ENERGINET

# ENERGY ISLAND BORNHOLM

## ENVIRONMENTAL BASELINE NOTE
## WP-H BATS

01-09-2022


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| Abbreviation | Explanation |
|---|---|
| **Client** | Energinet |
| **DEA** | Danish Energy Agency |
| **EIA** | Environmental Impact Assessment |
| **Pre-investigation area** | Gross area for the benthic survey including the two wind farm areas and the area in between in Danish waters |
| **OWF** | Offshore Wind Farm |

# 1 INTRODUCTION

The energy islands mark the beginning of a new era for the generation of energy from offshore wind, aimed at creating a green energy supply for Danish and foreign electricity grids. Operating as green power plants at sea, the islands are expected to play a major role in the phasing-out of fossil fuel energy sources in Denmark and Europe.

After political agreement on the energy islands has been reached, the Danish Energy Agency plays a key role in leading the project that will transform the two energy islands from a vision to reality. The Energy Island projects are pioneer projects that will necessitate the deployment of existing knowledge into an entirely new context.

In the Baltic Sea, the electrotechnical equipment will be placed on the island of Bornholm, where electricity from offshore wind farms will be routed to electricity grids on Zealand and neighbouring countries. The offshore wind farms will be constructed approximately 15 km south-southwest of the coast and will be visible, but not dominate the horizon. The turbines off the coast of Bornholm will have a capacity of 3 GW, corresponding to the electricity consumption of two million households.

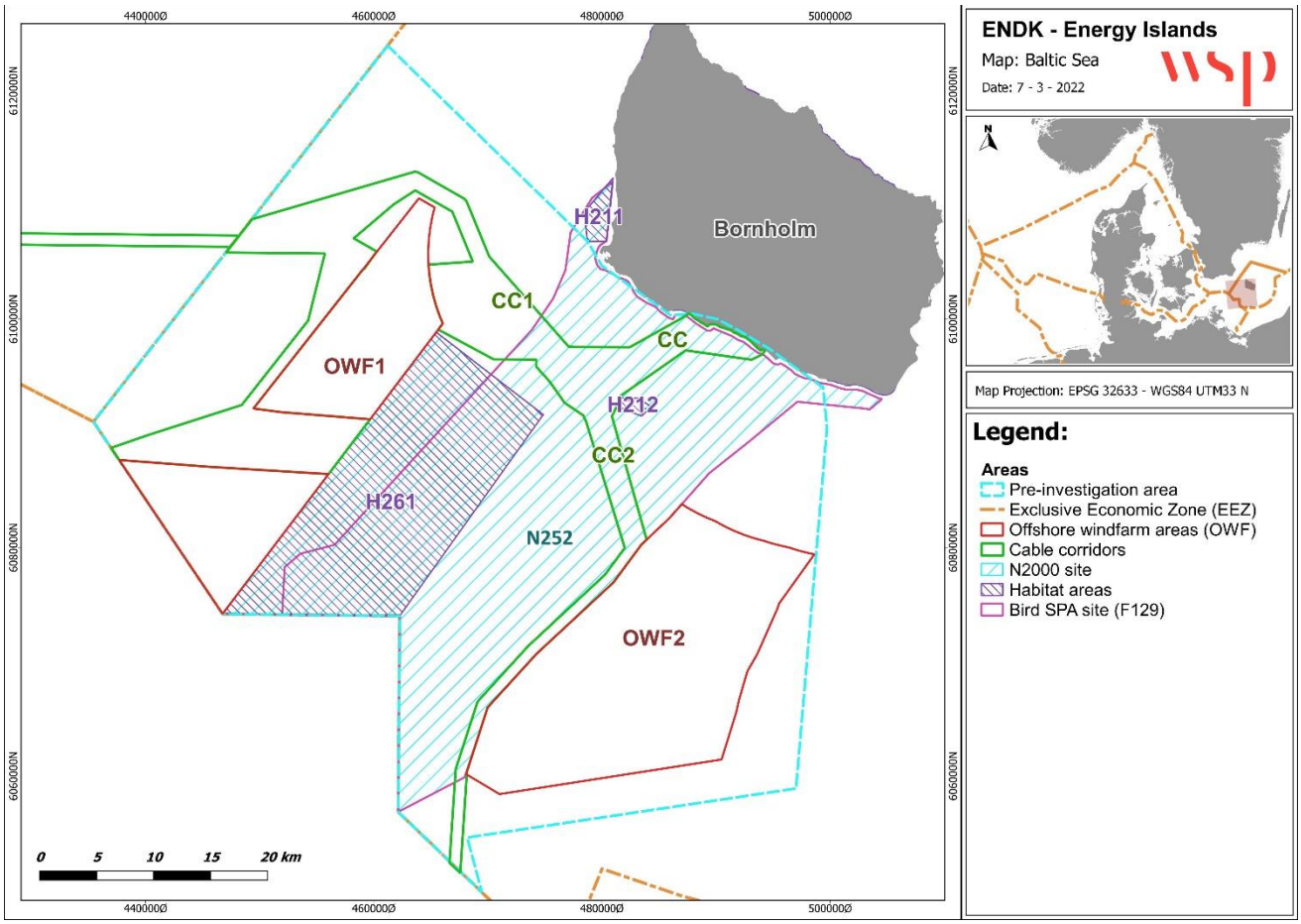


**Figure 1-1. Energy Island Bornholm.**

# 2 METHODOLOGY

Methodology used to map and describe existing data for bat activity and migration in the pre-investigation area for Energy Island Bornholm are presented below.

## 2.1 EXISTING DATA SOURCES

The information on bats inside the pre-investigation area for the Energy Island Bornholm is very limited. In 2014 a ship-based bat survey was carried out six nights in August (28 & 30 August) and September, (5, 6, 19 & 20 September) in an area southwest of Bornholm (AmphiConsult 2015) designated for Bornholm Near Shore Windfarm. Only few bats were observed during this survey. During three of the nights no bats were detected. Daubenton's Bat was recorded two nights and Common Noctule and Nathusius Pipistrelle were recorded one nigh each. The areas studied in this study was situated closer, up to 12 km from the coast of Bornholm than the present project.

Therefore, the existing data for this baseline note also include data collected from different projects and studies outside the pre-investigation area. The projects were chosen in the same geographical region (southern Baltic Sea). For large review of existing data for the larger Baltic Sea please see Seebens-Hoyer et al. (2021).

# 3 EXISTING DATA

There have been several studies of bat migration in the Baltic area. However, the studies address the bat migration in different way and use different methods. This makes the comparability of the studies difficult.

## 3.1 BAT MIGRATION

The bat species can be divided into three groups with different migration patterns. Some bats are sedentary and only rarely move more than few kilometres from their breeding and roosting sites. Other species are short distance migrating bats with a moving distance up to around 100 kilometres, typical between a breeding site or summer roost to a winter roosting site. Most bats of northern Europe belong to the latter group. The last group is long distance migrating bats, typically migrating between few hundred kilometres and several thousand kilometres. The long-distance migrating bats are considered the species most vulnerable to offshore windfarms (Rydell et al. 2010, Voigt et al. 2012, Lehnert et al. 2014, Arnett et al. 2016, Kruszynsk et al. 2021).

It is generally suggested that most migrating bats avoid crossing long distance over the sea. Therefore, the main migration routes are expected to follow land and coast until sea crossing cannot be avoided. In Northern Europe large number of bats are known to migrate from Finland, Baltic countries, and Sweden to Holland, Belgium and France.

### *3.1.1 BAT MIGRATION IN SOUTHERN BALTIC SEA*

There are rather few scientific studies on bat migration over the Baltic Sea. The available studies show that bats in autumn from the southern Swedish coast head south towards the Baltic Sea and return to the coast in spring (Figure 3-1) (Ahlén 1997, Baagøe 2001, Hutterer et al. 2005, Ahlén et al. 2007, Ahlén et al. 2009, Bach et al. 2015, Ijäs et al. 2017).

From the German Baltic coast studies of bat migration include studies on the island Greifswalder Oie, offshore Pomeranian Bay east of Rügen (Seebens et al. 2013). For large review of existing data for the German Baltic Sea coast please see Walter et al. (2007) and Seebens-Hoyer et al. (2021).
Bat migration is also known from Poland, Lithuania and Estonia in spring and late summer where especially Nathusius Pipistrelle migrate along the coast (Ciechanowski et al. 2016, Masing 2011, Pētersons 2004, Šuba et al. 2012).

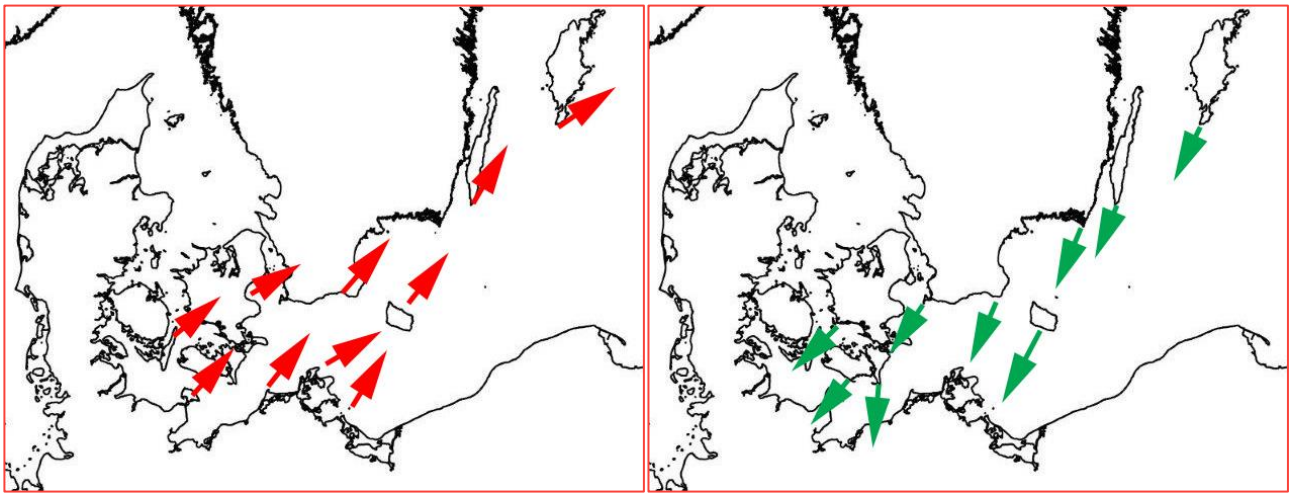

**Figure 3-1. Patterns of bat spring and autumn migration in southern Baltic Sea (Based on Walters et al. 2007, Ahlén et al. 2009, Seebens et al. 2013, Seebens-Hoyer et al. 2021).**

### *3.1.2 OFFSHORE BAT SURVEYS IN SOUTHERN BALTIC SEA*

Several offshore surveys for bats have been carried out in the southern Baltic Sea in the last decade. Most of the studies are in the German part of the area, where two marine platforms and four marine buoys have been used (Figure 3-2). Beside these offshore surveys a few coastal surveys are also relevant for the understanding of the bat migration in the area. Figure 3-2 provide an overview of the existing bat surveys of relevance for the Energy Island Bornholm project.

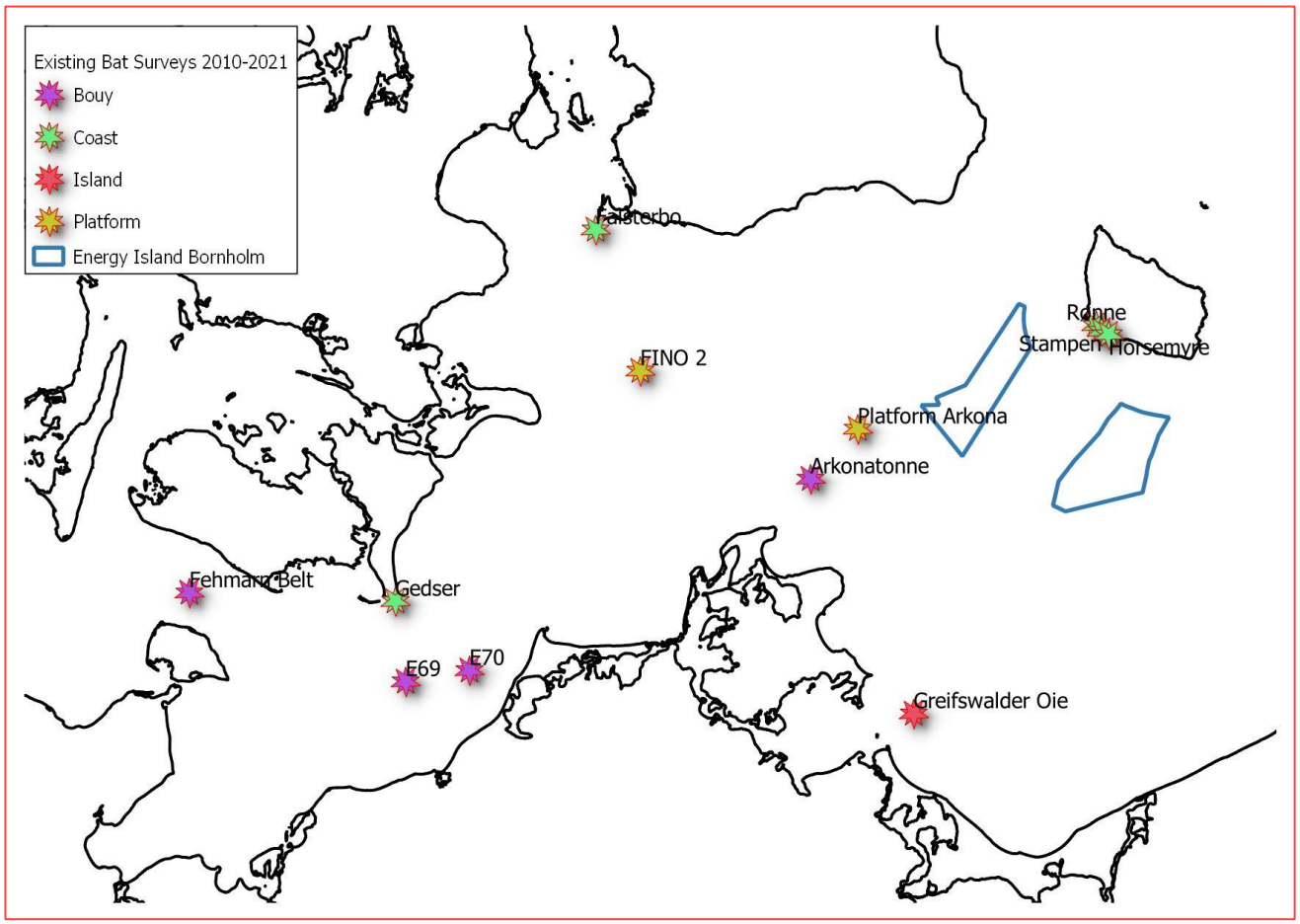


**Figure 3-2. Bat surveys in the southern Baltic Sea.**

The results from the offshore surveys on buoys and platform are supplemented with studies from ferries and ships. See Seebens-Hoyer et al. (2021) for overview of these surveys.

At least eight species of bats are recorded offshore in the Baltic Sea. Nathusius Pipistrelle is in all studies the most frequent species with 70-90% of all records. Common Noctule, Common Pipistrelle and Soprano Pipistrelle are also recorded in most offshore surveys. Table 3-1 provide an overview of the recording of bat species in seven offshore surveys in German part of the Baltic Sea.

**Table 3-1. Species recorded on platforms and buoys in the German part of the Baltic Sea (Seebens-Hoyer et al. 2021). The last three buoys and platforms are considered most relevant for the Energy Island project. Please refer to Figure 3-2 for location of the platforms and buoys.**

| | Common Noctule | Leislers Bat | *Noctule or Leislers* | Particoloured Bat | Common Serotine | *Myotis sp.* | Common Pipistrelle | Soprano Pipistrelle | Nathusius Pipistrelle | *Pipistrelle sp.* |
|---|---|---|---|---|---|---|---|---|---|---|
| Femmern Belt (n=122) | **8%** | | *6%* | | 1% | *1%* | 1% | 8% | **75%** | |
| Tonne E69 (n=231) | **6%** | <1% | *10%* | **<1%** | <1% | | 1% | 11% | **71%** | |
| Tonne E70 (n=20) | | | | | | | | 5% | **95%** | |
| DS-W (n=31) | | 3% | | | | | | 6% | **90%** | |
| FINO 2 (n=289) | **4%** | | *4%* | | | | 16% | <1% | **73%** | *3%* |
| Arkonatonne (n=78) | **5%** | 3% | *8%* | **4%** | | | 3% | 3% | **76%** | |
| Plattform Arkona (n=6) | **17%** | | | | | | | | **83%** | |

Note: n = number of registered bats.

## 3.2 BAT SPECIES LIKELY TO MIGRATE THROUGH THE PRE-INVESTIGATION AREA

Two species of bats, Common Noctule and Nathusius Bat are likely to migrate through the Energy Island Bornholm pre-investigation areas in large number. Both species are known to migrate long distance and both species are present in large population in Sweden, Finland and the Baltic countries.

### 3.2.1 COMMON NOCTULE (NYCTALUS NOCTULA)

**Figure 3-3. Distribution of common noctule (Source: EUROBAT).**

Common Noctule is widespread and common on Bornholm (Møller et al 2013), in northern Germany (BfN 2008) and in Sweden (De Jong et al. 2020) and the distribution also include the Baltic countries and southernmost Finland (Figure 3-3).

Common Noctule is a typical migratory bat species. Populations from north-eastern Europe are known to migrate southwest in autumn, thus covering distances of up to 1 000 km. Due to the weather conditions, western populations tend to be more sedentary (Lehnert et al. 2018).

Common Noctule is recorded in most offshore bat survey in the southern Baltic Sea (Table 3-1).

### 3.2.2 NATHUSIUS PISTRELLE (PIPISTRELLUS NATHUSII)

**Figure 3-4. Distribution of Nathusius pipistrelle (Source: EUROBAT).**

Nathusius Pipistrelle breed regularly on Bornholm but in relatively small number (Møller et al. 2013, Hans Baagøe pers. Comm.). The species is very common on Bornholm during migration both in spring and in autumn. Nathusius Pipistrelle is also widespread and common in Germany (BfN 2008) and Sweden (De Jong et al. 2020) and the distribution also include the Baltic countries and southernmost Finland (Figure 3-4).

The Nathusius' Pipistrelle undertakes a seasonal long-distance migration, usually from northeast to southwest Europe.

All offshore surveys in the Baltic Sea shows Nathusius Pipistrelle to be the most frequent species observed.

## 3.3 BAT SPECIES LIKELY TO MIGRATE THROUGH THE PRE-INVESTIGATION AREA BUT IN SMALL NUMBERS

### *3.3.1 PARTICOLOURED BAT (VESPERTILIO MURINUS)*

Particolored Bat is observed few times on Bornholm with indication of breeding animals (Møller et al. 2013) but is not verified (Hans Baagøe pers. Comm.). Particolored Bat is scattered in northern Germany (BfN 2008) and Sweden (De Jong et al. 2020) and distributed eastward to Baltic countries and Russia (Dietz et al. 2011). Particoloured Bat is a migratory species, and the species might occur in the pre-investigation area in small numbers.

### *3.3.2 LEISLERS BAT (NYCTALUS LEISLERII)*

Recorded few times on Bornholm (Hans Baagøe pers. Comm.). Rare in northern Germany and very rare in Sweden (De Jong et al. 2020). Leislers Bat is recorded few times in the offshore surveys in southern Baltic Sea. However, large number is not expected in the Energy Island pre-investigation area because it is on the Northern margin of the distribution.

### *3.3.3 NORTHERN BAT (EPTESICUS NILSSONII)*

Recorded on Bornholm several time and recent findings indicate that the species may breed in small number on the Island (Hans Baagøe pers. Comm.). Northern Bat is very rare in Northern Germany. Although Northern Bat appears to be a sedentary species, ring recoveries have shown that occasionally longer distances. None of the offshore survey recorded Northern Bats and it is not expected that the species will occur in significant numbers in the pre-investigation area.

### *3.3.4 SEROTINE BAT (EPTERSICUS SEROTINUS)*

Serotine is a common species on Bornholm (Møller et al. 2013) and in Germany (BfN 2008). In Sweden the species is rather rare and only in the southernmost part of the country (De Jong et al. 2020). Serotine bat is rather sedentary and the distance between summer and winter roosts tends to be small. The species are only recorded very few times in the offshore survey in the southern Baltic Sea.

### *3.3.5 SOPRANO PIPISTRELLE (PIPISTRELLUS PYGMAEUS)*

Soprano Pipistrelle is only observed in small number on Bornholm but may be increasing (Hans Baagøe pers. Comm.). Soprano Pipistrelle is also widespread and quite common in north-eastern Germany (BfN 2008) and in southern Sweden (De Jong et al. 2020). It is likely that a small number of Soprano Pipistrelle may migrate through the pre-investigation area.

### 3.3.6 COMMON PIPISTRELLE (PIPISTRELLUS)

Common Pipistrelle is regularly breeding on Bornholm especially on the south coast between Rønne and Dueodde. Common Pipistrel is one of the most common bats in northern Germany (BfN 2008). Common Pipistrelle is a rather sedentary species, with summer and winter roosts often less than 20 km apart. However, long distance migrations have also been recorded. It is likely that a small number of Common Pipistrelle may migrate through the pre-investigation area.

### 3.3.7 POND BAT (MYOTIS DASYCNEME)

Pond Bat is only recorded on Bornholm few times. There is no indication of breeding colonies on the island. Nearest breeding site is in northern Germany (BfN 2008). Large numbers of migrating Pond Bats are not likely in the pre-investigation area.

### 3.3.8 DAUBENTON'S BAT (MYOTIS DAUBENTONII)

Daubenton's Bat is common on Bornholm both as breeding but also during the migration seasons. A common species in both Germany (BfN 2008) and Sweden (De Jong et al. 2020). Daubenton's Bat is a migrant species and is known to cover a distance of up to 150 km between roosts and breeding sites. There are only few records of Daubenton's Bat in the offshore surveys in the Baltic Sea. However, the species is recorded two nights on a ship-based survey south of Bornholm in 2014 (AmphiConsult 2015).

### 3.3.9 BRANDT'S BAT (MYOTIS BRANDTII)

Brandt's Bat is widespread and common on Bornholm (Møller et al 2013) and in Sweden. Rather common in north-eastern Germany (BfN 2008). Brandt's Bat is an occasional migrant, but the distances covered are usually no more than 40 km.. Large numbers of Brandt's Bat in the pre-investigation area are considered unlikely.

### 3.3.10 WHISKERED BAT (MYOTIS MYSTACINUS)

Whiskered Bat is common and widespread on Bornholm and in Sweden. Rare and scattered in Northern Germany (BfN 2008). Whiskered Bat is an occasional migrant, but the distances covered are usually small. Large number of Whiskered Bat in the pre-investigation area is considered unlikely.

### 3.3.11 NATTERER'S BAT (MYOTIS NATTERI)

Natterer's Bat is common and widespread on Bornholm and rather common in north-eastern Germany (BfN 2008). Natterer's Bat is generally considered a sedentary species; however, some individuals are known to have covered long distances. Large number of Natterer's Bat in the pre-investigation area is considered unlikely.

## 3.4 SPECIES UNLIKELY TO MIGRATE IN THE BORNHOLM ENERGY ISLAND PRE-INVESTIGATION AREA.

### *3.4.1 WESTERN ARBASTELLE (BARBASTELLA BARBASTELLUS)*

Western Barbastelle is not recorded on Bornholm (Møller et al. 2013) and very rare on Rugen (BfN 2008) and in Sweden (De Jong et al. 2020). Western barbastelle is largely a sedentary species; the distance between summer and winter roosts usually being under 40 km. Occurrences over the Baltic Sea far away from the coast seems unlikely.

### *3.4.2 BROWN BIG-EARED BAT (PLECOTUS AURITUS)*

Brown Big-Eared Bat is common and widespread on Bornholm (Møller et al. 2013) and Rugen (BfN 2008), but a very sedentary species. Occurrences over the Baltic Sea far away from the coast seems unlikely.

### *3.4.3 GREATER MOUSE-EARED BAT (MYOTIS MYOTIS)*

Greater Mouse-Eared Bat is a regional migrant, whose movements between traditional summer and winter roosts usually range from 50 to 100 km. It only regularly breeding species south of the Baltic Sea (BfN 2008) and never recorded at Bornholm and there are only very few records from Sweden. Because the pre-investigation area is outside the main distribution area of the species it seems unlikely that the species will occur in the pre-investigation area except for very few spontaneous individuals.

## 3.5 TIMING OF BAT MIGRATION OVER THE SOUTHERN BALTIC SEA

Unfortunately, only few systematic studies of migrating bats have been carried out on Bornholm (see Rydell et al. (2014) for studies in a greater area of the Baltic Sea).

Most relevant is the study from 2014 as part of the environmental assessment for Bornholm Havmøllepark (AmphiConsult 2015). This study showed a peak on the southern coast of Bornholm (Figure 3-2) for the migration of Nathusius Pipistrelle from late April to early May in Spring and in September in Autumn (Figure 3-5) and a peak of Common Noctule in early May and mid-August to mid-September (Figure 3-6).

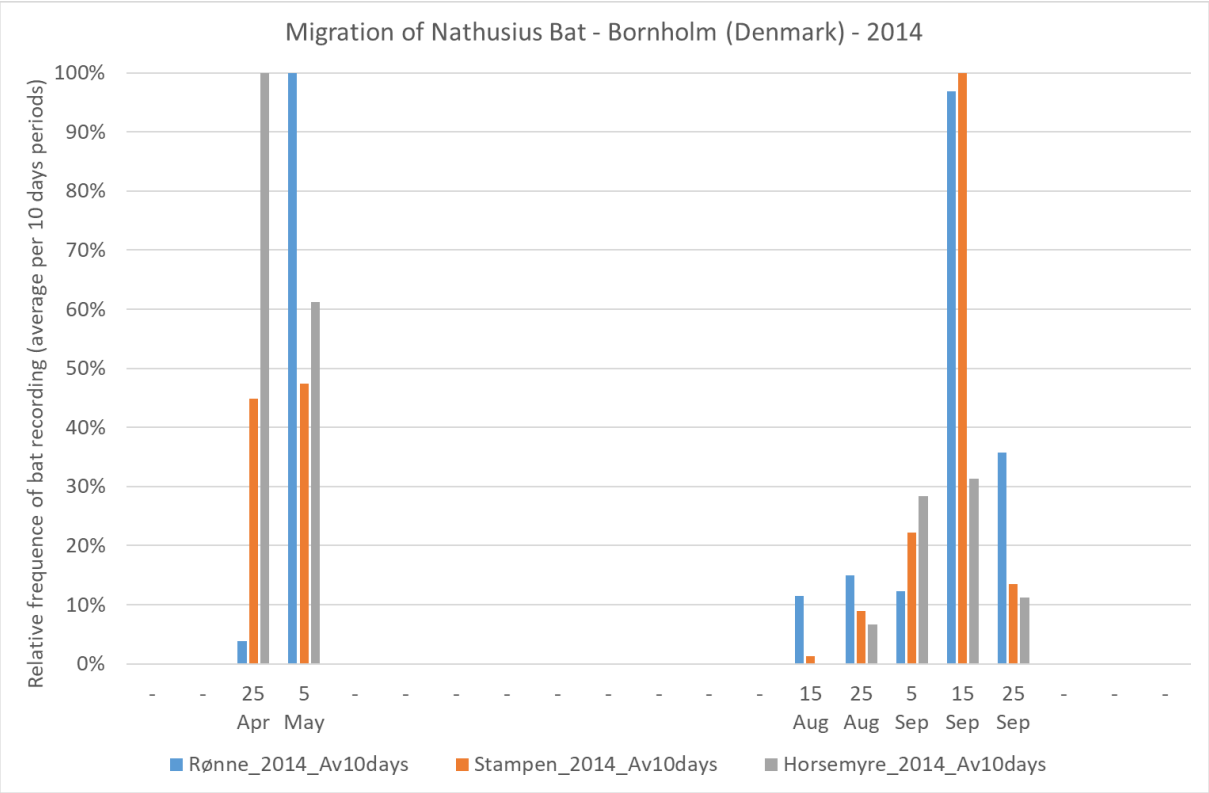


**Figure 3-5. Activity of Nathusius Bats at southern coast of Bornholm (figure based on data from Amphi (2014)). Remark: The survey only includes data collection from 22 April to 7 May and from 13 August to 25 September.**

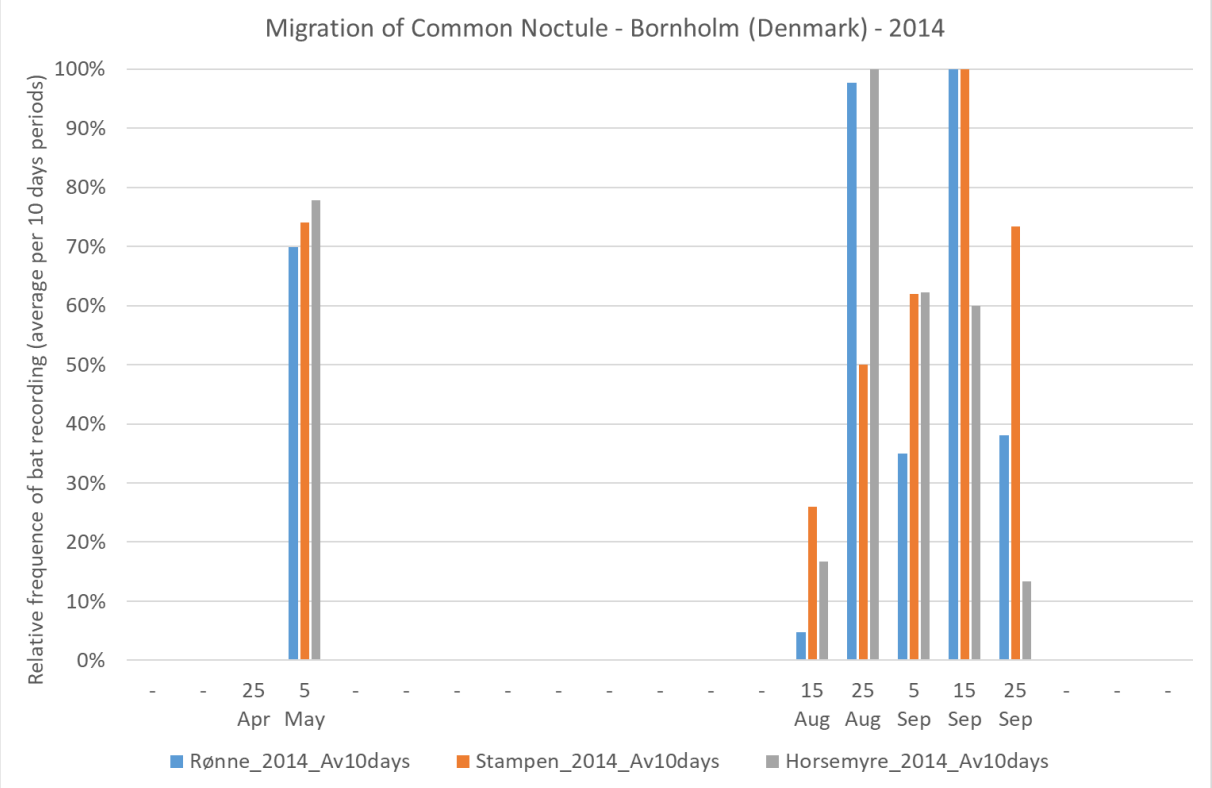


**Figure 3-6. Activity of Common Noctule at southern coast of Bornholm (figure based on data from Amphi (2014)). Remark: The survey only includes data collection from 22 April to 7 May and from 13 August to 25 September.**

The spring migration seems short, whereas the autumn migration is much longer and starts already in Mid-August and run until early October. It should, however, be considered that the survey in 2014 did not cover Mid-May to Early-June or October.

Studies on the Spring migration on the small island Greifswalder Oie (Figure 3-2) out the coast of North-eastern Germany indicate a peak for both Nathusius Pipistrelle and Common Noctule in Mid-May and a migration continuing until first part of June (Figure 3-7, 3-8) (Seebens et al. 2013).

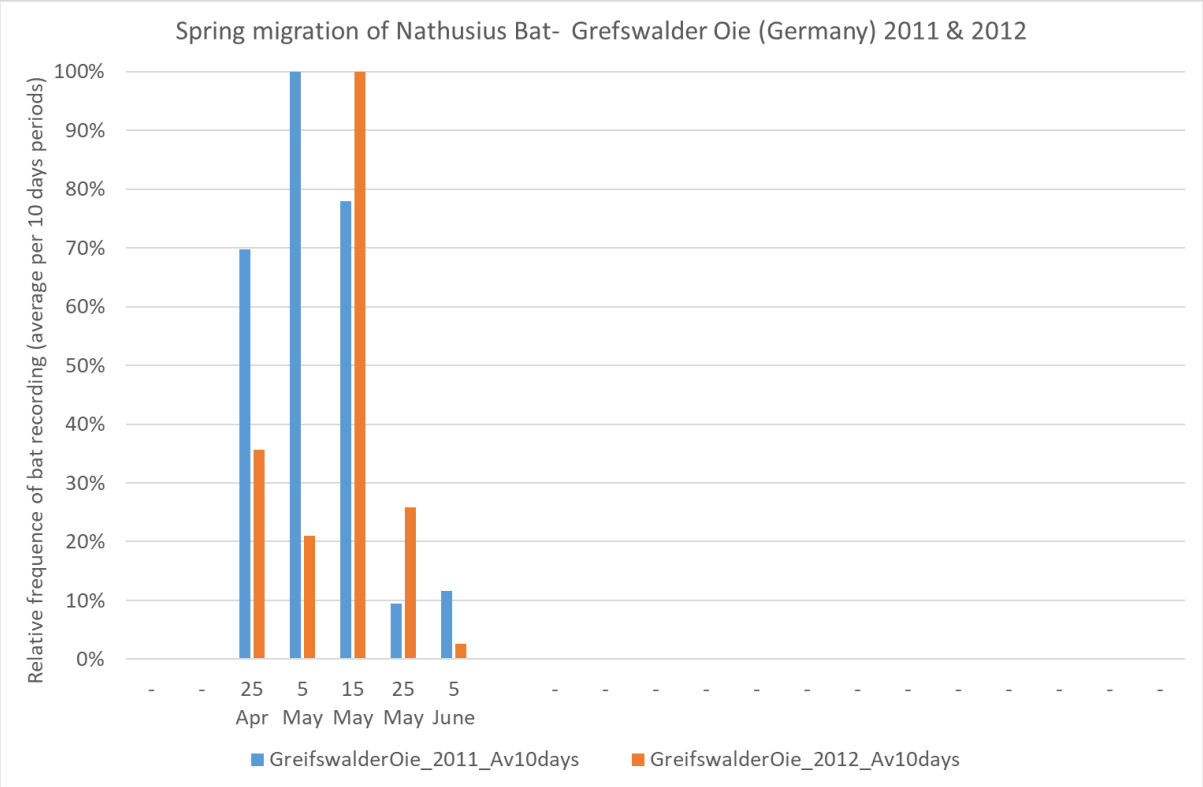


**Figure 3-7. Activity of Nathusius Pipistrelle at a small island North of the German coast (figure based on data from Seebens et al. (2013)). Remark: The survey only includes data collection from 27 April to 1 June.**

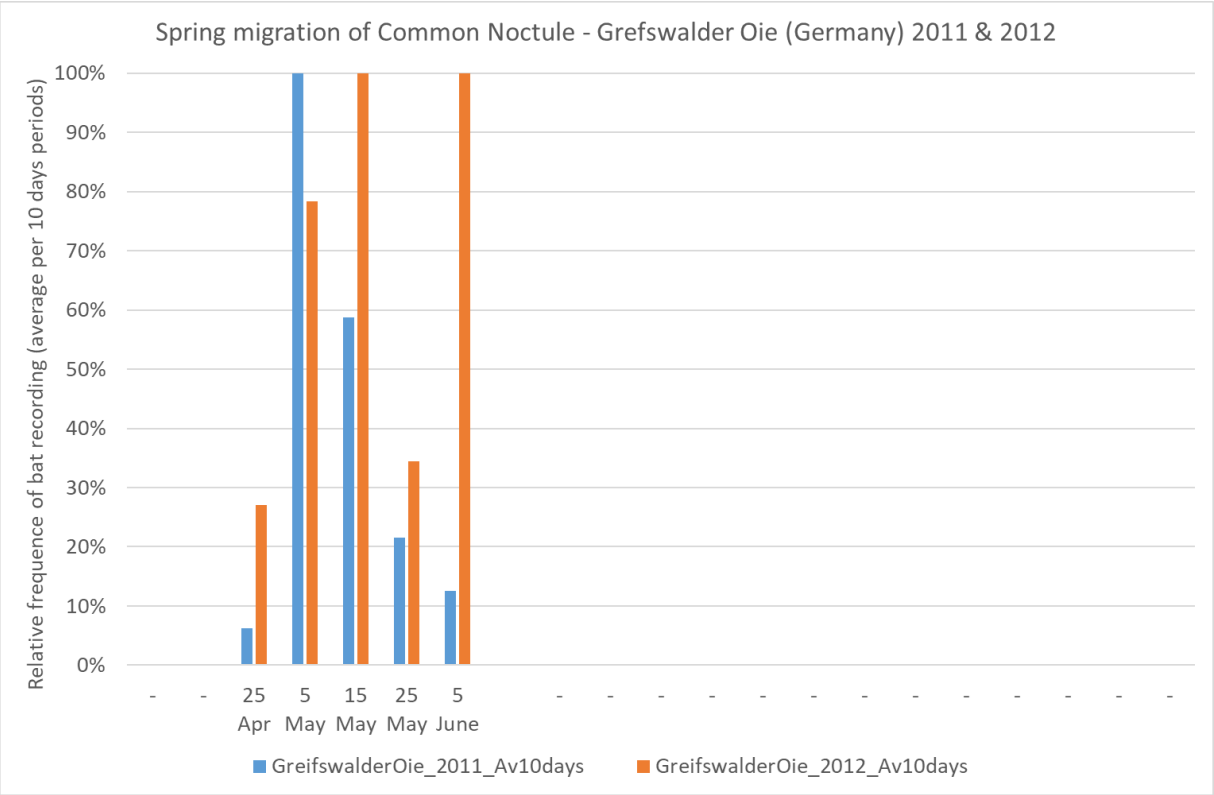


**Figure 3-8. Activity of Common Noctule at a small island North of the German coast (figure based on data from Seebens et al. (2013)). Remark: The survey only includes data collection from 27 April to 1 June.**

The overall patterns for the Autumn migration Bornholm are supported by similar studies from southern Sweden (Bach 2021, Figure 3-9) and Denmark (Figure 3-10).

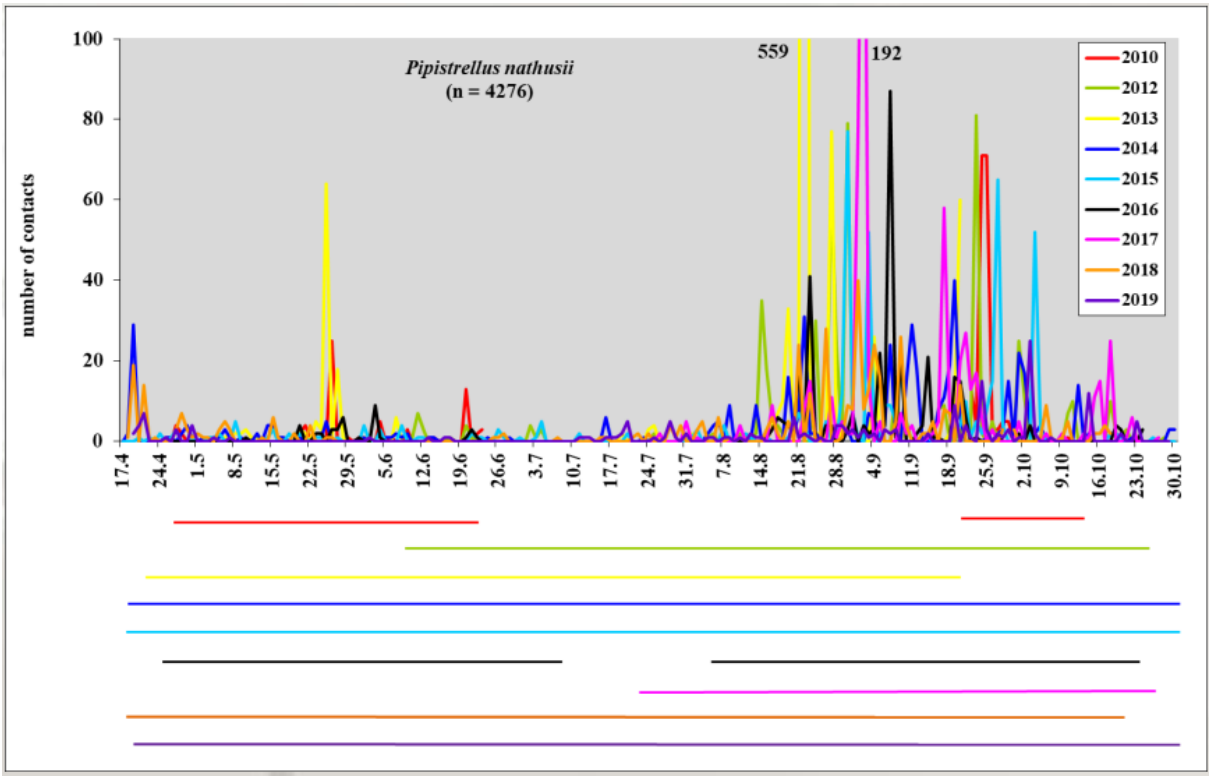


**Figure 3-9. Number of recordings of Nathusius Pipistrelle at Falsterbo in Sweden from 2010 to 2019 (figure from Bach 2021).**

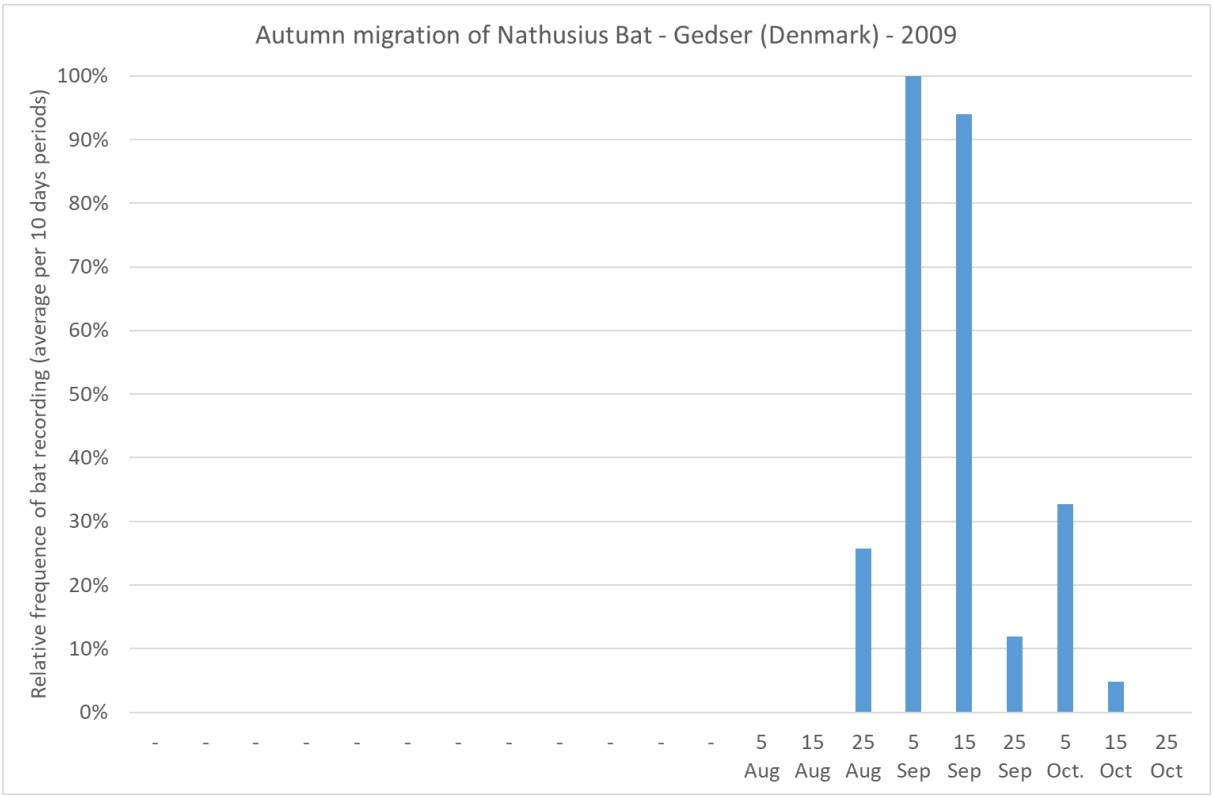


**Figure 3-10. Activity of Nathusius Pipistrelle at Gedser (FEBI 2013) Remark: The survey only includes data collection from 1 August to 31 October.**

On offshore installation only few long-term studies are reported from the Southern Baltic (see chapter 3.1.1 and Table 3-1) and the number of bat observation are too few for an analysis of the phenology.

## 3.6 CLIMATE CHANGE AND THE TIMING OF BAT MIGRATION

The timing of the bat migration is obviously linked to the present of the types of insects which are the main feeding source for each bat species. Change in winter temperature and change in the timing of spring and autumn may influence the insect abundancy and occurrences. How exactly this influence the timing of the bat migration and how quickly the bats will adapt to the changed condition are not known. However, data from an 8-years series from Falsterbo in southernmost Sweden indicates a change in the migration time for Nathusius Bat from a median of the autumn migration in late August 2012 to late September 2019 (Bach 2021).

It is likely that especially the autumn migration is highly sensitive to change in temperature during August, September, and October. Generally, it could be considered that the bats will stay longer in their breeding areas if there are plenty of insects to feed on. The migration in spring is less predictable because the bat doesn't know the conditions in the end destination and the timing of the exit from the wintering areas must be driven by other parameters.

## 3.7 FEEDING BAT DURING BREEDING SEASON

During the summer most bats are on their breeding sites. Most species feed on insect in the near surrounding of the roost. However, when the weather is suitable some bat species feed also over the sea. How far out over the open sea the bats feed and how often they feed over the sea is not documented. It is, expected that most activity is just along the coast where most insect are found, and less activity is expected far away from the coast. None of the offshore studies in the Baltic Sea shows significant number of bats in the summertime.

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# 5 BILAG 1 – BAT NAMES

| ***Latin*** | **English** | **Danish** | **German** | **Swedish** |
|---|---|---|---|---|
| *Nyctalus leisleri* | **Leisler's Bat** | Leislers flagermus | Kleiner Abendsegler | Mindre brunfladdermus/<br>Leislers fladdermus |
| *Nyctalus noctula* | **Common Noctule** | Brunflagermus | Großer Abendsegler | Större brunfladdermus/<br>Stor fladdermus |
| *Vespertilio murinus* | **Parti-colored Bat** | Skimmelflagermus | Zweifarbfledermaus | Gråskimlig fladdermus/<br>Råttlik flädermus |
| *Eptesicus nilssonii* | **Northern Bat** | Nordflagermus | Nordfledermaus | Nordfladdermus /<br>Nordisk fladdermus |
| *Eptesicus serotinus* | **Common Serotine** | Sydflagermus | Breitflügelfledermaus | Sydfladdermus |
| *Pipistrellus nathusii* | **Nathusius's Pipistrelle** | Troldflagermus | Rauhautfledermaus | Trollpipistrell/<br>Trollfladdermus |
| *Pipistrellus pipistrellus* | **Common Pipistrelle** | Pipistrelflagermus | Zwergfledermaus | Sydpipistrell/<br>Pipistrell |
| *Pipistrellus pygmaeus* | **Soprano Pipistrelle** | Dværgflagermus | Mückenfledermaus | Dvärpipistrell/<br>Dvärgfladdermus |
| *Myotis bechsteinii* | **Bechstein's Bat** | Bechsteins flagermus | Bechsteinfledermaus | Bechsteins fladdermus |
| *Myotis brandtii* | **Brandt's Bat** | Brandts flagermus | Große Bartfledermaus | Taigafladdermus/<br>Brandts fladdermus |
| *Myotis dasycneme* | **Pond Bat** | Damflagermus | Teichfledermaus | Dammfladdermus |
| *Myotis daubentonii* | **Daubenton's Bat** | Vandflagermus | Wasserfledermaus | Vattenfladdermus/<br>Daubentons flädermus |

| | | | | |
|---|---|---|---|---|
| *Myotis myotis* | **Greater Mouse-eared Bat** | Stor museøre | Großes Mausohr | Större musöra/ Jättefladdermus |
| *Myotis mystacinus* | **Whiskered Bat** | Skægflagermus | Kleine Bartfledermaus | Mustaschfladdermus/ Mustascherad fladdermus |
| *Myotis nattereri* | **Natterer's Bat** | Frynseflagermus | Fransenfledermaus | Fransfladdermus/ Fransad fladdermus |
| *Barbastella barbastellus* | **Western Barbastelle** | Bredøret flagermus | Mopsfledermaus | Barbastell/ Bredörad fladdermus |
| *Plecotus auritus* | **Brown Long-eared Bat/ Brown Big-eared Bat** | Langøret flagermus/ Brun langøre | Braunes Langohr | Brunlångöra/ Långörad fladdermus |