The biodiversity of saline lagoons in the Uists with notes on the morphological and molecular identification of Hydrobiidae

Ware, F. J.[1], Pye, S.[1], Howson, C. M.[2], Porter, J. S.[3], Chevalier, M.[1] and Chambers, S. J.[1]

National Museums Scotland

Summary

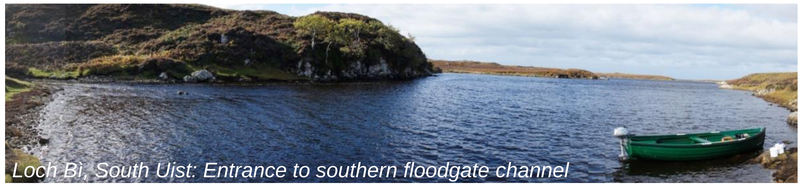
Saline lagoons are bodies of water that have a restricted connection to the sea and the salinity of the enclosed water may vary from brackish to fully saline or hyper-saline. The biological communities of lagoons are often less diverse than in other marine habitats but the species that are present are unusual and highly specialised.

Internationally important examples of the habitat type occur in North and South Uist, Outer Hebrides, but knowledge of the diversity and distribution of the lagoon biota has not been sufficient to inform a monitoring strategy.

The aim of a qualitative survey of 23 Uists lagoons in September 2012 was to produce a permanent collection of geo-referenced zoological and botanical specimens with a particular focus on lagoon specialist species.

By incorporating the results of new taxonomic work, including an investigation of the morphological and molecular identification of Hydrobiidae, previously uncertain distributions of the lagoon specialists have been clarified.

243 taxa were recorded with 587 zoological and 262 botanical specimens incorporated into the collections of NMS and the Royal Botanic Garden Edinburgh.



Loch Bi, South Uist: Entrance to southern floodgate channel

Hydrobia acuta neglecta

Acknowledgements

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National Museums Collection Centre

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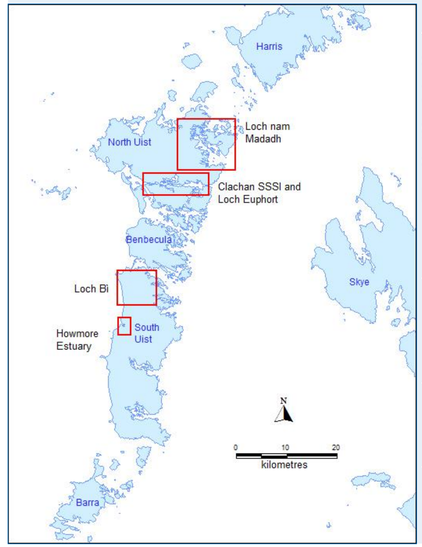
Introduction

Saline lagoons are recognised under the UK's Biodiversity Action Plan and are considered a priority habitat ('in danger of disappearance') under Annex 1 of the European Habitats Directive. In Scotland five Special Areas of Conservation have been established for lagoons and a further two list lagoons as a qualifying feature.

Taxonomic confusion within a number of phyla has led to doubts in some existing species records and without access to historic specimens the records cannot be verified. Therefore, before developing a monitoring strategy for some of these Scottish sites, it was necessary to assess the true distribution of the flora and fauna.



A meticulous search was carried out at 75 stations in 23 lagoons in the Uists and great care was taken to ensure specimens were retained in good condition,

References

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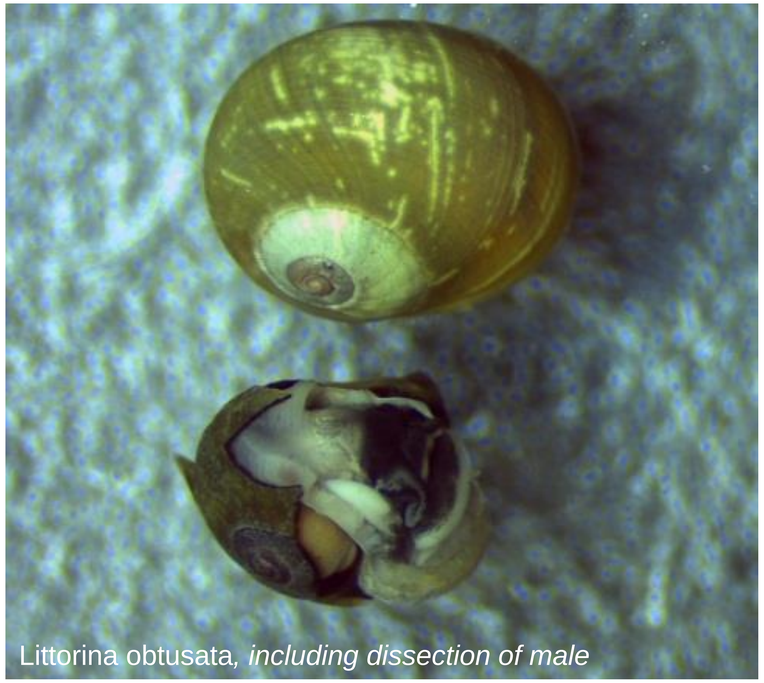

Littorina obtusata*, including dissection of male*

Fucus ceranoides at the head of Loch Portain

Main findings

243 taxa were recorded including the lagoon specialists *Idotea chelipes* and *Lekanesphaera hookeri* (Isopoda), *Hydrobia acuta neglecta* and *Ecrobia ventrosa* (Gastropoda) and the algae *Chaetomorpha linum* and *Fucus ceranoides*.

The lagoon cockle *Cerastoderma glaucum* was confirmed from three areas in Loch Bì and the rare foxtail stonewort *Lamprothamnium papulosum* was refound in five lagoons.

A comparison with previous data concentrated on Loch Bì. NMS found 106 taxa in the loch, a 60% increase on previous surveys. The majority of the species known from Loch Bì have only been recorded on one previous occasion, reflecting differences in sampling approach between surveys and illustrating the diversity of habitats within the loch.

Loch Bì, Loch Leòdasaigh and Oban nam Fiadh produced the most records of specialist species, whilst the most taxa overall were recorded from Loch Bì, Oban Spònis and Oban nam Fiadh.

The results illustrate the complexity of the network of fresh water, brackish and marine lagoons in the Uists. A high diversity of species tolerant of brackish conditions was found, with the fauna dominated by Crustacea, particularly isopods, and hydrobiid gastropods, and the flora dominated by green algae.

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Identification of Hydrobiidae

Shell form is often used to differentiate between hydrobiids but this is not always reliable *e.g.* when separating *Hydrobia acuta neglecta* and *Ecrobia ventrosa.*[1,2] Characteristics such as shell form and body size can be affected by environmental and parasitic factors.[1,3,4] Morphological characters, *i.e.* tentacle pigmentation and penis shape, are thought to be more reliable than shell form.

In 2011 lochs on North Uist were sampled for hydrobiids. Living specimens were identified using tentacle pigmentation patterns then a subsample of each phenotype from each loch underwent genetic analysis of the Cytochrome Oxidase I mitochondrial gene region.

There is much phenotypic variation within each species and no one feature is a 'fool proof' indicator of species (intermediate characteristics may be seen (Wilke & Pfenniger 2002)). Tentacle pigmentation is useful for separating species, particularly *Hydrobia acuta neglecta* and *Ecrobia ventrosa*. Other features should also be taken into account and a reasonable sample size used.

References

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3. Muus, B.J. 1962. Proc. Malac. Soc. Lond. 35: 131-138
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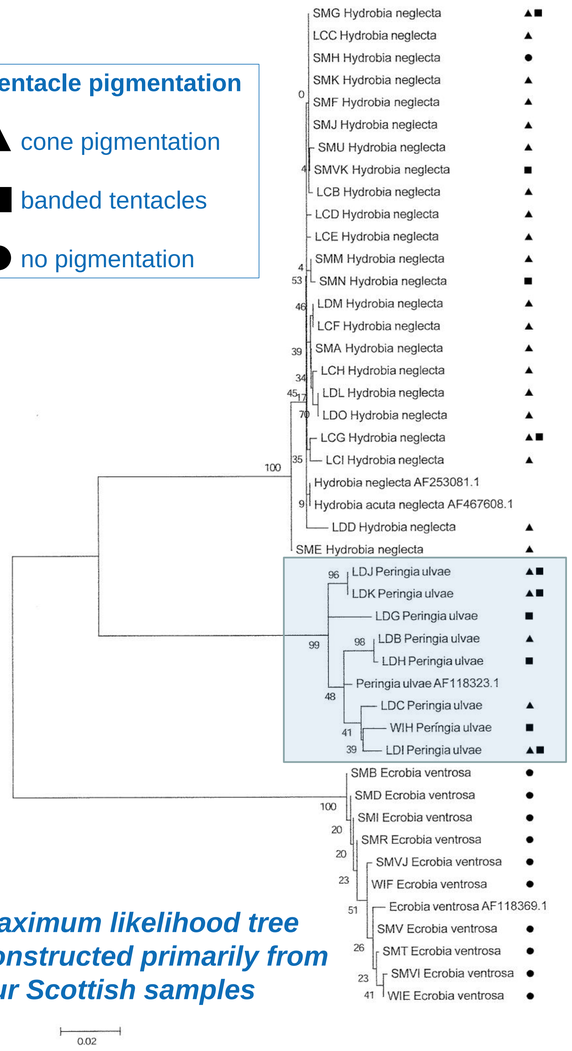
Tentacle pigmentation

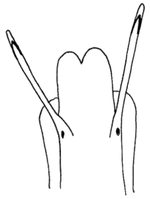
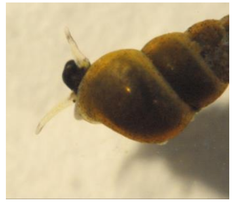
▲ cone pigmentation

■ banded tentacles

● no pigmentation

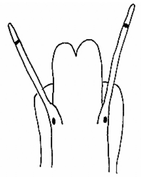


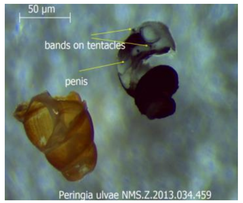
Maximum likelihood tree constructed primarily from our Scottish samples


Typical tentacle pigmentation ▲ and penis shape

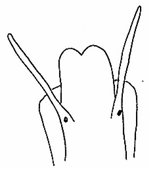
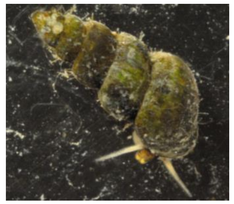
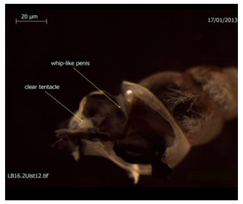
Hydrobia acuta neglecta





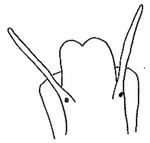
Typical tentacle pigmentation ■ and penis shape

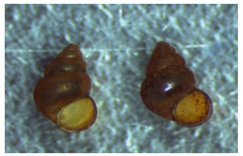
Peringia ulvae

Typical tentacle pigmentation ● and penis shape

Ecrobia ventrosa





Typical tentacle pigmentation ●. No males were found. We could not extract DNA from *P. antipodarum*.

Potamopyrgus antipodarum