



**Cyfoeth  
Naturiol**  
Cymru  
**Natural  
Resources**  
Wales

# Garndolbenmaen Weir Freshwater Pearl Mussel Survey

Kate Williamson  
Cambrian Ecology Ltd

Report No 174

## About Natural Resources Wales

Natural Resources Wales is the organisation responsible for the work carried out by the three former organisations, the Countryside Council for Wales, Environment Agency Wales and Forestry Commission Wales. It is also responsible for some functions previously undertaken by Welsh Government.

Our purpose is to ensure that the natural resources of Wales are sustainably maintained, used and enhanced, now and in the future.

We work for the communities of Wales to protect people and their homes as much as possible from environmental incidents like flooding and pollution. We provide opportunities for people to learn, use and benefit from Wales' natural resources.

We work to support Wales' economy by enabling the sustainable use of natural resources to support jobs and enterprise. We help businesses and developers to understand and consider environmental limits when they make important decisions.

We work to maintain and improve the quality of the environment for everyone and we work towards making the environment and our natural resources more resilient to climate change and other pressures.

## Evidence at Natural Resources Wales

Natural Resources Wales is an evidence based organisation. We seek to ensure that our strategy, decisions, operations and advice to Welsh Government and others are underpinned by sound and quality-assured evidence. We recognise that it is critically important to have a good understanding of our changing environment.

We will realise this vision by:

- Maintaining and developing the technical specialist skills of our staff;
- Securing our data and information;
- Having a well resourced proactive programme of evidence work;
- Continuing to review and add to our evidence to ensure it is fit for the challenges facing us; and
- Communicating our evidence in an open and transparent way.

This Evidence Report series serves as a record of work carried out or commissioned by Natural Resources Wales. It also helps us to share and promote use of our evidence by others and develop future collaborations. However, the views and recommendations presented in this report are not necessarily those of NRW and should, therefore, not be attributed to NRW.

Report series: NRW Evidence Report  
Report number: 174  
Publication date: October 2016  
Contract number: CT0239  
Contractor: Black & Veatch  
Contract Manager: Andrew Basford  
Title: Garndolbenmaen Weir Freshwater Pearl Mussel Survey  
Author(s): **Williamson, K** (Cambrian Ecology Ltd)  
Technical Editor: Nicole Price (Black & Veatch)  
Peer Reviewer(s): Tristan Hatton-Ellis  
Restrictions: None

#### **Distribution List (core)**

NRW Library, Bangor	2
National Library of Wales	1
British Library	1
Welsh Government Library	1
Scottish Natural Heritage Library	1
Natural England Library (Electronic Only)	1

#### **Distribution List (others)**

Not Applicable

#### **Recommended citation for this volume:**

Williamson, K (2016) Garndolbemaen Weir Freshwater Pearl Mussel Survey. NRW Evidence Report No: 174, pp 30, Natural Resources Wales, Bangor.

## Contents

Crynodeb Gweithredol / Executive Summary .....	1
1. Introduction.....	4
1.1. Background information .....	4
2. Methodology.....	6
2.1. Site extent.....	6
2.2. Licensing and access permission .....	6
2.3. Health and safety .....	6
2.4. Survey method.....	7
3. Survey Results .....	9
3.1. Survey section 1 (downstream of weir).....	9
3.2. Survey section 2 .....	10
3.3. Survey section 3 .....	11
3.4. Survey section 4 .....	14
4. Results .....	17
5. Survey Limitations .....	18
6. Survey Conclusions.....	19
7. Ecological Impacts .....	20
7.1. Status of Species .....	20
7.2. Impact Assessment from potential works at Garndolbenmaen Weir.....	20
7.2.1. Short term: disturbance .....	20
7.2.2. Long term: habitat loss or destruction .....	20
7.2.3. Predicted scale of impact .....	20
7.2.4. Favourable Conservation Status (FCS) and Continued Ecological Functionality (CEF).....	20
8. Mitigation and Recommendations .....	21
9. Legal Implications.....	22
10. References .....	23

## List of Figures

- Figure 1 – Survey area and Sub-Reaches
- Figure 2 – Section 1 Target Note Location Plan
- Figure 3 – Section 2 Target Note Location Plan
- Figure 4 – Section 3 Target Note Location Plan
- Figure 5 – Section 4 Target Note Location Plan

## Crynodeb Gweithredol / Executive Summary

Rhestrir y fisglen berlog dŵr croyw fel rhywogaeth 'dan fygythiad' gan yr IUCN a chaiff ei chynnwys ar eu Rhestr Goch ar gyfer creaduriaid di-asgwrn-cefn. <sup>1</sup> Mae'r poblogaethau wedi gostwng yn sylweddol ar draws eu cynefinoedd, sy'n ymestyn dros y rhan fwyaf o hemisffer y Gogledd. O'r herwydd, caiff y rhywogaeth ei gwarchod yn llym dan ddeddfwriaeth y DU ac Ewrop. Yng Ngogledd Cymru, gellir dod o hyd i fisglod perlog dŵr croyw mewn nifer fechan o ddalgylchoedd, gan gynnwys Glaslyn, Conwy a Dwyfor.

Caiff Cored Garndolbenmaen ar Afon Dwyfor ei defnyddio gan CNC i fesur y llyf. Efallai y bydd angen atgyweirio'r gored yn y dyfodol er mwyn cynnal y safle fel rhan o'r rhwydwaith mesur.

Gan fod y fisglen berlog dŵr croyw yn rhywogaeth a warchodir gan Ewrop a chan y gwyddom ei bod yn bresennol yn nalgylch Dwyfor. Mae angen cynnal arolwg er mwyn sicrhau na fydd unrhyw waith o'r fath yn torri deddfwriaethau bywyd gwyllt.

Mae cofnodion a geir eisoes o'r fisglen berlog dŵr croyw yn yr ardal wedi'u hadolygu. Cynhaliwyd chwiliad data gan y ganolfan gofnodion leol, Cofnod. Bu'r canlyniadau'n negyddol.

Darparwyd gwybodaeth trwy ymgynghori gyda staff CNC o ran oddeutu chwech o unigolion a gofnodwyd mewn arolwg yn 2008. Oherwydd y posibilrwydd fod misglod nas darganfuwyd o'r blaen yn bresennol, cynhaliwyd arolwg maes ym mis Awst 2016. Roedd y fethodoleg a ddefnyddiwyd yn seiliedig ar ddull safonol lle yr aeth yr arolygwyr ati i rydio ar draws gwely'r afon er mwyn chwilio am fisglod gydag offer 'bathyscope'.

Ni chofnodwyd misglod perlog dŵr croyw yn ystod yr arolwg, gan gynnwys yr ardal a nodwyd fel bod â chwech o unigolion yn 2008. Ystyrir bod llawer o'r cynefin yn addas i bresenoldeb misglod perlog dŵr croyw, er nad yn ddelfrydol.

Ar sail canlyniadau'r arolwg, ar y cyd ag asesiad o'r cynefin, deuir i'r casgliad fod gan yr ardal weithio bosibl o amgylch Cored Garndolbenmaen y potensial i gynnal misglod perlog dŵr croyw. Fodd bynnag, gan na chofnodwyd unrhyw unigolyn, ni fydd angen trwydded ddatblygu. Ystyrir ei bod yn annhebygol iawn y bydd unrhyw waith arfaethedig yn effeithio ar fisglod perlog dŵr croyw os caiff yr argymhellion canlynol eu rhoi ar waith:

- Yn ystod pob cam o'r gwaith, dylid dilyn arferion gweithio da yn unol â PPG5 er mwyn lleihau'r perygl y bydd deunyddiau peryglus yn mynd i'r cwrs dŵr yn uniongyrchol neu ar ffurf dŵr ffo.
- Ni ddylai'r gwaith darfu'n ormodol ar wely'r afon nac arwain at siltio.
- Pe bai is-haenau'n cael eu symud, rhaid i'r ardal benodol honno gael ei harchwilio'n syth gan arolygwr misglod perlog dŵr croyw, er mwyn sicrhau nad oes unrhyw fisglod i'w cael yno.

- Pe bai misglod perlog dŵr croyw'n cael eu darganfod yn ystod y gwaith – rhywbeth sy'n annhebygol o ddigwydd – fe fydd yn rhaid dirwyn y gwaith i ben a dylid rhoi gwybod i CNC. Efallai y byddai angen trwydded wedyn.

Os dilynir y camau hyn, dylid sicrhau na fydd yna unrhyw effaith ddrwg ar gynefin posibl y fisglen berlog dŵr croyw a dylid sicrhau bod y swyddogaethau ecolegol yn cael eu cynnal.

## Executive Summary

Freshwater pearl mussel is listed as 'vulnerable' by the IUCN and included on its Invertebrate Red List<sup>1</sup>. Populations have crashed across its range, which covers most of the Northern hemisphere. Consequently, the species is now strictly protected under both UK and European legislation. Within North Wales, freshwater pearl mussels are found in a small number of catchments, including the Glaslyn, Conwy and Dwyfor.

Garndolbenmaen Weir on the Afon Dwyfor is used by NRW for flow gauging. Future repairs to the weir may be required to maintain the site as part of its gauging network. As FWPM are a European protected species and known to have been present within the Dwyfor catchment, a survey is necessary to ensure any such works do not breach wildlife legislation.

Existing records of pearl mussel within the area were reviewed. A data search was conducted by the local records centre; Cofnod. This search gave a negative return. Consultation with NRW staff provided information with regard to approximately six individuals recorded within the survey area in 2008. Due to the possibility that previously undiscovered mussels were present, a field survey was also carried out in August 2016. The survey methodology used was based on a standard approach in which surveyors wade across the river bed searching for mussels with bathyscopes.

No live freshwater pearl mussels were recorded during the survey, including the area identified as having six individuals present in 2008. Much of the habitat, although not optimal, is considered suitable for FWPM to be present.

It is concluded from the results of this survey, combined with an assessment of the habitat, that the potential working area around Garndolbenmaen Weir has the potential to support FWPM. However, as no individuals were recorded, a development license will not be required. It is considered highly unlikely that any proposed works will impact on FWPM if the following recommendations are adopted:

- During all phases of work, good working practices in accordance with PPG5 should be followed to minimise the risk of hazardous material entering the watercourse directly or as runoff.
- Works must not excessively disturb the riverbed or cause siltation.
- In the event of removal of substrate, an inspection of that specific area must be undertaken immediately before the works by a trained FWPM surveyor, to ensure that no mussels are present.
- In the unlikely event of FWPMs being discovered during the works, all work will stop and NRW will be informed. A license may be required at this stage.

If these measures are followed, it should ensure that there is no adverse impact on the potential FWPM habitat and continuity of ecological functionality is maintained.

---

<sup>1</sup> [http://ec.europa.eu/environment/nature/conservation/species/redlist/downloads/European\\_molluscs.pdf](http://ec.europa.eu/environment/nature/conservation/species/redlist/downloads/European_molluscs.pdf)



## 1. Introduction

Cambrian Ecology Ltd was commissioned by Black & Veatch Ltd to carry out a freshwater pearl mussel (FWPM) (*Margaritifera margaritifera*) survey on a stretch of the Afon Dwyfor near Garndolbenmaen Weir.

Freshwater pearl mussel is listed as 'vulnerable' by the IUCN and included on its Invertebrate Red List. Populations have crashed across its range, which covers most of the Northern hemisphere. The species naturally occurs in vast numbers, but examples of populations that continue to show active recruitment are now thought to be restricted to fewer than 50 rivers (Young et al, 2000).

Consequently, the species is now strictly protected under Schedule 5 of the Wildlife and Countryside Act (1981), Wildlife (Northern Ireland) Order (1985), annexes II and V of the EU Habitats and Species Directive and Appendix III of the Bern Convention.

Within North Wales, freshwater pearl mussels are found in a small number of catchments, including the Glaslyn, Conwy and Dwyfor. All of the current sites consist of relatively few remnant individuals, and the only population considered to be still actively recruiting is within the Afon Eden – Cors Goch Trawsfynydd Special Area of Conservation. The population within the Dwyfor catchment have not been recorded as recruiting for at least 20 years, and this was at the top of the catchment in Afon Ddu.

Presently, Garndolbenmaen Weir (SH 44) is used by NRW for flow gauging. NRW have concerns regarding the quality of data recorded at the site along with the overall condition of weir and are therefore considering future repairs to the weir to maintain the site as part of its gauging network. A geomorphological survey is also being undertaken to evaluate the riverbed along a stretch from SH 51119 43011 (downstream extent) to SH 49490 42422 (upstream extent) with regard to movement of the substrate and potential for future sediment management activities. As FWPM are a European protected species and known to have been present within the Dwyfor catchment, a survey is necessary to ensure any such works do not breach wildlife legislation.

### 1.1. Background information

A data search was conducted by the local records centre (Cofnod) for the species within the survey area. This search gave a negative return.

A suite of surveys of rivers in North Wales for FWPM were conducted in 2007 and 2008, including the Afon Dwyfor catchment. There is a known population of FWPM within the Afon Ddu at the top end of the catchment (approximately 5km upstream of the study site), which was discovered in 1996 following some unconsented drainage works by a local farmer. Unpublished results from surveys undertaken in 2007-08 found 160 mussels on the Afon Dwyfach, 30 individuals recorded in a different area during 2008, and 12 from the Afon Dwyfor. These populations are all considered to be in serious decline, and consultation with various FWPM surveyors suggests there is no indication of any recruitment since the Afon Ddu population crash in 1996.

Consultation with NRW staff, Dave Thorpe and Walter Hanks, provided information with regard to approximately six individuals recorded under the eroded root of an old sycamore tree within SH 54 from the 2008 surveys. These were not formally recorded but are identified in individual surveyor's notes.

## 2. Methodology

Objectives of the FWPM survey at Garndolbenmaen were:

- To identify any FWPMs present within the survey area;
- Assess the potential of the in-river habitat to support the species;
- Identify any inaccessible survey areas;
- Assess the levels of potential disturbance and loss of habitat due to the proposed movement of substrate and repair works;
- Recommend mitigation and compensation measures to ensure the continued ecological functionality of the site for FWPM;
- Note any other protected or non-native, invasive species issues associated with the site.

The survey methodology used was based on a standard species survey methodology published by Scottish Natural Heritage (SNH, undated<sup>2</sup>), as requested by NRW. The site surveys were undertaken on 15<sup>th</sup> and 17<sup>th</sup> August 2016, during periods of fine weather and relatively low flow.

A geomorphological survey was carried out at the same time by Black & Veatch Ltd, therefore this report purely describes the habitat in relation to its suitability for FWPMs.

### 2.1. Site extent

The survey area was a stretch of the Afon Dwyfor approximately 2.5km long, as required by NRW (refer to Figure 1). This was significantly more than the 0.1km upstream and 0.5km downstream of the weir which would have been in accordance with the SNH guidance. The study reach was split into four sections, described in Section 3.

### 2.2. Licensing and access permission

The survey was carried out by licensed FWPM worker Kate Williamson, (65800:OTH:SA:2015) and three assistants; Chris Hall, Lucia Ruffino and Rebecca Clews-Roberts, all of whom are accredited agents on the above license. Access permissions were provided by NRW.

### 2.3. Health and safety

A desk top risk assessment was carried out by Cambrian Ecology Ltd CEL, based on knowledge of the area and notes from site visits conducted by Black & Veatch staff. A 'Reasonable Avoidance Method Statement' was also produced. Both these documents were provided to the contract manager at Black & Veatch prior to site surveys being undertaken.

The survey team comprised three people on each day; two surveyors in the river at any one time and one on the bank. A throw rope was carried, along with mobile phone. Spare clothes were available. Surveyors remained within sight of

---

<sup>2</sup> <http://www.snh.gov.uk/docs/A372955.pdf>

each other at all times. No areas of riverbed with a depth greater than waist height were accessed.

Most of the survey length was accessible to surveyors for at least a part of its width, but much of the length was inaccessible in the deepest part of the channel. This deeper channel tended to move from one side of the river to the other along the route. It was possible to sample almost the entire length of the river. The deeper areas often had slower flow and less suitable substrate for FWPMs.

#### 2.4. Survey method

The entire accessible riverbed was searched for FWPM individuals using bathyscopes. This search was conducted under favourable conditions of bright light, clear water and low flow. Surveyors waded in all areas sufficiently shallow for safe wading in an upstream direction, checking all potentially suitable substrate.

Although the SNH guidance discusses 'favourable sites' for FWPM, the individuals in the remnant population within the Afon Dwyfor catchment have been recorded in a wide variety of situations, including in deep silt, under riverbanks and within open, mobile gravel beds. These would not be thought of as 'suitable' or 'favourable' sites for mussels, but within a severely depressed and vulnerable population they can be found in unfavourable conditions. Where this occurs, they are generally large, senescent individuals, which are relatively robust compared to the juveniles.

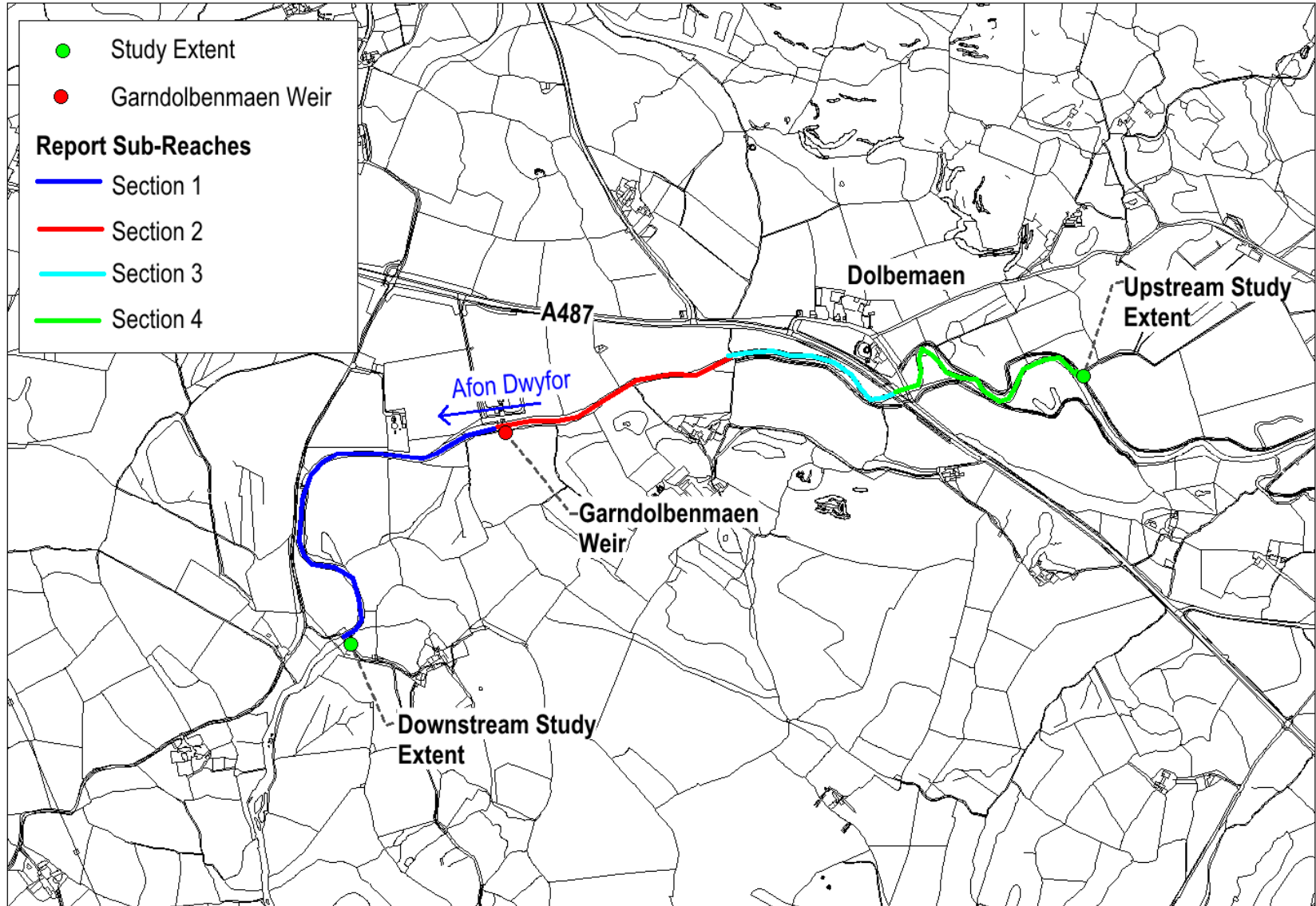
Any individuals noted as present would be mapped with a GPS reference. The SNH guidance outlines a 1m x 1m grid methodology, however, with the numbers potentially present within this catchment a full search of occasional individuals was adequate.

No searching or sieving of the substrate was undertaken for juvenile mussels. It was not considered that the presence of juveniles would make any difference to the mitigation recommendations and the risk of disturbance and damage to vulnerable juvenile mussels was regarded as greater than the benefits to be gained by this activity. The likelihood of juveniles being present was almost zero.

No more in depth survey methodology was necessary due to the lack of individuals recorded.

Downstream areas likely to be indirectly affected by the proposal were surveyed in the same manner as above.

Figure 1 – Survey area and Sub-Reaches



## 3. Survey Results

### 3.1. Survey section 1 (downstream of weir)

The extent of Section 1 is shown in Figure 2 followed by target notes and selected photographs.

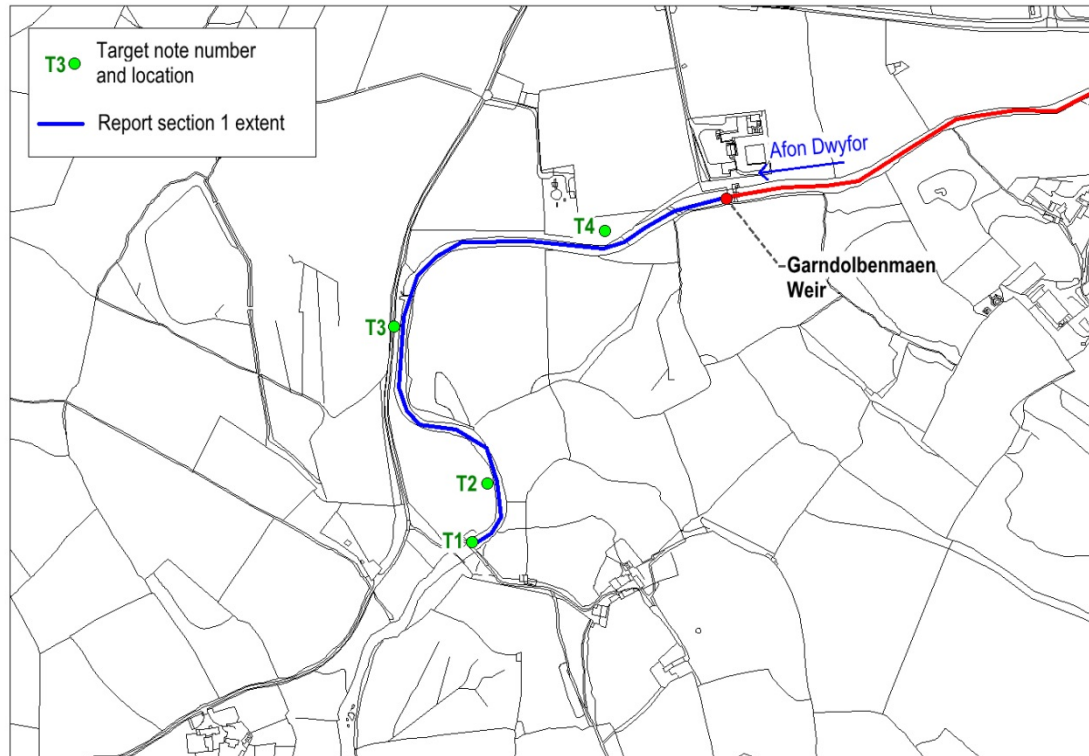


Figure 2 – Target Note Locations for Section 1

The substrate primarily comprised boulders and cobbles, with gravels in between, at the downstream end. There is very slow flow above a small weir, upstream of the footbridge (T1). Good habitat up to the ford (T2). Above the ford there are a series of riffles. There is a second footbridge (T3) approximately half way up this section. The stretch downstream of this second footbridge has a slow flow and an accumulation of weed vegetation. There are more riffles and some small dams between the footbridge and the weir, with areas of slower flow between them (T4).



*Photograph 1: Target Note Location T4*

### 3.2. Survey section 2

The extent of Section 2 is shown in Figure 3 followed by target notes and selected photographs.

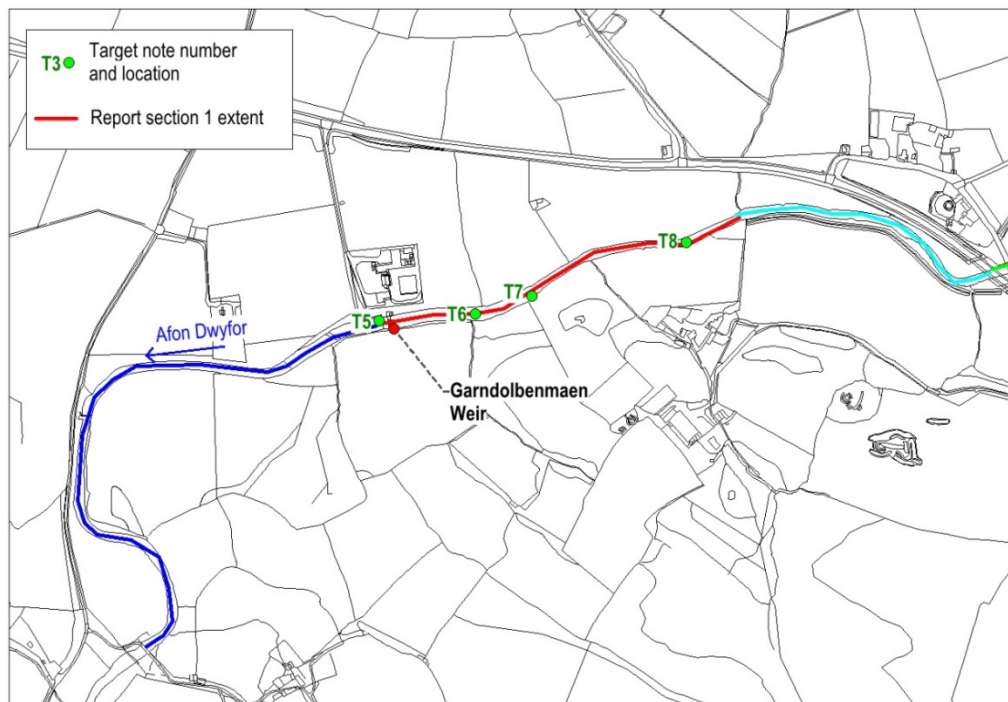


Figure 3 – Target Note Locations for Section 2

The area immediately downstream of the weir has large boulders and cobbles. Some areas are too deep for survey, but mainly the width of the river is accessible and the substrate shows some opportunity for mussels within patches of finer substrates (T5). However, it is likely that the substrate here is very mobile, which significantly impacts on the potential for mussels to remain embedded.

Immediately upstream of the weir the substrate has been modified with a concrete pad, totally unsuitable for mussels. Upstream of this (T6), the accumulation of weed vegetation is much higher, although the water is clear and the flow is relatively slow. Mature trees are present along the bank and the river is faster flowing, with weedy riffles (T7) and deeper water with fine sediments at the upstream extent of this section (T8).



*Photograph 2: Target Note Location T5*

### 3.3. Survey section 3

The extent of Section 3 is shown in Figure 4 followed by target notes and selected photographs.



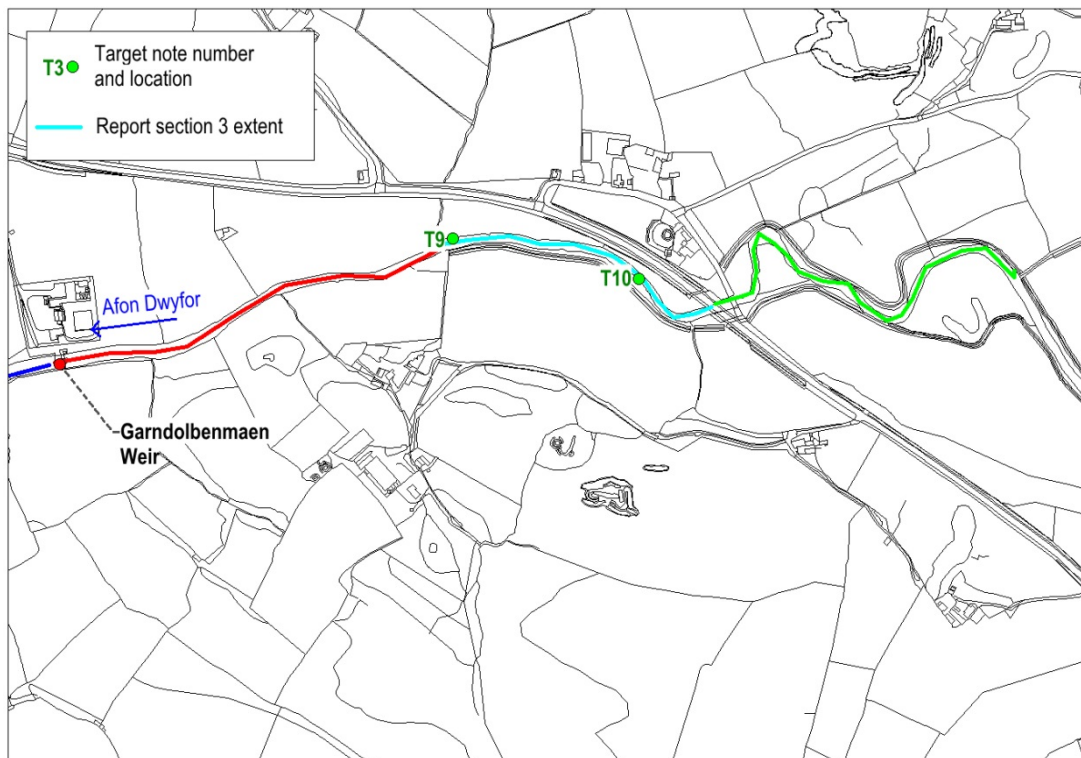


Figure 4 – Target Note Locations for Section 3

The majority of this stretch is considered less suitable for FWPMs due to the predominance of overhanging bankside trees and the size of the substrate. The trees lead to larger amounts of organic debris, such as leaf litter, in the water. Due to the slow flow in this section, over time this litter breaks down and fine silt builds up (T9). There are faster flowing areas and pockets of larger cobbles, which are more suitable (T10).



*Photograph 3: Target Note Location T9*



*Photograph 4: Target Note Location T10*

### 3.4. Survey section 4

The extent of Section 4 is shown in Figure 5 followed by target notes and selected photographs.

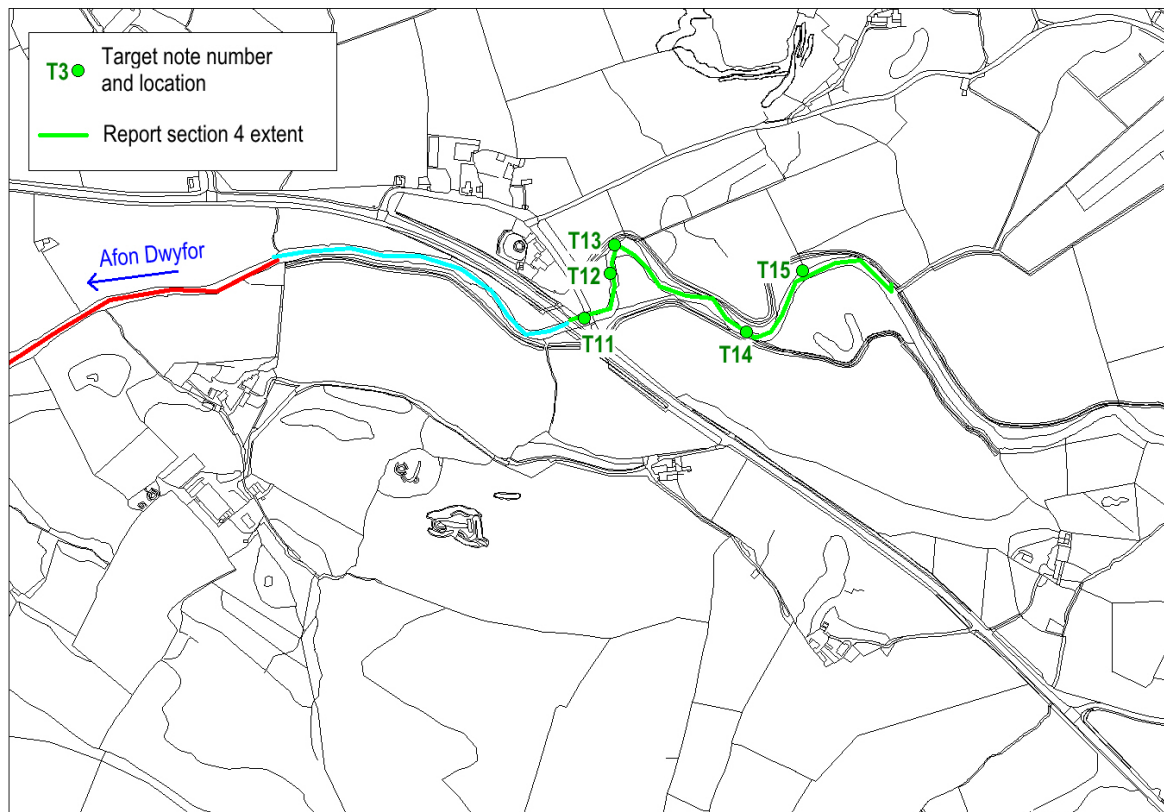


Figure 5 – Target Note Locations for Section 4

This section is where there were records of six individuals having been present in 2008. The majority of this stretch was sub-optimal for FWPMs. Bankside trees and relatively slow flow speeds give rise to sediment deposition and fine silt on the substrate, especially on inner bends (T12). Large accumulations of weed vegetation are developing in the channel and gravel beds appear to be relatively mobile (T13). Further upstream, these conditions are interspersed with strong mid-channel currents and rockier patches (T14), although the extensive weed beds prevail (T15).



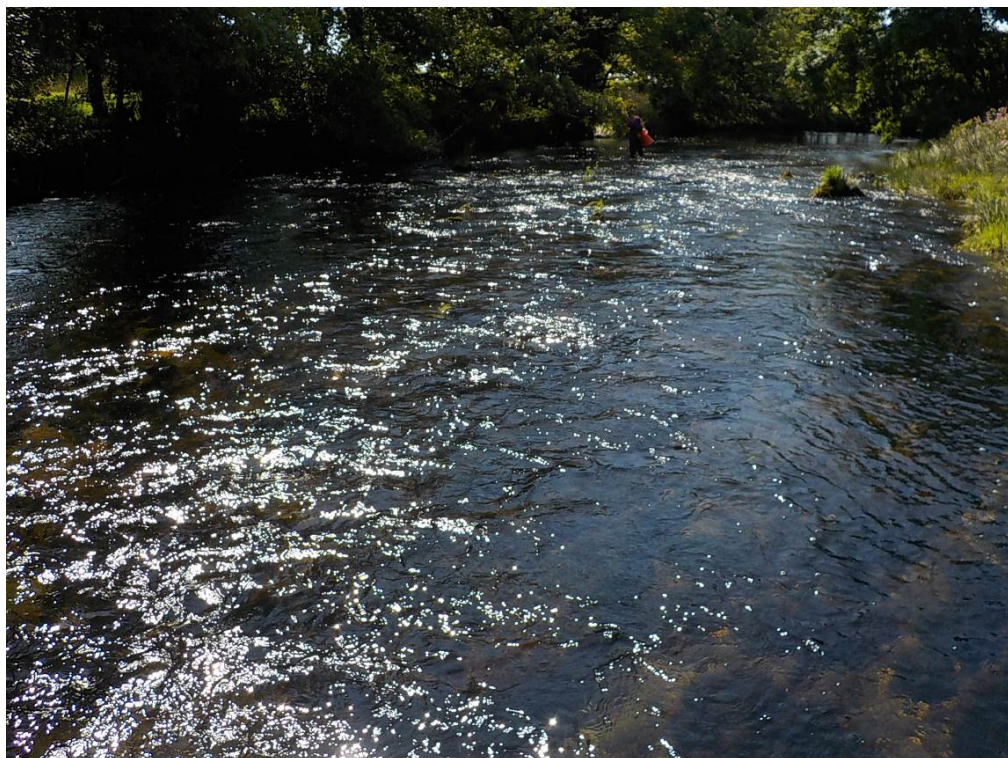
*Photograph 5: Target Note Location T11*



*Photograph 6: Target Note Location T12*



*Photograph 7: Target Note Location T13*



*Photograph 8: Target Note Location T14*

## 4. Results

No live freshwater pearl mussels or any dead specimens were recorded during the survey, including in the area previously identified as having six individuals present in 2008.

Much of the habitat is suitable for FWPM to be present, but there are areas of dense weed accumulation, silt deposition and wooded banks<sup>3</sup> that are sub-optimal. Mobile substrates such as those recorded in much of the river survey length are also less conducive to FWPM population stability, with individuals being periodically washed downstream.

---

<sup>3</sup> While wooded banks are not directly thought to conflict with ideal FWPM conditions, if extensive they can give rise to large amounts of leaf litter in the water, which can lead to high levels of organic matter in the water, especially in areas of very slow flow.

## 5. Survey Limitations

While the methodology used in this survey is recognised as the standard methodology to use when searching for the presence of FWPM in a river, it is not infallible. The species are very cryptic in certain riverbed habitats, and as such can be difficult to locate. Their colouration and shape resemble stones or pebbles. The substrate in Afon Dwyfor is variable, with areas of boulders and pebbles, where any mussels present could have been very well camouflaged. The methodology is also largely developed for use in more standard populations of FWPM, which should number in the thousands or tens of thousands. In Afon Dwyfor there are very small numbers of senescent individuals, often no longer found in 'populations' but as isolated individuals in sub-optimal habitats.

FWPMs bury themselves in the substrate of the river, leaving a section from a couple of millimetres to several centimetres exposed for filtration. In areas of heavy siltation or dense weed growth, they can be completely obscured for periods, making them impossible to record. Where possible, a fingertip search was undertaken in areas of dense weed but it is possible that individuals were not found.

Under conditions of extreme stress, FWPMs may expose themselves entirely on the surface of the substrate and using their muscle 'foot', move proactively over the surface. They can also be washed out of areas during times of spate conditions and thus 'move' to new areas downstream. In either of these ways they can be found in different areas to where they previously were located.

The fact that no mussels are found in an area during a survey does not necessarily mean that there will be no mussels present when it comes to undertaking the proposed works. It is possible that a very small number of individual mussels were present during the survey period but were not recorded, or that they have since 'moved' or been washed in to the area. This is considered highly unlikely, but nevertheless possible.

Although every effort has been made to survey the area thoroughly, there is the possibility that a handful of mussels are present but were undetected. The above caveats notwithstanding, there is good confidence that no substantial FWPM population exists in the surveyed section, and it most likely that no mussels at all are present.

## 6. Survey Conclusions

The substrate of the survey area is largely suitable for FWPMs, with a stony, cobbly substrate with finer gravels present for burying in. The water is clear and appears satisfactory for filtration, and there are previous records of pearl mussels in the area.

There are known populations of brown trout (*Salmo trutta*) and salmon (*Salmo salar*) within the catchment, which are hosts for the larval stage of the FWPM.

Areas of weed accumulation and fine silt may indicate periodic influxes of nutrients and run-off, both of which can be detrimental to the survival of juvenile mussels. The adults, once they attain a certain minimum size (approx. 10cm) rise to the surface of the substrate to filter feed. From this stage onwards they tend to be fairly robust. However they are likely to be prone to being washed out downstream during periods of particularly high flow rates and flooding.

It is concluded from the results of this survey, combined with an assessment of the habitat, that the potential working area around Garndolbenmaen Weir does have the potential to support FWPM. However, no live individuals were recorded during this survey and it is considered highly unlikely that the proposed works will impact on the population as a whole in the river. Any short-term disturbance during the actual works can be kept to a minimum by following best practice guidelines.



## 7. Ecological Impacts

### 7.1. Status of Species

FWPM are on the IUCN red list, category; endangered. In Wales, only the Afon Eden is thought to be functionally active, i.e. recruiting juveniles into the population. The population within the Dwyfor catchment have not been recorded as recruiting for at least 20 years, and this was at the top of the catchment in Afon Ddu.

### 7.2. Impact Assessment from potential works at Garndolbenmaen Weir

#### 7.2.1. Short term: disturbance

In the absence of mitigation, potential works may cause direct disturbance to individual mussels present within the working area. However, this survey was negative and it is considered highly unlikely that any mussels are present in this area.

#### 7.2.2. Long term: habitat loss or destruction

Any potential works to the weir are likely to involve a minimal footprint and no in-river habitat will be lost in the long term. It is essential to ensure passage for salmonids, which are the larval hosts for freshwater pearl mussels.

Potential works to reduce the risk of future scouring to the weir from mobile sediments run the risk of removing possible FWPM habitat within the river. However, these areas of mobile substrate are not generally favourable due to the potential for individuals to be periodically washed downstream. A proactive approach to replacing boulders and large woody debris within areas of the river not required to be clear for the weir may create more favourable conditions by creating sheltered patches of fine gravel sediments suitable for pearl mussels.

Prevention of run-off or increased siltation in the river during any future works is important to retain the suitability of remaining habitats for FWPMs. Excess silt in the water can inhibit mussel feeding by filtration.

#### 7.2.3. Predicted scale of impact

Due to the very low chance of any mussels being present within the survey area and the likely small scale of any proposed works, if all the measures identified within this report are adhered to there should be no negative impact on the species.

#### 7.2.4. Favourable Conservation Status (FCS) and Continued Ecological Functionality (CEF)

The species is currently not considered to have a favourable conservation status within this catchment. The ecological functionality of the site for FWPMs will remain largely unchanged post-works, as long as the measures below are adhered to.

## 8. Mitigation and Recommendations

Although a few pearl mussels were found in the river in 2008, no mussels were found in the current survey despite a careful search. As such, there is no need for a development license. However, as the species occurs elsewhere in the catchment and individuals could potentially be washed down or have been overlooked during the survey, the measures below must be strictly adhered to.

- During all phases of the work, good working practises in accordance with PPG5 should be followed to minimise the risk of hazardous material entering the watercourse directly or as runoff.
- No materials or refuelling plants are to be stored within 10m of the river.
- All fuel storage tanks should be bunded and spill kits available on site. Contractor staff must be trained in how to use the spill kits.
- Any water that comes into contact with wet concrete must be treated as contaminated and not discharged into the watercourse.
- No dewatering water shall be discharged into the watercourse without first receiving sufficient settlement to settle out solids.
- Any in-river works must not excessively disturb the riverbed or cause silting of the watercourse. All precautions must be taken to prevent sedimentation of the watercourse.
- In the event of any removal of bed substrate, an inspection of that specific area should be undertaken immediately before the works by a trained FWPM surveyor, to ensure that no mussels are present.
- In the unlikely event of any FWPMs being discovered during the works, all work will stop and NRW informed. It may be that a license will be required at this stage.

If these measures are followed, it should ensure that there is no impact on the potential FWPM habitat and a continuity of ecological functionality is maintained.

## 9. Legal Implications

Freshwater pearl mussels are protected under UK law by the Wildlife and Countryside Act 1981 (as amended) and also under European law by the Habitat and Species Regulations 2010. Under these laws it is an offence to deliberately kill or injure a FWPM, to disturb a FWPM or to damage/destroy its habitat. The habitat is protected under these laws whether the animals are present at the time of survey or not. NRW are empowered to issue licences to carry out work to these habitats for reasons of overriding public interest.

## 10. References

Cuttelod A, Seddon M and Neubert E (2011) European Red List of Non-marine Molluscs. Luxembourg, Publications Office of the European Union. [http://ec.europa.eu/environment/nature/conservation/species/redlist/downloads/European\\_molluscs.pdf](http://ec.europa.eu/environment/nature/conservation/species/redlist/downloads/European_molluscs.pdf)

Scottish Natural Heritage. *Freshwater Pearl Mussel Survey Protocol* (undated) available at: <http://www.snh.gov.uk/docs/A372955.pdf>

Skinner A, Young M & Hastie L (2003). *Ecology of the Freshwater Pearl Mussel*. Conserving Natura 2000 Rivers Ecology Series No. 2. English Nature, Peterborough.

Unpublished survey results from SNPA/EAW/CCW surveys (2007 & 2008) and personal consultation with surveyors.

Williamson CA 2000. Studies on the Distribution of *Margaritifera margaritifera* in Afon Ddu. Unpublished MSc thesis. University of Wales, Bangor.

Young et al 2001. The extent of, and causes for, the decline of a highly threatened naiad: *Margaritifera margaritifera*. *Ecological Studies*, vol. 145, pp337-357

Unpublished survey results from SNPA/EAW/CCW surveys 2007 & 2008

## Data Archive Appendix

No data outputs were produced as part of this project other than this report.



**Cyfoeth  
Naturiol**  
Cymru  
**Natural  
Resources**  
Wales

Published by:  
Natural Resources Wales  
Maes y Ffynnon  
Penrhosgarnedd  
Bangor  
Gwynedd LL15 2DW

0300 065 3000

© Natural Resources Wales 2016

All rights reserved. This document may be reproduced with prior permission of  
Natural Resources Wales

Further copies of this report are available from:

Email: [library@cyfoethnaturiolcymru.gov.uk](mailto:library@cyfoethnaturiolcymru.gov.uk)