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:

S1304 - Greater horseshoe bat (*Rhinolophus ferrumequinum*)

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	**1304**
1.3 Species scientific name	**Rhinolophus ferrumequinum**
1.4 Alternative species scientific name	
1.5 Common name (in national language)	Greater horseshoe bat

2. Maps

2.1 Sensitive species	No
2.2 Year or period	2010-2016
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

Arnold, H., 1993. Atlas of Mammals in Britain. (Institute of Terrestrial Ecology Research Publication no. 6), London.
Barrett-Hamilton, G.E., Hinton, M., 1910-1921. A history of British mammals. Gurney and Jackson, London.
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)
Bat Conservation Trust. 2018. The National Bat Monitoring Programme. Annual Report 2017. Bat Conservation Trust, London. Available at http://www.bats.org.uk/pages/results_and_reports.html
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.
JNCC., 2013. Third Report by the United Kingdom under Article 17 on the implementation of the Habitats Directive from January 2007 to December 2012. Species S1304 - Greater horseshoe bat (Rhinolophus ferrumequinum), Peterborough: JNCC, Available from: www.jncc.gov.uk/article17.
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.
Millais, J., Rothschild, C., Wheler, E., 1904. The mammals of Great Britain and Ireland. Longmans Green & Co, London.
Ransome, R., 1989. Population changes of greater horseshoe bats studied near Bristol over the past twenty-six years. Biological Journal of the Linnean Society

38, 71-82.
Ransome, R., 1990. The Natural History of Hibernating Bats. Christopher Helm Mammal Series, London.
Ransome, R., 1997. The management of greater horseshoe bat feeding areas to enhance population levels. English Nature Research Reports 241, Peterborough.
Ransome, R., 2000. Monitoring diets and population changes of greater horseshoe bats in Gloucestershire and Somerset. English Nature Research Report 341, Peterborough.
Ransome R., Jones, G. 2008. Greater horseshoe bat (Rhinolophus ferrumequinum). Pp. 298-306 in Harris, S & Yalden, D.W. Mammals of the British Isles: Handbook, 4th edition. The Mammal Society, Southampton.
Ransome, R., McOwat, T., 1994. Birth timing and population changes in greater horseshoe bat colonies (Rhinolophus ferrumequinum) are synchronized by climatic temperature. Zoological Journal of the Linnean Society 112, 337-351.
Stebbings, R.E., 1988. The conservation of European bats. Christopher Helm Publishers Limited.

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)	29567
	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	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	The main reason for change is use of a different method as well as improved knowledge and more accurate data. R. ferrumequinum is at the northern edge of its range in Britain and is limited by climate to South West England and Wales. The range is similar to that described by (Arnold 1993), except with an expansion into mid and north Wales. The Article 17 Report (JNCC 2013) noted that the range appears to be stable, with slight changes being likely to result mainly from better data rather than a true range shift. The discovery of greater horseshoes breeding in the Tanat Valley in Wales and areas of Herefordshire over the past decade indicate a slight shift in the population to the north (Mathews et al 2018). An increase in range may be due in part to climate change as the greater horseshoe is on the northern and Eastern edges of its range around Herefordshire. Climatic conditions are a critical factor in greater horseshoe bat survival and the annual growth rate of colonies has found to be strongly correlated with spring temperatures and precipitation (Ransome and McOwat 1994 and Froidevaux et al 2017). Increases in spring temperatures in past decades is likely to have facilitated range shift to the North. An increase may also be due to more effective protection and management of roost sites for the more widespread lesser horseshoe bats (R. hipposideros) bat which have similar roost requirements. Increased breeding success will also promote dispersal of young further afield.

6. Population

6.1 Year or period	1995-2016	
6.2 Population size (in reporting unit)	a) Unit	number of individuals (i)
	b) Minimum	7280
	c) Maximum	14600
	d) Best single value	10200
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	Complete survey or a statistically robust estimate	
6.7 Short-term trend Period	2006-2017	
6.8 Short-term trend Direction	Increasing (+)	

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 The change is mainly due to: Genuine change
6.17 Additional information	

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	1999-2016	
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
Removal of small landscape features for agricultural land parcel consolidation (hedges, stone walls, rushes, open ditches, springs, solitary trees, etc.) (A05)	H

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Abandonment of grassland management (e.g. cessation of grazing or mowing) (A06)	H
Livestock farming (without grazing) (A14)	H
Logging without replanting or natural regrowth (B05)	M
Roads, paths, railroads and related infrastructure (e.g. bridges, viaducts, tunnels) (E01)	H
Construction or modification (e.g. of housing and settlements) in existing urban or recreational areas (F02)	H
Sports, tourism and leisure activities (F07)	M
Reduced fecundity / genetic depression (e.g. inbreeding or endogamy) (L05)	M
Other natural catastrophes (M10)	M
Extraction of minerals (e.g. rock, metal ores, gravel, sand, shell) (C01)	M

Threat	Ranking
Removal of small landscape features for agricultural land parcel consolidation (hedges, stone walls, rushes, open ditches, springs, solitary trees, etc.) (A05)	H
Abandonment of grassland management (e.g. cessation of grazing or mowing) (A06)	H
Livestock farming (without grazing) (A14)	M
Logging without replanting or natural regrowth (B05)	M
Roads, paths, railroads and related infrastructure (e.g. bridges, viaducts, tunnels) (E01)	H
Construction or modification (e.g. of housing and settlements) in existing urban or recreational areas (F02)	H
Sports, tourism and leisure activities (F07)	M
Reduced fecundity / genetic depression (e.g. inbreeding or endogamy) (L05)	M
Other natural catastrophes (M10)	H
Extraction of minerals (e.g. rock, metal ores, gravel, sand, shell) (C01)	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)

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9.5 List of main conservation measures

Manage the use of natural fertilisers and chemicals in agricultural (plant and animal) production (CA09)
Reduce impact of transport operation and infrastructure (CE01)
Manage/reduce/eliminate noise, light and other forms of pollution from transport (CE05)
Manage conversion of land for construction and development of infrastructure (CF01)
Adapt mowing, grazing and other equivalent agricultural activities (CA05)
Restore small landscape features on agricultural land (CA02)
Improvement of habitat of species from the directives (CS03)
Adapt/change forest management and exploitation practices (CB05)
Reduce impact of outdoor sports, leisure and recreational activities (CF03)

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 R. ferrumequinum is likely to have remained stable as the species 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 increasing as shown continuously through the NBMP trend data, with the short-term trend (2006-2017) recording an increase of 24.8% in the hibernation survey results for Great Britain. The index for England is now 118.7% higher than the base-level established in 1999 and the increases have been consistent throughout the monitoring period, equivalent to an annual increase of 4.7%. However, a small number of sites where colony sizes have increased dramatically contribute a high proportion of the total monitored population (notably those in South Devon, which includes the largest known roost in a building in central and western Europe). Elsewhere there is concern for smaller colonies, which appear particularly vulnerable to the impact of adverse weather conditions on reproductive output. R. ferrumequinum uses a mosaic of habitats, and useage of one habitat depends on the configuration and extent of other habitats. There is insufficient data on any change in the level of suitable habitat or any change in the quality of habitat for the species, however given that the population appears to be increasing and range is stable it is considered that the habitat can also be considered to be 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

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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: 2939 c) Maximum: 4115 d) Best single value
12.2 Type of estimate	95% confidence interval
12.3 Population size inside the network Method used	Complete survey or a statistically robust estimate
12.4 Short-term trend of population size within the network Direction	Increasing (+)
12.5 Short-term trend of population size within the network Method used	Complete survey or a statistically robust estimate
12.6 Additional information	2939 individuals have been counted in maternity sites that are within SAC's. This includes Berry Head Caves, Dean Hall, Rock Farm Barn, Brockley Hall Stables, Chudleigh Caves, Kings Wood mines and Banwell Ochre Caves. The minimum population estimate is the actual number of bats counted at maternity sites that are within SAC's in July 2016. These bats will be predominantly breeding females, so this figure underestimates the total population. The maximum estimate is predicted assuming 30% of the bats present are males and that the sex ratio in the general population is 1:1 (Mathews et al 2018).

13. Complementary information

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

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Distribution Map

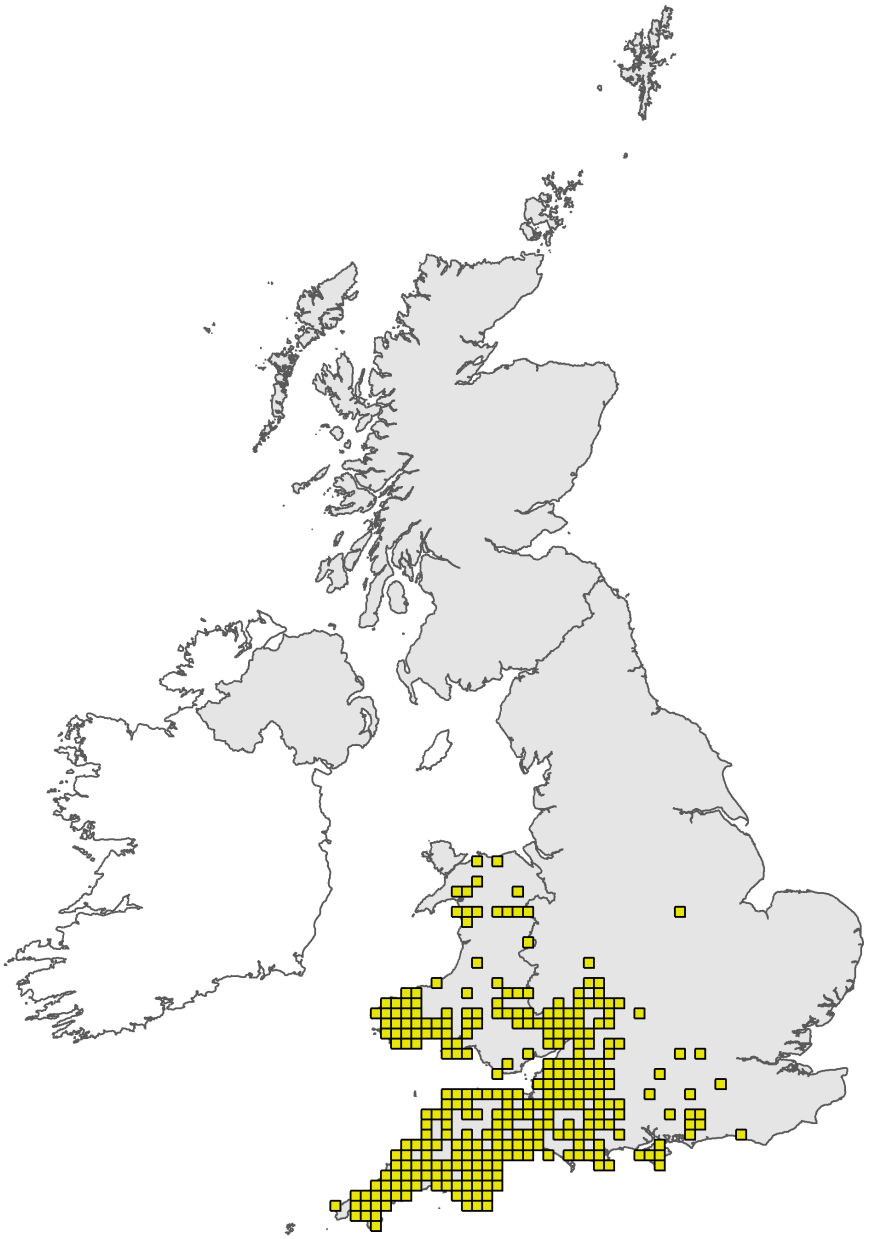

Figure 1: UK distribution map for S1304 - Greater horseshoe bat (*Rhinolophus ferrumequinum*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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 S1304 - Greater horseshoe bat (*Rhinolophus ferrumequinum*).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: Rhinolophus ferrumequinum (1304)

Field label	Note
1.5 Common name	Greater horseshoe bats (Rhinolophus ferrumequinum) underwent an estimated 90% population decline in the UK within the 20th Century (Stebbings 1988). They were present in Kent until circa 1900 and at the beginning of the twentieth century was considered to be fairly numerous on the Isle of Wight (Millais 1904-1906). It was also abundant in some parts of the south-west (Barrett-Hamilton & Hinton 1910-1921). Therefore although the extent of loss in England is not known, it can be considered that the species was once more numerous and widespread. However, there are several factors that, due to the ecology of the greater horseshoe bat, will limit their natural range such as climatic limitation, roost site limitation and habitat limitation. The concentration of populations into large maternity sites makes the species vulnerable, for example a single incident of fire at a roost building could significantly impact the population. Populations appear to be continuing to recover, but they are not thought to have reached pre-decline levels. With the effects of climate change producing warmer and dryer springs the species is likely to continue to increase in population size and possibly range (Mathews et al 2018, Ransome 1989). Protection of roost sites and changes in agricultural patterns under agri-environment schemes are also responsible for positive shifts for the species. Linear infrastructure and associated lighting, along with risk of inbreeding through loss of mating roosts are continuing and emerging risks to the species long term.
2.2 Year or Period	This time period has been selected as distribution has been calculated using data from Mathews et al 2018. The extended time period is not considered problematic as the species has shown range expansion in Wales. Data have been collected as part of long-term studies and structured long-term monitoring as well as on an ad hoc basis. This is a well-studied species and data quality is considered to be good. The horseshoe bats are easily identifiable using visual or bat detector identification. Their habit of roosting in the open (within the roost site), rather than in crevices means that the presence of colonies is likely to be noticed. Confusion is possible with the more common and widespread lesser horseshoe bat (R. hipposideros) if roosting bats are not seen close up (e.g. in mines or cave chambers). In such circumstances, records are not considered as valid unless confirmed using another method.
2.3 Distribution map	R. ferrumequinum has a restricted and fragmented distribution in Great Britain, with populations scattered across south-west and southern England and south and south-west Wales. Individuals, perhaps vagrants or colonisers, have been recorded more widely, but do not appear to represent established populations. Surveillance is well-covered by the National Bat Monitoring Programme with annual counts at all significant maternity sites and counts at many hibernation sites.

Species name: Rhinolophus ferrumequinum (1304) Region code: ATL

Field label	Note
5.3 Short term trend; Direction	Monitoring of all known maternity colonies has been undertaken since the early 1980s with co-ordinated monitoring of summer roosts in Wales and England since 1998 and 2000 respectively (Bat Conservation Trust 2017). It is therefore assumed that most maternity roosts of this species are known given the fact most maternity roosts are within buildings and the species is very visible when roosting. Hibernation site monitoring has also been undertaken for some time. The range is considered to be stable for England given that no new maternity roosts have been discovered outside of the existing known range.

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.
6.2 Population size	The greater horseshoe bat is one of the best studied species in the UK. Although originally a cave-breeding species, it is now highly dependent on buildings with only a small number of maternity roosts being found in underground sites. Because of this close dependency on people, the size of the maternity colonies, and the visibility of the bats when roosting, it is likely that a high proportion of its colonies are known. Intensive conservation efforts have also been undertaken by both Statutory Nature Conservation Bodies and Non-Governmental Organisations over the last 25 years. The population estimates are therefore based on published data and expert opinion on maternity colony size and do not use inferences from habitat associations. A best estimate is 10,200 based on expert opinion that 70% of the individuals in maternity colonies are female. The lower limit of 7,280 uses a conservative assumption of 50% females, meaning that entire population is counted at maternity sites; whereas the upper limit of 14,600 assumes that the maternity site contains only females, so the true population is double the number of animals observed at the maternity sites. These estimates are higher than for the last reporting round with a minimum estimate of 4,750 and a maximum estimate of 7,120. This is due to a different method alongside a genuine increase in population.
6.8 Short term trend; Direction	Results from the National Bat Monitoring Programme annual report 2017 (Bat Conservation Trust 2018) have shown a 58.7% increase in roost count data for England. The trend for hibernation, although also increasing, is not significant. Overall, the greater horseshoe bat population appears to be increasing significantly in England.
6.16 Change and reason for change in population size	Surveillance of c.25 known maternity roosts is undertaken annually and creates accurate data giving a minimum count with a high degree of confidence. These data support the trends drawn from hibernation surveys, and confirm the increase in population reported is genuine. The drivers for this change include legislative protection of maternity roosts preventing destruction / disturbance, allowing interventions to improve thermal conditions which improves reproductive success, and mild winters and warm springs permitting population growth.

7.1 Sufficiency of area and quality of occupied habitat	R. ferrumequinum mainly occupies lowlands, usually below 800m. The species requires a mosaic of grazed pasture and woodlands within a radius of 4km from roost sites. This should provide enough food during the spring and summer months for pregnant and lactating females, as well as for the young on their early foraging flights; usually within 1km from the roost. The ideal habitat is a landscape mosaic of permanent pasture and ancient, deciduous woodland with a good supply of insect food that is well connected by habitat structures such as mature hedgerows (Ransome 1997; 2000). A study on the preferred habitat of R. ferrumequinum carried out over a number of different sites suggests in order of preference, habitats most often visited are: Cattle pastures (39%), Ancient semi-natural woodland (19%) > Meadows (10%) > Other pastures (10%) > Broad leaved woodlands > Others (Ransome and McOwat 1994). The order of preference changes throughout the seasons with woodlands being utilised more frequently in cooler months, possibly as they maintain a 1 - 1.5 degree C higher temperature than open pasture which may be enough to encourage insect flight. R. ferrumequinum has high roost fidelity and is highly selective in the type of roosts used throughout the year. Maternity roosts in buildings are often in large roof spaces warmed by the sun such as those found in large older houses, churches and barns. The species hibernates underground in caves and disused mines and occasionally cellars and tunnels. It prefers warmer sites than those chosen by other bat species, 11 degree C in October down to 7 degree C in February (Ransome 1990) ideally with a high humidity >90% (Harris et al 1995). If the temperature fluctuates individuals will awake from hibernation to search for a more suitable site. When hibernating they are especially prone to arousal by lights or noises when at 9 degree C or above, or at dusk (Ransome and Jones 2008). R. ferrumequinum is very faithful to its roosts and hibernation sites are generally close to maternity roosts. All roosts need to be surrounded by good foraging habitat.
7.2 Sufficiency of area and quality of occupied habitat; Method used	There is detailed information on the habitat requirements/limitations of this species, but the total area of suitable habitat is unknown as the species depends on a matrix of habitats in a landscape. 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	There is insufficient data on any change in the level of suitable habitat or any change in the quality of habitat for the species. This is extremely difficult question to answer as this is a generalist species, using a mosaic of habitats across a large area.
8.3 Additional information	Pressures can generally be divided into those that affect roosts and those that affect commuting and foraging (including prey availability). Although roosts are strictly protected, R. ferrumequinum has quite specific summer roosting requirements that are not provided by most modern buildings, so roost availability may eventually be limiting and current roosts must be maintained. For hibernation, R. ferrumequinum is dependent on underground sites, that may be subject to disturbance or loss. Modern extraction methods are unlikely to create suitable mines and galleries for future occupation. R. ferrumequinum commute and forage along linear features, over grazed pasture and in woodland. Agricultural and forestry practices that remove or simplify these habitats, or affect the biomass of insect prey could negatively affect populations. Environmental land-management schemes have been used extensively to support this species.

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 (CF03). This helps to address Pressures/Threats F02, L05, F07, C01. Road design, construction and operation need to take into account the likely impact on bats, e.g. in relation to the provision of safe crossing structures and the loss of and severance of bat habitat and lighting (CE01, CEO5). This helps to address Pressures/Threats E01 & A05. R. ferrumequinum hunts over cattle-grazed pasture 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. All maternity roosts are protected, many as Natura 2000 sites, and are managed to maintain appropriate conditions for the bats. Planning at landscape scale is required to conserve commuting routes and foraging areas (CA09, CA02, CA05, CS03, CB05, CF01). This helps to address Pressures/Threats A06, A14, B05 & B02.