

First records of hibernating Leisler's bats (*Nyctalus leisleri*) in Belgium and the Netherlands

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Introduction

Leisler's bat (*Nyctalus leisleri*) is a rare, but widespread species in Belgium and the Netherlands. The species typically roosts year-round in tree cavities, although bat boxes are also sometimes used (Boston et al. 2020). While Leisler's bat is recorded across the region, known maternity roosts are limited to larger, ancient forest fragments in the south of Flanders and the eastern part of the Netherlands. Leisler's bat is recorded from April to October (waarnemingen.be and waarneming.nl), but virtually nothing is known about hibernation of the species in Belgium and the Netherlands. In Europe the species is often considered migratory (Boston et al. 2020). Recoveries of ringed individuals (mainly in Germany and Spain) revealed that individuals from northwestern Europe migrate in a southwesterly direction, with several recoveries over more than 1500 km in the Iberian peninsula (Hutterer et al. 2005, Steffen et al. 2007). Ohlendorf et al. (2001) describe a case of a female Leisler's bat that was ringed in Germany in May 1998, recaptured in Spain in September 1999 (more than 1500 km to the southwest) and then recaptured in May 2000 at the original ringing site in Germany. Although data is sparse, many of such long distance recoveries were

females (Roer 1989, Wohlgemuth et al. 2004), indicating a possible sex difference in migratory behaviour, as has been observed in noctules (*Nyctalus noctula*) (Dechmann et al. 2014, Lehnert et al. 2018). The migratory behaviour of Leisler's bat is also supported by stable isotope analyses. By examining hydrogen isotopes in fur keratin, Voigt et al. (2012) showed that wind turbine victims of this species found in Germany likely originated from the Baltic states or Belarus. A previous record also indicated migratory behaviour in the Belgian population. In autumn 2010, a ringed adult female was found in the province of Namur. This individual was ringed in autumn 2007 in Lizaso, Spain - over 960 km to the south-west of the recovery site (Alcalde et al. 2013). Winter records of Leisler's bat are also known from northwestern and Central Europe, for example from Germany and Switzerland, in tree cavities, bird and bat boxes (Kulzer et al. 1987, Roer 1989, Kretzschmar et al. 2005, Ohlendorf et al. 2010, Kohnen et al. 2020, Windeln 2023).

Results

In 2022 and 2023, Leisler's bats were recorded

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for the first time in winter in Belgium and the Netherlands. At all the sites where these observations were made, the species was also previously recorded in spring, summer and autumn.

On 26 February 2022, the third author checked 27 bat boxes in two forest plots on the Veluwe, namely Hoog Buurlo and Hoenderloo (Province of Gelderland, the Netherlands). In the boxes of plot Hoog Buurlo, two Leisler's bats were found roosting solitarily in Schwegler 1FS bat boxes (Schwegler Vogel- und Naturschutzprodukte GmbH, Schorn-dorf, Germany). In this batbox plot, 15 bat boxes were installed (five Schwegler 1FS, four Schwegler 2F, two Schwegler 1FF and four flat wooden boxes, model Boshamer).

The same day, four Leisler's bats were also found hibernating at bat box plot Hoenderloo. In this plot twelve Schwegler 1FS boxes were installed. Three of these bats were roosting together, while the fourth one was roosting solitary. Weather conditions preceding these observations were relatively cold (-3.0 °C the night before).

On 8 February 2023, the first two authors checked bat boxes in four forest plots in the southeast of the Province of Limburg (Belgium), namely the Nietelbroeken, Jongenbos, Bellevuebos en Kolmontbos. At these sites, 210 bat boxes (Schwegler 2FN) had been installed in 2012 (Janssen & Dekeukeleire 2012). These boxes are regularly checked in spring, summer and autumn, which often leads to observations of maternity colonies and solitary individuals of Leisler's bat. This winter check was aimed at cleaning the boxes for the next season. The weather during the preceding weeks was relatively cold, with temperatures of -4.5 °C the night before. Six Leisler's bats were found hibernating in five different bat boxes (Figure 1). Furthermore, one Nathusius' pipistrelle (*Pipistrellus nathusii*) was observed hibernating in a bat box.

As the bats were immediately awoken when the bat boxes were opened, it was decided to briefly handle the bats. Sexual state, age, and

Table 1. Mass and forearm length of the Belgian winter records. YOY: Young-of-the-Year; Ad: adult.

Age	Mass (g)	Forearm length (mm)
YOY male	14.6 13.2	43.3 42.5
YOY female	11.6	45.5
Ad male	12.1 14.4	43.0 45.0
Ad female	13.6	43.8

mass was determined (Table 1) following epiphyseal plates in the finger bones, secondary sexual characteristics and facial colouration (Haarsma 2008). Three solitary individuals were young of the year, namely two males and one female. One solitary adult male was also found. An adult male and an adult female were roosting together in a single bat box. Interestingly, the adult male was still sexually active (filled epididymides; Haarsma 2008).

Discussion

These observations indicate that a part of the Belgian and Dutch Leisler's bat population does not migrate, but hibernates in their summer roost areas. Conversely, the Belgian recovery of an individual ringed in Spain (Alcalde et al. 2013) indicates that other individuals of this population migrate over large distances in a southwesterly direction. A similar pattern has also been observed in the noctule in the Netherlands. In two studies, individuals ringed in a single summer roost were recovered in winter both at short distances (<10 km) from the summer roost and at sites more than 800 km to the southwest (Bels 1952, Van Heerdt & Sluiter 1965). Such partial migration is also found in Atlantic populations of bird species such as the European robin (*Erithacus rubecula*) (Adriaensen & Dhondt 1990) and the skylark (*Alauda arvensis*) (Hegemann et al. 2010). Another possible explanation is that the local summer population partly migrates southwest, while at the same time individuals from northern populations spend the winter here. Further research is needed to reveal



Figure 1. An adult female and an adult male in a bat box on 9 February 2023, Kolmont forest, Belgium. Photo: René Janssen.

if the migratory behaviour of Leisler's bat is linked to individual differences in age or sex, and is consistent between years.

At another bat box scheme in the Netherlands (Epe, Province of Gelderland), Leisler's bats were found only in autumn, spring and summer, but not during regular bat box checks in winter (personal communication Frans Bosch). As bat boxes often have a less stable microclimate than tree cavities, bat box checks likely underestimate the number of hibernating Leisler's bats (e.g. Ohlenforf et al. 2010).

In Leisler's bat, mating is thought to take place from August through the hibernation period (reviewed in Boston et al. 2020).

Interestingly, the two individuals observed roosting together in Belgium were an adult female and a sexually active male with filled epididymis.

In conclusion, we report the first observations of hibernating Leisler's bats in Belgium and the Netherlands. These observations took place in forest fragments where maternity colonies of the species were known. Together with an earlier ringing record (Alcalde et al. 2013), this indicates that in this region, the species is likely to be partially migratory, with some individuals residing year-round. Bat box checks are an efficient way to record Leisler's bat, not only in spring, summer and autumn, but also in winter. Most individuals likely reside in tree cavities, and thus felling trees with cavities in winter could further endanger Leisler's bat populations already threatened by wind turbines (Voigt et al. 2012). Especially in forest plots where colonies are known in summer, the felling in winter of trees with cavities should be done with utmost care. In general, trees with cavities should be preserved as much as possible.

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References

- Adriaensen, F. & A.A. Dhondt 1990. Population dynamics and partial migration of the European Robin (*Erithacus rubecula*) in different habitats. *Journal of Animal Ecology* 59: 1077-1090.
- Alcalde, J.T., C. Ibáñez, I. Antón & P. Nyssen 2013.

- First case of migration of a Leisler's bat (*Nyctalus leisleri*) between Spain and Belgium. *Le Rhi-nolophe* 19: 87-88.
- Bels, L. 1952. Fifteen years of bat banding in the Netherlands. *Publicaties Natuurhistorisch Genootschap Limburg* 5: 1-99.
- Boston, E.S., D.K. Dechmann & I. Ruczynski 2020. Leisler's Noctule *Nyctalus leisleri* (Kuhl, 1817). In: K. Hackländer & F.E. Zachos (eds). *Handbook of the Mammals of Europe*: 1-15. Springer Nature, Cham, Switzerland.
- Dechmann, D.K., M. Wikelski, K. Varga, E. Yohannes, W. Fiedler, K. Safi, W.-D. Burkhard. & M.T. O'Mara 2014. Tracking post-hibernation behavior and early migration does not reveal the expected sex-differences in a "female-migrating" bat. *PLoS One* 9: e114810.
- Haarsma, A.J. 2008. Manual for assessment of reproductive status, age and health in European Vespertilionid bats. Electronic publication, version 2. https://www.researchgate.net/publication/228874636_Manual_for_assessment_of_reproductive_status_age_and_health_in_European_Vespertilionid_bats
- Hegemann, A., H.P. van der Jeugd, M. de Graaf, L.L. Oostebink & B.I. Tieleman 2010. Are Dutch skylarks partial migrants? Ring recovery data and radio-telemetry suggest local coexistence of contrasting migration strategies. *Ardea* 98: 135-143.
- Hutterer, R., T. Ivanova, C.H. Meyer-Cords & L. Rodrigues 2005. Bat migration in Europe. A review of banding data and literature. Federal Agency for Nature Conservation, Bonn, Germany.
- Janssen, R. & D. Dekeukeleire 2012. Bechsteins vleermuis in Limburg, indicator van oude bossen en boomgaarden. *Likona Jaarboek* 2011: 66-75.
- Kohnen, A., C. Ebert, W. Schorch, C. Dietz, J. Hurst & R. Brinkmann 2020. Verwandtschaftsverhältnisse und Populationsstruktur in Wochenstubenkolonien, Paarungs- und Überwinterungsgruppen des Kleinabendseglers (*Nyctalus leisleri*). In: J. Hurst (ed.) 2020. Erfassungen der Fledermausaktivität über dem Wald als Grundlage für methodische Empfehlungen zu Untersuchungen und Maßnahmen an Windkraftstandorten im Wald. 327-352. Bundesamt für Naturschutz, Bonn-Bad Godesberg, Germany.
- Kretzschmar, F., M. Braun & R. Brinkmann 2005. Zur Situation des Kleinabendseglers (*Nyctalus leisleri*) in Baden-Württemberg. *Nyctalus* 10: 305-310.
- Kulzer, E., H.V. Bastian & M. Fiedler 1987. Fledermäuse in Baden-Württemberg. Beihefte zu den Veröffentlichungen für Naturschutz und Landschaftspflege Baden-Württemberg 50: 1-152.
- Lehnert, L.S., S. Kramer-Schadt, T. Teige, U. Hoffmeister, A. Popa-Lisseanu, F. Bontadina, M. Ciechanowski, D.K.N. Dechmann, K. Kravchenko, P. Presetnik, M. Starrach, M. Straube, U. Zoephel & C.C. Voigt 2018. Variability and repeatability of noctule bat migration in Central Europe: evidence for partial and differential migration. *Proceedings of the Royal Society B* 285 (1893): 20182174.
- Ohlendorf, B., B. Hecht, D. Strassburg, A. Theiler & P.T. Agirre Mendi 2001. Bedeutende Migrationsleistung eines markierten Kleinabendseglers (*Nyctalus leisleri*): Deutschland–Spanien – Deutschland. *Nyctalus* 8: 60-64.
- Ohlendorf, B., M. Fritze & J. Schats 2010. Winterbeobachtungen von Zwergfledermäusen (*Pipistrellus pipistrellus*) und Kleinabendseglern (*Nyctalus leisleri*) in Fledermauskästen im Naturschutzgebiet Bodetal/NO-Harz (Sachsen-Anhalt). *Nyctalus* 15: 235-243.
- Roer, H. 1989. Zum Vorkommen und Migrationsverhalten des Kleinen Abendseglers (*Nyctalus leisleri* Kuhl, 1818) in Mitteleuropa. *Myotis* 28: 131–132.
- Steffen, R., U. Zöpfel & D. Brockmann 2007. 40th anniversary Bat Marking Centre Dresden - evaluation of methods and overview of results. Saxon State Office for Environment and Geology, Dresden, Germany.
- van Heerdt, P. & J. Sluiter 1965. Notes on the distribution and behaviour of the noctule bat (*Nyctalus noctula*) in the Netherlands. *Mammalia* 29: 463–477.
- Voigt, C.C., A.G. Popa-Lisseanu, I. Niermann & S. Kramer-Schadt 2012. The catchment area of wind farms for European bats: a plea for international regulations. *Biological Conservation* 153: 80-86.
- Windeln, H.-J. 2023 [in press]. Erste Funde von überwinternden Kleinabendseglern (*Nyctalus leisleri*) und Rückgang von überwinternden Großen Abendseglern (*Nyctalus noctula*) in Überwinterungskästen im Kreis Kleve, Nordrhein-Westfalen.

Nyctalus 20 (3).

Wohlgemuth, R., I. Devrient, A. García & R. Hutterer 2004. Long-distance flight of a Lesser noctule (*Nyctalus leisleri*) after rehabilitation. *Myotis* 41: 69-73.

Samenvatting

Eerste waarnemingen van overwinterende bosvleermuizen (*Nyctalus leisleri*) in België en Nederland

De bosvleermuis (*Nyctalus leisleri*) is een wijdverspreide, maar zeldzame soort in België en Nederland. In onze regio verblijft de soort typisch het hele jaar in boomholten, hoewel soms ook vleermuiskasten worden gebruikt. In Europa zijn waarnemingen bekend van migratie tussen Noordwest Europa en Zuid-

west Europa, en wordt de soort dan ook als migrerend beschouwd. In België en Nederland is, op één ringwaarneming van een dier uit Spanje na, niets bekend over het wintergedrag van de bosvleermuis. In dit artikel beschrijven we de eerste winterwaarnemingen van de soort. Winterslapende dieren werden aangetroffen in vleermuiskasten in januari 2022 in de Nederlandse provincie Gelderland en in februari 2023 in de Belgische provincie Limburg. Het ging hier steeds om gebieden waar de soort ook in het zomerseizoen waargenomen wordt. Samen met de eerdere ringvondst suggereert dit dat een deel van de populatie bosvleermuizen in deze regio naar het zuiden trekt, maar een ander deel in de zomergebieden blijft overwinteren.

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