

Distribution of *Myotis mystacinus* and *Myotis brandtii* (Chiroptera) in Sweden

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Abstract

Studied the distribution of the two sibling species of whiskered bats *Myotis mystacinus* and *M. brandtii* in Sweden. The northern range of *M. mystacinus* reaches about the latitude of 62° N while that of *M. brandtii* extends to 64° N. The two species are sympatric in South and Central Sweden. *M. brandtii* seems to be the more frequent species in Sweden.

Introduction

When a species is splitted into two species one has to rebuild the distribution picture of the original species. Lack of knowledge, however, often brings the handbook writer to preserve the old distribution of the original species. The new species, on the other hand, is handled as a rare species. So it has been done with the whiskered bats, *Myotis mystacinus* (Kuhl, 1819) and *M. brandtii* (Eversmann, 1845).

The distribution of *M. mystacinus* and *M. brandtii* in Sweden has been dealt with by BAAGØE (1973), who examined Swedish museum records, representing 17 different localities (Fig. 1).

Material and methods

Within the scope of a project on bats supported by World Wildlife Fund, dead bats were collected through the public. Up to now, about 300 bats have been received of which 45 specimens have been identified as whiskered bats. All records obtained are referred as summer records.

Another two specimens, one of each species, were nettrapped at the same locality in Skåne (southernmost part of Sweden).

Results

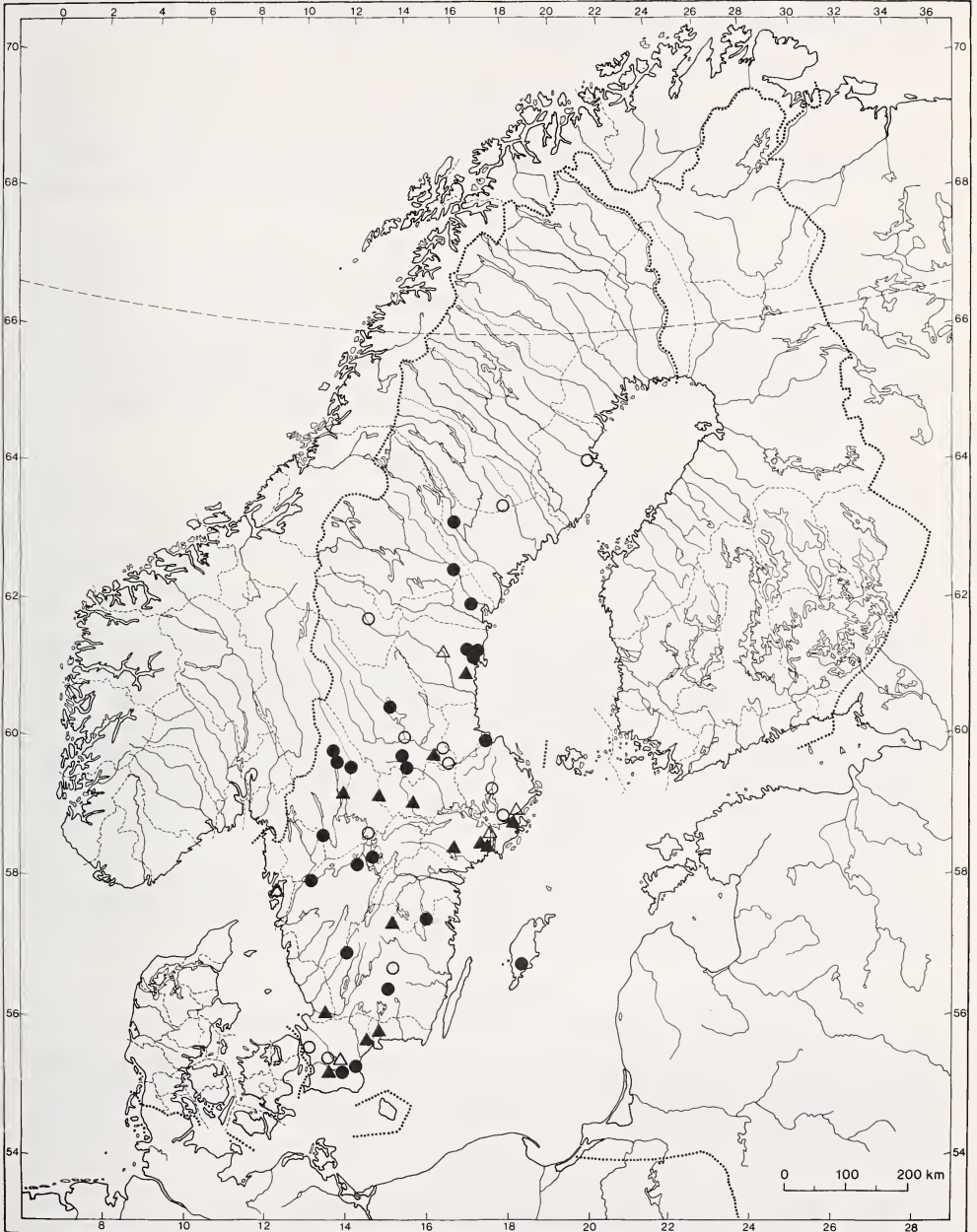
The sex and age distribution of the collected specimens (Table) don't differ statistically when comparing the two species ($\chi^2 = 1.75$, d.f. = 3, $P > 0.50$). The male majority among the juveniles can not be explained.

Table

Sex and age distribution of the records of *Myotis mystacinus* and *M. brandtii*

Species	Males		Females		Total
	Ad.	Juv.	Ad.	Juv.	
<i>M. mystacinus</i>	2	5	6	0	13
<i>M. brandtii</i>	5	10	6	1	22

The new records obtained (see Fig.) strengthen the distributional differences of the two species indicated by the earlier records examined by BAAGØE (1973). Hence, the northern range of *M. mystacinus* reaches about the latitude of 62°N while that of *M. brandtii* extends to 64°N. The two species are sympatric in South and Central Sweden.



Distribution of *Myotis mystacinus* (triangles) and *M. brandtii* (circles). Filled symbols denote records obtained in this study, open ones refer to BAAGØE (1973)

The records of *M. brandtii* is in majority (63%) in the collection as it was among the earlier records examined (70%). The distribution map gives the impression that the two species are evenly distributed but when relating the number of records to the encounter rate (dependent on human population density), both species are probably more common north of the latitude of 60°N.

Most records of both species (80%) were obtained in dwelling houses, which is to expect with regard to the way of collecting.

Discussion

The two sibling species are sympatric in Central Europe (GAUCKLER and KRAUS 1970; HANÁK 1971; RUPRECHT 1974) but separated in greater part of the Soviet Union (STRELKOV 1983).

In Sweden, *M. brandtii* is found farther north (64°N) compared to *M. mystacinus* (62°N). The same distribution pattern is found in Finland (LEHMANN 1983). This agrees with the statement by STRELKOV (1983) that *M. brandtii* is a typical boreal forest species.

M. mystacinus seems to be the more common species in Central Europe while *M. brandtii* is more frequent in Sweden and Finland (LEHMANN 1983), based on the number of localities obtained. In southern Norway, *M. mystacinus* predominates while in Denmark, only *M. mystacinus* is recorded, except from the island of Bornholm where both species occur (BAAGØE 1983).

No evident differences in the habitat selection of the two sibling species have yet been found (GAUCKLER and KRAUS 1970; OHLENDORF 1983). Both species have been trapped by mistnets at the same locality in Skåne indicating that the two species can coexist.

RYBERG (1947) found that *M. mystacinus* (s.l.) was more common in the northern part of Sweden than in the southern one. Censuses by means of bat detectors has confirmed that (GERELL 1981). *M. mystacinus* (s.s.) is rare in Zealand while it is rather common on the island of Bornholm. BAAGØE (1984) has explained the difference of the population density of the species in Denmark as due to competition with *Pipistrellus pipistrellus*. *P. pipistrellus* is absent on the island of Bornholm but very common in Zealand. This hypothesis fits also the distribution pattern of the three species in Sweden. *P. pipistrellus* forms the biggest nursery colonies in houses in South Sweden (up to 500 individuals) while *M. mystacinus/brandtii* makes the biggest ones in North Sweden. Furthermore, *P. pipistrellus* is absent on the island of Gotland while *M. mystacinus* (Ahlén, 1983) and *M. brandtii* are common species.

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Zusammenfassung

Verbreitung von Myotis mystacinus und Myotis brandtii (Chiroptera) in Schweden

Die Zone sympatrischen Vorkommens der beiden Bartfledermausarten *Myotis mystacinus* und *M. brandtii* umfaßt Süd- und Mittelschweden. Die Verbreitung von *M. brandtii* erstreckt sich bis zur Latitüde von 64°N, während die von *M. mystacinus* nur 62°N erreicht. *M. brandtii* erscheint die häufigste der beiden Arten zu sein.

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Activity budget and foraging behaviour of the Red squirrel (*Sciurus vulgaris* Linnaeus, 1758) in a coniferous habitat

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Abstract

The daily and seasonal activity-pattern, habitat use and foodchoice of free-ranging red squirrels (*Sciurus vulgaris* Linnaeus, 1758) were studied over a one year period using radio-telemetry. The daily activity-rhythm changed over the year. In winter squirrels were only active for a few hours, emerging from the drey with first light. Their activity was concentrated towards foraging, feeding mainly on high-energy seeds of pines. The large amount of time spent in the nest reduced the energy-costs of thermoregulation in cold weather. In spring the active period progressively expanded throughout the afternoon. This increase in the time spent active per day was probably caused by changes in environmental factors, such as increasing daylength and temperature, and a decreasing abundance of primary food-resources. From May to October the activity-pattern of the whole population was bimodal. Most likely endogenous factors, related to the depletion of the stomach content, form the basis of this bimodal pattern. Relating external factors to the length of the active phase, it was shown that daylength and temperature played an important role, being able to explain 93 % of the variation in the length of the active period throughout the year. Undoubtedly feeding-requirements are also of importance.

Introduction

Like most other tree-squirrels the European red squirrel (*Sciurus vulgaris* Linnaeus, 1758) is a diurnal animal, which offers the possibility to study its activity-pattern and behaviour through field observations. Some general information is available about activity and food-preference of red squirrels from direct field observations (SHORTEN 1962; PULLIAINEN 1973; ZWAHLEN 1975; TITTENSOR 1977; WAUTERS 1984), or from stomach-contents analysis of shot animals (DEGN 1974; TITTENSOR 1977; GRONWALL 1982). These studies show that, in general, red squirrels have a long and bimodal pattern of activity in summer, a short unimodal pattern in winter, and an intermediate pattern in spring and autumn. Their foraging-behaviour is concentrated on high-energy food resources, especially tree-

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