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:

S1314 - Daubenton's bat (*Myotis daubentonii*)

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	**1314**
1.3 Species scientific name	**Myotis daubentonii**
1.4 Alternative species scientific name	
1.5 Common name (in national language)	Daubenton's bat

2. Maps

2.1 Sensitive species	No
2.2 Year or period	1999-2016
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

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

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)
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.
Warren, R, D., Waters, D, A., Altringham, J.D., and Bullock, D.J. (2000). The distribution of Daubenton's bats (Myotis daubentonii) and pipistrelle bats (Pipistrellus pipistrellus) (Vespertilionidae) in relation to small-scale variation in riverine habitat. Biological Conservation, 92 (1), 85-91
Langton, S. D., P. A. Briggs and K. A. Haysom (2010). Daubenton's bat distribution along rivers - developing and testing a predictive model. Aquatic Conservation: Marine and Freshwater Ecosystems, 20(S1), S45-S54.
Lucan, R. K. & Radil, J. (2010). Variability of foraging and roosting activities in adult females of Daubenton's bat (Myotis daubentonii) in different seasons. Biologia, 65, 1072-1080
Abbott, I. M., Sleeman, D. P. & Harrison, S. (2009). Bat activity affected by sewage effluent in Irish rivers. Biological Conservation, 142, 2904-2914.
Racey, P. R., Swift, S. M., Rydell, J. & Brodie, L. (1998). Bats and insects over two Scottish rivers with contrasting nitrate status. Animal Conservation, 1, 195-202
Vaughan, N., Jones, G. & Harris, S. (1996). Effects of sewage effluent on the activity of bats (Chiroptera: Vespertilionidae) foraging along rivers. Biological Conservation, 78, 337-343.
Shirley, M. D. F., Armitage, V. L., Barden, T. L., Gough, M., Lurz, P. W. W., Oatway,

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

D. E., South, A. B. & Rushton, S. P. (2001). Assessing the impact of a music festival on the emergence behaviour of a breeding colony of Daubenton's bats (Myotis daubentonii). Journal of Zoology, 254, 367-373.
Fensome, A. G. & Mathews, F. (2016). Roads and bats: a meta-analysis and review of the evidence on vehicle collisions and barrier effects. Mammal Review, 46, 311-323.
Bat Conservation Trust, 2018. The National Bat Monitoring Programme. Annual Report 2017. Bat Conservation Trust, London. Available at http://www.bats.org.uk/pages/nbmp_annual_report.html

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)	129146
	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 addesd 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

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

5.12 Additional information	

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 individuals (i)
	b) Minimum	18100
	c) Maximum	2950000
	d) Best single value	
6.5 Type of estimate	95% confidence interval	
6.6 Population size Method used	Complete survey or a statistically robust estimate	
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	Genuine change Improved knowledge/more accurate data Use of different method	
	The change is mainly due to:	Genuine change
6.17 Additional information	Also, improved knowledge and different methodology. Acoustic detectors used to record bat activity in the field have changed considerably over time and have become much more sensitive. Data from the Waterway Survey indicates that the	

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

GB-level short-term population trend is stable; however, there has been a small (-1.2%) decrease in M. daubentonii between 2010-2015 at an England-level. Contradicting this, the NBMP hibernation survey indicates that there has been a statistically significant increase (23.3%) in the population during this time. The Waterway Survey trend is considered the most statistically robust survey for this species, but overall, the decline is not statistically significant (BCT, 2018) and the population is considered to be stable at an England-level.

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 extrapolation from a limited amount of data	
7.3 Short-term trend Period	1995-2016	
7.4 Short-term trend Direction	Stable (0)	
7.5 Short-term trend Method used	Based mainly on extrapolation from a limited amount of 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
Conversion from one type of agricultural land use to another (excluding drainage and burning) (A02)	H
Construction or modification (e.g. of housing and settlements) in existing urban or recreational areas (F02)	H
Use of other pest control methods in agriculture (excluding tillage) (A23)	M
Conversion to other types of forests including monocultures (B02)	M
Logging without replanting or natural regrowth (B05)	M
Roads, paths, railroads and related infrastructure (e.g. bridges, viaducts, tunnels) (E01)	M
Mixed source pollution to surface and ground waters (limnic and terrestrial) (J01)	M
Modification of hydrological flow or physical alteration of water bodies for agriculture (excluding development and operation of dams) (A33)	M

Temperature changes (e.g. rise of temperature & extremes) due to climate change (N01)	M
Residential or recreational activities and structures generating noise, light, heat or other forms of pollution (F24)	H

Threat	Ranking
Conversion from one type of agricultural land use to another (excluding drainage and burning) (A02)	H
Construction or modification (e.g. of housing and settlements) in existing urban or recreational areas (F02)	H
Use of other pest control methods in agriculture (excluding tillage) (A23)	M
Conversion to other types of forests including monocultures (B02)	M
Logging without replanting or natural regrowth (B05)	M
Roads, paths, railroads and related infrastructure (e.g. bridges, viaducts, tunnels) (E01)	M
Mixed source pollution to surface and ground waters (limnic and terrestrial) (J01)	M
Modification of hydrological flow or physical alteration of water bodies for agriculture (excluding development and operation of dams) (A33)	M
Temperature changes (e.g. rise of temperature & extremes) due to climate change (N01)	M
Residential or recreational activities and structures generating noise, light, heat or other forms of pollution (F24)	H

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

Prevent conversion of natural and semi-natural habitats, and habitats of species into agricultural land (CA01)
Other measures related to agricultural practices (CA16)
Adapt/manage reforestation and forest regeneration (CB04)
Adapt/manage renewable energy installation, facilities and operation (CC03)
Reduce impact of transport operation and infrastructure (CE01)

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

Reduce/eliminate diffuse pollution to surface or ground waters from industrial, commercial, residential and recreational areas and activities (CF05)

Reduce/eliminate noise, light, heat or other forms pollution from industrial, commercial, residential and recreational areas and activities (CF09)

Reduce impact of mixed source pollution (CJ01)

9.6 Additional information

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 M. daubentonii is likely to have remained stable as the species continues to be widespread and although the range is smaller than the previous reporting round, this is likely to be due to a change in methodology rather than a real change. Evidence on different habitat types is conflicting and as a consequence the future prospect for habitat is unknown. Although there has not been a change in estimated range size in the last 20 years, a lack of data on population densities, size, and the conflicting effects of drivers of population change mean that the reported stable range size is not considered to be sufficient evidence for a stable population. Although the short-term trend (2006-2017) from the NBMP shows a slight decrease in population in the Waterways Survey data (not statistically significant) and an increase in the hibernation data, the future prospects for population size for this species are uncertain.

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

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

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

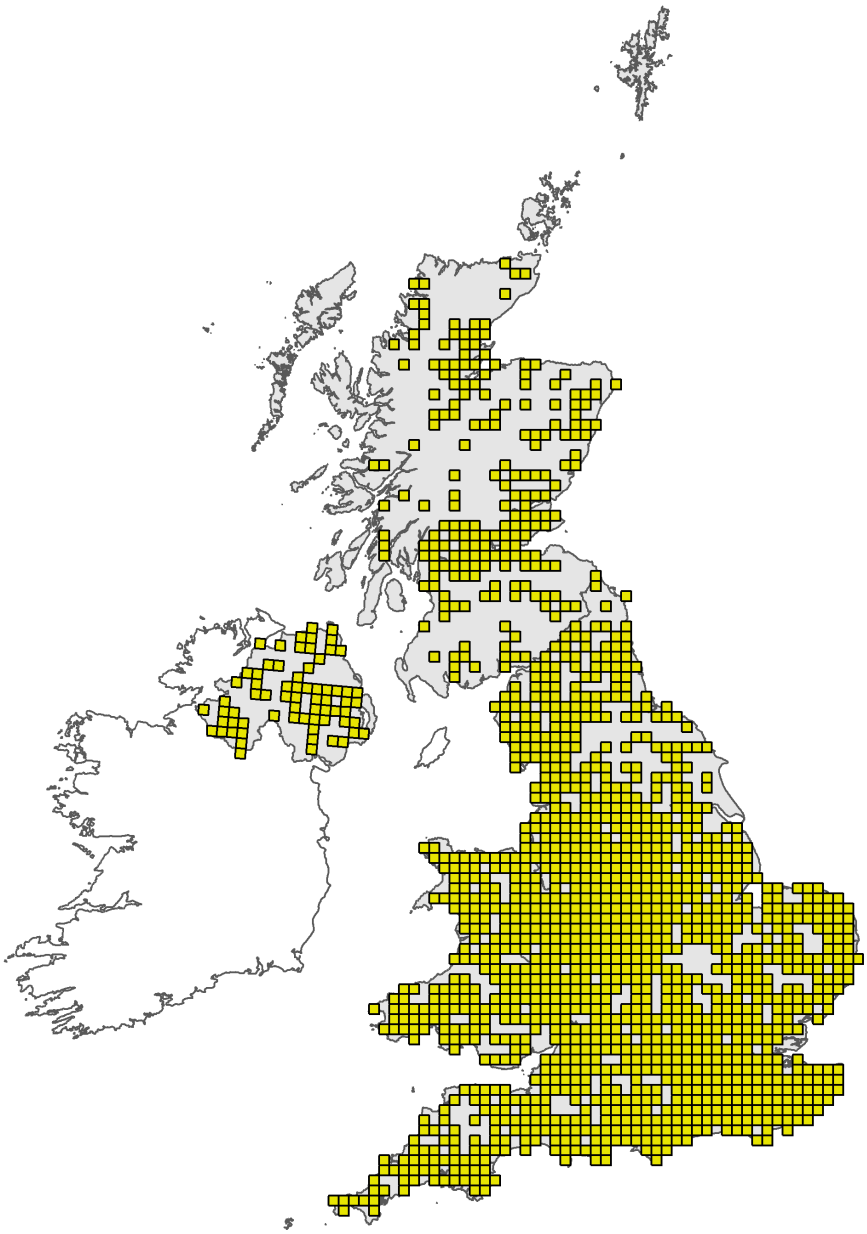

Figure 1: UK distribution map for S1314 - Daubenton's bat (*Myotis daubentonii*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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

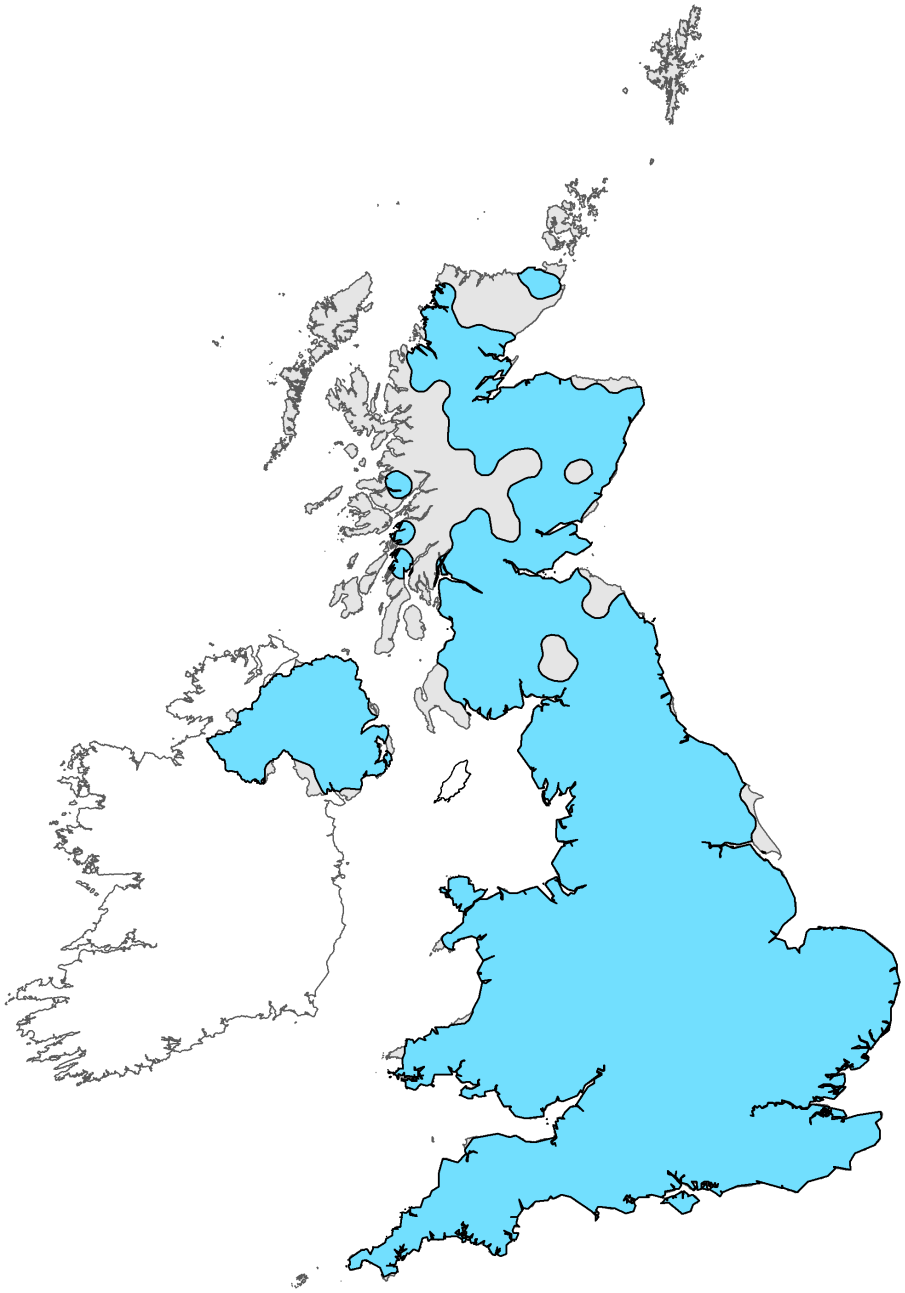

Figure 2: UK range map for S1314 - Daubenton's bat (*Myotis daubentonii*).Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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 daubentonii (1314)

Field label	Note
1.5 Common name	Myotis daubentonii is strongly associated with riparian habitats and prefers large waterways with abundant woodland (Langton et al, 2010). In upland riverine environments it appears to select locations with trees on both banks (Warren et al, 2000). Maternity roosts are usually located in trees, most commonly in broadleaved woodland, but also solitary trees, bat boxes, buildings, bridges and other artificial structures. Roosts are usually, although not always, located close to riparian habitats.

Species name: Myotis daubentonii (1314) 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.
6.4 Additional population size	Mathews et al (2018) gives estimates of 18,100 individuals (lower plausible limit) to 2,950,000 (upper plausible limit) in England, with a main estimate of 682,000. The overall estimate was based on information on adult population density across mixed habitat types and multiplied by the available habitable area within the range of the species. Habitable area as defined as all habitats within the range, excluding montane habitats, since these are unlikely to provide suitable locations for roosts. The plausible range of the estimated population size for Daubenton's bats is extremely wide. This is partly because of uncertainty about roost size. The median roost size was 40 but the 95% confidence intervals were 20-143 individuals. It appears likely, based on data from elsewhere in Europe, that Daubenton's bats have a fission-fusion social structure and frequently move roosts (Lucan and Radil, 2010). Not only do colonies switch roosts very frequently, but the group can also divide across multiple sites before re-joining. It is possible that there is some over-estimation caused by smaller subunits of the colony not being counted and a tendency for observers to report large roosts only, biasing the data towards the roost containing greater numbers of individuals. However, this bias may be counteracted by the difficulty of performing complete exit counts. The roost density estimates are likely to be underestimated in both the published literature and expert opinion since a relatively low proportion of all roosts are in houses, and it is difficult to find roosts in trees, bridges and tunnels. Therefore the true population size is likely to be somewhat higher than the lower limit. Reliability scores for the habitat density estimates were assigned to give an indication of the reliability of the data underpinning the population estimate. The habitat density estimates and occupancy data used for this species population estimate were given a reliability score of 1 from a maximum of 5.
6.8 Short term trend; Direction	There are two long-term studies of M. daubentonii; the hibernation surveys and the Waterway Survey. The hibernation survey shows a population increase at both the GB and England level, but the Waterways Survey indicates a small decline at an English level. The GB-level trend for the population is stable (Waterway Survey), but there has been a slow decline since 2007. However, this is not statistically significant (BCT, 2018).

7.1 Sufficiency of area and quality of occupied habitat	This species is strongly associated with riparian habitats. It prefers large waterays with abundant woodland within the local vicinity (Langton et al, 2010) and, at least in upland areas, appears to favour locations with trees on both banks (Warren et al, 2000). Maternity roosts are usually located in trees, most comminly in broadleaved woodland, but also within solitary trees, bat boxesm buildings, bridges etc. Roosts are usually near riparian habitats, although not always.
7.2 Sufficiency of area and quality of occupied habitat; Method used	Habitable area was defined as all habitats within the range excluding montane habitats since these are unlikely to provide suitable locations for 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 habitable area within the range is estmated to be 129,000km2.
7.4 Short term trend; Direction	Although the estimated area of suitable habitat for this species appears to have increased since the last Article 17 report, it is likely that this results from mapping species records at a finer scale, using an alpha hull value of 20km an adding an additional 10km buffer to the final hull polygon to provide smoothing to ensure that the hull covered the areas recorded. It is assumed that this species which can occupy a wide variety of habitat types could be present throughout the entire area, except for montane areas.
8.1 Characterisation of pressures/ threats	Drivers of change to M. daubentonii, including pressures and threats, include: the loss of roosts during works to bridges, tunnels and other structures; alterations to ater quality and riparian vegetation management, resulting in an alteration in the abundance of prey (Abbott et al, 2009; Racey et al, 1998; Vaughn et al, 1996); the impact of lighting, particularly around bridges and waterways (Mathews et al, 2018); the negative impact of noise (Shirley et al, 2001) and collisioons with vehicles (Fensome & Mathews, 2016). There are data deficiencies in areas such as the effect of lighting around riparian habitats; the impact of road casualties and habitat fragmentation in Britiain; impacts of agricultural changes; and the impact of aquatic pollution.