Saline lagoons

Introduction

Saline lagoons in the UK may be natural or artificial water bodies that are partially separated from the sea. The separation from the sea may be due to sand or shingle banks or a rocky sill or sea wall. Lagoons may also form in depressions on soft sedimentary shores. They can be brackish, saline or hyper-saline and may contain a variety of substrata. Salinity varies according to the input of both sea water and freshwater. Seawater may enter through channels, overtopping the barrier between the lagoon and the sea or by percolation through the barrier. Freshwater input is from ground or surface waters.

The small number of coastal lagoons that have survived infilling or unsympathetic modification are important wildlife habitats. They support a range of salt-tolerant invertebrates; the range of species found at each site will depend upon the salinity regime of the individual lagoon. Some of the specialist lagoon invertebrates are protected by law under Schedule 5 of the Wildlife and Countryside Act.

Important invertebrate species associated with saline lagoons include the Lagoon sea slug (*Tenellia adspersa),* Lagoon sand shrimp (*Gammarus insensibilis*), Starlet sea anemone (*Nematostella vectensis*), De Folin's lagoon snail *(Caecum armoricum*) and the Lagoonal sea-snout cranefly (*Geranomyia bezzii).*

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Threats

• Pollution

Industrial and agricultural run-off, sewage outfalls, illegal dumping of rubbish. All these can have disastrous effects on lagoon ecosystems, which are quite enclosed. Pollution may become concentrated in lagoons with no outflow of water.

• Development

Development on the landward side creates coastal squeeze and will prevent any natural inland extension of lagoons, which may then become infilled as the sand or shingle barriers encroach. Drainage of surface water from nearby building developments can alter the salinity regime of lagoons.

• Coastal defences

Interruption of natural coastal processes may prevent the formation of new lagoons or cause the destruction of existing ones as natural shingle barriers degrade.

• Sea level rise

Many coastal lagoons may be lost to rising sea levels if the sea breaches the natural barriers that separate it from the lagoons.

Habitat management

Maintain the salinity regime

Each lagoon will have a different level of salinity and the invertebrate community will have developed accordingly. It is therefore important to keep the salinity of such lagoons at as stable a level as possible. In general, the salinity should range predominantly between 15% and 40%, with the salinity within a particular lagoon ranging by no more than this, and often by less, during a year.

Any changes to the inflow of freshwater, for example by redirecting surface water flow from housing development through a lagoon will disrupt the balance, adversely affecting the invertebrate habitat. In periods of high rainfall, opening sluices to remove excess freshwater may be necessary to maintain the salinity. Long periods of reduced salinity during winter periods of heavy rainfall and low evaporation could cause local extinction of specialist species.

Similarly, tidal incursions may raise the salinity. The RDB rove beetle *Philonthus punctus*, for example, lives at the margins of lagoons and favours only weakly saline conditions. It is likely to be affected by an increased inflow of seawater.

Salinity gradients or patchiness across larger or more structurally diverse lagoons will increase habitat diversity, for example by encouraging populations of chironomids or submerged plants in low salinity areas.

A freshwater supply is not necessary to a coastal lagoon, but some input of saline water is vital. The inlet/outflow of a lagoon should offer only restricted access to water exchange. Ideally it should enable the rapid release of freshwater at peak input as well as allowing a seawater supply sufficient to counter any threat of reduced salinity. Lagoons with a regular exchange of water with the sea have a greater potential for recruitment of species and tend to support more diverse communities.

Maintain water quality

Water pollution is likely to affect all elements of the special invertebrate fauna; for example the Lagoon sea slug (*Tenellia adspersa*) may be directly affected by pollution or indirectly by a reduction in the population of its hydroid prey.

Minimise human disturbance

Poorly managed physical disturbance by boats or other craft for water sports (e.g. in larger water bodies such as the Fleet) can have a detrimental effect on invertebrate populations.

Maintain structural diversity

Convoluted margins, shallow areas and islands add variety and also help to disrupt turbulent mixing induced by wind. Specialist lagoonal species require an extent of shallow but continually submerged lagoon bed of <1m in depth; the presence of a small proportion of deeper habitat, however, will give some protection against the impacts of dehydration, pollution or physical disturbance.
Encroachment from the lagoon edge of beds of Phragmites or Sea club-rush *(Bolboschoenus maritimus*) may significantly affect the extent and structural quality of the lagoonal habitat, but in some cases a limited amount of vegetation encroachment may be acceptable. For example, reeds can provide sheltered habitat for the Starlet sea-anemone (*Nematostella vectensis*) and a substratum for bryozoan colonies.

Maintain the margins

It is the margins of saline lagoons which are of importance to invertebrates such as carabid and rove beetles, myriapods and terrestrial isopods. The management of the surrounding habitat is therefore more important to these groups than the lagoon itself. However, the individual nature of the lagoons makes it difficult to offer generic management advice. For example, the ground beetle Pogonus littoralis is seemingly associated with the upper fringes of saltmarsh and the margins of saline lagoons and seepage salt pans where it may be found on rather bare wet gravelly areas. Gently sloping sides, fluctuating water levels and a preponderance of early succession conditions at the margins are likely to favour most of the rove beetles associated with this habitat. A range of salinity levels are favoured, depending on the species.

Shelter for adult RDB Lagoonal sea-snout craneflies (*Geranomyia bezzii*) at high tide is a matter of concern; hence it is reasonable to assume that close grazing of landward fringe vegetation would be to the detriment of this species.

BAP species associated with saline lagoons:

Lagoon sea slug (*Tenellia adspersa*)
Lagoon sand shrimp (*Gammarus insensibilis)*
Starlet sea anemone (*Nematostella vectensis*)
Ivell's sea anemone (*Edwardsia ivelli*)
A hydroid *Clavopsella navis*
Lagoon sandworm (*Armandia cirrhosa*)

For a more comprehensive list of terrestrial invertebrate species associated with this habitat, please see the download list.