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:

S6284 - Natterjack toad (*Epidalea calamita*)

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	**6284**
1.3 Species scientific name	**Epidalea calamita**
1.4 Alternative species scientific name	
1.5 Common name (in national language)	Natterjack toad

2. Maps

2.1 Sensitive species	No
2.2 Year or period	2013-2018
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

Amphibian and Reptile Conservation Trust Ltd 2017. Monitoring of natterjack toads in Scotland. Scottish Natural Heritage commissioned report (unpublished), Scotland.
ARC occupancy data 2018. Occupancy data for Epidalea calamita is based on data held internally by Amphibian and Reptile Conservation, combining a variety of data sources
ARC population data 2018. Population data for Epidalea calamita is based on data held internally by Amphibian and Reptile Conservation, combining a variety of data sources.
Baker, J Beebee T, Buckley J, Gent T, Orchard D 2011. Amphibian Habitat Management Handbook. Amphibian and Reptile Conservation, Bournemouth.
Bardsley, L and Beebee, T 1998. Interspecific competition between Bufo larvae under conditions of community transition. Journal of Ecology. Pp. 1751-1759.
Beebee, T & Denton, J 1996. The natterjack toad conservation handbook. English Nature, Peterborough.
Beebee, T & Buckley, J 2001. Natterjack toad (Bufo calamita) Site Register for the UK 1970 -1999 inclusive. University of Sussex and the Herpetological Conservation Trust, UK.
Beebee, T & Buckley, J 2014. Natterjack toad (Bufo calamita) site register for the UK 1970 -2009 inclusive. University of sussex and amphibian and reptile conservation trust, UK.
Boyd, M 1971. Survey of the Distribution of the Natterjack Toad on the Dumfriesshire Coast. Unpublished report to the Nature Conservancy Council (NCC).
Bridson, RH 1976. The Natterjack Toad; its distribution in south-west Scotland in

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1976. Unpublished report to the Nature Conservancy Council (NCC).
Cunningham, AA & Minting, P. 2008. National survey of batrochochytridium dendrobatridis infection in UK amphibians 2008. Final report, Institute of Zoology, London.
Griffiths 1991. Interspecific competition in tadpoles: growth inhibition and growth retrieval in natterjack toads, Bufo calamita. Journal of Animal Ecology. Vol. 60, pp. 1065-1076
McInery, C and Minting P. 2016. The Amphibians & Reptiles of Scotland. Glasgow Natural History Society. Glasgow, Scotland.
Minting, P 2012. Scottish natterjack project 2012. Scottish Natural Heritage commissioned report (unpublished), Scotland.
Minting, P 2015. Scottish natterjack toad report 2013 - 2015. Scottish Natural Heritage commissioned report (unpublished), Scotland.
Rowe G & Beebee, T 2007. Defining population boundaries: use of three Bayesian approaches with microsatellite data from British natterjack toads (Bufo calamita). Journal of Molecular Ecology. Vol 16, pp. 785-796
Https://www.arc-trust.org/saving-species-natterjack-toad
ARC, 2018. Distribution data supplied to SNH in respect of Article 17 reporting for amphibians; Sources: ARC, Record Pool, NBN Trust. Dates: 1990-2017; copyright status as stated in relevant column; (Excel spreadsheet, December 2018.)
Beebee, T & Buckley, J 2012. Natterjack toads - Achieving Favourable Conservation Status (FCS). ARC, unpublished.

5. Range

5.1 Surface area (km²)		
5.2 Short-term trend Period		
5.3 Short-term trend Direction	Decreasing (-)	
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	Genuine change	
	The change is mainly due to:	Genuine change
5.12 Additional information		

6. Population

6.1 Year or period	1990-2017

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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	23
6.3 Type of estimate	Best estimate	
6.4 Additional population size (using population unit other than reporting unit)	a) Unit	number of breeding females (bfemales)
	b) Minimum	
	c) Maximum	
	d) Best single value	49
6.5 Type of estimate	Minimum	
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:	Genuine change
6.17 Additional information		

7. Habitat for the species

7.1 Sufficiency of area and quality of occupied habitat	a) Are area and quality of occupied habitat sufficient (to maintain the species at FCS)?	No
	b) Is there a sufficiently large area of occupied AND unoccupied habitat of suitable quality (to maintain the species at FCS)?	No

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	Decreasing (-)
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
Extensive grazing or undergrazing by livestock (A10)	H
Drainage for use as agricultural land (A31)	H
Mowing or cutting of grasslands (A08)	M
Mixed source pollution to surface and ground waters (limnic and terrestrial) (J01)	M
Abiotic natural processes (e.g. erosion, silting up, drying out, submersion, salinization) (L01)	H
Natural succession resulting in species composition change (other than by direct changes of agricultural or forestry practices) (L02)	H
Interspecific relations (competition, predation, parasitism, pathogens) (L06)	M

Threat	Ranking
Extensive grazing or undergrazing by livestock (A10)	H
Drainage for use as agricultural land (A31)	H
Mowing or cutting of grasslands (A08)	M
Mixed source pollution to surface and ground waters (limnic and terrestrial) (J01)	M
Abiotic natural processes (e.g. erosion, silting up, drying out, submersion, salinization) (L01)	H
Natural succession resulting in species composition change (other than by direct changes of agricultural or forestry practices) (L02)	H
Interspecific relations (competition, predation, parasitism, pathogens) (L06)	M
Temperature changes (e.g. rise of temperature & extremes) due to climate change (N01)	M
Sea-level and wave exposure changes due to climate change (N04)	M

8.2 Sources of information

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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		Increase the population size and/or improve population dynamics (improve reproduction success, reduce mortality, improve age/sex structure) (related to 'Population')
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

Adapt mowing, grazing and other equivalent agricultural activities (CA05)
Other measures related to forestry practices (CB15)
Reduce impact of mixed source pollution (CJ01)
Management of habitats (others than agriculture and forest) to slow, stop or reverse natural processes (CL01)
Other measures related to natural processes (CL04)
Implement climate change adaptation measures (CN02)

9.6 Additional information

10. Future prospects

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

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

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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

Distribution Map

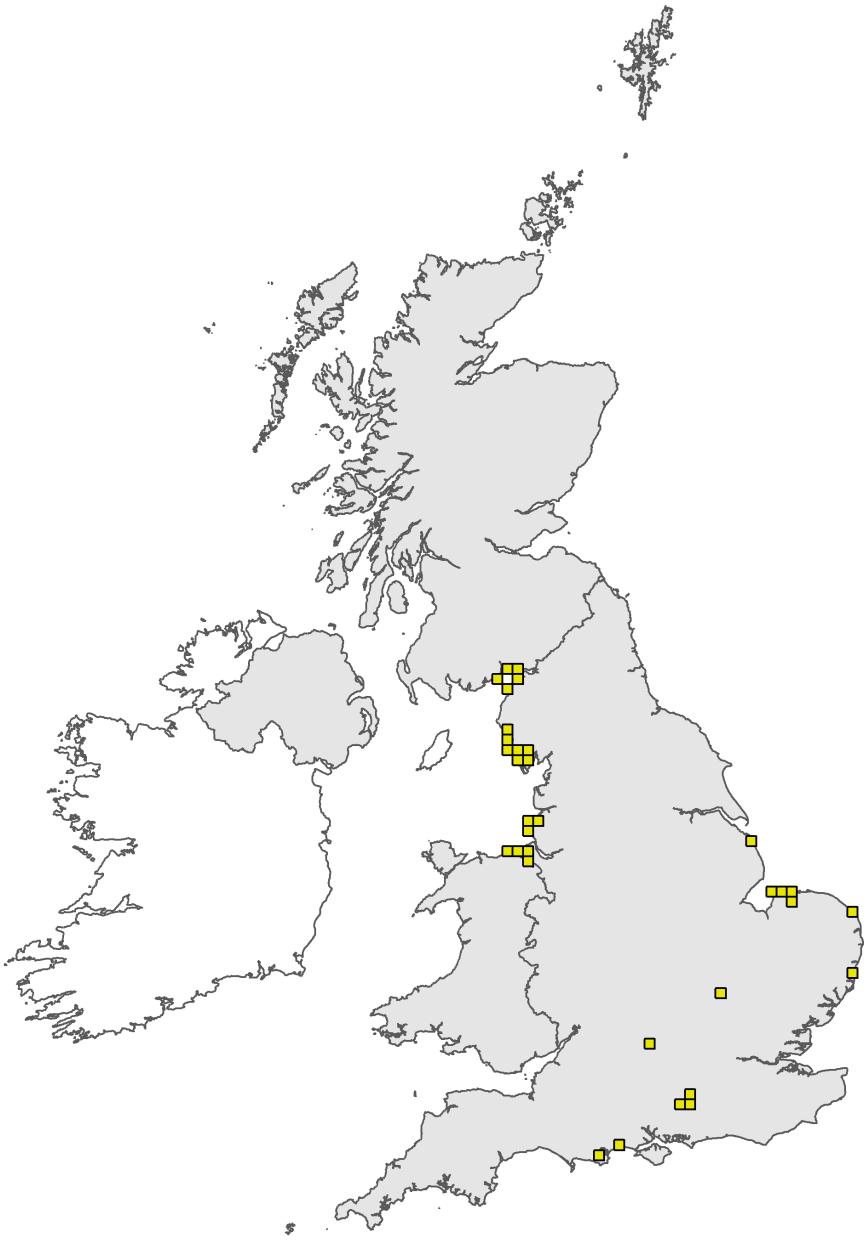

Figure 1: UK distribution map for S6284 - Natterjack toad (*Epidalea calamita*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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

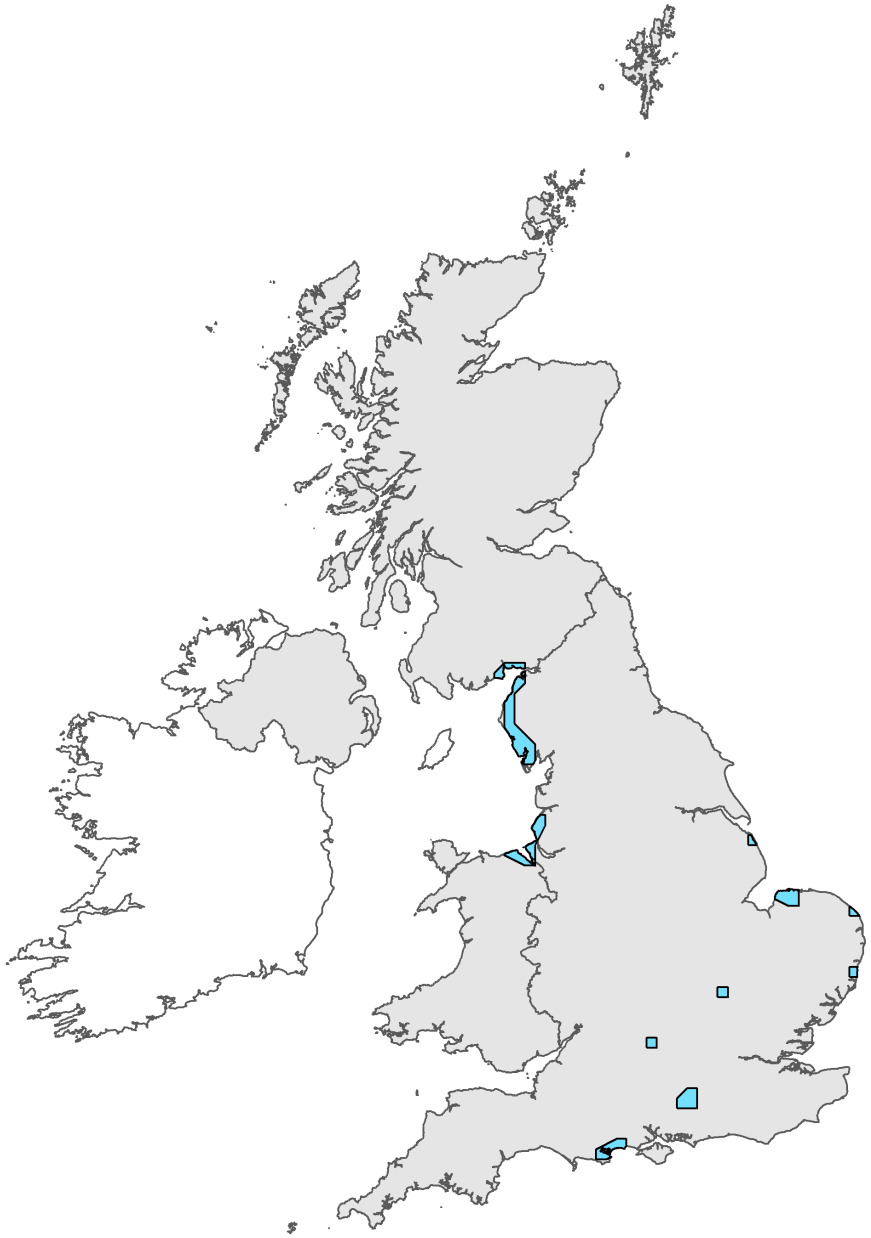

Figure 2: UK range map for S6284 - Natterjack toad (*Epidalea calamita*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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 20km. For further details see the 2019 Article 17 UK Approach document.

Explanatory Notes

Species name: Epidalea calamita (6284) Region code: ATL

Field label	Note
5.3 Short term trend; Direction	Within the Scottish population the range is decreasing, this is due to localised extinction and a decrease in distribution across sites where natterjack toads are still present. On some sites this retracted range can be attributed to a decline in the amount of optimal terrestrial and aquatic habitat (McInery & Minting. 2016, ARC 2017). When comparing the data avaiable (1990-2018) with the most recent reporting round (2013-2018) the decrese in range while not evident in the number of occupied 10 km grid squares (23 in both cases) is evident at a 1km scale (23 to just 19).
5.11 Change and reason for change in surface area of range	The decrease in the range of natterjack toads in Scotland is a genuine change. Reasons for the decline in range can be attributed to a number of factors including changes in terrestrial land use, increased land drainage, aquatic habitat succession, increased tidal inundation and disease (McInery & Minting 2016, ARC 2017).
6.1 Year or Period	Data was used from 2013-2018, this reflects the most recent round of monitoring, furthermore survey effort increased on some sites in the years between 2016 and 2018 (ARC 2017).
6.2 Population size	Population size as expressed in 1x1km grids derived from ARC monitoring data. The time period for the present report of 1990-2017 with 23 grid squares reported does not reflect data for the most recent reporting round 2013-2018. The figure for 2013-2018 is 19 grid squares, this represents a loss of 17% of the number of grid squares in which natterjack toads were found between 1990 and 2012.
6.3 Type of estimate	Best Estimate' based on data collated from a variety of sources including ARC, SNH and Record Pool for the recording period. Considered reasonably reliable as it is unlikely that there are additional presences at 1km resolution not detected via recent monitoring effort.
6.4 Additional population size	The numbers of breeding females are recorded here for comparison with the previous reporting round. The numbers of spawn strings are recorded annual to produce an estimate of breeding females and a metric for population viability (Beebee and Buckley 2014)
6.5 Type of estimate	Based on spawn count data analysis averaged over the reporting period, see ARC Population Data. Best estimate as survey effort varies across the Scottish sites (ARC 2017) and survey effort could impact these results (Beebee and Buckley 2014).
6.8 Short term trend; Direction	The decrease from 50 breeding females (noted in the previous reporting round) to 49 in this most recent reporting round is not truly representative of the population declines experienced in Scotland. Less than 30% of all known natterjack toad sites have been monitored sufficiently enough (both within this and the previous reporting round) to produce accurate estimates of numbers of breeding females (ARC Population data 2018). Structured site surveys (Minting 2012, 2016 and ARC 2017) revealed that a minimum of two localities have been lost during this most recent reporting period (Minting 2015). Breeding is unlikely at another locality (ARC 2017) but further surveys are needed to establish localised extinction. The seemingly small decline in the numbers of breeding females is misleading because breeding events in Dumfriesshire are at an all-time low, while breeding in Kirkcudbrightshire (as a result of translocations to a single site - RSPB Mersehead - in the 1990s) are at an all-time high. In Kirkcudbright a decline in the area of occupancy (1km2) remains a concern; recorded breeding events at the only historic site in this vice county have halved between this and the previous reporting round (ARC population data 2018).

6.10 Short term trend; Method used	The localities of natterjack toads along the Solway coast have been long established (Boyd 1970 and Bridson 1976). Structured survey methodology prescribed by ARC (www.arc-trust.org/saving-species-natterjack-toad) aims to produce a breeding population metrics based on spawn counts, these counts can be used to establish a number of breeding females and subsequent breeding population metric (Beebee and Buckley 2014). Structured recording can vary from year to year depending on volunteer recruitment. Between 2013 and 2018 structured surveys were carried out on between 4 and 5 sites, with some sites being monitored sufficiently one year but not the next. Structured recording is established at 4 of the 12 presumed extant sites along the Solway Coast (ARC 2017). ARC Occupancy and Population data (2018) provides a 'near complete' picture of natterjack populations along the Solway Coast.
6.16 Change and reason for change in population size	Data analysis (ARC Population and Occupancy data 2018) suggests a decline in the area of occupancy from 23km2 to 19km2. The significance of this decline when explored spatially is clear; the area of land occupied by natterjack toads appears to have contracted at both the east (Royal Ordinance SSSI) and west (Caerlaverock NNR) of Dumfriesshire. In addition the Priestside merse is now fragmented, localised extinction is assumed at Thwaite (Minting 2015) and it is unlikely that there is sufficient good quality habitat to support breeding at Riddingdyke (ARC 2017). This is being reported as a genuine change, however the accuracy of data has improved since the previous reporting period; annual structured population monitoring is now being carried out at 4 of the Scottish sites as opposed to 1 in the previous reporting round (ARC 2017). One additional site has been monitored sporadically over the most recent recording round and data is missing for one out of the six years. The method has changed from breeding females (in the previous reporting round) to 1km2, but data on breeding females is included under 6.4 for comparison.
7.1 Sufficiency of area and quality of occupied habitat	Area of habitat occupied habitat: The area of occupied habitat by natterjack toads is not sufficient to maintain a dynamic meta-population as once existed along the Solway coast (Bridson 1976). The area of habitat is sufficient in some localities to maintain isolated breeding populations (ARC 2017). Quality: the quality of habitat available for natterjack toads varies across each of its five localities (McInery and Minting 2016), habitat surveys (ARC 2017) revealed habitat changes e.g. a lack of grazing and succession of ephemeral water bodies could be contributing range contraction.
7.2 Sufficiency of area and quality of occupied habitat; Method used	Field surveys were carried out by ARC staff over the summer of 2017 and 2018. The surveys aimed to quantify the number of high quality breeding ponds available on each site (ARC 2017).
7.4 Short term trend; Direction	Decreasing: The amount of good quality aquatic and terrestrial habitat available for natterjack toads is decreasing (ARC 2017).
7.5 Short term trend; Method used	Site Condition Monitoring is undertaken by SNH staff on all designated sites. There are however a small number of natterjack toad sites without any formal designation. Sites visits have been carried out on all sites by ARC staff between 1995 and 2011, expert knowledge has been used to judge the suitability of the site for the species. From 2012 onwards structured habitat assessments have been carried out by ARC staff (2012, 2015 and ARC 2017).

8.1 Characterisation of pressures/ threats

A10: Extensive grazing or undergrazing by livestock: The lack of grazing on a number of sites has been identified by ARC (Minting 2012, 2015 and ARC 2017) as having a detrimental impact on the overall quality of habitat available for natterjack toads. Habitat assessments carried out by ARC in 2018 also identified a small number of sites where overgrazing and subsequent wallowing by cattle has led to eutrophication of historic breeding ponds. J01: Mixed source pollution to surface and ground waters (limnic and terrestrial): In Scotland all natterjack toad sites are found along a short coastal stretch known as the Solway Firth. The majority of sites are bound by merse to the seaward side and by pastoral fields landward. This stretch of the Solway coast has a relatively small human population however two sites are bound by caravan parks. While the threat of mixed source pollution as a result of agricultural runoff is understood further investigation is needed to assess the level of threat posed by these two recreational spaces. A31: Drainage for use as agricultural land: Agricultural intensification has resulted in the instillation of field drainage systems across the majority of the pastoral land adjacent to the Priestside merse. This modification of the hydrological flow has reduced the amount of standing water available for natetrjack toads in both these pastoral fields and on the merse. In extreme cases large straight ditches are visible on satellite images (McInery and Minting 2016), and in some instances these ditches carry water from the pastoral land straight out to sea bypassing any opportunity to benefit natterjack toads. L01: Abiotic natural processes: A lack of proactive habitat management has resulted in the succession of both aquatic and terrestrial habitat (ARC 2017). Large stretches of the Priestside merse which were historically grazed have now been abandoned and little or no habitat management is evident (Minting 2015 and ARC 2017). Conservation measures have been identified to mitigate against this threat in the future but they do not address the current and ongoing pressure. L02: Natural succession resulting in species composition change (other than by direct changes of agricultural or forestry practices: Succession of the natural habitat is a significant threat to natterjack toads in Scotland. As a result of changes to land use (not associated with agriculture or farming) the Royal Ordinance SSSI is now in a state of severe habitat succession. What was once a sandy heath has been taken over by a dense network of willow scrub, birch and bramble (ARC 2017). L06: Interspecific faunal and floral relations: Predation of spawn and tadpoles by fish is only thought to be a considerable pressure on sites with more permanent water bodies e.g. Royal Ordinance SSSI and those sites linked to larger populations e.g. Southerness. On most sites natterjack toads breed in ephemeral pools and this should reduce the risk of stocking by fish. Invertebrate pressure is highest in years with heavy rainfall resulting in more permanent water bodies becoming established. Tidal inundation can help to mitigate against predation from invertebrate predators but only if the ponds freshen up in time for spawning. Competition from other anuran species is well documented (Griffiths 1991, Beebee 1998 and Baker 2011) as having a negative impact on the development of natterjack tadpoles, and while no structured monitoring has taken place the habitat changes documented by ARC (ARC 2017) suggest this successive habitat is more likely to support migration efforts by common anuran species. The presence of chytrid fungus remains a threat in Scotland, and while it has only been identified on a single natterjack toad site (Cunningham and Minting 2008) further investigation is needed to assess the impact of chytrid on natterjack toads at their most northerly range. A08: Mowing or cutting of grasslands: Site visits made by ARC in 2017 and 2018 (ARC internal 2017 and 2018) documented evidence of inappropriate times of mowing and mulching. Natterjack toads need a short sward in order to forage and the act of mulching on some sites may act to impede foraging efforts. N01: Temperature changes (e.g. rise of temperature & extremes) due to climate change: The threat of increased tidal inundation as a result of climate change is apparent on the Scottish Solway. Large areas of the Priestside merse are eroding at an alarming rate while other areas are accreting. Erosion, accretion and greater frequency of tidal inundation are all threats along this small stretch of coast. Erosion of the merse means that pools which

	were historically inundated once or twice a year are now inundated more frequently and remain too saline for breeding (Minting 2015). Accretion on some sites has resulted in the loss of historic pools after they were buried by shingle deposits (ARC 2017). N04: Sea-level and wave exposure changes due to climate change: Increased costal erosion as a result of wave exposure could lead to a decline in the availability of good quality breeding habitat for natterjack toads (see N01).
9.1 Status of measures	Conservation measures are needed in order to maintain or restore the species to a favourable level. Important: the status of measures is given as Measures taken and identified, however not all of the measures needed are being undertaken. The main measures being undertaken are monitoring, advice and - at a very small proportion of the occupied area - positive management. Importantly, across much of the range of the species in Scotland, there is little active habitat management.
9.2 Main purpose of the measures taken	Data analysis (ARC Population data 2018) suggest that all but one population (Mersehead) has suffered significant declines over the past 12 years. Habitat restoration measures could help to address the decline in population size on sites in Scotland.