

## Appendix 11.3: Overview of Potential Impacts on Bats

### 1.1 Introduction

1. This chapter presents the available information on migratory bat species which may occasionally be present in or transit across the offshore environment.

### 1.2 Guidance and Legislation

2. All bats and their roosts are legally protected in UK. Legislation relating specifically to bats includes the following which are discussed in more detail in Chapter 3: Regulatory and Policy Context and Chapter 11: Nature Conservation.
  - The Bern Convention 1979;
  - Bonn Convention 1979;
  - Wildlife and Countryside Act 1981; and
  - The Habitats Directive 1992.
3. In addition to the above legislation, the following guidance relating to bats and wind farms has been used in the development of this chapter:
  - Bats and Onshore Wind Turbines. Interim Guidance. Natural England Technical Information Note TIN051;
  - EU Guidance on Wind Energy Development in Accordance with EU Nature Legislation. Wind Energy Development and Natura 2000. Guidance Document; and
  - Guidelines for consideration of bats in wind farm projects. EUROBATS publication series No.3 UNEP/EUROBATS Secretariat, Bonn Germany.

### 1.3 Engagement and Commitments

4. To date, bats have not been raised as an issue in any response to either formal or informal consultation on the wider project.
5. The information presented in this chapter has been gathered as the result of a desk based exercise. No consultation has been undertaken specifically on the subject of bat migration or the presence of bats offshore.

### 1.4 The Approach to Impact Assessment

6. No bats have been recorded from boat-based surveys undertaken over two years within the Neart na Gaoithe survey area. Published evidence indicates that bats are not regularly observed offshore.
7. Due to the lack of data on bats in the offshore environment an in depth impact assessment to the same extent as discussed in Chapter 6: Approach to Impact Assessment was not possible. In order to provide an estimation of the likely impacts, a qualitative assessment has been carried out using information gathered from the desk study and sensitivity evaluations from published sources.

#### 1.4.1 Bat Sensitivity

Natural England has produced interim guidance on assessing the risk posed by turbines on bats for onshore wind farms. The assessment is based on morphological, ecological and behavioural traits for regularly occurring species of bat. The results of the assessment identified Noctule, Leisler's and Nathusius' pipistrelle as being at high risk due to their adaptations for foraging in open areas and

migrating (Table 9-1). The sensitivity assessment will be used to quantify the potential impact on identified bat species.

Factor	Low risk	Medium risk	High risk
<b>Habitat Preference</b>	Bats preferring cluttered habitat	Bats able to exploit background cluttered space	Bats preferring to use open habitat
<b>Echolocation characteristics</b>	Short range High frequency Low intensity Detection distance ~ 15 metres	Intermediate – more plastic in their echolocation	Long range Low frequency High intensity Detection distance ~ 80 metres
<b>Weight</b>	Lightest	Medium	Heaviest
<b>Wing shape</b>	Low wing loading Low aspect ratio Broadest wings	Intermediate	High wing loading High aspect ratio Narrow wings
<b>Flight speed</b>	Slow	Intermediate	Fast
<b>Flight behaviour and use of landscape</b>	Manoeuvre well, will travel in cluttered habitat, Keeps close to vegetation Gaps may be avoided	Some flexibility	Less able to manoeuvre May avoid cluttered habitat Can get away from unsuitable habitat quickly Commute across open landscape
<b>Hunting techniques</b>	Hunt close to vegetation Exploit richer food sources in cluttered habitat Gleaners	Hunt in edge and gap habitats Aerial hawkers	Less able to exploit insect abundance in cluttered habitat Aerial hawker Feed in open
<b>Migration</b>	Local or regional movements	Regional migrant in some parts of range	Long-range migrant in some parts of range
<b>Conclusion</b>	Myotis Sp. Long-eared bats Horseshoe bats	Common pipistrelle Soprano pipistrelle Serotine Barbastelle	Noctule Leisler's bat Nathusius' pipistrelle Parti-coloured bat

Table 9-1: Bat species at risk from onshore wind turbines. Source: Natural England (2009)

## 1.5 The Baseline Conditions

10. A total of eighteen species of bat occur regularly in the UK and a further eight species occur as scarce or rare migrants. Scottish Natural Heritage (SNH) consider only nine of the UK bat species occur in Scotland (SNH 2011).
11. Many species of bat are known to be migratory at least in part of their ranges, particularly in continental Europe where more northerly breeding species migrate southwards during the autumn and return north in the spring. In the UK, bat migration is less obvious and less well understood than elsewhere but seasonal movements do occur. Table 11-2 details the known migratory distances for those bat species discussed in the baseline.

Species	Migration	Longest recorded migratory movement
Leisler's bat	Long	Up to 1,500 km
Noctule	Long	Up to 1,000 km
Nathusius' pipistrelle	Long	Up to 1,900 km
Parti-coloured	Long	Up to 900 km
Brandt's bat	Regional migrant	Up to 308 km
Daubenton's bat	Regional migrant	Up to 304 km
Whiskered bat	Regional migrant	Up to 625 km
Common pipistrelle	Regional migrant	Up to 1,123 km
Natterer's bat	Sedentary	Up to 327 km
Brown long-eared bat	Sedentary	Up to 90 km
Soprano pipistrelle	Unknown	Unknown

Table 0-2: Summary of migration distances for bats known to occur in the UK

12. It is recognised that detailed knowledge on the migration of bats, particularly in offshore waters, is not available and that the use of detection equipment to monitor for bats in open seas may not be suitable due to the very short detection range of 100 m or less. The recording of bats relies upon them to be echolocating during migration, which may not be the case, particularly for some species, e.g. long-eared bats that do not regularly echolocate even when foraging onshore. Therefore, to assess the potential impacts the proposed development may have on bats, all possible regularly occurring species of bat in Scotland have initially been considered in the baseline assessment.
13. The following section provides a brief summary of those species of bat that regularly occur in Scotland and that may be at potential risk of occurring within the proposed development area based on their known distribution and populations, migratory routes and behaviour. There are no migratory species of bat that occur regularly elsewhere in the UK but not in Scotland.

#### 1.5.1 Whiskered Bat (*Myotis mystacinus*)/Brandt's Bat (*M. brandtii*)

14. Although both whiskered and Brandt's bats occur throughout England, particularly in the north and west, there have been only ten confirmed records of whiskered bat and one confirmed record of Brandt's bat in Scotland (Haddow & Herman 2000; Racey *et al.* 2004). Neither species is thought to be strongly migratory and although recorded onshore there were no records of either species at the offshore wind turbines in Sweden (Ahlén *et al.* 2007). There have been no records of this species from offshore North Sea platforms (Boshammer and Bekker 2008; Racey *et al.* 2004). There has only been one record of a fatality caused by a wind turbine from onshore wind farms across Europe (Jones *et al.* 2009).
15. Based on the assessment for onshore wind farms this species is considered to be at low risk (Natural England 2009) and is not taken forward to impact assessment.

#### 1.5.2 Natterer's Bat (*M. nattereri*)

16. The Natterer's bat is relatively common and widespread throughout the UK but is less frequent in Scotland. The UK population is estimated to be approximately 100,000 individuals of which, 17,500 occur in Scotland (Racey *et al.*, 2004). The species occurs widely across southern and central Scotland and is known to occur in Fife and Lothian area (Haddow & Herman 2000).

17. The Natterer's bat has not been recorded from North Sea platforms or from offshore islands and is thought not to undertake extensive migrations (Jones *et al.* 2009). Therefore, the species is unlikely to be encountered offshore.
18. Based on the assessment carried out by Natural England it is a species considered to be at low risk from wind farm developments (Natural England 2009) and is not taken forward to impact assessment.

#### **1.5.3 Daubenton's Bat (*M. daubentonii*)**

19. Daubenton's bat is a widespread species found throughout most of the UK with a population of 150,000 individuals of which 40,000 are estimated to occur in Scotland and is known to occur in Fife and Lothian region. Daubenton's bats occur primarily close to fresh water rivers and lakes and can forage up to 10 km from roosts. They forage between 2 m and 20 m but may fly higher. Five Daubenton's bats have been reported as fatalities from onshore wind turbines and migrant Daubenton's bats were one of the most frequently recorded bats offshore during the studies undertaken in the Kalmar Sound (Ahlén *et al.*, 2007). However, they have not been reported at offshore platforms in the North Sea and although not considered to be long-distance migrants they may be regional migrants and therefore may occur offshore.
20. Based on the assessment for onshore wind farms this species is considered to be at low risk (Natural England 2009) and is not taken forward to impact assessment.

#### **1.5.4 Brown long-eared bat (*Plecotus auritus*)**

21. The brown long-eared bat is widespread throughout the UK with an estimated UK population of 200,000 individuals of which 20,000 to 30,000 occur in Scotland (BCT 2011; NBN 2011; Racey *et al.* 2004). Though, long-eared bats are often under-represented in acoustical surveys as their low-amplitude calls may only be detected within 5 m of each individual. The species occurs in old buildings and barns and is strongly associated with woodlands and tend not to forage over open areas.
22. There has been one reported sighting of brown long-eared bat from North Sea platforms and they have been reported from lighthouses and light-ships in the North Sea. Therefore, there may be some migration of brown long-eared bats across the North Sea (Boshamer and Bekker, 2008; Racey *et al.*, 2004).
23. There have been three reported fatalities of brown long-eared bats from onshore wind turbines in Europe. Based on the assessment for onshore wind farms this species is considered to be at low risk (Natural England, 2009).

#### **1.5.5 Parti-coloured Bat (*Vespertilio murinus*)**

24. The parti-coloured bat occurs widely over Europe and eastwards into Asia. It is a rare vagrant in the UK with approximately 20 recent UK records, including three on UK North Sea oil platforms (Racey *et al.*, 2004) and a further three from North Sea platforms in the Dutch Sector (Boshamer and Bekker, 2008). There have been seven records in Shetland (NIS 2011). The species is highly migratory and has been reported to migrate up to 180 km a day, with total seasonal movements reaching over 900 km.

#### **1.5.6 Common Pipistrelle (*Pipistrellus pipistrellus*)**

25. The common pipistrelle is the most abundant and widespread species of bat in Scotland although the exact population is not known due to the similarity between this and Soprano pipistrelle. The Scottish population for both species combined is estimated to be about 550,000 (Racey *et al.*, 2004; BCT 2011; NBN 2011). Both species occur widely in neighbouring Fife and Lothian. Common pipistrelle tend to fly around 10 m above the ground.
26. No common pipistrelles have been reported at offshore platforms in the Dutch sector of the North Sea indicating that they may not be regular migrants far offshore (Boshamer and Bekker 2008) but

they have been recorded at offshore wind farms in Sweden (Ahlén *et al.*, 2007). It is the second most frequently recorded species impacted by onshore wind farms (Jones *et al.*, 2009).

27. It is not reported as being a long distance migrant but is considered a regional migrant in the UK (Jones *et al.* 2009) and is considered to be at medium risk from wind turbines (Natural England 2009).

#### **1.5.7 Soprano Pipistrelle (*P. pygmaeus*)**

28. The soprano pipistrelle was not identified as a separate species from the common pipistrelle until the 1990's. Since then it has been found to be widespread throughout the UK and along with the common pipistrelle it is the most common species in the UK with a combined pipistrelle population estimated to be about 2,000,000 individuals in the UK, of which 550,00 are in Scotland (BCT 2011; NBN 2011). The species is widespread in Scotland with a distribution concentrated along the major rivers (NBN 2011, Racey *et al.* 2004). The soprano pipistrelle is not known to be a migratory species in the UK and there have been no records from offshore platforms. However, studies undertaken in Sweden found it to occur regularly at the offshore turbines where it was thought to be a migrant (Ahlén *et al.*, 2007).
29. The soprano pipistrelle is considered to be at medium risk from wind turbines (Natural England, 2009).

#### **1.5.8 Noctule (*Nyctalus noctula*)**

30. The noctule bat is one of the largest bats in the UK and occurs widely throughout the UK but is largely absent from Scotland, with few records in the south-west.
31. The noctule is a long distance migrant and the species has been recorded at offshore wind turbines in Sweden (Ahlén *et al.*, 2007) and offshore installations in the North Sea (Boshammer and Bekker, 2008). Radar studies undertaken in Sweden recorded migrating noctule bats flying mainly below 40 m. However, during foraging they have been recorded as high as 1,200 m above the ground.
32. A study undertaken to assess the potential risk to bats from onshore wind turbines throughout Europe reported the noctule bat as the species with the highest number of fatalities (Jones *et al.*, 2009) and it is one of three species considered to be at high risk from wind farms (Natural England 2009) and is taken forward to impact assessment.

#### **1.5.9 Leisler's Bat (Lesser noctule) (*N. leisleri*)**

33. The Leisler's bat is widespread but not common throughout most of England and Wales and becomes less abundant further north (BCT 2011). There have been a few records of this species in North-east and South-west Scotland (Haddow & Herman 2000; NBN 2011).
34. Leisler's bats are long distance migrants and the species has been recorded from offshore installations and islands in the North Sea and is therefore likely to at least occasionally occur as a migrant across the North Sea (Boshamer and Bekker 2008; Racey *et al.*, 2004).
35. Based on this information and the Natural England assessment, Leisler's bat is considered to be high risk and is taken forward to assessment.

#### **1.5.10 Nathusius' Pipistrelle (*P. nathusii*)**

36. The Nathusius' pipistrelle is a rare bat in the UK but is increasingly being recorded, possibly due to a westward expansion in its range (BCT 2011; NBN 2011). Sightings are widely scattered across the whole of the UK with most from the southern half of England.
37. Nathusius' pipistrelle is a highly migratory species and is one of the most frequently recorded bats from North Sea platforms and offshore islands, e.g. Shetland. Out of 34 bats reported from North Sea platforms located in the Dutch sector between 1988 and 2007, 26 (76%) were of this species (Boshamer and Bekker, 2008).

38. The species occurs mainly around freshwater lakes and marshes and forages mainly between 5 m and 25 m above the ground. It is the third most frequently recorded species killed by onshore wind farms in Europe and is considered one of three species to be at particularly high risk from onshore wind turbines (Natural England, 2009).

## 1.6 Impact Assessment

39. Bats can be directly affected by wind turbines in a number of ways. There are few reports of bats being directly impacted through collision with the rotor blades but although it does occur, it may not be the primary cause of death to bats (Horn *et al.*, 2008). A significant cause of mortality to bats from operating wind turbines is from barotrauma caused by rapid air pressure reduction near moving turbine blades (Baerwald *et al.*, 2008).

40. There is an increasing body of evidence to indicate that bats are at potentially significant risk from onshore wind turbines with reported deaths caused by wind turbines for a number of species both in the UK and elsewhere. In particular, species that fly relatively high and undertake long migrations appear to be at greatest risk of collision.

41. In Europe the species with highest mortality rates are the migratory species: noctule, common pipistrelle and Nathusius' pipistrelle (Mathews *et al.*, 2009). Similarly, studies in the United States also indicate that it is the strongly migratory species that are at greatest risk of impacts with turbines, e.g., eastern red bats (*Lasiurus borealis*), hoary bats (*L. cinereus*) and silver haired bats (*Lasionycteris noctivagans*) (Edkins, 2008).

42. Further studies have indicated that bat mortality is highest during the autumn migration period with significant increase at the end of July and during August and early September (Bach and Harbusch, 2007).

43. Studies undertaken in Sweden have reported the regular detection of bats at the Utgrunden and Yttre Stengrund offshore wind farms in the Kalmar Sound. The studies reported the regular occurrence of up to ten species of bat foraging or migrating offshore (Ahlén *et al.*, 2007).

44. Based on the above baseline information an overall sensitivity for bats occurring in the UK is presented in

45. Table 45-3. Based on the above baseline information the following species of bat have been identified as being at possible risk of an impact with the proposed Neart na Gaoithe Wind Farm development and will be considered further within this section:

- Noctule,
- Leisler's bat,
- Nathusius' pipistrelle,

Species	Migration	Recorded Offshore North sea	Collision Risk <sup>-1</sup>	Risk from wind turbines <sup>-2</sup>
Greater horseshoe bat	Sedentary	No	No	Low
Lesser horseshoe bat	Sedentary	No	No	Low
Whiskered bat	Regional migrant	No	Yes	Low
Brandt's bat	Regional migrant	No	Yes	Low
Bechstein's bat	Sedentary	No	No	Low
Natterer's bat	Sedentary	No	No	Low

<b>Daubenton's bat</b>	Regional migrant	Yes	Yes	Low
<b>Parti-coloured bat</b>	Long	Yes	?	?
<b>Serotine</b>	Regional migrant	No	Yes	Medium
<b>Noctule</b>	Long	Yes	Yes	High
<b>Leisler's bat</b>	Long	Yes	Yes	High
<b>Common pipistrelle</b>	Regional migrant	No	Yes	Medium
<b>Soprano pipistrelle</b>	Unknown	No	Yes	Medium
<b>Nathusius' pipistrelle</b>	Long	Yes	Yes	High
<b>Barbastelle</b>	Regional migrant	No	No	Medium
<b>Brown long-eared bat</b>	Sedentary	No	Yes	Low
<b>Grey long-eared bat</b>	Sedentary	No	Yes	Low

1 = Source Jones *et al.* 2009

2 = Source Natural England 2009

Table 45-3: Bat sensitivity

### 1.6.1 Potential Effects

46. The European Commission (EC) has summarised potential impacts on bats in guidance relating to the impacts on bats from onshore wind farms (Table 46-4) (EU 2010); the summary is based on previous studies (e.g. Rodrigues *et al.*, 2008). Of the possible impacts identified, two may be relevant to proposed development: These are ultrasound emissions and collision with rotors. Any possible impacts arising from the proposed development will therefore, should they occur, arise during the operational phase and there are no predicted impacts on bats during the construction or decommissioning phases of the proposed development.

<b>Possible Impacts on bats related to siting</b>			
<b>Impact</b>	<b>Summer time</b>	<b>During migration</b>	<b>Relevance to proposed development</b>
<b>Loss of hunting habitats during construction of access roads, foundations etc.</b>	Small to medium impact depending on the site and species present at that site	Small impact	Not relevant – offshore construction
<b>Loss of roost sites due to construction of access roads, foundations etc.</b>	Probably high or very high impact depending on the site and species present at that site	High or very high impact, e.g. loss of mating roosts	Not relevant – offshore construction
<b>Possible impacts related to operating the wind farm</b>			
<b>Impact</b>	<b>Summer time</b>	<b>During migration</b>	<b>Relevance to proposed development</b>
<b>Ultrasound emissions</b>	Probably a limited impact	Probably a limited impact	Relevant
<b>Loss of hunting areas because</b>	Medium to high impact	Probably a minor impact in	Not relevant as prey

the bats avoid the area		spring. A medium to high impact in autumn and hibernation period	concentrations will not occur in open sea areas far offshore and therefore not a hunting area.
Loss or shifting of flight corridors	Medium impact	Small impact	Not relevant as no flight corridors predicted offshore
Collision with rotors	Small to high impact, depending on the species	High to very high impact	Relevant

Table 46-4: Possible Impacts on Bats (EU 2010)

### 1.6.1.1 Ultrasound Emissions

47. Ultrasound emissions from operating turbines may be at a frequency that could cause bats to become attracted to the turbines or disorientated and consequently be at increased risk of collision or barotrauma affects (EU 2010, Rodrigues et al. 2008). However, studies undertaken at onshore wind farms in the United States of America indicated that the turbines emitted ultrasound frequencies of between 20 kilohertz (kHz) to 40 kHz at between 2 decibel (db) and 5 db above ambient background levels. Above 50 kHz the sound levels were below background levels. The study concluded that, at least at ground level, the turbines were unlikely to attract bats (Szewczak, 2006). Additionally, bats have been observed flying around onshore turbines regardless of whether they are moving or not (Horn *et al.*, 2008) suggesting that operational noise is unlikely to be the cause of attraction. Jones *et al.*, (2009) identified that the noctule, Leisler's and serotine bats were at risk of disturbance from ultrasounds emitted by the wind turbines (Jones *et al.*, 2009).

### 1.6.1.2 Collision with Rotors (including barotrauma)

48. There is an increasing level of evidence indicating that bats are at potentially significant risk of impacts from wind turbines from either collision risk or barotrauma (Jones et al. 2009). The reasons why bats may be at risk from collision are not clearly understood but they may be attracted to the wind turbines by increased prey availability or are attracted to the turbines due to their loose similarity to tall trees which bats use to rest in or as landmarks for navigation. Jones et al. (2009) presents a list of bat species considered to be at risk of potential collision or barotrauma impacts (
49. Table 45-3). Of those listed noctule, Leisler's and Nathusius' pipistrelle are considered to be at high risk of potential impact.

## 1.6.2 Species at Potential Risk

### 1.6.2.1 Noctule Bats

50. Noctule bats are the most frequently recorded species of bat killed at onshore wind turbines. This species is known to be long distance migrant travelling up to 1,000 km from their breeding sites to wintering grounds. They have been recorded at offshore platforms in both the UK and Dutch sectors and also islands in the North Sea. However, the northern most populations in the UK are considered largely sedentary (Jones *et al.*, 2009).
51. In Europe the noctule is a well known migrant but there is little evidence of any significant migration across the North Sea. Although occasionally recorded from North Sea platforms and islands there are relatively few records compared to the number of sightings in North-west Europe during the migration periods. In particular, as it was one of the more frequently recorded species in offshore studies in Sweden. There were only two sightings offshore in the Dutch sector of this species and only very small numbers in the UK sector (Bashamer & Bekker 2008).



52. Consequently, although noctule bats can and do migrate they are not regularly recorded offshore nor from offshore islands and therefore there will not be a significant impact on noctule bat from the proposed development.

#### 1.6.2.2 *Leisler's Bat*

53. This species has rarely been recorded at offshore platforms (Boshamer & Bekker 2008; Racey, Raynor & Pritchard 2004). There are no records from platforms in the Netherlands and only a few sightings from UK platforms. There are no reported sightings of Leisler's bats along the east coast of Scotland (NBN 2011). The species only occurs locally in North-east and South-west Scotland. Consequently, there is little evidence that there is a regular migration of Leisler's bat across the North Sea. Furthermore, DNA analysis indicates that there is little or no gene flow between the European populations of Leisler's bats and those in the UK (Russ 2008).
54. Consequently, it is concluded that there is no evidence of any significant migration across the North Sea and there will not be a significant impact on Leisler's bat from the proposed development.

#### 1.6.2.3 *Nathusius' Pipistrelle*

55. The *Nathusius' pipistrelle* is the only regularly occurring bat in the UK that is known to migrate across the North Sea (Russ et al. 2001). The species breeds across Europe but the eastern populations migrate west and south-west during the autumn and winter in Western Europe. There is a relatively small breeding population in Britain and most records of *Nathusius' pipistrelles* in the UK are thought to be migrants originating from Scandinavia (Jones *et al.*, 2009). Although *Nathusius' pipistrelle* is the most frequently recorded bat on offshore platforms with 26 out of 34 records from the Dutch sector being of this species and the most frequently recorded species from the northern Isles, it is still a rare species in Britain. There are no records of *Nathusius' pipistrelle* from south-east Scotland (Russ *et al.*, 2001; NBN 2011). The main periods of migration occur in September. The species was frequently recorded during offshore studies undertaken in Sweden where it was detected foraging and migrating (Ahlén, Baagoe, & Bach 2009).
56. Although there have been no records of *Nathusius' pipistrelle* in the area of the proposed development there is the potential for *Nathusius' pipistrelle* to occur during the migration periods.
57. Studies undertaken in Sweden recorded the flight heights of *Nathusius' pipistrelle* and other species. The majority of records were of bats flying <10 metres above the sea surface with only occasional sightings at rotor height and the majority of those sightings being of noctule bats and not *Nathusius' pipistrelle* (Ahlén, Baagoe, & Bach 2009). Consequently, the risk of collision with the turbines by *Nathusius' pipistrelle* should they occur is very low.
58. Based on the widely scattered sightings in the UK there is no evidence of a migratory corridor across the North Sea.
59. Consequently, based on the relative scarcity of *Nathusius' pipistrelle* in the UK, the low flight heights recorded offshore and that there is no evidence of a migratory corridor across the North Sea it is concluded that there will not be a significant environmental impact from the proposed development on *Nathusius' pipistrelle*.

## 1.7 Conclusions

60. The majority of bats in the UK do not undertake long migrations and rarely cross the North Sea and are therefore not at risk of an impact from the proposed development. Three species of bat may occur offshore: Noctule, Leisler's and *Nathusius pipistrelle*. Of these three species the noctule and Leisler's bats are scarce in the North Sea and there are few, if any sightings, of migrants along the east coast of Scotland. Therefore, if they do occur they are considered to be scarce or very scarce migrants. The *Nathusius' pipistrelle* is probably a regular but scarce migrant and could occur within the proposed development area. However, sightings offshore indicate that the majority of flights are below 10 metres and therefore the species is at very low risk of collision.
61. Based on the available data, the proposed Neart na Gaoithe Offshore Wind Farm development will not have a significant environmental impact on bats.



## 1.8 References

- Ahlén, N.I., Baagoe, H.J. & Bach, L., 2009. Behaviour of Scandinavian bats during migration and foraging at sea. *Journal of Mammology* 90(6) 1318-1323.
- Ahlén, I, Bach, L, Baagoe, H.J. & Pettersson, J., 2007. Bats and offshore wind turbines studied in southern Scandinavia. Swedish Environmental Protection Agency.
- Bach, L., & Harbush, Ch., 2007. The Impacts on Bats: The European Experience. Presentation at Bat Conservations Trust Workshop on Wind Turbines and Bat Populations Workshop. February 2007 Defra. London. [http://www.bats.org.uk/pages/wind\\_turbines\\_workshop\\_feb\\_07.html](http://www.bats.org.uk/pages/wind_turbines_workshop_feb_07.html)
- Baerwald, E.F., Amours, D,H, Brandon, J.K., & Barclay, M.R. (2008). Barotrauma is a significant cause of bat fatalities at wind turbines. *Current Biology*, 18, 16: R695 – 696. 26 August 2008.
- BCT (2011). UK Bat Species. [http://www.bats.org.uk/pages/uk\\_bat\\_species.html](http://www.bats.org.uk/pages/uk_bat_species.html) Accessed June 2011.
- Boshamer, J.P.C. & Bekker, J.P., 2008. Nathusius' pipistrelles (*Pipistrellus nathusii*) and other species of bats on offshore platforms in the Dutch sector of the North Sea. *Lutra* 2008 51: (1) 17-36
- European Commission 2010. EU Guidance on Wind Energy Development in Accordance with EU Nature Legislation. Wind Energy Development and Natura 2000. Guidance Document.
- Edkins, M.T. 2008. Impacts of wind developments on birds and bats. Report prepared for FPL Energy.
- Haddow, J.F. & Herman, J.S., 2000. Recorded distribution of bats in Scotland. *Scottish Bats* 5:2000.
- Horn, J., Arnett, E.B. & Kunz, T.H., 2008. Behavioural Response to Bats to Operating Wind Turbines. *Journal of Wildlife Management* 72 (1): 123-231 (2008).
- Jones, G., Cooper-Bohannon, R., Barlow, K. & Parsons, K., 2009. Determining the potential ecological impact of wind turbines on bat populations in Britain. Scoping and Method Development Report, Defra.
- Matthews, J., Mitchell-Jones, T. & Raynor, R., 2009. Natural England Technical Information Note TIN059 Bats and single large wind turbines: Joint Agencies interim guidance. Peterborough: Natural England.
- Natural England 2009. Bats and onshore wind turbines. Interim Guidance. Natural England Technical Information Note TIN051.
- NBN (2011). National Biodiversity Network. <http://www.nbn.org.uk/>
- NIS 2011. Nature in Shetland. <http://www.nature-shetland.co.uk/naturelatest/latestothers.htm>. Accessed August 2011.
- Racey, P.A., Raynor, R. and Pritchard, S. 2004 Eds. A review of European Bat Lyssavirus (EBLV) and the status of bats in Scotland. Scottish Natural Heritage Commissioned Report No. 063 (ROAME No. F03AC318).
- Rodrigues, L., Bach, L., Dubourg-Savage, M.J., Goodwin, J. and Harbusch, C. 2008. Guidelines for consideration of bats in wind farm projects. EUROBATS Publication Series No. 3 (English version). UNEP/EUROBATS Secretariat, Bonn, Germany.
- Russ, J. 2008. Review of ASSI designation for bats in Northern Ireland. Northern Ireland Environment Agency, Research and Development Series 08/09.
- Russ, J.M., Hutson, A.M., Montgomery, W.I., Racey, P.A. & Speakman, J.R. 2001. The status of Nathusius' pipistrelle (*Pipistrellus nathusii* Keyserling & Blasius, 1839) in the British Isles. *J. Zoo.*, London (2001) 254: 91-100.
- SNH, 2011. Bat Species in Scotland. Available from: <http://www.snh.gov.uk/docs/C208532.pdf> [accessed 13 October 2011].
- Szewczak, J.M. and Arnett E.B. 2006. Ultrasound emissions from wind turbines as a potential attractant to bats: a preliminary investigation. Report produced by Humboldt State University, Arcata, California and Bat Conservation International, Austin, Texas both in the U.S.A.