ENERGINET ELTRANSMISSION A/S

KRIEGERS FLAK II

TECHNICAL REPORT - BATS

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SUMMARY

INTRODUCTION

In order to accelerate the expansion of Danish offshore wind production, it was decided with the agreement on the Finance Act for 2022 to offer an additional 2 GW of offshore wind for establishment before the end of 2030. In addition, the parties behind the Climate Agreement on Green Power and Heat 2022 of 25 June 2022 (hereinafter Climate Agreement 2022) decided), that areas that can accommodate an additional 4 GW of offshore wind must be offered for establishment before the end of 2030. Most recently, a political agreement was concluded on 30 May 2023, which establishes the framework for the Climate Agreement 2022 with the development of 9 GW of offshore wind, which potentially can be increased to 14 GW or more if the concession winners – i.e. the tenderers who will set up the offshore wind turbines – use the freedom included in the agreement to establish capacity in addition to the tendered minimum capacity of 1 GW per tendered area.

In order to enable realization of the political agreements on significantly more energy production from offshore wind before the end of 2030, the Danish Energy Agency has drawn up a plan for the establishment of offshore wind farms in three areas in the North Sea, the Kattegat and the Baltic Sea respectively.

The area for Kriegers Flak II Offshore Wind Farm consists of two sub-areas: North and South. The areas are located 25-50 km off the coast of South Zealand and Møn. Kriegers Flak II North is located approximately 15 km from the east coast of Møn, while Kriegers Flak II South is located approximately 30 km southeast of Møn. The area for the Kriegers Flak II OWF is approximately 175 km2, divided into 99km2 for North and 76km2 for South.

This report presents the results of the bat survey for the proposed areas Kriegers Flak II OWF (North and South) from the first year between March 2023 and November 2023. The second-year survey program will be undertaken from April 2024 – November 2024.

EXISTING DATA AND KNOWLEDGE

Bat species can be divided into three groups depending on their typical migration distances. Some bats are sedentary and only rarely move more than a few kilometres from their breeding and roosting sites. Other species are short distance migrating bats with a moving range up to around 100 kilometres, typically between a breeding site or a summer roosting site to a winter roosting and hibernation site. Most bats of Northern Europe belong to this group. The third group is long distance migrating bats, typically migrating between a few hundred kilometres and several thousand kilometres. The long-distance migrating bats are considered the species most vulnerable to offshore wind farms.

It is generally presumed that most migrating bats avoid crossing long distances 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 numbers of bats are known to migrate from Finland, the Baltic countries, and Sweden to Holland, Belgium, Northern France and even the southern parts of England.

There are rather few scientific studies on bat migration over the pre-investigation area, and in the Baltic Sea in Fennoscandia in general. The available studies show that bats in autumn head south from the southern Swedish coast towards the Baltic Sea and return along the coast in spring

At least eight species of bats have prior to this study been recorded offshore in western Baltic Sea. In all studies nathusius pipistrelle is the most frequent species with 70-90 % of all recordings. Common noctule, common pipistrelle and soprano pipistrelle are also recorded in most offshore surveys. Three species of bats, common noctule, parti-colored bat and nathusius pipistrelle, are most likely to migrate through the pre-investigation area for Kriegers Flak II in larger numbers, because all species are known to migrate long distance and are present in large populations in Sweden, Finland, and the Baltic countries.

METHODOLOGIES

In spring 2023 (late March-early April) bat detectors were installed onshore on Stevns, Møn and at Gedser (Falster) in Denmark, at Falsterbo and near Skåre in southern Sweden and on the peninsula Darsser Ort on the Germany north coast. Bat detectors were also installed offshore on sixteen buoys in the pre-investigation areas for the Krieger Flak II (North and South). The bat detectors recorded the ultrasound from bats in the vicinity of the detector and saved the recording for later analysis. The range of the recording varies between the different bat species. Large bat, like common noctule and parti-colored bat can be recorded up to 100 meters from the detector, whereas smaller bat only can be recorded when they are within a distance below 50 meters.

RESULTS

The recordings from the coastal (onshore) detectors show that the spring activity of common noctule starts mid-April and peaks mid-May. In late May or early June, the number of recordings are lower, indicating a lower activity in most sites. The autumn migration for common noctule starts mid-August and peaks in September indicated by higher number of recordings at most sites. Latest significant activity of common noctule is observed mid-October.

The recordings of Nathusius pipistrel provides strong indication of migration patterns at most of the coastal sites. The activity starts mid-April and peaks in early May and in most sites fade out by the end of May. The autumn migration for nathusius pipistrel starts late August, the main migration activity is in September and last migrating nathusius pipistrel activity is in mid-October. The general pattern observed for nathusius pipistrel on the coastal detectors support the patterns observed in the offshore areas. However, the time window for the actual sea passing in spring seem to be even more narrow than the pattern observed on land.

Parti-colored bat only shows significant activity at the detectors on Northern Stevns and only in autumn. On all other sites the observations of the species are low and may be considered as sporadical However, the large number in the northern part of the survey area may indicated that bats observed offshore may originate from the areas near Copenhagen which are well known to house a large population of parti-colored bat. These bats may not be on migration but rather use the area as their feeding ground in certain nights.

The patterns of activity for soprano pipistrel are difficult to interpret. In most sites the activity is distributed all over the season which indicate local breeding and less migration. This is also supported by the very few observations of soprano pipistrel offshore.

The bat detectors on the offshore buoys generally recorded less bats than on the land-based detector. Recordings per buoy at Kriegers Flak range from 25 to 116 per season. The average bat recording per buoy, when corrected for detector failure, is 62,6 per year. This is considerably higher than similar figures from the Baltic Sea south of Bornholm where a similar survey was carried out for the Energy Island project in 2022 and 2023. The buoys at Bornholm recorded in average 5.3 bats per buoy per season. Also, similar survey in southern Kattegat shows less recordings of bats than the present survey.

In spring very few bats are recorded by bat detectors in the pre-investigation areas and all recordings are nathusius pipistrel. This spring migration are restricted to the night between 10th May and 26 May.

Most of the recordings of bats in the pre-investigation areas are in September, with few recordings in the last week of August and first week of October. Unusual hot weather in beginning of September (5th to 12th September) is likely to be the reason for a large number of recordings of especially common noctule and parti-colored bat. It is likely that this peak is due to a combination of feeding and migration of both species. The migration of nathusius pipistrel occurs from late August until beginning of October. Soprano pipistrel is only recorded few times in August and September and this might be related to migration.

Most bat species prefer to fly over the sea in the dark hours where the risk from predators is lower. This is confirmed by the pattern shown in this data, only very few common noctules are recorded by bat detectors outside the dark part of night.

The data from this survey indicates that most bats fly when the temperature is higher than 17 C. Only 9 out of 979 recordings are from temperature lower than 17 C. Nathusius pipistrels are recorded down to 12 C and parti-colored bat down to 14 C.

The bats also prefer to fly in low-wind speeds. Of alle the bat recordings in the survey 86 percent are recorded when windspeeds measurements in 100 meters height were less than 6 m/s and 97 percent of all bats were recorded when the windspeeds were less than 7 m/s. Most species follow these overall patterns. However, nathusius pipistrel and possibly also soprano pipistrel tend to fly in slightly higher wind speed. A possible explanation for such pattern could be due to the difference between these migrating bats and the feedings bats. Migrating bats need to cross over the sea whereas feeding bat only visit the area when the weather conditions are optimal.

CONCLUSIONS

Based on data from 1st year survey of the pre-investigation area for Kriegers Flak II it can be concluded that during spring and autumn migration several bat species occur. This indicates that migration take place in the area. Most likely this migration goes from Møn to Sweden in spring and from Sweden to Møn in autumn.

In late summer and early autumn, in nights with high temperature and low wind speed, bats, most likely from Møn and Stevns use the pre-investigation areas for Kriegers Flak II for feeding. Most likely related to the presence of large insects over the open sea.

In spring there are only very few recordings of bats, and all is nathusius pipistrel in late May, most likely on migration. Autumn migration of nathusius pipistrel is from late August until beginning of October. Migration of common noctule and parti-colored bat may occur in beginning of October. However, it is difficult to distinguish the migrating bat from feeding bat in this period.

The recordings of bat are mainly from nights with low wind and high temperature. Recordings in nights with temperature lower than 17 C and wind speed over 7 m/s are very rare.

The data collection will continue in 2024 and will strengthen the data set and provide better information on the pattern and the magnitude of the migration over the Kriegers Flak area and the feeding patterns of bats from the surrounding coastal areas.

INTRODUCTION

In order to accelerate the expansion of Danish offshore wind production, it was decided with the agreement on the Finance Act for 2022 to offer an additional 2 GW of offshore wind for establishment before the end of 2030. In addition, the parties behind the Climate Agreement on Green Power and Heat 2022 of 25 June 2022 (hereinafter Climate Agreement 2022) decided), that areas that can accommodate an additional 4 GW of offshore wind must be offered for establishment before the end of 2030. Most recently, a political agreement was concluded on 30 May 2023, which establishes the framework for the Climate Agreement 2022 with the development of 9 GW of offshore wind, which potentially can be increased to 14 GW or more if the concession winners – i.e. the tenderers who will set up the offshore wind turbines – use the freedom included in the agreement to establish capacity in addition to the tendered minimum capacity of 1 GW per tendered area.
In order to enable the realization of the political agreements on significantly more energy production from offshore wind before the end of 2030, the Danish Energy Agency has drawn up a plan for the establishment of offshore wind farms in three areas in the North Sea, the Kattegat and the Baltic Sea respectively.
The area for Kriegers Flak II Offshore Wind Farm (OWF) consists of two sub-areas: North and South. The areas are located 25-50 km off the coast of South Zealand and Møn. Kriegers Flak II North is located approximately 15 km from the east coast of Møn, while Kriegers Flak II South is located approximately 30 km southeast of Møn. The area for the Kriegers Flak II OWF is approximately 175 km2, divided into 99km2 for North and 76km2 for South. The Kriegers Flak II OWF will be connected to land via subsea cables making landfall close to Rødvig on South Zealand (Figure 1).

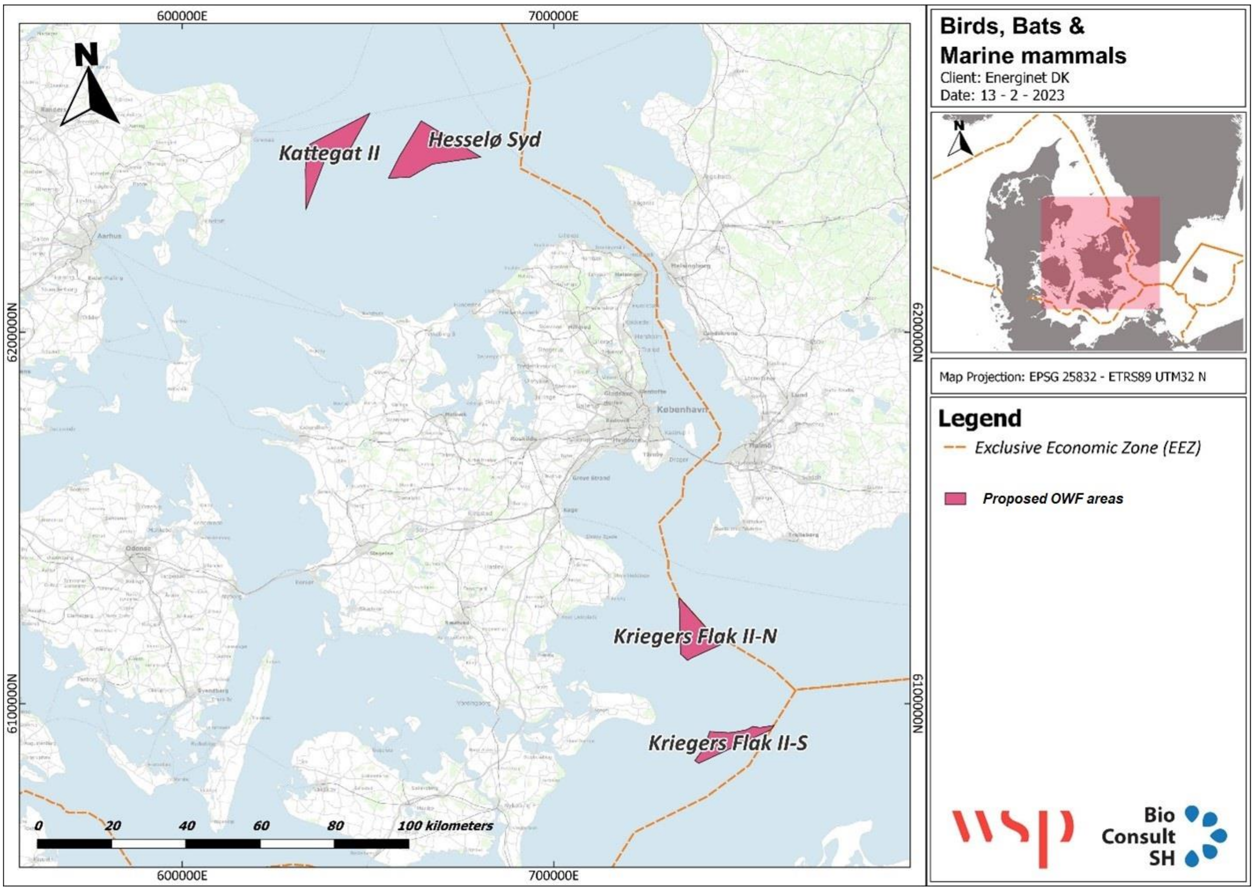


Figure 1 - Map showing the location of the investigated wind farm areas Kattegat, Hesselø and KF II OWF. The present report focuses on KF II OWF.

Bat migration across offshore areas of Denmark is poorly known and long series of observation offshore in Danish water is almost absent. Due to the planning of several new offshore wind farms in Denmark,

there is a need for information on bat migration and behaviour in the area as baseline for the environmental impact and risk assessment.
To support the environmental impact assessment for the future Kriegers Flak II OWF project a bat monitoring program was initiated by Energinet in spring 2023. The program will run for two years, and this technical report is based only on the first-year data collected in 2023.

EXISTING DATA AND KNOWLEDGE

BAT MIGRATION

Bat species can be divided into three groups depending on their typical migration distances (Figure 2). Some bats are sedentary and only rarely move more than a few kilometres from their breeding and roosting sites. Other species are short distance migrating bats with a moving range up to around 100 kilometres, typically between a breeding site or a summer roosting site to a winter roosting and hibernation site. Most bats of Northern Europe belong to this group. The third group is long distance migrating bats, typically migrating between a few hundred kilometres and several thousand kilometres. The long-distance migrating bats are considered the species most vulnerable to offshore wind farms (Rydell et al. 2010, Voigt et al. 2012 Lehnert et al. 2014, Arnett et al. 2016, Kruszynski et al. 2020).

It is generally presumed that most migrating bats avoid crossing long distances 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 numbers of bats are known to migrate from Finland, the Baltic countries, and Sweden to Holland, Belgium, Northern France and even the southern parts of England.

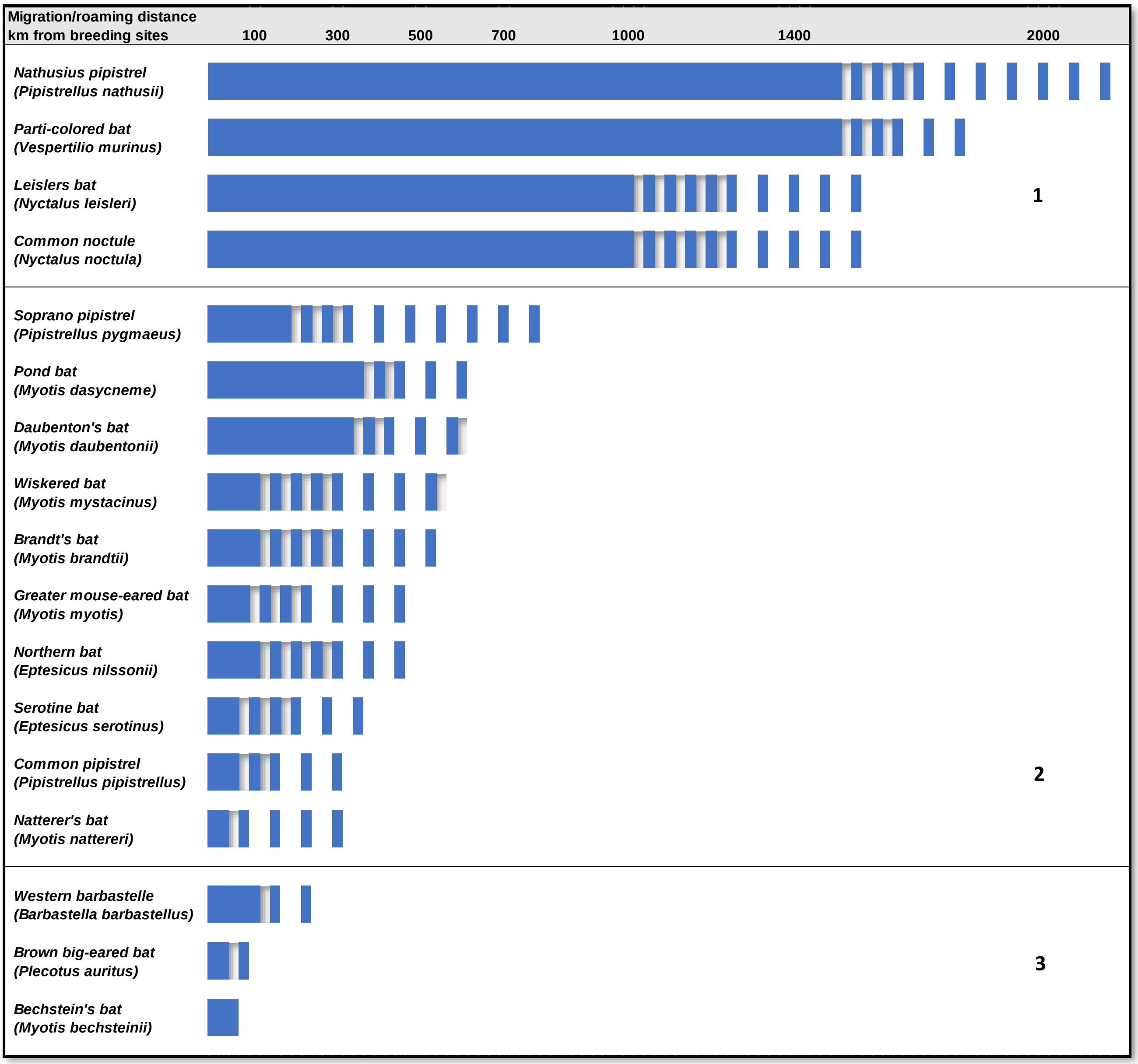


Figure 2 – General distance of migration and roaming for bat species found in Denmark. Figure from Christensen & Hansen 2023 (Translated from Danish). Based on sources: Baagøe 2001, Pētersons 2004, Hutterer et al. 2005, Dietz et al. 2011, Baagøe & Jensen 2007, Alcalde et al. 2021 a.o.

OFFSHORE BAT SURVEYS IN WESTERN BALTIC SEA

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

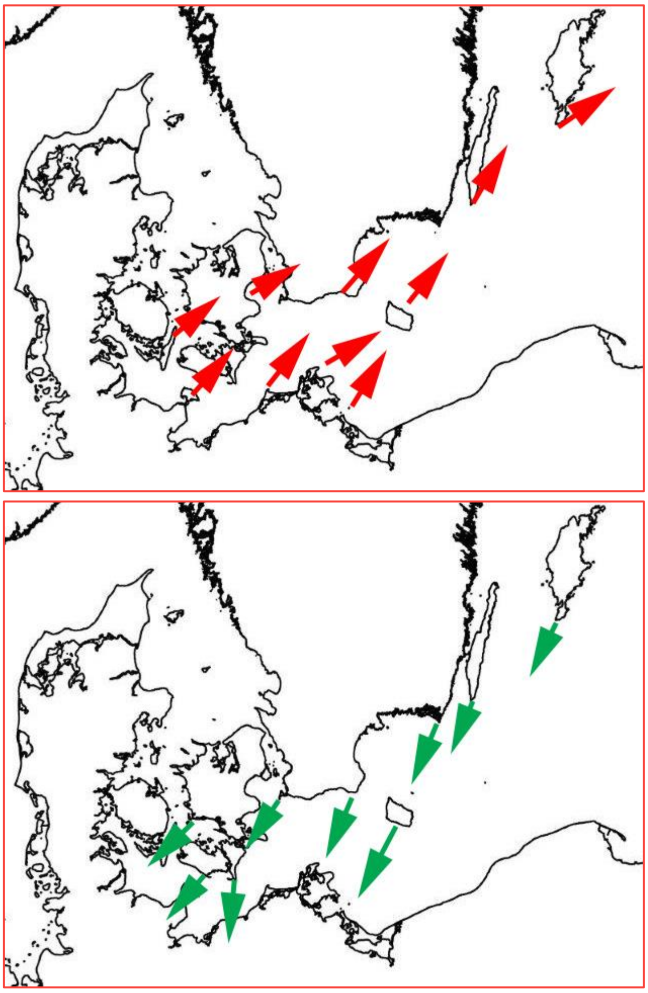


Figure 3 – Suggested patterns of bat spring (left) and autumn (right) migration in western Baltic Sea (based on (Walter et al. 2007; Ahlén et al 2009; Seebens et al. 2013 & Seebens-Hoyer et al. 2021).

OFFSHORE AND COASTAL BAT SURVEYS IN WESTERN BALTIC SEA

Few offshore surveys for bats have been carried out in the western Baltic Sea in the last decade (Figure 4 and Tabel 1). Most of the studies have been carried out in the German part of the Baltic Sea at two platforms and four marine buoys and carried out during the environmental impact assessment for various German offshore wind farms as well as the Fehmarn tunnel connection between Denmark and Germany (Figure 4). Beside these offshore surveys, a few coastal surveys from southern Bornholm (Amphi Consult 2015), Falsterbo in southern Sweden (Bach et al. 2017) and Gedser (FEBI 2013) are also relevant for the understanding of bat migration in the area. Coastal studies provide knowledge of how bats concentrate and most likely start migration from onshore locations that minimize migration distance or about potential feeding offshore at certain weather conditions.

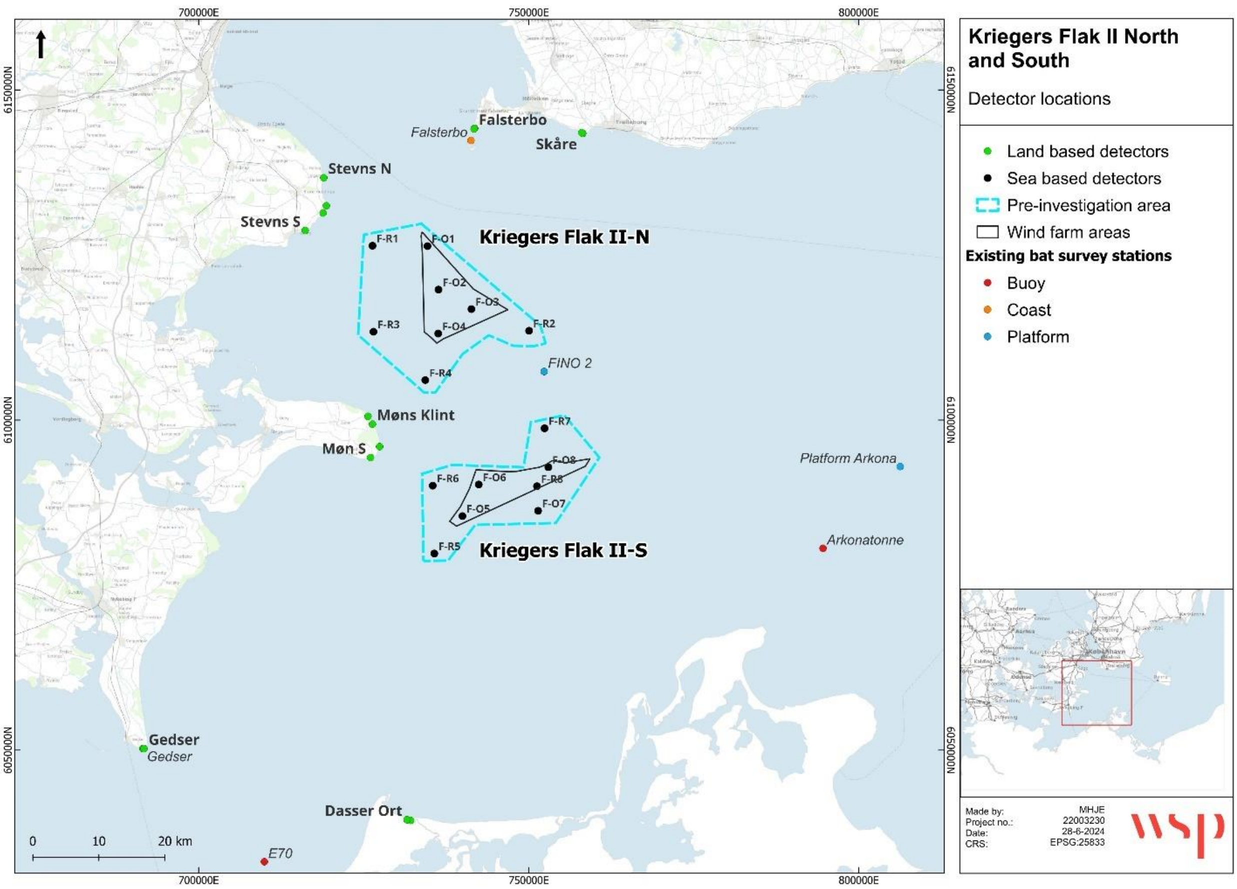


Figure 4 - Bat surveys in the western Baltic Sea. For offshore references please see Tabel 1.

At least eight species of bats have prior to this study been recorded offshore in western Baltic Sea (Tabel 1). In all studies nathusius pipistrelle is the most frequent species with 70-90 % of all recordings. Common noctule, common pipistrelle and soprano pipistrelle are also recorded in most offshore surveys. Tabel 1 provide an overview of the recording of bat species in seven offshore surveys in the German part of the Baltic Sea.

Tabel 1 - Species recorded on platforms and buoys in the German part of the Baltic Sea (Seebens-Hoyer, et al., 2021).

	Common noctule	Leislers bat	Noctule or Leislers bat	Parti-colored bat	Common serotine	*Myotis sp.*	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	*Pipistrellus sp.*
Femmern Belt* (n=122)	8%		*6%*		1%	*1%*	1%	8%	75%	
Tonne E69 (2016-18)**** (n=231)	6%	<1%	*10%*	<1%	<1%		1%	11%	71%	
Tonne E70 (2018)**** (n=20)								5%	95%	
DS-W (2014)** (n=31)		3%						6%	90%	
FINO 2 (2013)*** (n=289)	4%		*4%*				16%	<1%	73%	*3%*
Arkonatonne (2017, 2018)**** (n=78)	5%	3%	*8%*	4%			3%	3%	76%	
Plattform Arkona (2017, 2018)**** (n=6)	17%								83%	

*) FEBI 2013
**) Wawra et al. 2016
***) Skov et al. 2015
****) Seebens-Hoyer et al. 2021

BAT SPECIES MIGRATING THROUGH WESTERN BALTIC SEA AREA IN LARGER NUMBERS

Three species of bats, common noctule, parti-colored bat and nathusius pipistrelle, are most likely to migrate through the pre-investigation area in larger numbers, because all species are known to migrate long distance (Figure 2) and all species are present in large populations in Sweden (Wesling et al. 2020), Finland (Tidenberg 2019), and the Baltic countries (Eurobat 2014).

COMMON NOCTULE (NYCTALUS NOCTULA)

Common noctule is widespread and common in Denmark (Møller et al. 2013) and Sweden (De Jong et al. 2020, Wesling et al. 2020) (Figure 5). The Swedish population is estimated to 130,000 individuals (Wesling et al 2020).
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).
It is expected that the common noctule migrates through the pre-investigation area and it is likely that individuals from Møn and Stevns will use the area for feeding on days with low wind and high temperatures.

Figure 5 - Distribution of common noctule (Source: EUROBAT).

PARTICOLOURED BAT (VESPERTILIO MURINUS)

Particolored bat is common in the northern part of the island Zealand (Denmark) (Møller et al. 2013) and has a scattered distribution in Sweden (De Jong et al. 2020) (Figure 6). Particoloured bat is a long-distance migratory species, and the species might occur in the marine pre-investigation area both as a migratory species and as a part of their feeding behaviour.

Figure 6 - Distribution of parti-colored bat (Source: EUROBAT).

NATHUSIUS PIPISTRELLE (PIPISTRELLUS NATHUSII)

Nathusius pipistrelle is widespread and common in Denmark (Møller et al. 2013) and Sweden (De Jong et al. 2020) and the distribution in the region also include the Baltic countries and southernmost Finland (Figure 7). The nathusius pipistrelle undertakes a seasonal long-distance migration, usually from northeast to southwest Europe.

Existing data from offshore surveys in western Baltic Sea shows nathusius pipistrelle to be a frequent species.

Figure 7 - **Distribution of nathusius pipistrelle (Source: EUROBAT).**

BAT SPECIES MIGRATING THROUGH WESTERN BALTIC SEA AREA IN SMALL NUMBERS

LEISLERS BAT (NYCTALUS LEISLERII)

Leislers bat is only recorded a few times in Denmark (Møller et al. 2013) and is very rare in Sweden (De Jong et al. 2020). Large numbers of Leislers bats are not expected in western Baltic Sea. However small number may occur accidentally.

NORTHERN BAT (EPTESICUS NILSSONII)

Northern bat is common in Sweden (De. Jong et al. 2020, Wesling et al. 2020) but rare in Denmark (Møller et al. 2013). Although northern bat appears to be a sedentary species, ring recoveries have shown that they occasionally fly longer distances. None of the previous offshore surveys in western Baltic Sea recorded northern bats and it is therefore not expected that the species will occur in the pre-investigation area.

SEROTINE BAT (EPTERSICUS SEROTINUS)

Serotine bat is a common species in most part of Denmark (Møller et al. 2013). In Sweden the species is rather rare and only found 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. It is therefore not expected that the species will occur in significant numbers in the pre-investigation area.

SOPRANO PIPISTRELLE (PIPISTRELLUS PYGMAEUS)

Soprano pipistrelle is widespread and common in Denmark (Møller et al. 2013) and in southern Sweden (De Jong et al. 2020). Due to its abundance and occurrence in Denmark and southern Sweden it is likely that a small number of soprano pipistrelle may migrate through the pre-investigation area.

COMMON PIPISTRELLE (PIPISTRELLUS PIPISTRELLUS)

Common pipistrelle is widespread and common in southern parts of Denmark (Møller et al 2013) and found scattered in southern Sweden (De Jong et al 2020). 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 possible that a small number of common pipistrelle may migrate through the pre-investigation area.

POND BAT (MYOTIS DASYCNEME)

Pond bat is rather common in the northern parts of Jutland and scattered in southern Denmark (Møller et al. 2013) but rare in Sweden (De Jong et al. 2020). Large number of migrating pond bats are not likely to occur in the pre-investigation area.

DAUBENTON'S BAT (MYOTIS DAUBENTONII)

Daubenton's bat is common in Denmark (Møller et al 2013) and in Sweden (De Jong et al. 2020). Daubenton's bat is a migrant species and is known to fly up to 150 km between roosts. The migration seems however, primary to be over land along rivers and lakes. Daubenton’s bat is rarely observed offshore, and large number are not expected in the pre-investigation area.

BAT SPECIES UNLIKELY TO MIGRATE THROUGH WESTERN BALTIC SEA AREA

BRANDT’S BAT (MYOTIS BRANDTII)

Brandt’s bat is widespread and common in Sweden (De. Jong et al. 2020) but rare in Denmark (Møller et al 2013). Brandt’s bat is an occasional migrant, but the distances covered are usually no more than 40 km. Brandt’s bat in the pre-investigation area are considered unlikely.

WHISKERED BAT (MYOTIS MYSTACINUS)

Whiskered bat is common and widespread in Sweden (De Jong et al. 2020) but not recorded in Denmark outside Bornholm in the Baltic Sea (Møller et al. 2013). Whiskered bat is an occasional migrant, but the distances covered are usually small. Whiskered bat in the pre-investigation area is considered unlikely.

WESTERN BARBASTELLE (BARBASTELLA BARBASTELLUS)

Western barbastelle is only recorded in the southern part of Zealand and the islands in southern Denmark (Møller et al. 2013) and is rare in Sweden (De Jong et al. 2020). Western barbastelle is largely a sedentary species; the distance between summer and winter roosts are usually below 40 km. Occurrences in the offshore parts of Baltic Sea far away from the coast are therefore considered unlikely.

BROWN BIG-EARED BAT (PLECOTUS AURITUS)

Brown big-eared bat is common and widespread in Denmark (Møller et al. 2013) and Sweden (De Jong et al. 2020). Brown big-eared bat is a very sedentary species. Occurrences over the sea in the Baltic Sea far away from the coast is considered unlikely.

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 is only regularly breeding south of the Baltic Sea (BfN 2008) and there are only very few recordings from Sweden (de Jong et al. 2020). Because the Baltic Sea is situated outside the main distribution area of the species (Dietz et al. 2011), it seems unlikely that the species will occur in the pre-investigation area.

NATTERER'S BAT (MYOTIS NATTERI)

Natterer's bat is common and widespread in Sweden (De Jong et al. 2020) and scattered in Denmark (Møller et al 2013). Natterer's bat is generally considered a sedentary species; however, some individuals are known to have covered long distances. Occurrences of natterer's bat in the pre-investigation area are considered unlikely.

TIMING OF BAT MIGRATION THROUGH THE WESTERN BALTIC SEA AREA

The spring migration is expected to start in April and continue until early June and the autumn migration is starting in August and may continue until late October.

CLIMATE CHANGE AND THE TIMING OF BAT MIGRATION

The timing of the bat migration is obviously linked to the presence of the specific 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 abundance and occurrences. Exactly how this influence the timing of the bat migration and how quickly the bats will adapt to the changed conditions are not known. However, an 8-year data 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 bats do not know, the conditions at the end destination and the timing of the exit from the wintering areas is predominantly driven by other factors such as day length.

FEEDING DURING BREEDING SEASON

During the summer most bats are located at or in close proximity to their breeding sites feeding on the abundance of insect within this area. However, when the weather is suitable some bat species also forage at sea, and even far from the coast. Exactly how far out the bats feed and how often they feed over the sea is not documented. It is expected that most activity occur along the coast where most insects are found, and less far away from the coast.

METHODOLOGY

In spring 2023 (late March-early April) bat detectors were installed onshore on Stevns, Møn and at Gedser (Falster) in Denmark, at Falsterbo and near Skåre in southern Sweden and on the peninsula Darsser Ort on the Germany north coast. Bat detectors were also installed offshore on sixteen buoys in the pre-investigation areas for the Krieger Flak II (North and South) (Figure 8) The bat detectors recorded the ultrasound from bats in the vicinity of the detector and saved the recording for later analysis. The range of the recording varies between the different bat species. Large bat, like common noctule and parti-colored bat can be recorded up to 100 meters from the detector, whereas smaller bat only can be recorded when they are within a distance below 50 meters.

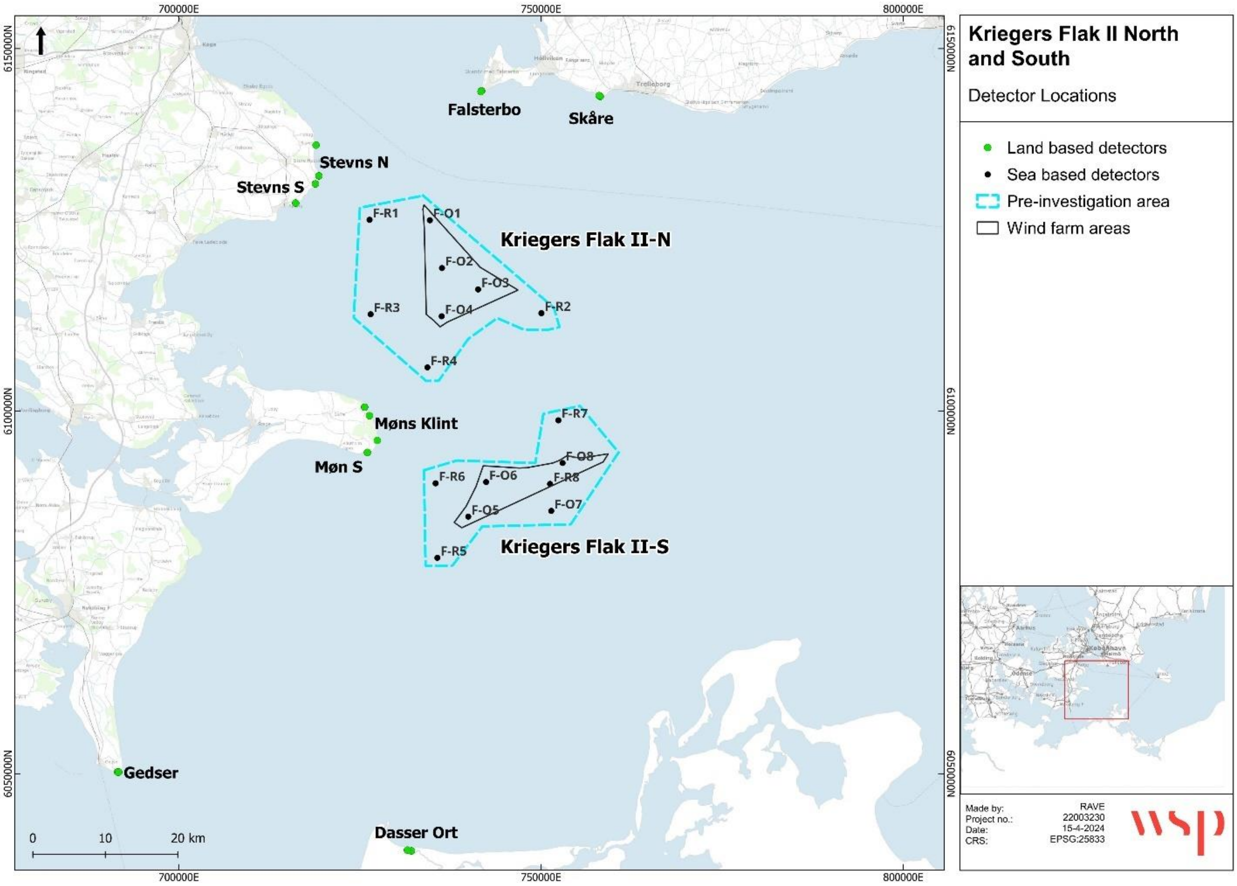


Figure 8 - Map showing the position of the buoys used for the survey. Bat detectors on coastal areas (green dots) and on sixteen buoys located within the pre-investigation area for the planned Kriegers Flak II (North and South) Offshore Wind Farm (black dots)

OFFSHORE BUOY BASED SURVEY

A total of sixteen bat detectors have been attached to buoys used for the marine mammal survey (Figure 8, Figure 9 & Figure 10). The detectors collect recordings of all bats passings on sixteen positions in the pre-investigation areas in spring, summer, and autumn (1st of April to 31st of October) in 2023. The position of the buoys ranges from 10 km up to 35 km from the coast of Møn.

Figure 9 - Automatic bat detector mounted on a buoy used for the marine mammal survey.

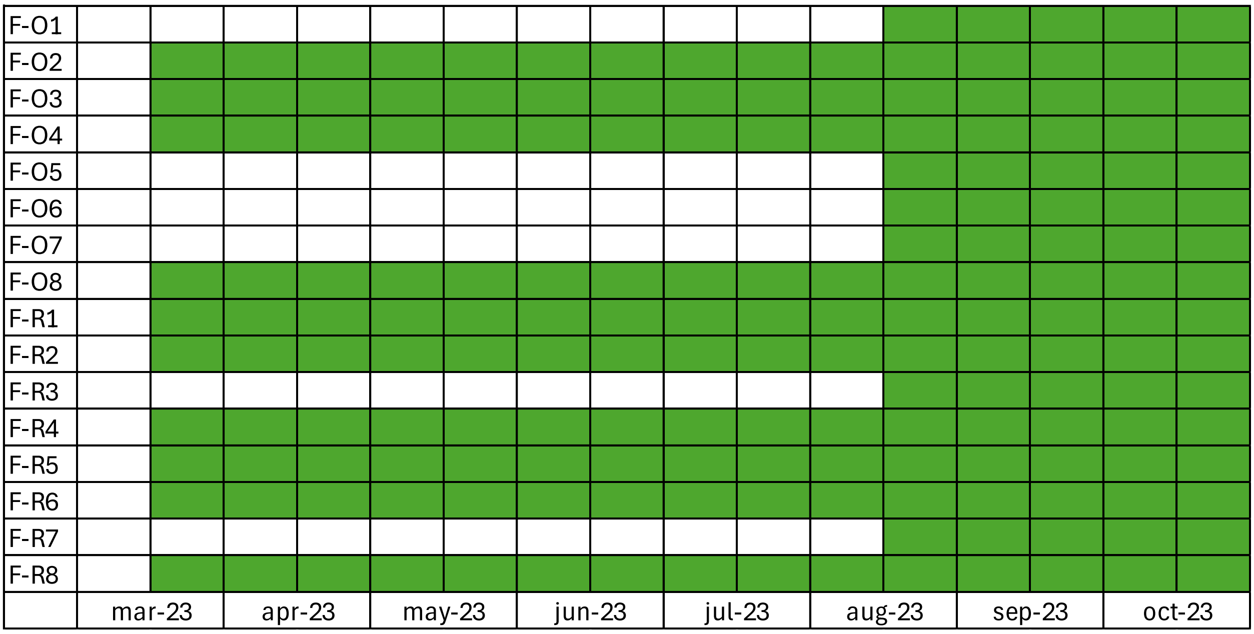


Figure 10 – Deployment-time of each of the 16 bat detectors. Green bars indicate that the detector runs without failure (For detector number see Figure 8).

OFFSHORE VESSEL BASED SURVEY

The survey vessel Skoven has been visiting the survey areas for different purposes throughout the survey period in 2023. A bat detector has been installed on the vessel (Figure 11). The bat detector was programmed to record completely independent with no assistance from the staff onboard the vessel. The bat detector recorded the ultrasound from bats around the vessel and saved the recording for later analysis. The bat detector also recorded the position of the vessel and the time. Weather conditions (wind direction, wind speed and temperature were taken from the vessels logbook). The vessel-based bat surveys included data collection from March 2023 to October 2023. From March to mid-August 10 detector were deploy for the full period and from August 16 detectors were deployed (Figure 10)

Figure 11 - Automatic bat detector (in front) mounted on the survey vessel Skoven.

COASTAL (ONSHORE) SURVEY

The land-based detectors were mounted on trees in coastal areas in Sweden, Stevns, Møn, Gedser and on the German north coast (Figure 8). The specific position was selected on spot with high possibility for feeding bat if any bat were present (Figure 12**).**

Figure 12 – Bat detector mounted on a tree at the coast of Møn

ANALYSIS

The detectors mounted on buoys were the SeaBat 2.0 model used for other offshore projects in Denmark. Land-based detectors were the MAM model also used I previous projects. Both detectors are based on the AudioMoth technology and were setup to record all bat activity from half hour before sunset to half hour after sunrise. The recordings were divided into 5 seconds recordings separated by 10 seconds' pause. The sorting of the recording was made by the software Kalaidoscope.
The range of the recording depends on the species of bats. Loud speaking bat like common noctule may be recorded up to 100 meters from the detector, whereas small and more silent bats may be recorded up to less than 50 meters from the recorder. Due to these differences, the amount of recording of different species cannot be compared directly.
The basic measure is recordings per night. The number of recordings cannot be translated into number of individuals. However, large activity and a high number of recordings per night may indicate more individuals.

DATA AND RESULTS

GENERAL COASTAL PATTERNS

The patterns of the bat activity measured on the coastal detectors are shown in Appendix 2. Often the patterns found on these coastal positions are a mixture of local and migrating bats. However, some general patterns for each of the species during 2023 can be highlighted.

The spring activity of common noctule starts mid-April at Møn and Stevns and peaks mid-May. In late May to early June, the activity is lower in most sites. However, at Møns Klint and Southern Stevns activity by local breeders is observed during June and July. The spring activity of common noctule in Sweden (Falsterbo and Skåre) is low and seems to be restricted to May.

The autumn migration for common noctule starts mid-August and peaks in September at most sites. Latest significant activity of common noctule is observed mid-October.

Nathusius pipistrel shows clear migration patterns at most of the coastal sites. The activity starts mid-April and peaks in early May and in most sites fade out by the end of May.

Autumn migration for nathusius pipistrel starts late August, the main migration activity is in September and last migrating nathusius pipistrel activity is in mid-October.

The general pattern observed for nathusius pipistrel on the coastal detectors support the patterns observed in the offshore areas (Figure 15). However, the time window for the actual sea passing in spring seem to be even more narrow than the pattern observed on land.

Parti-colored bat only shows significant activity at the detectors on northern Stevns and only in autumn. On all other sites the observations of the species are low and may be considered as accidental. However, the large number in the northern part of the survey area may indicated that bats observed offshore may originate from the areas near Copenhagen which are well known to house a large population of parti-colored bat. These bats may not be on migration but rather use the area as their feeding ground in certain nights.

The patterns of activity for soprano pipistrel are difficult to interpret. In most sites the activity is distributed all over the season which indicate local breeding and less migration. This also supported by the very few observations of soprano pipistrel offshore (see next chapter).

GENERAL OFFSHORE PATTERNS

The bat detectors on the offshore buoys generally recorded less bats than on the land-based detector (see Appendix 2)

The recordings per buoy at Kriegers Flak range from 25 to 116 per season (Figure 13). The average bat recording per buoy, when corrected for detector failure, is 62,6 per year). This is considerable higher than similar figures from the Baltic Sea south of Bornholm where a similar survey was carried out for the Energy Island project in 2022 and 2023 (Christensen 2024a). The buoys at Bornholm recorded in average 5.3 bats per buoy per season. Also, similar survey in Southern Kattegat shows less recordings of bats than the present survey (reports in prep. From Kattegat and Hesselø offshore wind farm pre-investigation areas).

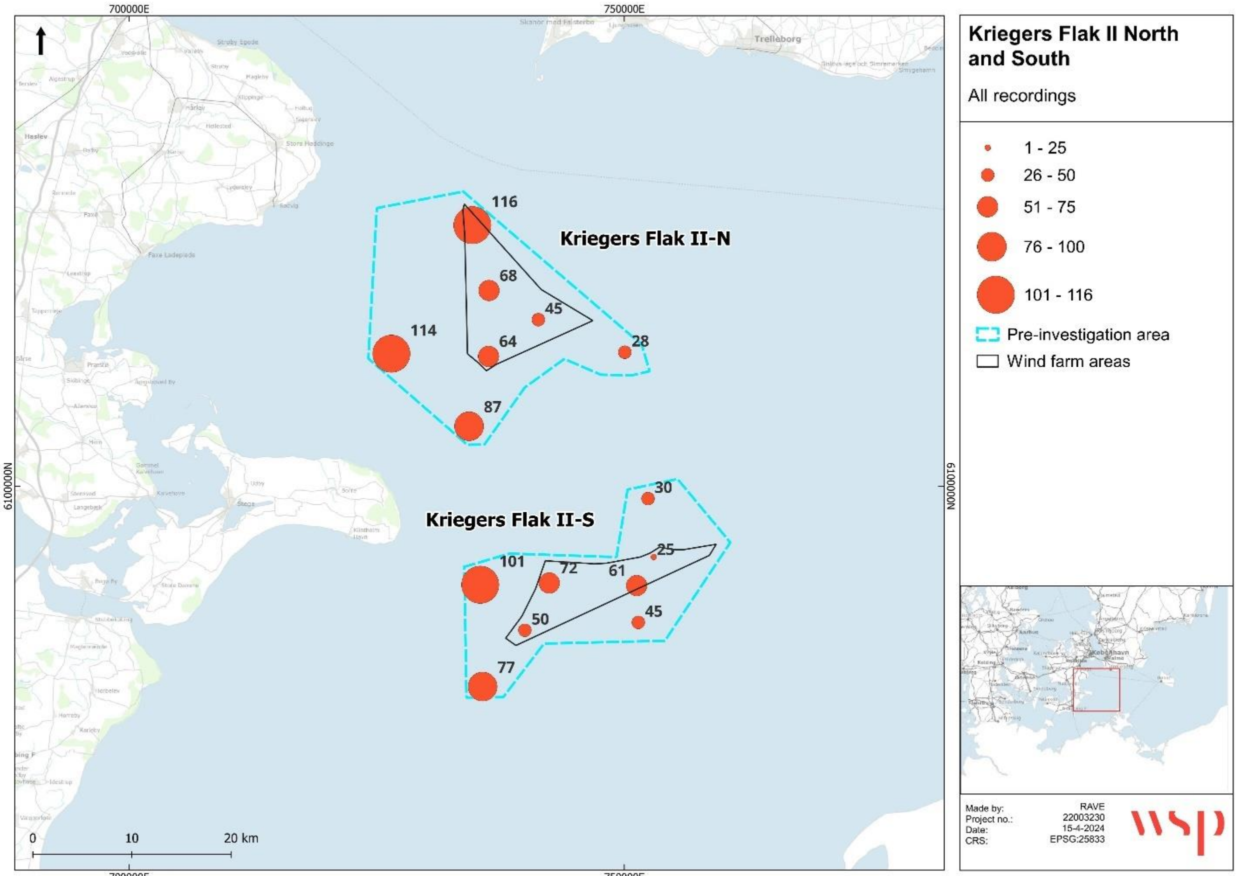


Figure 13 - *Number of bat recordings per buoy in 2023.*

Compared to a similar survey on the wind turbine in the existing Kriegers Flak OWF the present study shows lower number (Christensen 2024b). In 2023 the average recording of bats around the wind turbines 184.3. This may indicate some attraction by the wind turbines.

SEASONAL VARIATION IN OBSERVATIONS

OFFSHORE OBSERVATIONS

In spring very few bats are recorded by bat detectors in the pre-investigation areas and all recordings are nathusius pipistrel. This spring migration are restricted to the night between 10th May and 26 May (Figure 15).

Most of the recordings of bats in the pre-investigation areas are in September, with few recordings in the last week of August and first week of October. Unusual hot weather in beginning of September (5th to 12th September) is likely to be the reason for a large number of recordings of especially common noctule and parti-colored bat (Figure 14 & Figure 16). It is like that this peak is due to a combination of feeding and migration of both species. The migration of nathusius pipistrel (Figure 15) occurs from late August (24th August) until beginning of October (7th October). Soprano pipistrel is only recorded few times in August and September and this might be related to migration (Figure 17).

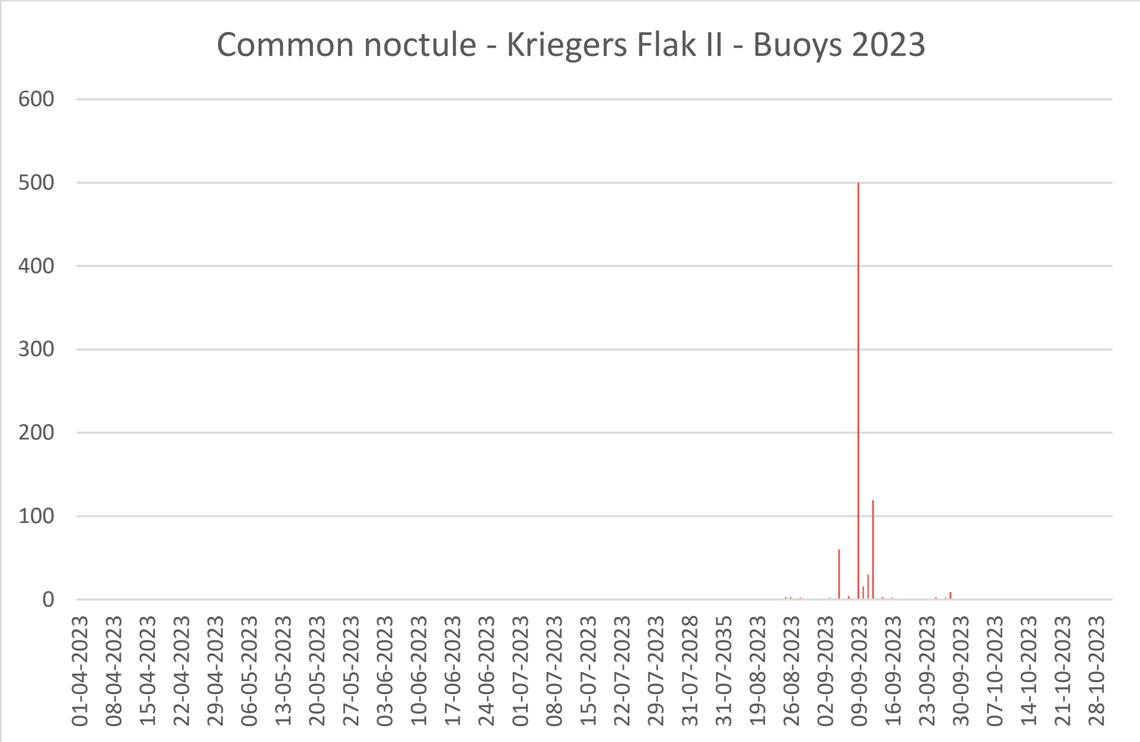


Figure 14 - *Total number of common noctule recordings (from 16 buoys) per night in 2023.*

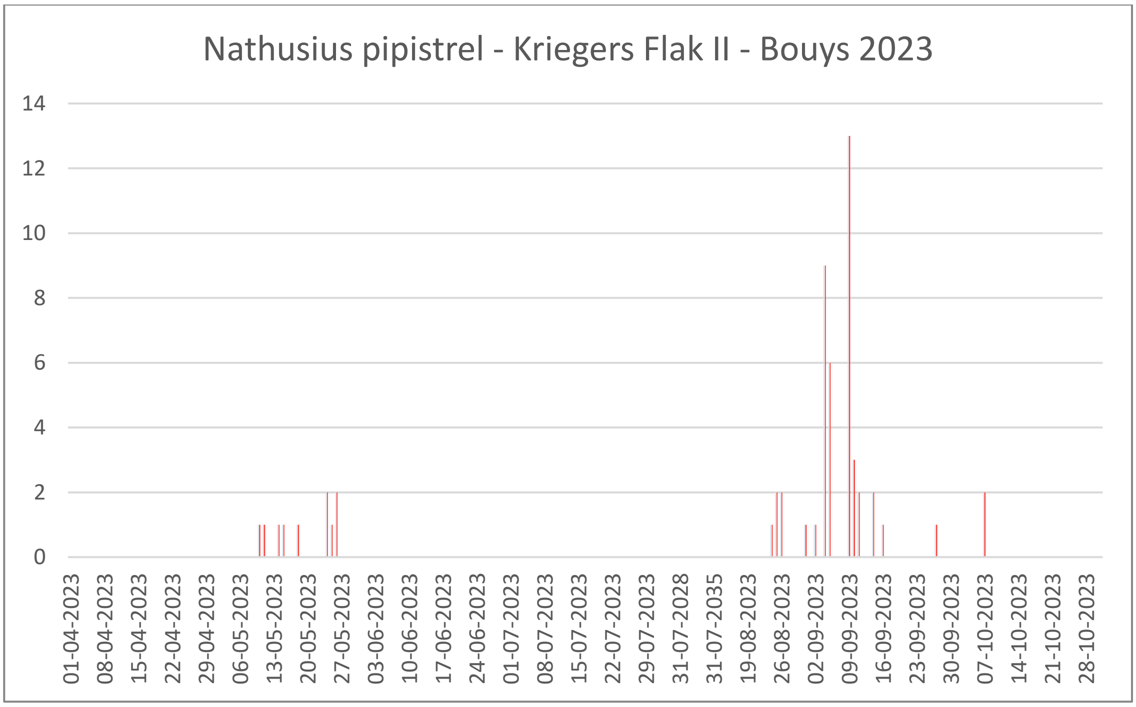


Figure 15 - *Total number of nathusius pipistrel recordings (from 16 buoys) per night in 2023.*

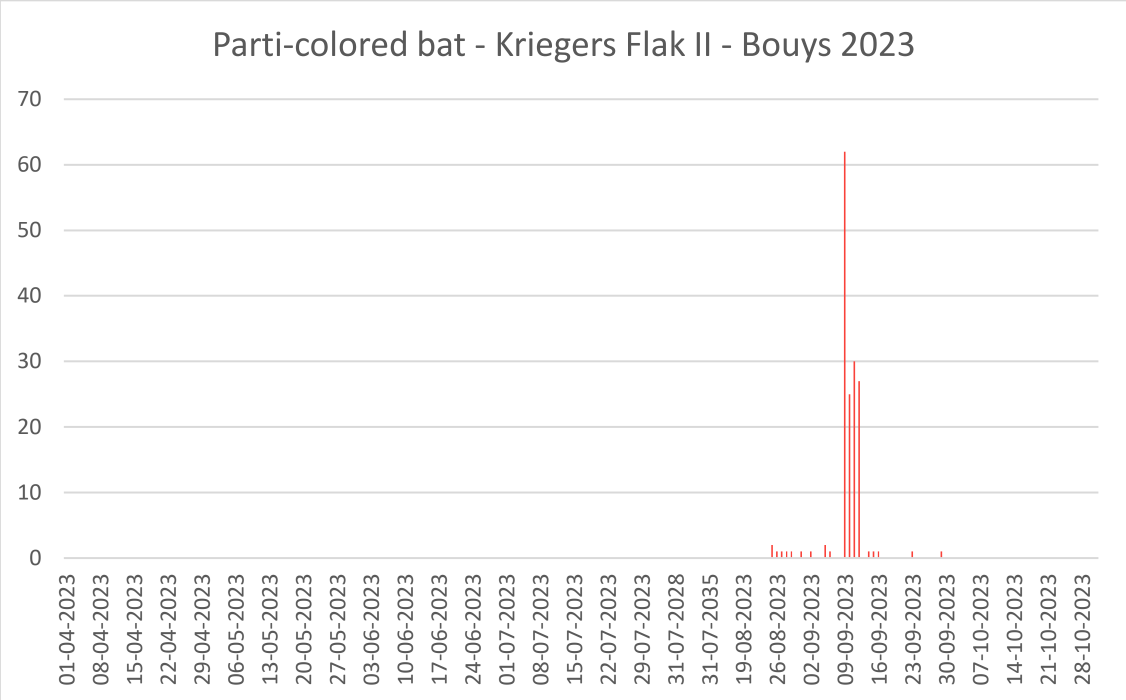


Figure 16 - *Total number of parti-colored bat recordings (from 16 buoys) per night in 2023.*

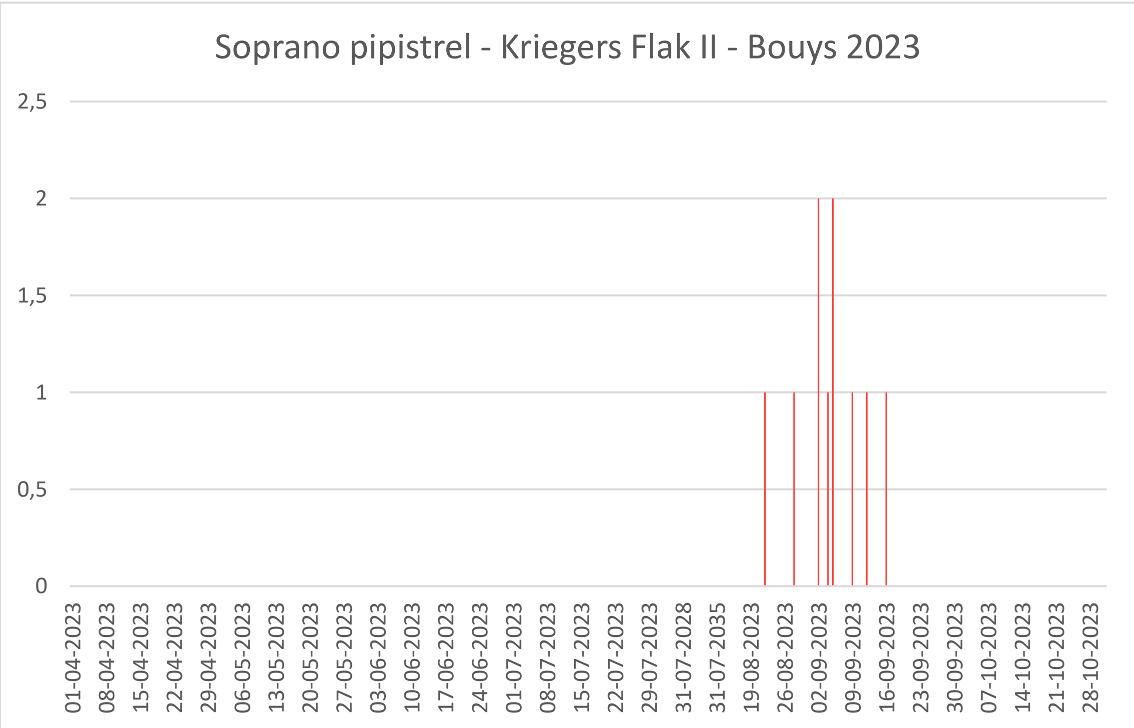


Figure 17 - *Total number of soprano pipistrel recordings (from 16 buoys) per night in 2023.*

TIME OF OFFSHORE OBSERVATIONS

Most bat species prefer to fly over the in the dark hours where the risk from predators is lower (Figure 18). This is confirmed by the pattern shown in this data, only very few common noctules are recorded by bat detectors outside the dark part of night.

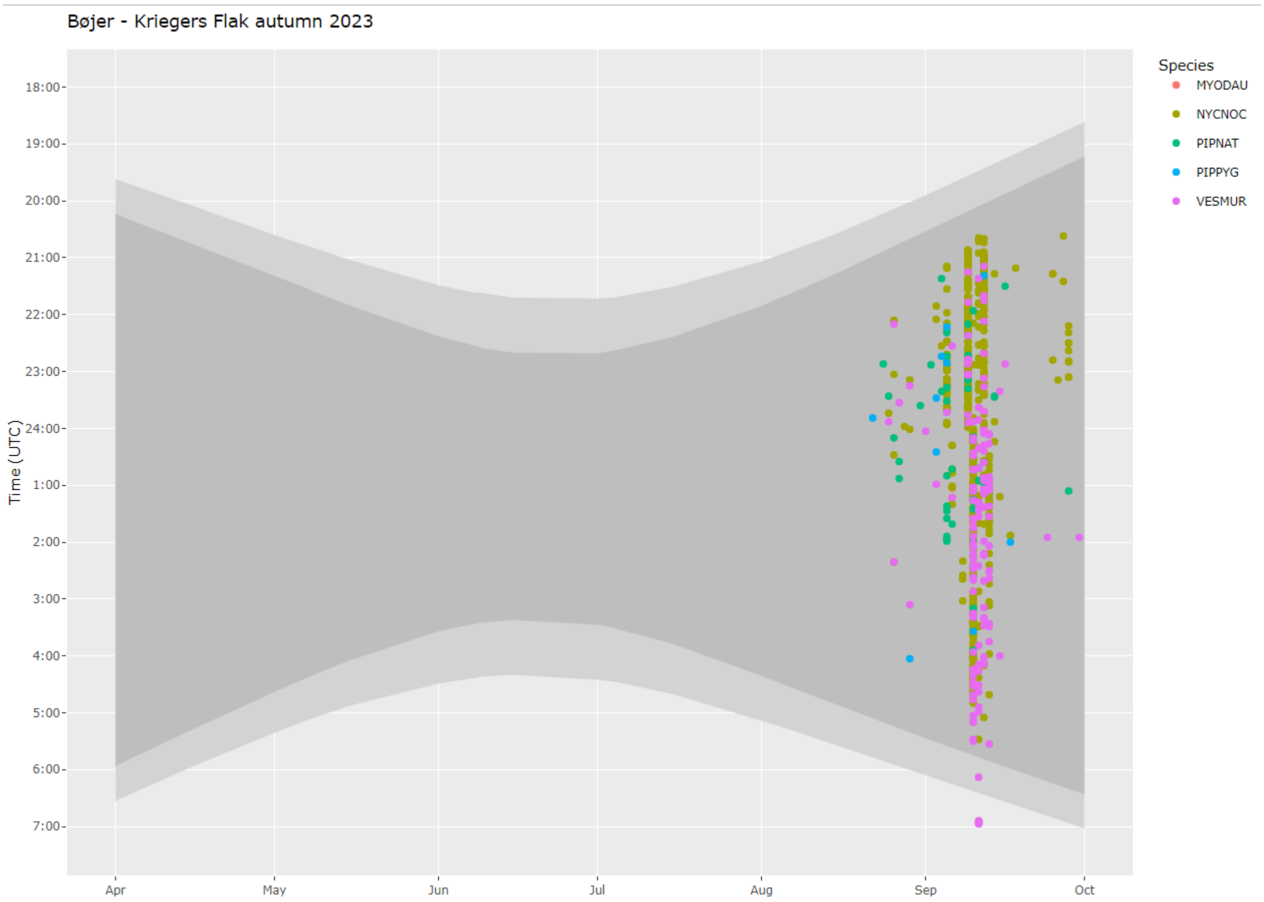


Figure 18 - Time of the bat recordings on the buoy-based detectors in autumn 2023 (9th August to 31st October). Shaded areas indicate the nights. Pale shading indicates the dusk from sun set to the sun is more than 6 degrees under the horizon and similar in the morning until sunrise (see suninfo.dk for more information)

OFFSHORE OBSERVATIONS AND WEATHER CONDITIONS

The time of the recordings of bats on the buoys are compared to the information on temperature and wind speed. The data on temperature and wind speed is measured at existing wind turbines no. 1 (data provided from Vattenfall).

The data indicates that most bats fly when the temperature is higher than 17 C (Figure 19). Only 9 out of 979 recordings are from temperature lower than 17 C. Nathusius pipistrels are recorded down to 12 C and parti-colored bat down to 14 C (Figure 20).

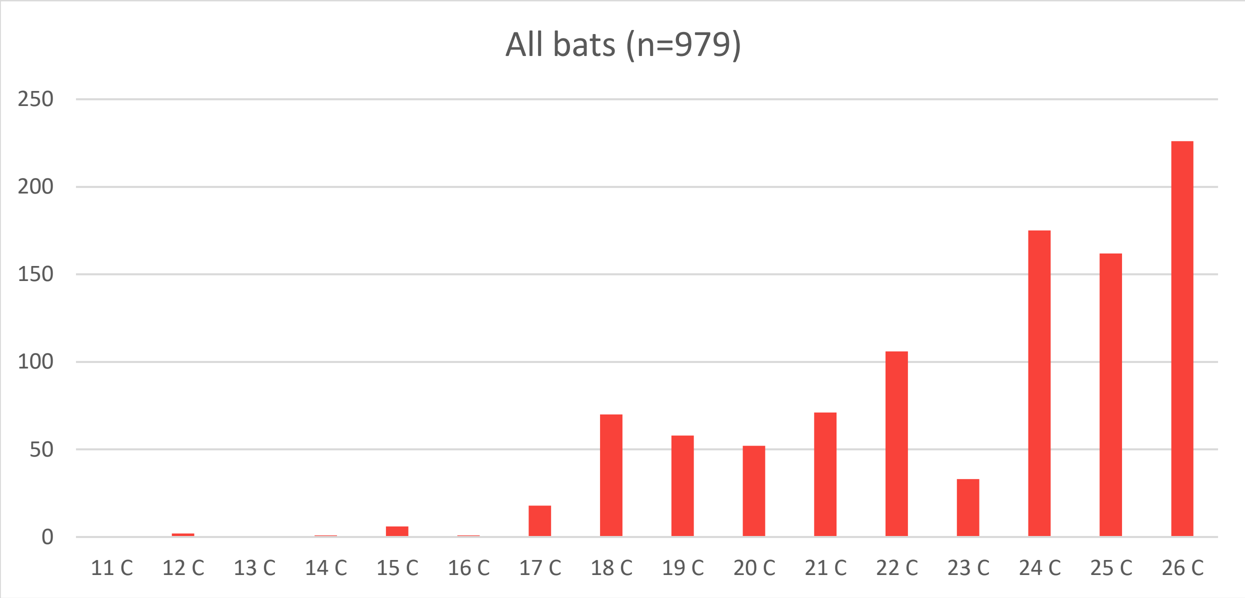


Figure 19 – Number of bat recordings compared to temperature measured in nacelle of an existing wind turbine (100 meters height).

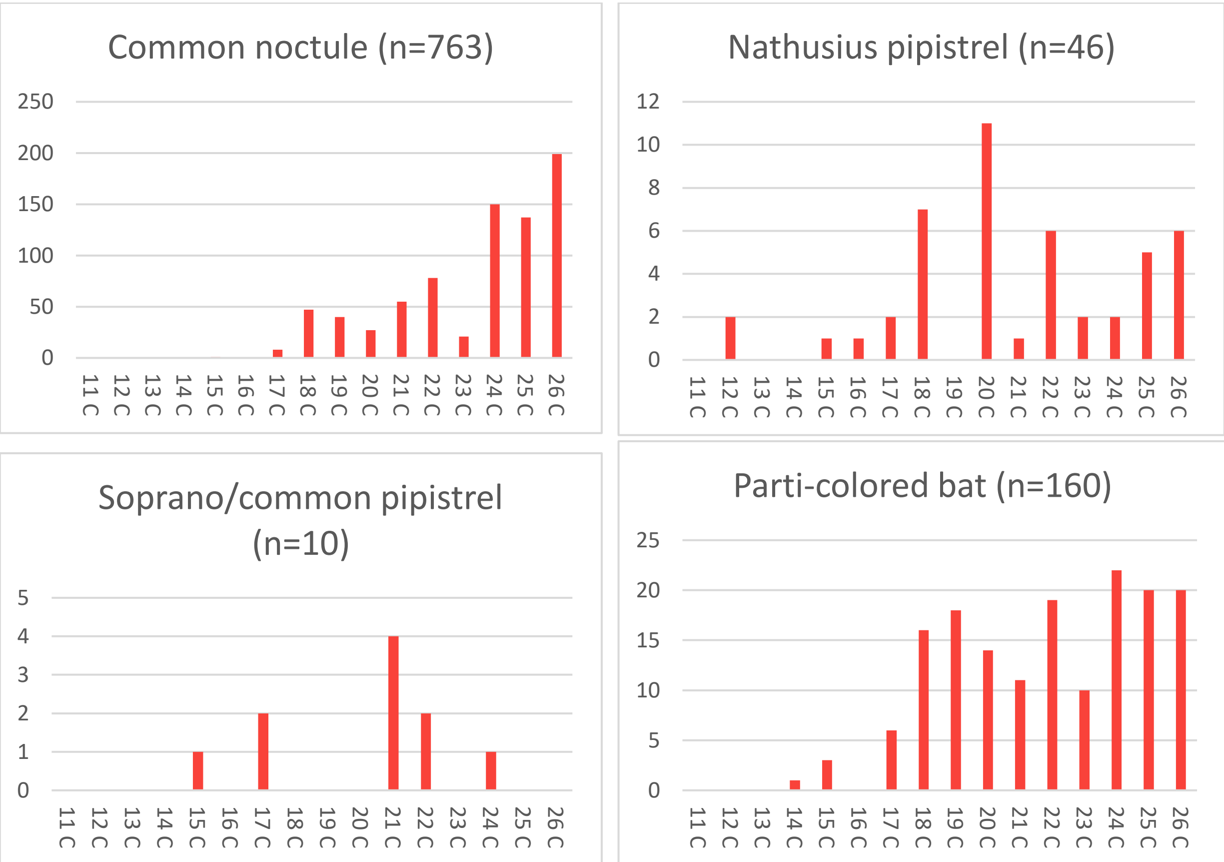


Figure 20 – Number of bat recordings (same data as Figure 19) divided in to species. Remark two record of daubentons bat are not included.

The bats also prefer to fly in low wind speed (Figure 21). 86 percent of all bats are recorded when the windspeeds measurements in 100 meters hight were less than 6 m/s and 97 percent of all bats were recorded when the windspeeds were less than 7 m/s. Most species follow these overall patterns. However, nathusius pipistrel and possibly also soprano pipistrel tend to fly in slightly higher wind speed. A possible explanation for such pattern could be due to the difference between these migrating bats and the feedings bats. Migrating bats need to cross over the sea whereas feeding bat only visit the area when the weather conditions are optimal.

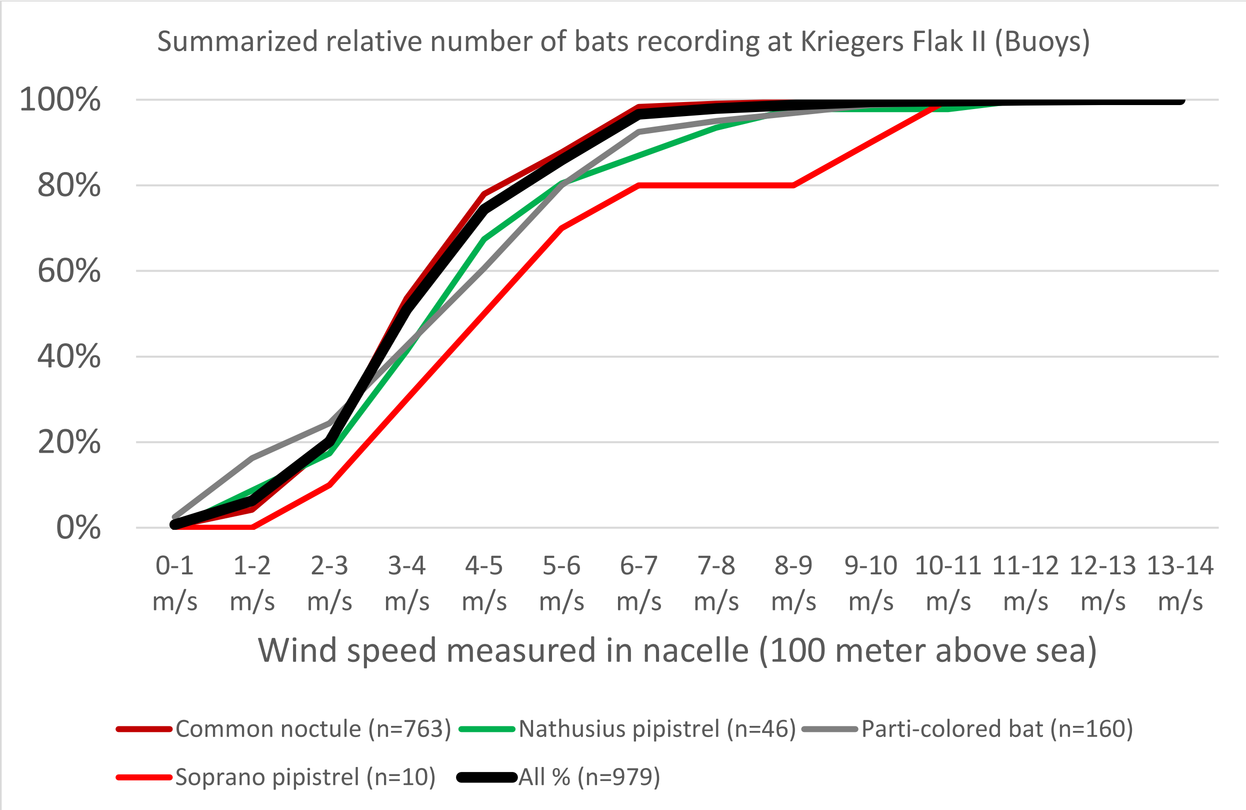


Figure 21 – Summarized percentage of bat recordings in relation to wind speed.

STATUS

The reason for the large number of bat recordings in early September nights may not be related to migration. It is more likely that the occurrences are linked to feeding behaviour of the larger bat species such as common noctule and particolored bat. In late summer and early autumn species of large moths are known to migrate and aggregate in large number and it is likely that the bats are feeding on these insects. The patterns shown on (Figure 13) also indicate that these bats are flying out from Møn. The theory of feeding behaviour as the main driver for the bat presence offshore is supported by many feeding buzzes (ultra-sounds with indication of feeding behaviour) on the recordings from the detectors on the buoys.

In the interpretation of the results, it is very important not to compare number of recordings of the offshore buoy-based detector with the number of the recordings from the land-based detector. The buoys are placed on the open sea and the bats are just passing by. Due to the relatively small range of the detectors for smaller bats (20 – 50 meters) and the low number of buoys in a large area, the likelihood of recording a bat is very low. The land-based detectors are placed in areas expected to have high activity of bats and thus many recordings, potentially of the same individual.

CONCLUSION

Based on data from 1st year survey of the pre-investigation area for Kriegers Flak II it can be concluded that during spring and autumn migration several bat species occur. This indicates that migration take place in the area. Most likely this migration goes from Møn to Sweden in Spring and from Sweden to Møn in autumn.

In late summer and early autumn, in nights with high temperature and low wind speed, bats, most likely from Møn and Stevns use the pre-investigation areas for Kriegers Flak II for feeding. Most likely related to the presence of large insects over the open sea.

In spring there are only very few recordings of bats and all is nathusius pipistrel in late-May, most likely on migration. Autumn migration of nathusius pipistrel is from late August until beginning of October. Migration of common noctule and parti-colored bat may occur in beginning of October. However, it is difficult to distinguish the migrating bat from feeding bat in this period.

The recordings of bat are mainly from nights with low wind and high temperature. Recordings in nights with temperature lower than 17 C and wind speed over 7 m/s are very rare.

The data collection will continue in 2024 and will strengthen the dataset and provide better information on the pattern and the magnitude of the migration over the Kriegers Flak area and the feeding patterns of bats from the surrounding coastal areas.

DATA AND KNOWLEDGE GAPS

Monitoring of bat activity on open sea is a challenge, due to harsh weather condition and risk of damages from fishing and shipping activities. Therefor is failure on some detector unavoidable. During the survey in spring and early summer the several detectors had failures and therefor this part of the survey is based on information from relative few detectors.
The survey on migrating bat in the pre-investigation area for Kriegers Flak II North and South is done for the first time. Therefore, direct comparison to previous studies in the area is not possible.

REFERENCES

Ahlén, I. 1997. Migratory behaviour of bats at south Swedish coasts. Zeitschrift für Säugetierkunde 62, 375–380.

Ahlén, I., Bach, L., & Baagøe, H. &. 2007. Bats and offshore wind turbines studied in southern Scandinavia. Report (Nr. 5571) to the Swedish Environmental Protection Agency.

Ahlén, I., Baagøe, H., & Bach, L. (2009). Behavior of scandinavian bats during migration and foraging at sea. Journal of Mammalogy 90 (6), 1318-1323.

Alcalde, J.T., Jiménez, M., Brila, I., Vintulis, V., Voigt, C.C. & Pētersons, G. 2021. Transcontinental 2200 km migration of a Nathusius' pipistrelle (Pipistrellus nathusii) across Europe. Mammalia 85: 161–163.

Amphi Consult 2015. Marine forekomster af flagermus – Bornholms Havmøllepark - VVM-redegørelse - baggrundsrapport.

Arnett E.B., Baerwald E.F., Mathews F., Rodrigues, L., Rodriguez-Durán, A., Rydell, J., Villegas-Patraca, R. & Voigt, C.C. 2016. Impacts of wind energy development on bats: A global perspective. In: Bats in the Anthropocene: Conservation of Bats in a Changing World (Springer) pp. 295- 323.

Baagøe, H. & Jensen, T. 2007. Dansk pattedyratlas. Gyldendal, Copenhagen.

Baagøe, H. 2001. Danish bats (Mammalia: Chiroptera): Atlas and analysis of distribution, occurrence, and abundance. Steenstrupia, 26 (1): 1-117.

Bach, P 2021. Flyttande fladdermöss på Måkläppen. Presentation – Bat Life Sweden

Bach, L., Bach, P., & Ehnbom, S. 2015. Bat migration at Måkläppen (Falsterbo) 2010 – 2014. Falsterbo Report no. 292.

Bach, L., Bach, P., Ehnbom, S., & Karlsson, M. 2017. Flyttande fladdermös vid Måkläppen, Falsterbo. Fauna och Flora 112: 37-45.

Christensen, M. 2024a. Energy Island Bornholm. Technical report – Bats. Report prepared by WSP for Energinet and Danish Energy Agency.

Christensen, M. 2024b. Flagermus ved Kriegers Flak havmøllepark 2022 og 2023. WSP-report to Danish Energy Agency.

Christensen, M., & Hansen, B. 2023. Flagermus og havvind. Report for Danish Energy Agency.

De Jong, J, Blank, SG, Ebenhard, T & Ahlén, I. Fladdermusfaunan i Sverige – arternas utbredning och status 2020. Fauna & flora 115(3): 2–16.

Dietz, C., von Helversen, O. & Nill, D. 2011 Bats of Britain, Europe & Northwest Africa.

Eurobats 2014. EUROBATS.MoP7. Record. Annex 8. 7th Session of the Meeting of the Parties Brussels, Belgium, 15 – 17 September 2014 Resolution 7.5 Wind Turbines and Bat Populations.

FEBI. (2013). Fehmarnbelt Fixed Link EIA. Fauna and Flora – Bats - Bats of the Fehmarnbelt Area – Baseline Volume I. Report No. E3TR0016.

Hutterer R, Ivanova T, Meyer-Cords C, Rodrigues LL. Bat Migrations in Europe: A Review of Banding Data and Literature; 2005.

Kruszynski C., Bailey L.D., Courtiol A., Bach, I., Bach, P., Göttsche, M., Göttsche, M., Hill, R., Lindecke, O., Matthes, H., Pommeranz, H., Popa-Lisseanu, A.G., Seebens-Hoyer, A., Tichomirowa, M. & Voigt, C.C. 2020. Identifying migratory pathways of Nathusius' pipistrelles (Pipistrellus nathusii) using stable hydrogen and strontiumisotopes. Rapid Communications in Mass Spectrometry 35: e9031.

Lehnert, L.S., Kramer-Schadt, S., Schönborn, S., Lindecke, O., Niermann, I., Voigt, C.C. 2014. Wind farm facilities in Germany kill noctule bats from near and far. PLoS ONE 9(8): e103106.

Lehnert L.S. et al. 2018. Variability and repeatability of noctule bat migration in Central Europe: evidence for partial and differential migration. Proc. R. Soc. B 285: 20182174.

Møller, J.D., Baagøe, H.J. & Degn, H.J. 2013. Forvaltningsplan for flagermus. Beskyttelse og forvaltning af de 17 danske flagermusarter og deres levesteder. Naturstyrelsen.

Pētersons G. 2004. Seasonal migrations of north-eastern populations of Nathusius' bat Pipistrellus nathusii (Chiroptera). Myotis 41–42: 29-56.

Rydell, J., Bach, L., Dubourg-Savage, M.-J., Green, M., Rodrigues, L., Hedenström, A. 2010. Bat mortality at wind turbines in northwestern Europe. Acta Chiropterologica 12(2): 261- 274.

Seebens, A., Fuß, A., Allgeyer, P., Pommeranz, H., Mähler, M., Matthes, H., . . . Paatsch, C. 2013. . Fledermauszug im Bereich der deutschen Ostseeküste. Bundesamt für Seeschifffahrt und Hydrographie. .

Seebens-Hoyer, A., Bach, L., Bach, P., Pommeranz, H., Göttsche, M., Voigt, C., . . . Matthes, H. 2021. Fledermausmigration über der Nord- und Ostsee Abschlussbericht zum F+E-Vorhaben „Auswirkungen von Offshore-Windparks auf den Fledermauszug über dem Meer“ (FKZ 3515 82 1900, Batmove). Bundesamt für Naturschutz mit Mitteln des Bundesministeriums für Umwelt.

Skov, H., Desholm, M., Heimänen, S., Johansen, T., & Therkildsen, O. (2015). Kriegers Flak offshore wind farm. Environmental impact assessment. Technical background report. Birds and bats. Energinet.dk.

Tidenberg , E-M, Liukko, U-M & Stjernberg, T 2019. Atlas of Finnish bats, Annales Zoologici Fennici , vol. 56 , no. 1-6 , pp. 207-250.

Voigt, C.C., Popa-Lisseanu, A.G., Niermann, I. & Kramer-Schadt, S. 2012. The catchment area of wind farms for European bats: A plea for international regulations. Biol Conserv. 153: 80-86.

Walter, G., Matthes, H., & Joost, M. 2007. Fledermauszug über Nord- und Ostsee – Ergebnisse aus Offshore-Untersuchungen und Derren Einordnung in das bisher bekannte Bild zum Zuggeschehen. Nyctalus 12, 221-233.

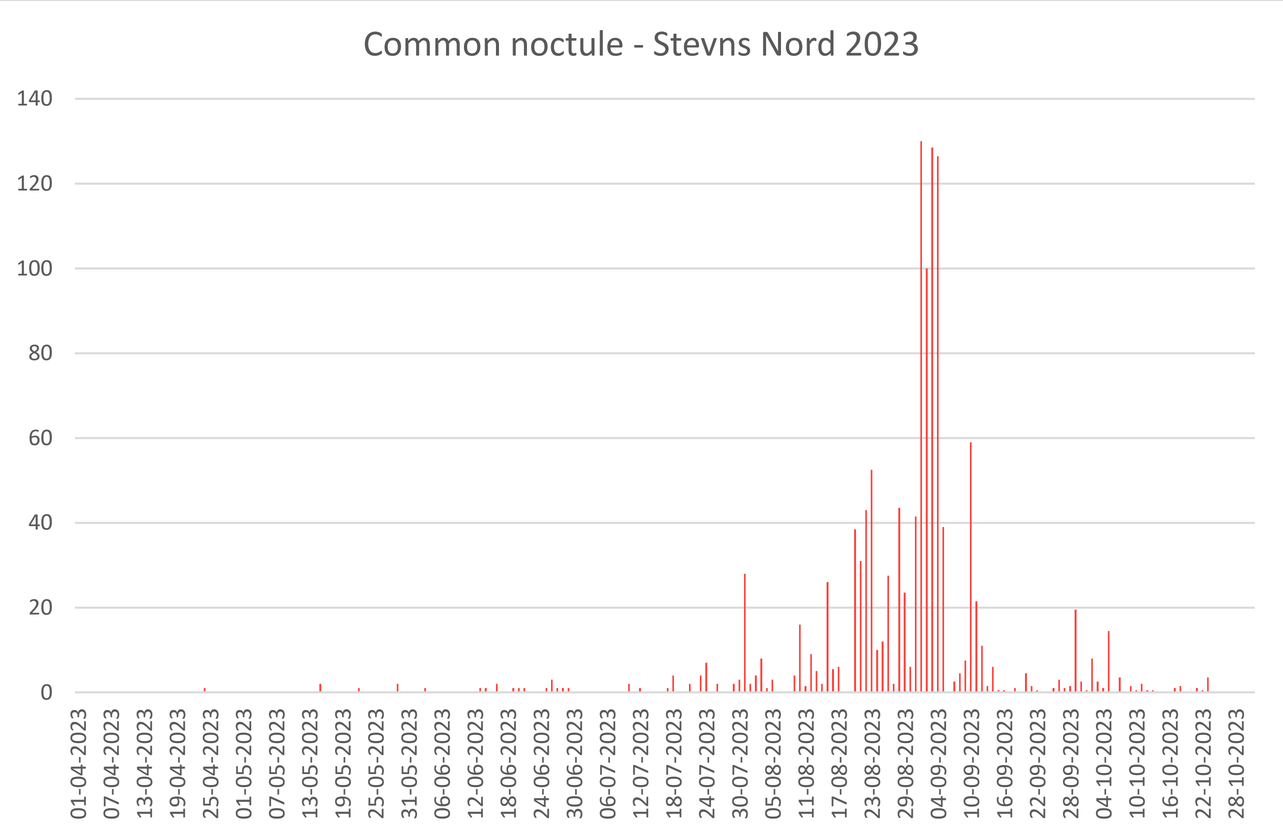
Wawra, C. 2016. Fachgutachten Fledermäuse für das Offshore-Windparkprojekt „Gennaker“. 2. Jahr der Basisaufnahme. Gutachten i.A. der OWP Gennaker GmbH.

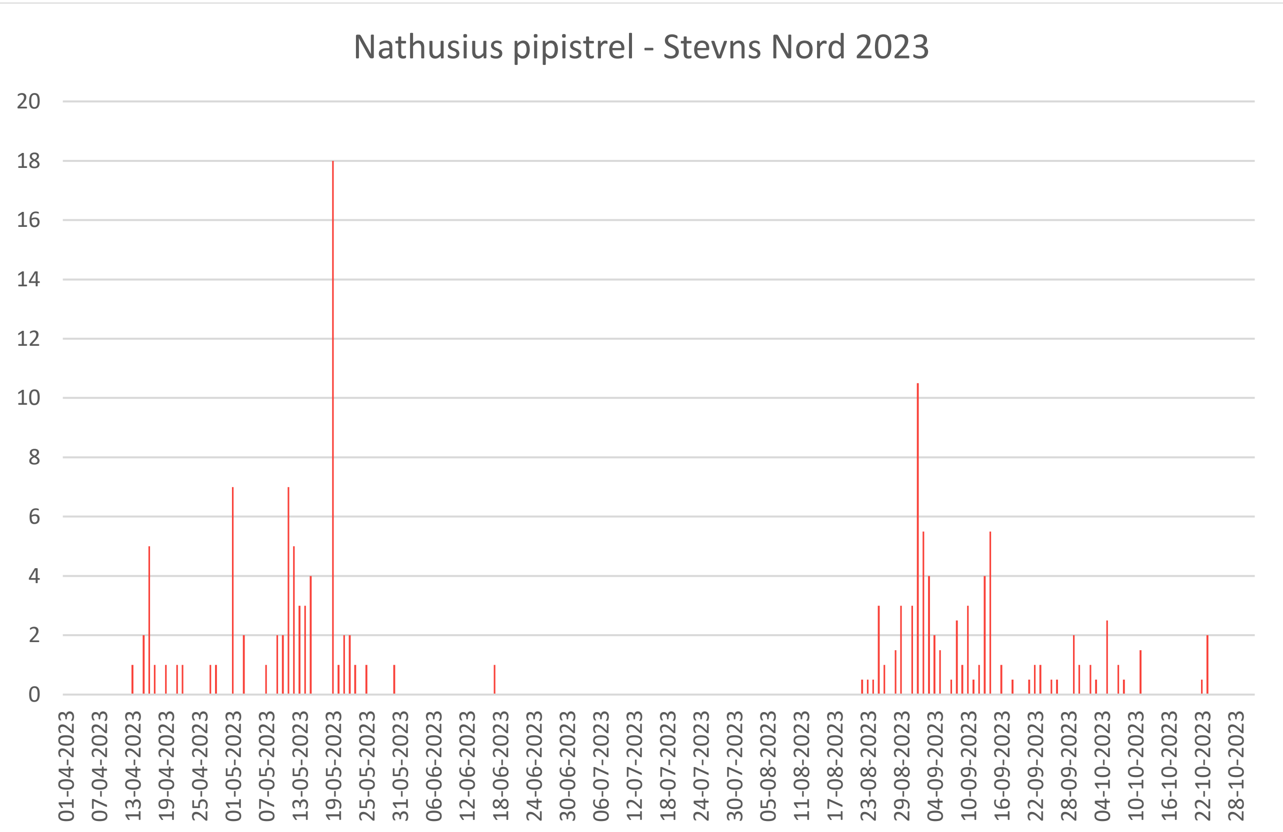
Westling, A., Toräng, P., Haldin, M. & Naeslund, M. 2020. Sveriges arter och naturtyper i EU:s art- och habitatdirektiv: resultat från rapportering 2019 till EU av bevarandestatus 2013–2018. Naturvårdsverket.

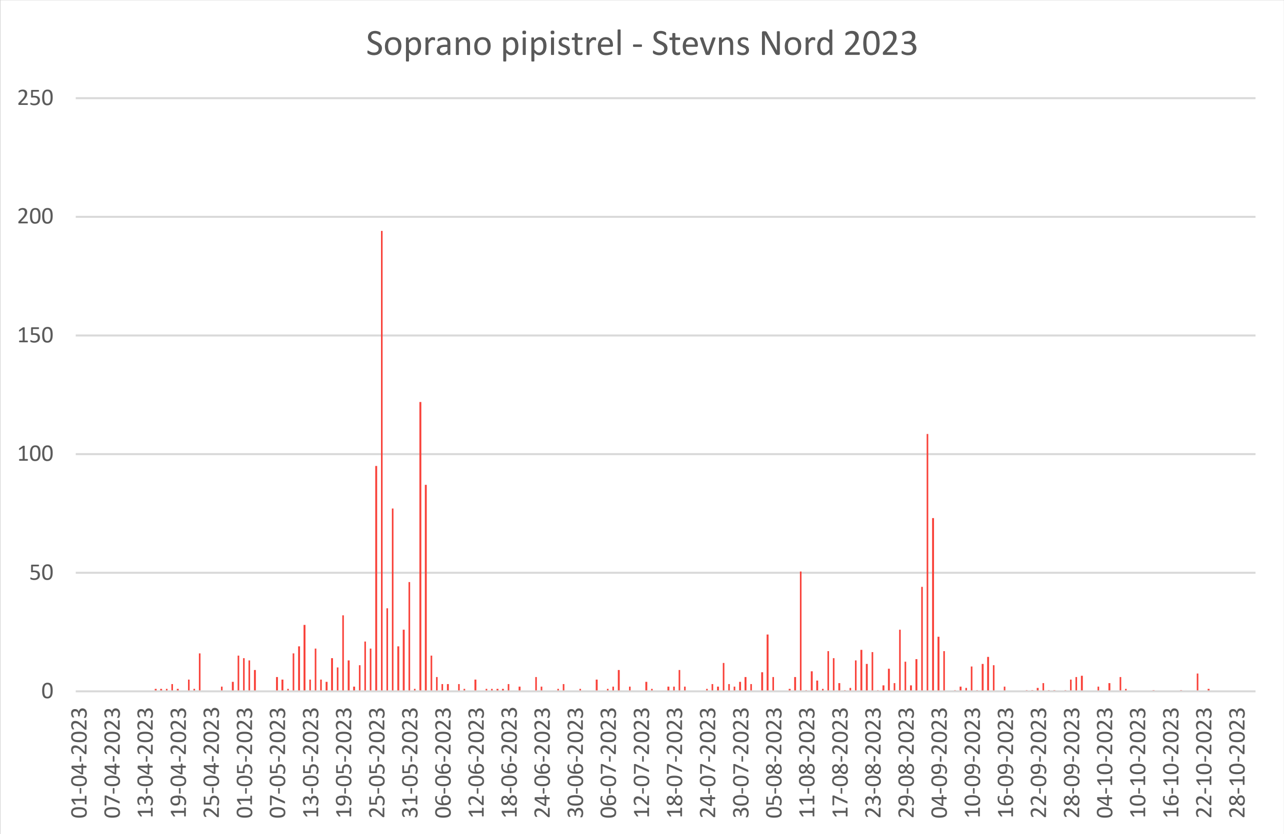
APPENDIX 1 – SPECIES DISTRIBUTION

To be added after 2024 field season

APPENDIX 2 – OBSERVATIONS BY BAT DETECTORS PER NIGHT






Soprano pipistrel - Stevns Nord 2023
250
200
150
100
50
0
01-04-2023
07-04-2023
13-04-2023
19-04-2023
25-04-2023
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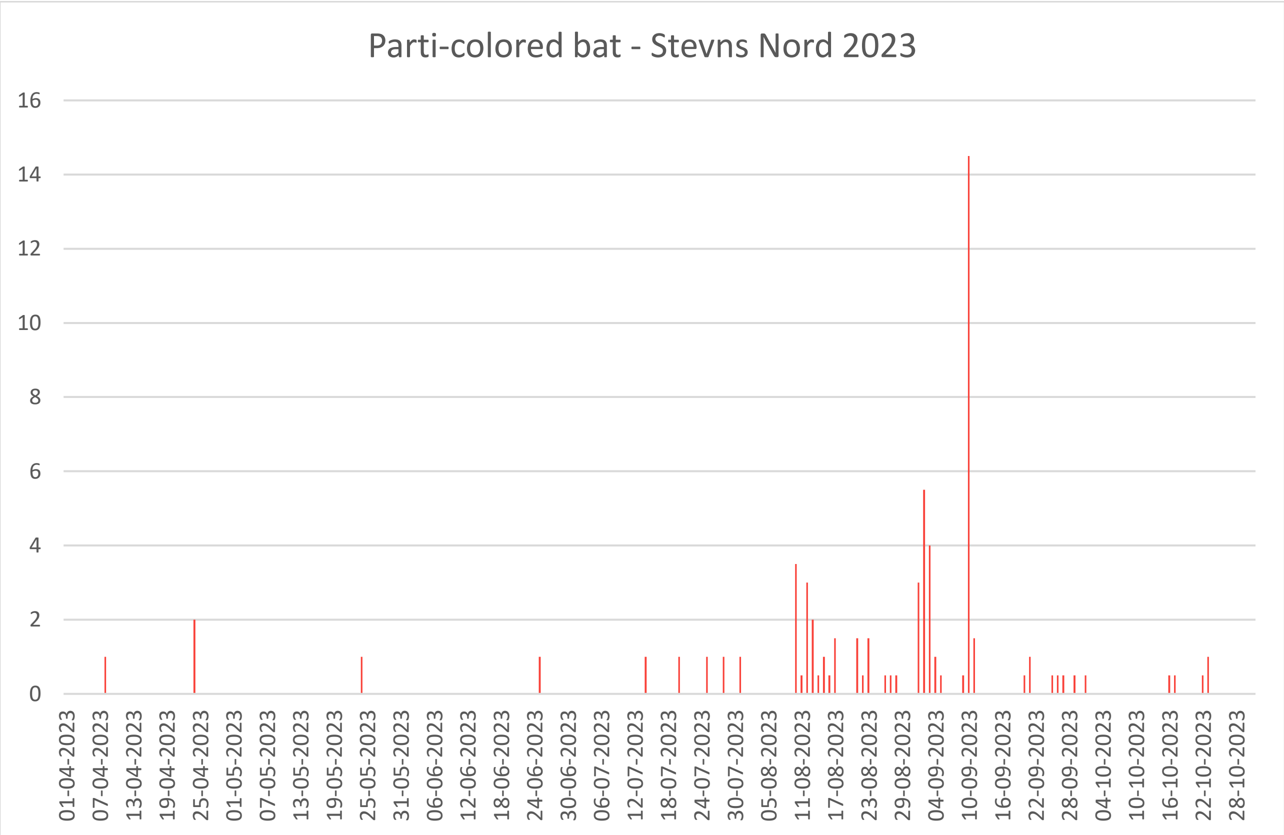
Parti-colored bat - Stevns Nord 2023
16
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8
6
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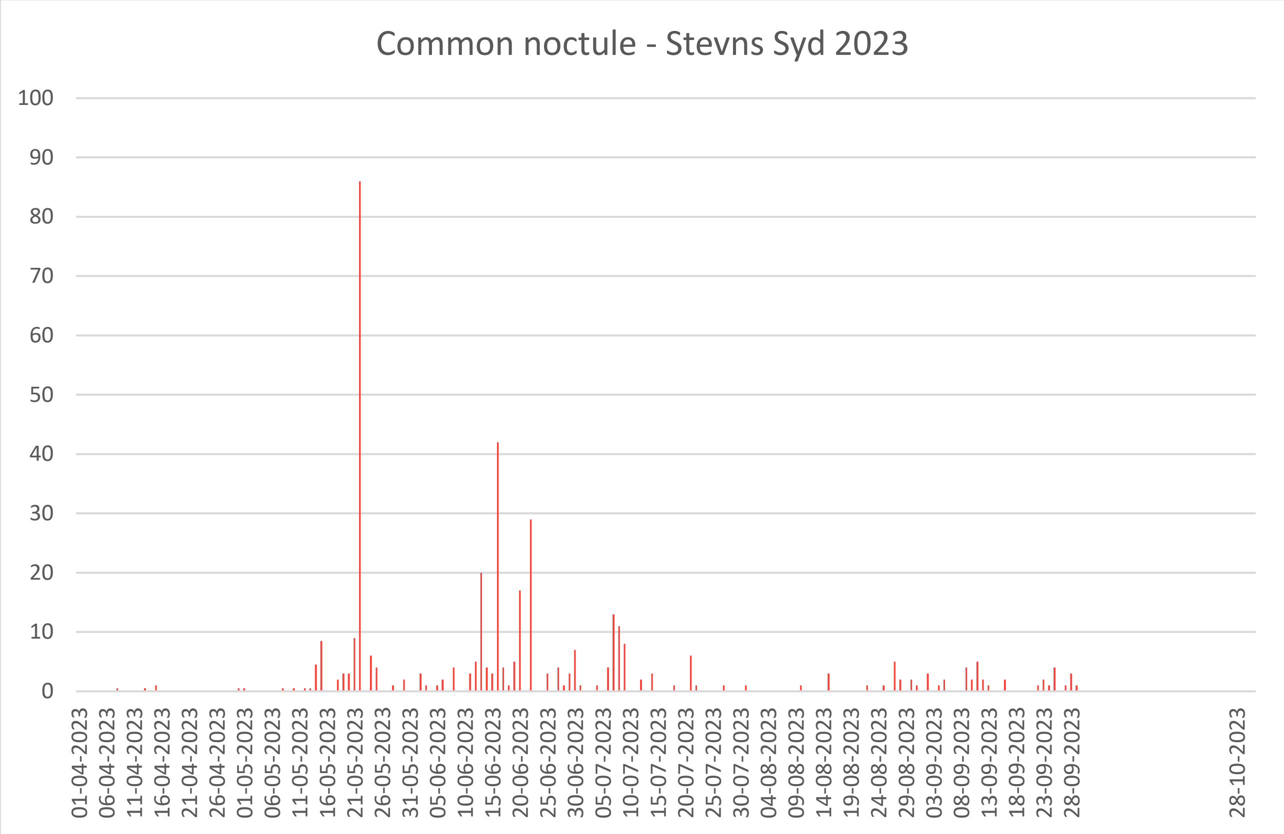
Common noctule - Stevns Syd 2023
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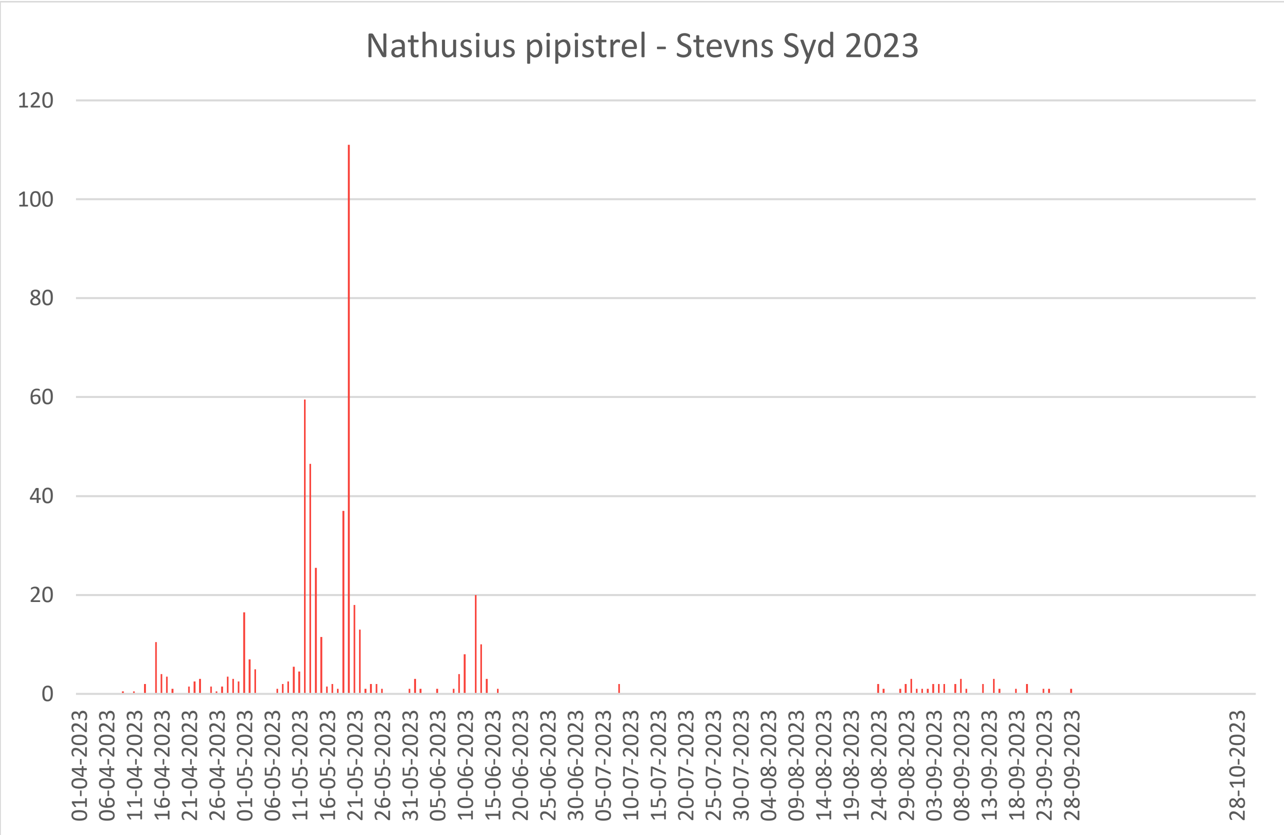
Nathusius pipistrel - Stevns Syd 2023
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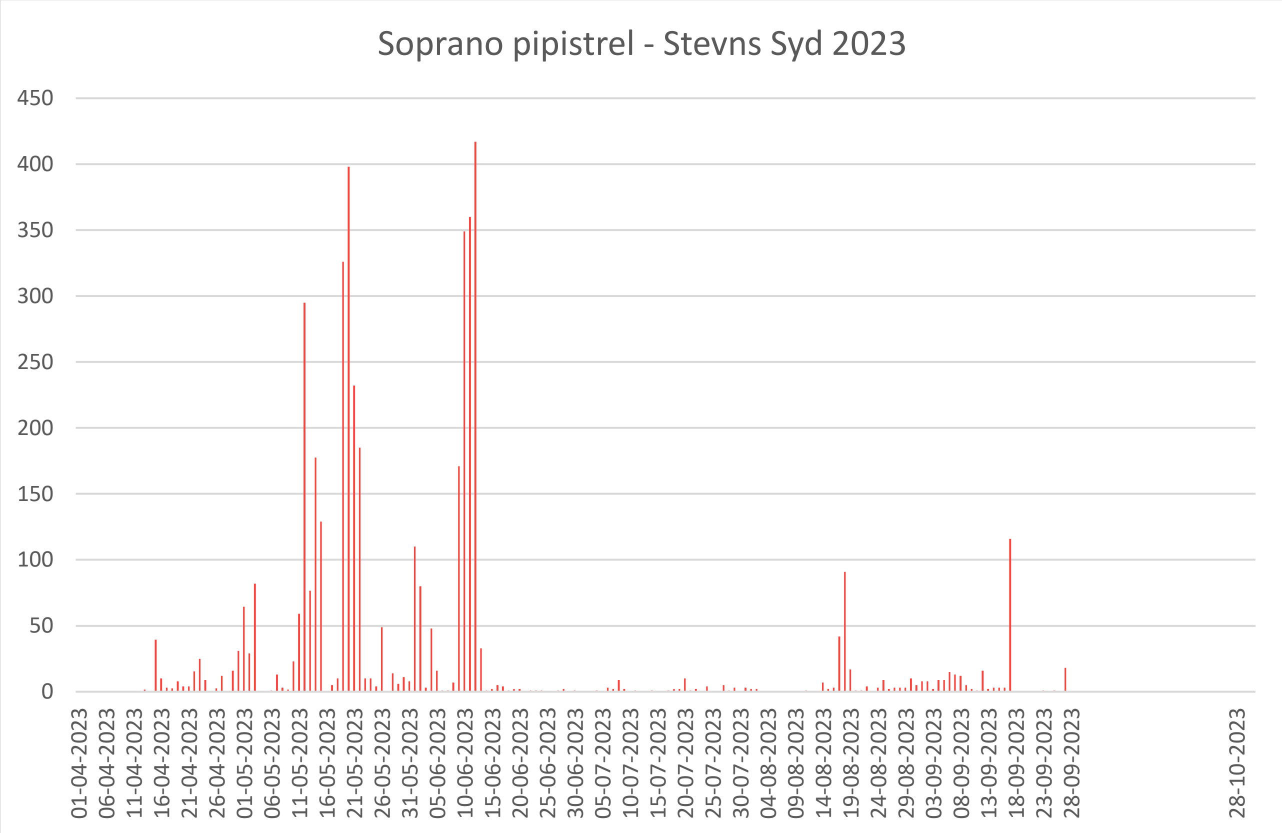
Soprano pipistrel - Stevns Syd 2023
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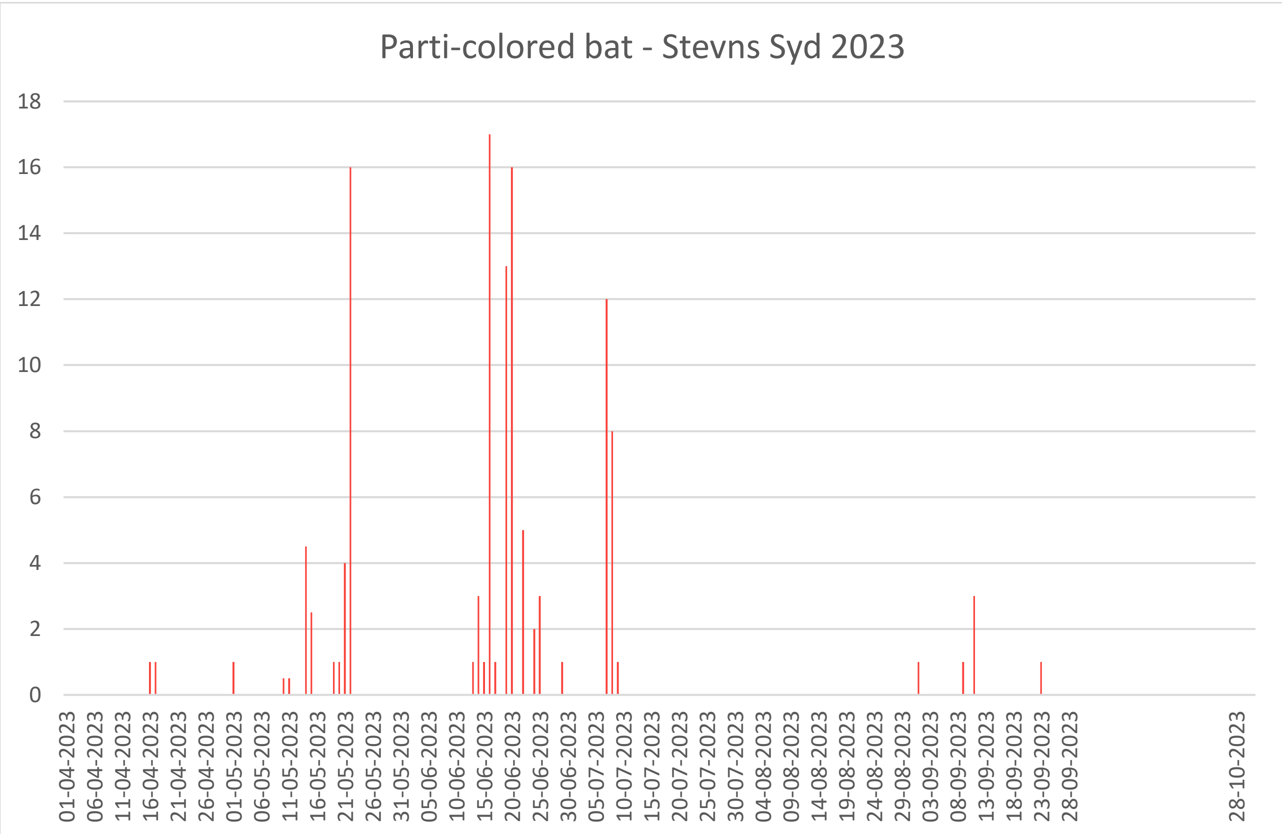
Parti-colored bat - Stevns Syd 2023
18
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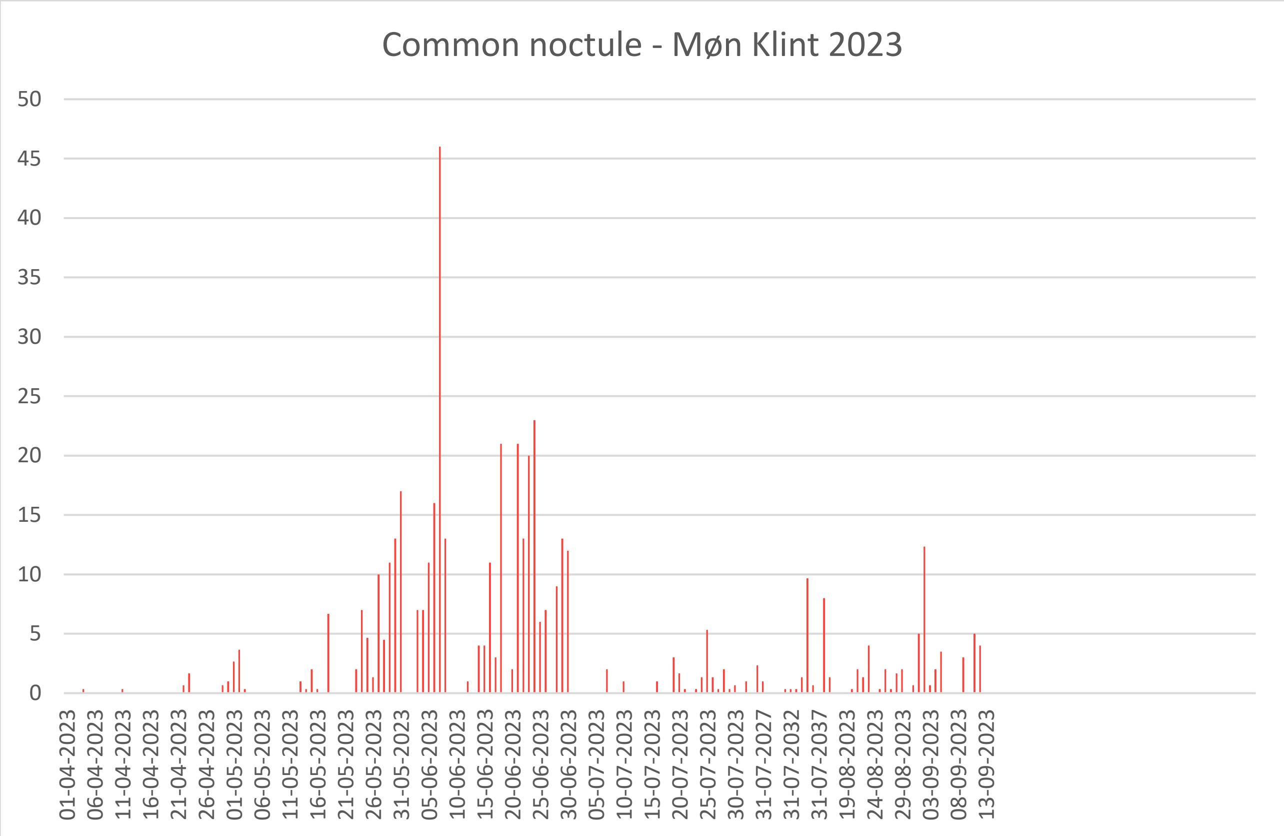
Common noctule - Møn Klint 2023
50
45
40
35
30
25
20
15
10
5
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01-04-2023
06-04-2023
11-04-2023
16-04-2023
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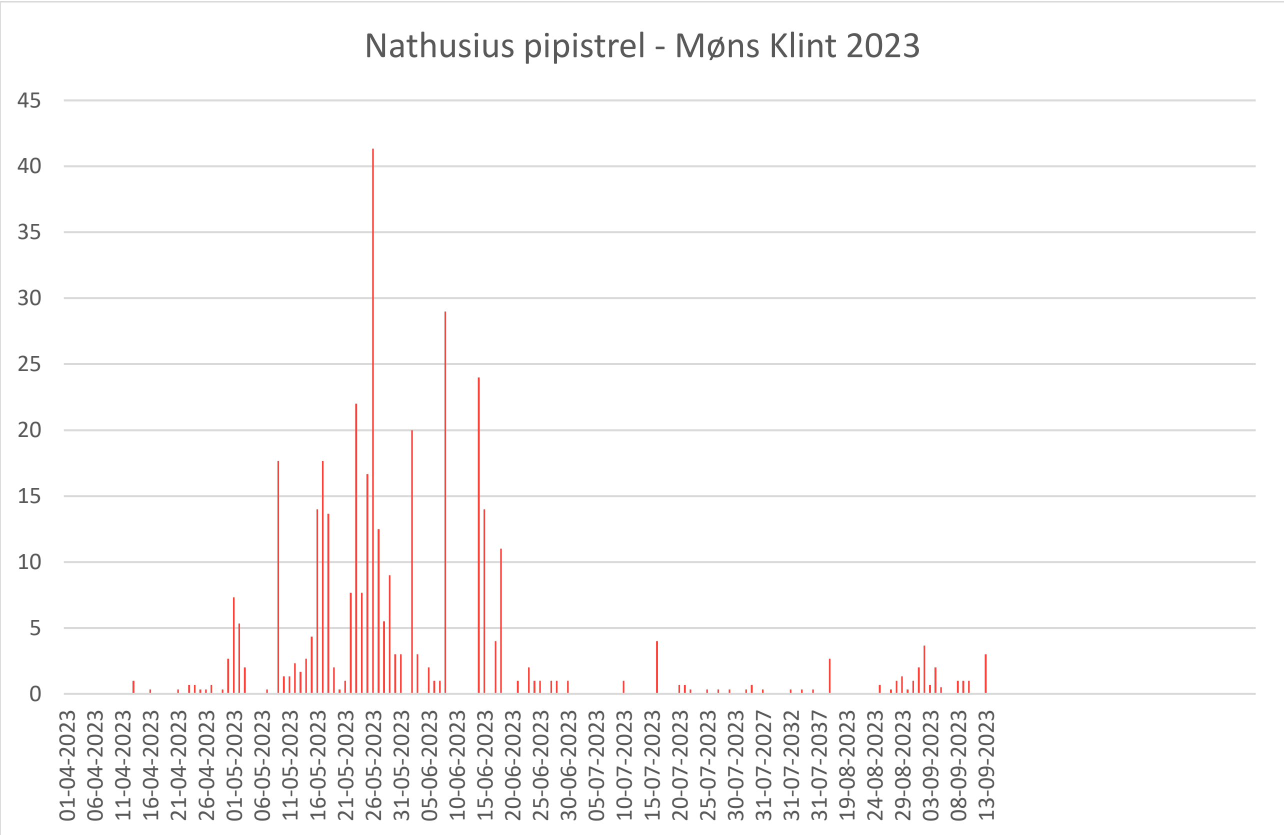
Nathusius pipistrel - Møns Klint 2023
45
40
35
30
25
20
15
10
5
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01-04-2023
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11-04-2023
16-04-2023
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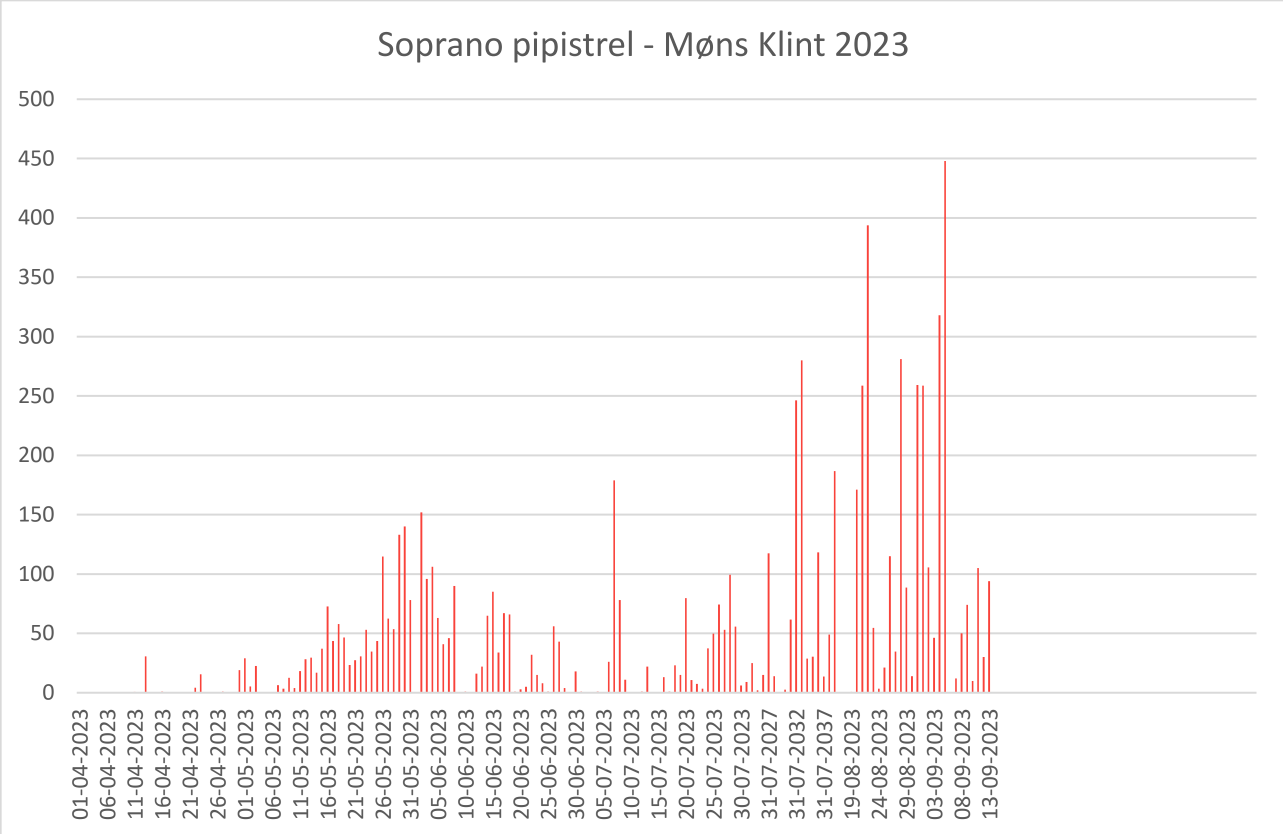
Soprano pipistrel - Møns Klint 2023
500
450
400
350
300
250
200
150
100
50
0
01-04-2023
06-04-2023
11-04-2023
16-04-2023
21-04-2023
26-04-2023
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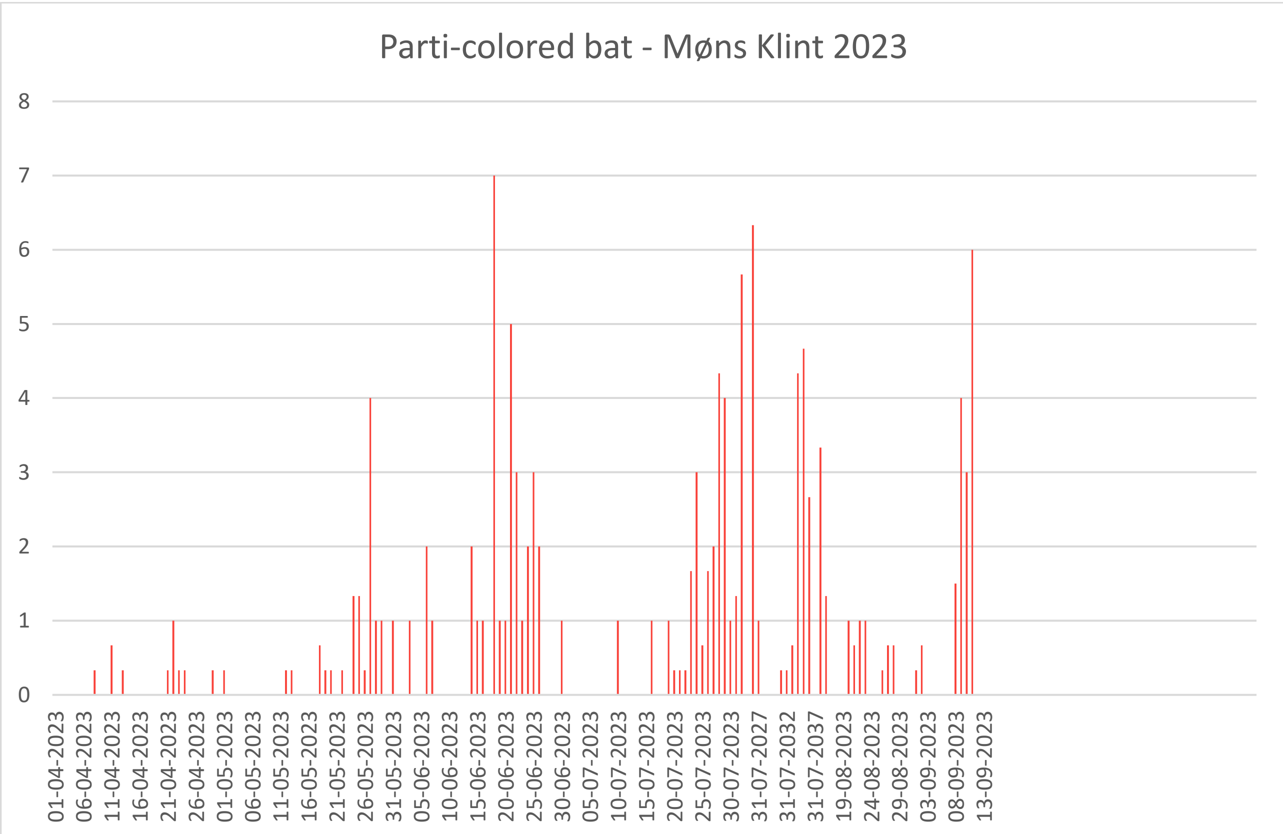
Parti-colored bat - Møns Klint 2023
8
7
6
5
4
3
2
1
0
01-04-2023
06-04-2023
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16-04-2023
21-04-2023
26-04-2023
01-05-2023
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31-07-2027
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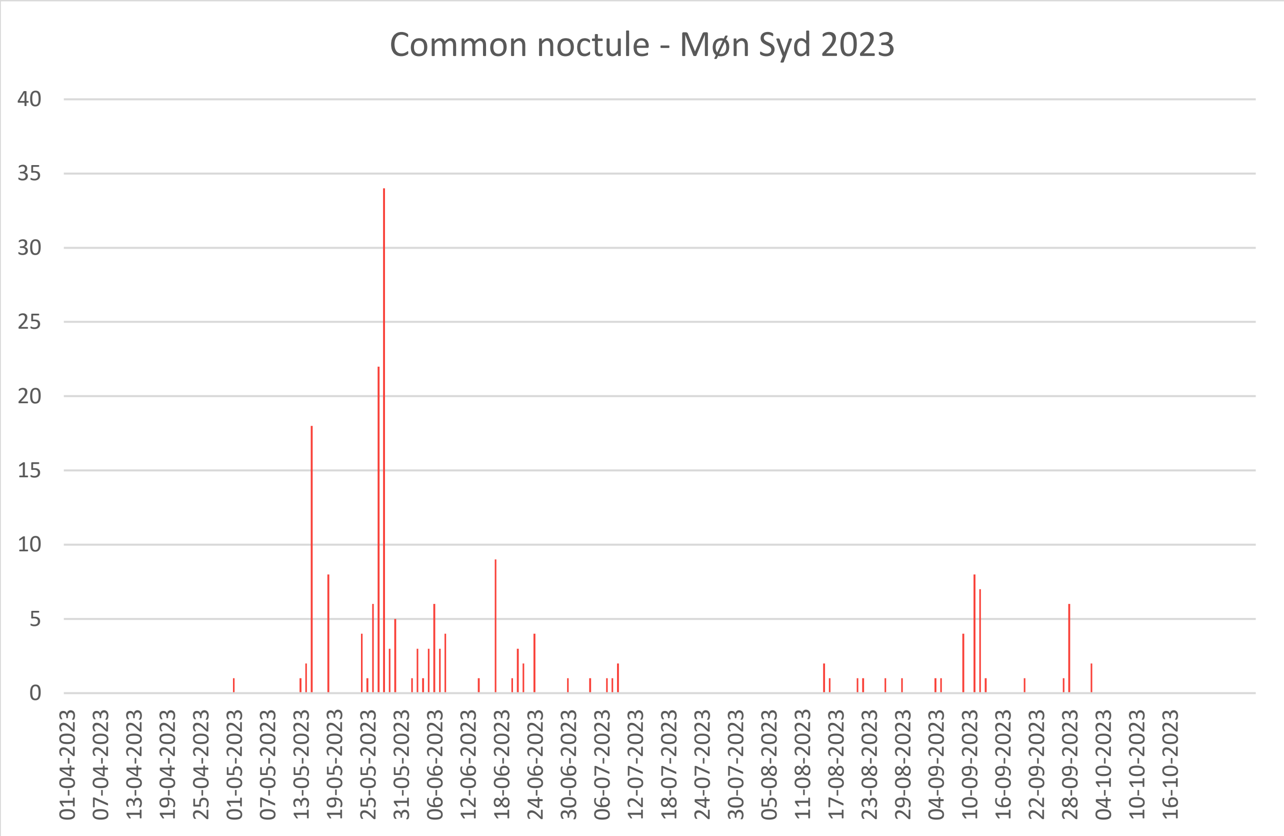
Common noctule - Møn Syd 2023
40
35
30
25
20
15
10
5
0
01-04-2023
07-04-2023
13-04-2023
19-04-2023
25-04-2023
01-05-2023
07-05-2023
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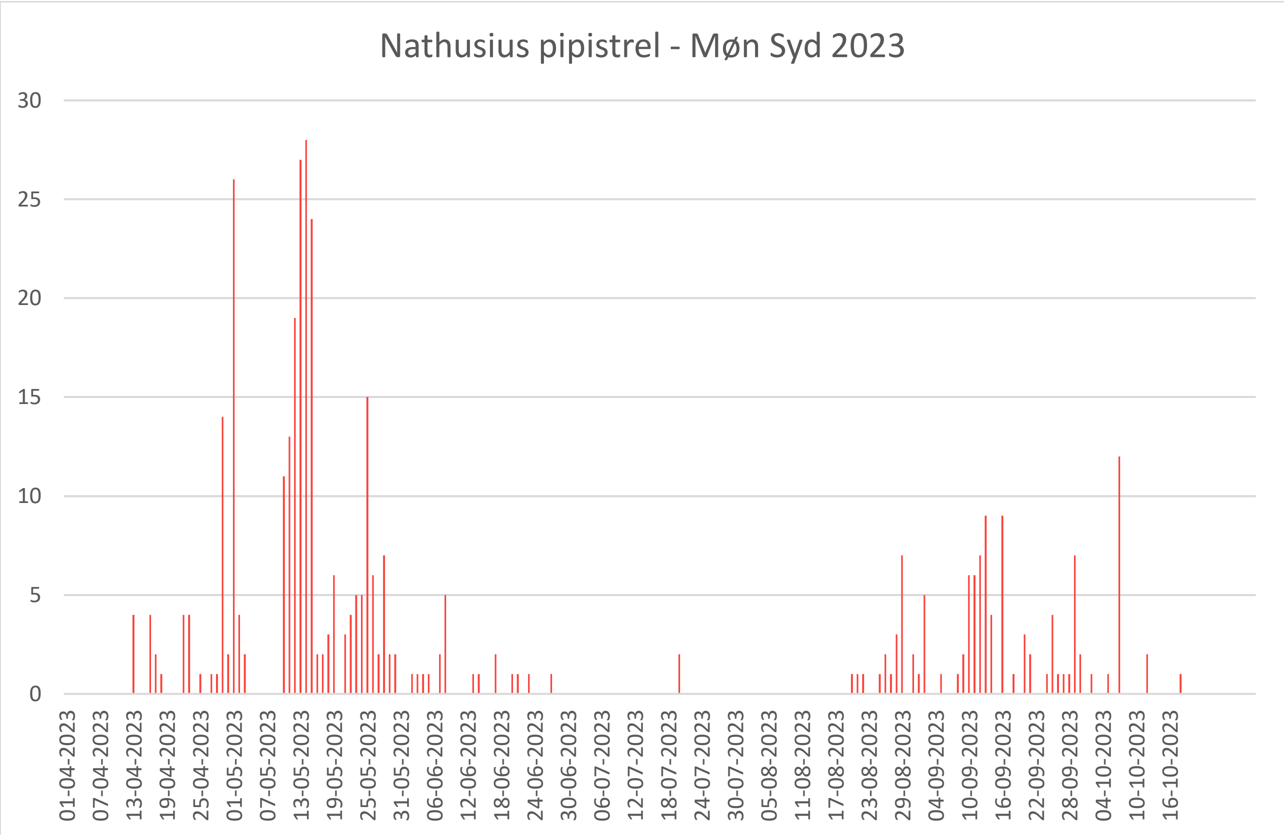
Nathusius pipistrel - Møn Syd 2023
30
25
20
15
10
5
0
01-04-2023
07-04-2023
13-04-2023
19-04-2023
25-04-2023
01-05-2023
07-05-2023
13-05-2023
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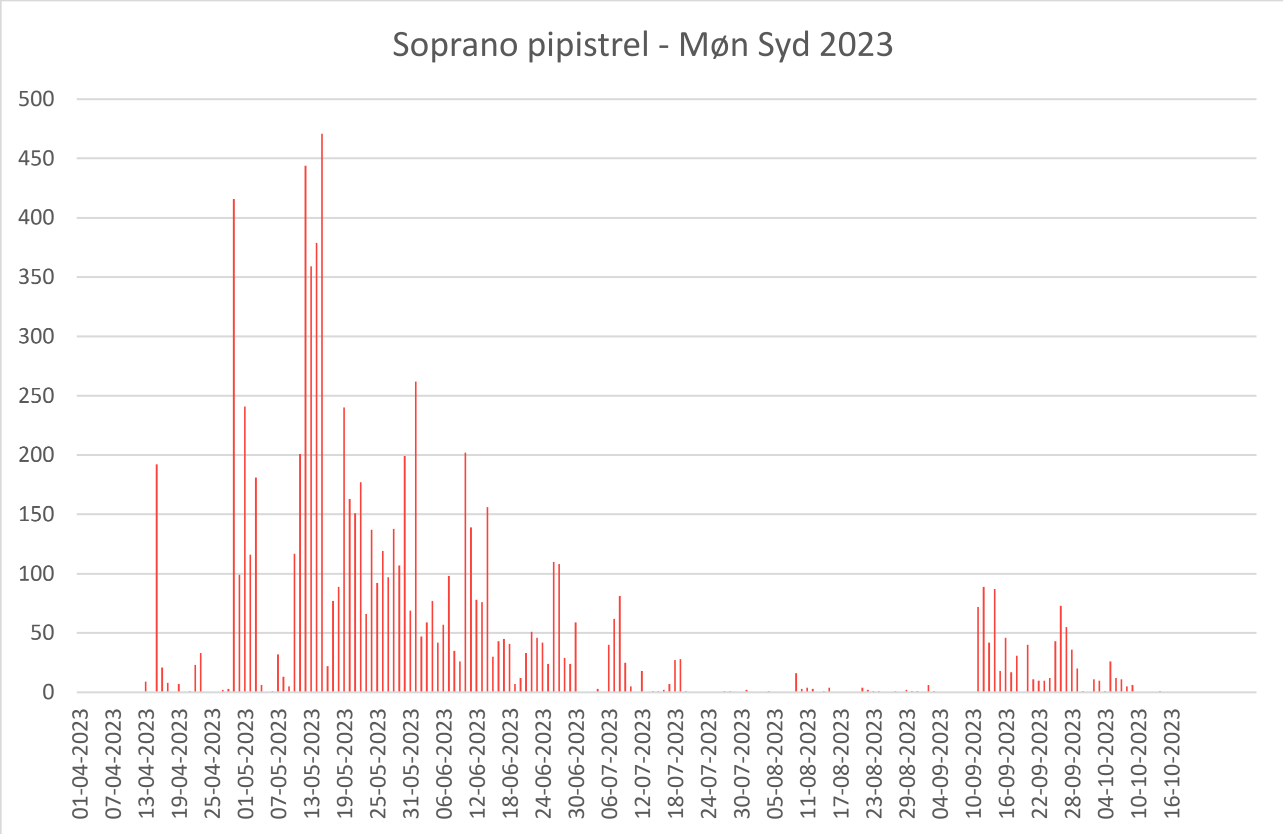
Soprano pipistrel - Møn Syd 2023
500
450
400
350
300
250
200
150
100
50
0
01-04-2023
07-04-2023
13-04-2023
19-04-2023
25-04-2023
01-05-2023
07-05-2023
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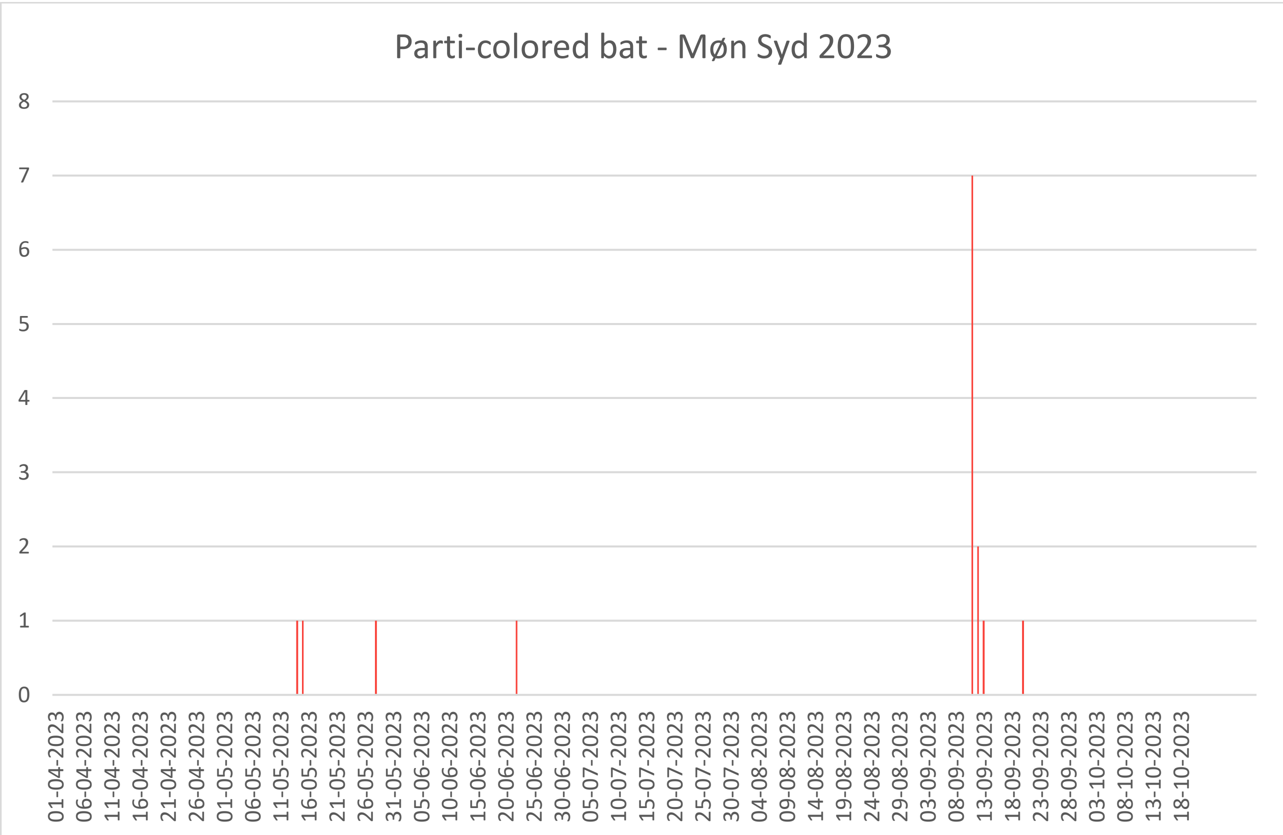
10-10-2023
16-10-2023


Parti-colored bat - Møn Syd 2023
8
7
6
5
4
3
2
1
0
01-04-2023
06-04-2023
11-04-2023
16-04-2023
21-04-2023
26-04-2023
01-05-2023
06-05-2023
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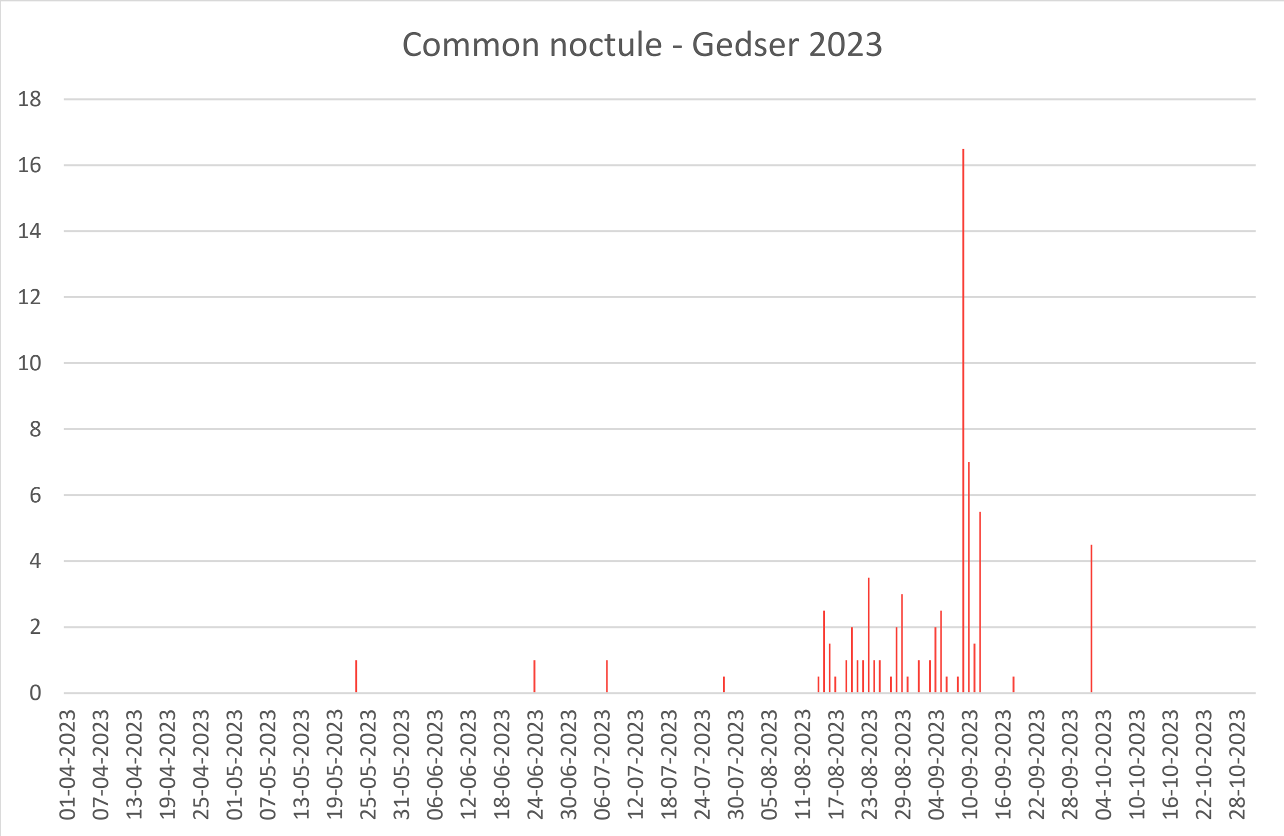
Common noctule - Gedser 2023
18
16
14
12
10
8
6
4
2
0
01-04-2023
07-04-2023
13-04-2023
19-04-2023
25-04-2023
01-05-2023
07-05-2023
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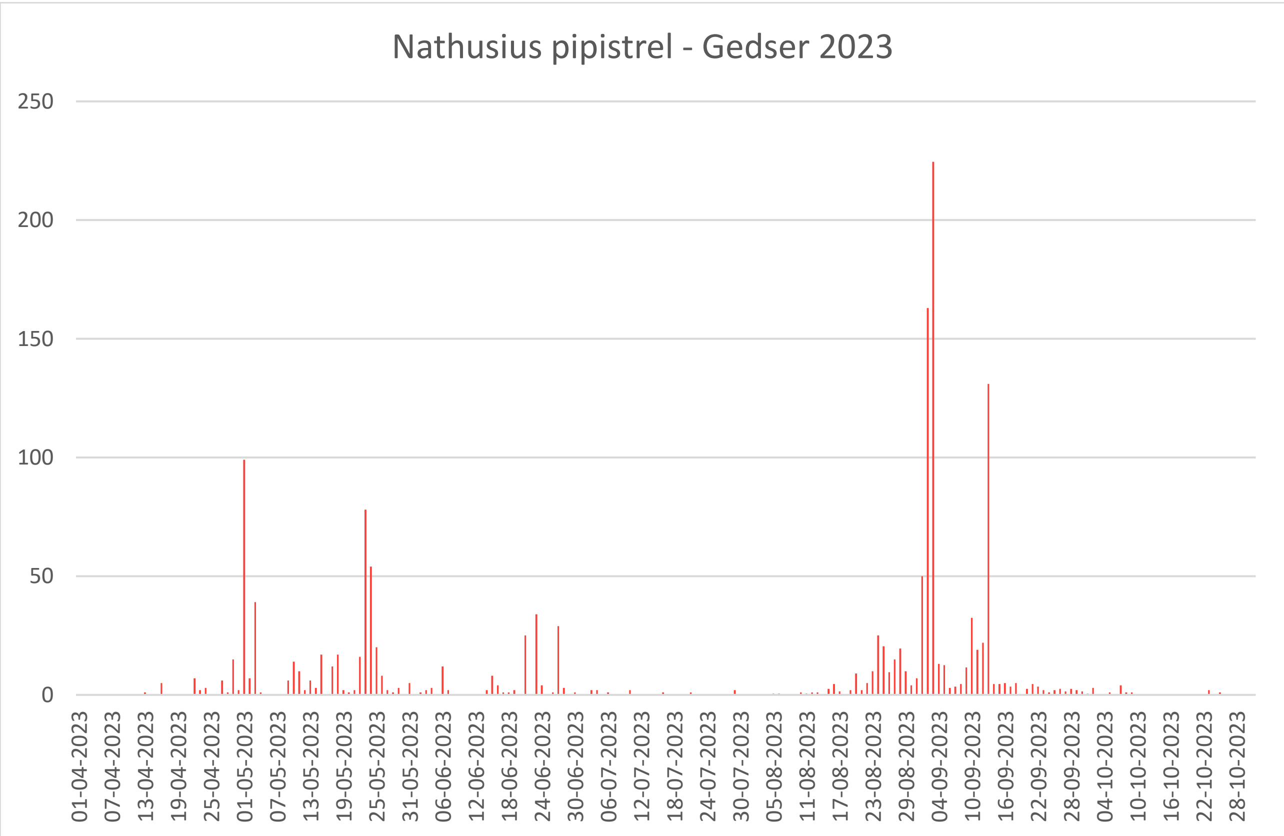
Nathusius pipistrel - Gedser 2023
250
200
150
100
50
0
01-04-2023
07-04-2023
13-04-2023
19-04-2023
25-04-2023
01-05-2023
07-05-2023
13-05-2023
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16-09-2023
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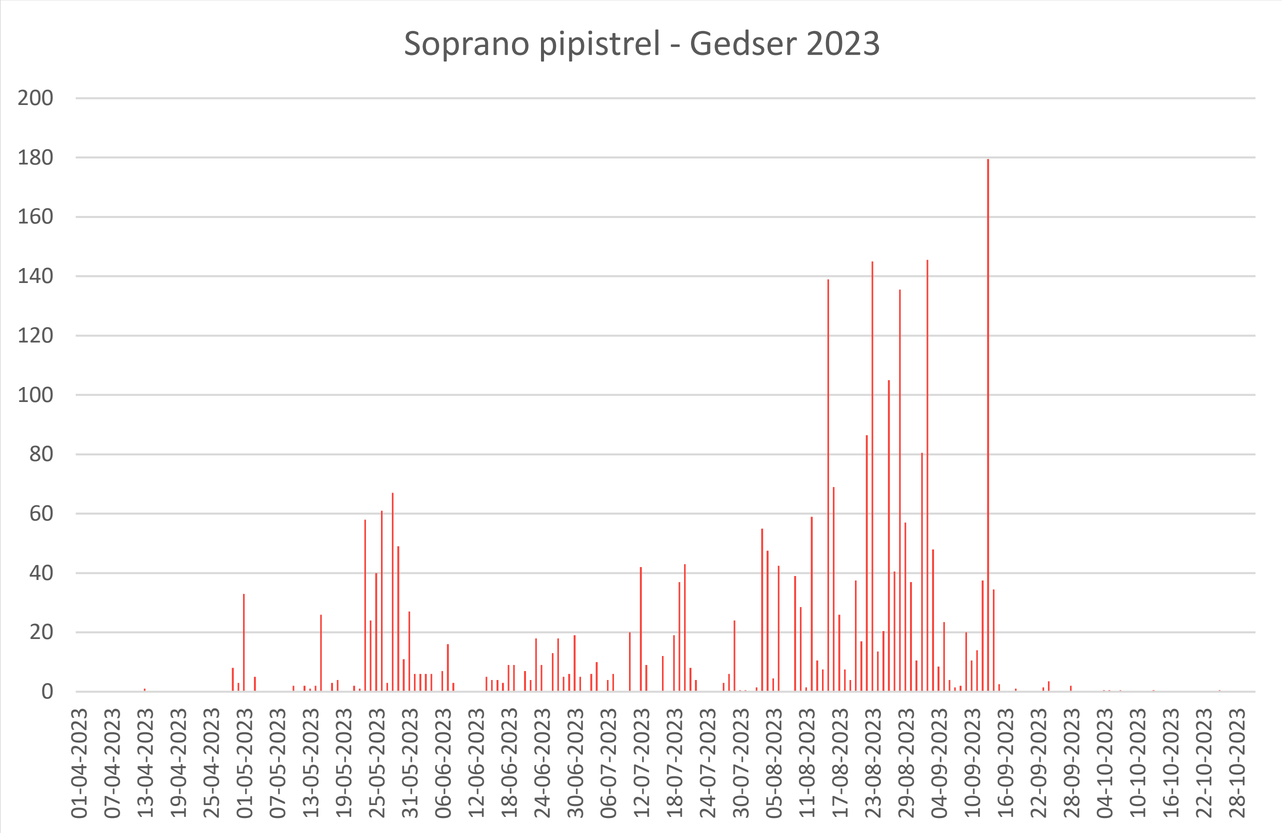

Soprano pipistrel - Gedser 2023
200
180
160
140
120
100
80
60
40
20
0
01-04-2023
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13-04-2023
19-04-2023
25-04-2023
01-05-2023
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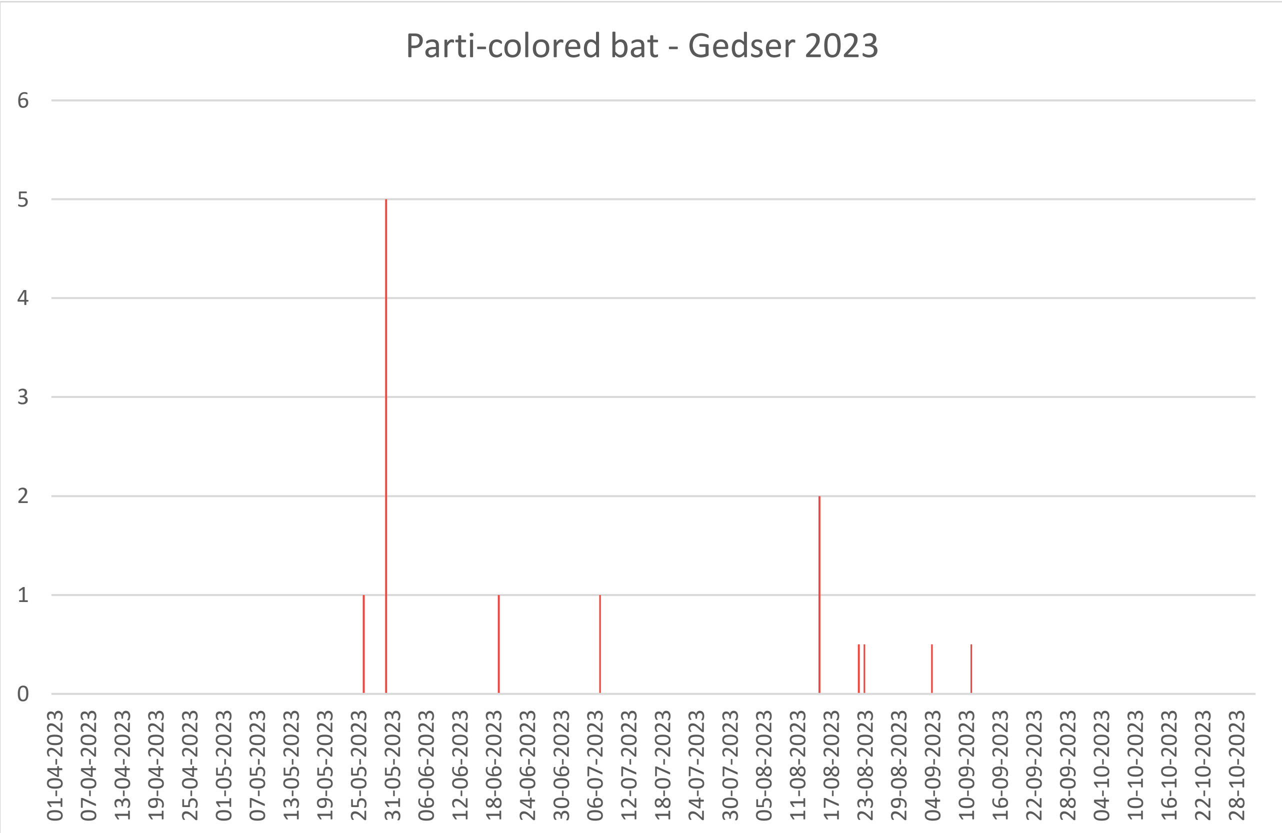

Parti-colored bat - Gedser 2023
6
5
4
3
2
1
0
01-04-2023
07-04-2023
13-04-2023
19-04-2023
25-04-2023
01-05-2023
07-05-2023
13-05-2023
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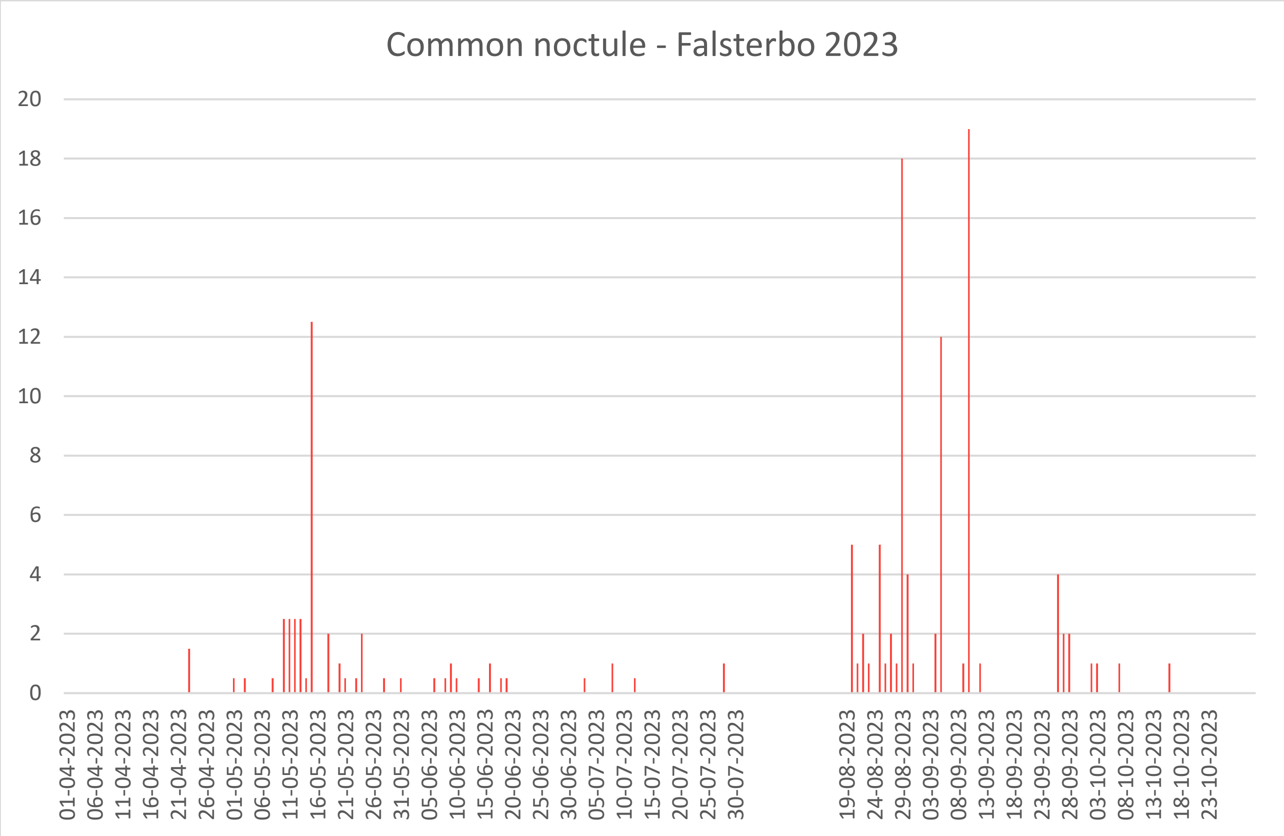
Common noctule - Falsterbo 2023
20
18
16
14
12
10
8
6
4
2
0
01-04-2023
06-04-2023
11-04-2023
16-04-2023
21-04-2023
26-04-2023
01-05-2023
06-05-2023
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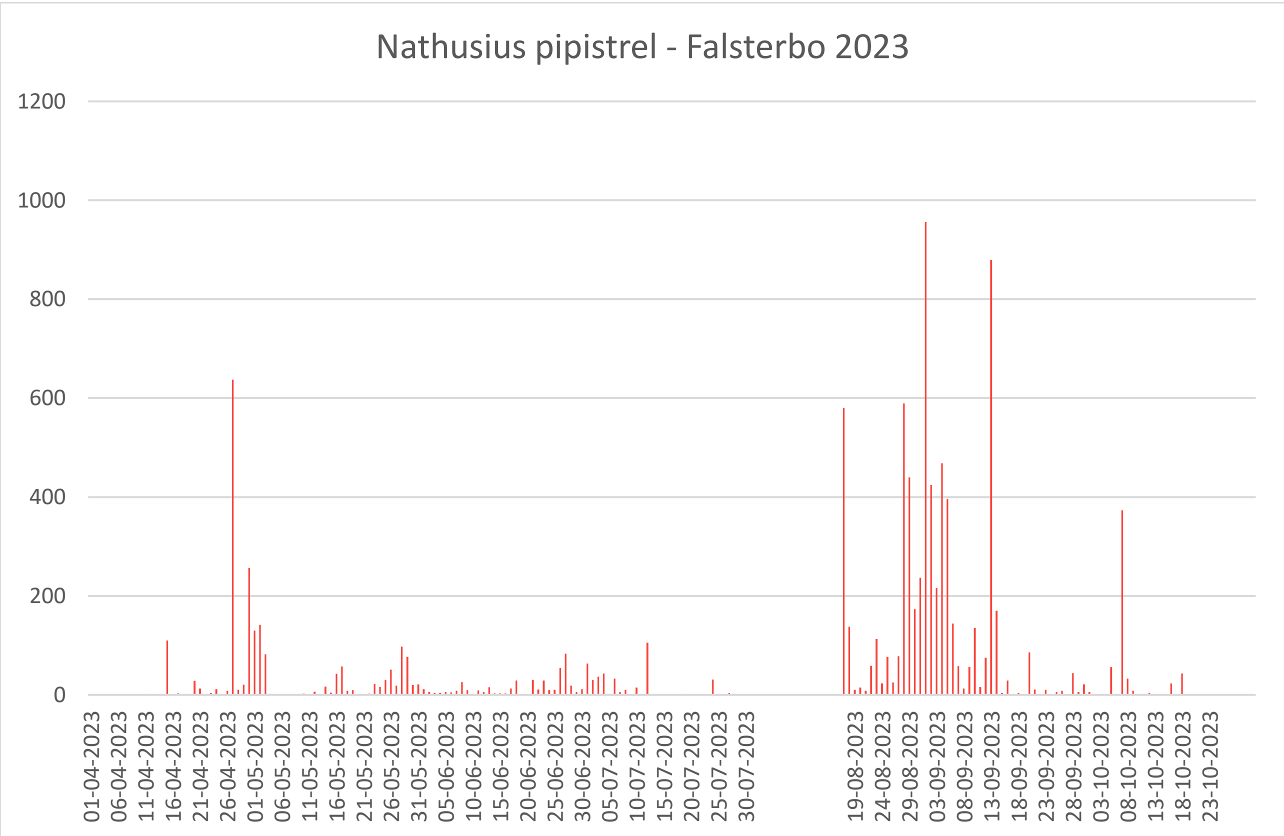
Nathusius pipistrel - Falsterbo 2023
1200
1000
800
600
400
200
0
01-04-2023
06-04-2023
11-04-2023
16-04-2023
21-04-2023
26-04-2023
01-05-2023
06-05-2023
11-05-2023
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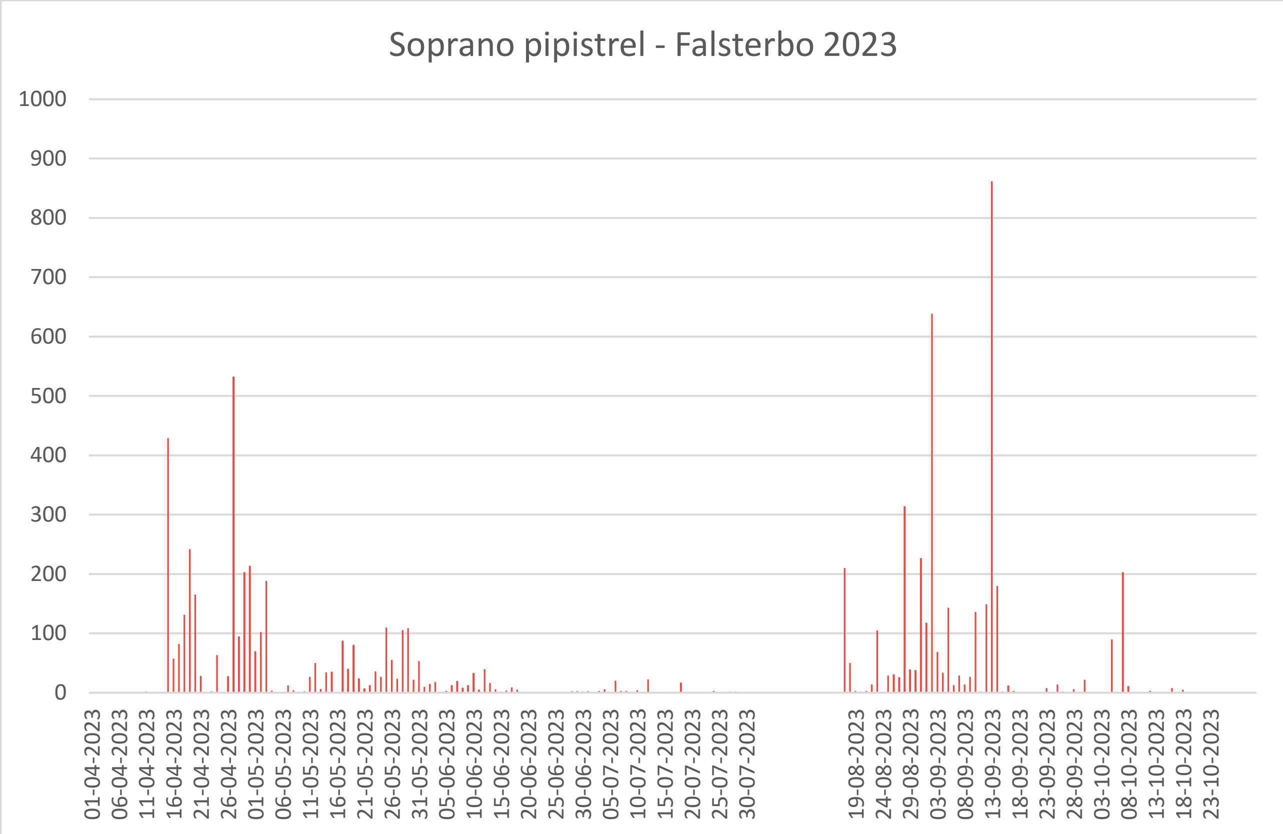
Soprano pipistrel - Falsterbo 2023
1000
900
800
700
600
500
400
300
200
100
0
01-04-2023
06-04-2023
11-04-2023
16-04-2023
21-04-2023
26-04-2023
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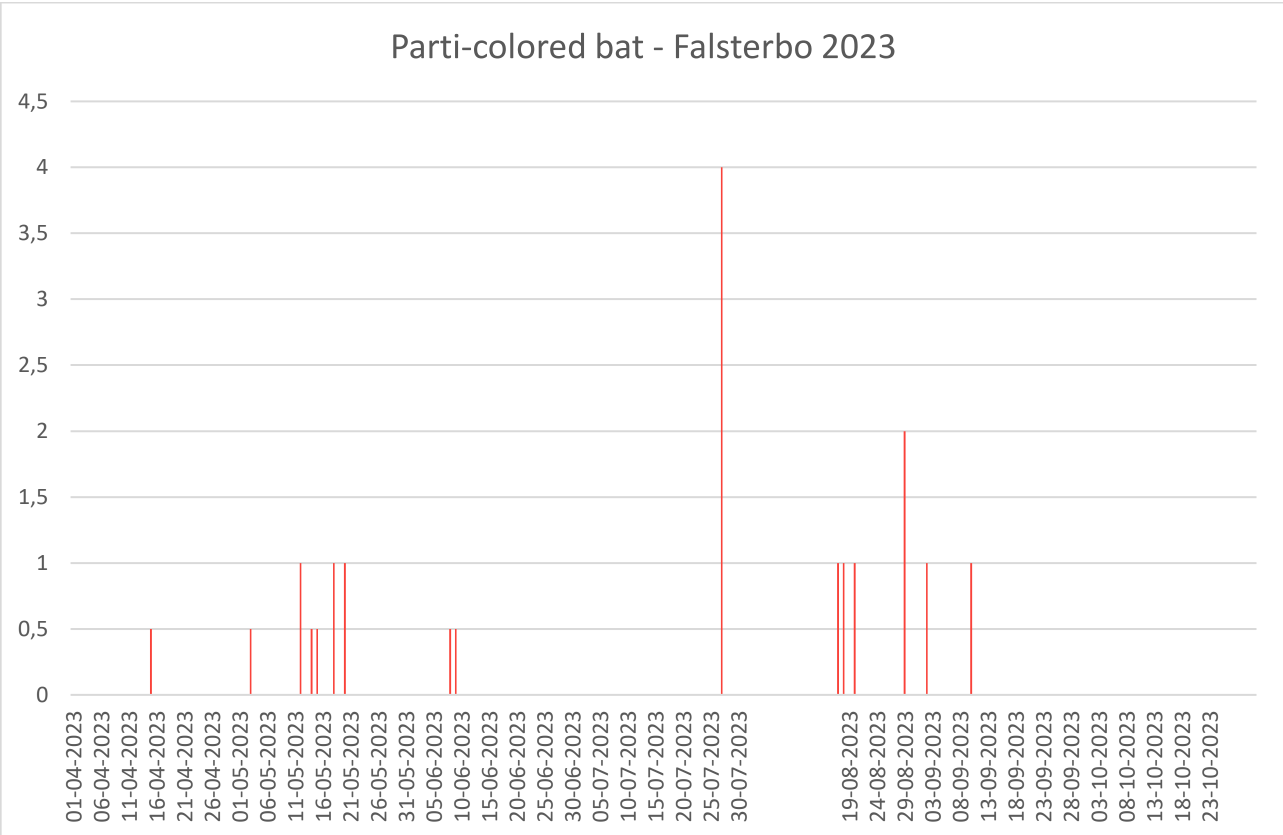
Parti-colored bat - Falsterbo 2023
4,5
4
3,5
3
2,5
2
1,5
1
0,5
0
01-04-2023
06-04-2023
11-04-2023
16-04-2023
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26-04-2023
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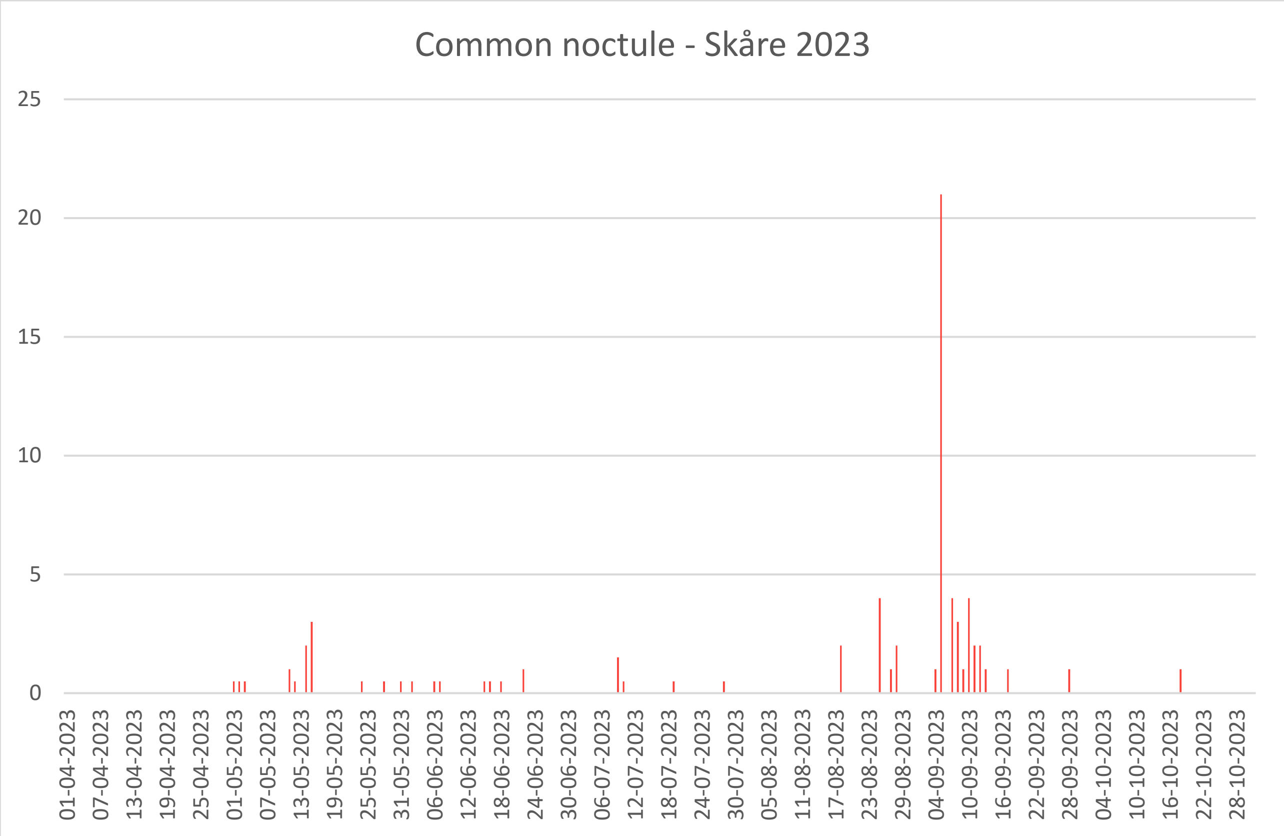
Common noctule - Skåre 2023
25
20
15
10
5
0
01-04-2023
07-04-2023
13-04-2023
19-04-2023
25-04-2023
01-05-2023
07-05-2023
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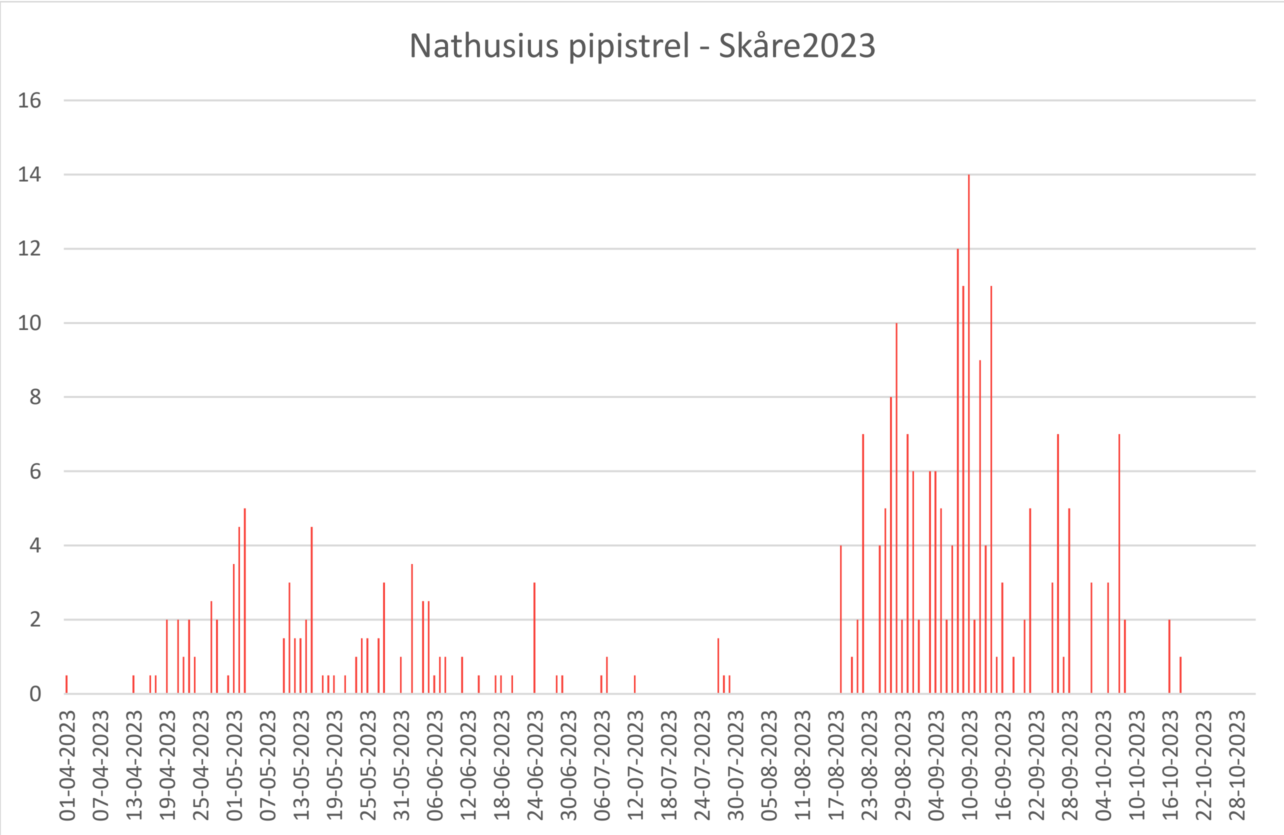
Nathusius pipistrel - Skåre2023
16
14
12
10
8
6
4
2
0
01-04-2023
07-04-2023
13-04-2023
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01-05-2023
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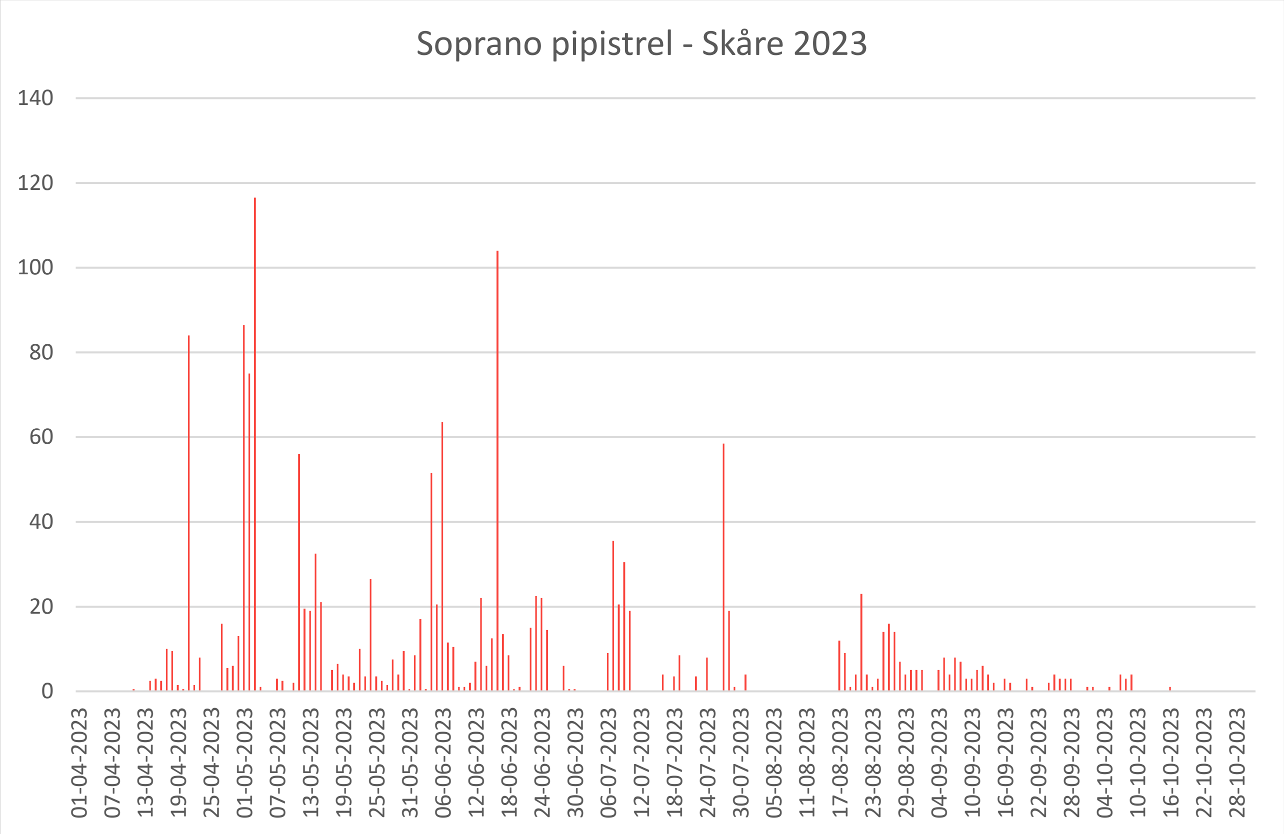
Soprano pipistrel - Skåre 2023
140
120
100
80
60
40
20
0
01-04-2023
07-04-2023
13-04-2023
19-04-2023
25-04-2023
01-05-2023
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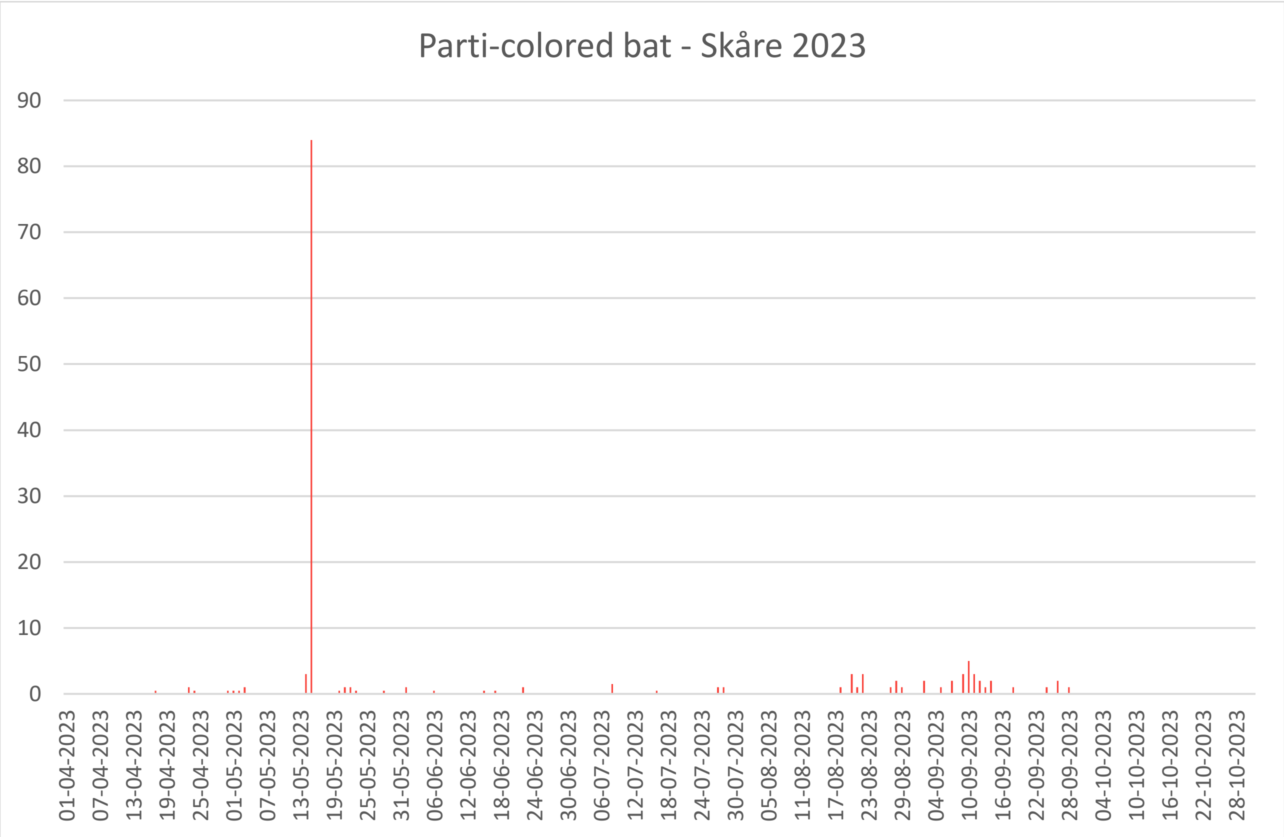
Parti-colored bat - Skåre 2023
90
80
70
60
50
40
30
20
10
0
01-04-2023
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13-04-2023
19-04-2023
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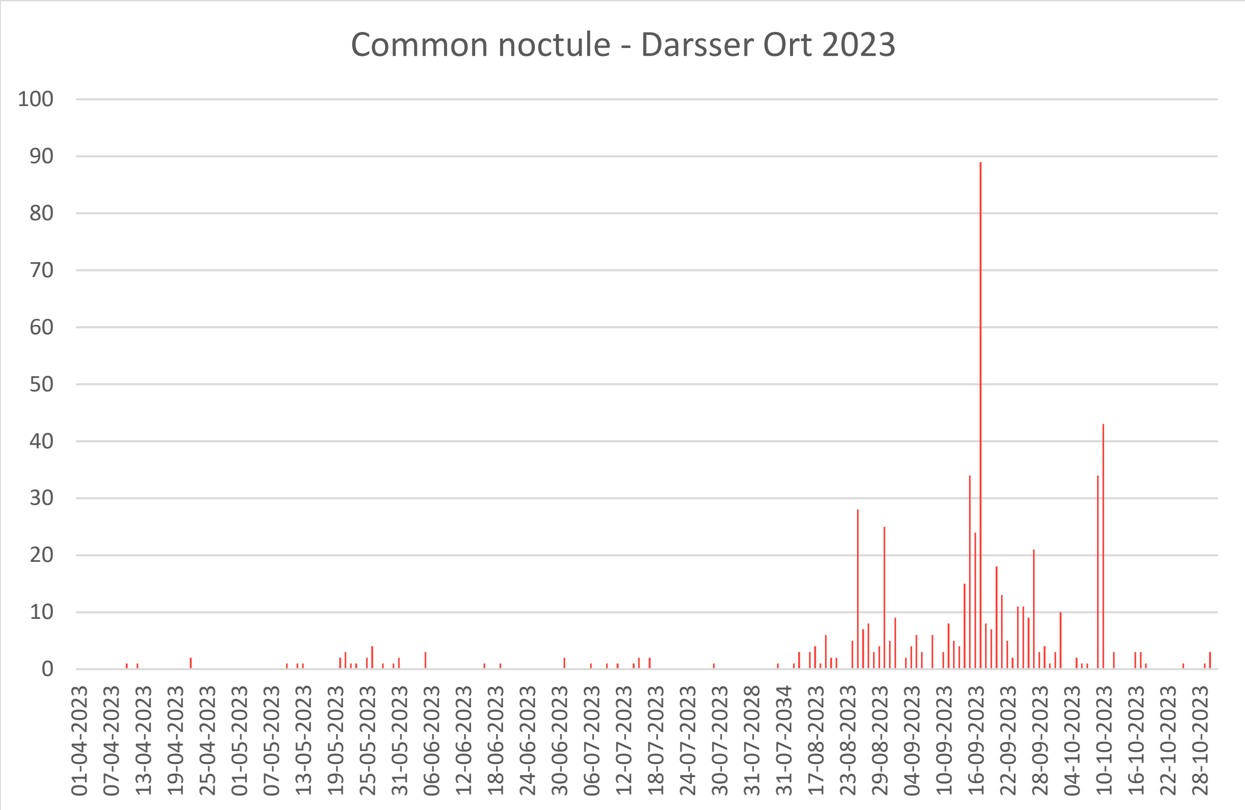
Common noctule - Darsser Ort 2023
100
90
80
70
60
50
40
30
20
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01-04-2023
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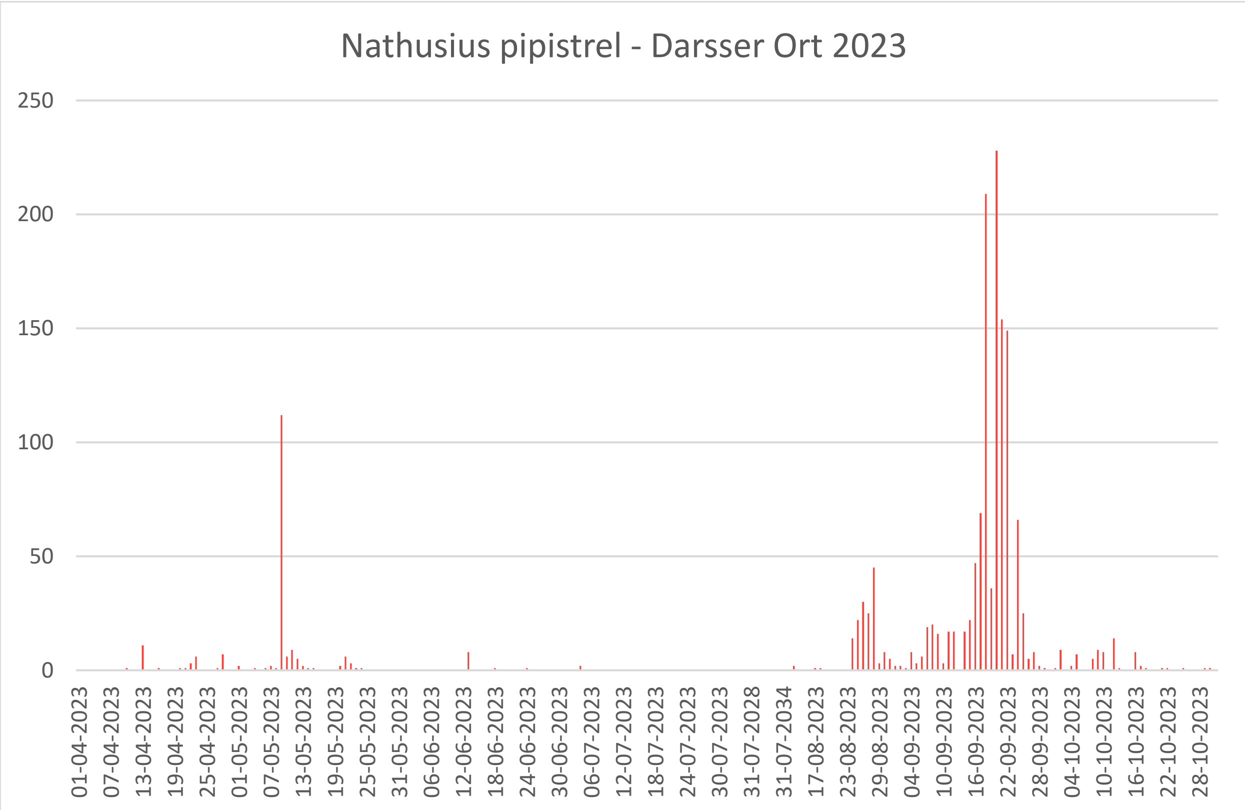
Nathusius pipistrel - Darsser Ort 2023
250
200
150
100
50
0
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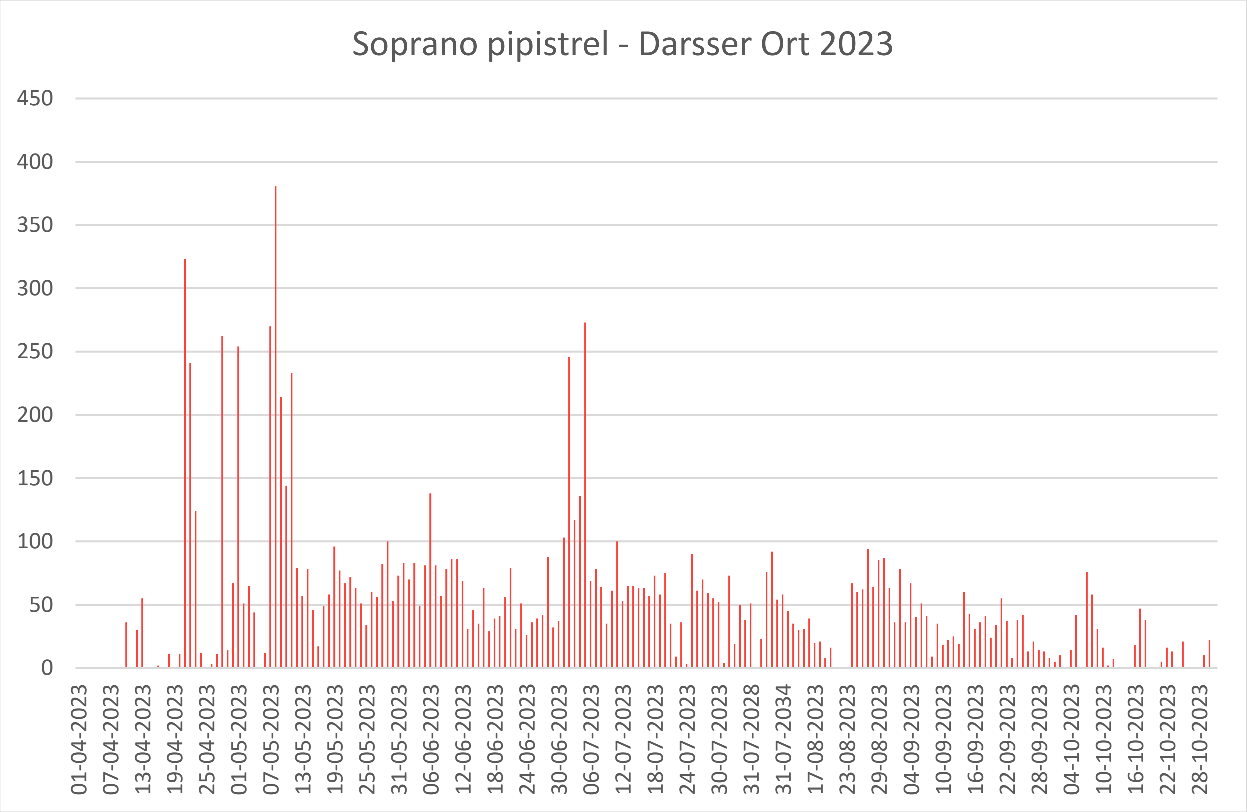
Soprano pipistrel - Darsser Ort 2023
450
400
350
300
250
200
150
100
50
0
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13-04-2023
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01-05-2023
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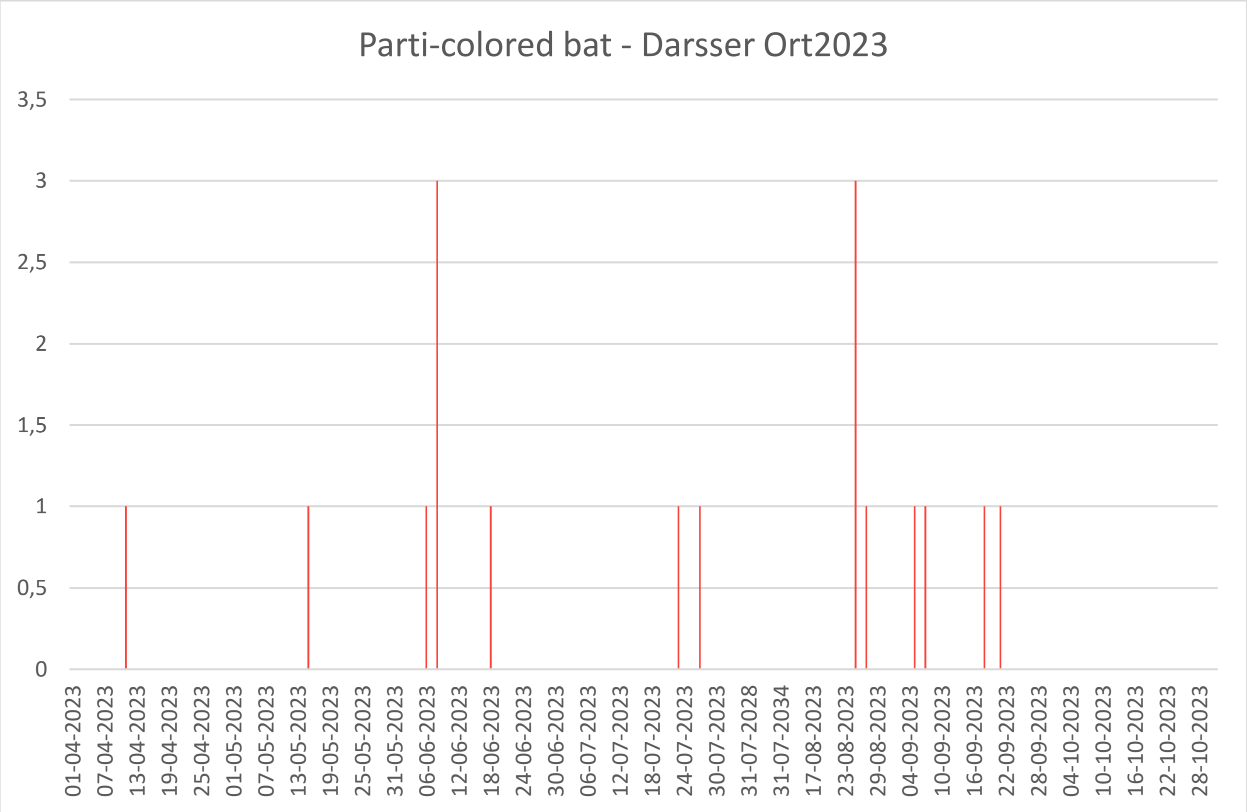
Parti-colored bat - Darsser Ort2023
3,5
3
2,5
2
1,5
1
0,5
0
01-04-2023
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