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:

S1341 - Common dormouse (*Muscardinus avellanarius*)

WALES

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 (Wales information only)**
1.2 Species code	**1341**
1.3 Species scientific name	**Muscardinus avellanarius**
1.4 Alternative species scientific name	
1.5 Common name (in national language)	Common dormouse

2. Maps

2.1 Sensitive species	No
2.2 Year or period	1995-2016
2.3 Distribution map	Yes
2.4 Distribution map Method used	Complete survey or a statistically robust estimate
2.5 Additional maps	No

3. Information related to Annex V Species (Art. 14)

3.1 Is the species taken in the wild/exploited?	No	
3.2 Which of the measures in Art. 14 have been taken?	a) regulations regarding access to property	No
	b) temporary or local prohibition of the taking of specimens in the wild and exploitation	No
	c) regulation of the periods and/or methods of taking specimens	No
	d) application of hunting and fishing rules which take account of the conservation of such populations	No
	e) establishment of a system of licences for taking specimens or of quotas	No
	f) regulation of the purchase, sale, offering for sale, keeping for sale or transport for sale of specimens	No
	g) breeding in captivity of animal species as well as artificial propagation of plant species	No
	h) other measures	No

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3.3 Hunting bag or quantity taken in the wild for Mammals and Acipenseridae (Fish)

a) Unit

b) Statistics/ quantity taken	Provide statistics/quantity per hunting season or per year (where season is not used) over the reporting period					
	Season/ year 1	Season/ year 2	Season/ year 3	Season/ year 4	Season/ year 5	Season/ year 6
Min. (raw, ie. not rounded)						
Max. (raw, ie. not rounded)						
Unknown	No	No	No	No	No	No

3.4. Hunting bag or quantity taken in the wild Method used

3.5. Additional information

BIOGEOGRAPHICAL LEVEL

4. Biogeographical and marine regions

4.1 Biogeographical or marine region where the species occurs

Atlantic (ATL)

4.2 Sources of information

Battersby J. (Ed) 2005. UK Mammals, Species Status and Population Trends JNCC/Tracking Mammals Partnership.
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People's Trust for Endangered Species 2009. Managing small woodlands for dormice PTES London PTES (2011) National Dormouse Monitoring Programme results for 2011
Quine C, Cahalan C, Hester A, Humphrey J, Kirby K, Moffat A, Valatin G. 2011 Chapter 8: Woodlands. UK National Ecosystem Assessment: Technical Report: 241-294.
Sanderson FJ. 2004. The Population Ecology and Monitoring of Muscardinus avellanarius Unpublished PhD thesis Royal Holloway University of London
Schulz B, Ehlers S, Lang J, Buchner S. 2012. Hazel dormice in roadside habitats. Peckiana, 8, 49-55.

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) b) Operator	

	c) Unknown	
	d) Method	
5.11 Change and reason for change in surface area of range	Improved knowledge/more accurate data Use of different method	
	The change is mainly due to:	Use of different method
5.12 Additional information		

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	4169
6.3 Type of estimate	Best estimate	
6.4 Additional population size (using population unit other than reporting unit)	a) Unit	number of adults (adults)
	b) Minimum	90700
	c) Maximum	529000
	d) Best single value	
6.5 Type of estimate	95% confidence interval	
6.6 Population size Method used	Based mainly on extrapolation from a limited amount of data	
6.7 Short-term trend Period	2005-2014	
6.8 Short-term trend Direction	Decreasing (-)	
6.9 Short-term trend Magnitude	a) Minimum	39
	b) Maximum	55
	c) Confidence interval	0.95
6.10 Short-term trend Method used	Complete survey or a statistically robust estimate	
6.11 Long-term trend Period	1993-2014	
6.12 Long-term trend Direction	Decreasing (-)	
6.13 Long-term trend Magnitude	a) Minimum	62
	b) Maximum	79
	c) Confidence interval	0.95
6.14 Long-term trend Method used	Complete survey or a statistically robust estimate	
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	

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

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)?	Unknown
	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	Insufficient or no data available	
7.3 Short-term trend Period		
7.4 Short-term trend Direction	Unknown (x)	
7.5 Short-term trend Method used	Insufficient or no data available	
7.6 Long-term trend Period		
7.7 Long-term trend Direction		
7.8 Long-term trend Method used		
7.9 Additional information		

8. Main pressures and threats

8.1 Characterisation of pressures/threats

Pressure	Ranking
Removal of small landscape features for agricultural land parcel consolidation (hedges, stone walls, rushes, open ditches, springs, solitary trees, etc.) (A05)	M
Abandonment of traditional forest management (B04)	H
Clear-cutting, removal of all trees (B09)	M
Roads, paths, railroads and related infrastructure (e.g. bridges, viaducts, tunnels) (E01)	M
Conversion from other land uses to housing, settlement or recreational areas (excluding drainage and modification of coastline, estuary and coastal conditions) (F01)	M
Invasive alien species of Union concern (I01)	M
Temperature changes (e.g. rise of temperature & extremes) due to climate change (N01)	H
Increases or changes in precipitation due to climate change (N03)	H

Threat	Ranking
Removal of small landscape features for agricultural land parcel consolidation (hedges, stone walls, rushes, open ditches, springs, solitary trees, etc.) (A05)	M

Abandonment of traditional forest management (B04)	H
Clear-cutting, removal of all trees (B09)	M
Roads, paths, railroads and related infrastructure (e.g. bridges, viaducts, tunnels) (E01)	M
Conversion from other land uses to housing, settlement or recreational areas (excluding drainage and modification of coastline, estuary and coastal conditions) (F01)	M
Invasive alien species of Union concern (I01)	M
Temperature changes (e.g. rise of temperature & extremes) due to climate change (N01)	H
Increases or changes in precipitation due to climate change (N03)	H
Desynchronisation of biological / ecological processes due to climate change (N06)	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: Restore the habitat of the species (related to '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

Restore small landscape features on agricultural land (CA02)
Maintain existing traditional forest management and exploitation practices (CB02)
Reinstate forest management and exploitation practices (CB03)
Habitat restoration of areas impacted by transport (CE06)
Habitat restoration of areas impacted by residential, commercial, industrial and recreational infrastructure, operations and activities (CF02)
Management, control or eradication of established invasive alien species of Union concern (CI02)
Management of problematic native species (CI05)

9.6 Additional information

10. Future prospects

10.1 Future prospects of parameters

a) Range

b) Population

c) Habitat of the species

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10.2 Additional information

11. Conclusions

11.1. Range

11.2. Population

11.3. Habitat for the species

11.4. Future prospects

11.5 Overall assessment of Conservation Status

11.6 Overall trend in Conservation Status

11.7 Change and reasons for change in conservation status and conservation status trend

a) Overall assessment of conservation status

No change

The change is mainly due to:

b) Overall trend in conservation status

No change

The change is mainly due to:

11.8 Additional information

12. Natura 2000 (pSCIs, SCIs and SACs) coverage for Annex II species

12.1 Population size inside the pSCIs, SCIs and SACs network (on the biogeographical/marine level including all sites where the species is present)

a) Unit

b) Minimum

c) Maximum

d) Best single value

12.2 Type of estimate

12.3 Population size inside the network Method used

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

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Distribution Map

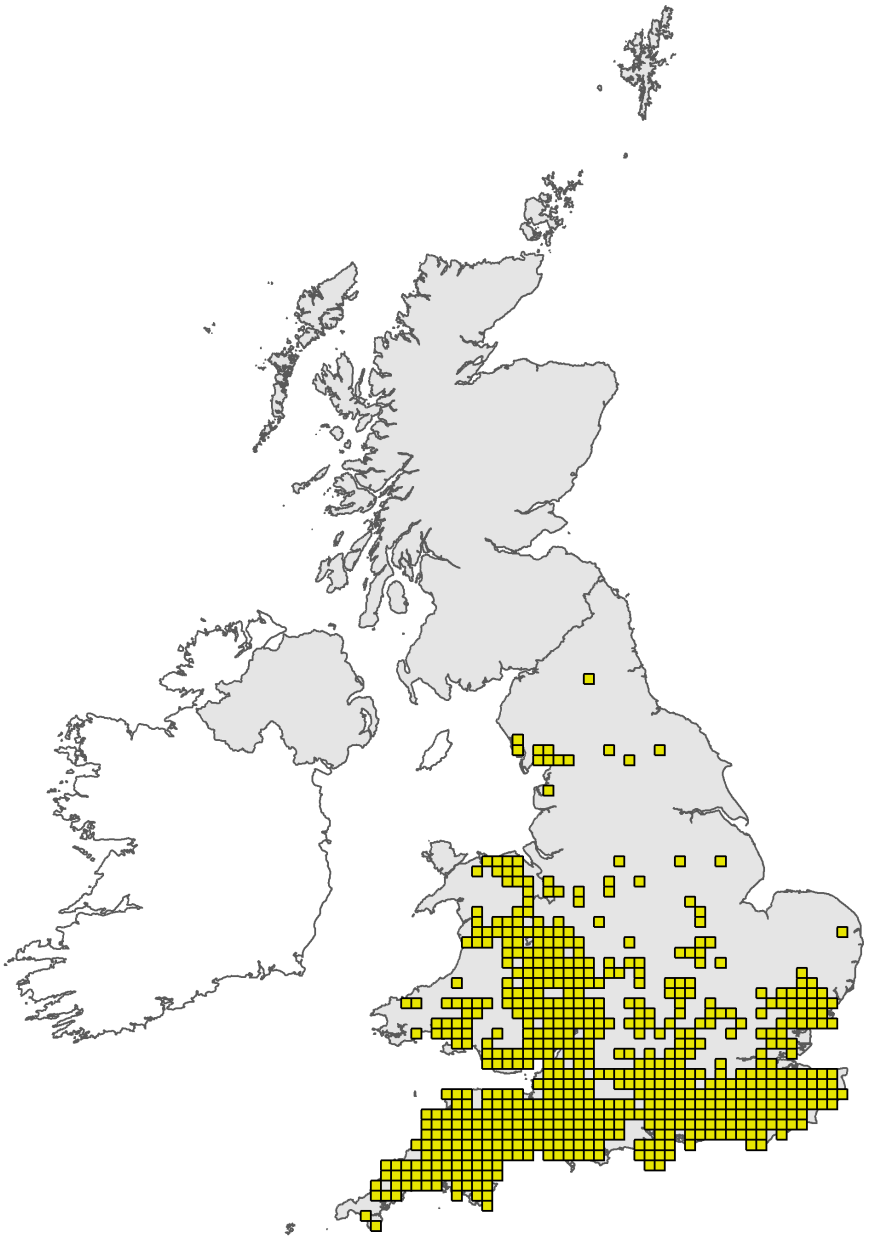

Figure 1: UK distribution map for S1341 - Common dormouse (*Muscardinus avellanarius*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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

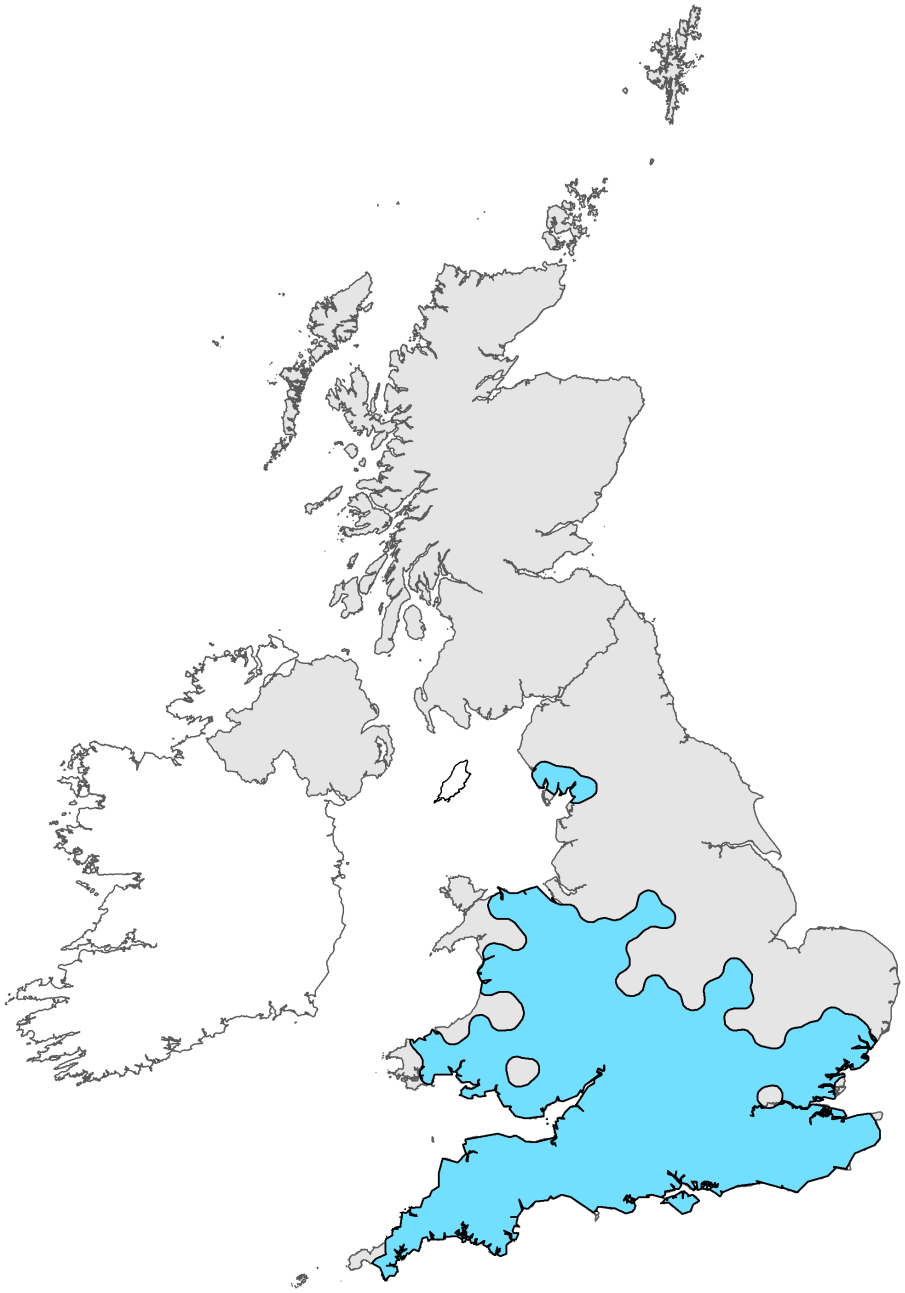

Figure 2: UK range map for S1341 - Common dormouse (*Muscardinus avellanarius*).Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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: Muscardinus avellanarius (1341)

Field label	Note
2.4 Distribution map; Method used	Shape files supplied by The 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. Natural England, Peterborough. ISBN 978-1-78354-494-3.

Species name: Muscardinus avellanarius (1341) Region code: ATL

Field label	Note
5.11 Change and reason for change in surface area of range	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.Whilst change in range area is based on a new methodology available evidence on range changes suggests there has been no noticeable expansion or reduction in range.
6.3 Type of estimate	Time period in 6.1 reflects range of records used for 1km square count. But more than 97% of the records are from 2011 or later.
6.4 Additional population size	Population estimate from Mathews et al. (2018). Method utilised to estimate population size was to multiply habitat-specific density estimates by the extent of these habitats within the geographical range. Where multiple estimates were available, the median value was used to produce the 'best' estimate, and 95% confidence intervals were created. Where possible, population sizes were adjusted to account for the percentage of occupied habitat within the species' range. Occupancy data were only included where studies used standardised surveys and reported both presence and absence. In the absence of data on percentage occupancy, 100% was assumed. For dormouse, percentage occupancy in broadleaved woodland (accounting for >75% of the population estimate) was based on percentage of woodlands that contained signs of dormice (gnawed nuts). Survey sites were stratified by age, area and isolation and were selected at random, but survey areas within these woodlands were only surveyed where hazel scrub was heavily fruiting to maximise the probability of detecting dormice and reduce the risk of false negatives (Bright et al. 1994). The possibility of dormice living in a wider range of habitats was not considered. As recent research suggests that the species are less specialised than previously thought (Juskaitis & Buchner, 2013), percentage occupancy used in this estimate may not be representative of all habitats within the species' range. 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 the dormouse population estimate were given a reliability score of 2 from a maximum of 5.

6.9 Short term trend; Magnitude	There have been declines of 47% (95% CLs: 55, 39%) in the 10-year period 2005 to 2014 (Goodwin et al. 2017). Goodwin et al. 2017, Annual mean rate of decline not available for 2005-2014, but Goodwin et. (2017) state that the England and Wales decline between 1993-2014 of 72% (95% confidence limits: 62-79% decline) is equivalent to annual mean rate of decline of 5.8% (95% confidence limits: 4.5-7.1% decline). No data is available at country level for short-term trend. However, in Wales there was a 79% decline (95% confidence limits: 51-96%) between 1993 and 2014 (McDonald 2017, see 6.13) which is also greater than 1% annual decline.
6.10 Short term trend; Method used	Population trend from the National Dormouse Monitoring Programme (NDMP). The NDMP was established in 1991 with the aim of monitoring changes in dormouse populations using data from dormouse nest box schemes established throughout England and Wales. Nest boxes at monitoring sites are checked at least twice between May and October. Data collected include number of dormice in each box, body weight, sex and breeding condition. Goodwin et al. (2017) identified population trends from the analysis of data from 400 sites in England and Wales, with the Wales only analysis based on 44 sites (McDonald 2017). Inferences about decline in the population are made on the assumption that fewer dormice using nest boxes equates to fewer dormice in the population, but it is possible that dormice may use boxes less frequently if the habitat has improved at that site and more natural nesting sites are available (Mathews et al. 2018). However, there is evidence that the dormice found in trapping studies are also found in nest boxes if studies are carried out over several years, which supports the use of nest box monitoring to indicate population size for long-term studies of the species (Goodwin et al. 2017).
6.13 Long term trend; Magnitude	Goodwin et. (2017) state that the England and Wales decline between 1993-2014 of 72% (95% confidence limits: 62-79% decline) is equivalent to annual mean rate of decline of 5.8% (95% confidence limits: 4.5-7.1% decline). Annual mean rate of decline is not available for Wales, but the 79% decline (95% confidence limits: 51-96%) over 22 years between 1993 and 2014 (McDonald 2017, see 6.13) will be greater than 1% annual decline.
6.16 Change and reason for change in population size	Comparison of population estimates between the current reporting round and previous reporting round (Wales: 2013=7,500 individuals; 2018=172,000 individuals; UK: 2013= 45,000 individuals; 2018=2,640,000) suggests a significant increase in population size. However, the 2013 estimate originates from a pers com in Battersby 2005. The 2018 estimate (Mathews et al 2018) has been calculated using more robust methods, although does still have a low reliability estimate (see 6.4). These population size estimates cannot therefore be relied upon to determine trend in population size. However, the the National Dormouse Monitoring Programme provides a statistically robust estimate of population trends and shows a significant population decline as reported in 6.9 and 6.13 (Goodwith et al 2017).
6.17 Additional information	Analysis of population trends in the NDMP is based on abundance of adult dormice. No information is available regarding age structure, mortality and reproduction.

7.1 Sufficiency of area and quality of occupied habitat	- area = Unknown -quality = Unknown Overall = Unknown Dormice utilise a range of early to mid-successional wooded habitats including hazel coppice, PAWS, hedgerows, scrub and some conifer woodlands (Juskaitis & Buchner, 2013). The quality, structure and connectivity of woodland habitats are a significant predictor of dormouse abundance. Goodwin et al (2018) found that abundance of hazel dormouse populations was higher at sites with active woodland management, with greater landscape connectivity and with higher woodland species composition. These habitat types are present throughout the species' range but the sufficiency of the area and quality is unknown. The area of woodland cover in the UK has doubled since 1945, but much of this a result coniferous afforestation (Quine et al 2011) which will be of low suitability for dormice. More recently new planting has been predominately native broadleaves, but rates of new planting over the last 20 years in Wales have been 'low' (Natural Resources Wales 2016; 3,392 ha total planted between 2009-2015) and are often small in size and not well connected (Quine et al 2011). The extent of ancient and semi-natural woodland has declined and reduction in woodland management techniques such as coppicing has resulted in ageing of broadleaved woodlands and a subsequent loss in structural and species diversity (Quine et al. 2011). In Wales around 40% of woodlands have little or no management (Natural Resources Wales 2016).
8.1 Characterisation of pressures/ threats	Pressures: M avellanarius is a species associated with the early successional stages of woodland, though it also uses other habitats, such as hedgerows and conifer plantation (Juskaitis, 2008). High species diversity and a dense shrub layer are both considered important in maintaining this species and so loss of hedgerows/hedgerow deterioration/agricultural intensification (A05) and a lack of sympathetic woodland management (B04, B05, B09), are considered to be an important pressure on dormouse populations (Bright et al, 2006). Goodwin et. al (2018) investigated factors affecting dormouse abundance in the National Dormouse Monitoring Programme. Dormouse abundance was found to be higher on sites with good habitat connectivity, greater woodland species composition and where active management was taking place. Grazing within woodlands reduces woodland suitability and there is increasing evidence that rising deer populations (native I04 and non-native, primarily muntjac I01) are having a negative impact on the structure of the understorey (Newson et al, 2011). Habitat loss and fragmentation from development activities (E01, F03, F01) also reduce the quality of availability habitat and licensing data shows that there are many cases of infrastructure development affecting dormice every year. There is evidence of dormice crossing open areas including roads (Chanin & Gubert 2012; Schulz et al 2012), but more information is needed on the fragmentation impacts of roads on populations. Climate is also an important predictor of dormouse abundance. Goodwin et al (2018) found that dormice were less abundant on sites with warmer more variable temperatures and Bright & Morris (1996) found reduced activity during wetter conditions (NO1, NO3). Threats: Dormice will continue to be subject to the same pressures already described. Advice to woodland managers on appropriate management options to favour dormice is available (PTES, 2009) and may be supported by agri-environment schemes, but there is no guarantee that these will be implemented without sufficient incentives. The Deer Initiative is encouraging the formation of local deer management groups to improve the management of rising deer populations, but evidence to date is that deer numbers continue to rise. In addition, dormice are vulnerable to the effects of climate change. Warmer winters may cause an increased frequency of energy-demanding arousals from hibernation and, unlike some hibernators (eg bats), dormice do not have access to food supplies during winter. This has the potential to cause increased over-winter mortality. Goodwin et al (2018) found that dormouse numbers were lower at sites with warmer and more variable winter temperatures (N01), and wet weather (N03) affects activity and food availability (Bright & Morris 1996, Juskaitis et al. 2016). Desynchronisation of flowering with emergence from hibernation also has the potential to affect survival (N06).

9.5 List of main conservation measures	Appropriate habitat management to maintain sufficient speices and structural diversity in dormouse habitat is key to dormouse conservation (CA02, CB02, CB03), and this has been demonstrated by Goodwin et al (2018). Advice to woodland managers on appropriate management options to favour dormice is readily available (PTES, 2009) and may be supported by agri-environment schemes, but there is no guarantee that these will be implemented without sufficient incentives. The Deer Initiative is encouraging the formation of local deer management groups to improve the management of rising deer populations, but further work is needed to manage deer numbers (CI02, CI05). Development activities (road schemes, housing) contribute to habitat loss and fragmentation, requiring management of mitigation habitat (CE06, CF02).
10.1 Future prospects of parameters	Hazel dormouse populations in England and Wales have shown an almost continuous decline since 1994 (Goodwin et al 2017). Recent evidence has found that larger dormouse populations were found on sites with greater habitat connectivity, higher species composition and where active woodland management was taking place (Goodwin et al 2018). The authors conclude that conservation would be best served by increasing woodland size and reducing fragmentation alongside implementing active management to improve areas of shrub and successional habitats. These are factors that it is possible to control, but which is likely to need support from agri-environment schemes or similar to provide the incentive for improved woodland management. Effective management of the Welsh Government Woodland Estate for dormice, alongside other priorities, has the potential to support improved future prospects. The negative impact of climate change is likely to increase making the need for improve habitat quality even greater.