

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

**Second Report by the United Kingdom under
Article 17
on the implementation of the Directive
from January 2001 to December 2006**

**Conservation status assessment for :
S1304: *Rhinolophus ferrumequinum* - Greater
horseshoe bat**

Please note that this is a section of the report. For the complete report visit <http://www.jncc.gov.uk/article17>

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S1304 *Rhinolophus ferrumequinum* Greater horseshoe bat

Audit trail compiled and edited by JNCC and the Inter-Agency Mammal Working Group

This document is an audit of the data and judgements on conservation status in the UK's report on the implementation of the Habitats Directive (January 2001 to December 2006) for this species. Superscript numbers accompanying the headings below, cross-reference to headings in the corresponding Annex B reporting form. This supporting information should be read in conjunction with the UK approach for species (see 'Assessing Conservation Status: UK Approach').

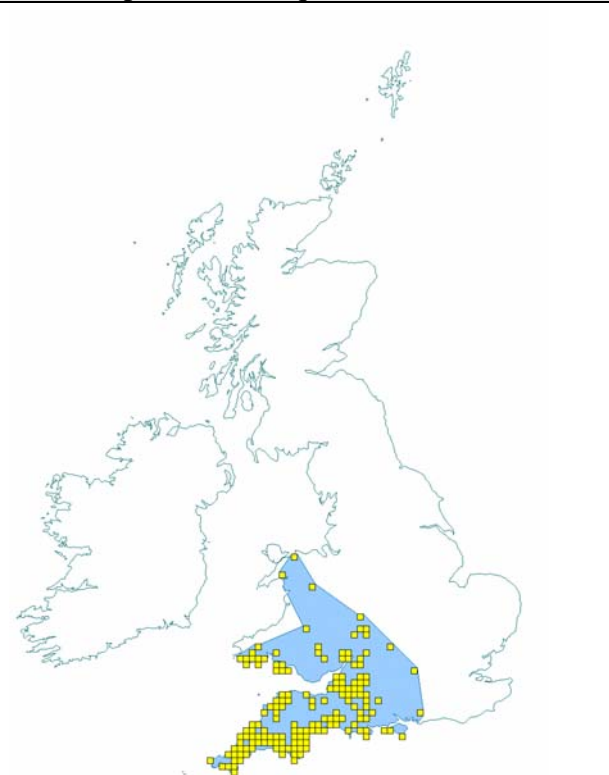
1. Range Information^{2.3}

This species occurs only in Wales and the south west of England. It is absent from northern England, Scotland and Northern Ireland.

1.1 Surface area of range^{2.3.1} 50,543km²

The above estimate was calculated within Alpha Hull software, using extent of occurrence as a proxy measure for range (as shown in Map 1.1). The value of alpha was set at 45 km to reflect the mobility of this species and quality of recording effort.

Map 1.1 Current extent of occurrence
and occupied 10-km squares (1990-2006)



1.2 Date of range determination^{2.3.2}

1990 – 2006

This species has been subject to a relatively high level of recording meaning that it is possible to consider current range using only data collected since 1990.

1.3 Quality of range data^{2.3.3}

Moderate

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. Hibernation site monitoring has also been undertaken for some time, with more co-ordinated efforts being made particularly over the past year. However, there has not been a full survey of every 10-km square within the species range and the data are therefore assessed as Moderate.

1.4 Range trend^{2.3.4} and range trend magnitude^{2.3.5}

Stable

There is no information to suggest that there has been a decline in range for this species during the specified time period 1990-2006.

1.5 Range trend period^{2.3.6}

1990 – 2006

The time period selected is considered to reflect the current situation regarding range change for this species and incorporates the time period since the Habitats Directive came into force.

1.6 Reasons for reported trend in range^{2.3.7}

Not applicable

1.7 Favourable reference range^{2.7.1}

50,543km² (Equal to current range)

The favourable reference range value has been derived using 1994 as the baseline and making a judgement on whether the range in 1994 was sufficient to allow the long-term survival of the species, using the decision tree in Note 1 (see 'Assessing Conservation Status: UK Approach') as a guide. Historic and current information on range size and trends have been used to assess this and, if the 1994 level was not sufficient, then consideration has been given to what would constitute a large enough range.

The current range is no less than it was in 1994, and is stable or may be increasing.

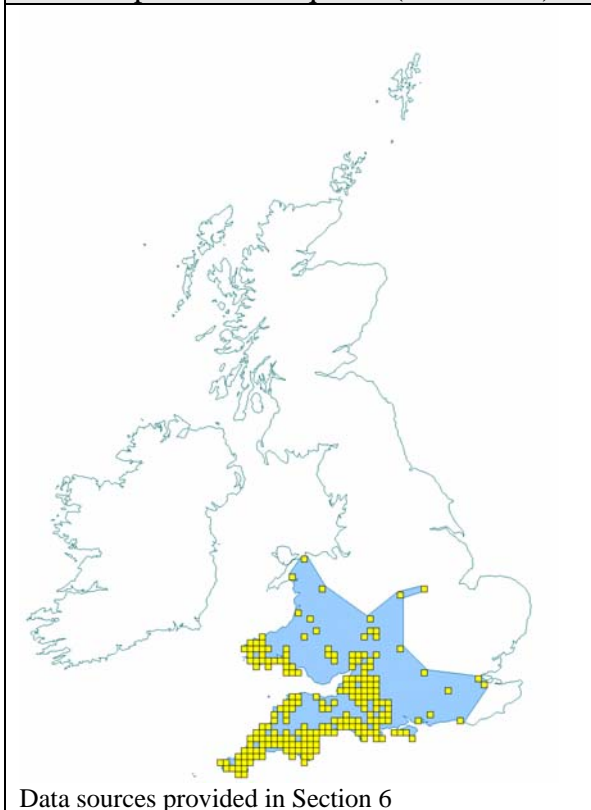
Map 1.2 shows *Rhinolophus ferrumequinum* historical extent of occurrence (1900-2006). The limit of historic distribution, from records in the early 1900s, was described as the line drawn from Aberystwyth in mid-Wales, through to north London (Stebbing & Arnold 1987). There are more recent records to the north of this line but they are unlikely to represent viable populations. The relative scarcity of fossil and sub-fossil remains in caves suggests the species was never more widely distributed or more abundant (Yalden 1992).

Available records suggest that there has been a decline in range since historic times of approximately 20% (see Maps 1.1 & 1.2: current = 50,543km², historic = 62,978km² using Alpha Hull software and assuming an alpha value of 45 km).). However, there are doubts

about the quality of records from the south-east of England, which may not represent historic breeding populations. Furthermore, it is unlikely that the range of the species could return to the south-east of England, given the agricultural changes and urbanisation that have occurred since the early 20th century.

On this basis, although current range is relatively restricted, it is probably of sufficient size to support a viable population in the long-term. Furthermore, it is large enough to allow for increase in distribution within the current range, and is therefore set as the favourable reference range.

Map 1.2 Historic extent of occurrence and occupied 10-km squares (1900-2006)



Data sources provided in Section 6

All records have been included in the historic range estimate, and not only those obtained prior to 1990. This is based on the assumption that a decline over time for this species was more likely than an increase and that where the species occurs currently it would also have occurred historically, but historic recording was not comprehensive enough to provide sufficient information. Data prior to the 1900s has been excluded from the historic range on the basis that it is unlikely to be numerous or reliable. Historic range has been calculated from the total of the data accumulated over the longer period, is not adjusted for natural fluctuations in range, and could exceed the maximum actual range occupied by the species at any given time during that period.

1.8 Range conclusion^{2.8}

Favourable

There is no evidence of decline in range for this species during the range trend time period, and with the increasing population the range may be expanding again. The current range is smaller than it was historically, but is equal to the favourable reference range and judged to be large enough to support a viable population. This combination of factors makes the range assessment Favourable.

2. Population of the Species^{2.4}

2.1 Population estimate^{2.4.1}

>6,600 individuals

The most recent UK population estimate for this species stands at >6600 individuals (Battersby & TMP 2005).

2.2 Date of population estimate^{2.4.2}

2005

2.3 Method of population estimate^{2.4.3}

3 = from comprehensive inventory

The estimate is from counts at all known maternity roosts multiplied by a figure to account for missing males and non-breeding females. Expert opinion was used to derive a multiplication factor for missing adults (Tony Mitchell-Jones pers. comm.).

2.4 Quality of population data^{2.4.4}

Good

R. ferrumequinum is probably the best studied of all bat species in the UK. The estimate is from counts at all known maternity roosts and it is thought that most of the major roosts have been recorded. However, there is little information on ratio of males to females or whether new colonies are being formed that might be small and therefore overlooked. It is possible, therefore, that this is an underestimate of the true population.

2.5 Population trend^{2.4.5} and population trend magnitude^{2.4.6}

Stable

Data from the UK National Bat Monitoring Programme (NBMP) Hibernation Survey, 1998-2005, suggests populations are currently stable, with an average non-significant annual decline of 1%, while the Colony Counts Survey shows a significant increase in populations, equivalent to 4.9% annually. This species is highly philopatric to roost sites and colony counts are considered to be a robust surveillance method (BCT 2006). However, these are relatively short time series for assessing true population trends and should be viewed with caution at present.

2.6 Population trend period^{2.4.7}

1998 – 2005

This time period has been selected because it allows consideration of the most recent trend data from surveillance schemes and is indicative of population trends since the Directive came into force.

2.7 Reasons for reported trend in population^{2.4.8}

3. Direct human influence (restoration, deterioration, destruction);

In recent times population recovery is probably due to legislative protection of the species, including strict protection of roost sites, the use of appropriate chemicals for timber treatment and management of the landscape around important roosts to benefit the species (English Nature 2000).

2.8 Justification of % thresholds for trends^{2.4.9}

Not applicable

2.9 Main pressures^{2.4.10}

101 Modification of cultivation practices

110 Use of pesticides

140 Grazing

151 Removal of hedges and copses

160 General forestry management

164 Forestry clearance

490 Other urbanisation, industrial and similar activities

624 Mountaineering, rock climbing, speliology

2.10 Threats^{2.4.11}

110 Use of pesticides

141 Abandonment of pastoral systems

624 Forestry clearance

624 Mountaineering, rock climbing, speliology

2.11 Favourable reference population^{2.7.2}

8,800 individuals (Current is 25% below the favourable reference population)

The favourable reference population value has been derived using 1994 as the baseline and making a judgement on whether the population in 1994 was viable in the long-term, using the decision tree in Note 1 (see 'Assessing Conservation Status: UK Approach') as a guide. Historic and current information on population size, distribution and trends have been used in order to assess viability and, if the 1994 level was not viable, then consideration has been given to what would constitute a viable population.

The total pre-breeding population estimate in 1995 was between 4,000 and 6,600 individuals and there have been improvements in population size and structure since then. Current trend information is contradictory, which means it is difficult to assess what is happening to the population currently, but it is at least stable and may be increasing. However, much of the improvement is due to legislative protection and a high level of conservation management.

There is very little information on historic population size for this species, with estimates ranging up to 300,000 (Stebbing & Arnold 1989) while others considered it was much lower (Ransome, 1989). A recorded loss of colonies through timber treatment in roof spaces as well as loss of recruitment, due to particularly severe winters, led to a large decline in populations in the 1950-1980s to around 3,500 – 3,800 individuals.

As a result of population loss the remaining population was more fragmented and more vulnerable to stochastic events. This is particularly true for a colonial species that forms large colonies that are highly philopatric to their roost sites and where one colony can represent the total female component of a local population.

It is, therefore, unlikely that the population in 1994 was viable and expert opinion considers that the current population is probably still only 75% of a viable population, giving a favourable reference value of at least 8,800. However, this value has been set with limited information and could be revised in the future if better information becomes available.

2.12 Population conclusion^{2.8}

Unfavourable - Inadequate but improving

The current population is below the favourable reference population by up to 25%, which gives a judgement of Unfavourable - Inadequate. Surveillance schemes show stable or increasing populations since at least 1998. The assessment is therefore, Unfavourable – Inadequate but improving.

3. Habitat for the Species in the Biogeographic Region or Sea^{2.5}

R. ferrumequinum mainly occupies altitudes from sea level and 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 of permanent pasture and ancient, deciduous woodland, linked with an abundance of tall bushy hedges with a good supply of insect food (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 & 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°C higher temperature than open pasture which may be enough to encourage insect flight.

R. ferrumequinum has quite specific roosting requirements. Maternity roosts are usually in attics of old buildings, but also caves and mines will be utilised. 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°C in October down to 7°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°C or above, or at dusk (Corbett & Harris 1992). *R. ferrumequinum* is very faithful to its roosts and hibernation sites are generally close to maternity roosts.

3.1 Surface area of habitat^{2.5.2}

Unknown

There is some 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. Only approximately 8% of England and Wales is currently covered by broadleaved woodland (Haines-Young *et al.* 2000), and there has also been a decline in grazed pasture, both important habitats for *R. ferrumequinum*. However, 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. Therefore area estimate is Unknown.

3.2 Date of estimation^{2.5.3}

Not applicable

3.3 Quality of data on habitat area^{2.5.4}

Poor

Detailed information is available on the habitat requirements/limitations of this species. However the area of habitat/suitable habitat is unknown as the species depends on a matrix of habitats in a landscape.

3.4 Habitat trend^{2.5.5}

Unknown

There is very limited information on changes in amount and quality of foraging and roosting habitats suitable for this species. Indications are that broadleaved, mixed and yew woodland have increased by about 4% in England and Wales since 1990 and there has been a small increase in tree lines and hedgerows, and some loss of pasture (Haines-Young et al. 2000). This is very limited information on which to base an assessment of trend in habitat suitable for this particular species. The assessment is, therefore, Unknown.

3.5 Habitat trend period^{2.5.6}

1990 – 2000

The time period selected reflects the results of two Countryside Surveys carried out in 1990 and 1998 (Haines-Young *et al.* 2000).

3.6 Reasons for reported trend in habitat^{2.5.7}

Not applicable

3.7 Suitable habitat for the species (in km²)^{2.73}

Unknown

Since the current area of habitat is unknown, it would be inappropriate to try and estimate an area of suitable habitat.

3.8 Habitat conclusion^{2.8}

Unknown

There is insufficient information to make a robust assessment on the habitat status for this species. The conclusion is, therefore, Unknown at the present time.

4. Future Prospects^{2.6}

Good prospects

Species is expected to survive and prosper

Factors likely to affect the species over the next 12-15 years are considered below.

Legislation. This species is listed on Schedules 5 and 6 of the Wildlife and Countryside Act 1981 (as amended) and the Conservation (Natural Habitats, &c.) Regulations 1994 and is listed on Annexes IIa and IVa of the Habitats Directive.

Conservation Action. There are 25 Special Areas of Conservation (SAC) where the species is recorded, with eight of those designated as SACs for this species and three other where the species is a feature of interest. Monitoring has been undertaken at Sites of Special Scientific

Interest (SSSIs) and the first round of monitoring and reporting of SACs has been undertaken.

The species is the subject of a Species Action Plan under the UK Biodiversity Action Plan. Main aims include maintaining the current range and populations and in the long term expanding the current range through natural colonisation and landscape enhancement, into areas where research shows the climatic and landscape features are suitable.

Research has shown that *R. ferrumequinum*, which preys on dung beetles and moths, depends heavily on the availability of grazed pasture and woodland within a few kilometres of maternity roosts. Changes in farming practices have resulted in the loss of permanent pasture leading to reduced prey abundance. Evidence suggests that moths, the favoured food source at certain times of year, have undergone declines (Fox *et al.* 2006) and the use of antiparasitic drugs, such as avermectins have affected dung beetle populations, a major food source for juvenile *R. ferrumequinum* (Ransome 1990).

Since 1998 English Nature's (now Natural England) greater horseshoe bat project has distributed advice on the management of foraging areas and promoted favourable management by persuading landowners to enter Countryside Stewardship agreements. Over the past five years the Project has visited and provided advice to 163 landowners managing approximately 13,211 hectares of land in bat foraging areas around key maternity and hibernation roost sites in Devon, Cornwall and Somerset. The Project has been a real success story and has helped contribute to a 58% increase of *R. ferrumequinum* recorded from the Devon maternity roosts since 1995.

A review has been carried out in Wales, looking at the impact of new and improved road schemes on bats and the measures which are being implemented to reduce potentially adverse effects (Catherine Bickmore Associates 2003).

There is a well-established monitoring programme providing trend data as part of the UK National Bat Monitoring Programme.

Threats. Temperature is a critical factor in species survival. Severe, prolonged, cold winters reduce survival rates, especially of adult males. Juvenile survival varies according to winter climate, with 40 - 80% making it through to the spring (Corbett & Harris 1991). However the single greatest cause of death seems to be starvation in late cold springs which has a knock on effect to reducing birth timings. The later the young are born, the less likely they will be, to survive hibernation (Ransome & McOwat, 1994, Harris et al 1995).

The critical temperature limit for the species is a mean temperature of 9.4°C for the combined months of April and May. If the mean temperature sinks below this by as little as 2°C the mean birth date can go up by 18 days (Ransome & McOwat, 1994). Therefore viable populations can only exist where the average temperatures for April and May are consistently higher than this threshold.

Climate change. The effects of Climate Change could be beneficial for this species. Evidence from the Butterfly Monitoring Scheme (www.ukbms.org/default.htm) suggests that there is already an impact with butterflies being recorded much earlier in the year. The predicted warmer, wetter winters may aid a greater percentage of the over-wintering population to survive and provide a greater variety of insect prey. In addition, if mean spring

temperatures rise the isolated pockets of suitable habitat may become contiguous with the current distribution effectively increasing their natural range. The recent increase in range in north Wales may be connected to these climatic changes.

On the negative side precipitation predictions indicate much drier summers and reduced soil moisture which will have indirect effects via insect prey biomass and distribution which could cause either declines in the species abundance or behavioural changes and further restrict range (Robinson *et al.* 2005).

Due to the colony forming nature of this species a single event has the potential to threaten a large percentage of the population, such as a fire in a maternity roost or the loss of a cave or mine (Stebbing & Arnold 1987). This, combined with a dependence on a favourable climate has led to the current disjunct population distribution. In order to maintain the species and not reduce the range, those roost sites, and their respective surrounding habitat, at the current northern edge need to be sustained.

A shortage of hibernacula over large areas of their range (there is a large gap in the distribution of known available underground roost sites in the middle of the range around Hampshire and Surrey) may be another barrier to range expansion.

4.1 Future prospects conclusion^{2.8}

Unfavourable - Inadequate but improving

Although there have been improvements in the legal protection of this species and restoration of suitable habitat, the potential loss of suitable habitat and maternity roost sites, paucity of suitable hibernation sites and the unknown effects of climate change mean that some threats are still likely to be a problem. For this reason the assessment is Unfavourable - Inadequate but improving.

5. Overall Assessment^{2.8}

Unfavourable - Inadequate but improving

Range is Favourable, population and future prospects are Unfavourable-Inadequate but improving and habitat for the species is Unknown. Following the Annex C format the overall assessment is, therefore, Unfavourable - Inadequate but improving.

Table 5.1. Summary of conclusions

Parameter	Judgement	Grounds for Judgement (in accordance with Annex C)	Reliability*
Range	Favourable	Range is stable and not smaller than the favourable reference range	2
Population	Unfavourable – Inadequate but improving	Any other combination Population below the favourable reference population, but significant upward trends detected in surveillance schemes	1
Habitat	Unknown	No or insufficient reliable information available	3
Future Prospects	Unfavourable – Inadequate but improving	Any other combination Threats and pressures still significant but long-term survival not threatened	2
Overall Assessment	Unfavourable – Inadequate but improving	One or more Unfavourable – Inadequate but not Unfavourable – Bad	2

*1=High, 2=Moderate, 3=Low

High – Expert opinion is that the concluding judgement accurately reflects the current situation based on a professional understanding of the species. For range, population, and habitat, quality of data used to establish the current estimate has been identified as good; data used to inform trends is comprehensive and up to date.

Moderate – A greater understanding of the feature, or the factors affecting it, is required before a confident concluding judgement can be made by experts. For range, population, and habitat, the current estimate and/or trend are based on recent, but incomplete or limited survey data; or alternately, a comprehensive, but outdated (pre-1994) review.

Low – Judgements, and comprising estimates, are based predominately on expert opinion.

N/A – Assessment conclusion is unknown, on the basis of insufficient reliable information

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Map Data Sources

Biological Records Centre - Mammals Database 100m; and Natural England - Batsites inventory for Britain (via NBN Gateway)
Bat Conservation Trust National Bat Monitoring Programme (NBMP) Colony Survey (1998 - 2005), Hibernation Survey (1997-2005)