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

Conservation status assessment for the species:

S1029 - Freshwater pearl mussel (*Margaritifera margaritifera*)

UNITED KINGDOM

IMPORTANT NOTE - PLEASE READ

- The information in this document represents 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.
- It is based on supporting information provided by the geographically-relevant Statutory Nature Conservation Bodies, which is documented separately.
- The 2019 Article 17 UK Approach document provides details on how this supporting information contributed to the UK Report and the fields that were completed for each parameter.
- The reporting fields and options used are aligned to those set out in the European Commission guidance.
- Maps showing the distribution and range of the species are included (where available).
- Explanatory notes (where provided) are included at the end. These provide additional audit trail information to that included within the UK assessments. Further underpinning explanatory notes are available in the related country-level reports.
- Some of the reporting fields have been left blank because either: (i) there was insufficient information to complete the field; (ii) completion of the field was not obligatory; and/or (iii) the field was not relevant to this species (section 12 Natura 2000 coverage for Annex II species).
- The UK-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**
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	1999-2018
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

England
NATURAL ENGLAND, 2014. Planning for the Future Improvement Programme for England's Natura 2000 Sites (IPENS). Site Improvement Plan: River Clun SAC UK0030250. http://publications.naturalengland.org.uk/publication/6216527934128128?category=4879822899642368
KILLEEN, I.J., 2013. The 2013 survey for the freshwater pearl mussel Margaritifera margaritifera (L., 1758) in the River Clun and associated tributaries. Unpublished report to the Environment Agency.
MEASURES, G.H. & HOWDEN, V., 2016. River Clun freshwater pearl mussel survey, August 2016. Natural England.
GUNNING, K., 2017. River Clun catchment environmental monitoring report 2016-2017. Report to Environment Agency and Natural England.
KNOTT, R. & MEASURES, G.H., 2013. Report on 2013 fieldwork undertaken on the Rivers Torridge and Mole, for the freshwater pearl mussel Margaritifera margaritifera, December 2013. Environment Agency, Natural England.
MOSSER, I., 2016. Restoring Freshwater Mussel Rivers in England Project: River Torridge Juvenile Augmentation Trial Report 2015. Devon Wildlife Trust.
GOSSELIN, M-P., 2015. Conservation of the freshwater pearl mussel (Margaritifera margaritifera) in the River Rede, UK: Identification of instream indicators for catchment-scale issues. Limnologica 50, 58-66. https://www.sciencedirect.com/science/article/pii/S0075951114000838?via%3Dihub
E3 ECOLOGY LTD, 2016. Freshwater pearl mussel survey River North Tyne tributaries, November 2016. Report to Natural England.

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KILLEEN, I.J. & MOORKENS, E., 2015. An assessment of freshwater pearl mussel current and potential habitat in the River Esk, Yorkshire. Malacological Services. Report to North York Moors National Park Authority.
MOORKENS, E. & KILLEEN, I.J., 2016. Study to age the population of freshwater pearl mussels (Margaritifera margaritifera) in the River Esk, Yorkshire. Malacological Services. Report to North York Moors National Park Authority.
WEST, C., 2015. River Irt 2015 Mussel Survey. West Cumbria Rivers Trust.
WEST, C., 2016. River Irt 2016 Mussel Survey. West Cumbria Rivers Trust.
GIBSON, C., LAVICTOIRE, L. & WEST, C., 2017. Reintroduction of Irt 2008 cohort (May 2017). Partnership work delivered under 'Restoring Freshwater Mussel Rivers in England' project. Freshwater Biological Association, West Cumbria Rivers Trust.
KILLEEN, I.J. & MOORKENS, E., 2013. Environmental monitoring of the River Ehen freshwater pearl mussel population in 2012. Report to United Utilities. Malacological Services.
MOORKENS, E. & KILLEEN, I.J., 2013. Study to age the population of freshwater pearl mussels (Margaritifera margaritifera) in the River Ehen, Cumbria. Report to United Utilities. Malacological Services.TURAL ENGLAND, 2014. Planning for the Future Improvement Programme for England's Natura 2000 Sites (IPENS). Site Improvement Plan: River Ehen SAC UK0030057. http://publications.naturalengland.org.uk/publication/6203335036108800?category=6329101765836800
O'LEARY, D., 2016. Pearls in Peril Project. River Ehen freshwater mussel survey report 2014-2016. LIFE + 11 NAT UK 000383: PIP GB. West Cumbria Rivers Trust.
O'LEARY, D., 2016. Pearls in Peril Project. Action A3: Conservation Actions for the Freshwater Pearl Mussel in the River Ehen, Cumbria, September 2013-2016. LIFE + 11 NAT UK 000383: PIP GB. West Cumbria Rivers Trust.
O'LEARY, D., 2017. River Ehen: Freshwater mussel survey for Ennerdale Mill Weir, July 2017. West Cumbria Rivers Trust.
MEASURES, G.H., 2015. Survey for the freshwater pearl mussel Margaritifera margaritifera in the River Liza, Cumbria. In sections on Char Dubb downstream of the Woundell Beck. Natural England.
MEASURES. G.H., 2017. A survey for the freshwater pearl mussel Margaritifera margaritifera (L., 1758) in Swindale Beck, Cumbria July 2017. Report to Natural England, United Utilities and RSPB. Confidential report.TURAL ENGLAND, 2014. Planning for the Future Improvement Programme for England's Natura 2000 Sites (IPENS). Site Improvement Plan: River Kent SAC UK0030256. http://publications.naturalengland.org.uk/publication/6050544158244864?category=6329101765836800
WEST, M. 2016. River Kent Initial Mussels Survey 2016. South Cumbria Rivers Trust.
SOUTH CUMBRIA RIVERS TRUST, 2013. De-silting Dubbs Beck. Report to Natural England.
SOUTH CUMBRIA RIVERS TRUST, 2016. The River Restoration Strategy: The River Kent & Tributaries SSSI/SAC - Dubbs Beck Restoration. Report to the Environment Agency and Natural England.
MEASURES, G.H., 2009-2018. A series of monitoring reports on the status of freshwater pearl mussel population at Dubb's Beck (Cumbria). Natural England. Confidential reports.
MEASURES. G.H., 2014. Survey for the freshwater pearl mussel Margaritifera margaritifera (L., 1758) in the River Brathay, Cumbria. Clappersgate, May 2014. Natural England.
WEST, M. & BONITO, E., 2015. Report on Freshwater Pearl Mussel Survey, 2nd

September 2015. South Cumbria Rivers Trust.
BRITISH STANDARDS INSTITUTION, 2017. BS EN 16859:2017. Water quality - Guidance standard on monitoring freshwater pearl mussel (Margaritifera margaritifera) populations and their environment. The British Standards Institution.
KILLEEN, I. & MOORKENS, E., 2016. The translocation of freshwater pearl mussels: a review of reasons, methods and success and a new protocol for England. Natural England Commissioned Reports, Number 229.
CUTTELOD, A., SEDDON, M. & NEUBERT, E., 2011. European red list of non-marine molluscs. Luxembourg. Publications office of the European Union.
CAUWELIER, E., VERSPOOR E., TARR E. C., THOMPSON, C. & YOUNG M., 2009. Genetic diversity and differentiation of freshwater pearl mussel (Margaritifera margaritifera) populations in the UK. Scottish Natural Heritage Commissioned Report No.344 (ROAME No. F05AC701).
FOWLES, A., BARNFATHER, N. & MEASURES, G., 2010a. Rationale: A conservation plan for freshwater pearl mussel Margaritifera margaritifera populations in England and Wales. Countryside Council for Wales, Environment Agency and Natural England.
FOWLES, A., BARNFATHER, N. & MEASURES, G., 2010b. Defining priorities: a conservation plan for freshwater pearl mussel Margaritifera margaritifera populations in England and Wales. Countryside Council for Wales, Environment Agency and Natural England.
Natural England freshwater pearl mussel survey dataset (unpublished)
Interagency Freshwater Group, 2018. UK Article 17 Reporting: Procedure for estimating population (including Favourable Reference Population) using 1km square resolution records data.
KILLEEN, I. & MOORKENS, E., 2015. River Ehen freshwater mussel habitat mapping. Results of pilot study carried out in September 2014. Report to United Utilities - March 2015.
KILLEEN, I. & MOORKENS, E., 2018 (in prep.). Assessment of juvenile freshwater pearl mussel habitat in the River Ehen SAC, Cumbria. Report to United Utilities.
E3 ECOLOGY LTD, 2018. Freshwater pearl mussel survey: River North Tyne, July 2018. Report to Environment Agency.
Scotland
Watt, J, Cosgrove, P.J & Hastie, L.C. 2015. A national freshwater pearl mussel. (Margaritifera margaritifera, L.) survey of Scotland. Scottish Natural Heritage Commissioned
Report No. 901.
Baum, D. 2018. Host salmonid specificity of selected pearl mussel populations. Scottish Natural Heritage Research Report No. 972.
Watt, J., Hastie, L.C., and Cosgrove, P.J. 2018. Monitoring the success of freshwater pearl mussel reintroductions. Scottish Natural Heritage Research Report No. 956.
Pearls in Peril 2013. Encystment monitoring.
Pearls in Peril 2017. Final project report.
Scottish Natural Heritage 2018. Unpublished Site Condition Monitoring survey, Rannoch Moor SAC.
Cooksley, S.L., Addy, S., Watson H. and Johnstone, L. (2011). Fluvial audit of the upper
River Moriston. Scottish Natural Heritage Commissioned Report No. 477.
Irene Tierney, IMTECO Ltd. Freshwater Pearl Mussel Survey, October 2015.
COSGROVE, P. 2017. FRESHWATER PEARL MUSSEL SURVEY, 2017. CNPA COMMISSIONED REPORT.

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COSGROVE, P. & SHIELDS, D. 2016. FRESHWATER PEARL MUSSEL SURVEY. JBA COMMISSIONED REPORT.
Direct Ecology 2016. Freshwater pearl mussel survey.
HEL Ltd 2016. Freshwater pearl mussel survey & species protection plan.
Esk Rivers and Fisheries Trust. 2010. Freshwater pearl mussel survey.
Cosgrove, P.J., Hastie, L.C. and Watt, J. 2017. Surveys of high risk freshwater pearl mussel populations. Report to SNH.
Galloway Fisheries Trust. 2016. Survey to determine presence of freshwater pearl mussels in Galloway. Report to SNH.
Cosgrove, P. 2013. Shetland 2012 Freshwater Pearl Mussel Survey. Report to SNH.
COSGROVE, P., FARQUHAR, J. AND COSGROVE, C. 2013 RVER XX FRESHWATER PEARL MUSSEL SURVEY. ALBA ECOLOGY.
Cosgrove, P.J. 2016. Site Condition Monitoring of freshwater pearl mussels in the Inverpolly Special Area of Conservation. Report to SNH.
Sime, 2014. Report of Site Condition Monitoring survey of freshwater pearl mussels in the River Spey during 2013 and 2014. SNH report.
Barnes. M. 2015. Effects of depth and current on Freshwater pearl mussel (Margaritifera margaritifera) in a Scottish river. University of Oxford.
Baum, 2013 Assessment of the Ardnamurchan Burns Special Area of Conservation. Report to SNH.
Cosgrove, P., Watt, J., Hastie, L. et al. Biodivers Conserv (2016) 25: 2093.
Mertens, C. 2018. SCM surveys of freshwater SACs in Lochaber. Internal, unpublished results.
Wales
Arvidsson BL, Karlsson J, Osterling ME. 2012. Recruitment of the threatened mussel Margaritifera margaritifera in relation to mussel population size, mussel density and host density. Aquatic Conservation: Marine and Freshwater Ecosystems, 22: 526-532.
Cosgrove P, McInnes N, Dolby S, Gunn D, Shields D, Cosgrove C, Kortland K. 2017. Forest management and freshwater pearl mussels: a practitioners' perspective from the north of Scotland. Scottish Forestry, 71 (1): 14-21.
Degerman E, Alexanderson S, Bergengren J, Henrikson L, Johansson B-E, Larsen BM, Soderberg H. 2009. Restoration of freshwater pearl mussel streams. Solna: WWF Sweden.
Fowles A. 2004. A strategy for the recovery of Freshwater Pearl Mussel Margaritifera margaritifera populations in Wales. Bangor: Countryside Council for Wales.
Fowles AP, Barnfather N, Measures G. 2010. Defining priorities: a conservation plan for freshwater pearl mussel Margaritifera margaritifera populations in England and Wales. Unpublished report. Countryside Council for Wales, Environment Agency & Natural England.
Garrett, HM. 2016. Freshwater pearl mussel larval encystment of host fish species on the Afon Eden - Cors Goch Trawsfynydd SAC. NRW Evidence Report 164. 31pp. Bangor: Natural Resources Wales.
Garrett HM, Thomas Rh. 2012. Freshwater pearl mussel Margaritifera margaritifera monitoring Report: Afon Eden - Cors Goch Trawsfynydd SAC 2011. CCW Staff Science Report No. 12/8/3. Bangor: Countryside Council for Wales.
Garrett HM. In preparation. Afon Eden - Cors Goch Trawsfynydd SAC Monitoring Summary note. Redox assessment of juvenile freshwater pearl mussel habitat. Monitoring Round 2012 to 2018. Bangor: Natural Resources Wales.
Geist J. 2010. Strategies for the conservation of endangered freshwater pearl mussels (Margaritifera margaritifera L.): a synthesis of Conservation Genetics

and Ecology. Hydrobiologia 644:69-88.
Geist J, Auerswald K. 2007. Physicochemical stream bed characteristics and recruitment of the freshwater pearl mussel (Margaritifera margaritifera). Freshwater Biology, 52: 2299-2316.
Gum B, Lange M, Geist J. 2011. A critical reflection on the success of rearing and culturing juvenile mussels with a focus on the endangered freshwater pearl mussel (Margaritifera margaritifera L.). Aquatic Conservation: Marine and Freshwater Ecosystems. 21: 743-751.
Hastie LC, Cooksley SL, Scougall F, Young MR, Boon PJ, Gaywood MJ. 2003. Characterization of freshwater pearl mussel (Margaritifera margaritifera) riverine habitat using River Habitat Survey data. Aquatic Conservation: Marine and Freshwater Ecosystems, 13: 213-224.
Hatton-Ellis TW, Garrett H, Hearn S, Jenkins M, Jones HP, Taylor J, Watkin N. 2017. A Freshwater Pearl Mussel Conservation Strategy for Wales. Bangor: Natural Resources Wales.
Hearn SM and Garrett HM 2017. Afon Eden - Cors Goch Trawsfynydd SAC freshwater pearl mussel population condition assessment report. Habitats Directive reporting cycle 3 2013 - 2018. NRW Evidence Report No: 169, 28pp. Bangor: Natural Resources Wales.
Holman I. et al. 2003. A risk assessment for the Afon Eden, Meirionnydd. CCW Contract Science Report No 570. Bangor: Countryside Council for Wales.
Killeen IJ. 2004. Monitoring of the freshwater pearl mussel Margaritifera margaritifera on the Afon Eden candidate Special Area of Conservation. CCW Contract Science. 618. Countryside Council for Wales.
Killeen IJ. 2007. A survey of Welsh rivers supporting populations of the freshwater pearl mussel Margaritifera margaritifera (L., 1758). CCW Contract Science Report 770. Bangor: Countryside Council for Wales.
Killeen IJ. 2012. A redox potential survey of Freshwater Pearl Mussel rivers in Wales. Report to EA Wales.
Killeen IJ. 2013. A redox potential survey of the Afon Eden SAC and associated tributaries, North Wales. Report to EA Wales.
Killeen IJ. 2014. A redox potential survey of the Afon Eden SAC and associated tributaries, North Wales. Report to NRW.
Killeen IJ. 2015. A redox potential survey of the Afon Eden SAC and associated tributaries, North Wales. Report to NRW.
Killeen IJ, Moorkens E. 2003. A survey of the Afon Aeron, Ceredigion, for the freshwater pearl mussel Margaritifera margaritifera (L. 1758). CCW Contract Science Report No. 650. Bangor: Countryside Council for Wales.
Killeen I, Oliver PG. 1997. A Survey of Mynydd Preseli SSSI, Pembrokeshire, for the Freshwater Pearl Mussel, Margaritifera margaritifera (L., 1758). CCW Contract Science Report No 183. Cardiff, Department of Zoology, National Museum of Wales.
Killeen IJ, Oliver G, Wood D. 1997. The Status of the Freshwater Pearl Mussel, Margaritifera margaritifera (L., 1758), in North-west Wales. CCW Contract Science Report No. 182. Bangor: Countryside Council for Wales.
Killeen IJ, Oliver PG. 1998. The status and distribution of Freshwater Pearl Mussel (Margaritifera margaritifera [L., 1758]) in Wales: Report on the 1997 survey. 1998. Cardiff: National Museum of Wales.
Killeen IJ, Oliver PG. 1999. The Status and Distribution of the Freshwater Pearl Mussel (Margaritifera margaritifera [L., 1758]) in Wales: 1998/99 Survey of the Afon Taf and Afon Tywi. CCW Contract Science Report No. 371. Bangor: Countryside Council for Wales.
Marples H. 2017 An assessment of water quality in Brynteg Forest settlement

ponds. MSc Thesis, School of Biological Sciences, Bangor University.
McIvor A, Aldridge D. 2008. The cultivation of the freshwater pearl mussel, Margaritifera margaritifera. CCW Contract Science. 849. Bangor: Countryside Council for Wales.
Moorkens E, Cordeiro J., Seddon, M.B., von Proschwitz, T. & Woolnough, D. 2017. Margaritifera margaritifera. The IUCN Red List of Threatened Species 2017: e.T12799A508865. http://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T12799A508865.en. Downloaded on 17 April 2018.
Oliver PG, Meechan CJ, Trew A. 1993. Report on the 1992/93 survey of the freshwater pearl mussel (Margaritifera margaritifera L., 1758) in the River Wye. CCW Contract Science No 30. Bangor: Countryside Council for Wales.
Pearls in Peril LIFE+ Project. 2016. Available online at www.pearlsinperil.scot.
Purser GJ. 1985. Factors affecting the distribution of the freshwater pearl mussel Margaritifera margaritifera (L.) in Britain. Ph.D. Thesis, University of Aberdeen.
RESTORE 2018. Case study: Pearls in Peril LIFE+ GB Project - Afon Eden. Available from: https://restorerivers.eu/wiki/index.php?title=Case_study%3APearls_in_Peril_LIFE%2B_GB_Project_-_Afon_Eden (Accessed 10th April 2018).
Skinner A, Young M, Hastie L. 2003. Ecology of the Freshwater Pearl Mussel. Conserving Natura 2000 Rivers Ecology Series No. 2. Peterborough: English Nature.
Taylor J. 2007. Captive breeding and juvenile culture of the freshwater pearl mussel (Margaritifera margaritifera): restoration of a critically endangered species. Finfish News, 4: 23-24.
Williamson, K. 2016. Garndolbenmaen Weir freshwater pearl mussel survey. NRW Evidence Report No. 174. Bangor: Natural Resources Wales.
Wye and Usk Foundation (WUF). 2018. ISAC. The Irfon Special Area of Conservation Project. Available from: http://www.wyeuskfoundation.org/isac/ (Accessed 10th April 2018).
Young M. 2005. A literature review of the water quality requirements of the freshwater pearl mussel (Margaritifera margaritifera) and related freshwater bivalves. Commissioned Report. 84. Edinburgh: Scottish Natural Heritage.
N.Ireland
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.
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)	46571.2	
5.2 Short-term trend Period	2007-2018	
5.3 Short-term trend Direction	Decreasing (-)	
5.4 Short-term trend Magnitude	a) Minimum	b) Maximum
5.5 Short-term trend Method used	Complete survey or a statistically robust estimate	
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)	56389
	b) Operator	
	c) Unknown	
	d) Method	The FRR is the same as in 2013. The value is considered to be large enough to support a viable population and no lower than the range estimate when the Habitats Directive came into force in the UK. For further information see the 2019 Article 17 UK Approach document.
5.11 Change and reason for change in surface area of range	Genuine change	

	Improved knowledge/more accurate data Use of different method	
	The change is mainly due to:	Genuine change
5.12 Additional information	The short term trend direction is considered most likely to be 'decreasing <=1% (one percent or less) per year on average', based on the reported declines in Scotland and Wales. Several known populations have been lost in the reporting period and therefore the number of sites, and the species range in northeast Scotland and southern Wales has particularly decreased.	

6. Population

6.1 Year or period	1999-2018	
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	549
6.3 Type of estimate	Minimum	
6.4 Additional population size (using population unit other than reporting unit)	a) Unit	
	b) Minimum	
	c) Maximum	
	d) Best single value	
6.5 Type of estimate		
6.6 Population size Method used	Based mainly on extrapolation from a limited amount of data	
6.7 Short-term trend Period	1999-2018	
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	More than (>)
	c) Unknown	
	d) Method	The FRP has changed since 2013. An FRP operator has been used because it has not been possible to

calculate the exact FRP value. This is partly because the population unit has changed from 'localities' in the 2013 reporting to 'number of 1x1 km grids' in the 2019 reporting. The FRP is considered to be no more than 25% above the current population. For further information see the 2019 Article 17 UK Approach document.

6.16 Change and reason for change in population size	Genuine change Improved knowledge/more accurate data Use of different method The change is mainly due to: Improved knowledge/more accurate data
6.17 Additional information	The short term trend direction is considered most likely to be decreasing >1% (more than one percent) per year on average, based on the reported declines in Scotland, England, Wales and Northern Ireland. At the UK-level it is considered most likely that the FRP is no more than 25% above the current population, even though there are severe declines reported in Wales. In terms of age-structure, mortality and reproduction, there are severe juvenile recruitment problems reported in Scotland England, Wales and Norther Ireland, resulting in ageing populations. Therefore age-structure and reproduction is strongly deviating from normal.

7. Habitat for the species

7.1 Sufficiency of area and quality of occupied habitat	a) Are area and quality of occupied habitat sufficient (for long-term survival)?	No
	b) Is there a sufficiently large area of unoccupied habitat of suitable quality (for long-term survival)?	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	1999-2018	
7.4 Short-term trend Direction	Uncertain (u)	
7.5 Short-term trend Method used	Based mainly on expert opinion with very limited data	
7.6 Long-term trend Period		
7.7 Long-term trend Direction		
7.8 Long-term trend Method used		
7.9 Additional information	Poor river habitat quality (e.g. water quality, riparian and instream habitat (including the interstitial substrate quality) and host fish populations) remains the serious limiting factor in juvenile recruitment. The sufficiency of the area of occupied and unoccupied habitat is less of a problem. There have been some habitat improvements within the Natura 2000 network, with some populations now recovering, but not at a sufficiently wide scale to provide an overall improving short-term trend. There are long-term declines elsewhere.	

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

8. Main pressures and threats

8.1 Characterisation of pressures/threats

Pressure	Ranking
Intensive grazing or overgrazing by livestock (A09)	M
Agricultural activities generating diffuse pollution to surface or ground waters (A26)	H
Forestry activities generating pollution to surface or ground waters (B23)	H
Illegal harvesting, collecting and taking (G11)	H
Other impacts from marine aquaculture, including infrastructure (G19)	M
Modification of hydrological flow (K04)	M
Physical alteration of water bodies (K05)	H
Increases or changes in precipitation due to climate change (N03)	M

Threat	Ranking
Intensive grazing or overgrazing by livestock (A09)	M
Agricultural activities generating diffuse pollution to surface or ground waters (A26)	H
Forestry activities generating pollution to surface or ground waters (B23)	H
Illegal harvesting, collecting and taking (G11)	H
Introduction and spread of species (including alien species and GMOs) in freshwater aquaculture (G24)	M
Modification of hydrological flow (K04)	M
Physical alteration of water bodies (K05)	M
Temperature changes (e.g. rise of temperature & extremes) due to climate change (N01)	M
Increases or changes in precipitation due to climate change (N03)	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

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)

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9.5 List of main conservation measures

Manage the use of natural fertilisers and chemicals in agricultural (plant and animal) production (CA09)
Reduce/eliminate point pollution to surface or ground waters from agricultural activities (CA10)
Reduce diffuse pollution to surface or ground waters from agricultural activities (CA11)
Adapt/manage reforestation and forest regeneration (CB04)
Reduce diffuse pollution to surface or ground waters from forestry activities (CB10)
Control/eradication of illegal killing, fishing and harvesting (CG04)
Other measures to reduce impacts from marine aquaculture infrastructures and operation (CG09)
Other measures related to natural processes (CL04)
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	Bad
b) Population	Bad
c) Habitat of the species	Bad

10.2 Additional information

Future trend of Range is Negative - decreasing <=1% (one percent or less) per year on average; Future trend of Population is Negative - decreasing <=1% (one percent or less) per year on average; and Future trend of Habitat for the species is Negative - slight/moderate deterioration. For further information on how future trends inform the Future Prospects conclusion see the 2019 Article 17 UK Approach document.

11. Conclusions

11.1. Range	Unfavourable - Bad (U2)
11.2. Population	Unfavourable - Bad (U2)
11.3. Habitat for the species	Unfavourable - Bad (U2)
11.4. Future prospects	Unfavourable - Bad (U2)
11.5 Overall assessment of Conservation Status	Unfavourable - Bad (U2)
11.6 Overall trend in Conservation Status	Deteriorating (-)
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	Conclusion on Range reached because: (i) the short-term trend direction in

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Range surface area is decreasing by more than 1% per year; and (ii) the current Range surface area is more than 10% below the Favourable Reference Range.
Conclusion on Population reached because: (i) the short-term trend direction in Population size is decreasing by more than 1% per year; (ii) the current Population size is not more than 25% below the Favourable Reference Population; and (iii) age structure, mortality and reproduction are strongly deviating from normal.
Conclusion on Habitat for the species reached because: (i) the area of occupied and unoccupied habitat is sufficiently large and (ii) the habitat quality is not adequate for the long-term survival of the species; and (iii) the short-term trend in area of habitat is uncertain.
Conclusion on Future prospects reached because: (i) the Future prospects for Range are bad; (ii) the Future prospects for Population are bad; and (iii) the Future prospects for Habitat for the species are bad.
Overall assessment of Conservation Status is Unfavourable-bad because all of the conclusions are Unfavourable-bad.
Overall trend in Conservation Status is based on the combination of the short-term trends for Range - decreasing, Population - decreasing, and Habitat for the species - uncertain.
The Overall assessment of Conservation Status has not changed between 2013 and 2019. The Overall assessment is Unfavourable-bad.
The Overall trend in Conservation Status has not changed between 2013 and 2019. The overall trend is declining.

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	266
12.2 Type of estimate		Minimum
12.3 Population size inside the network Method used		Based mainly on extrapolation from a limited amount of data
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		

13. Complementary information

13.1 Justification of % thresholds for trends	
13.2 Trans-boundary assessment	England The only trans-boundary population is the River Wye which flows from Wales into England. Historically, the Wye has supported a large mussel population in

the 1970s. The river was last surveyed between 1992-1994. Eighty sites were investigated but only six contained mussels and a total of only 21 individuals were found (four in England, 17 in Wales). Without any recent records, it is likely that the population has been lost in the England sections of the Wye.

13.3 Other relevant Information

England
Translocation protocol produced for the movement of mussels for conservation purposes (Killeen, I. & Moorkens, E., 2016). Freshwater pearl mussels are taken for conservation purposes and captive breeding.

Distribution Map

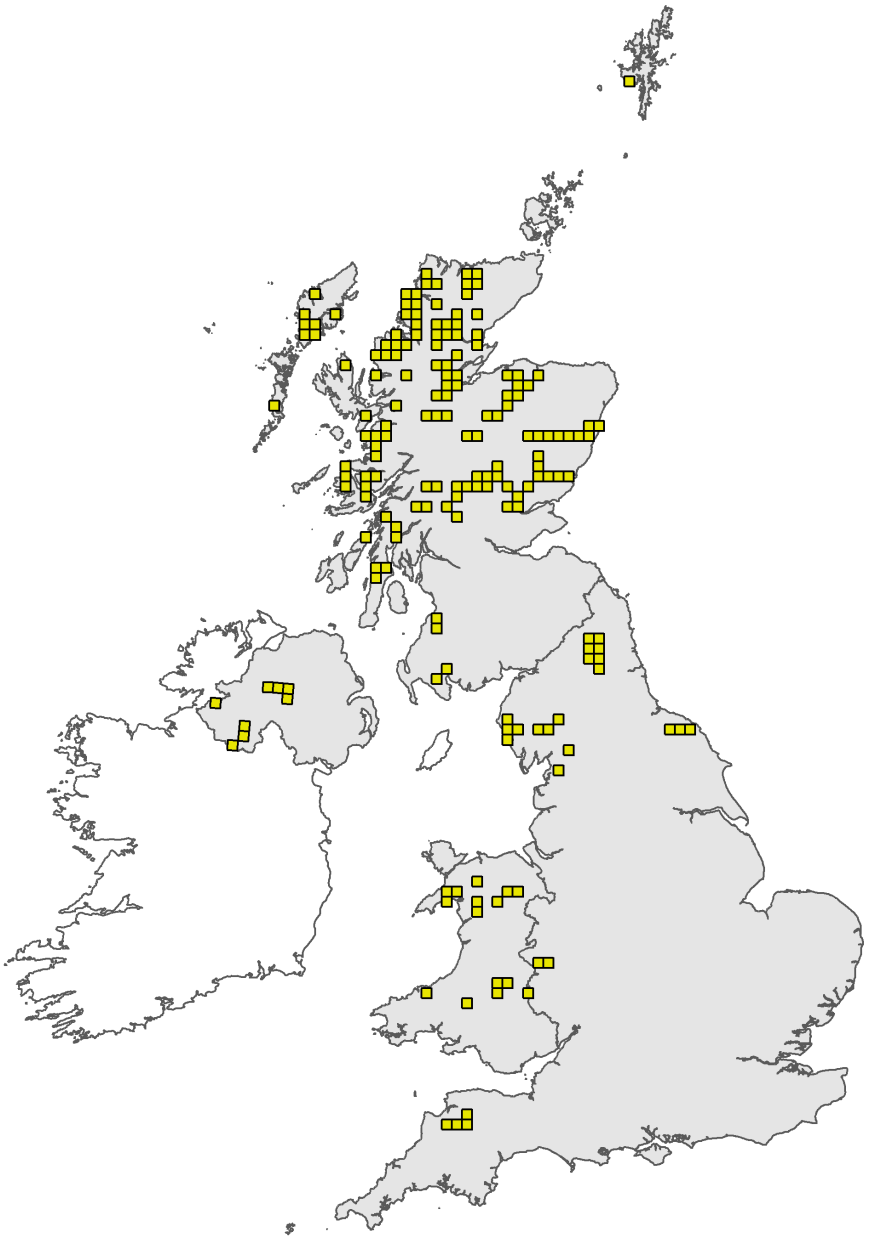

Figure 1: UK distribution map for S1029 - Freshwater pearl mussel (*Margaritifera margaritifera*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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

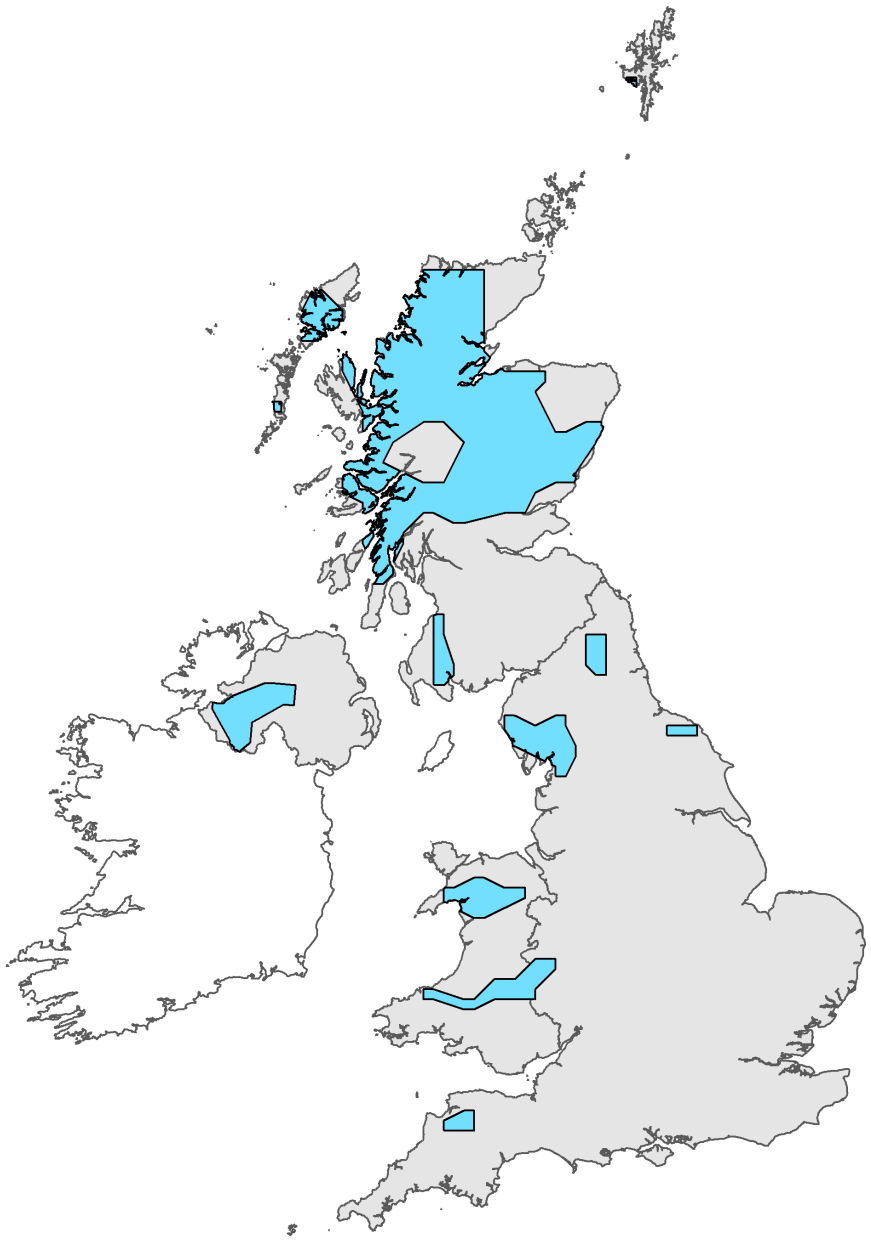

Figure 2: UK range map for S1029 - Freshwater pearl mussel (*Margaritifera margaritifera*). Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority.

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.