

CHARACTERISTICS OF MIGRATION FLIGHT IN NATHUSIUS'S BATS

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Populations of Nathusius's bats *Pipistrellus nathusii* that breed in north-eastern Europe perform seasonal migrations and hibernate in poorly insulated roosts in central and southern Europe. Banding recoveries indicate that 1) the average migration speed of this bat species during autumn migration varies from 31.7 to 76.9 km per 24-hour period (Pētersons 2004) and 2) individual bats may settle down for 1 to 3 days as they migrate (V. Jusys unpubl. data). Nathusius's bats frequently interrupt their migration flight to feed on flying insects (Šuba et al. 2012, Voigt et al. 2012).

The aim of this study was to investigate migration flight of Nathusius's bats as they fly along the coastline of the Baltic Sea. Theoretical flight speeds were calculated using morphometric data of captured individual bats and the widely accepted flight mechanistic theory of Pennycuick (2008). Flying at minimum power speed, ca. 6 m/s (22 km/h), would allow Nathusius's bats to maximise flight duration. Flying at maximum range speed, ca. 11 m/s (40 km/h), would minimise the energy cost of transport. Flying faster would require additional energy, but may contribute to time economy in turn. It was hypothesised that migrating Nathusius's bats would fly faster than 11 m/s to compensate for time spent on foraging and stopover days.

Actual flight speeds during uninterrupted migration were measured by a stopwatch as the bats passed along two reference poles located 20 m apart on a known migration flyway. One of these reference poles was also used to estimate the flight height. On average, the bats were flying 11.5 m above the ground (SD = 2.4 m) and crossed the twenty-metre distance in 1.53 s (SD = 0.40), which corresponds to 13.1 m/s or 47.2 km/h.

The results of this study confirm that the speed of observed low-altitude migration flight of Nathusius's bats exceeds the maximum range speed. However, the actual time spent on migration flight appears to be relatively short and most of time during the course of the night may be spent on other activities, e.g. foraging.

References

- Pennycuick C.J. 2008. Modelling the flying bird. Elsevier Science, Academic Press Inc, San Diego, USA, 496 pp.
- Pētersons G. 2004. Seasonal migrations of north-eastern populations of *Pipistrellus nathusii*. Myotis 41–42: 29–56.
- Šuba J., Petersons G., Rydell J. 2012. Fly-and-forage strategy in the bat *Pipistrellus nathusii* during autumn migration. Acta Chiropterologica 14: 379–385.
- Voigt C.C., Sörgel K., Šuba J., Keišs O., Petersons G. 2012. The insectivorous bat *Pipistrellus nathusii* uses a mixed-fuel strategy to power autumn migration. Proceedings of the Royal Society B 279: 3772–3778.