

## Home ranges and population densities of shrews (*Soricidae*) inhabiting a spruce plantation in Bavaria, Germany

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The common shrew *Sorex araneus* Linnaeus, 1758 and pygmy shrew *S. minutus* Linnaeus, 1766 were live-trapped for 10 months in a spruce plantation. Mean home range sizes were 1058 (SD = 381) m<sup>2</sup> for the common shrew and 2146 (SD = 147) m<sup>2</sup> for the pygmy shrew. The density estimates of *S. araneus* varied from 4 ind/ha in winter to 26 ind/ha in summer, and these of *S. minutus* were 2 ind/ha and 7 ind/ha, respectively. Peak densities for both species occurred during August. It appears that maintaining a viable population of these two shrew species in this spruce plantation requires no special precaution.

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### Introduction

Few studies of the population dynamics of shrews under agricultural conditions have been conducted in Germany (Stein 1961, Bäumlér 1981). This capture-mark-recapture study was conducted to determine if home range sizes, population densities, and sex ratios of *Sorex araneus* Linnaeus, 1758 and *S. minutus* Linnaeus, 1766 inhabiting a spruce plantation were similar to populations occurring in other habitats.

### Methods

The study area was 128 m long by 75 m wide (0.96 ha) and was located in a spruce plantation (5 years growth) in the forest of Grafrath, approximately 40 km west of Munich. The entire plantation was about 25 ha, of which ca 60% was composed of *Picea pungens glauca* mixed with *Abies grandis* and *Alnus glutinosa*. The other 40% contained storage buildings and plowed fields. Some of the dominant grasses and herbs were *Agropyron repens*, *Calamagrostis epigejos*, *Trifolium campestre*, *T. aureum*, *Taraxacum officinale*, *Cirsium arvense*, *Nicia craeca*, *Hypericum perforatum*, *Epilobium montanum*, and *Lupinus* sp. The soil was sandy clayous.

The trapping period lasted four days each month, from April 1986 through January 1987, excluding November. Pitfall traps consisting of plastic buckets (25 cm diameter × 27 cm height) with

holes in the bottom for water drainage were placed 7.5 m apart in a grid 10 by 17, totaling 170 traps. Traps were checked every 4 hours. Cotton balls and food [1:1 mixture of commercially available Tupaii food (Altromin 8010) with canned dog food] were placed in traps to aid survival of captured shrews (Kollars and Bäumlér 1994). Trapped shrews were anesthetized with ether, individually numbered by toe clipping, weighed, sexed, and determined to be juvenile or adult using the criteria of Crowcroft (1956, 1964) and Searle (1985), and released.

A minimum of three captures was considered necessary to estimate home range. Home range and corrected grid size were calculated using the methods of Pernetta (1977) and density estimates using methods of Pucek (1969).

## Results and discussion

There were 134 captures, 68 of *S. araneus* and 25 of *S. minutus*; 41 were recaptures. Eighty-two percent of *S. araneus* and 76% of *S. minutus* captured were juveniles.

The mean home range size of juvenile *S. araneus* was 721 m<sup>2</sup> (SD = 161, *n* = 4), and for adult female *S. araneus* it was 1395 m<sup>2</sup> (SD = 202, *n* = 2). The mean home range size of *S. minutus* was 2146 m<sup>2</sup> (SD = 148, *n* = 2). Home ranges of juvenile males and females overlapped intraspecifically only with the opposite sex. Juveniles appeared to have established home ranges by late fall, as found by Pernetta (1977). The mean home range of adult female *S. araneus* (spring) was 48% larger than that of juveniles (fall). This may indicate that home range sizes of females expanded during the breeding season as Shillito (1963) found that home ranges were smaller in winter than in summer.

Population density, from April through October, was estimated by dividing the corrected grid area by the mean number of vagrants captured each month, and the estimate of the resident population density was added to this number. From

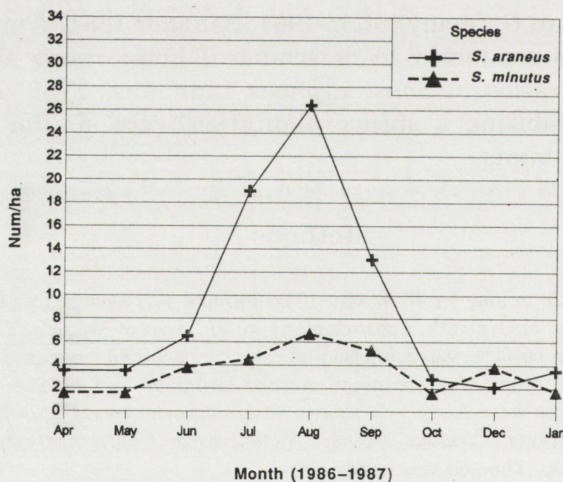


Fig. 1. Population density of *Sorex araneus* and *S. minutus* represented as number of individuals per hectare.

November through January, the population was stable (no births or immigration) because no new unmarked individuals were captured. Therefore, the population density during this period was estimated only by dividing the corrected grid size by the number of captures. The peak population densities (Fig. 1) of *S. araneus* and *S. minutus* occurred during August, with 26 ind/ha and 7 ind/ha respectively. Summer density peaks of other *Sorex* populations have been shown in many studies (eg Borowski and Dehnel 1952, Pucek 1969, Bäumler 1981).

The density estimates of *S. araneus*, from 4 ind/ha in winter to 26 ind/ha in summer, are within the range of other estimates (2 to 71 ind/ha) (Crowcroft 1957, Croin-Michielsen 1966, Yalden 1974, Pernetta 1977, Churchfield 1980, 1984). The minimum density of *S. minutus* was 2 ind/ha, and maximum – 7 ind/ha. This is below estimates from other parts of Europe, i.e. 15 ind/ha in England (Churchfield 1984). But the ratio of *S. araneus* to *S. minutus* found in this study (2.7:1) was similar to those in other agricultural and reclaimed areas in Germany (3.5:1 and 2.2:1, respectively; Heydemann 1960). Ratios of *S. araneus* to *S. minutus* in different habitat types in Germany vary between 125:1 and 1:38 (Löhr 1938, Schmidt 1973). In a long term study of *Soricidae* in Białowieża Primeval Forest, Poland, ratios of *S. araneus* to *S. minutus* varied from 3.2:1 to 9.2:1 (Borowski and Dehnel 1952). Although this study was not conducted for an extensive period of time, it would appear that maintaining a viable population of these two shrew species in this spruce plantation requires no special precaution.

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