# European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC)

## Supporting documentation for the Third Report by the United Kingdom under Article 17

on the implementation of the Directive
from January 2007 to December 2012
Conservation status assessment for

Species:

S1029 - Freshwater pearl mussel. (*Margaritifera margaritifera*)

**IMPORTANT NOTE – PLEASE READ**

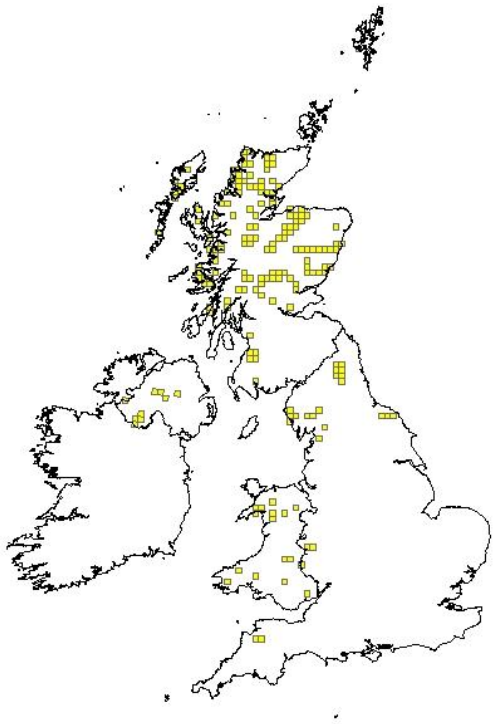
- The country-level reporting information contained in this document is a contribution to the Article 17 UK report for the habitat/species concerned.
- It has been provided by **Natural Resources Wales** and refers only to the state of the habitat/species in **Wales** - it does not constitute an assessment for the whole of the UK.
- The Article 17 UK Approach document provides details on how this information has been used and, combined with information supplied by other Statutory Nature Conservation Bodies
- The format of the document is closely aligned to that set out by the European Commission for Member State reporting – as a result, some of the fields are not applicable at a country-level and have deliberately been left blank – in addition, the content of most fields is constrained by the EC reporting categories.

As of 1 April 2013, the Countryside Council for Wales, Environment Agency Wales and Forestry Commission Wales became Natural Resources Wales/Cyfoeth Naturiol Cymru

## Reporting format on the 'main results of the surveillance under Article 11' for Annex II, IV & V species

| *Field name* | *Brief explanations* | |
|---|---|---|
| **0.2 Species** | **0.2.1 Species code** | **S1029** |
| | **0.2.2 Species scientific name** | ***Margaritifera margaritifera*** |
| | **0.2.3 Alternative species scientific name** Optional | |
| | **0.2.4 Common name** Optional | **Freshwater Pearl Mussel** |

| **1.1 Maps** | | | |
|---|---|---|---|
| **1.1.1 Distribution map** | | **Sensitive** | **False** |
| | | | |



| | |
|---|---|
| **1.1.2 Method used - map** | **Complete survey/Complete survey or a statistically robust estimate** |
| | |
| **1.1.3 Year or period** | **2004-2012** |
| | |
| **1.1.4 Additional distribution map** | **False** |
| | |
| **1.1.5 Range map** | |

| | |
|---|---|
| | |

| | |
|---|---|
| **2.1 Biogeographical region & marine regions** | **ATL** |
| | |
| **2.2 Published sources** | **"Garrett, H.M. & 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. Countryside Council for Wales.**<br>**Fowles, A.P., 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.**<br>**Holman, I. et al. 2003. A risk assessment for the Afon Eden, Meirionnydd: final report. CCW Contract Science. 570. Countryside Council for Wales.**<br>**Killeen, I.J. 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.**<br>**Killeen, I.J. 2007. A survey of Welsh rivers supporting populations of the freshwater pearl mussel Margaritifera margaritifera (L., 1758). CCW Contract Science. 770. Countryside Council for Wales.**<br>**McIvor, A. & Aldridge, D. 2008. The cultivation of the freshwater pearl mussel, Margaritifera margaritifera. CCW Contract Science. 849. Countryside Council for Wales.**<br>**Oliver, P.G., Meechan, C.J. & 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. 30. Countryside Council for Wales.**<br>**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.**<br>**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. Scottish Natural Heritage."** |
| | |

| **2.3 Range** | |
|---|---|
| **2.3.1 Surface area Range** | |
| | |
| **2.3.2 Method used Surface area of Range** | **Complete survey/Complete survey or a statistically robust estimate** |
| | JNCC have calculated Range from UK data using alpha-hull. This has not been separately calculated for Wales and hence the entry here does not indicate that Range analysis has taken place for Wales. It is merely a marker for JNCC to indicate the quality of the raw distribution data |

| | | |
|---|---|---|
| | that was supplied to them in order to undertake the UK analysis | |
| **2.3.3 Short-term trend Period** | **2001-2012** | |
| **2.3.4 Short term trend Trend direction** | **stable** | |
| | Since 2001 pearl mussels have been reported from 15 10km squares in Wales, but records are only available from 12 10km squares in the period 2007-2012. Of the three unrecorded squares: two squares (Conwy and Dee) have not been resurveyed in this period, and on the Western Cleddau all mussels were taken from the river and placed into captivity in 2006. | |
| **2.3.5 Short-term trend Magnitude** | **a) Minimum** | |
| | | |
| | **b) Maximum** | |
| | | |
| **2.3.6 Long-term trend Period** | **1989-2012** | |
| | | |
| **2.3.7 Long-term trend Trend direction** | **decrease 1% or less/year** | |
| | Since 1989 pearl mussels have been recorded from 20 10km squares in Wales. The species is now assumed to be extinct in the rivers Taf, Tywi, Teifi and Usk - although a single dead shell was found in the latter river in 2012 suggesting that a few old adults may still survive. Entire populations from the rivers Wye, Western Cleddau and Pensarn have been taken into captivity (Killeen 2007), so these are also effectively extinct | |
| **2.3.8 Long-term trend Magnitude** Optional | **a) Minimum** | |
| | | |
| | **b) Maximum** | |
| | | |
| **2.3.9 Favourable reference range** | **a) Value in km²** | |
| | | |
| | **b) Operator for FRR** | |
| | | |
| | **c) FRR is unknown (indicated by "true")** | **False** |
| | | |

| | | |
|---|---|---|
| | **d) Method used to set FRR** | |
| | | |
| **2.3.10 Reason for change**<br>Is the difference between the reported value in 2.3.1 and the previous reporting round mainly due to… | **a) Genuine change?** | **True** |
| | See note 2.3.4 | |
| | **b) Improved knowledge/more accurate data?** | **False** |
| | | |
| | **c) Use of different method (e.g. "Range tool")?** | **False** |
| | | |

| **2.4 Population** | | |
|---|---|---|
| **2.4.1 Population size estimation**<br>(using individuals or agreed exceptions where possible) | **a) Unit** | |
| | | |
| | **b) Minimum** | |
| | | |
| | **c) Maximum** | |
| | | |
| **2.4.2 Population size estimation** (using population unit other than individuals)<br>Optional *(if 2.4.1 filled in)* | **a) Unit** | **number of localities** |
| | | |
| | **b) Minimum** | **2** |
| | Only two rivers in Wales have yielded records of juvenile pearl mussels since survey work began in 1993 (Oliver et al 1993). One of these (unknown at the time) was dredged in winter 1995 but following restoration efforts juvenile mussels have once again begun to appear | |
| | **c) Maximum** | **2** |
| | | |
| **2.4.3 Additional information on population estimates / conversion**<br>Optional | **a) Definition of "locality"** | **The population unit used is 'functional populations'. Here the term is used to imply populations that show evidence of recent recruitment by the presence of juveniles** |
| | | |
| | **b) Method to convert data** | |
| | | |
| | **c) Problems** | |

| | | |
|---|---|---|
| | **encountered to provide population size estimation** | |
| | | |
| **2.4.4 Year or period** | **2007-2012** | |
| | | |
| **2.4.5 Method used Population size** | **Complete survey/Complete survey or a statistically robust estimate** | |
| | | |
| **2.4.6 Short-term trend Period** | **2007-2012** | |
| | See note 2.3.4 | |
| **2.4.7 Short-term trend Trend direction** | **stable** | |
| | See note 2.3.4 | |
| **2.4.8 Short-term trend Magnitude** | **a) Minimum** | **0** |
| | | |
| | **b) Maximum** | **0** |
| | | |
| | **c) Confidence interval** | |
| | | |
| **2.4.9 Short-term trend Method used** | **Complete survey/Complete survey or a statistically robust estimate** | |
| | See note 2.4.5 | |
| **2.4.10 Long-term trend – Period** | **1989-2012** | |
| | See note 2.4.11 | |
| **2.4.11 Long-term trend Trend direction** | **stable** | |
| | Few records of pearl mussels in Wales exist prior to 1993 but since systematic surveys have taken place there have been records of juvenile mussels from only two rivers | |
| **2.4.12 Long-term trend Magnitude** Optional | **a) Minimum** | **0** |
| | | |
| | **b) Maximum** | **0** |
| | | |
| | **c) Confidence** | |

| | | |
|---|---|---|
| | **interval** | |
| | | |
| **2.4.13 Long term trend Method used** | **2** | |
| | See note 2.4.11 | |
| **2.4.14 Favourable reference population** | **a) Number of individuals/agreed exceptions/other units** | |
| | | |
| | **b) Operator** | |
| | | |
| | **c) FRP is unknown indicated by "true"** | **False** |
| | | |
| | **d) Method used to set FRP** | |
| | | |
| **2.4.15 Reason for change**<br>Is the difference between the value reported at 2.4.1 or 2.4.2 and the previous reporting round mainly due to: | **a) Genuine change?** | **False** |
| | | |
| | **b) Improved knowledge/more accurate data?** | **False** |
| | | |
| | **c) Use of different method (e.g. "Range tool")?** | **False** |
| | | |

| **2.5 Habitat for the species** | |
|---|---|
| **2.5.1 Area estimation** | **0** |
| | No attempt has been made to map the area of habitat utilised by pearl mussels in Welsh rivers. Since 1989 mussels have been recorded from a total length of 47 kms on sixteen rivers, but distribution within these stretches is very patchy. If an average width of these rivers was taken as 10m and mussel habitat occurred in one-tenth of the occupied stretches this would imply suitable habitat occupied 0.47 square kilometres, but it must be stressed that this is a very crude estimate. The corresponding figures for 2007-2012 would be 41km river length and hence 0.41 sq kms habitat area |

| | | |
|---|---|---|
| | There is thought to be a sufficient amount of habitat in the UK to support a viable population of the species. | |
| **2.5.2 Year or period** | **2007-2012** | |
| | | |
| **2.5.3 Method used Habitat for the species** | **Absent data** | |
| | | |
| **2.5.4 Quality of the habitat** | **a) Habitat quality** | **Bad** |
| | Only one of the seven transects on the Afon Eden SAC passed the Conservation Objective targets (Garrett & Thomas 2012) in 2011. Evidence of excessive siltation was found throughout the transects. As this river is considered to be the best for pearl mussels in Wales it is logical to assume that all other pearl mussel rivers will have poor habitat quality.<br><br>The main Welsh pearl mussel rivers have recently been surveyed for Redox potential (results not available) and this survey should provide more information on interstitial substrate quality | |
| | **b) Assessment method** | **Habitat quality has only been assessed on the Afon Eden SAC (Killeen 2004, Garret & Thomas 2012). The river is divided into identifiable sections and transects record the number of sample points that meet defined criteria of suitability:**<br>**• A substrate comprising a size range from coarse (1mm) to small cobble (100mm), but principally of stable gravel in riffles and runs**<br>**• No filamentous algae in potential mussel beds.**<br>**• No obvious siltation in the surface layers of gravels in potential mussel areas.** |
| | | |
| **2.5.5 Short-term trend Period** | **2001-2012** | |
| | See note 2.5.6 | |
| **2.5.6 Short-term trend Trend direction** | **stable** | |
| | Killeen (2004) recorded that none of the transects had suitable habitat in 2003 and indicated that less than 15% of the riverbed in the core area supported a suitable substrate. Although one transect was assessed as containing suitable habitat in 2011, there is no evidence to suggest that the habitat has significantly improved in the Afon Eden since 2003 (Garrett & Thomas 2012). | |
| **2.5.7 Long-term trend Period** | **1989-2012** | |
| | See note 2.5.8 | |
| **2.5.8 Long-term trend Trend direction** | **unknown** | |
| | Habitat quality has only been assessed on a single river and the first assessment took place in 2003 (Killeen 2004). It is, therefore, not | |

| | | |
|---|---|---|
| | possible to report on the long-term direction of habitat quality in Welsh pearl mussel rivers | |
| **2.5.9 Area of suitable habitat for the species** | **a) Value in km²** | **0** |
| | See note 2.5.1 | |
| | **b) Absence of data indicated as '0'** | |
| | | |
| **2.5.10 Reason for change**<br>Is the difference between the value reported at 2.5.1 and the previous reporting round mainly due to | **a) Genuine change?** | **False** |
| | | |
| | **b) Improved knowledge/more accurate data?** | **False** |
| | | |
| | **c) Use of different method (e.g. "Range tool")?** | **False** |
| | | |

**2.6 Main pressures**

| a) Pressure | b) Ranking<br>H = high importance<br>M = medium importance<br>L = low importance | c) Pollution qualifier |
|---|---|---|
| A08: Fertilisation | H | |
| H01: Pollution to surface waters (limnic & terrestrial, marine & brackish) | H | |
| A04: grazing | M | |
| B02: Forest and Plantation management & use | M | |
| E03: Discharges | M | |
| J02: human induced changes in hydraulic conditions | M | |
| D01: Roads, paths and railroads | L | |
| G01: Outdoor sports and leisure activities, recreational activities | L | |
| K03: Interspecific faunal relations | L | |
| | | |

Excessive siltation that clogs interstitial gavels is universally acknowledged as the main pressure faced by pearl mussel populations as this prevents juvenile mussels from developing successfully (Young 2005). The main sources of silt are thought to be agricultural run-off, forestry activities, road-run-off, and bank erosion by grazing stock. Interstitial gravels are also choked as a result of eutrophication from agricultural inputs, sewage discharge and farmyard run-off. In the past sheep-dip may have been a significant pressure but this should have effectively ceased now.

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| River regulation affects several Welsh pearl mussel rivers and spate discharges on the Tryweryn, in particular, are thought to damage pearl mussel beds. Canoeing is a localised problem with (at present) minor impact | |
| **2.6.1 Method used – Pressures** | **mainly based on expert judgement and other data**<br>Little direct evidence is available for the source of pressures on Welsh pearl mussel populations. Knowledge of catchment land use is usually taken as an indication of the type of activities that are likely to be contributing to poor water quality. Catchments for rivers that have historically supported pearl mussels in Wales amount to 575511 hectares, of which 345973 ha (or 60.1%) is classed as 'intensive'. Studies in Ireland (Moorkens 2006) suggest that catchments with more than 15% intensive land use are unlikely to support healthy pearl mussel populations. Of the rivers still supporting populations, 45.6% (75242ha) of their 159231ha catchments are under intensive land use. Only two Welsh pearl mussel rivers lie in catchments with less than 20% intensive land use (Fowles 2012, unpublished).<br><br>The distribution and abundance of salmonid fish stocks as host for pearl mussel glochidia is also a concern. Most rivers probably have sufficient juvenile fish to support pearl mussel populations but it may not always be the case that the fish are in the right place in the river at the right time due to changes in riverbed substrate.<br><br>Holman et al (2033) have undertaken a Risk Assessment of the Afon Eden catchment and report a similar list of pressures as that included here. |

**2.7 Threats**

| a) Threat | b) Ranking<br>H = high importance<br>M = medium importance<br>L = low importance | c) Pollution qualifier |
|---|---|---|
| A08: Fertilisation | H | |
| H01: Pollution to surface waters (limnic & terrestrial, marine & brackish) | H | |
| A04: grazing | M | |
| E03: Discharges | M | |
| J02: human induced changes in hydraulic conditions | M | |
| M02: Changes in biotic conditions | M | |
| B02: Forest and Plantation management & use | L | |
| D01: Roads, paths and railroads | L | |

| | | |
|---|---|---|
| K03: Interspecific faunal relations | L | |
| | | |

| |
|---|
| Measures are in place to address many of the pressures currently faced by pearl mussels in Wales, but improving water quality in main rivers is a long-term task. It is likely that many of the pressures will continue to impinge on water quality in the years ahead, although the impact should be lessened by agri-environment schemes, better liaison with the forestry industry, improvements to waste water discharge, and fencing of riverbanks to exclude grazing stock. Whilst this gives hope for the future, climate change may detrimentally affect habitat quality in the long term. Any increase in water temperature could affect spatting and a rise in the incidence of summer spates will probably lead to increased instability of the riverbed. |

| **2.7.1 Method used – Threats** | **expert opinion** |
|---|---|
| | |

| **2.8 Complementary information** | |
|---|---|
| **2.8.1 Justification of % thresholds for trends** | |
| | |
| **2.8.2 Other relevant information** | |
| | |
| **2.8.3 Trans-boundary assessment** | |
| | |

| **2.9 Conclusions *(assessment of conservation status at end of reporting period)*** |
|---|
| Please refer to the United Kingdom assessment for this species. |

## 3 Natura 2000 coverage & conservation measures - Annex II species
***(only applies to species listed under Annex II of the Directive)***

| **3.1 Population** | | |
|---|---|---|
| **3.1.1 Population size**<br><br>Estimation of population size included <u>in the SAC network</u> | **a) Unit** | **number of localities** |
| | The population unit used here is 'functional populations' (evidence of recent juvenile recruitment) in line with the unit used in section 2.4. | |
| | **b) Minimum** | **1** |
| | | |
| | **c) Maximum** | **1** |
| | | |

| | |
|---|---|
| **3.1.2 Method used** | **Complete survey/Complete survey or a statistically robust estimate** |
| | |
| **3.1.3 Trend of population size within the network** (short-term trend) | **stable** |
| | On the basis of the population unit (functional populations) the single SAC population on the Afon Eden is classed as stable as small numbers of juveniles continue to be found (Garrett & Thomas 2012). This is somewhat misleading, however, as pearl mussels are probably declining in every Welsh river as the mature cohort dies off. On the Afon Eden, pearl mussel numbers in the monitored transects have declined by 24% in eight years, from 237 mussels to 181. This pattern is likely to be mirrored in other Welsh pearl mussel rivers. |

**3.2 Conservation measures**

Conservation measures taken (i.e. already being implemented) within the reporting period and provided information about their importance, location and evaluation.

| 3.2.1 Measure | 3.2.2 Type | | | | | 3.2.3 Ranking<br>H = high importance<br>M = medium importance<br>L = low importance | 3.2.4 Location<br>where the measure is PRIMARILY applied | | | 3.2.5 Broad evaluation of the measure | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a) Legal/statutory | b) Administrative | c) Contractual | d) Recurrent | e) One-off | | a) Inside | b) Outside | c) Both inside & outside | a) Maintain | b) Enhance | c) Long term | d) No effect | e) Unknown | f) Not evaluated |
| 2.0: Other agriculture-related measures | | | | Y | | H | | | Y | | Y | | | | |
| 3.2: Adapt forest management | | | | Y | | M | | | Y | | Y | | | | |
| 4.1: Restoring/improving water quality | | | | Y | | H | | | Y | | Y | | | | |
| 6.1: Establish protected areas/sites | Y | | | | | M | | | Y | | Y | | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.4: Specific single species or species group management measures | | | | | Y | M | | | Y | | Y | | | | |
| 8.1: Urban and industrial waste management | | | | Y | | M | | | Y | | Y | | | | |

A suite of measures has been employed to improve catchment management for those rivers still supporting pearl mussel populations. Most of the effort has been focussed in north-west Wales where the Environment Agency, Countryside Council for Wales and Snowdonia National Park Authority have collaborated to tackle out-dated farming practices, fence stock out from river banks, regulate sewage discharge, and advise on forestry management. One river with juvenile recruitment has been notified as a Site of Special Scientific Interest and the Environment Agency has restored part of the river channel here following a catastrophic dredging operation by landowners.

A captive breeding exercise has been operative throughout the reporting period (McIvor 2008, Taylor 2007) but despite initial successes it has proven difficult to maintain juveniles long-term due to water quality issues. This is now being scaled back in line with a national prioritisation exercise (Fowles et al 2010) and in the future efforts will be concentrated on short-term encystment and release of host fish