First record of Geoffroy's bat (*Myotis emarginatus*) in the province of Zeeland, the Netherlands

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First observation

On 23 December 2016, during the annual winter census of hibernating bats in Haamstede, province of Zeeland, a Geoffroy's bat (*Myotis emarginatus*) was encountered. The specimen had chosen a horizontal niche in a relatively dry casemate in the forest around the castle of Haamstede (figure 1). The medium-sized bat showed several characteristics that are typical for the species: a rhomboid outline, a warm yellow-brown coloured fur and relatively small feet and long ears, which drop down almost perpendicularly; the ears' lateral margins showed an almost rectangular notch (see left ear in figure 1).

The winter census in Haamstede was first accomplished in 1982-1983 and 1983-1984 by Gerhard Glas and Gerard Slob and has since 1985-1986 been repeated every year (Bekker & Mostert 1995) up till now. This is the first observation of Geoffroy's bat in Haamstede as well as in the province of Zeeland.

Figure 1. Geoffroy's bat (*Myotis emarginatus*) in a hibernaculum in a casemate in Haamstede, province of Zeeland, the Netherlands. *Photo: Kees Mostert*.

Hibernation ecology

Geoffroy's bat is considered a thermophilic bat species (Vergoossen & Buys 1997). During hibernation, Bezem et al. (1964) found a preference of this bat species for limestone quarries in small excavations in the ceilings, where the ascending warmer air can accumulate, resulting in higher temperatures at these hibernation sites. In natural cave systems these bats hibernate in the warmer parts at temperatures between 5 °C and 9 °C (Gaisler 1970). In Vlaanderen, Geoffroy's bat is predominantly found in hibernacula in the fortresses of Antwerp (Lefevre & Verkem 2003). For some of these fortresses with hibernating Geoffroy's bats, Jooris & Goossens (1980) mention temperatures between 8 °C and 11 °C.

Former distribution

The distribution of Geoffroy's bat in Europe is concentrated in southern and central Europe and reaches its northern border in Oirschot (province of Noord-Brabant, the Netherlands), Hönnetal (Nordrhein-Westfalen, Germany) and further to the east in Olsztyn (Silesia, Poland) (Topál 2001). Glas (1986) mentions for the Netherlands a northern limitation along the line Roermond-Tilburg-Antwerpen and, further on for Belgium, a northern-western limitation along the line Antwerpen-Kortrijk.

Winter censuses in southern Limburg (the Netherlands) started in 1937 and since that time Geoffroy's bats have been found regularly in limestone quarries (Bels 1942, 1952). In 1983 a nursery colony was discovered in the loft of an abbey near Echt, in the central part of Limburg (Vergoossen & Buys 1992). In the first decade of this century a new nursery colony was found in the loft of a nearby monastery (Dekker & Regelink 2010), and later, in the years 2012, 2013, 2015 also in cattle barns (Dekker & Janssen 2016) in this part of Limburg. In 2003 a single specimen was discovered in a church loft in the municipality of Valkenswaard in the southeastern part of the adjacent province of Noord-Brabant (Rienks & Twisk 2003). In 2008 other summer observations of single Geoffroys' bats (discovered during church loft visits, mist netting, autonomous bat recordings and tracking down of animals with radio-transmitters) were done in this part of Noord-Brabant, resulting in Bergeijk as the northwesternmost known location of the species (Regelink & Dekker 2009).

Besides the provinces of Noord-Brabant (southeastern part) and Limburg (southern half), extralimital discoveries of Geoffroy's bat in the Netherlands were reported from the provinces of Groningen and Noord-Holland. In the province of Groningen a Geoffroy's bat was collected in 1954. It is now in the collection of Naturalis Biodiversity Center, Leiden (RMNH.MAM .29135 20/2/1954 leg. G.F.Wilmink).

In the province of Noord-Holland two specimens were collected in September 1953 in the Kennemerduinen, and stored in the collection of the Zoological Museum Amsterdam (nowadays relocated in Naturalis Biodiversity Center, Leiden, ZMA.MAM.1967 25/9/1953 Velzen, NH). In the same province a single specimen was reported in January 1954 in the fortress Hinderdam in Nederhorst den Berg (observation of S. Braaksma and J. Th. de Smidt) (Van Wijngaarden et al. 1971). Glas (1986) noted that this observation could not be validated because evidence was missing.

The collected specimens from the provinces of Groningen and Noord-Holland were checked again (for reasons of preparing regional atlases) and were confirmed.

Population developments

Glas (1986) estimated the total population of Geoffroy's bats in limestone quarries in southern Limburg in the early period of bat banding (starting in 1937) at more than 600 individuals. Daan (1980) noticed a sharp decline in numbers of hibernating individuals in these quarries in the 1940s and 1950s. After that period the total numbers showed a steady decline until the 1960s, while the numbers during the winter censuses in the 1970s and 1980s up until 1987 varied between 50 and 70 individuals (Glas & Voûte 1992). After these years of stabilisation the total numbers of hibernating Geoffroy's bats from 1986 onwards showed a steady increase: winter census data showed an eighteenfold increase compared to 2006 (Verboom 2006, Dekker & Regelink 2010), while total numbers in nursery colonies peaked at over 1000 individuals in 2015 and 930 in 2016, including colonies directly across the border in Germany (Dekker & Janssen 2016). In recent years, these colonies have shown a lot of dynamics, moving and separating from sites in two large groups

and several smaller groups (Dekker et al. 2014).

As seen from the Geoffroy's bat hibernation site in Haamstede in Zeeland, the nearest hibernation sites and nursery colonies in the Netherlands are located in the municipality of Echt (Dekker & Regelink 2016), at a distance of 166 km. In May 2008 Regelink & Dekker (2009) reported an observation of Geoffroy's bat in the municipality of Bergeijk, province of Noord-Brabant, 113 km from the hibernation site in Haamstede (figure 2).

During the late 1990s in Vlaanderen (Belgium), which comprises the provinces of West-Vlaanderen, Oost-Vlaanderen, Antwerpen, Vlaams-Brabant and Limburg, a total of ten nursery colonies of Geoffroy's bat were known, spread out over all of these provinces and with an approximate total of 400 to 500 individuals (Lefevre & Verkem 2003). After repeated visits to these nursery colonies, numbers in the provinces of Antwerpen, Vlaams-Brabant and Limburg alone were determined at a combined total of 412 specimens in 2010, 478 in 2011 and ca. 560 in 2012 (Dekeukeleire & Janssen 2012). The nursery colony nearest to the hibernation site in Haamstede is in the municipality of Sint-Amands (96 individuals in 2015), at a distance of 79 km (personal communication Daan Dekeukeleire). The nearest hibernation sites are located in the fortresses around Antwerpen, at a distance of 65-80 km in a southeastern direction (Boers 2012). In summer and early autumn, when several species of bats (including Geoffroy's bat) show swarming behaviour, the fortresses around Antwerpen were surveyed with mist nets. In 2013 one specimen was caught in Kapellen (Willems et al. 2016), 65 km southeast of Haamstede (figure 2).

Figure 2. Location of a newly discovered Geoffroy's bat (*Myotis emarginatus*) hibernation site in Haamstede (province of Zeeland) (indicated by arrow) and the locations of the hibernation sites (▪), nursery colonies (*) and mistnet/hand catches (o) in the Netherlands and Belgium nearest to Haamstede. (+) indicates the location of a radio-transmittered specimen in the Netherlands, close to the Belgium border.

Discussion

The Geoffroy's bat in Haamstede described here is the first documented observation for the Netherlands just outside its regular distribution area after the decline of the species, which took place until the 1960s. Considering the distance from Haamstede to the nearest edges of its range, it is plausible that the hibernating Geoffroy's bat in Haamstede originates from a nursery colony in the municipality of Sint-Amands (Belgium), although evidence is missing.

Červený (1999) describes Geoffroy's bat as a predominantly sedentary species, which shows limited movements of usually less than 40 km. Bels (1952), who studied banded individuals, found a longest migration distance of 106 km for Geoffroy's bat. Like Geoffroy's bat, the greater mouse-eared bat (*Myotis myotis*) does not migrate over long distances. Stutz (1999) characterised the greater mouse-eared bat as an occasional migrant with longest recorded movements of 390 km. Since both species of bats also share the same southern distribution in the Netherlands, it is interesting to note that several verifiable reports of mouse-eared bat are available from the central, more northern regions in the Netherlands (Verheggen 2016).

The Geoffroy's bats collected in the city of Groningen in the province of Groningen

(1954: 1 specimen) and in the Kennemerduinen in the province of Noord-Holland (1953: 2 specimens) as well as the Geoffroy's bat in Haamstede could indicate a wider (more northerly) distribution of Geoffroy's bat in the Netherlands than assumed up to now, as Dekker & Regelink (2010) suggested. However, the near future will show whether the reported Geoffroy's bat in Haamstede was an incidental vagrant. Or that it is the result of a changing climate, or of more favourable local circumstances in Vlaanderen (Belgium), gradually influencing favourable adjacent areas in a north-western direction.

Through this report, we call upon surveyors to pay extra attention to the possible presence of Geoffroy's bat during the annual winter and regular church attic censuses and during mist net inventories, including those performed well outside the species' currently known distribution.

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Samenvatting

De eerste waarneming van de ingekorven vleermuis (*Myotis emarginatus*) in de provincie Zeeland

Op 23 december 2016 werd tijdens de jaarlijkse wintertelling in Haamstede (provincie Zeeland) een overwinterende ingekorven vleermuis aangetroffen in een relatief droge bunker. Het betreft de eerste gedocumenteerde melding in Nederland buiten Limburg en aangrenzend zuidoostelijke Brabant sinds

de jaren 1950. De populaties in Limburg bevinden zich op een afstand van 166 km van de huidige, dichtstbijzijnde vindplaats in Nederland. De meest noordelijke bekende zomerverblijfplaats in Vlaanderen (België) bevindt zich in de omgeving van Antwerpen, op 65 km ten zuidoosten van de winterverblijfplaats te Haamstede. Oude meldingen (waarvan er twee verifieerbaar zijn) van ingekorven vleermuizen in de Kennemerduinen in september 1953 en een vondst in Groningen in 1954 (Naturalis Biodiversity Center, Leiden) kunnen er op wijzen dat de soort tot in de eerste helft van de vorige eeuw een ruimere verspreiding in Nederland heeft gekend. De nabije toekomst zal uitwijzen of deze waarneming in Haamstede betrekking heeft op een incidentele zwerver of dat het om een voorbode gaat van een verdere uitbreiding van het leefgebied. De klimaatopwarming en de gunstige aantalsontwikkelingen in Limburg en Vlaanderen zullen eventuele uitbreiding van deze zuidelijk georienteerde soort zeker gunstig beïnvloeden. Wij hopen door middel van deze melding extra aandacht te vestigen op de mogelijke aanwezigheid van de ingekorven vleermuis tijdens de wintertellingen alsmede tijdens kerkzoldertellingen buiten het huidige bekende verspreidingsgebied.

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