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:

S1029 - Freshwater pearl mussel (*Margaritifera margaritifera*)

NORTHERN IRELAND

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 (Northern Ireland information only)**
1.2 Species code	**1029**
1.3 Species scientific name	**Margaritifera margaritifera**
1.4 Alternative species scientific name	
1.5 Common name (in national language)	Freshwater pearl mussel

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	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

Beasley, C.R. and Roberts, D. 1996. Survey of the distribution of Freshwater Pearl Mussel Margaritifera margaritifera L. in Northern Ireland, pp 1-38. Research and Development Series, Environment and Heritage Service, Northern Ireland.
Beasley, C.R. and Roberts, D. 1999. Assessing the conservation status of the Freshwater pearl mussel in the north of Ireland - relevance of growth and age characteristics. Journal of Conchology, 36, 53-61.
Drowns, S. and Moorkens, E. 2014. Practical implications of Freshwater Pearl Mussel Measures, Swanlinbar sub management plan, INTERREG IVA Program, Document Number BE57000 No 40. Report to Northern Ireland Environment Agency.
Drowns, S., Moorkens, E., and Mackin, F. 2014. Practical implications of Freshwater Pearl Mussel Measures, Ballinderry sub management plan, INTERREG IVA Program, Document Number BE57000/R025. Report to Northern Ireland Environment Agency.
Horton, M., Keys, A., Kirkwood, L., Mitchell, F., Kyle, R. & Roberts, D., (2015). Sustainable catchment restoration for reintroduction of captive bred freshwater pearl mussels Margaritifera margaritifera, Limnologica: Ecology and Management of Inland Waters, Volume 50, pp21-28
Horton, M., Bell, D., Keys, A. & Mitchell, F. (2018) Freshwater pearl mussel survey of Northern Ireland 2017. Report prepared by Ballinderry Rivers Trust for the Northern Ireland Environment Agency. Northern Ireland Environment Agency Research and Development Series No. XX/XX
Killeen, I. D. 2007 The Freshwater Pearl Mussel Margaritifera margaritifera (L., 1758) in three Northern Ireland SAC Rivers, pp 1-46. Report to Northern Ireland Environment Agrncy.

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Magee, M. 2014. Practical implications of Freshwater Pearl Mussel Measures, Owenkillew sub management plan, INTERREG IVA Program, Document Number BE57000/R021. Report to Northern Ireland Environment Agency.
Northern Ireland Environment Agency unpublished survey and monitoring data 2000-2012.
Preston, J., Portig, A., and Muise, E. 2000. The Freshwater Pearl Mussel Margaritifera margaritifera in Northern Ireland. Preliminary Research to identify targets for future monitoring and conservation. A.T.E.C. Report to The Environment and Heritage Service, Northern Ireland.
Preston, J., Kelly, J., Sweeney, O. and McDonald, R.D. 2006. Isolated populations of freshwater pearl mussel Margaritifera margaritifera in Northern Ireland, pp 1-20. Quercus project QU05-13. Report to Northern Ireland Environment Agency.
Reid, N., Preston, J., and Keys, A. D. 2011. Freshwater pearl mussel Survey of Northern Ireland 2011, pp 1-75. Quercus Project QU11-01. Report to Northern Ireland Environment Agency.
Reid, N., Keys, A., Preston, J.S., Moorkens, E., Roberts, D., Wilson, C.D. 2012. Conservation status and reproduction of the critically endangered freshwater pearl mussel (Margaritifera margaritifera) in Northern Ireland. Aquatic Conservation: Marine and Freshwater Ecosystems (2012)
Wilson, C. D. 2011. Empirical approaches to the conservation of Margaritifera margaritifera, pp 2-32. A thesis submitted for the degree of Doctor of Philosophy, School of Biological Sciences, Faculty of Medicine, Health and Life Sciences, Queen's University Belfast.

5. Range

5.1 Surface area (km²)		
5.2 Short-term trend Period		
5.3 Short-term trend Direction	Stable (0)	
5.4 Short-term trend Magnitude	a) Minimum	b) Maximum
5.5 Short-term trend Method used		
5.6 Long-term trend Period		
5.7 Long-term trend Direction		
5.8 Long-term trend Magnitude	a) Minimum	b) Maximum
5.9 Long-term trend Method used		
5.10 Favourable reference range	a) Area (km²) b) Operator c) Unknown d) Method	
5.11 Change and reason for change in surface area of range	No change The change is mainly due to:	
5.12 Additional information		

6. Population

6.1 Year or period	2013-2018

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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	30
6.3 Type of estimate	Best estimate	
6.4 Additional population size (using population unit other than reporting unit)	a) Unit	number of individuals (i)
	b) Minimum	
	c) Maximum	
	d) Best single value	27886
6.5 Type of estimate	Best estimate	
6.6 Population size Method used	Complete survey or a statistically robust estimate	
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	Complete survey or a statistically robust estimate	
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	
	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	Complete survey or a statistically robust estimate	

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7.3 Short-term trend Period	2007-2018
7.4 Short-term trend Direction	Stable (0)
7.5 Short-term trend Method used	Complete survey or a statistically robust estimate
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
Agricultural activities generating diffuse pollution to surface or ground waters (A26)	H
Forestry activities generating pollution to surface or ground waters (B23)	H
Extraction of minerals (e.g. rock, metal ores, gravel, sand, shell) (C01)	M
Illegal harvesting, collecting and taking (G11)	M
Other invasive alien species (other then species of Union concern) (I02)	M
Mixed source pollution to surface and ground waters (limnic and terrestrial) (J01)	H
Drainage (K02)	M
Modification of hydrological flow (K04)	H
Physical alteration of water bodies (K05)	H
Change of habitat location, size, and / or quality due to climate change (N05)	M

Threat	Ranking
Agricultural activities generating diffuse pollution to surface or ground waters (A26)	H
Forestry activities generating pollution to surface or ground waters (B23)	M
Extraction of minerals (e.g. rock, metal ores, gravel, sand, shell) (C01)	M
Illegal harvesting, collecting and taking (G11)	M
Other invasive alien species (other then species of Union concern) (I02)	M
Mixed source pollution to surface and ground waters (limnic and terrestrial) (J01)	H
Drainage (K02)	M
Modification of hydrological flow (K04)	H
Physical alteration of water bodies (K05)	H

Change of habitat location, size, and / or quality due to climate change (N05)	H

8.2 Sources of information

8.3 Additional information

9. Conservation measures

9.1 Status of measures	a) Are measures needed?	Yes
	b) Indicate the status of measures	Measures identified and taken
9.2 Main purpose of the measures taken		Restore the habitat of the species (related to 'Habitat for the species')
9.3 Location of the measures taken		Both inside and outside Natura 2000
9.4 Response to the measures		Medium-term results (within the next two reporting periods, 2019-2030)

9.5 List of main conservation measures

- Manage the use of natural fertilisers and chemicals in agricultural (plant and animal) production (CA09)
- Reduce/eliminate soil pollution from agricultural activities (CA14)
- Reduce soil pollution from forestry activities (CB13)
- Reduce diffuse pollution to surface or ground waters from forestry activities (CB10)
- Management of hunting, recreational fishing and recreational or commercial harvesting or collection of plants (CG02)
- Control/eradication of illegal killing, fishing and harvesting (CG04)
- Reduce impact of mixed source pollution (CJ01)
- Restore habitats impacted by multi-purpose hydrological changes (CJ03)
- Implement climate change adaptation measures (CN02)
- Reinforce populations of species from the directives (CS01)

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

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11.6 Overall trend in Conservation Status	
11.7 Change and reasons for change in conservation status and conservation status trend	a) Overall assessment of conservation status No change The change is mainly due to: b) Overall trend in conservation status No change The change is mainly due to:
11.8 Additional information	

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

12.1 Population size inside the pSCIs, SCIs and SACs network (on the biogeographical/marine level including all sites where the species is present)	a) Unit	number of map 1x1 km grid cells (grids1x1)
	b) Minimum	
	c) Maximum	
	d) Best single value	20
12.2 Type of estimate	Best estimate	
12.3 Population size inside the network Method used	Complete survey or a statistically robust estimate	
12.4 Short-term trend of population size within the network Direction	Decreasing (-)	
12.5 Short-term trend of population size within the network Method used	Complete survey or a statistically robust estimate	
12.6 Additional information	Despite the current successful artificial breeding programme, the lack of juvenile recruitment and an ageing population will almost certainly lead to the future extinction of this species from NI, unless there is a fundamental improvement of their current habitat.	

13. Complementary information

13.1 Justification of % thresholds for trends
13.2 Trans-boundary assessment
13.3 Other relevant Information

Distribution Map

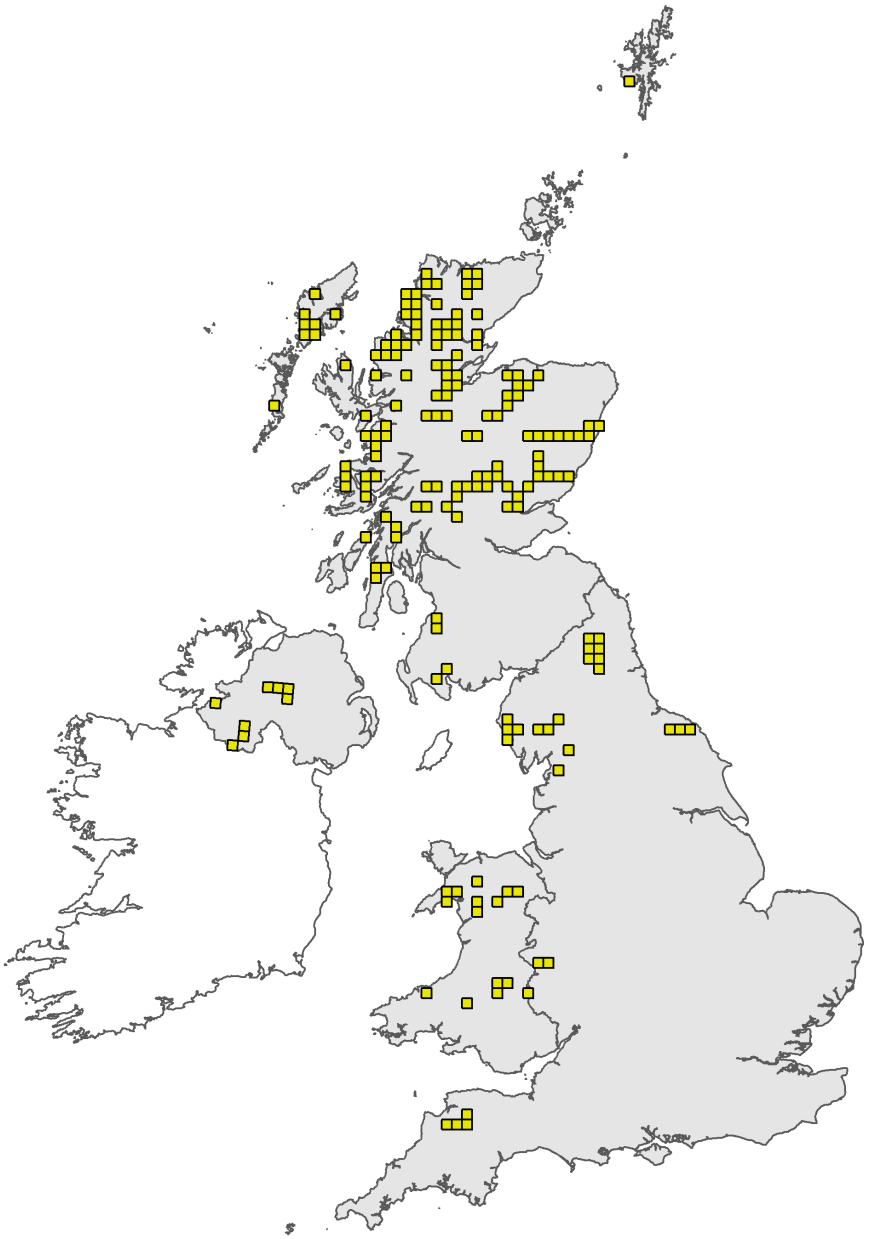

Figure 1: UK distribution map for S1029 - Freshwater pearl mussel (*Margaritifera margaritifera*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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

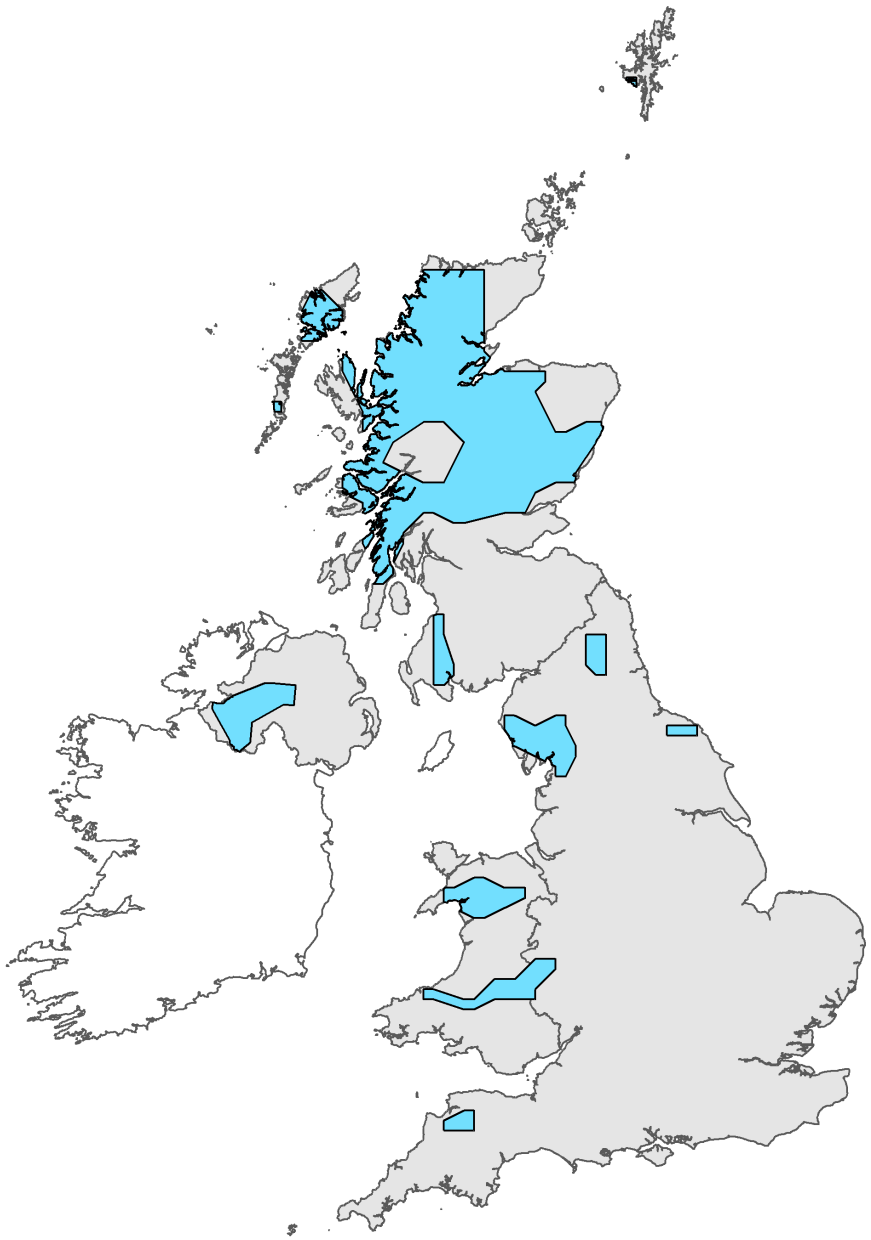

Figure 2: UK range map for S1029 - Freshwater pearl mussel (*Margaritifera margaritifera*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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

Explanatory Notes

Species name: Margaritifera margaritifera (1029)

Field label	Note
2.1 Sensitive species	This species has a history of exploitation for their pearls, which although now illegal, still sporadically occurs in UK.

Species name: Margaritifera margaritifera (1029) Region code: ATL

Field label	Note
5.3 Short term trend; Direction	Margaritifera margaritifera was formerly widespread throughout western and northern parts of the UK. Research into Freshwater Pearl Mussel distribution in Northern Ireland was initiated in 1996, as documented in Section 4.2 (Sources of Information). In Northern Ireland, the species formerly occurred widely in several catchments - there are past records for 11 rivers from which no recent records have been obtained (presumed locally extinct), including the Blackwater, Bush, Broughderg, Colebrooke, Derg, Drumragh, Finn, Glenelly, Mourne/Strule, Moyola and Upper Bann (Mackie, 1992; Preston et al., 2006; Reid et al, 2012). The presence of dead shells at three locations on the Colebrooke (Preston et al., 2006) may suggest that remnant mussel beds or isolated individuals still exist in the river, although no live shells have been found recently. Extant populations are now known from only six rivers - Owenkillew River, Cladagh-Swanlinbar River and Upper Ballinderry River SACs, in addition to Owenreagh River and Tempo River ASSIs, and the Waterfoot River in Co Fermanagh . Surveys of all rivers with historical populations has been undertaken in Northern Ireland. Although as indicated above, the species is not recruiting, the most recent survey (Horton, et al, 2018) indicates that the 6 rivers which contained Pearl mussel colonies in 2013 still have extant populations. Hence, although the species has undergone a significant decline in its range within NI over the longer time period, short term range trend is assessed as stable.
5.5 Short term trend; Method used	Surveys of all rivers with historical populations has been undertaken in Northern Ireland. The most recent survey was undertaken in 2016/17 (Horton, et al, 2018).
6.2 Population size	This equates to the number of 1km squares where mussels where recently recorded on the Ballinderry, Owenreagh, Owenkillew, Swanlinbar, Tempo and Waterfoot rivers.

6.4 Additional population size	During the recent NI survey (Horton et al, 2018), a total of 24,396 freshwater pearl mussels were recorded in the defined survey sections on the six NI rivers with Freshwater Pearl Mussel colonies, compared with 21,979 recorded in the previous survey (Reid et al., 2011). This is an increase of 2,417 (+11% increase). Additional mussels were counted in areas outside the defined survey sections on the Ballinderry River and Owenkillew River, bringing the total recorded to 27,886. Note that this increase is not attributable to mussel recruitment, as very few mussels<65mm were found, but is almost certainly the result of increased survey effort in this assessment compared to previous surveys. Population figures for the 6 rivers: Owenkillew River SAC: A total of 8434 live mussels were observed in 2016/17. This represents a +4.6% increase on the 8062 mussels observed in 2011 (Reid et al.), despite having not surveyed eight of the 21 point transects. This total also represents a +6.3% increase on the combined count of 7931 mussels reported in 2004 (EHS) and 2007 (Killen) surveys. Swanlinbar River SAC: a total of 3995 live mussels were observed (Table 9). This represents a 10.15% increase on the 3627 mussels reported in 2011 and a 20.73% increase on the 3309 mussels reported in 2007. However, there was high mortality of mussels during the time of survey for unknown reasons. Upper Ballinderry River SAC: a total of 520 live mussels were observed. This represents a -38.53% decrease on the 846 mussels reported in 2011 and a -47.42% decrease on the 989 mussels reported in 2007. Following this survey, in 2017, Ballinderry Rivers Trust undertook the largest reintroduction of freshwater pearl mussel ever taken, releasing 1993 captive-bred juveniles, ranging in size from 3-8cm. Owenreagh River ASSI: a total of 9750 live mussels were observed (Table 16). This represents an 18.97 % increase on the 8195 mussels reported in 2011. Tempo River ASSI: total of 413 live mussels were observed. This represents a 4.18% decrease on the 431 mussels reported in 2011 and a 21.33% decrease on the 525 mussels reported in 2009. Waterfoot River: total of 1023 live mussels were observed (Table 24). This represents a 152% increase on the 406 mussels reported in 2011 (Reid et
6.8 Short term trend; Direction	Although the 2016/17 survey recorded an apparent increase in the total number of mussels, very few mussels<65mm were found, illustrating that the apparent increase could not be due to recruitment of young mussels, but to increased survey efforts/improved methods compared to previous surveys. Given that some of the rivers showed a decline in numbers (i.e. Upper Ballinderry River and Tempo River) despite this improved recording, we have suggested that the overall population numbers must be decreasing, but at an unknown
6.16 Change and reason for change in population size	See 6.8 above - for the reasons outlined there, we believe that this is genuine change in population.
6.17 Additional information	NI populations of Freshwater Pearl Mussel have had virtually no juvenile recruitment over the last 30 years, resulting in a progressively ageing population. This will inevitably lead to local extinctions unless appropriate conservation measures are implemented.
8.1 Characterisation of pressures/ threats	The species is very sensitive to changes in its river environment. Therefore, pressures and threats to Freshwater Pearl Mussel are generally related to issues of water quality (chemistry and sediment loading), hydrology, invasive species and inter-specific faunal and floral relations, climate change, etc. These include: A26: Agricultural activities generating diffuse pollution to surface or ground waters; B23: Forestry activities generating pollution to surface or ground waters; C01: Extraction of minerals (e.g. rock, metal ores, gravel, sand, shell); G11: Illegal harvesting, collecting and taking; I02: Other invasive alien species (other then species of Union concern); J01: Mixed source pollution to surface and ground waters (limnic and terrestrial); K02: Drainage; K04: Modification of hydrological flow; K05: Physical alternation of water bodies; L06: Interspecific faunal and floral relations (competition, predation, parasitism, pathogens,); N05: Change of habitat location, size, and / or quality due to climate change

8.2 Sources of information	Documented evidence of the detrimental effects of the pressures and threats listed can be found in section 4.2 and in other domestic and international literature. Evidence from condition assessment reports was also used, in addition to expert opinion.
9.2 Main purpose of the measures taken	The Conservation measures are aimed at improving the species' habitat to a point where natural recruitment can be established and safeguarded, while ensuring that populations remain viable until this long-term improvement is achieved. Conservation measures CA09 & CJ01 relate to pollution control from all human activity; Conservation measures CA14 & CB13 relate specifically to restoring the quality of the river bed gravels to the point where juveniles can survive; CG02 relates to maintaining a sufficient density of salmonid hosts vital in the life cycle of this species; CG04 is to tackle any illegal pearl fishing; and CS01 relates to the current artificial breeding program which will be required to maintain the continued existence of this species in the wild until natural recruitment is established. CN02 will be necessary if this extremely sensitive species is to survive in NI in the future. Note that re-stocking has already been trialled, and in 2017 a large re-introduction was carried out in the Upper Ballinderry River SAC (see 9.6 below).
9.6 Additional information	Locally, sub management plans for 4 of the 6 NI populations have being developed and published by Intereg Project No 003705 and are documented in section 4.2. Also note that Ballinderry Rivers Trust, funded by NIEA, has undertaken the largest reintroduction of freshwater pearl mussel ever taken, releasing 1993 captive-bred juveniles, ranging in size from 3-8cm, into the Upper Ballinderry River SAC.
10.1 Future prospects of parameters	NI populations have had virtually no recruitment of juveniles in the last 30 years, resulting in a progressively ageing population which will, without urgent action inevitably lead to local extinctions. Water quality continues to be an issue in most of the rivers in which the species occurs. Hence habitat for species is assessed as negative.
12.1 Population size inside the pSCIs, SCIs and SACs network	The species occurs on 3 SACs - Owenkillew River, Cladagh - Swanlinbar River and Upper Ballinderry River.
12.3 Population size inside the network; Method used	Estimate based upon recent (2016/17) survey.
12.4 Short term trend of the population size within the network; Direction	Short-term trend decreasing, based upon results from Upper Ballinderry River. Estimates from Owenkillew and Cladagh-Swanlinbar showed and increase in numbers, but this was almost certainly the result of improved survey techniques/increased search efforts.
12.6 Additional information	Despite the current successful artificial breeding programme, the lack of juvenile recruitment and an ageing population will almost certainly lead to the future extinction of this species from NI, unless there is a fundamental improvement of their current habitat.