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:

S1308 - Barbastelle (*Barbastella barbastellus*)

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.

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NATIONAL LEVEL

1. General information

1.1 Member State	**UK (England information only)**
1.2 Species code	**1308**
1.3 Species scientific name	**Barbastella barbastellus**
1.4 Alternative species scientific name	
1.5 Common name (in national language)	Barbastelle

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	Complete survey or a statistically robust estimate
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

Ancillotto, L., L. Cistrone, F. Moscini, G. Jones, L. Boitani and D. Russo (2015). The importance of non-forest landscapes for the conservation of forest bats: lessons from barbastelles (Barbastella barbastellus). Biodiversity and Conservation, 24 (1), 171-185.
Arnold, H.R. (1993). Atlas of Mammals in Britain, Joint Nature Conservation Committee/ Institute of Terrestrial Ecology.
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.
Russo, D., L. Cistrone, G. Jones and S. Mazzoleni (2004). Roost selection by barbastelle bats (Barbastella barbastellus, Chiroptera: Vespertilionidae) in beech woodlands of central Italy: consequences for conservation. Biological Conservation, 117 (1), 73-81
Sierro, A. and R. Arlettaz (1997). Barbastelle bats (Barbastella spp) specialise in the predation of moths: implications for foraging tactics and conservation. Acta Oecological, 18 (2), 91-106
Zeale, M.R.K. (2011). Conservation biology of the barbastelle (Barbastella barbastellus): applications of spatial modelling, ecology and molecular analysis of diet. PhD, University of Bristol
Zeale, M.R.K., I. Davidson-Watts and G. Jones (2012). Home range use and habitat selection by barbastelle bats (Barbastella barbastellus): implications for conservation. Journal of Mammology, 93 (4), 1110-1118

5. Range

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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)	67610
	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 FRR. Added to which acoustic detectors have changed considerably over the years in both accuracy and sensitivity, which also adds to the production of this value.
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 distributions reported in previous Article 17 reports were based on very sparse data compared with the data currently available. Whilst, Arnold (1993) suggested that there had been a serious decline in the population, based on the difference in the range of the species inferred from records up to 1959 compared with those from 1960 onwards, the current data indicates that range is similar to all available historical data with the exception that there are no longer any records north of the Humber (whereas, Arnold (1993) shows positive hectads in S.Yorkshire). The last Article 17 report for this species (2007-2012) used a larger alpha kernel (45km compared with 20km) used in this report, taken from Mathews et al (2018). The choice of alpha value is a compromise between	

over estimating the range and giving too much weight to absences that result from lack of recorder effort. Given the recent increases in observer effort and the widespread deployment of static acoustic detectors, it has been possible to use a smaller alpha kernel. The current range is therefore considered likely to be more appropriate than the previous report. The apparent change in range is therefore an artefact.

6. Population

6.1 Year or period	1995-2016	
6.2 Population size (in reporting unit)	a) Unit	number of individuals (i)
	b) Minimum	4500
	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	
	b) Minimum	
	c) Maximum	
	d) Best single value	
6.5 Type of estimate		
6.6 Population size Method used	Based mainly on expert opinion with very limited data	
6.7 Short-term trend Period	1995-2016	
6.8 Short-term trend Direction	Unknown (x)	
6.9 Short-term trend Magnitude	a) Minimum	
	b) Maximum	
	c) Confidence interval	
6.10 Short-term trend Method used	Based mainly on expert opinion with very limited data	
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	x
	d) Method	It has not been possible to determine a Favourable reference population for this species as there is too little data available for this species to be able to set a value.
6.16 Change and reason for change in population size	No change	

	The change is mainly due to:
6.17 Additional information	The population figure has remained the same as that recorded in the previous Article 17 reporting period (Jan 2007 - Dec 2012) as there is insufficient data to update the population for this species.

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)?	Unknown
	b) Is there a sufficiently large area of occupied AND unoccupied habitat of suitable quality (to maintain the species at FCS)?	Unknown
7.2 Sufficiency of area and quality of occupied habitat Method used	Insufficient or no data available	
7.3 Short-term trend Period	1995-2016	
7.4 Short-term trend Direction	Unknown (x)	
7.5 Short-term trend Method used	Insufficient or no data available	
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
Conversion to other types of forests including monocultures (B02)	H
Logging without replanting or natural regrowth (B05)	H
Logging (excluding clear cutting) of individual trees (B06)	H
Removal of dead and dying trees, including debris (B07)	M
Removal of old trees (excluding dead or dying trees) (B08)	H
Clear-cutting, removal of all trees (B09)	H
Application of synthetic fertilisers in forestry, including liming of forest soils (B19)	M
Conversion from one type of agricultural land use to another (excluding drainage and burning) (A02)	M
Drainage for use as agricultural land (A31)	M

Threat	Ranking
Conversion to other types of forests including monocultures (B02)	H
Logging without replanting or natural regrowth (B05)	H
Logging (excluding clear cutting) of individual trees (B06)	H

Removal of dead and dying trees, including debris (B07)	M
Removal of old trees (excluding dead or dying trees) (B08)	H
Clear-cutting, removal of all trees (B09)	H
Application of synthetic fertilisers in forestry, including liming of forest soils (B19)	M
Conversion from one type of agricultural land use to another (excluding drainage and burning) (A02)	M
Drainage for use as agricultural land (A31)	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: Long-term results (after 2030)

9.5 List of main conservation measures

Prevent conversion of natural and semi-natural habitats, and habitats of species into agricultural land (CA01)
Manage drainage and irrigation operations and infrastructures in agriculture (CA15)
Prevent conversion of (semi-) natural habitats into forests and of (semi-)natural forests into intensive forest plantation (CB01)
Adapt/manage reforestation and forest regeneration (CB04)
Adapt/change forest management and exploitation practices (CB05)
Stop forest management and exploitation practices (CB06)
Manage the use of chemicals for fertilisation, liming and pest control in forestry (CB09)

9.6 Additional information

Legal and administrative measures continue to be required to ensure that the protection provided by the legislation is effective. However, although a few measures have been identified for the species, the list is likely to be incomplete as several knowledge gaps persist for this species and further research is needed to identify further measures and the practical implementation of those measures for this species.

10. Future prospects

10.1 Future prospects of parameters

a) Range

b) Population

c) Habitat of the species

10.2 Additional information

Whilst Arnold (1993) suggested that there had been a serious decline in population, based on the difference in the range of the species inferred from

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records up to 1959 compared with those from 1960 onwards, the current data indicates that range is similar to all available historical data with the exception that there are no longer any records north of the Humber (whereas Arnold shows positive hectads in S. Yorkshire) (Mathews et at, 2018). Given the recent increases in observer effort given the widespread deployment of static acoustic detectors, it was possible to use a smaller alpha kernel (20km as opposed to 45km) when computing range. The current range is considered to be more appropriate than that reported in the previous Article 17 report (January 2007 - December 2012) and any apparent change in range size is therefore an artefact of this process (Mathews et al, 2018). Range is likely to have remained stable. It has not been possible to determine the habitat for the species or any change in population as there is insufficient data to be able to determine this at this time.

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	

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	Insufficient or no data available
12.4 Short-term trend of population size within the network Direction	Unknown (x)

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12.5 Short-term trend of population size within the network Method used	Insufficient or no data available
12.6 Additional information	Although, the species is monitored within the protected sites, where it occurs through the National Bat Monitoring Programme (NBMP) Woodland Survey, there is currently only sufficient information to record species presence rather than populations or any changes in trend for this species.

13. Complementary information

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

Distribution Map

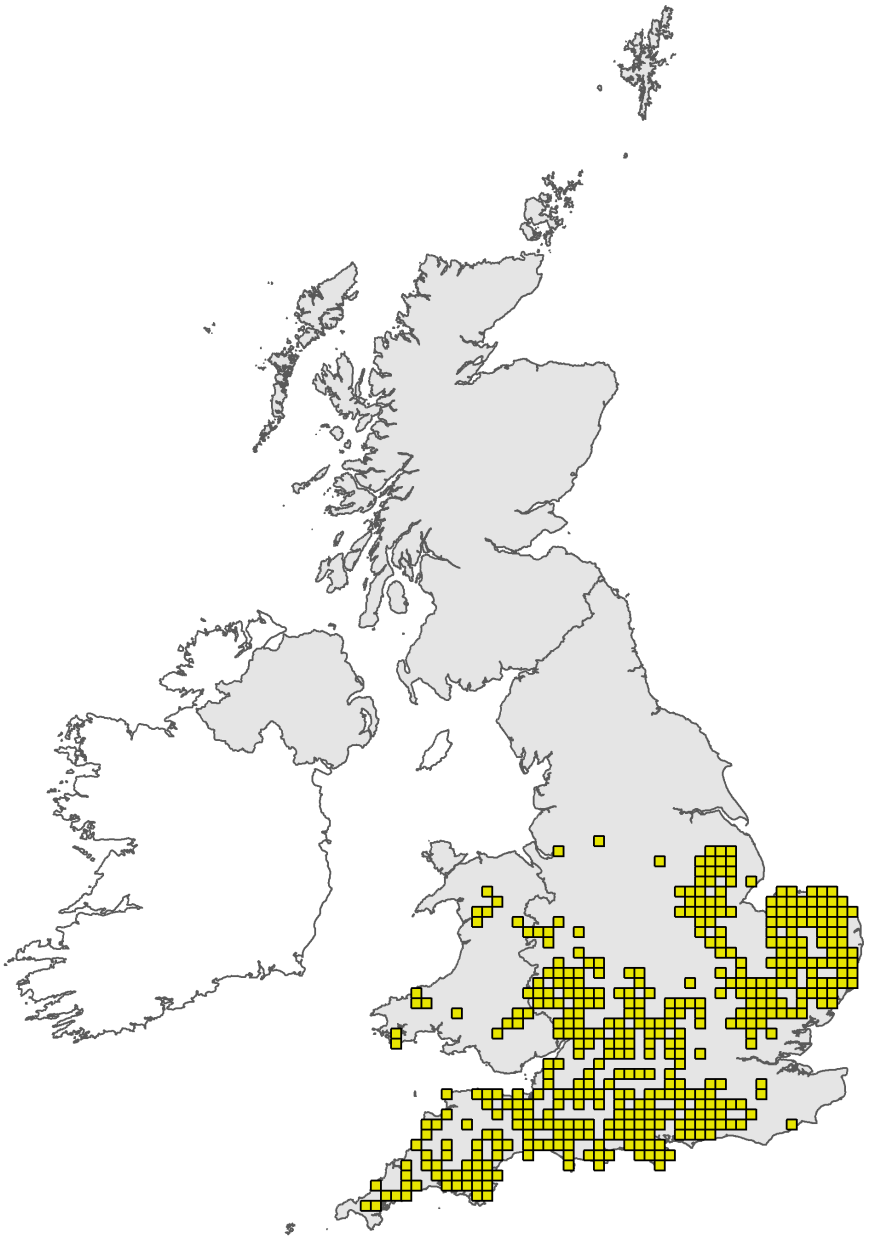

Figure 1: UK distribution map for S1308 - Barbastelle (*Barbastella barbastellus*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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

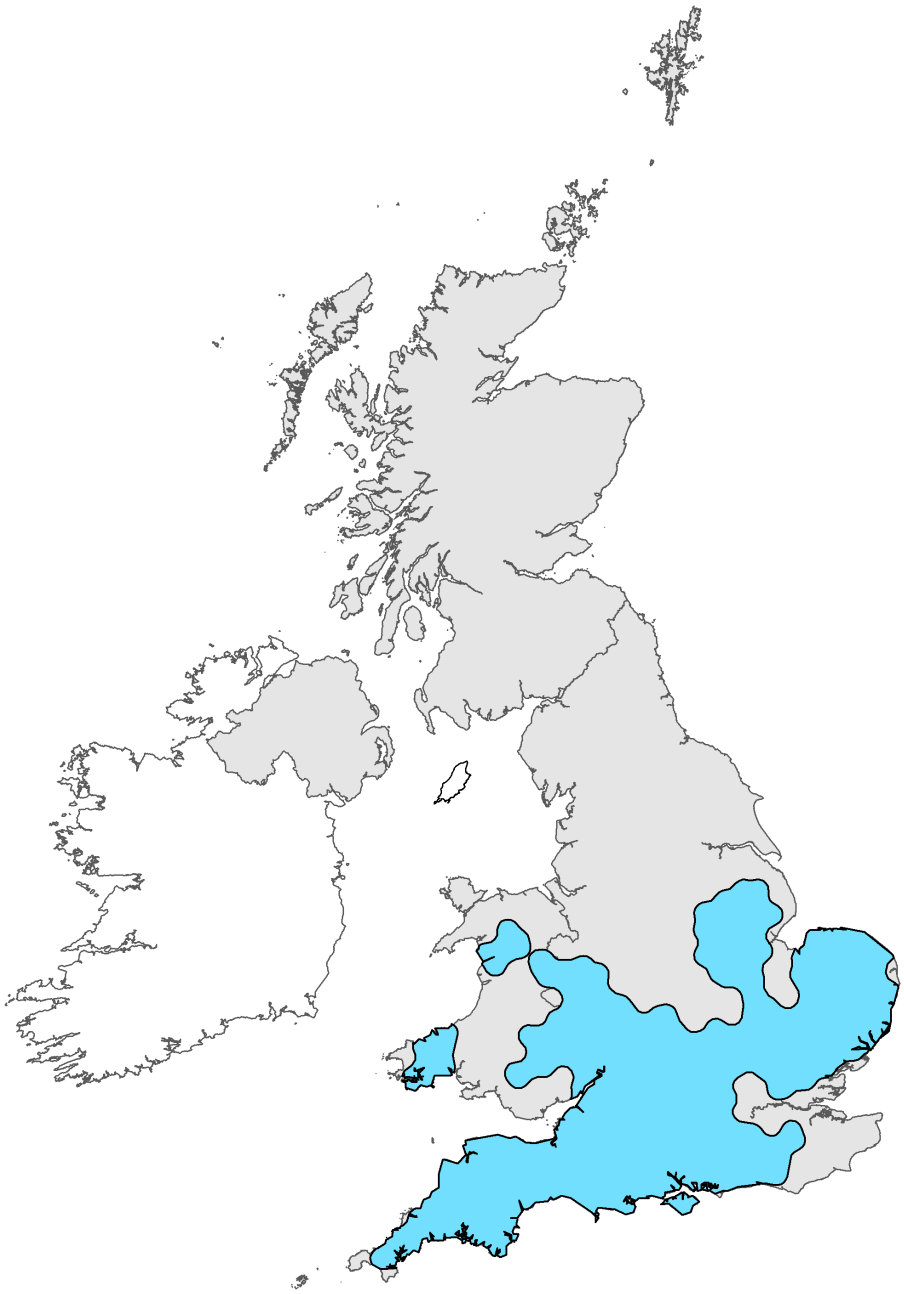

Figure 2: UK range map for S1308 - Barbastelle (*Barbastella barbastellus*).Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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: Barbastella barbastellus (1308)

Field label	Note
1.5 Common name	The barbastelle bat is a rare species throughout its UK range, with relatively few known roosts. The use of acoustic detectors has improved the detection of the species and increased its known range slightly. Records of the species are scattered, though the species is known to be present in England south of a line from the Mersey to the Humber. The first maternity colonies were identified in 1997. More than 30 maternity roosting locations have now been found, all of which are in tree holes bar one, a building roost - Paston Great Barn NNR, Norfolk. Individual bats can be found in barns and other buildings in Britain, though the preference seems to be for old or dead oak (Zeale et al, 2012). The barbastelle bat is a specialist of broadleaved woodland and radiotracking shows that riparian margins and broad-leaved woodland are strongly selected for foraging, though unimproved grassland, field margins and hedgerows are also important (Zeale et al, 2012). However, the species continues to use formerly forested landscapes long after they have changed to apparently unsuitable habitat (Ancillotto et al, 2015).

Species name: Barbastella barbastellus (1308) Region code: ATL

Field label	Note
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.
6.3 Type of estimate	The population estimate quoted was based on subjective estimates of relative abundance because there were few density estimates and a paucity of quantified data on bat numbers in relation to habitat associations and patterns of land use. For this species the estimate was believed on subjective criteria to be within the right order of magnitude but no greater degree of accuracy was thought to have been achieved. Insufficient data are available from monitoring to allow an update of this estimate from the previous Article 17 reporting round (Jan 2007 - Dec 2012).
6.8 Short term trend; Direction	The population estimate cannot be updated for this species due to insufficient data for this species; as such there is no data available to detect any change in trend so the trend is unknown.
7.1 Sufficiency of area and quality of occupied habitat	The area and quality of habitat for the species has been assessed as unknown as there is insufficient information available for this species to undertake this assessment. Further to this work in Italy has indicated that barbastelle bats can continue to use formerly forested landscapes long after they have changed to apparently unsuitable habitat, indicating that habitat suitability models based on woodland availability must be used with great caution (Ancillotto et al, 2015). Also, in GB there appears to be a preference for old or dead oak, almost any tree with suitable cavities can be used (Zeale, 2011) and elsewhere in Europe, the species preferentially roosts in beech trees (Russo et al, 2004). This further demonstrates that caution must be used before inferring habitat suitability from woodland composition (Mathews et al, 2018).

7.2 Sufficiency of area and quality of occupied habitat; Method used	The area and quality of habitat for the species has been assessed as unknown as there is insufficient information available for this species to undertake this assessment. Further to this work in Italy has indicated that barbastelle bats can continue to use formerly forested landscapes long after they have changed to apparently unsuitable habitat, indicating that habitat suitability models based on woodland availability must be used with great caution (Ancillotto et al, 2015). Also, in GB there appears to be a preference for old or dead oak, almost any tree with suitable cavities can be used (Zeale, 2011) and elsewhere in Europe, the species preferentially roosts in beech trees (Russo et al, 2004). This further demonstrates that caution must be used before inferring habitat suitability from woodland composition (Mathews et al, 2018).
7.4 Short term trend; Direction	As the area and quality of known occupied and unknown habitat cannot be assessed the short term trend direction is unknown.
7.5 Short term trend; Method used	There is insufficient information to assess the trend.
8.1 Characterisation of pressures/ threats	The barbastelle bat is predominantly a woodland species, roosting most commonly under loose bark on large old trees. The species appears to have a preference for old or dead oak in GB (Zeale et al, 2011). Radiotracking evidence shows that riparian margins and broad-leaved woodland are strongly selected for foraging but unimproved grassland, field margins and hedgerows are also important (Zeale et al, 2012). Forestry operations and preventing the maintenance or development of this resource are likely to have an adverse effect. The barbastelle is a specialist moth feeder (>99% of diet; Sierro & Arlettaz, Zeale, 2011) so it's likely to be adversely affected by agricultural operations, including pesticide use that affect the biomass of suitable prey.
9.5 List of main conservation measures	Low population density and slow population growth are likely to have made this species particularly vulnerable to factors such as loss and fragmentation of ancient deciduous woodland habitat; the loss, destruction and disturbance of roosts in buildings, trees and underground sites and the reduction in numbers of insect prey due to habitat simplification and factors such as fertiliser and pesticide use and intensive grazing. The availability of dead and dying trees as roost sites and the lack of wetland for foraging are still major factors likely to affect the species status.