at equal distances from the roosting area (Kruskal–Wallis ANOVA on ranks, $H(df = 10, N = 198) = 173.5, p < 0.001$): P2, P3, P4, P5, P6 and P11 were generally closer to roosts than P1, P7, P8, P9 and P10 (Dunn's Multiple Comparison tests, $p < 0.05$). Mean flight distance of bats between roost and foraging area was 2.4 ± 1.0 km (range: 0.5–3.8 km). Bat activity and distances between hunting sites and roosts showed no association (Spearman Rank Correlation, $r = -0.05, p = 0.88$). Tagged individuals visited one to three different ponds each night, some bats returning to the same hunting site up to six times in a single night.

Table 2. Quantitative use of roost by Daubenton's bats.

Tracking days																				
Bat nr	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	No. (days)	% time in a roost
<i>Mist netting over pond</i>																				
1	P2	–	A	A	A	A	A	B											6	83
2	P2	C																	1	–
3	P2	–	–	–	D	D	E	E	E	E	E	F	F	F					10	50
4	P2	–	–	G	G	G	G	G	G	G									7	100
5	P2	H	I	I	I	I	I	I	I	I	I	J	J	J	J	K	K		16	56.2
6	P2	L	M	N	N	N	N	–	N	O	N	N	N						12	72.7
10	P2	B	N	N															3	66.6
11	P2	B	B	B	B	B	B	B	B	B	B	B	B						12	100
12	P2	P	P	P	P	P	P												6	100
<i>Harp trapping at roost</i>																				
7	N	N	N	N	N	N	N	N	N										8	100
8	N	N	N	N	N	N	N												6	100
9	N	N	N	N	N	N	N												6	100
13	P	P	Q	Q	P	P	P												6	71.4
14	P	Q	P	P	P	P	P	P	P	P	P	P	R						12	85.7

Table 3. Use of hunting grounds by monitored Daubenton's bats in 2004

Bat nr	Capture location	Age class	Sex	P1		P2		P3		P4		P11	
				n	%	n	%	n	%	n	%	n	%
<i>Mist netting over pond</i>													
5	P2	Ad	F	102	79	28	22	–	–	–	–	–	–
6	P2	Ad	F	95	100	–	–	–	–	–	–	–	–
10	P2	Ad	F	35	86	–	–	5	12	1	2	–	–
11	P2	Ad	M	–	–	12	41	–	–	–	–	17	59
12	P2	Ad	F	–	–	30	100	–	–	–	–	–	–
<i>Harp trapping at roost</i>													
7	N	Ad	F	–	–	84	92	7	8	–	–	–	–
8	N	Ad	F	46	98	–	–	–	–	1	2	–	–
9	N	Ad	F	–	–	86	100	–	–	–	–	–	–
13	P	Ad	F	11	33	22	67	–	–	–	–	–	–
14	P	Ad	F	32	24	96	73	4	3	–	–	–	–
			Total	321	45	358	50	16	2	2	1	17	2

n: periods of 20 min during which we observed the bat over ponds P1, P2, P3, P4 and P11. %: proportion of time we observed the bat over the pond.

Four females, roosting in the same site, monitored simultaneously were found to hunt over ponds P1 and P2: bats 8 and 10 were hunting predominantly over P1 and bats 7 and 9 over P2 (Table 3).

Discussion

Roost fidelity

Roost fidelity in summer greatly varies according to bat species. Whereas some are faithful to a single roost

site (e.g., horseshoe bat *Rhinolophus* sp., Rossiter et al. 2002; serotines bat, Catto et al. 1996; soprano pipistrelle *Pipistrellus pygmaeus*, Barlow and Jones 1999), others shift roost site regularly (e.g., common pipistrelle, Barlow and Jones 1999). Our data show that females Daubenton's bats do not display a strict pattern of roost fidelity: some bats changed roost frequently, whereas others did not. During monitoring time, half the bats switched roost after a stay of about 3 days, which is consistent with Rieger (1996a) and Senior et al. (2005). Roost availability and permanency have been suggested to affect roost fidelity (Kunz 1982). Daubenton's bats

occupying spatially abundant roosts in a forest are more likely to change roost frequently. On the other hand, an adult male and five females did not switch roost during our study. Telemetry only allows a limited time of tracking because of transmitter loss or battery failure and except for the male, the five females were tracked at most for 7 days, which could partly explain why these individuals did not exhibit roost changes. Roost lability, defined as changing roost locations at least once in every 10 days, could result from disturbance, predation, changes in micro-climate and roost structure, parasitism, avoiding guano accumulation, or teaching newly volant juveniles about site locations (Lewis 1995). Costs and benefits of site fidelity for females might also change with the reproductive cycle. During pregnancy and lactation, females might be more faithful to some roosts because of the energetic constraints associated with the carrying of offspring to new roosts (Lewis 1995). As in Natterer's bats, it is possible that females Daubenton's bats shift roost sites frequently, but that they remain in specific roosts at certain periods of the year (Swift 1997).

Roost site fidelity

Our data also reveal that Daubenton's bats occupy many roosts clumped in a restricted area of forest. Females and juveniles captured over a given pond during summer 2003 and 2004 were all found to roost in a specific number of trees, in a small section of the forest. When bats switched to a new roost, they remained in the same limited area. It is unlikely that the restricted dispersion of the roost range results from hollowed trees availability, since mature beeches rich in cavities and in which we found the roosts, cover most of the forest clumps. Our study also indicates that different roosts may be connected to each other, since some individuals captured in roost N during pregnancy were found in roost P during lactation. This supports that Daubenton's bats use a network of roosting sites within a single forest, as previously suggested by Rieger (1996a). However, in this latter study, the author called 'forests' small woods more or less isolated from each other. Our investigations provide new information and demonstrate that loyalty to small roosting areas is not influenced by the forest surface. They also agree with Willis and Brigham (2004), according to whom loyalty to defined roosting areas, occupation of multiple trees within a roosting area, and roost switching are consistent with the hypothesis that tree-roosting bats maintain stable social groups that are larger than the number of individuals occupying any given tree. In Bechstein's bats, females show little roost fidelity but exhibit an extreme degree of philopatry to a specific home range in the forest (Kerth et al. 2002). Daubenton's bats could follow the same biological trait.

Several studies suggest that bat colonies using tree cavities are not restricted to individual trees, and that forest roosting bats are faithful to a defined area containing many potential roost trees (Vonhof and Barclay 1996; O'Donnell and Sedgely 1999; O'Donnell 2000; Cryan et al. 2001; Willis and Brigham 2004). Daubenton's bats that are loyal to small roosting area in the forest could learn and memorise the location and thermal characteristics of the different roosts and thus reduce time and energy invested in searching for suitable roosts and/or colony mates, reducing the risk of having to roost alone. Under the fission–fusion model, on a given night, the colony would consist of multiple roosting sub-groups spread among different trees within the roosting area (Kerth and König 1999; O'Donnell 2000; Kerth et al. 2001). Repeated roost switching over time may eventually enable bats to share roosts and maintain long-term associations with other residents to their roosting area (O'Donnell 2000). Although it seems likely, whether fission–fusion occurs in Daubenton's bats await further study. Moreover, monitoring time in the present work never exceeded 2 weeks. It might be necessary to investigate whether roosting site fidelity remains over years.

Hunting site fidelity

Our findings are consistent with hunting ground fidelity in Daubenton's bats. Dietz et al. (2006) showed that female Daubenton's bats forage next to their nursery colonies along a river in Germany. In our study, foragers had access to 11 ponds but used only four of them, with two ponds being more intensively exploited. None of the females and juveniles tagged was recorded foraging on the remaining seven ponds of the study area, even though some were closer to the roosting area. More precisely, our bats foraged in the North, North-east whereas other ponds were available South or North-east to the roosting area. It seems unlikely that water quality and, hence, insect availability accounted for this pond selection. Macro-benthos samples revealed that other ponds (i.e. P9 and P10) do produce large amounts of insects (unpublished data). Furthermore, all ponds of the study site were actively visited each night by several species, including Daubenton's bats indicating that they were prosperous foraging sites (Devillers et al. 2004).

Many studies agreed that foraging areas are limiting resources for Daubenton's bats populations with individuals competing and partitioning their home ranges according to food location (Encarnaçao et al. 2005; Senior et al. 2005). Sexual segregation was described in this species, females and males hunting at different elevation levels (Leuzinger and Brossard 1994; Russo 2002; Encarnaçao et al. 2005; Dietz et al. 2006). A shorter stay of males compared to females at foraging sites was

also reported as an evidence for males being evicted from feeding sites by females defending rewarding places against males (Encarnaçao et al. 2005). Senior et al. (2005) also documented intra-sexual segregation in male population of Daubenton's bats along a river. Dominant males excluded other males from better foraging and roosting places near nursery colonies for prior access to food but also to females. These data and the occurrence of chases over water bodies (Wallin 1961; Rieger et al. 1992, Encarnaçao et al. 2005) denote the particular territorial trend of the species. Territoriality in bats occurs either individually or collectively (Gerell and Lundberg 1985; Leonard and Fenton 1984). To date, group defence of maternity roost has been documented for Bechstein's bats, where individuals severely attack intruders to the colony (Kerth et al. 2002). Other studies in tropical regions described a group territorial behaviour with females actively defending foraging grounds against conspecifics (Bradbury and Verhecamp 1976; McCracken and Bradbury 1981). In Daubenton's bats competition occurs between males and females but also among males for access to hunting sites. As mentioned by Dietz et al. (2006), such a competition might also occur between females, which might defend high-quality water bodies against strangers to their colony, especially during cost intensive periods such as pregnancy and lactation. Whether groups of females display collective hunting and/or collective defence of resources awaits further investigation.

Management implications

There is an urge to consider roosting areas, comprising all the roosts used by a sub-population of tree-dwelling bats, as distinct entities and to define their spatial boundaries. In Daubenton's bats, roosting entities seem also to be closely associated with discrete hunting grounds. The link between roosting and hunting sites in our study was exclusive, since individuals caught on a given ponds were found in a specific roosting area, and vice-versa. This particular resource selection and use implies very specific management actions. First, managers should avoid clear cutting in forest parcels where a roosting entity has been located. Total clearing of roosting trees could impair bat population badly, even if after some intensive search for new roosts, some bats were able to mix with other sub-groups or create a new roosting entity. Big brown bats, *Eptesicus fuscus*, are loyal to their roosts but after eviction from their roost, bats tend to produce fewer offspring in the newly discovered roosts (Brigham and Fenton 1986). Second, there should not be simultaneous water draining of all ponds used as main hunting grounds by a sub-population. Finally, connectivity between roosting entity and hunting grounds of each sub-group should

be maintained because biological corridors are indispensable to Daubenton's bats for commuting flights between sites (Limpens et al. 1989).

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Zusammenfassung

Tagesquartier- und Jagdgebietstreue von weiblichen und juvenilen Wasserfledermäusen *Myotis daubentonii* (Kuhl, 1817) (Chiroptera: Vespertilionidae).

Wir haben die Tagesquartier- und Jagdgebietstreue von Wasserfledermäusen im Forêt de Soignes, einem alten Wald mit 150 bis 200 Jahre alten Buchen, während der Sommer 2003 und 2004 beobachtet. Das Tagesquartier-Verhalten und die Jagdaktivität von Weibchen und Jungtieren über Teichen wurden mittels Telemetrie aufgezeichnet. Achtzehn Tagesquartiere wurden geortet, alle befanden sich in natürlichen Hohlräumen. Die Fledermäuse belegten eine begrenzte Anzahl von Bäumen, die in einem bestimmten und kleinen Tagesquartier-Gebiet lagen. Es bestand kein Bezug zwischen diesen Tagesquartieren und der Streuung hohler Bäume. Weiterhin wurde festgestellt, dass, obwohl alle elf Teiche in dem observierten Gebiet von Wasserfledermäusen besucht wurden, die überwachten Tiere sich auf zwei Teiche beschränkten, für die sie eine große Treue zeigten. Diese beiden Teiche waren nicht immer die dem Tagesquartier-Gebiet am nächsten gelegenen. Allgemein zeigen die Ergebnisse, dass zumindest während der Zeit unserer Studie die Weibchen und die juvenilen Wasserfledermäuse bestimmten Tagesquartier- und Jagdgebieten sehr treu sind.

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