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 habitat:

H8310 - Caves not open to the public

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 habitat, 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 habitat 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; and/or (iii) the field was only relevant at UK-level (sections 10 Future prospects and 11 Conclusions).
- For technical reasons, the country-level future trends for Range, Area covered by habitat and Structure and functions 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 17 for Annex I habitat types (Annex D)

NATIONAL LEVEL

1. General information

1.1 Member State	**UK (England information only)**
1.2 Habitat code	**8310 - Caves not open to the public**

2. Maps

2.1 Year or period	2018-
2.3 Distribution map	Yes
2.3 Distribution map Method used	Based mainly on expert opinion with very limited data
2.4 Additional maps	No

BIOGEOGRAPHICAL LEVEL

3. Biogeographical and marine regions

3.1 Biogeographical or marine region where the habitat occurs	**Atlantic (ATL)**
3.2 Sources of information	BAKER, A. & GENTY, D. 1998. Environmental pressures on conserving cave speleothems: effects of changing surface land-use and increased tourism. Journal of Environmental Management 53: 165-175. British Caving Association. 2016. Minimal Impact Caving Guidelines. Available from http://www.ogof.org.uk/Downloads/minimalimpactcaving.pdf [last checked 22/03/2018] CIGNA, A.A. 1993. Environmental management of tourist caves. Environmental Geology 21: 173-180. Derbyshire Caving Association Cave Registry https://thedca.org.uk/dca-cr/registry/index.php [last checked 22/03/2018] GROBELAAR, J.U. 2000. Lithophytic algae: A major threat to the karst formation of show caves. Journal of Applied Phycology 12: 309-315. Hinde, A. 2014. How Fairy Holes Cave retains its magic. Earth Heritage, 41, 15-16. Hypogean Crustacea Database. November 2015. http://hcrs.freshwaterlife.org/hcrs-database [last checked 22/03/2018]. JNCC. 2004a. Common Standards Monitoring for Earth Science Sites. Available from http://jncc.defra.gov.uk/page-2202 [last checked 22/03/2018]. JNCC. 2004b. Common Standards Monitoring for Mammals. Available from http://jncc.defra.gov.uk/page-2229 [last checked 22/03/2018]. Knight, L. 2008. The Biodiversity Action Plan (BAP) for Niphargus glenniei (Crustacea: Amphipoda: Niphargidae): the first British troglobite to be listed. Cave and Karst Science, Vol. 35, No. 1. Knight, L. (2016). The Pen Park Hole Invertebrate Survey: the first cave SSSI in Britain to include ecology in its notification. Cave and Karst Science, Vol.43, No.3, (2016) 107-108 Mendip Cave Registry http://www.mcra.org.uk/registry/browse.php?cv=cave&lc=gte&lv=&dc=gte&dv=&ac=gte&av=&page=35 [last checked 22/03/2018] MOSELEY, M. 2016. Subterranean biology of Morecambe Bay and the Isle of Man, British Isles. Cave and Karst Science, Vol.43, No.2, (2016) 51-64. MURPHY, P.J. & CHAMBERLAIN, A.T. 2008. Cavers and geoconservation: the history of cave exploration and its contribution to speleology in the Yorkshire Dales. In BUREK, C.V. & PROSSER, C.D. (eds) The history of Geoconservation. Geological Society, London, Special Publications, 300, 207-215.

Report on the main results of the surveillance under Article 17 for Annex I habitat types (Annex D)

PROUDLOVE, G.S., KNIGHT, L.R.F.D. & LEWINGTON, A. (in preparation). Subterranean biodiversity in Great Britain and Ireland: Composition and origin: Characterising a post-glacial subterranean biota.
VILES, H.A. 2003. Conceptual modelling of the impacts of climate change on karst geomorphology in the UK and Ireland. Journal for Nature Conservation 11: 59-66.
Waltham, A.C., Simms, M.J., Farrant, A.R. and Goldie, H.S. (1997) Karst and Caves of Great Britain, Geological Conservation Review Series, No. 12, Chapman and Hall, London, 358 pp
WALTHAM, Tony and David LOWE (eds.) (2017). Caves and Karst of the Yorkshire Dales (Volume 2). Buxton: British Cave Research Association. ISBN 978-0-900265-48-8. 360pp
WATSON, J., HAMILTON-SMITH, E., GILLIESON, D. & KIERNAN, K. 1997. Guidelines for Cave and Karst Protection. International Union for the Conservation of Nature and Natural Resources: Cambridge.
WHITAKER, T., JONES, D., BALDINI, J.U.L. & BAKER, A.J. 2009. A high-resolution spatial survey of cave air carbon dioxide concentrations in Scoska Cave (North Yorkshire, UK): implications for calcite deposition and re-dissolution. Cave and Karst Science 36(3) 85-92.
WOOD, P.J. & GUNN, J. 2000. The aquatic invertebrate fauna within a cave system in Derbyshire, England Vehr. Internat. Verein. Limnol. 27: 901-905.
WOOD, P.J., GUNN, J. & PERKINS, J. 2002. The impact of pollution on aquatic invertebrates within a subterranean ecosystem - out of sight out of mind. Arch Hydrobiologia 155 (2) 223-237.
WOOD, P.J., GUNN, J. & RUNDLE, S.D. 2008. Response of benthic cave invertebrates to organic pollution events. Aquatic Conservation: Marine and Freshwater Ecosystems 18, 909-922.

4. Range

4.1 Surface area (in km²)		
4.2 Short-term trend Period		
4.3 Short-term trend Direction	Stable (0)	
4.4 Short-term trend Magnitude	a) Minimum	b) Maximum
4.5 Short-term trend Method used		
4.6 Long-term trend Period		
4.7 Long-term trend Direction		
4.8 Long-term trend Magnitude	a) Minimum	b) Maximum
4.9 Long-term trend Method used		
4.10 Favourable reference range	a) Area (km²)	
	b) Operator	
	c) Unknown	No
	d) Method	
4.11 Change and reason for change in surface area of range	No change	
	The change is mainly due to:	
4.12 Additional information		

5. Area covered by habitat

5.1 Year or period	1997-2018		
5.2 Surface area (in km²)	a) Minimum	b) Maximum	c) Best single value

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5.3 Type of estimate			
5.4 Surface area Method used	Insufficient or no data available		
5.5 Short-term trend Period	2012-2018		
5.6 Short-term trend Direction	Stable (0)		
5.7 Short-term trend Magnitude	a) Minimum	b) Maximum	c) Confidence interval
5.8 Short-term trend Method used	Based mainly on expert opinion with very limited data		
5.9 Long-term trend Period			
5.10 Long-term trend Direction			
5.11 Long-term trend Magnitude	a) Minimum	b) Maximum	c) Confidence interval
5.12 Long-term trend Method used			
5.13 Favourable reference area	a) Area (km²) b) Operator c) Unknown No d) Method		
5.14 Change and reason for change in surface area of range	No change The change is mainly due to:		
5.15 Additional information			

6. Structure and functions

6.1 Condition of habitat	a) Area in good condition (km²)	Minimum 2.017	Maximum	
	b) Area in not-good condition (km²)	Minimum 0.125	Maximum	
	c) Area where condition is not known (km²)	Minimum	Maximum	
6.2 Condition of habitat Method used	Based mainly on expert opinion with very limited data			
6.3 Short-term trend of habitat area in good condition Period	2007-2018			
6.4 Short-term trend of habitat area in good condition Direction	Stable (0)			
6.5 Short-term trend of habitat area in good condition Method used	Based mainly on expert opinion with very limited data			
6.6 Typical species	Has the list of typical species changed in comparison to the previous reporting period?			No
6.7 Typical species Method used				
6.8 Additional information				

7. Main pressures and threats

7.1 Characterisation of pressures/threats

Pressure	Ranking
Application of natural fertilisers on agricultural land (A19)	M
Deposition and treatment of waste/garbage from household/recreational facilities (F09)	M

Deposition and treatment of waste/garbage from commercial and industrial facilities (F10)	M
Abstraction of ground and surface waters (including marine) for commercial/industrial use (excluding energy) (F34)	M
Abiotic natural processes (e.g. erosion, silting up, drying out, submersion, salinization) (L01)	M
Sports, tourism and leisure activities (F07)	M
Vandalism or arson (H04)	M
Other modification of hydrological conditions for residential or recreational development (F31)	M
Extraction of minerals (e.g. rock, metal ores, gravel, sand, shell) (C01)	M
Agricultural activities generating diffuse pollution to surface or ground waters (A26)	M

Threat	Ranking
Extraction of minerals (e.g. rock, metal ores, gravel, sand, shell) (C01)	M
Droughts and decreases in precipitation due to climate change (N02)	M
Increases or changes in precipitation due to climate change (N03)	M
Use of plant protection chemicals in agriculture (A21)	M
Deposition and treatment of waste/garbage from household/recreational facilities (F09)	M
Deposition and treatment of waste/garbage from commercial and industrial facilities (F10)	M
Other modification of hydrological conditions for residential or recreational development (F31)	M
Vandalism or arson (H04)	M
Agriculture activities not referred to above (A36)	M
Sports, tourism and leisure activities (F07)	M

7.2 Sources of information

7.3 Additional information

8. Conservation measures

8.1 Status of measures	a) Are measures needed?	Yes
	b) Indicate the status of measures	Measures identified, but none yet taken

8.2 Main purpose of the measures taken

8.3 Location of the measures taken

8.4 Response to the measures

8.5 List of main conservation measures

Manage changes in hydrological and coastal systems and regimes for construction and development (CF10)

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Reduce diffuse pollution to surface or ground waters from agricultural activities (CA11)

8.6 Additional information

9. Future prospects

9.1 Future prospects of parameters	a) Range b) Area c) Structure and functions
9.2 Additional information	

10. Conclusions

10.1. Range	
10.2. Area	
10.3. Specific structure and functions (incl. typical species)	
10.4. Future prospects	
10.5 Overall assessment of Conservation Status	
10.6 Overall trend in Conservation Status	
10.7 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:
10.8 Additional information	

11. Natura 2000 (pSCIs, SCIs, SACs) coverage for Annex I habitat types

11.1 Surface area of the habitat type inside the pSCIs, SCIs and SACs network (in km² in biogeographical/ marine region)	a) Minimum b) Maximum c) Best single value 3.424
11.2 Type of estimate	Best estimate
11.3 Surface area of the habitat type inside the network Method used	Based mainly on expert opinion with very limited data
11.4 Short-term trend of habitat area in good condition within the network Direction	Stable (0)
11.5 Short-term trend of habitat area in good condition within network Method used	Based mainly on expert opinion with very limited data
11.6 Additional information	

12. Complementary information

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12.1 Justification of % thresholds for trends

12.2 Other relevant information

Distribution Map

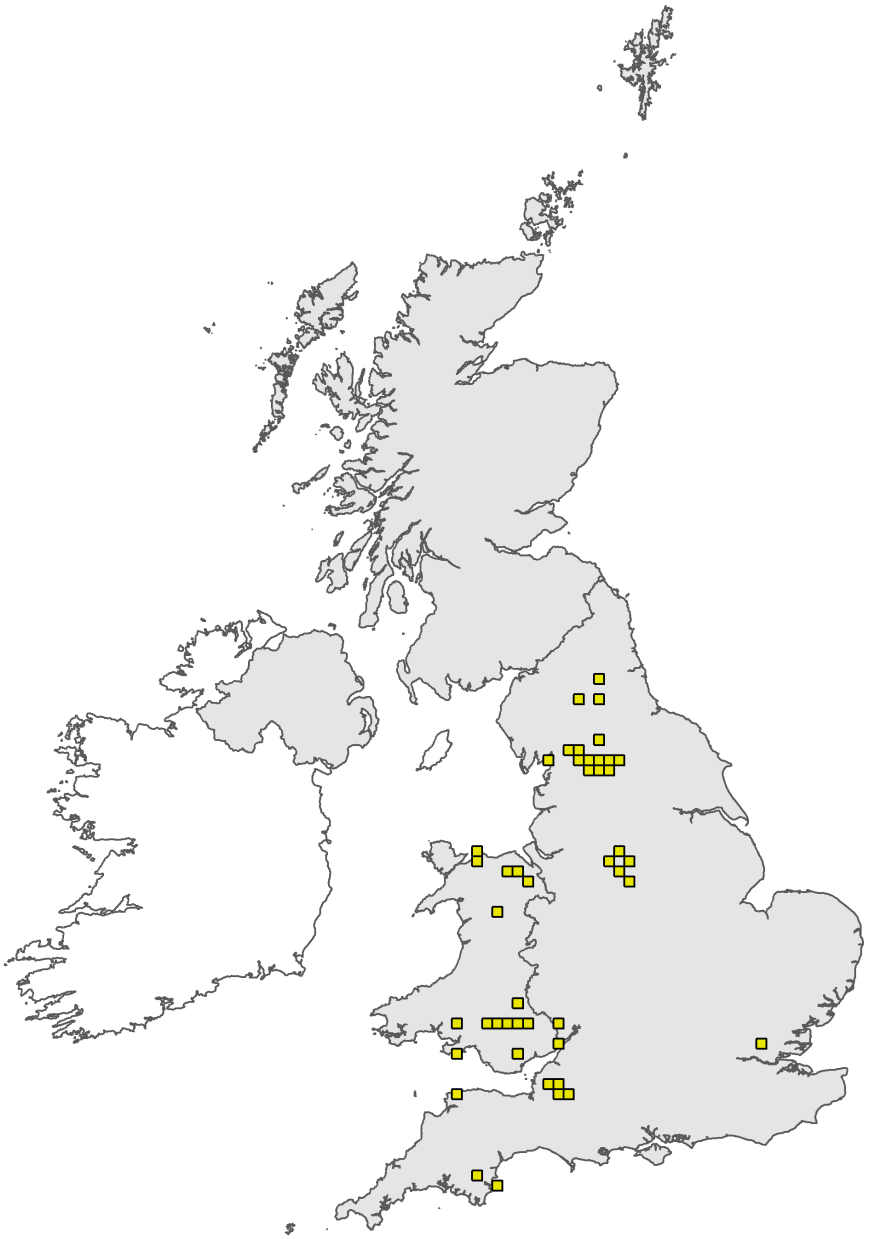

Figure 1: UK distribution map for H8310 - Caves not open to the public. Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

The 10km grid square distribution map is based on available habitat records which are considered to be representative of the distribution within the current reporting period. For further details see the 2019 Article17 UK Approach document.

Range Map

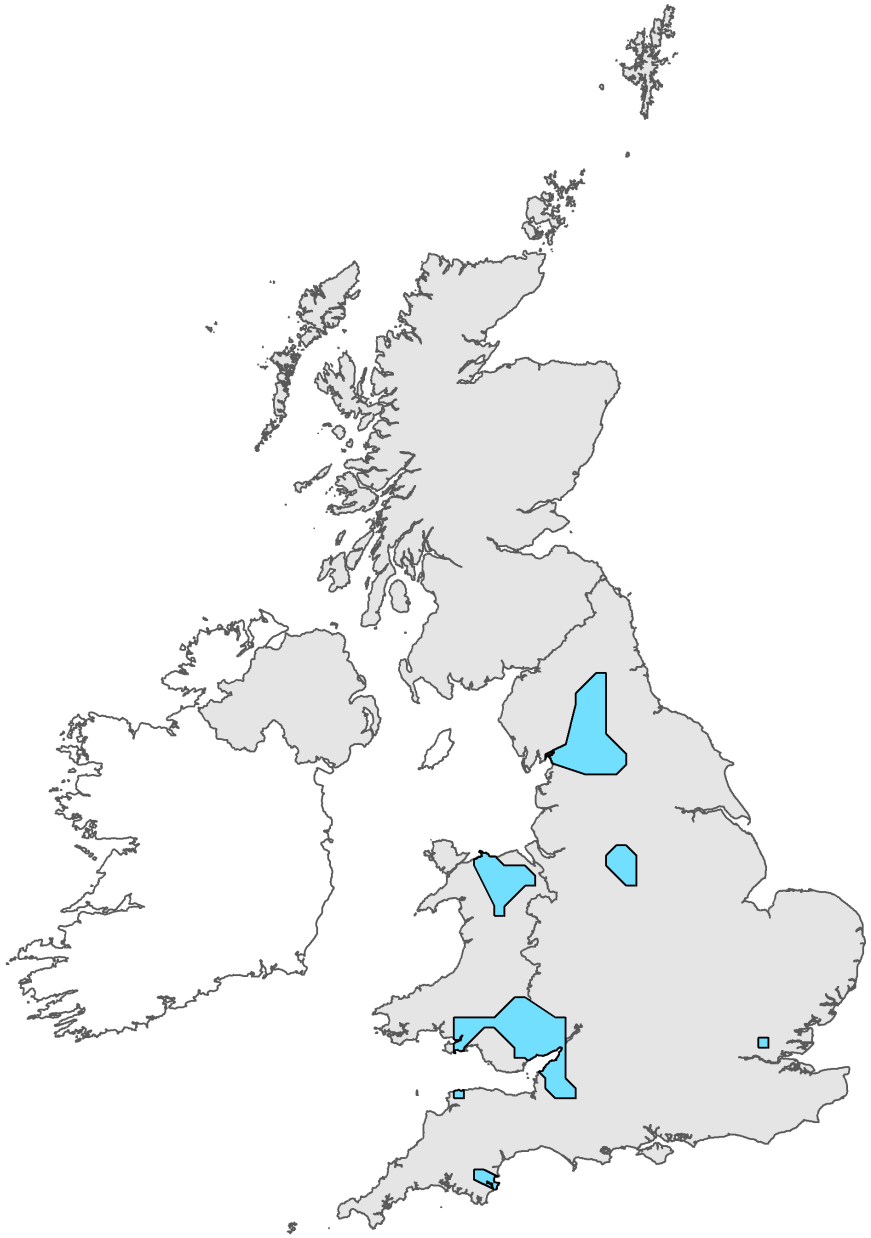

Figure 2: UK range map for H8310 - Caves not open to the public. Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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 habitat was 25km. For further details see the 2019 Article 17 UK Approach document.

Explanatory Notes

Habitat code: 8310

Field label	Note
2.3 Distribution map; Method used	The information for the distribution map is based upon the 10km grid squares where caves are found within the SSSI and SAC series. For SSSIs, this is primarily based on geological sites as selected through the Geological Conservation Review for karst and caves (Waltham et al, 1997), which is considered to be a reasonable approximation of the likely range of this habitat in England. Two SSSIs (Pridhamsleigh Caves and Buckfastleigh Caves) are notified for the Section 41 priority species Niphargus glenniei, as well as geological features. A third SSSI (Pen Park Hole) was notified in 2016 for Niphargus kochianus, N. fontanus and Microniphargus leruthi (see Knight, 2016), as well as geological features. This notifcation adds an extra 10km grid square to the distribution map. The SACs selected for this habitat have been identified for their bat populations rather than truly hypogean taxa. Most of the data, as submitted for the last reporting round remains unchanged. One data point/10km square centroid has been amended (this was recorded in the wrong location previously due to a typographical error in the grid reference) and one data point/ 10km square centroid has been added due to the notficiation of an addition cave SSSI. Both of these have had a minor impact on the range.

Habitat code: 8310 Region code: ATL

Field label	Note
4.3 Short term trend; Direction	The natural process that form caves do not change over time periods relevant to Article 17 reporting. The timescales for cave formation are long, inception rates are unknown, but cave enlargement is known to take tens or hundreds of thousands of years (see Waltham et al, 1997). The discovery of new cave passage continues at a slow rate, but this is considered to have no siginficant impact on the trend or range. The area of cave that is 'lost' to tourism is low. The natural process that form caves do not change over time periods relevant to Article 17 reporting, the area of habitat is effectively unchanged and the trend taken to be static.
5.2 Surface area	There is approximately 524 km (in length) of cave passage in England (claculated from Derbyshire Caving Association Cave Registry, 2017; Mendip Cave Registry, 2017; Waltham and Lowe, 2017), this excludes caves in Devon as data is currently unavailable. This is an increase in recorded cave passage since Waltham et al (1997), and is due to caving groups undertaking cave exploration and discovering previously unmapped cave passages, rather than new habitat being formed. Discoveries of completely new caves are rare. By their nature caves do not have a surface expression which can be measured in terms of area and the area of the habitat in km2 is unknown. The only measurement widely available for a large number of caves is the length of cave passage in kilometres. It is impossible to provide an area based measurement as individual cave passages may vary greatly in width along their length.
5.4 Surface area; Method used	The length of known cave passage in England has been estimated from data in the Derbyshire Caving Association Cave Registry (2017), the Mendip Cave Registry, 2017) and in Waltham & Lowe (2017). The area in km squared is unknown at present and cannot be estimated with any degree of accuracy.

5.6 Short term trend; Direction	The natural process that form caves do not change over time periods relevant to Article 17 reporting. The timescales for cave formation are long, inception rates are unknown, but cave enlargement is known to take tens or hundreds of thousands of years (see Waltham et al, 1997). The discovery of new cave passage continues at a slow rate, but this is considered to have no siginficant impact on the trend or range. The area of cave that is 'lost' to tourism is low. The natural process that form caves do not change over time periods relevant to Article 17 reporting, the area of habitat is effectively unchanged and the trend taken to be static.
5.8 Short term trend; Method used	By their nature caves do not have a surface expression which can be measured in terms of area. The only measurement widely available for a large number of caves is the length of cave passage in kilometres. It is impossible to provide an area based measurement as individual cave passages may vary greatly in width along their length. The natural process that form caves do not change over time periods relevant to Article 17 reporting, the area of habitat is effectively unchanged and the trend taken to be static.
5.14 Change and reason for change in surface area	The natural process that form caves do not change over time periods relevant to Article 17 reporting, the area of habitat is effectively unchanged and the trend taken to be static.
6.1 Condition of habitat	Condition data for SACs is provided. Although SAC assessments give an indication that this habitat is Favourable in England, this is only a small and unrepresentative part of the overall resource as defined by H8310. Water quality has major implementations for subterranean taxa (Wood et al, 2002 & 2008) but only limited work has been done on the identification of indicator organisms. As a result little information on habitat quality is available. The situation is even less well understood for other elements of this habitat, although current work (eg Proudlove et al, in preparation; Hypogean Crustacea Database, 2015; and Moseley, 2016) may help with determining this in the future.
6.2 Condition of habitat; Method used	Condition assessments based on CSM (JNCC, 2004b) provide a means to assess the structure and functioning of H8310. The following attributes were examined for all CSM assessments relevant to the habitat, which to date have only been for caves supporting important populations of bats: Site security. External and internal condition of roost. Site access. Disturbance. Use by bats (presence/absence). Only a small small proportion of the habitat H8310 is represented in SACs designated for bats. In England, the four SACs designated for bats are all found in Somerset and Devon. Area of Annex habitats on SAC are not recorded on Natural England's designated sites system, but we use the area of the unit in which they exists as a surrogate - this will lead to significant over-estimation of area for small habitat features.The area figures for condition may not be accurate, as assessments are based upon site ownership units where the Annex 1 feature is present although the feature may not present throughout the entire unit. A substantial part of the cave resource is represented within the geological SSSI series, these have assessed for their earth science features (see JNCC, 2004a). Some of these monitoring attributes will be relevant to the condition of H8310, but they have not been assessed for their subterranean fauna formally. There are no SSSI assessments that are considered strongly or weakly indicative of the future condition of H8310 on SSSIs.
6.4 Short term trend of habitat area in good condition; Direction	The natural process that form caves do not change over time periods relevant to Article 17 reporting, the area of habitat is effectively unchanged and the trend taken to be stable.
6.5 Short term trend of habitat area in good condition; Method used	The natural process that form caves do not change over time periods relevant to Article 17 reporting, the area of habitat is effectively unchanged and the trend taken to be stable.
7.1 Characterisation of pressures/ threats	Threats - A21: Use of plant protection chemicals in agriculture and A36: Agriculture activities not referred to above Although agri-environment measures are in place to protect caves and cave habitats, measures could be expanded to cover wider areas.

7.1 Characterisation of pressures/ threats	Threats - C01: Extraction of minerals (e.g. rock, metal ores, gravel, sand, shell) Although mining and quarrying is highly regulated, there is still the potential to remove caves through their activity and accidental pollution events may occur.
7.1 Characterisation of pressures/ threats	Threats - F09: Deposition and treatment of waste/garbage from household/recreational facilities and F10: Deposition and treatment of waste/garbage from commercial and industrial facilities. Although the disposal of waste is highly regulated, there is still the potential for discharge of waste gases, which may cause problems.
7.1 Characterisation of pressures/ threats	Threats - F07: Sports, tourism and leisure activities Although there is an increased awareness of cave conservation among recreational cavers there is still the potential inadvertent damage to occur
7.1 Characterisation of pressures/ threats	Threats - F31: Other modification of hydrological conditions for residential or recreational development Abstraction results in changes in hydraulic conditions, which may affect the cave environment.
7.1 Characterisation of pressures/ threats	Pressures - L01: Abiotic natural processes (e.g. erosion, silting up, drying out, submersion, salinization) The timescales for cave formation are long, inception rates are unknown, but cave enlargement (and therefore creation of new habitat) can take tens or hundreds of thousands of years (see Waltham et al, 1997).
7.1 Characterisation of pressures/ threats	H04: Vandalism or arson Visitors are potentially the most destructive threat to caves and their sediments (Murphy and Chamberlain, 2008), with potential impacts including trampling, disturbance, vandalism and littering. However, this is difficult to apply to the ecology of British caves in general because of the lack of information available on the fauna that utilise and/or may be dependent on subterranean environments.
7.1 Characterisation of pressures/ threats	Pressures - C01: Extraction of minerals (e.g. rock, metal ores, gravel, sand, shell) Mining and quarrying can lead to changes of aquatic habitats through changes in chemistry and hydrology as well as changes in erosion/ deposition regimes for sediments in cave passages. Cave ecosystems can also be significantly affected by changes to sediment loads, subsurface hydrology and both clastic (sediment) and chemical water quality (Watson et al. 1997) arising from associated activities on the surface. Quarrying has had a direct impact through the removal of caves and karst landforms. In a well-documented example, around 680 m of cave passages have been quarried away at Fairy Holes Cave in County Durham due to an extant planning permission; around 3.2 km of cave passages remain which have been protected as a SSSI (Hinde, 2014).
7.1 Characterisation of pressures/ threats	Pressures - F07: Sports, tourism and leisure activities A number of studies have shown that the greatest internal impacts on subterranean ecosystems come from intensive and uncontrolled tourism and from recreational caving. The impact of increased CO2 levels associated with respiration on delicate speleothems has been documented (Baker and Genty, 1998), although the human impact on subterranean fauna is poorly understood. The presence of lighting often leads to an elevation of temperature (Cigna, 1993) and the development of floral communities in illuminated areas (Grobbelaar, 2000), while artificial ventilation to reduce cave radon concentrations may cause changes in temperature, humidity and hence evaporation from cave habitats, including standing water pools. Guidelines have been developed to facilitate the sustainable development and conservation of cave and karst environments at national (British Caving Association, 2016) and international (Watson et al. 1997) scales.

7.1 Characterisation of pressures/ threats	Pressures - A19: Application of natural fertilisers on agricultural land Surface organic pollution can have a direct effect on cave fauna but also often washes in surface fauna (the species may be the same as some found in caves but the latter are often genetically distinct forms) which may out-compete and so denude the cave fauna (Wood et al, 2008). Pollution incidents within cave systems are frequently undetected due to the difficulty of identifying the pollutant source and gaining access to monitor features. Studies such as that reported in Wood et al (2002, 2008), which demonstrated the impact of contaminated agricultural runoff from the surface catchment on cave fauna in the English Peak District, are rare.
7.1 Characterisation of pressures/ threats	Pressures - F31: Other modification of hydrological conditions for residential or recreational development and F34: Abstractions of ground and surface waters (including marine) for commercial/industrial use (excluding energy) Groundwater abstraction can lead to reduced volumes of water and changes in siltation patterns within cave systems.
7.1 Characterisation of pressures/ threats	Pressures - F09: Deposition and treatment of waste/garbage from household/recreational facilities and F10: Deposition and treatment of waste/garbage from commercial and industrial facilities. Generation of gases from waste disposal can have impacts on both the aquatic and non-aquatic faunal elements of caves.
7.1 Characterisation of pressures/ threats	Pressures - A26: Agricultural activities generating diffuse pollution to surface or ground waters Agriculture can both affect the hydrology and hydrochemistry within caves, the latter particularly through washout of pesticides into cave systems.
7.1 Characterisation of pressures/ threats	Threats - N02: Droughts and decreases in precipitation due to climate change and N03: Increases or changes in precipitation due to climate change. Conceptual models predict that climate change may effect caves through changes in limestone dissolution rates, hydrological regime and the potential for greater slope instability (Viles, 2003), although further study would be needed to understand specific impacts on individual caves. Carbon dioxide concentration is a critical rate-determining variable in a variety of natural processes occurring in karstic environments, including speleogenesis, condensation corrosion and carbonate speleothem deposition (Whitacker et al, 2009).
7.1 Characterisation of pressures/ threats	Threats - H04: Vandalism or arson Potential impacts including trampling, disturbance, vandalism and littering.
7.2 Sources of information	The summary of main pressures and threats is mainly derived from Wood and Gunn (2000). This is the most recent work discussing the pressures on cave environments, no new pressures have been identified since the last reporting round, but some have been reclassified.

8.1 Status of measures	CF10: Manage changes in hydrological and coastal systems and regimes for construction and development The Water Framework Directive (2000/60/EC) has created considerable impetus for widespread action on improving water quality and addressing abstraction issues. The related Groundwater (Daughter) Directive (2006/116/EC) clarifies the requirements of the Water Framework Directive for the assessment of chemical status of groundwater bodies, trend reversal and the prevention or limitation of inputs of pollutants to groundwater. In addition the accompanying explanatory text encourages further consideration of groundwater ecosystems in groundwater management decisions and further research on groundwater ecosystem function. It is currently unclear whether this is having a direct impact on caves. CA11: Reduce diffuse pollution to surface or ground waters from agricultural activities A suite of agri-environment measures are now in place in both the uplands and lowlands. These may lead to some reductions in agricultural impacts and pollution, for example creating buffer zones around cave entrances and swallets to reduce the impacts of fertilisers from point sources. It is currently unclear whether this is having a direct impact on caves. In the last reporting round, there was a measure relating to establishing protected areas/sites. This would still be an important measure for this habitat, although it does not seem to be available for selection in this reporting round. Many caves are notified as SSSIs for their geological interest and some of these could additionally be notified for troglobite species. Two SSSIs (Pridhamsleigh Caves and Buckfastleigh Caves) are notified for the Section 41 priority species Niphargus glenniei, as well as geological features. A third SSSI (Pen Park Hole) has recently been notified for Niphargus kochianus, N. fontanus and Microniphargus leruthi, as well as geological features. As our knowledge of this habitat and its associated species increases, there is the potential of increasing the number of notified SSSIs and SACs.
9.1 Future prospects of parameters	Only a small and unrepresentative part of the overall H8310 resource is within the SAC series (caves used by bats). There are currently no SSSI assessments that are considered strongly or weakly indicative of the future condition of H8310 on SSSIs. Although a substantial part of the English resource is represented within the geological SSSI series, these have not been assessed for the condition of their subterranean fauna.
11.1 Surface area of the habitat type inside the pSCIs, SCIs and SACs network	The area of cave SAC habitat may be an over-estimation as caves are split into reportable features following above ground field boundaries rather than the actual area of cave passage for the current group of SACs. However, only a small and unrepresentative part of the overall H8310 resource is within the SAC series (caves used by bats) so it could also be seen as an underestimate.
11.2 Type of estimate	This is a best estimate based upon the limited number of SACs (caves used by bats rather than any other species) designated for H8310 in England.
11.3 Surface area of the habitat type inside the network; Method used	The current SACs designated are only a small proportion of the number/area of the caves which could potentially be classed as part of this habitat.
11.4 Short term trend of habitat area in good condition within the network; Direction	The natural process that form caves do not change over time periods relevant to Article 17 reporting and the area of habitat is effectively unchanged. The area in good condition is likely to remain the same.
11.5 Short term trend of habitat area in good condition within the network; Method used	The natural process that form caves do not change over time periods relevant to Article 17 reporting and the area of habitat is effectively unchanged. The area in good condition is likely to remain the same.