European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC)

Fourth Report by the United Kingdom under Article 17

on the implementation of the Directive
from January 2013 to December 2018

Supporting documentation for the
conservation status assessment for the species:

S1312 - Noctule (*Nyctalus noctula*)

ENGLAND

IMPORTANT NOTE - PLEASE READ

- The information in this document is a country-level contribution to the UK Report on the conservation status of this species, submitted to the European Commission as part of the 2019 UK Reporting under Article 17 of the EU Habitats Directive.
- The 2019 Article 17 UK Approach document provides details on how this supporting information was used to produce the UK Report.
- The UK Report on the conservation status of this species is provided in a separate document.
- The reporting fields and options used are aligned to those set out in the European Commission guidance.
- Explanatory notes (where provided) by the country are included at the end. These provide an audit trail of relevant supporting information.
- Some of the reporting fields have been left blank because either: (i) there was insufficient information to complete the field; (ii) completion of the field was not obligatory; (iii) the field was not relevant to this species (section 12 Natura 2000 coverage for Annex II species) and/or (iv) the field was only relevant at UK-level (sections 9 Future prospects and 10 Conclusions).
- For technical reasons, the country-level future trends for Range, Population and Habitat for the species are only available in a separate spreadsheet that contains all the country-level supporting information.
- The country-level reporting information for all habitats and species is also available in spreadsheet format.

Visit the JNCC website, https://jncc.gov.uk/article17, for further information on UK Article 17 reporting.

Report on the main results of the surveillance under Article 11 for Annex II, IV and V species (Annex B)

NATIONAL LEVEL

1. General information

1.1 Member State	**UK (England information only)**
1.2 Species code	**1312**
1.3 Species scientific name	**Nyctalus noctula**
1.4 Alternative species scientific name	
1.5 Common name (in national language)	Noctule

2. Maps

2.1 Sensitive species	No
2.2 Year or period	1995-2016
2.3 Distribution map	Yes
2.4 Distribution map Method used	Based mainly on extrapolation from a limited amount of data
2.5 Additional maps	No

3. Information related to Annex V Species (Art. 14)

3.1 Is the species taken in the wild/exploited?		No
3.2 Which of the measures in Art. 14 have been taken?	a) regulations regarding access to property	No
	b) temporary or local prohibition of the taking of specimens in the wild and exploitation	No
	c) regulation of the periods and/or methods of taking specimens	No
	d) application of hunting and fishing rules which take account of the conservation of such populations	No
	e) establishment of a system of licences for taking specimens or of quotas	No
	f) regulation of the purchase, sale, offering for sale, keeping for sale or transport for sale of specimens	No
	g) breeding in captivity of animal species as well as artificial propagation of plant species	No
	h) other measures	No

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3.3 Hunting bag or quantity taken in the wild for Mammals and Acipenseridae (Fish)

a) Unit

b) Statistics/ quantity taken	Provide statistics/quantity per hunting season or per year (where season is not used) over the reporting period					
	Season/ year 1	Season/ year 2	Season/ year 3	Season/ year 4	Season/ year 5	Season/ year 6
Min. (raw, ie. not rounded)						
Max. (raw, ie. not rounded)						
Unknown	No	No	No	No	No	No

3.4. Hunting bag or quantity taken in the wild Method used

3.5. Additional information

BIOGEOGRAPHICAL LEVEL

4. Biogeographical and marine regions

4.1 Biogeographical or marine region where the species occurs

Atlantic (ATL)

4.2 Sources of information

Arnold, H., 1993. Atlas of Mammals in Britain.(Institute of Terrestrial Ecology Research Publication no. 6), London.
Bat Conservation Trust, 2018. The National Bat Monitoring Programme. Annual Report 2017, Bat Conservation Trust, London.
Boye, P., Dietz, M. 2005. Development of good practice guidelines for woodland management for bats. English Nature.
Dietz, C., Kiefer, A., 2016. Bats of Britain and Europe. Bloomsbury, United Kingdom.
Harris, S., Morris, P., Wray, S. & Yalden, D. 1995. A review of British Mammals: population estimates and conservation status of British mammals other than cetaceans. JNCC, Peterborough.
Joint Nature Conservation Committee. 2013. Third Report by the United Kingdom under Article 17 on the implementation of the Habitats Directive from January 2007 to December 2012.
Jones, G. (1995). Flight performance, echolocation and foraging behaviour in noctule bats Nyctalus noctula. Journal of Zoology 237(2): 303-312.
Mackie, I. J. and P. A. Racey (2007). Habitat use varies with reproductive state in noctule bats (Nyctalus noctula): Implications for conservation. Biological Conservation 140(1-2): 70-77.
Mathews, F., Kubasiewicz, L.M., Gurnell, J., Harrower, C., McDonald, R.A., Shore, R.F. 2018. A review of the population and conservation status of British Mammals. A report by The Mammal Society under contract to Natural England, Natural Resources Wales and Scottish Natural Heritage.
Mitchell-Jones, T.J. 2010. Bats in houses - the conservation challenge. Pp 365-378 in Species Management:challenges and solutions for the 21st century.

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Rodrigues, L., Bach, L., Dubourg-Savage, M.-J., Karapandza, B., Kovac, D., Kervyn, T., Dekker, J., Kepel, A., Bach, P., Collins, J., Harbusch, C., Park, K.J., Micevski, B., Minderman, J., 2014. Guidelines for consideration of bats in wind farm projects - Revision 2014
Rydell, J., Bach, L., Dubourg-Savage, M.-J., Green, M., Rodrigues, L., Hedenstrom, A., 2010. Bat mortality at wind turbines in northwestern Europe. Acta Chiropterologica 12, 261-274.
Speakman, J. 1991. The impact of predation by birds on bat populations in the British Isles. Mammal Review. 21, 123-142.

5. Range

5.1 Surface area (km²)		
5.2 Short-term trend Period		
5.3 Short-term trend Direction	Stable (0)	
5.4 Short-term trend Magnitude	a) Minimum	b) Maximum
5.5 Short-term trend Method used		
5.6 Long-term trend Period		
5.7 Long-term trend Direction		
5.8 Long-term trend Magnitude	a) Minimum	b) Maximum
5.9 Long-term trend Method used		
5.10 Favourable reference range	a) Area (km²)	126913
	b) Operator	
	c) Unknown	
	d) Method	Range is based on presence data collected between 1995-2016. Areas that contain very isolated records may not have been included in the area of distribution. The range has been taken from Mathews et al 2018, whereby an alpha hull value of 20km was drawn around the presence records, which represented the best balance between the inclusion of unoccupied sites (i.e. where records are sparse but close enough for inclusion) and the exclusion of occupied areas due to gaps in the data (i.e. where records exist but are too isolated for inclusion). An additional 10km buffer was added to the final hull polygon to provide smoothing to the hull and to ensure that the hull covered the areas recorded rather than intersecting them. This differs from the approach taken in 2013 and 2007 whereby a 45km alpha hull value was used for all species with a starting range unit of individual 10km squares. The new method has led to much finer detail maps being produced underpinned by data gathered at a much finer resolution, leading to the production of a more accurate
5.11 Change and reason for change in surface area of range	Improved knowledge/more accurate data Use of different method	
	The change is mainly due to:	Use of different method
5.12 Additional information	The distribution in England is similar to that reported by Arnold (1993), but with more records around the border with Scotland. It is unclear whether this	

represents true range expansion or focused increase in observer effort, especially in relation to new wind farm developments in the borders and SW of Scotland. The range is comparable with that given in the Article 17 Reports (Joint Nature Conservation Committee 2013).

6. Population

6.1 Year or period		1995-2016
6.2 Population size (in reporting unit)	a) Unit	number of map 1x1 km grid cells (grids1x1)
	b) Minimum	
	c) Maximum	
	d) Best single value	
6.3 Type of estimate		Best estimate
6.4 Additional population size (using population unit other than reporting unit)	a) Unit	number of adults (adults)
	b) Minimum	17700
	c) Maximum	1872000
	d) Best single value	
6.5 Type of estimate		95% confidence interval
6.6 Population size Method used		Based mainly on extrapolation from a limited amount of data
6.7 Short-term trend Period		2006-2017
6.8 Short-term trend Direction		Stable (0)
6.9 Short-term trend Magnitude	a) Minimum	
	b) Maximum	
	c) Confidence interval	
6.10 Short-term trend Method used		Complete survey or a statistically robust estimate
6.11 Long-term trend Period		
6.12 Long-term trend Direction		
6.13 Long-term trend Magnitude	a) Minimum	
	b) Maximum	
	c) Confidence interval	
6.14 Long-term trend Method used		
6.15 Favourable reference population (using the unit in 6.2 or 6.4)	a) Population size	
	b) Operator	
	c) Unknown	
	d) Method	
6.16 Change and reason for change in population size		Improved knowledge/more accurate data Use of different method
	The change is mainly due to:	Use of different method
6.17 Additional information		The difference in population size between reporting rounds is most attributable

6.17 Additional information	to a change in methodology, although more data are also available. The estimates by Harris et al (1995) for the previous reporting rounds were based on expert judgement and extrapolation from limited field surveys. The 1995 population estimate for Great Britain was based on very limited information, extrapolating from the known size of Pipistrellus pipistrellus colonies in relation to size of N. Noctula colonies following the methods described by Speakman (1991) and taking into account the relative frequency of species in bats submitted for rabies testing. Harris et al's (1995) reliability rating of the estimate was 3, meaning that it is based on a limited amount of information on the species and the error margins around the estimate aree thought to be +/- 50%. The new estimate, taken from Mathews et al (2018) is considered to be more robust.

7. Habitat for the species

7.1 Sufficiency of area and quality of occupied habitat	a) Are area and quality of occupied habitat sufficient (to maintain the species at FCS)?	Yes
	b) Is there a sufficiently large area of occupied AND unoccupied habitat of suitable quality (to maintain the species at FCS)?	
7.2 Sufficiency of area and quality of occupied habitat Method used	Based mainly on expert opinion with very limited data	
7.3 Short-term trend Period	1999-2016	
7.4 Short-term trend Direction	Stable (0)	
7.5 Short-term trend Method used	Based mainly on expert opinion with very limited data	
7.6 Long-term trend Period		
7.7 Long-term trend Direction		
7.8 Long-term trend Method used		
7.9 Additional information		

8. Main pressures and threats

8.1 Characterisation of pressures/threats

Pressure	Ranking
Removal of small landscape features for agricultural land parcel consolidation (hedges, stone walls, rushes, open ditches, springs, solitary trees, etc.) (A05)	M
Abandonment of grassland management (e.g. cessation of grazing or mowing) (A06)	M
Use of other pest control methods in agriculture (excluding tillage) (A23)	M
Conversion to other types of forests including monocultures (B02)	M
Removal of dead and dying trees, including debris (B07)	H
Removal of old trees (excluding dead or dying trees) (B08)	H
Clear-cutting, removal of all trees (B09)	H

Forest management reducing old growth forests (B15)	H
Wind, wave and tidal power, including infrastructure (D01)	H
Construction or modification (e.g. of housing and settlements) in existing urban or recreational areas (F02)	M

Threat	Ranking
Removal of small landscape features for agricultural land parcel consolidation (hedges, stone walls, rushes, open ditches, springs, solitary trees, etc.) (A05)	M
Abandonment of grassland management (e.g. cessation of grazing or mowing) (A06)	M
Use of other pest control methods in agriculture (excluding tillage) (A23)	M
Conversion to other types of forests including monocultures (B02)	M
Removal of dead and dying trees, including debris (B07)	H
Removal of old trees (excluding dead or dying trees) (B08)	H
Clear-cutting, removal of all trees (B09)	H
Forest management reducing old growth forests (B15)	H
Wind, wave and tidal power, including infrastructure (D01)	H
Construction or modification (e.g. of housing and settlements) in existing urban or recreational areas (F02)	M

8.2 Sources of information

8.3 Additional information

9. Conservation measures

9.1 Status of measures	a) Are measures needed?	Yes
	b) Indicate the status of measures	Measures identified and taken
9.2 Main purpose of the measures taken		Maintain the current range, population and/or habitat for the species
9.3 Location of the measures taken		Both inside and outside Natura 2000
9.4 Response to the measures		Medium-term results (within the next two reporting periods, 2019-2030)

9.5 List of main conservation measures

Restore small landscape features on agricultural land (CA02)
Other measures related to agricultural practices (CA16)
Adapt/change forest management and exploitation practices (CB05)
Stop forest management and exploitation practices (CB06)
Prevent conversion of (semi-) natural habitats into forests and of (semi-)natural forests into intensive forest plantation (CB01)
Adapt/manage renewable energy installation, facilities and operation (CC03)

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Other measures related to residential, commercial, industrial and recreational infrastructures, operations and activities (CF12)

Adapt/manage reforestation and forest regeneration (CB04)

9.6 Additional information	Legal and administrative measures continue to be required to ensure that the protection provided by the legislation is effective and that protected habitats for the species are managed appropriately. Wind turbine design and operation needs to take into account the likely impact on bats, e.g. in relation to mortality and habitat fragmentation. Noctule bats hunt over pastures and in deciduous or mixed woodland. Environmental land management schemes in the agricultural and forestry sectors are now widely used to ensure these habitats in the vicinity of roosts are well-managed and provide appropriate insect food at the correct time of year. Planning at landscape scale is required to conserve commuting routes and foraging areas.

10. Future prospects

10.1 Future prospects of parameters	a) Range b) Population c) Habitat of the species
10.2 Additional information	The range for noctule bats is likely to have remained stable as the species is relatively widespread and appears to be covering roughly the same range as in the previous reporting round (2007-2012), even though different methods were used to perform this calculation. The population appears to be stable as shown continuously through the National Bat Monitoring Programme trend data. Due to the species ability to roost in a variety of woodland locations and inhabit a matrix of woodland habitat types the habitat for the species has been recorded as stable

11. Conclusions

11.1. Range	
11.2. Population	
11.3. Habitat for the species	
11.4. Future prospects	
11.5 Overall assessment of Conservation Status	
11.6 Overall trend in Conservation Status	
11.7 Change and reasons for change in conservation status and conservation status trend	a) Overall assessment of conservation status No change The change is mainly due to: b) Overall trend in conservation status No change The change is mainly due to:
11.8 Additional information	

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12. Natura 2000 (pSCIs, SCIs and SACs) coverage for Annex II species

12.1 Population size inside the pSCIs, SCIs and SACs network (on the biogeographical/marine level including all sites where the species is present)	a) Unit b) Minimum c) Maximum d) Best single value
12.2 Type of estimate	
12.3 Population size inside the network Method used	
12.4 Short-term trend of population size within the network Direction	
12.5 Short-term trend of population size within the network Method used	
12.6 Additional information	

13. Complementary information

13.1 Justification of % thresholds for trends
13.2 Trans-boundary assessment
13.3 Other relevant Information

Distribution Map

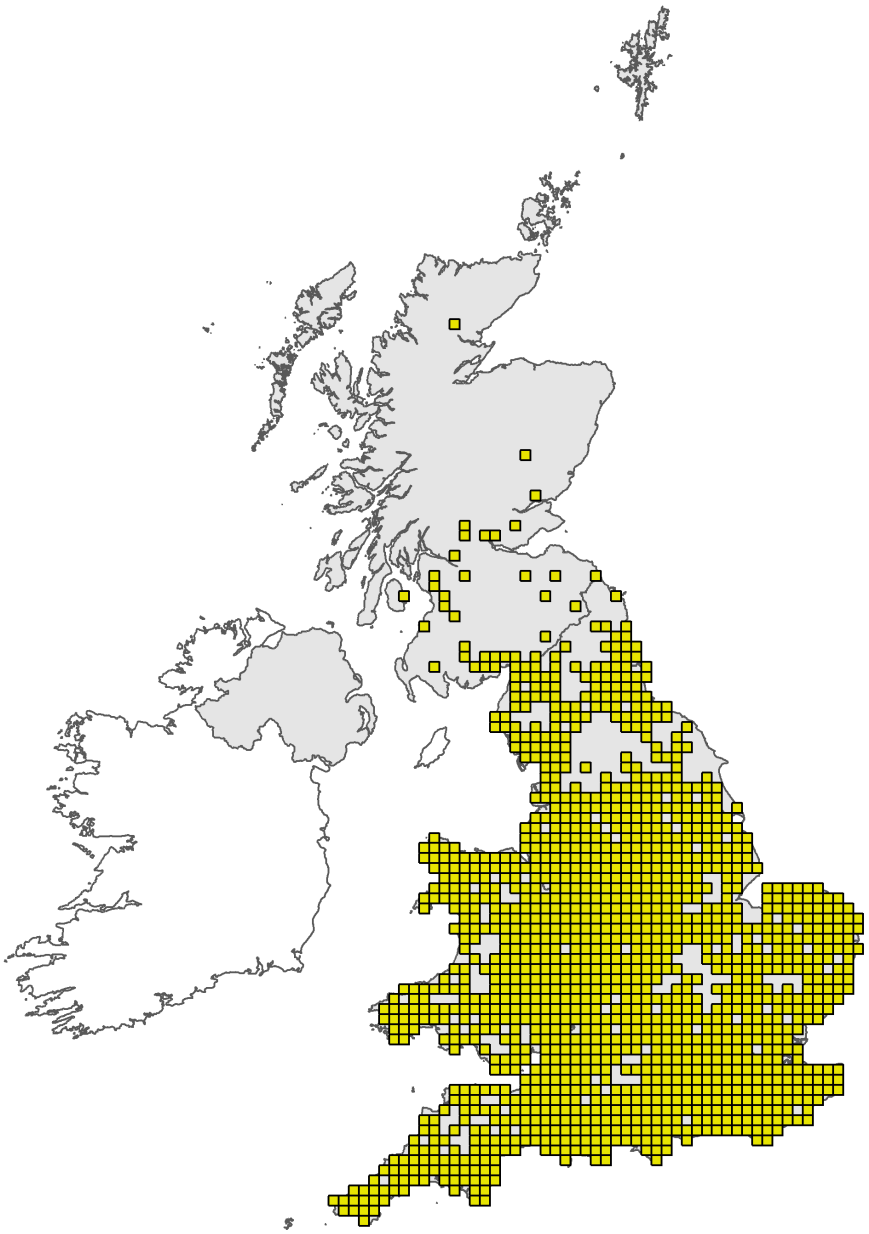

Figure 1: UK distribution map for S1312 - Noctule (*Nyctalus noctula*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

The 10km grid square distribution map is based on available species records within the current reporting period. For further details see the 2019 Article 17 UK Approach document.

Range Map

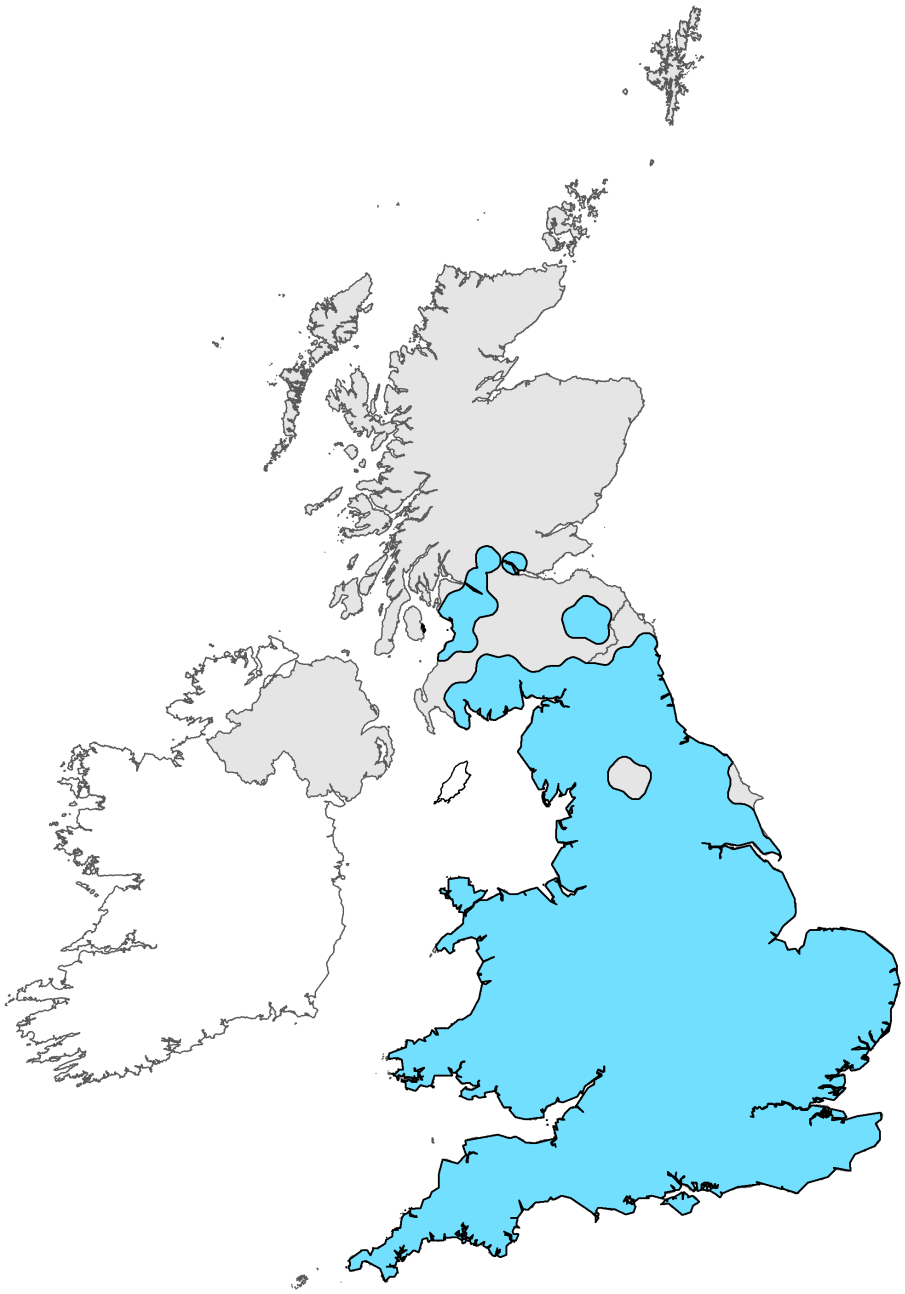

Figure 2: UK range map for S1312 - Noctule (*Nyctalus noctula*).Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

The range map has been produced by The Mammal Society applying a range mapping tool as outlined in Matthews et al. (2018), to the 10km grid square distribution map presented in Figure 1. The alpha value for this species was 20km. For further details see the 2019 Article 17 UK Approach document.

Explanatory Notes

Species name: Nyctalus noctula (1312)

Field label	Note
1.5 Common name	The noctule is a typical forest species that forages, breeds, mates, and hibernates in woodlands. However they have a characteristic powerful, direct flight on narrow pointed wings and fly in the open, often well above tree-top level, with repeated steep dives when chasing insects. The species has a loud echolocation call which is easily picked up on bat detectors, although overlap in call parameters with N. leiseri and Eptesicus serotinus can make accurate identification difficult if heterodyne detectors are used. The noctule is considered to be the most widespread and common of these species.
2.2 Year or Period	This time period has been selected as distribution has been calculated using data from Mathews et al 2018.
2.3 Distribution map	The noctule is widespread in England, but is absent from the uplands of northern England. Although there has been no structured distribution surveys, this species has been reasonably well recorded by local bat groups and during monitoring surveys organised by the National Bat Monitoring Programme due to the relatively long distance over which their calls can be heard (226530m) and their high altitude flight in open space (Dietz and Keifer 2016). There is considerable overlap in the call parameters with the other Nyctaloid bats, N. leiseri and Eptesicus serotinus. Many acoustic records are not supported by regional records of bats identified in the hand (or by molecular analysis of droppings), raising doubts about their validity, but the noctule is considered to be the most widespread of these species.

Species name: Nyctalus noctula (1312) Region code: ATL

Field label	Note
5.3 Short term trend; Direction	Structured field surveys for the species have been undertaken since 1998 through the National Bat Monitoring Programme (NBMP). There has not been a full survey of every 10km square within the species range and the species is not often encountered in dwelling houses. However, the level of recording is high for this species through surveys conducted by local bat groups and those conducted for development work.
6.1 Year or Period	Presence data was collected between 1995-2016 at 10km resolution or higher, gathered from the NBN gateway, local records centres, individual species experts, national and local monitoring schemes and iRecord for each species for the 'Review of the Population and Conservation Status of British Mammals (Mathews et al, 2018) used to determine population status for the species for this report. However, the population was determined between 2016-2017 and only data that had been verified by the source organisation was included in the distribution maps.

6.4 Additional population size	Mathews et al (2018) calculated a population size of adult individuals of 565,000 for England with upper and lower confidence intervals of 17,700 - 1,872,000. There is considerable uncertainty surrounding the population estimates for this species as demonstrated by the wide confidence intervals. Population size was calculated using the median adult density (bats/km2) * total habitable area within the range (km2) (for full details see Mathews et al 2018). Habitable area was defined as all area within the range excluding montane habitat since this is unlikely to include suitable locations for maternity roosts. Because of the landscape-wide movements of bats and their dependency on a matrix of habitats and roosting locations, it is not currently possible to make more refined estimates of the area of suitable habitat within the range. The density of maternity roosts accross England is highly uncertain as it is highly likely large numbers of roosts are unreported. Further, a colony may make use of multiple roosts and switch between them, meaning that there is likely to be high variability in counts at individual sites. There is a lack information available from the literature indicating that that there is little or no understanding of noctule bat roost (or colony) density. No information is available on the sex ratio within maternity colonies pre-breeding. The calculations presented by Mathews et al (2018) are based on an assumption that all individuals in recorded sites are female. If half of the individuals are male, this would halve the estimates presented. Given the large effect on the total population size, further research is urgently required. The main population size estimates provided by Mathews et al (2018) are an order of magnitude greater than those in Harris et al. (1995) and the Article 17 Reports (Joint Nature Conservation Committee 2013). Nevertheless, the values previously estimated do fall within the plausible limits
6.8 Short term trend; Direction	The National Bat Monitoring Programme (BCT 2018) monitors noctule populations through field surveys of stratified random 1km squares. The assumption is that trends occuring in sample sites reflect trends occuring in the general population. Populations of Noctules are considered to have been stable in England over the period 1999-2016, although there have been fluctuations throughout this period. Overall there has been no significant change in the smoothed index since the baseline year. Data from 495 sites contribute to the overall trend analysis in England.

7.1 Sufficiency of area and quality of occupied habitat	N. Noctula requires a complex mosaic of habitats to support foraging, roosting and commuting behaviour. Boye and Dietz (2005) provide a good overview of this species' habitat requirements. Foraging areas may be in several parts of the landscape, all of which host a high abundance of insect fauna and offer the space needed by the fast flying N. Noctula. Large water bodies, valley pastures and broadleaved woodland are preferred, but the bats also forage in other habitats and even above harvested fields and urban street lights. The species emerges early, particularly during lactation (Jones 1995, Mackie and Racey 2007), and is therefore sometimes thought to benefit from artificial night lighting. However there is no evidence of higher noctule activity in areas that are lit compared with dark control sites (Mathews et al 2015). N. Noctula can easily make foraging flights more than 10 kilometres away from the roost site, up to a maximum of 20 kilometres. However, the main activity of a maternity colony is within a radius of about 2 kilometres from the colony's roost. Summer roosts are predominantly in woodlands and parks. Deciduous and flood forests with a high percentage of old and dead trees are of highest importance. Roosts are mostly in woodpecker holes in broad-leaved trees. Maternity colonies use several roost sites in a network, which means that the individuals often change from one roost to another. Associations of males, which change their roost sites on average every second or third day, need at least eight tree holes suitable for roosting per square kilometre of forest. Besides tree holes, the bats also roost in bat boxes (flat constructions are preferred) and small spaces behind wall coverings of buildings or in houses. Winter roosts are mainly in forest and park trees, but large hibernation colonies also roost in buildings or rock crevices. Tree holes must provide a lot of space for a large number of bats in order to be a good hibernaculum for the species. There is no or insufficient reliable information available to determine the quality of the habitat, however, it is suspected that the amount of habitat in the UK is sufficient to support a viable population of the species.
7.2 Sufficiency of area and quality of occupied habitat; Method used	The habitable area has been taken from Mathews et al (2018), which defined all the area within the range as habitable excluding montane habitat since this is unlikely to include suitable locations for maternity roosts. The habitable area within the range is noted as 126,913 km2, but it is unlikely that the entirety of this area forms suitable habitat. To obtain a proper estimate of suitable habitat used by the species, it would be necessary to first identify all of the foraging and roosting habitat located within the current range boundary; determine whether or not each of these features were being used; and subsequently calculate the combined area of all currently used habitats. This process would require very detailed habitat information at a fine scale across the UK. We do not currently have this level of information.
7.4 Short term trend; Direction	Due to the species ability to roost in a variety of woodland locations and inhabit a matrix of woodland habitat types, the short term direction for habitat is thought to be stable.
8.1 Characterisation of pressures/ threats	The noctule bat is primarily a tree-roosting species, so would be vulnerable to loss of roost opportunities in dead, dying or damaged trees. The species can also roost in buildings, so could be vulnerable to roost loss through the demolition or alteration of buildings or changes to construction methods (Mitchell-Jones, 2010). Pressures that affect the biomass of flying insects, such as the widespread use of pesticides, could also affect this species. Noctule bats have a high risk of collision with wind turbines as they fly and forage in open areas and are known to be killed by wind turbines in Europe (Rodrigues et al 2014, Rydell et al 2010).