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Short note

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Transcontinental 2200 km migration of a Nathusius' pipistrelle (*Pipistrellus nathusii*) across Europe

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Abstract: A male *Pipistrellus nathusii* ringed in Pape Natural Park (S Latvia) in August 2015 was recovered recently dead in Pitillas' Lagoon Natural Reserve (N Spain) in March 2017. At 2224 km in SSW direction, this is the first documented bat migration between these countries and worldwide the longest migration record of a bat. We also report other observations of this species in autumn in Northern Spain, suggesting that the Iberian Peninsula may be an important wintering area for Nathusius' pipistrelles. Conservation measures should be agreed on by countries along the migration routes to improve the protection of this species.

Keywords: Latvia; migration; Spain; vespertilionidae; wintering.

Nathusius' pipistrelle (*Pipistrellus nathusii*) is a small migratory bat of usually less than 10 g body mass (6–16 g). Its distribution covers major parts of Europe, from Fennoscandia and British Isles in the north to the Mediterranean

areas in the south. However, the breeding areas of this species are restricted to north-eastern Europe and hibernation areas to south-western, southern and eastern parts of Europe (Hutterer et al. 2005; Sachanowicz et al. 2018; Steffens et al. 2007; Strelkov 1999). Typical foraging areas are edge habitats next to woodlands and water bodies.

Contrary to most other northern bat species which hibernate in below-ground sites, Nathusius' pipistrelles hibernate in above-ground sites such as buildings or trees. As a result, and based on the fact that the abundance of aerial insects is low in the breeding range during winter, Nathusius' pipistrelles perform long-distance flights with a dominant north-east to southwest direction. The late summer migration period spans approximately two months with intermittent stopovers for mating. To elucidate the connectivity between wintering and summer areas, a large banding campaign of Nathusius' pipistrelles was carried out between 1985 and 1992 at the Ornithological Station Pape, located on the south-western coastline of Latvia. Recapture data demonstrated that Nathusius' pipistrelles may travel up to 1905 km between Pape and potential wintering sites, indicating that Central European (Germany and Poland) and northeastern populations (Fennoscandia, the Baltic countries, Belarus, and Russia) leave breeding grounds to move in a west to southwest direction for wintering in the Benelux countries, France, Spain, Switzerland, Italy, and Croatia (Pētersons 2004).

Between 2014 and 2018, a second intensive campaign of banding Nathusius' pipistrelles was carried out at the Ornithological Station Pape, to elucidate if migratory patterns changed in response to global climate change. Bats were caught using a funnel trap located at the migratory corridor along the shore of the Baltic Sea.

Here we report the recovery of a male Nathusius' pipistrelle that was ringed in Pape Natural Park (56°9' 53" N, 21°1' 2" E) on 21st August 2015 and recovered in Pitillas' Lagoon Natural Reserve, Navarra, N Spain (42°24' 30" N, 1° 35' 36" W) on 12th March 2017. This observation suggests that this individual flew a minimum distance of 2224 km, from northeast to southwest Europe (Figure 1). So far, this

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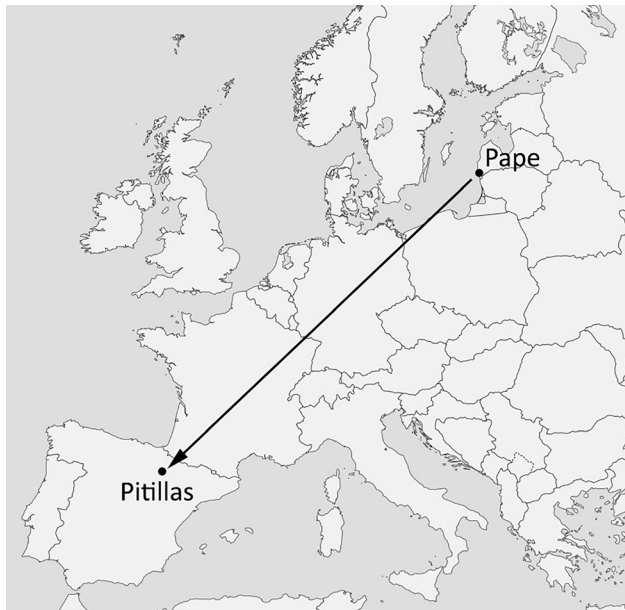


Figure 1: Long-distance movement of a *Nathusius' pipistrelle* from Pape (Latvia) to Pitillas (Spain).

is the longest documented movement of a banded bat in the World and the only one that exceeds 2000 km. The previous record of long-distance migratory flight also belonged to a male *Nathusius' pipistrelle* (Petersons 2004) that flew 1905 km from Latvia to France, in a southwest direction.

The high number of *Nathusius' pipistrelles* caught in Pape may originate from a large catchment area in the northeast of Pape (Petersons 2004). In general, *Nathusius' pipistrelles* follow the coastline of the Baltic countries, which suggests that the individual bat of this study did not migrate between Latvia and Spain in a straight line. Therefore, the recorded travel distance of 2224 km is most likely underestimated.

The fresh carcass of this bat was found near the visitors' center of Pitillas' lagoon. At this site common pipistrelles (*Pipistrellus pipistrellus*) and Kuhl's pipistrelles (*Pipistrellus kuhlii*) are commonly observed to roost in crevices. Both Pape and Pitillas are very important wetlands for bird migration and currently included in the Habitats Directive Sites (SAC) and Bird Directive Sites (SPA). Pitillas lagoon is an endorheic wetland partially covered by reed (*Phragmites spp.*), a typical hunting habitat for *Nathusius' pipistrelles* in the Mediterranean region (Flaquer et al. 2009).

The finding of this bat in early March shows that it most likely hibernated in the Iberian Peninsula, yet we have no information about its arrival at the hibernation site. Also, we are unaware about where the bat

traveled throughout the 567 day period between its ringing and recovery.

Recent surveys suggest that the population of *Nathusius' pipistrelle* is increasing in the north of Europe (Lundy et al. 2010). Also, over the past years, the species has been regularly observed in the north of Spain, but it has never been observed to breed in the Iberian Peninsula. Although these records could be due to the increase of the breeding bat population in the north, they are more likely due to the increment of bat researchers and bat studies in this area.

During a roost survey conducted between 2016 and 2018 in the provinces of Navarre and Gipuzkoa, six out of 700 boxes contained *Nathusius' pipistrelles* in autumn. Three bat-boxes located in Peralta, less than 20 km from Pitillas lagoon, were occupied by four males of this species. Another one located in the Pyrenees was occupied by a male (Alcalde, unpub. data). Besides, in Txingudi Bay (Cantabrian coast) two bat boxes have been regularly used by 1–12 *Nathusius' pipistrelles*, both males and females. The aforementioned two bat boxes have been regularly checked with evidence of bats roosting in them between the end of August and the beginning of May. Lastly, a male was found dead under a wind turbine close to Punta Lucero (Biscay, Cantabrian coast) in October 2017 (Alcalde et al. 2019). Additionally, this species has been recently observed in other regions of northern Iberian Peninsula, including Asturias, Navarre (Rodríguez-Muñoz et al. 1993–1994), Catalonia (Flaquer et al. 2004), the Vasque Country (Aihartza and Garin 2002) and Cantabria (Molleda and Fombellida 2018).

These observations suggest that the northern Iberian Peninsula may be an important wintering place for migrating populations of *Nathusius' pipistrelles*. This notion is supported by the observation that banded lesser noctules (*Nyctalus leisleri*) recaptured in this area originated from Germany and Belgium (Ohlendorf et al. 2000; Wohlgemut et al. 2004; Alcalde et al. 2013). Overall, the circumstance that many of these recaptures originate from bat box surveys highlights the usefulness of bat boxes for migrating bats as daytime roosts, especially in wetlands where suitable tree roosts are often lacking.

These movements also underpin the problem that wind farms can pose for long distance migrating bats; especially for *Nathusius' pipistrelles*, which is one of the species with the highest collision risk at wind turbines in Europe (Rodrigues et al. 2015). International efforts should be taken along the route of migration to reduce the mortality of these bats at wind turbines and to protect habitats essential for migration (Voigt et al. 2015).

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