



# The Freshwater Pearl Mussels of the River Moriston

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# Introduction

- Ecology
- Conservation Issues
- Pearls in Peril Project
- Artificial Bankside Encystment

**What they are and the lifecycle**

**What factors are influencing their decline**

**How we are trying to conserve and restore the species**

## Legislation

- It is a UKBAP Priority Species and is included on the Scottish Biodiversity List. It is listed on Annexes II and V of the EC Habitats Directive and is fully protected under the Wildlife and Countryside Act 1981, as amended.
- Freshwater pearl mussels are fully protected under law because they are so threatened. It is a crime to intentionally or recklessly kill, injure, take or disturb freshwater pearl mussel or to damage their habitat.

# Ecology



Distribution - Arctic and temperate regions of western Russia through Europe to the northeastern seaboard of North America.

UK Distribution - Formerly widespread and abundant in areas of England and Wales, recent surveys revealed most former populations to be virtually extinct, with very little active recruitment

Originally widely distributed throughout Scotland, a comprehensive survey from 1996 to 1999 revealed that the freshwater pearl mussel is now extinct in most of the lowlands, and scarce everywhere except for a handful of Highland rivers

**If the present rates of extinction continue, it has been estimated that surviving Scottish populations may only persist for a further 25 years.**

# The Hitch Hiker

## The **Amazing** Pearl Mussel's Life Cycle

2. In summer the females release millions of baby mussels (larvae)



3. Most larvae are swept away downstream but some are sucked into a young salmon or trout and they stick onto its gills

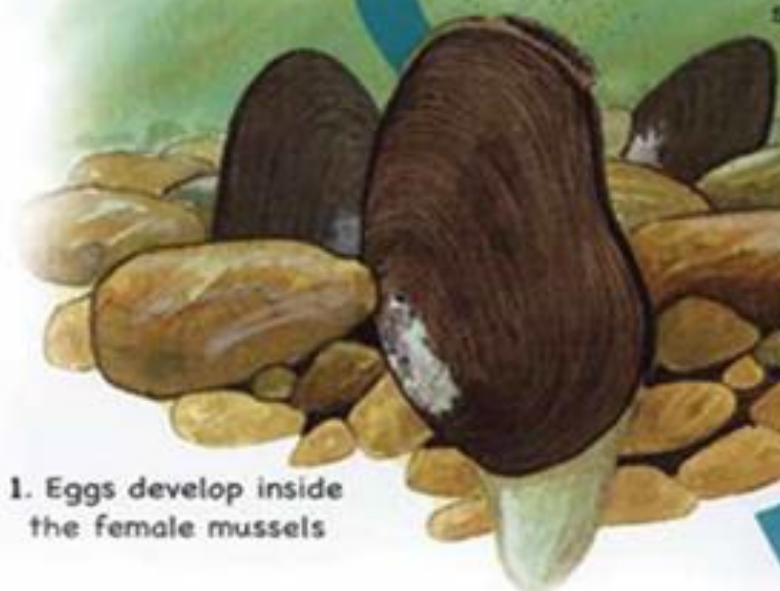


4. They hitch-hike upstream and drop off the gills

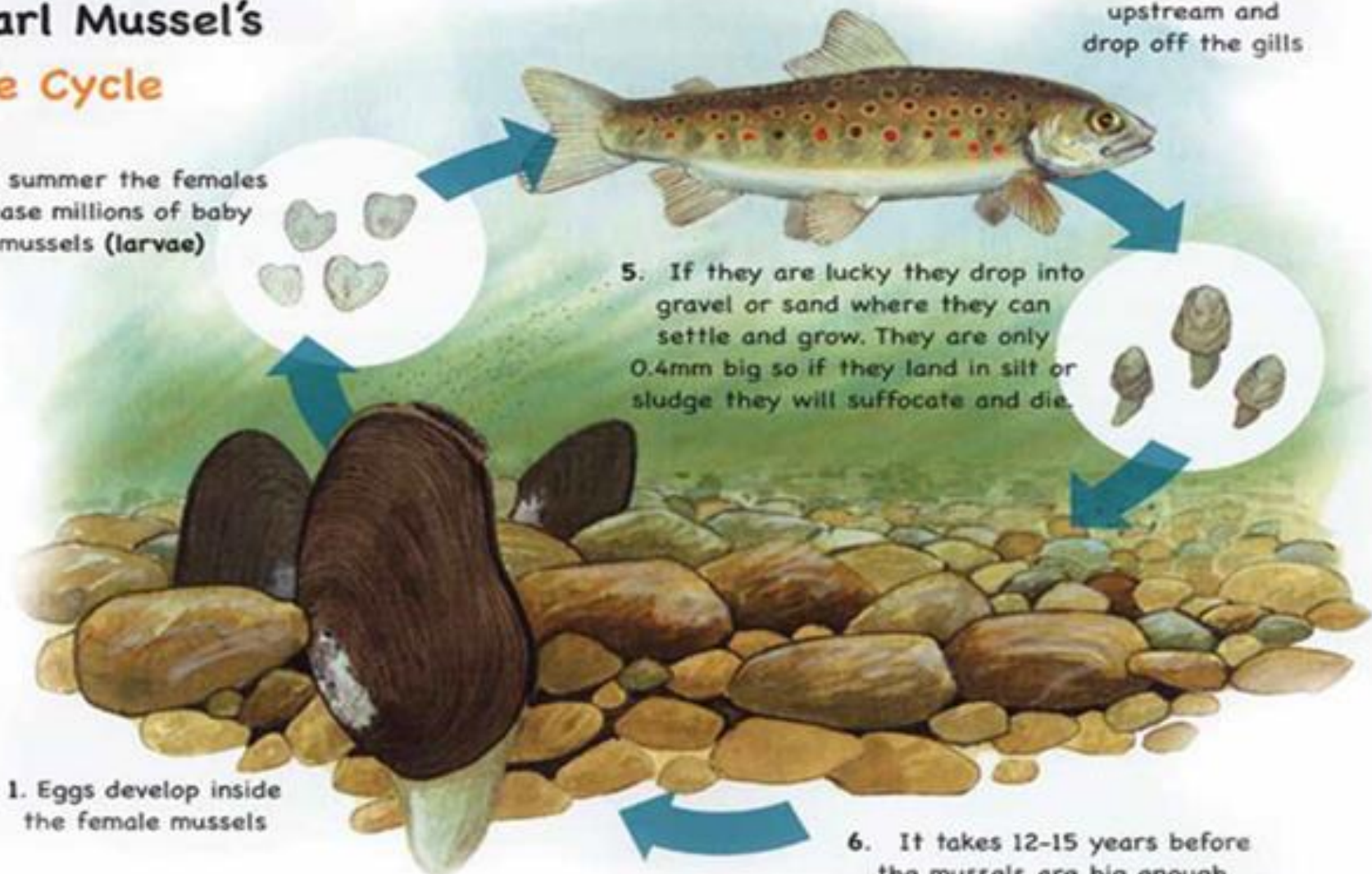


5. If they are lucky they drop into gravel or sand where they can settle and grow. They are only 0.4mm big so if they land in silt or sludge they will suffocate and die.

1. Eggs develop inside the female mussels

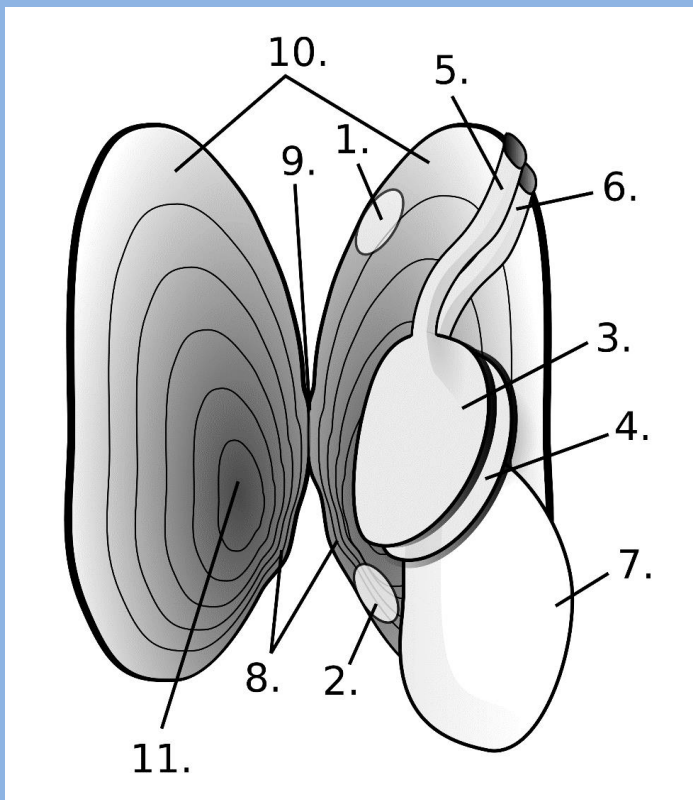


6. It takes 12-15 years before the mussels are big enough (6.5 cm) to make new eggs.



# So What are they?

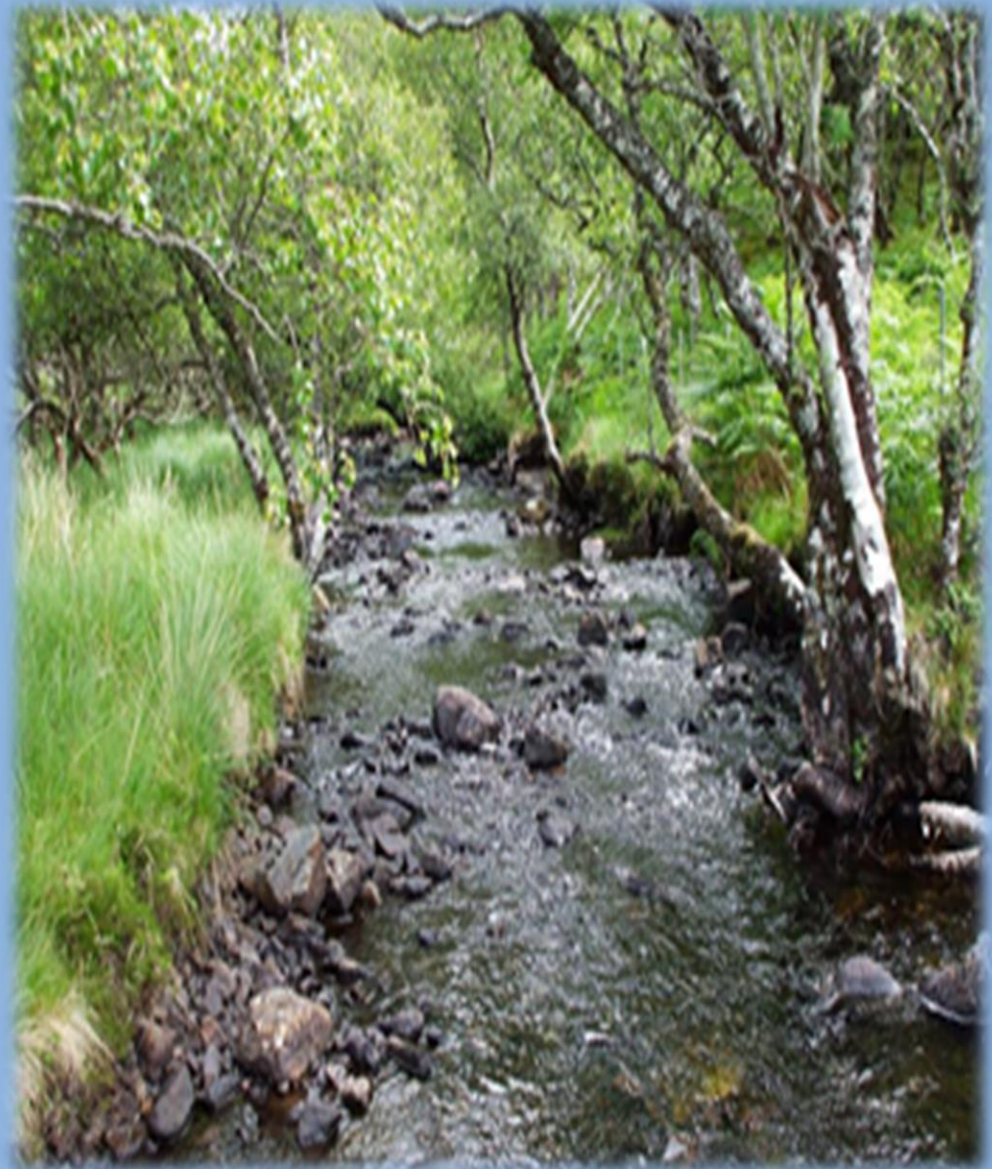
## Basic Anatomy



1. Posterior adductor muscle
2. Anterior adductor muscle
3. Frontal gill
4. Back gill
5. Exhalant aperture
6. Inhalant aperture
7. Foot
8. Pseudotooth
9. The hingeline and ligament
10. Mantle
11. The shell's thickest part, the umbo

# Habitat

- Coarse sand or fine gravel patches between boulders in fast flowing unpolluted rivers and streams
- Oligotrophic conditions – low in nutrients – low conductivity with a Ph of 7.5 or less.
- Inhale and exhale water via siphons to filter minute organic particles. Each mussel can filter 50 litres of water per day. Beneficial to other species.



# Conservation Issues

1. Pollution
2. River Engineering/Habitat Loss
3. Illegal Pearl Fishing
4. Decline in Host Species



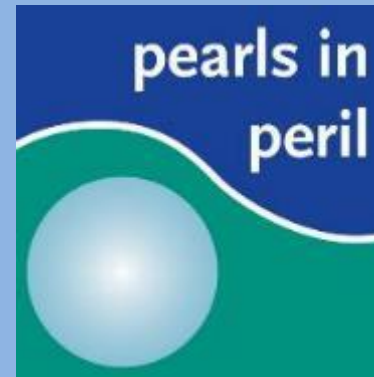
# Exploitation

- Caesar's biographer Suetonius claimed that his admiration for pearls was one of the reasons for invading in 55BC.
- In Scotland the earliest reference dates back to the 12<sup>th</sup> century where Alexander I was said to have the best pearl collection of any man.
- 14<sup>th</sup> Century poem entitled 'The Parl'
- 18<sup>th</sup> Century – The first references to the decline can be seen.
- Scottish Crown Jewels.
- 20<sup>th</sup> Century – Decline accelerated such that between 1970 and 1998 it was thought that pearl mussels became extinct in two rivers every year.
- Travelling families would walk the roads and fish for pearls.
- After the Tay pearl was found it created a 'mini goldrush'



# The Pearls in Peril LIFE+ Project

- Value - £3.5 million European Funding
- 48 project actions
- 21 Natura sites throughout UK
- 10 x co financiers and 5 Beneficiaries



# Project Aims

## RESTORE



Habitats for  
pearl mussels  
and  
salmonids

## SECURE



Safeguard  
vulnerable  
populations

## COMMUNICATE



Pearls in the  
classroom  
and project  
dissemination

# Shortlisted for RSPB Nature of Scotland Award

## SPECIES CHAMPIONS



### Shortlist for the RSPB Species Champion Category



Anne Youngman: A True Champion of Scottish Bats

Brian Etheridge's pioneering fieldwork has massively benefitted birds of prey

Fife and Angus Farmers, Land Managers and Estates for Corn Buntings

Pearls in Peril - River Moriston project

Trossachs Water Vole Re-introduction - Restoring ratty to the Trossachs

Sponsored by **THE ARDMORE**





# Introduction to the River Moriston

The River Moriston flows into the northern side of Loch Ness, the river and its main tributary, the river Loyne are regulated waters as part of a large scale SSE Hydro – electric scheme, with dams at Dundreggan, Cluanie and a fish pass at Ceannocroc.



# **Historical records dating back to 1921 show evidence of pearl mussels throughout the river.**

**1975 - Pearl Fisher Neil McCormick reported pearl mussels occurred from Invermoriston up to Loch Cluanie.**

**1997 - Scottish National Pearl Mussel survey,**

**2000 – Two live mussels and four empty shells were found in the upper river by SNH staff.**

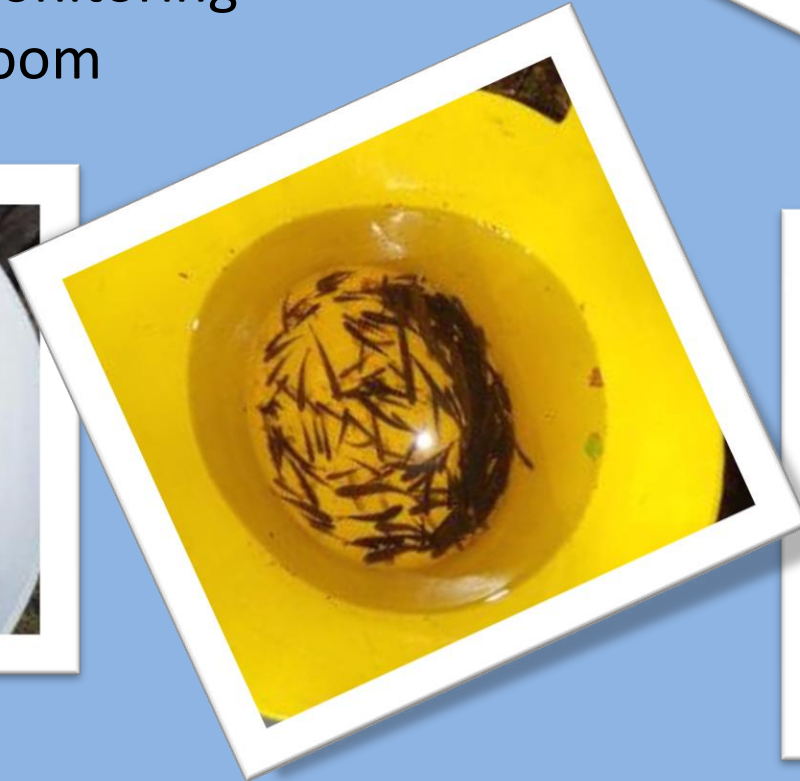
**2003 – SNH commissioned a full detailed survey of the whole River Moriston. Mussels were found patchily distributed between Loch Ness and cluanie. Despite losses to pearl fishing and hydro- electric operations, the Moriston contained a viable or functional population and was considered to be of key importance to the survival of the species.**

**2009 – Further surveys revealed that only a few mussels were present in the upper Moriston**

# Ness District Salmon Fishery Board

## What are we doing?

- Baseline encystment surveys
- Glochidial development monitoring
- Juvenile encystment
- Post Encystment monitoring
- Pearls in the classroom



# Baseline Encystment survey

## AIMS

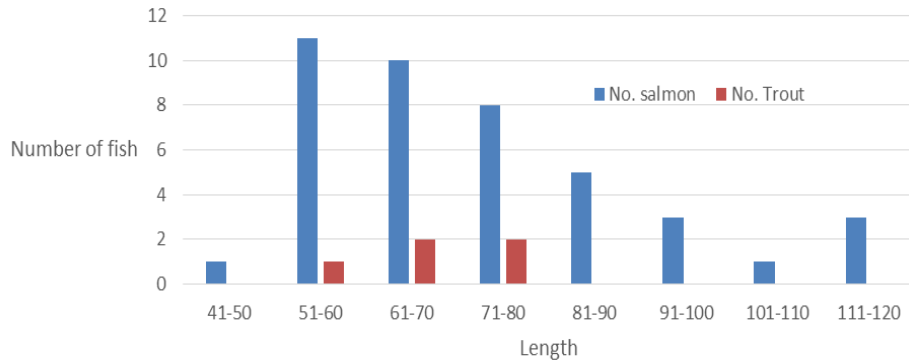
- To determine if recruitment/encystment was actually taking place
- To determine which species and what size/age fish were being encysted.

## Method

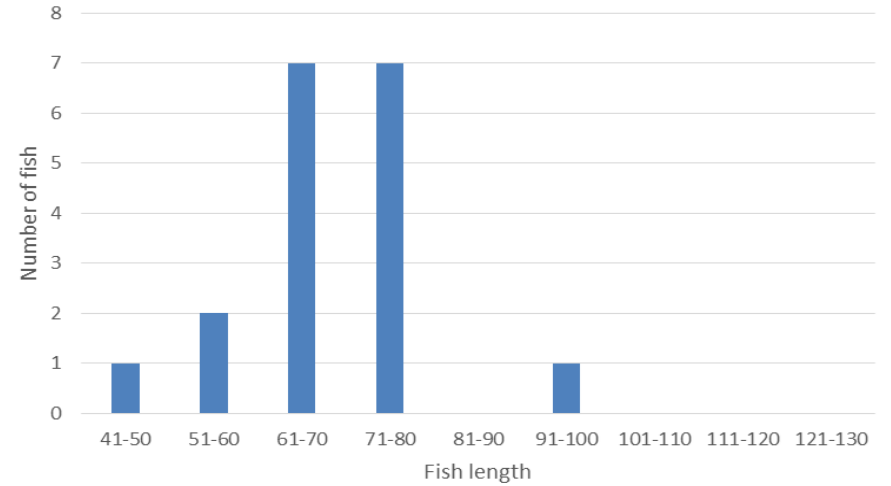
- Electrofishing at sites where both juveniles and mussels are found.
- All fish examined
- Species and Length and numbers of visible glochidia recorded.

# RESULTS

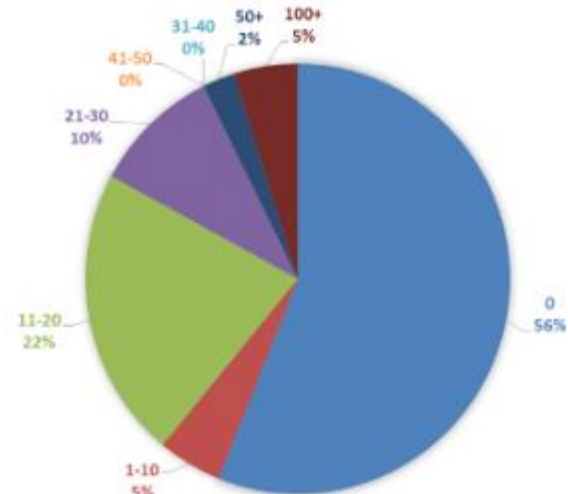
Length Frequency of Salmon and Trout



Number of encysted fish



PERCENTAGE OF ENCYSTED FISH AND NUMBERS OF GLOCHIDIA PRESENT



# Glochidial Development

## Aims

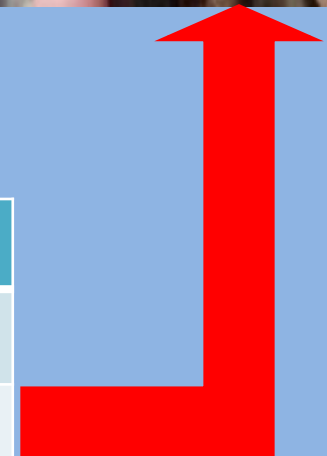
- To determine glochidial release or 'Spat' date
- Increase knowledge of larval development

## Methods

- Visual inspection of the gills
- Glochidia sample observed under x35 microscope



Condition	Description
Pre Gravid	Gills translucent, drab brown, with faint patches or streaks of pale brown/yellow (glochidia)
Gravid	Gills translucent, drab brown, but completely or partly full of pale brown/cream/yellow/golden coloured glochidia
Empty	Gills translucent, drab brown or grey-brown only
Spent	Gills shiny, dark green or green-brown gloss ( very distinct from normal colouration)



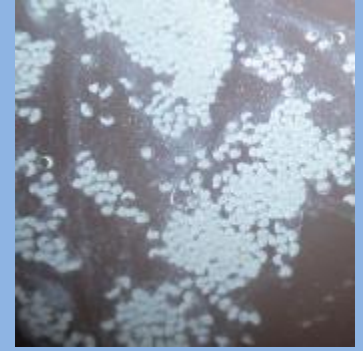
- a) Stage 1 (age 4 days)
- b) Stage 2 (age 16 days)
- c) Stage 3 (age 23 days)
- d) Stage 4 (age 28 days)
- e) Stage 5 (age 30 days)



Stage 1



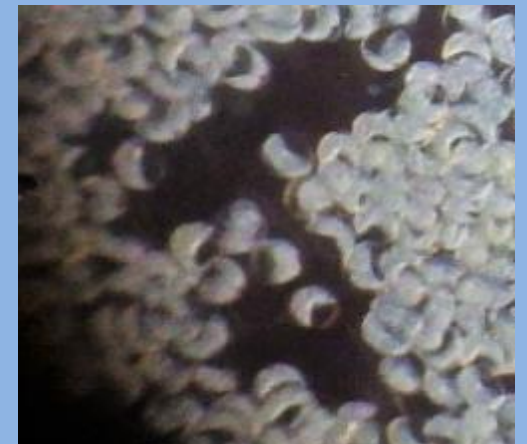
Stage 2



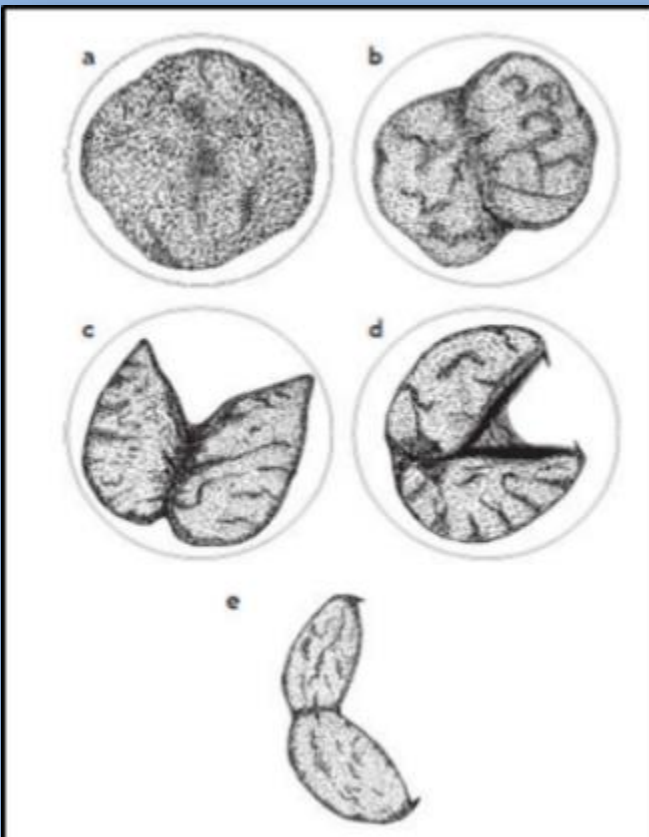
Stage 3



Stage 4



Stage 5



# Encystment

## Aim

- To restore the population in an area of low density

## Method

- Artificial Encystment.

1. Mussels induced to spat in bucket and returned
2. Glochidia transported to electrofishing site
3. Capture as many fish as possible – Salmon and Trout of all sizes.
4. Record fish species/length and retain in bucket with glochidia.
5. Return encysted fish
6. Monitor site/fish following Autumn and Spring.



# Post Encystment Monitoring

**Electro fish encystment sites**

**Record any encysted fish captured.**



## **2017 – Going Forward**

- **Donation received from Scottish Southern Energy – Blairidh Windfarm. Allowing us to continue into 2018.**
- **Encystment carried out on yearly basis with no further funding**
- **To date approximately 3000 juvenile salmonids encysted in the upper reaches of the Moriston**
- **Able to predict ‘Spatting’ dates through glochidia development monitoring**
- **Produced guidelines on Encystment for other organisations and held training events for other trusts.**
- **2022 – Pearl mussel surveys to be carried out in encystment areas with the hope of finding juveniles**
- **Beyond – Continue with the encystment.**

# Links to publications

- <http://www.snh.gov.uk/docs/B337911.pdf>
- <http://www.snh.gov.uk/docs/B168726.pdf>
- <http://www.arkive.org/freshwater-pearl-mussel/margaritifera-margaritifera/>
- <http://www.snh.gov.uk/docs/B464674.pdf>
- <http://www.snh.gov.uk/docs/B289810.pdf>

The Summer Walkers – Timothy Neat

The River and the Road: Diary of a Pearl Fisher – Peter Goodwin.

# Thanks for Listening



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