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:

S1334 - Mountain hare (*Lepus timidus*)

SCOTLAND

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 (Scotland information only)**
1.2 Species code	**1334**
1.3 Species scientific name	**Lepus timidus**
1.4 Alternative species scientific name	
1.5 Common name (in national language)	Mountain hare

2. Maps

2.1 Sensitive species	No
2.2 Year or period	1995-2016
2.3 Distribution map	Yes
2.4 Distribution map Method used	Based mainly on extrapolation from a limited amount of data
2.5 Additional maps	No

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

3.1 Is the species taken in the wild/exploited?	Yes	
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	Yes
	d) application of hunting and fishing rules which take account of the conservation of such populations	Yes
	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	Yes
	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 number of individuals (i)

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)	30148	38502	27542	649	486	369
Max. (raw, ie. not rounded)						
Unknown	No	No	No	Yes	Yes	Yes

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

Based mainly on extrapolation from a limited amount of data

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

AEBISCHER,N.J., DAVEY,P.D. & KINGDON,N.G. 2011. National Gamebag Census: Mammal Trends to 2009. Game & Wildlife Conservation Trust, Fordingbridge (www.gwct.org.uk/ngcmammals).
BATTERSBY, J. (ED) & TRACKING MAMMALS PARTNERSHIP. 2005. UK Mammals: Species Status and Population Trends. Joint Nature Conservation Committee/Tracking Mammals Partnership http://jncc.defra.gov.uk/page-3311.
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.
DAVIS, S.E., NEWSON, S.E., & NOBLE, D.G. 2007. The production of population trends for UK mammals using BBS mammal data: 1995-2005 update. BTO Research Report No. 462 http://jncc.defra.gov.uk/page-4309 (updated with additional data)
HARRISON, A., NEWEY, S., GILBERT, L., HAYDON, D.T. & THIRGOOD, S. 2010. Culling wildlife hosts to control disease: mountain hares, red grouse and louping ill virus. Journal of Applied Ecology 47: 926-930 http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2664.2010.01834.x/abstract
IASON, G.R., HULBERT, I.A.R., HEWSON, R & DINGERKUS, K. 2008. Mountain Hare. Pages 220-228 In HARRIS, S & YALDEN, D.W. Mammals of the British Isles: Handbook, 4th edition. The Mammal Society, Southampton.799pp.
KINRADE, V., EWALD, J., SMITH, A., NEWEY, S., IASON, G., THIRGOOD, S. & RAYNOR, R. 2008. The distribution of Mountain Hare (Lepus timidus) in Scotland (2006/07). Scottish Natural Heritage Commissioned Report No.278 www.snh.org.uk/pdfs/publications/commissioned_reports/Report%2520No278.

pdf

Massimino, D., Harris, S.J. & Gillings, S. 2018. Spatiotemporal trends in the relative abundance of selected terrestrial mammals as revealed by bird surveyors. Biological Conservation 226, 153-167

NEWEY, S., WILLEBRAND, T., HAYDON, D.T., DAHL, F., AEBISCHER, N.J., SMITH, A.A., & THIRGOOD,S.J. 2007. Do Mountain hare (Lepus timidus) populations cycle? Oikos, 116, 1547-1557.

NEWEY, S., DAHL, F., WILLEBRAND, T., & THIRGOOD, S.J. 2007. Unstable dynamics and population regulation in mountain hares: a review. Biological Reviews, 82, 527-549.

NORTON, L.R.; MURPHY, J.; REYNOLDS, B.; MARKS, S.; MACKEY, E.C. 2009 Countryside Survey: Scotland Results from 2007. NERC/Centre for Ecology & Hydrology, The Scottish Government, Scottish Natural Heritage, 83pp. (CEH Project Number: C03259) www.countrysidesurvey.org.uk/outputs/scotland-results-2007.

THULIN C.G. 2003. The distribution of mountain hares Lepus timidus in Europe: a challenge from brown hares L. europaeus? Mammal Rev.33:29-42 http://onlinelibrary.wiley.com/doi/10.1046/j.1365-2907.2003.00008.x/abstract.

Watson A, Wilson JD. 2018. Seven decades of mountain hare counts show severe declines where high-yield recreational game bird hunting is practised. J Appl Ecol. 2018;00:1-10. https://doi.org/10.1111/1365-

Mapping data were collated by the Mammal Scociety during the preparation of Mathews et al (2018) and include records from the NBN. Additional records collected for Kinrade et al (2008) are also included.

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	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	2016-2017

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

6.2 Population size (in reporting unit)	a) Unit	number of individuals (i)
	b) Minimum	79500
	c) Maximum	516000
	d) Best single value	
6.3 Type of estimate	95% confidence interval	
6.4 Additional population size (using population unit other than reporting unit)	a) Unit	
	b) Minimum	
	c) Maximum	
	d) Best single value	
6.5 Type of estimate		
6.6 Population size Method used	Based mainly on extrapolation from a limited amount of data	
6.7 Short-term trend Period	2007-2018	
6.8 Short-term trend Direction	Decreasing (-)	
6.9 Short-term trend Magnitude	a) Minimum	
	b) Maximum	
	c) Confidence interval	
6.10 Short-term trend Method used	Based mainly on extrapolation from a limited amount of data	
6.11 Long-term trend Period		
6.12 Long-term trend Direction		
6.13 Long-term trend Magnitude	a) Minimum	
	b) Maximum	
	c) Confidence interval	
6.14 Long-term trend Method used		
6.15 Favourable reference population (using the unit in 6.2 or 6.4)	a) Population size	
	b) Operator	
	c) Unknown	
	d) Method	
6.16 Change and reason for change in population size	Genuine change Improved knowledge/more accurate data Use of different method	
	The change is mainly due to:	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)?	Yes
	b) Is there a sufficiently large area of occupied AND unoccupied habitat of suitable quality (to maintain the species at FCS)?	

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

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	2007-2018
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 into agricultural land (excluding drainage and burning) (A01)	M
Conversion to forest from other land uses, or afforestation (excluding drainage) (B01)	M
Hunting (G07)	H
Management of fishing stocks and game (G08)	H

Threat	Ranking
Conversion into agricultural land (excluding drainage and burning) (A01)	M
Conversion to forest from other land uses, or afforestation (excluding drainage) (B01)	M
Hunting (G07)	H
Management of fishing stocks and game (G08)	H

8.2 Sources of information

8.3 Additional information

9. Conservation measures

9.1 Status of measures	a) Are measures needed?	No
	b) Indicate the status of measures	

9.2 Main purpose of the measures taken

9.3 Location of the measures taken

9.4 Response to the measures

9.5 List of main conservation measures

9.6 Additional information

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

10. Future prospects

10.1 Future prospects of parameters	a) Range b) Population c) Habitat of the species
10.2 Additional information	

11. Conclusions

11.1. Range	Favourable (FV)
11.2. Population	Unfavourable - Inadequate (U1)
11.3. Habitat for the species	Favourable (FV)
11.4. Future prospects	Unknown (XX)
11.5 Overall assessment of Conservation Status	Unfavourable - Inadequate (U1)
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

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

13.1 Justification of % thresholds for trends

13.2 Trans-boundary assessment

13.3 Other relevant Information

Distribution Map

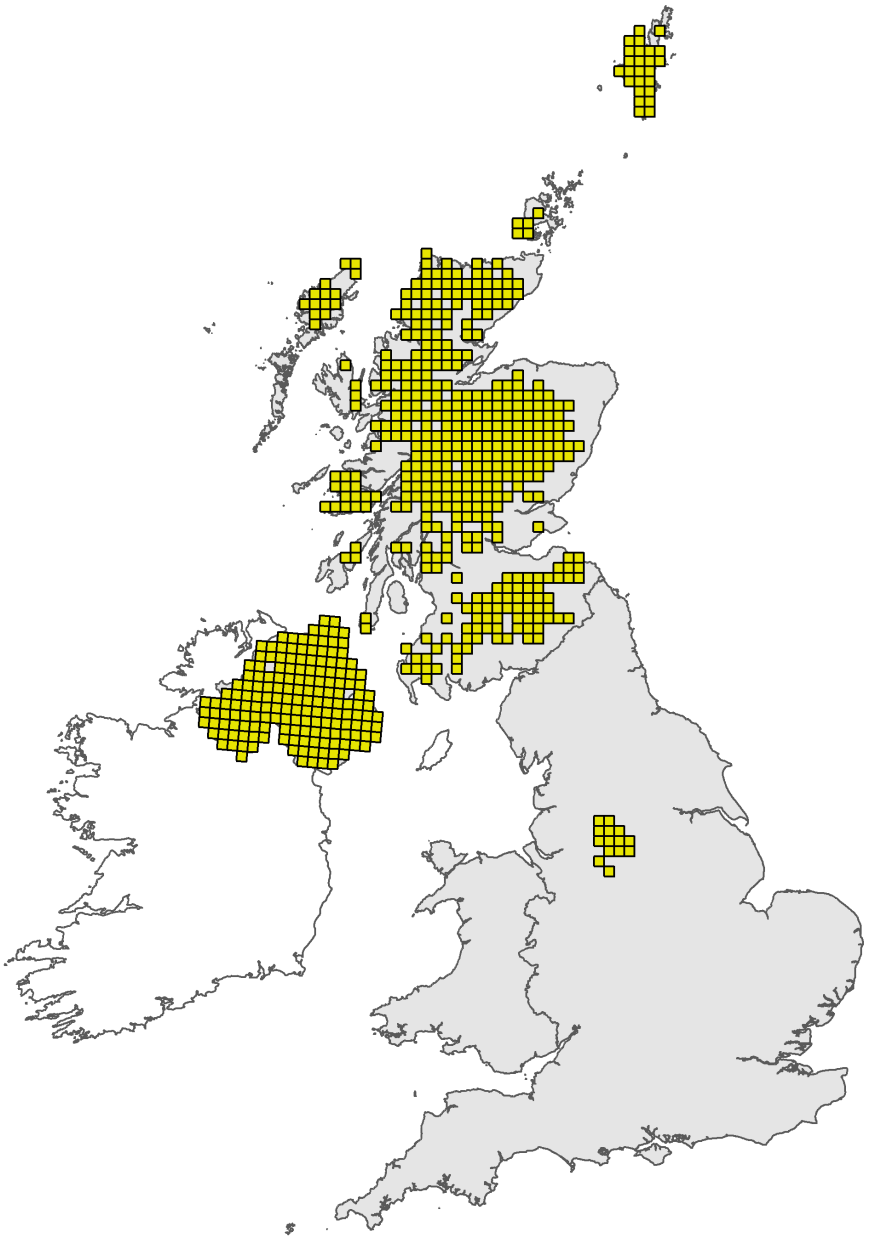

Figure 1: UK distribution map for S1334 - Mountain hare (*Lepus timidus*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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

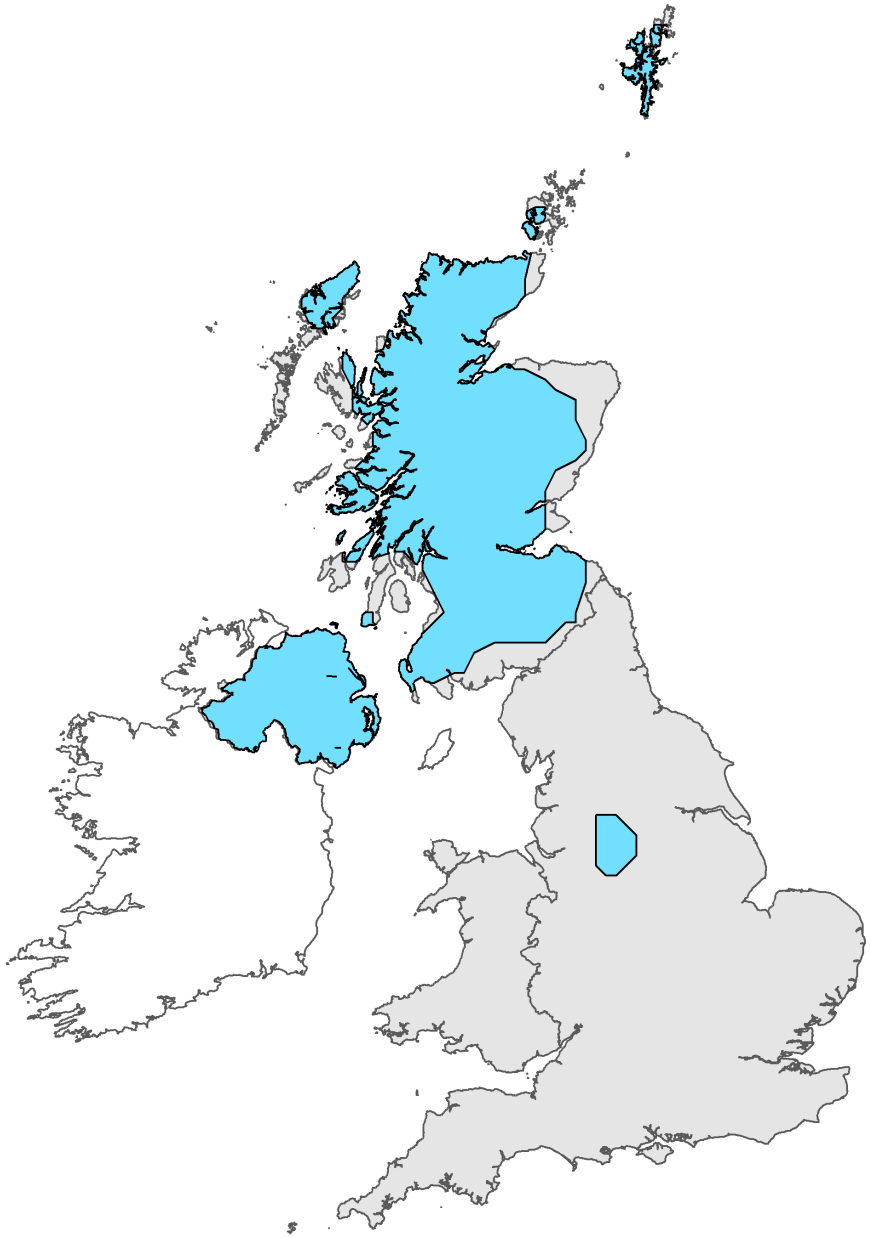

Figure 2: UK range map for S1334 - Mountain hare (*Lepus timidus*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

The range map has been produced by applying a bespoke range mapping tool for Article 17 reporting (produced by JNCC) to the 10km grid square distribution map presented in Figure 1. The alpha value for this species was 25km. For further details see the 2019 Article 17 UK Approach document.

Explanatory Notes

Species name: Lepus timidus (1334)

Field label	Note
3.2 Which of the measures in Art. 14 have been taken?	There is a licensing system to allow legitimate control of mountain hares in the closed season (1 March - 31 July) for specific purposes such as preventing serious damage to growing trees. The licensing system also allows for control of hares by otherwise illegal methods (such as shooting at night aided by spot-light) in certain limited circumstances, but the vast majority of hares that are legally shot each year do not fall into either of these categories and their control does not require a licence, hence the No response at 3.2(e).
3.3 Hunting bag or quantity taken in the wild for Mammals and Acipenseridae (Fish)	The data provided in 3.3 are a combination of actual numbers killed under licence (values in hundreds) and ESTIMATESof the numbers killed outside the closed season, where available. The latter are rounded to the nearest 1000 and are extrapolated from summary information on changes in the hare abundance index (derived from confidential National Gamebag Census bag data). The raw data are privately held and unavailable. Thus, for example, where a value of 30,148 is given, this equates to 148 hares known to have been killed under SNH licence plus an estimated 30,000 controlled outwith the closed season according to approved methods and therefore not subject to licensing. Where the value given is<1000, only the figure for the number of hares killed under licence is shown because no other information is

Species name: Lepus timidus (1334) Region code: ATL

Field label	Note
5.1 Surface area	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 approach to assessing Range is the same as taken in 2013 and 2007 whereby a 45km alpha hull value was used with a starting range unit of individual 10km squares.
5.3 Short term trend; Direction	Mountain hare range was assessed from information gathered for Mathews et. al., 2018, additional Scottish records and records from Northern Ireland to provide a UK range estimate. This compared the 2017 estimated range (based on known records) with range estimate for the 2013 assessment. The analysis suggested there was no evidence of a change in mountain hare range between these periods. Range is therefore considered to be stable.
6.1 Year or Period	Although the 95% CI values for the latest (2018) population estimate are broadly comparable with the indicative error margin given for the 1995 (Harris) estimate, recently published evidence (Watson & Wilson 2018 and Massimino et al 2018) supports the conclusion that there has been an overall decline in hare numbers since the mid 1990s.
6.2 Population size	Although a revised (2018) population estimate best single value exists, it is not considered reliable, as is suggested by the very wide confidence intervals around it. This is why the upper and lower confidence intervals are given instead.

6.8 Short term trend; Direction	Given the lack of survey information for mountain hares, there is no reliable evidence on which to base a national population estimate. In the absence of survey data, population estimates published in 1995 and 2018 both used the number of mountain hares in different habitats multiplied by the area of each habitat nationally. This crude approach provided highly unreliable estimates with no ability to detect any meaningful change over time, particularly as mountain hare populations are naturally cyclical, showing marked peaks and troughs over time. The assessment of population trend takes into account two recent publications on mountain hare trends. A paper published in August 2018 (Watson & Wilson, 2018) using survey data from NE Scotland concluded there to have been a decline of 99% in the mountain hare population across the study area between 1954 and 2017. The study was, however, geographically confined and the paper caveated against extrapolating the results to other sites. A wider analysis of the spatial trends in mountain hare populations was also published in August 2018 (Massimino et al., 2008). Using BTO Breeding Bird Survey mammal data, this concluded that there had been notable decreases in mountain hare populations in 108 of the 316 10km squares for which the species was assessed in Scotland between 1995/99 and 2011/15 time periods. While the time periods for both studies exceed the short term trend period for Article 17 reporting, the available evidence (including the latest trend analysis of BBS data up to and including 2017) does not suggest recovery during this reporting period. It is concluded that the data are not illustrative of a population cycle but do provide evidence of a gradual population decline.
7.4 Short term trend; Direction	With respect to habitat, based on Site Condition Monitoring data, the condition of dry heath has been unfavourable but is improving (subject to the impact of Nitrogen deposition). There is, however, no information on the condition of habitat outwith the designated sites from which to draw wider conclusions about this habitat. Mountain hares are not confined to dry heath habitat and, although research has shown that they can live at higher densities on such habitat when managed appropriately, there is no evidence that the extent and/or condition of supporting habitat during the period 2007-2018 has changed. Furthermore, declines in sheep numbers and stable deer populations mean there would be less competition from ungulates and, although there has been some bracken encroachment in upland margins and limited woodland regeneration, these do not signify major changes in habitat availability since 2007. Habitat is therefore considered to be stable.
8.1 Characterisation of pressures/ threats	Mountain hares benefit from moorland management, including areas of sustainably managed grouse moor. Altered land use, habitat fragmentation and loss of open moorland through afforestation can result in the loss of foraging opportunities and shelter, which may be detrimental to survival (Patton et al., 2010). Control measures are used to reduce damage to forestry and to reduce disease transmission of louping ill in grouse, as well as shooting for sport (Newey et al., 2008, Patton et al., 2010 and Harrison et al., 2010). Afforestation is likely to increase in marginal upland areas (mainly over wet heath and rough grassland, rather than over dry heaths), to meet increasing targets for commercial forestry cover. Hunting is recognised to be an unquantified impact on the population and further data are required on levels of hare management for disease control, grazing management and sport shooting in order to better understand any pressure this exerts on the population.

10.1 Future prospects of parameters	Range: Although any population decline presents the potential for range fragmentation and/or contraction, the paucity of survey data makes it difficult to quantify the risk. As range is measured by presence/absence, and mountain hares are not confined to a single habitat, it is considered that the likelihood of mountain hares maintaining their range is good. Population: The data on which to draw conclusions about population numbers and trend are imperfect and clear conclusions are confounded by the effects of population cyclicity. The combination of analyses (i.e. Watson & Wilson 2018 and Massimino et al 2018) does, however, provide sufficient evidence of decline to warrant concern. Habitat: The impact of woodland expansion and moorland management are considered to be the key impacts on future habitat prospects. Afforestation to meet commercial targets is likely to increase in marginal areas not central to the survival of mountain hares and is therefore not considered a notable risk. The prospects for habitat extent and condition are considered to be mixed but overall to be stable.
11.1 Range	Mountain hare range was assessed from information gathered under the Review of British Mammals . This compared the 2017 estimated range (based on known records) with range estimate for the 2013 assessment. The analysis suggested there was no evidence of a change in mountain hare range between these periods. Range is therefore considered to have been stable.
11.2 Population	It is concluded from two independent sources of evidence, namely Massimino et al (2018) and Watson & Wilson (2018), that there is evidence of mountain hare declines. The former study analysed BBS data and concluded that there had been notable decreases in mountain hare populations in 108 of the 316 ten kilometre squares for which the species was assessed in Scotland between 1995/99 and 2011/15 time periods. The latter study focused on NE Scotland only, but concluded there to have been a decline of 99% in the mountain hare population across the study sites between 1954 and 2017. NGC data were also considered during the assessment but were not considered sufficiently robust to enable firm conclusions to be drawn. There is no measure of hunting effort in the NGC statistics, so it is not possible to infer changes in the live hare population from the NGC trend.
11.3 Habitat for the species	Based on Site Condition Monitoring, the condition of dry heath has been unfavourable but is improving (subject to the impact of Nitrogen deposition). There is, however, no information on the condition of habitat outwith the designated sites from which to draw wider conclusions about this habitat. Mountain hares are not confined to dry heath habitat though and, although research has shown that they can live at higher densities on such habitat when managed appropriately, there is no evidence that the extent and/or condition of supporting habitat has changed. Declines in sheep numbers and stable deer populations mean there would be less competition from ungulates and, although there has been some bracken encroachment in upland margins and limited woodland regeneration, these do not signify major changes in habitat availability since 2007. Habitat is therefore considered to be stable
11.4 Future prospects	Future prospects for mountain hare are based on the assessment that range and habitat will be stable. Evidence of decline in population is sufficient to warrant concern and a lack of information on the impact of exploitation exacerbates concerns that this may be impacting on conservation status. Future prospects are anticipated to be a continuation of the current situation however the lack of information on the scale of exploitation across the species' range makes a definite conclusion difficult. For this reason, the assessment includes a precautionary 'unknown' for future prospects.
11.5 Overall assessment of Conservation Status	Our overall assessment for mountain hare is Unfavourable-inadequate primarily because of the evidence for population decline.
13.3 Other relevant information	The assessment draws on three population data sources: GWCT National Game Bag Census (NGC) data 1961-2016; BTO Breeding Bird Survey (BBS) data 1995-2017 and survey data from north-east Scotland 1954-2017 (see Watson & Wilson 2018).