

## Variation in two wing dimensions in *Pipistrellus nathusii* (Keyserling et Blasius, 1839)

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With 1 Figure

### Introduction

The hiding-places of „forest“ bats are usually more difficult to detect than those of „cave“ bats. That is why there are relatively less data concerning the occurrence, density, and morphology of these animals. This also regards *Pipistrellus nathusii* (Keyserling et Blasius, 1839).

In the morphological characterization of this species two parameters are of special importance: forearm length (FA) and the 5th wing finger length (Vd), used to differentiate this species from *P. pipistrellus* (Schreber, 1774) (KOWALSKI & RUPRECHT 1981).

The broadest series of measurements of FA and Vd in *P. nathusii* so far has been carried on in the east of Germany (SCHMIDT 1978, HEISE 1979, 1982). A considerable series of FA measurements for Southern Sweden gives LUNDBERG (1989).

The aim of this work was to obtain information about the values of the this two parameters in *P. nathusii* from Northern Poland. Those scores were compared with data collected in Western and Central Europa on the territories where this species occurs.

### Materials and methods

Bats were caught in the forests of Mierzeja Wiślana (Vistula Coastal Belt) (54° 23'N, 19° 23'E), on the Southern coast of the Baltic Sea. The area of 2-4,5 km in length and 1-1,5 km in width was wooded with pine and, on wetter spots, mixed forests (*Pinus silvestris*, *Quercus robur*, *Fagus silvatica*, and *Carpinus betulus*). Bird nesting boxes, installed by the Ornithological Station of the Institute of Zoology (Polish Academy of Sciences) between 1977 and 1979, were inspected from May to the end of September in 1985 and 1986. The bats were marked individually. The FA and Vd lengths were measured with a vernier caliper exact to 0.1 mm, using the widely applied method (e.g. SCHOBER & GRIMMBERGER 1987). In the statistic analysis Student's t-Test was used.

### Results

403 representatives of *P. nathusii* were marked during 1985 and 1986. Altogether 351 FA and 334 Vd measurements were taken. It was found that values of both parameters were significantly higher in females than in males (Table 1). Because of this, the analysis of the FA-Vd interrelation was carried on separately for males and females. The interrelation between these two dimensions in males is reflected by the following regression line:

$y = 0.404x + 16.074$ . This interrelation is visibly statistically significant ( $r = 0.645$ ,  $p < 0.001$ ).

An analogical FA-Vd interrelation for females is represented with the regression line:  $y = 0.396x + 16.892$ . This is also of high statistical significance ( $r = 0.598$ ,  $p < 0.001$ ).

Table 1. Comparison of average length of the forearm (FA) and the 5th finger (Vd) length in males and females of *Pipistrellus nathusii*.

|    | Sex     | n   | $\bar{x}$ | S.D.  | t-test    |
|----|---------|-----|-----------|-------|-----------|
| FA | Males   | 202 | 33.637    | 0.857 | t= -10.19 |
|    | Females | 149 | 34.554    | 0.794 | p< 0.001  |
| Vd | Males   | 196 | 43.451    | 1.364 | t= -8.29  |
|    | Females | 138 | 44.655    | 1.212 | p< 0.001  |

### Discussion

The comparison of average FA lengths between various populations of *P. nathusii* in Europe does not show any clear geographic variation. It can be noted, however, that there exists a slight tendency to lengthen forearms eastwards (Table 2 and Fig. 1). Bats from Germany, Switzerland and Holland are characterized by the shortest FA, and those from Southern Sweden - by the longest. The bats from the Mierzeja Wiślana are typified by a little higher values of this parameter, which is concordant with the described tendency.

Table 2. Comparison of average length of the forearm (FA) and the 5th finger (Vd) in some European populations of *Pipistrellus nathusii*. Numbers of specimens in each sample are given in parentheses; only the samples of >5 specimens were used.

| Population           | Forearm length |           | 5th finger length |           | References                 |
|----------------------|----------------|-----------|-------------------|-----------|----------------------------|
|                      | Males          | Females   | Males             | Females   |                            |
| 1. Sarthe            | 34.2(6)        |           |                   |           | BEAUCORNU (1963)           |
| 2. Holland           | 33.7(28)*      |           | 45.8(28)*         |           | GROL (1985)                |
| 3. Westphalia        | 33.4(11)       | 34.0(5)   | 43.8(11)          | 44.6(5)   | VIERHAUS & v. BÜLOW (1978) |
| 4. Zurich            | 33.4(9)        | 34.2(6)   | 44.7(9)           | 46.1(6)   | CLAUDE (1976)              |
| 5. Sardinia          | 34.4(6)        |           | 44.1(6)           |           | HACKETHAL (1979)           |
| 6. South Sweden      | 33.9(34)       | 34.7(103) |                   |           | LUNDBERG (1989)            |
| 7. Neubrandenburg    | 33.4(65)       | 33.8(218) | 44.0(65)          | 45.1(218) | HEISE (1982)               |
| 8. Frankfurt/O.      | 33.8(42)       | 34.6(87)  | 44.1(42)          | 45.0(87)  | SCHMIDT (1978)             |
| 9. Czechoslovakia    | 33.7(7)        |           |                   |           | HANÁK & GAISLER (1976)     |
| 10. Mierzeja Wiślana | 33.6(202)      | 34.6(149) | 43.5(196)         | 44.7(138) | this study                 |
| 11. Dobrogea         | 33.6(18)       | 34.8(14)  | 43.1(7)           | 44.6(7)   | BARBU (1968)               |

\* both sexes together

Samples from two departments of Western France: Sarthe (BEAUCORNU 1963) and Vendee (GRISSET 1987) from a separate group of results. Bats from both these places have long FA (Sarthe: n=6,  $\bar{x}$ =34.2 mm; Vendee: n=4,  $\bar{x}$ =34.0 mm, and n=3,  $\bar{x}$ =35.2). However, insufficient number of those samples hinders a comparison with other data.

Vd varies more between populations than FA (Table 2). According to the quoted works, Vd lengths tend to be shorter at higher latitudes (the shortest Vd dimensions were recorded from Romania (BARBU 1968) and the Mierzeja Wiślana). Vd length considerably determines the wing size, and a decrease in the value of this parameter as the climate becomes more and more continental is in harmony with the tendency recorded by BURNETT (1983) in *Eptesicus fuscus*. This investigation, however, is too limited. Moreover, reservations about the comparability of this dimension are visibly bigger than in case of FA. As it was found by LÉBOULENGER et al. (1990), the most widely applied method of measuring Vd (the internal side of the wing, using a non-stopped ruler) is comparatively unreliable and of small repetitiveness.

The data quoted here are too fragmentary to allow any farfetched conclusions. Nevertheless, they encourage to carry on a more precise study of the geographic variability of *P. nathusii* body dimensions in the Palaearctic.

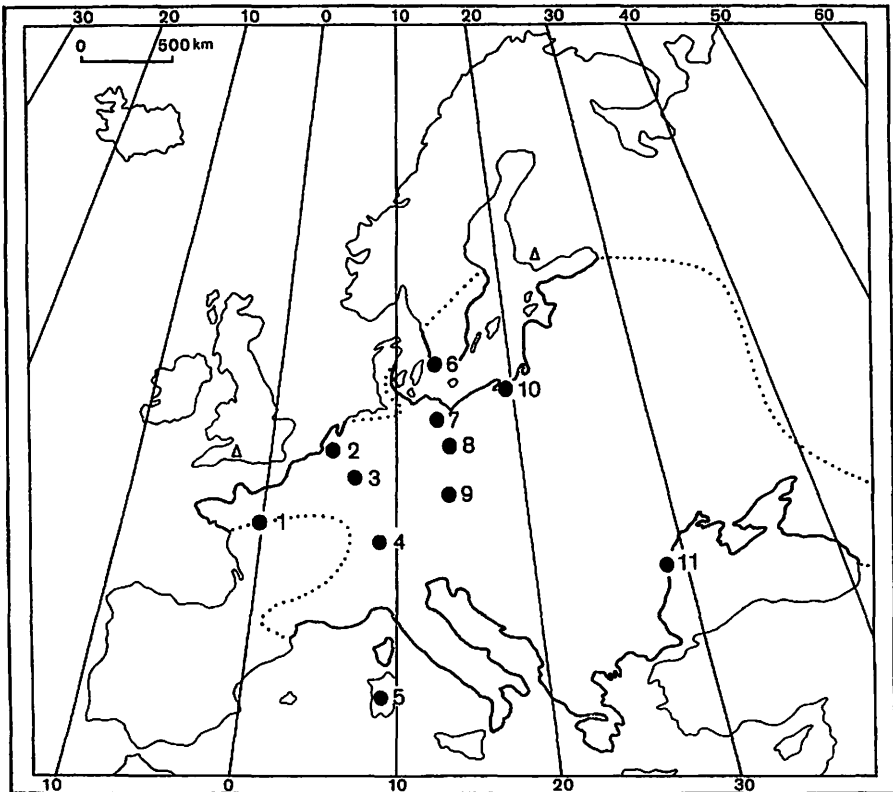


Fig. 1. Contemporary range of *Pipistrellus nathusii* according to literature. Points 1-11 denote localities of data given in Table 2.

### Summary

In 1985 and 1986, in the forests of the Mierzeja Wisłana (Southern coast of the Baltic Sea, Poland), measurements of FA (n=351) and Vd (n=334) lengths in *Pipistrellus nathusii* (*Chiroptera: Vespertilionidae*) were carried on. Both of these dimensions were found to be considerably bigger in females than males, and to be positively interrelated. Average FA and Vd lengths from a broader series of measurements taken on the territory of Western and Central Europa were compared, and it was noted that some geographical variability of these dimensions (bigger in case of Vd) existed. The direction of this trend was discussed.

### Zusammenfassung

In den Jahren 1985 und 1986 wurden in den Wäldern der Mierzeja Wisłana (Weichsel-Nehrung, südliche Ostseeküste, Polen) Messungen der Länge des Unterarms - FA - (n=351) und des 5. Fingers - Vd - (n=334) bei *P. nathusii* ausgeführt. Es wurde festgestellt, daß bei diesen beiden Meßwerten, im wesentlichen statistisch gesichert, die ♀ größer als die ♂ sind. Die Maße sind positiv korreliert. Es werden die durchschnittlichen Längen von FA und Vd mit den größeren

Meßserien an *P. nathusii* in West- und Mitteleuropa verglichen. Es wurde das Vorhandensein einer gewissen geographischen Variabilität dieser Größen (größer bei Vd) bewiesen und ihr Trend erörtert.

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