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:

S1166 - Great crested newt (*Triturus cristatus*)

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	**1166**
1.3 Species scientific name	**Triturus cristatus**
1.4 Alternative species scientific name	
1.5 Common name (in national language)	Great crested newt

2. Maps

2.1 Sensitive species	No
2.2 Year or period	1991-2017
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?	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

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Driver, D. and Foster.J. (in prep (a)). Natural England - Amphibian and Reptile Conservation Trust IPENS great crested newt SAC project 2014-15 (BRAVO no: ECM 6842), Barriers to implementation: To understand the barriers to implementation of best practice and identify solutions to inform management on the SAC series, Managing the impacts of fish introduction on SAC great crested newt
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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		

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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	From previous work (Wilkinson et al 2011 and Wilkinson et al 2014), the range for great crested newts has been estimated as 70 occupied 10km2, and 138 occupied km2. This latter figure has been increased to 140 occupied 1km2 following the Great Crested Newt Detective project (Minting & Loth (no date)). The position on range data is complicated by lack of consistent coverage; see audit for fuller explanation.	

6. Population

6.1 Year or period	1991-2017	
6.2 Population size (in reporting unit)	a) Unit b) Minimum c) Maximum d) Best single value	number of map 1x1 km grid cells (grids1x1) 205
6.3 Type of estimate	Best estimate	
6.4 Additional population size (using population unit other than reporting unit)	a) Unit b) Minimum c) Maximum d) Best single value	number of localities (localities) 200
6.5 Type of estimate	Best estimate	
6.6 Population size Method used	Based mainly on expert opinion with very limited data	
6.7 Short-term trend Period	2007-2018	
6.8 Short-term trend Direction	Uncertain (u)	
6.9 Short-term trend Magnitude	a) Minimum b) Maximum c) Confidence interval	
6.10 Short-term trend Method used	Insufficient or no data available	
6.11 Long-term trend Period		
6.12 Long-term trend Direction		

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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	Improved knowledge/more accurate data Use of different method The change is mainly due to: Use of different method
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)?	Unknown
7.2 Sufficiency of area and quality of occupied habitat Method used	Based mainly on expert opinion with very limited data	
7.3 Short-term trend Period	2008-2018	
7.4 Short-term trend Direction	Uncertain (u)	
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	Refer to 7.5 for results from various modelling and survey work to establish sufficiency and quality of habitat.	

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)	H
Use of plant protection chemicals in agriculture (A21)	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)	H

Other invasive alien species (other then species of Union concern) (I02)	H
Natural succession resulting in species composition change (other than by direct changes of agricultural or forestry practices) (L02)	H
Mixed source pollution to surface and ground waters (limnic and terrestrial) (J01)	M
Other modification of hydrological conditions for residential or recreational development (F31)	H
Conversion from other land uses to commercial / industrial areas (excluding drainage and modification of coastline, estuary and coastal conditions) (F03)	M

Threat	Ranking
Removal of small landscape features for agricultural land parcel consolidation (hedges, stone walls, rushes, open ditches, springs, solitary trees, etc.) (A05)	H
Use of plant protection chemicals in agriculture (A21)	M
Conversion from other land uses to housing, settlement or recreational areas (excluding drainage and modification of coastline, estuary and coastal conditions) (F01)	H
Other invasive alien species (other then species of Union concern) (I02)	H
Interspecific relations (competition, predation, parasitism, pathogens) (L06)	H
Natural succession resulting in species composition change (other than by direct changes of agricultural or forestry practices) (L02)	H
Mixed source pollution to surface and ground waters (limnic and terrestrial) (J01)	M
Increases or changes in precipitation due to climate change (N03)	M
Other modification of hydrological conditions for residential or recreational development (F31)	M
Conversion from other land uses to commercial / industrial areas (excluding drainage and modification of coastline, estuary and coastal conditions) (F03)	M

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

Maintain the current range, population and/or habitat for the species

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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

Prevent conversion of natural and semi-natural habitats, and habitats of species into agricultural land (CA01)
Restore small landscape features on agricultural land (CA02)
Management of problematic native species (CI05)
Reduce diffuse pollution to surface or ground waters from agricultural activities (CA11)
Reduce/eliminate point pollution to surface or ground waters from agricultural activities (CA10)
Management of habitats (others than agriculture and forest) to slow, stop or reverse natural processes (CL01)
Management, control or eradication of other invasive alien species (CI03)
Other measures related to natural processes (CL04)
Habitat restoration of areas impacted by residential, commercial, industrial and recreational infrastructure, operations and activities (CF02)
Reduce impact of transport operation and infrastructure (CE01)

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

No change

The change is mainly due to:

11.8 Additional information

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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	number of map 1x1 km grid cells (grids1x1)
	b) Minimum	
	c) Maximum	
	d) Best single value	48
12.2 Type of estimate		Best estimate
12.3 Population size inside the network Method used		Based mainly on expert opinion with very limited data
12.4 Short-term trend of population size within the network Direction		Unknown (x)
12.5 Short-term trend of population size within the network Method used		Based mainly on expert opinion with very limited data
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

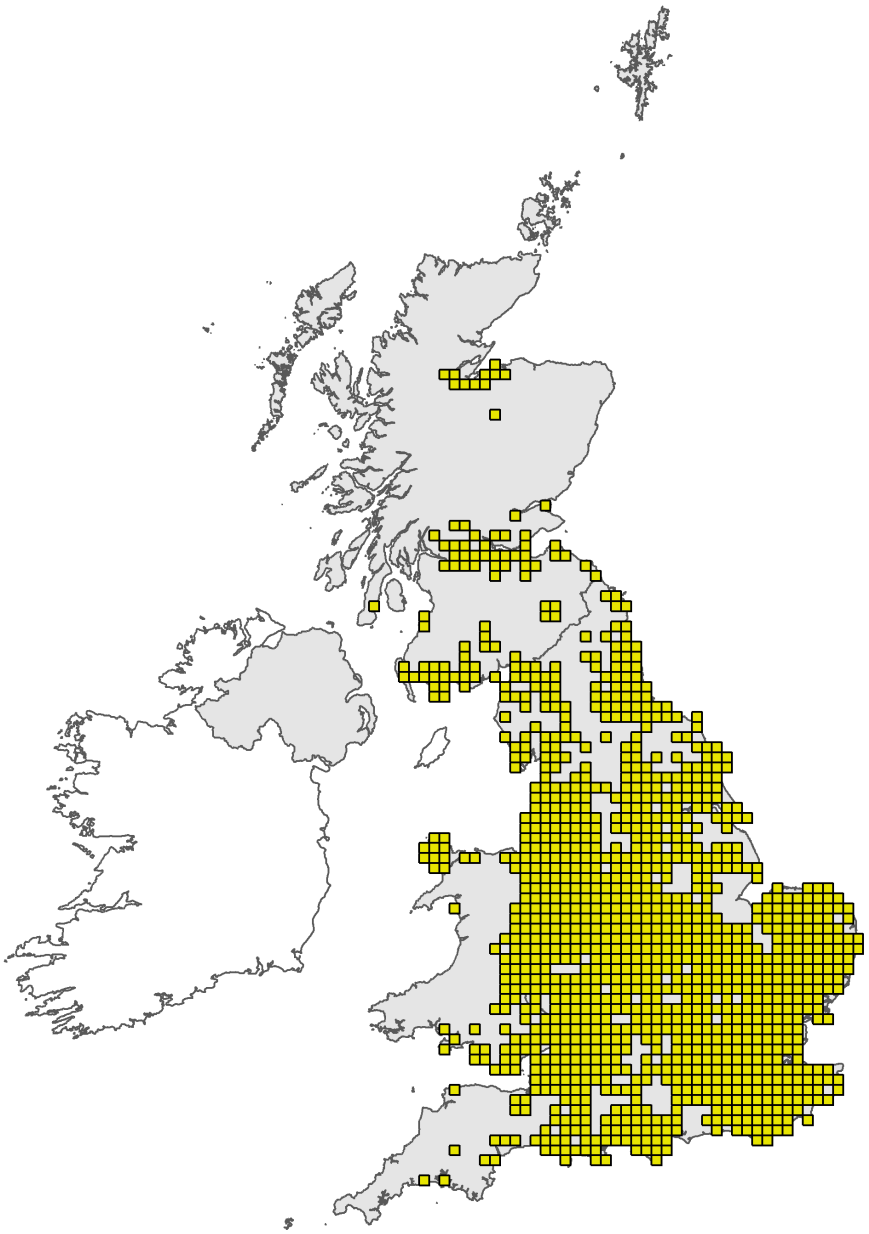

Figure 1: UK distribution map for S1166 - Great crested newt (*Triturus cristatus*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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 S1166 - Great crested newt (*Triturus cristatus*). 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 34km. For further details see the 2019 Article 17 UK Approach document.

Explanatory Notes

Species name: Triturus cristatus (1166) Region code: ATL

Field label	Note
5.3 Short term trend; Direction	The 10km2 maps (2007-2012) map using data from 1976-2012, with the map from this reporting round using data from 1991-2017), have been compared, and the data shows a slight increase although there are some 10km2 where the data shows a loss of 10km2 from between these two time periods. However, the species is data-deficient and recording effort not consistent across reporting periods or the species range. A time period of 1991-2017 was used due to the lack of sufficient data across the reporting period. Based on the evidence available, the short-term trend direction is considered to be stable.
5.12 Additional information	Assessment of the range of the great crested newt in Scotland is complicated by the fact that no single study or data source is sufficient to provide a high precision, high confidence estimate. The Art 17 report used data from the NBN Atlas, complemented by data collected via SNH, ARC (Living ARCive) and Record Pool (ARG UK and ARC initiative). For the time period 1991-2017, 206 1km2 and 84 10km2 were found to be occupied by newts, and for the time period 2013-2017, 82 1km2 and 42 10km2 were found to be occupied by newts but caution is required when comparing such different time periods and data quality. There is inadequate structured data for great crested newts across the range and for this reporting period to provide a definitive assessment and it is likely that the second time period (2013-2017) alone will provide an under-estimate of the status of newts in Scotland. Wilkinson et al 2011 and Wilkinson et al 2014 estimated the range for great crested newts as 70 occupied 10km2, and 138 occupied km2. This latter estimate has been increased to 140 occupied km2 following the results from fieldwork undertaken as part of the Great Crested Newt Detectives Project (Minting & Loth (undated)). Those studies took into account data collected back to 1991, with caveats for age of data
6.1 Year or Period	The period used in this report is 1991-2017. This extended period has been used as a comprehensive data set for the species was not available, due to inconsistent survey effort across the range of the species in Scotland and for this reporting period.
6.2 Population size	6.2 (d): Best single value The value provided (206) is the number of 1x1km grid squares derived from NBN Atlas, complemented by data stored by Scottish Natural Heritage, Amphibian and Reptile Conservation (Living ARCive) as well as data from Record Pool. The time period used for this population figure is 1991- 2017 due to the incomplete dataset for the species over the reporting period (2013-2018). Great crested newts remain data deficient in Scotland, with survey effort not being consistent across the reporting period or across the species range.
6.3 Type of estimate	The 'Best estimate' is based on an extended timeframe (1991-2017) and it would be reasonable to question the level of confidence that can be attached. However, the figure was derived from a range of data sources collected using different methods and recording has been inconsistent across the reporting period (2013-2018) which makes it difficult to provide a more definitive figure for this measure. The metric for this measure has changed since the last reporting period, where the number of localities (occupied ponds) was used. Refer to section 6.4(a) and (b).

6.4 Additional population size	6.4. a & b: Population: additional population size (optional) The 2013 reporting round used 'localities' as the metric for population, which was taken to be 'occupied ponds', where the figure provided was 1512 occupied ponds for Scotland, based on modelling work (Wilkinson et al, 2011). However, there were insufficient data to generate meaningful confidence limits for this metric. Over the current reporting period, SNH has commissioned reports to further the understanding of the status of great crested newts in Scotland, including Wilkinson et al, (2014); and Wilkinson et al, (2013), which has resulted in refined modelling and further surveys, including ground truthing and additional data. The number of occupied ponds is now thought to be c200, based on Wilkinson et al (2014), plus the addition of the information from the Great Crested Newt Detectives Project (Minting and Loth (undated)), although further work is required to refine this figure.
6.8 Short term trend; Direction	There is insufficient data available to determine the status of great crested newt for this metric, due to limited survey information. Although the short-term period is highlighted in the reporting (2007-2018), the statement of 'uncertain' for the trend would be the same for a longer period of time, such as 1991- present, as used for other unit assessments, due to insufficiency of these data.
6.16 Change and reason for change in population size	The unit used for population size has changed from localities (occupied ponds) to 1x1km2 between reporting periods. More information is also available about the status of great crested newts in Scotland, due to modelling and survey work. This includes work undertaken by Wilkinson et al, 2014, Wilkinson et al, 2013 and great crested newt projects such as the Great Crested Newt Detectives project (Minting and Loth, undated), although further work is required.
7.4 Short term trend; Direction	Habitat suitability modelling undertaken by ARC (Loth & Wilkinson, undated) used Maxent suitability modelling to determine the most suitable areas for great crested newts, based on species records and habitat and environmental variables, founded on previous work and protocols undertaken for similar work in Wales. This work produced maps for Scotland to highlight the most suitable habitat for great crested newts, based on this modelling. These maps were interrogated and it was determined that there are 206 1km2 occupied by great crested newts, and 194 (94%) of these overlapped with the habitat determined as 'most suitable' in the habitat suitability model for Scotland. It is important to note that it is not clear whether all newt areas have been detected yet, and from previous work, as highlighted above, it is possible that great crested newts are using sub-optimal habitat which the modelling work has not been detailed enough to detect (Wilkinson et al, 2014). The SNH commissioned survey work in 2012 (Wilkinson et al, 2013), involved the survey work of 125 ponds, including assessment of Habitat Suitability Index (Oldham et al, 2000), which assesses the suitability of ponds for great crested newts by looking at 10 factors known to influence great crested newts. Nine of these factors look specifically at ponds, such as pond shading, permanence and number of ponds etc. and one for terrestrial habitat. Out of the 125 ponds surveyed, 115 were from targeted sites (ponds known to be positive for great crested newts from previous surveys) and 10 from sites within 1km of targeted site (Wilkinson et al, 2013). Great crested newts were detected in 37 ponds of the 125 ponds, with the average HSI pond score for these great crested newt ponds as 0.61, with a range of 0.34- 0.87. (The average HSI score of all ponds was 0.55 and 0.54 for ponds where great crested newts were absent or not detected). The HSI score of 0.61 falls into the pond suitability category of 'average' (0.61-0.69). Importantly, the study found that ponds with an HSI score of 0.5 were more likely to support great crested newts, and ponds with an HSI score of ca.0.75 have an increased likelihood (more than 50%) of supporting great crested newts. It is important to highlight that due to the late start to the survey work and the dry conditions it is likely that the limited survey work was unsuccessful in locating all the great crested newt ponds. However, this work does provide a baseline for the HSI for 37 occupied ponds, but does not allow an assessment of the short-term trend in habitat, but will help with this in the future.

8.3 Additional information

Pressures A05: Removal of small landscape features for agricultural land parcel consolidation, and includes the loss of field boundaries, including hedges, stone walls etc., removal of scrub and the draining or infilling of ponds etc. The loss of these features results in the direct loss of great crested newt habitat, but can also lead to a loss of connectivity (habitat fragmentation) within the landscape and therefore impact on the meta-population dynamic often exhibited by the species (Beebee, 1997, Curado et al, 2011; Denoel 2012, Denoel et al, 2013). I04: Problematic native plants and animals The introduction of fish into great crested newt ponds has long been established as a reason for local extinction (pond level) of the species, and its overall decline, as documented by a number of scientific and specialist publications (e.g. Beebee 1997, Gent & Gibson 1998, Malmgren 2001, Jehle et al, 2011, Driver & Foster (in prep (a)). The main colonisation pathways are via human-intermediated means and involve both deliberate and accidental activities of both native and non-native fish. Fish introduction is harmful to great crested newts via a number of mechanisms; however, the principal negative impact is the predation of newt larvae, which are particularly vulnerable due to predation due to their habit of swimming in open water. The result is often a dramatic decline in recruitment from these ponds. It is also considered likely that fish also take newt eggs, although this has not yet been established. Fish can also lead to negative changes to the ponds themselves, and therefore in their suitability for newts, such as in the water chemistry, turbidity, invertebrate diversity and number, and the vegetation structure (Driver & Foster (in prep a)) and McInerny & Minting, 2016). A number of factors have been highlighted as leading to a higher probability of illegal fish introduction (Copp et al 2005, Copp et al, 2010, Gozlan et al, 2010.) as highlighted in Driver & Foster (in prep (a)), and include the closeness of newt pond(s) to a number of high risk sources: Proximity to human population centres; Proximity to roads, footpaths, car parks; Proximity to commercial sources of fish (fish farms, garden centres and pet shops); Larger ponds (especially for non-native fish species); Ponds subject to recent restoration. Royal Ordnance Powfoot SSSI lists the presence of fish as one of the reasons the site is in unfavourable condition (Open Space (a)), and work investigating SACs in England also notes fish introduction as a problem on protected sites (Driver & Foster (in prep (a)). L02: Natural succession resulting in species composition change (other than by direct changes of agricultural or forestry practices) A key threat (and pressure) is the reduction in the suitability of ponds (breeding and non-breeding) for great crested newts as a result of natural succession (Jehle et al 2011, Beebee 2015) where ponds typically become over-shaded by trees and scrub and/or become infilled with sediment. Natural succession leads to not only a loss of suitable ponds for breeding etc. in the landscape but leads to an actual loss of ponds due to pond senescence if left unmanaged (which is a common scenario). In the Habitat Suitability Index, as outlined in ARG UK (2010), pond shading is one of the ten factors used to determine the suitability of ponds for great crested newts, where this factor shows a significant decline in suitability where pond shading increases above 60%. Changes in agricultural practices are an important reason for this situation arising, as typically ponds are no longer required to water livestock, leading to neglect and the loss of suitable ponds in the landscape. Pond succession is also an issue on protected sites in Scotland, including those where great crested newts are designated interest features. Royal Ordnance Powfoot SSSI, Burrow Head SSSI/SAC and Torrs Warren- Luce Sands SSSI/Luce Bay and Sands SAC in a 2013 habitat survey (Open Space, in prep (a)) highlight ponds with too much pond vegetation and/or ponds becoming overgrown by trees or scrub. At Torrs Warren SSSI, all of the ponds where great crested newts had been recorded in 2013/2014 surveys had dense tree/scrub growth around the ponds and as a consequence are no longer optimal for the species. The sites listed above are considered to be in unfavourable condition due to a number of threats on site (Open Space, in prep (a)). A21: Use of plant protection chemicals in agriculture Pollution from agricultural sources (e.g. pesticides, fungicides etc.) will be impacting on the aquatic (Baker et al, 2011) and terrestrial environments of great crested newts. From studies

undertaken in Germany assessing pesticide exposure of amphibians and reptiles in agricultural landscapes (Berger et al, 2015), found that amphibians are at risk from coming into contact with plant protection chemicals both in the area being treated as well as in neighbouring (uncropped) land. The other key conclusions from this work included that amphibians were in danger of exposure to plant protection chemicals from contact with treated soil and vegetation. The work highlights that ponds, and other wet areas are the preferred location for amphibians in cropped fields and they are therefore at high risk of exposure to the chemicals in these locations. The findings also showed that amphibians are at risk from plant protection compounds through spray drift and runoff. Research investigating the effect of seven pesticides on juvenile European common frogs (Bruhl et al, 2013), found that when the chemicals were used at the recommended rate, the mortality rate was between 100% in 1 hour, to 40% in seven days. The study emphasises that it is likely that pesticides will adversely affect amphibians, due to their permeable skin. Bruhl et al (2013) also found that the effects were not limited to a particular type of pesticide, and other factors influencing the effect of the pesticide included the active substance and the formulation additives. E01: Roads, paths railroads and related infrastructure (e.g. bridges, viaducts, tunnels) Construction of roads and other transport links, leads to a loss of habitat and fragmentation of habitat as they form barriers to dispersal. This is particularly significant in situations where terrestrial habitats, such as hibernation and/or foraging areas are separated from breeding ponds, which may result in the mortality of migrating animals. Other associated dangers for great crested newts include the use of gully pots which act as traps (which aspect is rarely monitored), and the use of road salt which can lead to mortality of newts (Duff et al, 2011, Baker et al, 2011). Sustainable Drainage systems (SuDs), as highlighted in O'Brien (2014) have the potential to provide opportunities for newts, such as connecting populations. The 2007 Countryside Survey, compared the quality of ponds between 1996 and 2007, and one of the factors leading to a reduction in the quality was where ponds received run-off from roads (Williams et al, 2010). The creation of new roads, paths etc. can lead to increased access of previously 'hidden' ponds, which frequently results in unauthorised fish introductions (Copp et al 2005, Copp et al, 2010), as well other detrimental introductions such as invasive plants. For more information on fish introduction, refer to threat/pressures-I02 and I04. F01: Conversion from other land uses to housing, settlement or recreational areas (excluding drainage and modification of coastline, estuary and coastal conditions) and F03: Conversions from other land uses to commercial / industrial areas (excluding drainage and modification of coastline, estuary and coastal conditions) Housing developments and commercial/industrial areas are often built on semi-natural habitats and as a result key habitats used by newts are often lost and/or fragmented. This activity may lead to other impacts on great crested newt populations, including increased frequency of fish introduction (refer to I02 and I04), invasive species introduction (I02), due to new areas being opened up to recreation etc. F31: Other modification of hydrological conditions for residential or recreational development Hydrological conditions can be altered in a number of ways by development, where activities can lead to changes to the water table, diverting water away from certain areas, filling in ponds etc.. This may result in a number of impacts for great crested newts, such as changes to the permanency and functionality of ponds, the loss of ponds /waterbodies completely from the environment, and increased levels of pollutants from runoff from roads etc. I02: Other invasive alien species (other than species of Union concern) There are a number of invasive alien species negatively affecting great crested newts. The introduction of non-native fish such as Cyprinids, including Goldfish Carassius auratus auratus, are important to include, as fish introduction into newt ponds is an important factor in the decline of great crested newts (Beebee 1997; Malmgren 2001 & Jehle et al, 2011). Refer to section I04 for more detail. Alpine newts (Icthyosaura alpestris) are believed to be deliberately introduced into ponds to establish populations (in gardens and in the countryside) although accidental spread is

also thought likely via eggs moved on water plants (Wilkinson, 2012). This species is of concern as it has been linked to the spread of Batrachochytrium dendrobatidis (Bd) (Cunningham et al, 2008), although great crested newts were not found to be positive for Bd in the 2008 survey. With the emergence of Batrachochytrium salamandrivorans (refer to L06), it is important to acknowledge the possibility of further diseases effecting great crested newts in the future, with non-native species introductions often being linked to the emergence of pathogens (Driver & Foster, in prep (b)). There are several invasive non-native plants in the wider environment, including Crassula helmsii, Azolla filiculoides etc., which can affect the pond and newts in many ways. The negative effects include smothering the pond, due to excessive plant growth and thus reducing open water (Driver and Foster (in prep (b)) for male great crested newts to display to females (Langton et al, 2001 and Jehle et al, 2011), as well as decreasing the range of suitable plants for egg laying etc. Invasive non-native plants are found on SACs as well as the wider environment, with Japanese Knotweed (Fallopia japonica) being noted on Torrs Warren SSSI (overlaps with Luce Bay & Sands SAC) as outlined in Open Space in prep (a)). J01: Mixed source pollution to surface and ground waters (limnic and terrestrial) Pollution affecting ponds and terrestrial habitat comes from a number of sources. As ponds are small features, with a restricted capacity to dilute damaging chemicals etc., ponds are more vulnerable to damage by small amounts of pollutants than larger waterbodies or flowing waters (Williams et al, 2005). Agriculture, housing estates, roads, and recreational areas such as golf courses etc. are all potential sources of contaminants. There are obvious issues, such as surface run-off from agricultural fields, leading to pollutants, such as pesticides, (refer to A21), sediment and nutrients entering ponds. From SAC condition monitoring (Open Space (in prep (a)), issues such as direct pollution from livestock (manure and urine) is also an issue on some sites. The Countryside Survey's ponds report (Williams et al, 2007) identified three reasons leading to ponds being in poor quality, or having a low plant diversity; high nutrient levels, located within arable land and if the pond had an inflow (such as a ditch etc.). Plant and invertebrate diversity decreases in polluted ponds, which can lead to impacts on amphibians (Williams et al, 2005). It is also important to emphasise that due to their highly permeable skin, exposure to chemicals is likely to have a negative effect on great crested newts and other amphibians (Bruhl et al, 2013). Increased nutrient levels, especially from nitrate and phosphate, can lead to eutrophication, leading to the excessive growth of a limited number of plants able to cope with these conditions, dominating the growth of other plants (Williams et al, 2005). This situation can lead to the pond quickly becoming unsuitable for great crested newts, as open areas are reduced, favoured egg laying plants are suppressed, water quality declines and the excessive growth of vegetation can reduce the amount of sunlight reaching the water. Threats L06: Interspecific relations (competition, predation, parasitism, pathogens). Batrachochytrium salamandrivorans (Bsal), a chytrid fungus, is limited to salamanders and newts (Urodela) but is highly virulent and identified as the source for the severe declines of the European Fire Salamander (Martel et al, 2014). It is thought likely that Bsal originated from Asia, with the trade in amphibians being the vector for this disease into Europe (Fitzpatrick et al, 2018; Nguyen et al, 2017; Martel et al, 2014). Bsal was detected in private collections in the UK back in 2015 (Fitzpatrick et al, 2018), and there is a real risk that the disease can be spread into the wild if strict biosecurity is not observed. Amphibian and Reptile Conservation and the Zoological Society of London (ZSL) are liaising with Defra regarding Bsal, requesting that there is a universal response from government to this threat. It is important not to be complacent about the risk and to have monitoring and a rapid response plan in place. A biosecurity note has been written (ARG UK, 2017), highlighting disinfection procedures for amphibian fieldworkers. NB: From a national survey investigating the occurrence of Batrachochytrium dendrobatidis (Bd) in the UK (Cunningham and Minting, 2008), Bd positive sites were detected across the UK, including an amphibian site in Scotland, but no great crested newts tested positive in any of these surveys. N03: Increases or

changes in precipitation due to climate change A study undertaken by Griffiths et al (2010), investigated how the impacts of climate affected the dynamics of a declining great crested newt meta-population over a 12-year period, looking at the interactions of survival, recruitment and dispersal. The research identified a relationship of low survival rates of great crested newts when the winters were mild and wet, suggesting that mild winters are likely to have a negative impact on the viability of great crested newt meta-populations. The study points to the importance of activities such as habitat management to improve the habitat for great crested newts, including enhancing habitat connectivity and dispersal opportunities etc., to help meta- populations become more resilient to effects of climate change. The information provided under pressures (see pressure section, above) is also pertinent under threats for the following categories: Threat ranking: High - A05: Removal of small landscape features - F01: Conversion from other land uses to housing, settlement or recreational areas (excluding drainage and modification of coastline, estuary and coastal conditions) , - I02: Other invasive alien species (other than species of Union concern), - L02: Natural succession resulting in species composition change. Threat ranking: Medium - A21: Use of plant protection chemicals in agriculture - I04: Problematic native plants and animals) - J01: Mixed source pollution to surface and ground waters (limnic and terrestrial) - F31: Other modification of hydrological conditions for residential or recreational development

9.6 Additional information

CA01 Prevent conversion of natural and semi-natural & CA02 Restore small landscape features on agricultural land. These conservation measures require a targeted agri-environment scheme with the correct options allowing for the appropriate management, retention and creation of a range of semi-natural habitats, such as grassland, woodland, scrub and boundary features. Important conservation measures for great crested newts include the assessment of habitats, especially ponds, to determine whether pond management or creation is the best approach, or a combination of these, and is important if the threat and pressure of natural succession (pressure/threat - L02) is to be significantly addressed. The current Scottish scheme - Agri- Environment Climate Scheme (AECS) goes some way to address these issues, but action is required to ensure that benefits are maximised for the species. The above measures are important to retain key habitats for great crested newts, and to improve connectivity within the landscape and viability of the species in the long-term, and will help in securing FCS for the species. Conservation effort, including habitat creation and enhancement, including important habitat linkages is particularly pertinent in light of the likely effects of climate change, and the probable impacts on great crested newts (Griffiths et al, 2010). Conservation activities are required both on protected sites (including SACs) and in the wider countryside. CL01 Management of habitats (others than agriculture and forest) to slow, stop or reverse natural processes Active habitat management is required to maintain ponds in suitable condition, to allow for sufficient open water and to ensure ponds are not overly shaded; activity is required both in and outwith the farmed environment. Habitat management includes removal of silt etc., but also the removal of trees shading ponds, particularly on the southern edges of ponds. CL04: Other measures related to natural processes (disease) This conservation measure is important to address the threat/pressure category L06, where the pathogen Batrachochytrium salamandrivorans (Bsal) is a serious threat to great crested newts (Cunningham et al, 2015). A holistic government plan is required to address this threat, particularly as the disease is already present in captive collections in the UK (Fitzpatrick et al, 2018). Activities including monitoring for disease (for early detection), a rapid response plan as well as better communication regarding the threat to great crested newts and the need for strict biosecurity measures to be followed by field workers, pet keepers and those involved in the trade of amphibians. The work should also address sites where non-native species, such as alpine newts are present, as the presence of non-native species is one of the factors increasing the likelihood of disease introduction to a site. CA11: Reduce diffuse pollution to surface or ground waters from agricultural activities & CA10: Reduce/eliminate point pollution to surface or ground waters from agricultural activities. Activity to reduce the amount of pollution from diffuse pollution and point sources from agricultural activities is important to maintain ponds in good condition, and make them optimal habitats for great crested newts. Good water quality is not just important for newts (and other amphibians), but also for their prey items (invertebrates) and for aquatic macrophytes used for cover and egg laying. It should be noted that elevated nutrients and fertilisers not only has a negative impact on the water quality, but will likely accelerate growth rates of aquatic plants and as a result hasten succession. Action to prevent spray drift, and other ways where great crested newts might be exposed to large amounts of chemicals (direct contact with soil, vegetation & pond water) also need to be actioned. These conservation measures are required in both the wider environment and protected site network. CI03: Management, control or eradication of other invasive alien species. This conservation measure covers both alien invasive plants and animals. There are a number of alien plants, such as Crassula helmsii, which reduce the suitability of ponds for great crested newts, for example by decreasing the amount of open water at the surface, or out-competing native aquatic plants with knock-on effects on egg-laying substrate, prey availability and space.. Alpine newts (Icthyosaura alpestris) are also introduced into ponds (see McInerny & Minting 2016 for a summary of Scottish introductions), and this species has been linked to the spread of Batrachochytrium dendrobatidis (Bd) (see

Arntzen et al 2016 for similar disease vectoring concerns relating to introductions of alpine newts in France and New Zealand). With the threat of Batrachochytrium salamandrivorans (Bsal) now present in captive collections (Fitzpatrick et al 2018), it is important to be vigilant and to acknowledge the risk Bsal and other pathogens pose for great crested newts and our other native amphibians. Measures to prevent the introduction of alien species are required, including the adoption of strict biosecurity procedures and to undertake monitoring to detect diseases as an 'early warning' system. Non-native fish (as well as native fish) are introduced into newt ponds (both deliberately and accidentally), which impacts on great crested newt populations (refer to section 8: I04 and I02). Fish introduction is recognised as a serious decline factor for great crested newts. Management work is needed to remove fish from great crested newt ponds and, importantly, to help to prevent unauthorised introductions. Refer to Driver & Foster (in prep (a)) for recommendations to address issues relating to fish introduction. CI05: Management of problematic native species This measure is selected to highlight the need for the control of native fish species that have been introduced into great crested newt ponds, by accident or design. This includes species such as sticklebacks and stone loach etc. as their introduction into great crested newt breeding ponds can lead to serious impacts on the status of the newts on site (refer to section 8, I04 for more detail). This is important to note, because the introduction of native fish into ponds is often not recognised as a problem, frequently undertaken by people who are completely unaware of the detrimental impacts this activity has on the pond's existing wildlife. This activity can also be the result of good intentions, where there are concerns about a pond drying up and ponds are linked to ditches etc.. CF02: Habitat restoration of areas impacted by residential, commercial, industrial and recreational infrastructures, operations and activities & CE01: Reduce impact of transport operation and infrastructure Housing and industrial development, and related infrastructure work, including road and rail development reduces the availability of habitat and can lead to fragmentation of habitat for the species. Careful planning to avoid unnecessary loss of important habitat and connectivity, and appropriately well thought through mitigation that adequately replaces any loss would help to avert population decline or extinction from these areas. Simple changes to the placement of gully pots and modification of kerbs will help to prevent them from acting as traps and barriers to amphibian dispersal (Baker et al, 2011). Other options such as Sustainable Urban Drainage Systems need investigation, as they may provide additional suitable habitat in urban areas, and help to link existing populations (O'Brien, 2014). Other issues are prevalent in these areas too, including the deliberate introduction of fish and invasive plants etc. (refer to Section 8, I02 & I04 for more detail).

10.1 Future prospects of parameters	10.1 a) Range: Short-term trend: Stable, Future prospects: overall stable. For future prospects, assessment of the known pressures and likely threats for the species have been considered alongside the conservation measures, to determine whether the overall situation was positive or negative, as outlined in the EC Article 17 guidance. No range value was included for the previous reporting round (2007-2012) making it difficult to determine an overall trend, and therefore the future trend of this parameter. However, the consequence of any negative effects would need to be very large to impact on the range of the species. Currently, there is uncertainty over the magnitude of pressures and threats, and as a result, it is difficult to establish the net effect of the positive and negative activities. Refer to 10.1 (b) and 10.1 (c) for more detail on the key threat and pressures affecting the species. With these caveats, the future prospects (future trends of the range parameter) is considered to be 'overall stable'. 10.1 b) Population: Short-term trend: Uncertain. Future prospects: Negative (by 1% or less) For future prospects, assessment of the known pressures and likely threats for the species have been considered alongside the conservation measures, to determine whether the overall situation is positive or negative, as outlined in the EC Article 17 guidance. There is insufficient survey and monitoring work to determine trends in the great crested newt population in Scotland with high precision and confidence. Notwithstanding the lack of information, there are a number of threats and pressures facing the great crested newt in Scotland, more than could be highlighted in Section 8 of this report. Development is an important pressure and threat to be included here, as prime great crested newt habitat is sometimes lost and/or fragmented due to housing and industrial development. The resulting mitigation projects frequently results in a reduction in the status of the species at the site, as highlighted in Lewis et al (2017), where all the populations examined had experienced a decline in status, with some populations seemingly going extinct. However, it is not just the loss/fragmentation of habitat which negatively affects great crested newts; additional problems are associated with development including the increased risk of introduction of fish into great crested newt ponds (Copp et al, 2005, Copp et al, 2010); refer to 8.1 for detail. The 2012 survey (Wilkinson et al, 2013) provides recent evidence to show that great crested newt ponds are still being lost from the landscape, where 10 of the targeted survey ponds were no longer in existence, although the reason behind the pond loss was not documented. The decrease in the suitability of ponds through succession is also a key issue as this occurs naturally over time and needs pro-active management to keep ponds from becoming over-shaded and drying out too frequently (Jehle et al, 2011; Beebee 2015; McInerny & Minting 2016). Ponds requiring management is a ubiquitous issue for great crested newts, with ponds being in need of habitat management both in the wider countryside and on protected sites such as Royal Ordnance Powfoot SSSI, Burrow Head SSSI/SAC and Torrs Warren- Luce Sands SSSI/Luce Bay and Sands SAC, as highlighted in Open Space, in prep (a). Processes are not sufficiently in place to maintain habitat creation and maintenance levels required for the species. In addition to the issues above, Batrachochytrium salamandrivorans (Bsal), a newly detected chytrid fungus which causes infectious disease, is a significant threat to great crested newts in the UK (Cunningham et al, 2015). This pathogen is highly virulent to newts and is recognised as the cause of the severe declines of the European Fire Salamander (Martel et al, 2014). Discovery of the pathogen in UK captive collections occurred in 2015 (Fitzpatrick et al, 2018), resulting in an increased risk of the disease being spread to wild populations, particularly if strict biosecurity procedures are not followed. A monitoring plan (for detection) and rapid response action plan have yet to be developed to tackle this threat (refer to 8.1 for detail). 10.1 .c) Habitat Short-term trend: uncertain. Future prospects: slightly negative For future prospects, assessment of the known pressures and likely threats for the species have been considered alongside the conservation measures, to determine whether the overall situation was positive or negative, as outlined in the EC Article 17 guidance. As outlined in section 7 of the audit, modelling work has occurred to explore the amount of

	suitable habitat for great crested newts in Scotland (Wilkinson et al 2011 & Wilkinson, et al, 2014), and to determine the distribution of the species in the country (Wilkinson et al, 2013 & Wilkinson et al, 2014). Habitat suitability modelling work has also been undertaken (Loth et al, undated). In part, the work has undertaken surveys to find 'new' great crested newt ponds, with very few detected, and to investigate the suitability of habitat. In addition to this, one of the objectives of the Great Crested Newt Detectives Project was to find new sites through eDNA surveys with 11 'new' ponds discovered. Despite this level of effort, it is difficult to be certain that the available habitat is sufficient in area and quality. The HSI work undertaken (Wilkinson et al, 2013) will help to form a baseline for habitat suitability for future assessments, but it is unclear how many of the previously occupied ponds, targeted for survey, are still occupied by newts, due to the survey constraints in 2012, and therefore how representative this sample is. Habitat management and creation action remain important conservation activities to help address many of the pressures and threats facing the species, including creating a more connected landscape to help the great crested newt become more resilient to future threats, including climate change (Griffiths et al, 2010). Unfortunately, processes are not sufficiently in place to maintain habitat creation and maintenance at the levels needed by the species. The 2012 survey shows that previously occupied ponds are being lost from the landscape, with at least 10 ponds no longer extant from the 2012 targeted survey area (Wilkinson et al, 2013), with these losses apparently outnumbering discoveries of new populations. As highlighted in 10.1 (b), there are many pressures and threats facing the species, including development, where prime newt habitat is being lost and or fragmented, due to housing and industrial development, which also needs to be taken into account. The uncertainty over agricultural policy also has a bearing on both the availability and suitability of habitat, which will affect the species in the long-term. Refer to section 8 and 10.1 (b) for further detail. When the balance of threats, pressures and conservation measures is taken into consideration, habitat future prospects (future trends of parameter) is negative.
12.3 Population size inside the network; Method used	Methodology: A simple GIS assessment was undertaken, where the number of occupied 1km2 which overlapped with SACs were counted. The digital SAC boundaries were downloaded from SNH's Natural Spaces website: https://gateway.snh.gov.uk/natural-spaces/index.jsp. The great crested newt records came from data collated by SNH, complemented by data stored on the ARC Database (Living ARCive) as well as Record Pool. All the data has been supplied to SNH (ARC, 2018). Figures were generated for two time periods: 1991-2017, and 2013-2017. There are 8 km2 where great crested newts have been recorded in association with SACs in Scotland during the period 2013-2017, and 53 km2 for the period 1991-2017. The figure of 53 is used in the spreadsheet since the more restricted timescale likely reflects issues with data collection (see below). Caveats/notes: - The difference in number between the two time periods is unlikely to accurately reflect a real change in status; it is likely that there are some losses since the 1990s, but it is also likely that the significantly lower figure for 2013-18 is at least partially an artefact of data collection. - Some of the km2 only overlap with a very small part of an SAC, and the SAC may or may not contain occupied great crested newt habitat. Some sites are very large and contain habitat unlikely to support newts. In some cases the record of the newt may be outside the SAC boundary (this is not feasible to confirm at 1km resolution). - This assessment simply identifies presence, and does not provide information on population size beyond the coarse metric of occupied 1 km2.

12.4 Short term trend of the population size within the network; Direction	A summary of the species condition monitoring results for both surveys and habitat condition surveys are provided below and show a divergence in condition of the great crested newt interest feature on the three SACs. Burrow Head SAC The great crested newt interest feature is considered to be in unfavourable declining condition, as the numbers of individuals have declined, particularly when comparing the numbers of animals detected in 2013 to surveys in 2003 and 1999 (Open Space (Cumbria) Ltd (in prep (b)). This is further corroborated by the results of habitat suitability surveys (Open Space, in prep (a)) where five main threats are highlighted including scrub encroaching around ponds, poaching by livestock and ponds becoming overgrown with macrophytes etc.. Torrs Warren SSSI (overlaps Luce Bay and Sands SAC) From species surveys in 2013 and 2014 (Open Space (Cumbria) Ltd (in prep (b)) great crested newt numbers were low and no eggs were detected, with the feature considered to be in unfavourable declining condition. Habitat suitability surveys in 2013 (Open Space, in prep (a)) found that habitat features within this SSSI are deemed to be in unfavourable condition (no change), due to dense shade from scrub and trees, poaching by livestock and ponds becoming overgrown with vegetation. Fish and wildfowl are also reported on site in at least two of the eight ponds assessed for the amphibian surveys. Turflundie Wood SAC The Turflundie Wood SAC population is thought to be favourably maintained with a medium size population (10-100 individuals), with newt numbers remaining at a consistent level since 1987 (Forrester & Bell, 2017). There are important caveats to the reported results - The results from the surveys undertaken at the SACs are very useful indications of the great crested newt status of the great crested newt interest feature on site, nonetheless, there are some important caveats: - Assessments are only partial condition assessments as according to the Common Standards Monitoring Guidance (JNCC, 2004) as a full assessment requires four consecutive years of surveys over the 6-year reporting cycle. - The summary above is based on the survey information available at the time of the reporting.