

**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:

S1323 - Bechstein's bat (*Myotis bechsteinii*)

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	1323
1.3 Species scientific name	<i>Myotis bechsteinii</i>
1.4 Alternative species scientific name	
1.5 Common name (in national language)	Bechstein's bat

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

Bat Conservation Trust (2018). The State of the UK's Bats 2017. Bat Conservation Trust, London. Available at (http://www.bats.org.uk/pages/results_and_reports.html)

Bat Conservation Trust (2017). The National Bat Monitoring Programme. Annual Report 2016. Bat Conservation Trust, London. Available at (www.bats.org.uk/pages/nbmp_annual_report.html)

Boye P, Dietz M. 2005. Research Report No 661: Development of good practice guidelines for woodland management for bats. English Nature, Peterborough.

Carey, P.D., Wallis, S., Chamberlain, P.M., Cooper, A., Emmett, B.A., Maskell, L.C., McCann, T., Murphy, J., Norton, L.R., Reynolds, B., Scott, W.A., Simpson, I.C., Smart, S.M. & Ulliyett, J.M. 2008. Countryside Survey: UK Results from 2007. NERC Centre for Ecology & Hydrology. CEH Project Number: C03259

Dietz C, Keifer A. 2016. Bats of Britain and Europe. London, Bloomsbury

Dietz M, Pir JB. 2009. Distribution and habitat selection of *Myotis bechsteinii* in Luxembourg: implications for forest management and conservation. *Folia Zoologica*, 58, 327-340.

Durrant C J, Beebee TJC, Greenaway F, Hill DA. 2009. Evidence of recent population bottlenecks and inbreeding in British populations of Bechstein's bat, *Myotis bechsteinii*. *Conservation Genetics*, 10(2), 489-496.

Forestry Commission (2017). Forestry Statistics 2017. Forest Research. Edinburgh.

Forestry Commission (2016). Preliminary estimates of the changes in canopy cover in British woodlands between 2006 and 2015. National Forest Inventory, Edinburgh.

Greenaway F, Hill DA. 2004. Woodland management advice for Bechstein's and barbastelle bat. *English Nature Research Reports*. 658.

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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.

Harris, S. and Yalden, D. (2008). Mammals of the British Isles: Handbook, Mammal Society.

Mathews F, Kubasiewicz LM, Gurnell J, Harrower C, McDonald RA, Shore RF. 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.

Miller H. 2011. Bechstein's bat survey: final report. September 2007-September 2011. Bat Conservation Trust, London.

Palmer E, Pimley E, Sutton G, Birks J. 2013. A study on the population size, foraging range and roosting ecology of Bechstein's bats at Grafton Wood SSSI Worcestershire. Report for the People's Trust for Endangered Species and Worcestershire Wildlife Trust.

Schofield H, Morris C. 2000. Ranging behaviour and habitat preferences of female Bechstein's bat, *Myotis bechsteinii* (Kuhl, 1818), in summer. Vincent Wildlife Trust.

Wright, P.G., Hamilton, P.B., Schofield, H., Glover, A., Damant, C., Davidson-Watts, I. and Mathews, F. (2018). Genetic structure and diversity of a rare woodland bat, *Myotis bechsteinii*: comparison of continental Europe and Britain. Conservation Genetics, 11-11.

5. Range

5.1 Surface area (km ²)		
5.2 Short-term trend Period		
5.3 Short-term trend Direction	Increasing (+)	
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 (km ²) b) Operator c) Unknown d) Method	23344 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

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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 this current FRR. Definitive comparisons with earlier distribution maps cannot be made because of changes in monitoring techniques and observer effort. It's likely that the FRR is lower than it would need to be to sustain the long term survival of this species should a substantial change in habitat availability and roosting opportunities occur, which are vulnerable given the species reliance on broadleaved woodland, particularly semi-natural ancient woodland with dense structured understorey (Greenaway and Hill, 2004) for summer roosting and foraging and its largely sedentary nature with summer and winter roosts generally being in close proximity (Dietz and Keifer, 2016).

5.11 Change and reason for change in surface area of range

Genuine change
Improved knowledge/more accurate data
Use of different method
The change is mainly due to: Use of different method

5.12 Additional information

There would seem to have been a genuine change in range in recent years identified through greater survey effort and the use of different survey methods i.e. lures, harp traps, mist nets and radio-tracking. However, definitive comparisons with earlier distribution maps cannot be made because of changes in monitoring techniques and observer effort. The range of the species in England has been estimated at 23,300km², Mathews et al (2018), however, the range may be more extensive than this. The selection criteria used to target surveys in the Bechstein's Bat Project excluded some areas of South-West England, which are now thought likely to be suitable for the species, Mathews, et al, (2018). The species are difficult to identify with certainty using acoustic surveys and tree roosts are difficult to find. Surveys depend heavily on the availability of personnel suitably qualified to trap bats, Mathews et al, (2018).

6. Population

6.1 Year or period

1995-2006

6.2 Population size (in reporting unit)

a) Unit	number of individuals (i)
b) Minimum	10200
c) Maximum	55000
d) Best single value	

6.3 Type of estimate

95% confidence interval

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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 extrapolation from a limited amount of data
6.7 Short-term trend Period	2006-2017
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 extrapolation from a limited amount of 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 d) Method
6.16 Change and reason for change in population size	Genuine change Improved knowledge/more accurate data Use of different method The change is mainly due to: Use of different method
6.17 Additional information	Change in population size is also due to improved knowledge and more accurate data and possibly a genuine change in population, however, this remains uncertain. The population estimate taken from, Mathews et al, (2018) was based on adult population density and habitat availability within the range. There seems to have been an increase in population, though this may be an artefact of increased targetted survey effort over the past decade and change in surveying techniques using lures, traps and radio-tracking.

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)? 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	Based mainly on expert opinion with very limited data	

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7.3 Short-term trend Period	1995-2016
7.4 Short-term trend Direction	Unknown (x)
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
Conversion to other types of forests including monocultures (B02)	H
Logging (excluding clear cutting) of individual trees (B06)	H
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
Application of synthetic fertilisers in forestry, including liming of forest soils (B19)	M
Roads, paths, railroads and related infrastructure (e.g. bridges, viaducts, tunnels) (E01)	M
Interspecific relations (competition, predation, parasitism, pathogens) (L06)	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
Conversion to other types of forests including monocultures (B02)	H
Logging (excluding clear cutting) of individual trees (B06)	H
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
Application of synthetic fertilisers in forestry, including liming of forest soils (B19)	M
Roads, paths, railroads and related infrastructure (e.g. bridges, viaducts, tunnels) (E01)	M
Interspecific relations (competition, predation, parasitism, pathogens) (L06)	M

8.2 Sources of information

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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

Restore small landscape features on agricultural land (CA02)

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)

Reduce impact of transport operation and infrastructure (CE01)

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 some 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

Increased interest in afforestation as part of climate change mitigation measures means that the total area of broadleaved woodland is likely to continue to increase. However, the current trajectory of increase is modest once the loss of existing woodlands is taken into account; and the available statistics do not adjust for woodland recently converted into another land use (Forestry Commission 2017, Forestry Commission 2016). The rate of new planting of woodland (conifer and broadleaved combined) has fallen over the past 20 years, whilst the rate of restocking has remained approximately stable in all countries. Further to this artificial night lighting potentially severs commuting routes and delays emergence time. Habitat fragmentation owing to new roads/infrastructure disrupts commuting routes (some mitigation by green bridges, though these are unlikely to have a population wide impact). Isolated populations may be particularly negatively affected by further loss of

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connectivity. Between 1998-2007 there was a 6.1% decline in hedgerows and 1.7% decline in total woody linear features in GB (Carey et al., 2008) with likely negative effects on connectivity. So, future habitat has been assessed as unknown due to the uncertainties outlined above, the range is assumed to remain fairly stable. The effect that this may have on the population is unknown so the population parameter has been assessed as unknown.

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 number of individuals (i)

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)

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, there is currently only sufficient information to record species presence rather than populations or any changes in trend for this species. At the last assessment, 98.5% of SAC's for the species were reported as in favourable or unfavourable recovering condition.

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13. Complementary information

13.1 Justification of % thresholds for trends

13.2 Trans-boundary assessment

13.3 Other relevant Information

Distribution Map

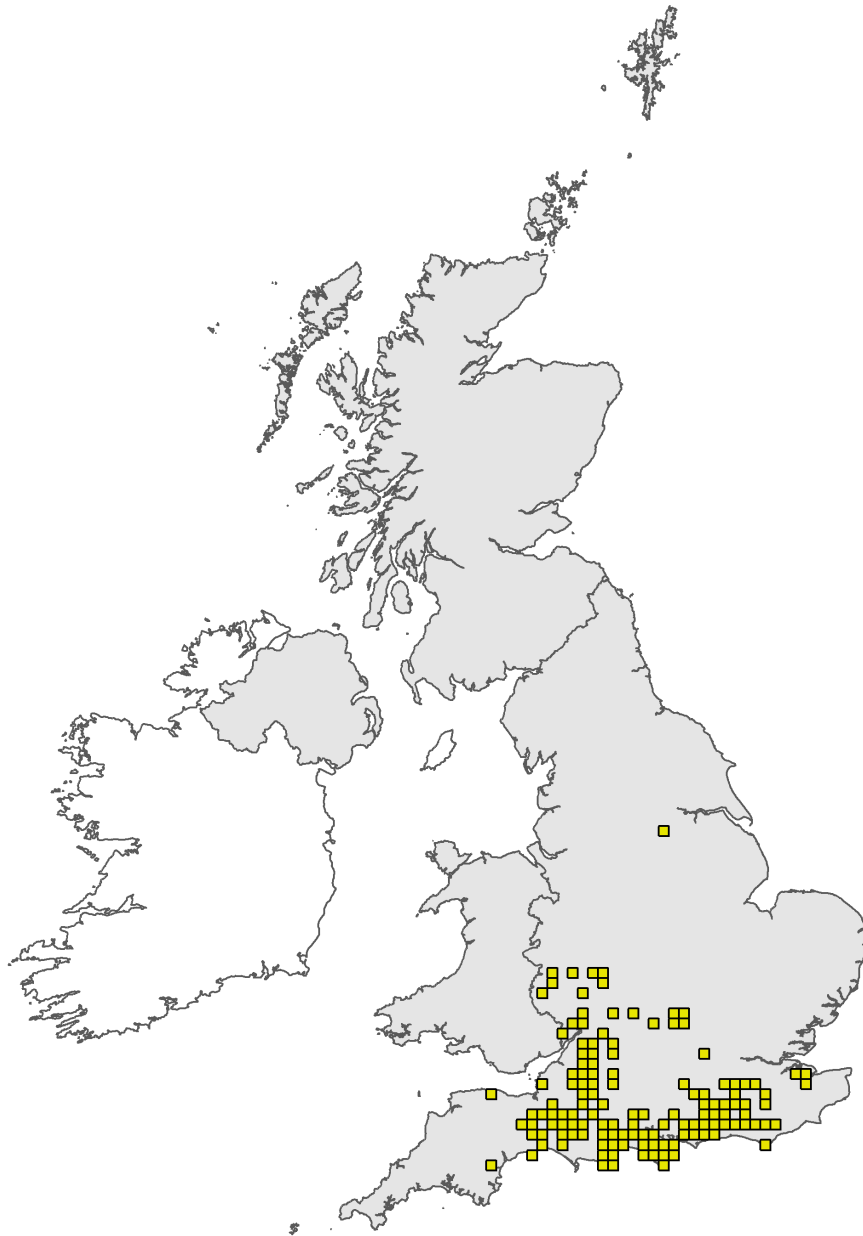


Figure 1: UK distribution map for S1323 - Bechstein's bat (*Myotis bechsteinii*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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

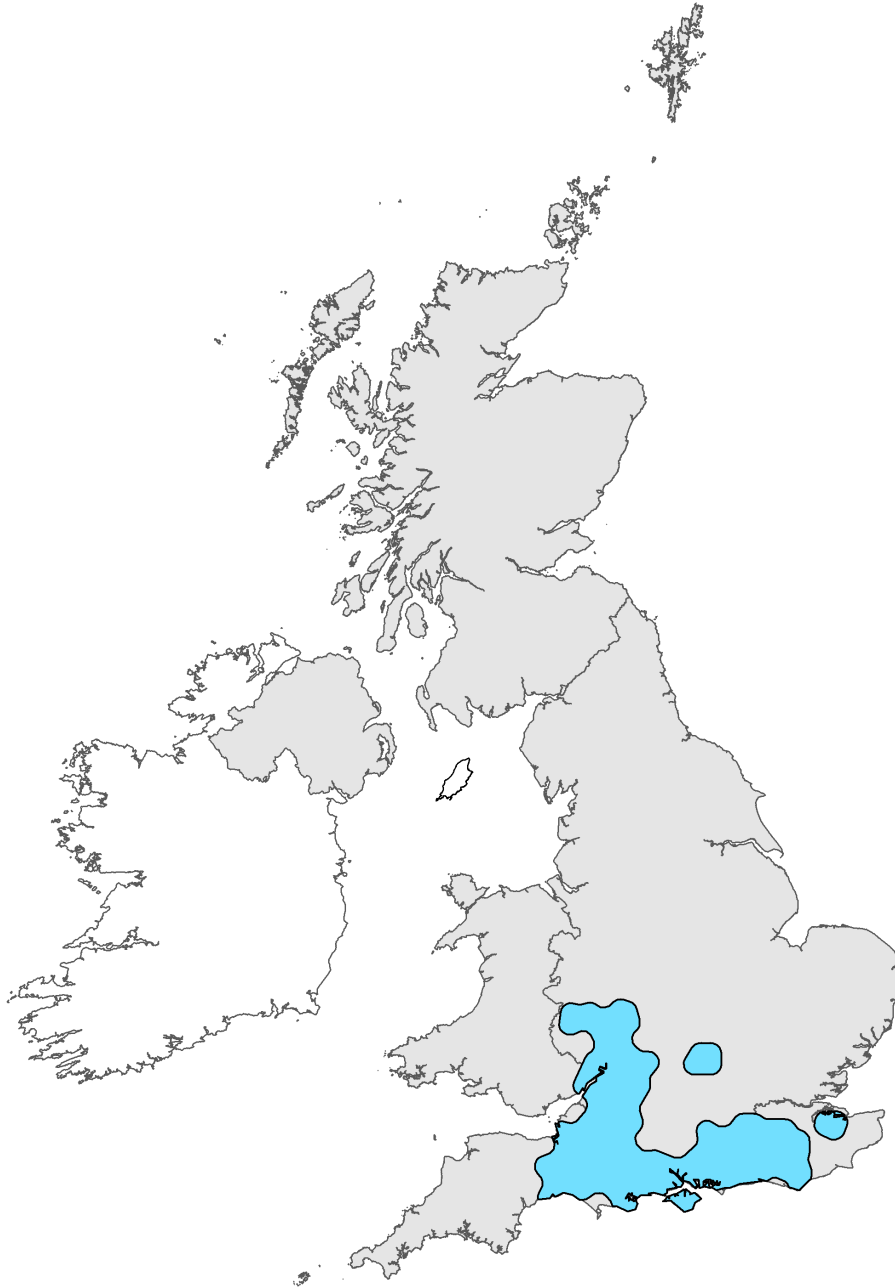


Figure 2: UK range map for S1323 - Bechstein's bat (*Myotis bechsteinii*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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: *Myotis bechsteinii* (1323)

Field label	Note
1.5 Common name	The Bechstein's bat is a rare species found only in central southern England with a few records in parts of S. Wales. The known distribution has been significantly improved due to the Bat Conservation Trust's Bechstein's Bat Project (Miller, 2011) and continued survey effort through other monitoring programmes and as a result of surveys undertaken for development work. Quiet echolocation calls mean that this species cannot be monitored with acoustic detectors. Roosts are difficult to detect. Surveys with acoustic lures, traps and radio-tracking individuals are used to locate new roosts/colonies. The species is strongly associated with broadleaved woodland, particularly semi-natural ancient woodland with dense understorey (Greenway and Hill, 2004) but it also forages along large hedgerows and wooded riparian corridors and can roost in individual trees found in these environments (Palmer et al, 2013). There is evidence of segregation of the sexes into different woodlands, with males potentially using less optimal habitats (Harris and Yalden, 2008, Dietz and Pir, 2011). Maternity roosts are usually located in trees, most commonly in woodpecker holes and rot holes but also in other crevices. A wide range of tree species are used including oak, ash, aspen, London Plane, crack-willow and field maple (Palmer et al., 2013, Mathews et al., 2018). In some woodlands particularly those with few natural tree holes, colonies can make extensive use of bat boxes. Only a single building roost is known in GB (Schofield and Morris, 2000).

Species name: *Myotis bechsteinii* (1323) Region code: ATL

Field label	Note
5.3 Short term trend; Direction	The range of Bechstein's bats would appear to be increasing with the increase of records of the species from previously unknown locations as a result of targeted survey programmes and through surveys for development works. However, definitive comparisons with earlier distribution maps cannot be made because of changes in monitoring techniques and observer effort.
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 taken from, Mathews et al, (2018) was based on adult population density and habitat availability within the range. Habitable area was defined as only broadleaved woodland because of the very strong dependency of maternity colonies on roost locations within woodland. It is acknowledged that there can be maternity roosts in other locations, such as within mature trees in hedgerows. However, there are sources of potential error in the population estimate as there is uncertainty about the occupancy rates for broadleaved woodland and the extent to which the species use hedgerow trees and parkland trees for roosting. The estimates provided in Mathews et al, 2018 are based on the assumption that bats in maternity colonies pre-breeding are all female and that males will be dispersed singly or in small groups throughout the woodland or among trees in adjacent habitats (eg hedgerows, parkland and gardens). The strategy for computing population sizes has therefore been to estimate total adult density as being twice that of the adult females counted at maternity roosts. However, if some broadleaved woodlands are occupied exclusively by females and others exclusively by males, then this approach may substantially over-estimate the population size by up to a factor of 2. The population estimate provided in the previous Article 17 reporting period 2007-2012 was taken from Harris et al 1995, this estimate had very poor reliability and at that time, no breeding colonies were known and all summer records were just of single individuals. However, there has been a substantial change in survey intensity techniques over the past decade and so comparisons with earlier estimates are not appropriate (Mathews et al, 2018).

6.8 Short term trend; Direction

There would seem to be a clear increase in population from the previous Article 17 reporting round 2007-2012. However, this apparent increase should be treated with caution as there has been a substantial increase in survey effort and techniques used over the past decade (Mathews et al, 2018) which began with the Bechstein's Bat Project (Miller, 2011) and has continued through a range of other projects many of which have yet to be reported on and through the species being discovered as a result of surveys undertaken for development purposes. So, the population parameter has been recorded as unknown.

7.1 Sufficiency of area and quality of occupied habitat

M. bechsteinii requires a complex mosaic of habitats to support foraging, roosting and commuting behaviour. The favoured habitat for maternity colonies is unevenly aged, ancient or semi-natural deciduous woodland with a high number of oaks in the species mix and a dense mixed species understorey. A minimum of 40-50 hectares of woodland is required to maintain an average maternity colony and very large continuous areas of high forest are less favoured than slightly fragmented structurally diverse woodlands. Small streams that have at least some water in the summer are an important requirement for most woodlands with maternity colonies, as is connectivity of woodland patches by hedgerows (Greenaway & Hill, 2004). Orchards with old trees also provide good foraging habitat, where they exist (Boye & Dietz 2005). The size of individual home ranges differs in relation to habitat quality: In optimal areas a home range might be smaller than 3 hectares (old oak forests or oak and beech forests), at other places its size is 15-30 hectares. However, in coniferous forests home ranges of more than 100 hectares have been recorded. Females of a maternity colony seem to use individual foraging areas exclusively for several years. Home ranges of neighbouring colonies are separated. The species shows a comparatively small range of movement around the summer roost, sometimes less than 1 kilometre. Main foraging areas are usually at distances of 500-1,500 metres from the roost, but can be nearly 4km and tend to be smaller in continuous woodlands than fragmented forests (Boye & Dietz 2005). Most summer roosts are in woodpecker holes, sometimes behind loose bark or in tree crevices. Maternity colonies also use bat boxes and move roost sites frequently throughout the season. Roosts are found at a height of 0.5-18 metres. An excellent woodland would provide in excess of a dozen large available roosts within the forage woodland and many other smaller holes (Greenaway & Hill, 2004) In winter the species usually roosts singly in underground hibernation sites (caves, mines, cellars) Most of the population may hibernate in tree holes or behind loose bark, but this is not proven. Usually distances between summer and winter roosts are quite small but can be as much as 39 km. It is unknown whether the amount of habitat in the UK is sufficient to support a viable population of the species.

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

This is currently unknown.

8.1 Characterisation of pressures/ threats

Pressures: *M. bechsteinii* is strongly associated with woodland, both for roosting and foraging, though it also uses underground places for hibernation. Specialist habitat requirements, 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 trees and underground sites; and the reduction in numbers of insect prey. Threats: This species is reliant on tree roosts and moves roosts frequently, requiring a large number of trees with suitable crevices. Loss of native broadleaf trees through new pathogens (such as *Chalara fraxinea*) could have a serious long term impact through reduction of resource.

9.5 List of main conservation measures

Low population density and slow population growth are likely to make this species particularly vulnerable to factors such as loss and fragmentation of ancient deciduous woodland habitat, trees and underground sites and the reduction in numbers of insect prey due to habitat simplification and factors such as fertiliser and pesticide use. The availability of large deciduous woodlands, containing dead and dying mature trees with features that can support roosting bats are major factors likely to affect the species status. Legal and administrative measures continue to be required to ensure that the protection provided by the legislation is effective. However, although some 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.