

Creating ponds for Lagoon Sand Shrimp *Gammarus insensibilis*

MILLION PONDS PROJECT

Freshwater Habitats Trust

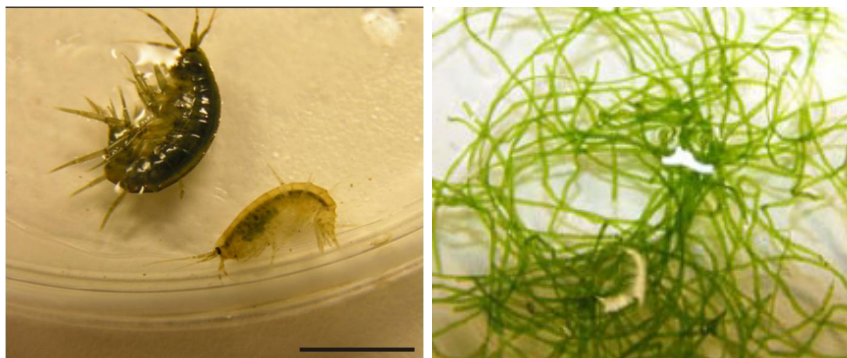
A 50-YEAR PROJECT TO CREATE A NETWORK OF CLEAN WATER PONDS FOR FRESHWATER WILDLIFE

1. The Lagoon Sand Shrimp

The Lagoon Sand Shrimp *Gammarus insensibilis* (Figure 1) is a rare and threatened crustacean which, in the UK part of its distribution, is restricted to coastal saline lagoons (Box 1). It is widely distributed along the south and east coasts of England, between Dorset and Humberside, including Hampshire and the Isle of Wight, West Sussex, Kent, Essex, Suffolk, Norfolk, Lincolnshire and Yorkshire.

The decline of the Lagoon Sand Shrimp has been due to inappropriate management of saline lagoons as well as loss of habitat. Sites from which the Lagoon Sand Shrimp has been lost include Stansore Point Lagoon (Hampshire), Keyhaven-Pennington (Hampshire), Hengistbury Head Lagoon (Dorset), Widewater Lagoon (West Sussex) and Benacre Broad (Suffolk). Owing to its restricted distribution it is protected by the Wildlife and Countryside Act.

Increasing the amount of suitable saline lagoon habitat within the Lagoon Sand Shrimp's distribution will help to increase the number of healthy populations and reduce its overall decline, maintaining UK populations into the future.



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Figure 1. The Lagoon Sand Shrimp is a typical shrimp-like crustacean which grows to about 19mm in length. It is associated with floating mats of the Spaghetti Algae *Chaetomorpha linum* (right).

2. Key habitat requirements

We have surprisingly little biological and ecological information on the Lagoon Sand Shrimp but we know that where conditions are right it can occur in very large numbers.

- **Saline conditions.** Lagoon Sand Shrimp prefer a salinity range of 15-40 ‰ which is achieved by an input of sea water into the lagoon via a channel but no direct freshwater input, other than rainfall or surface water run-off.
- **Permanent water.** Lagoon Sand Shrimp need water to be retained in all states of the tide and in all seasons. Sluices can be included in designs to maintain stable water levels. Keep water depth less than 1m.
- **Lagoon macrophytes,** particularly the lagoonal-specialist green Spaghetti Algae *Chaetomorpha linum* (Figure 1) which may form extensive floating mats.

Key messages

- **Create lagoons within the current and historical distribution of Lagoon Sand Shrimp to help reduce its decline in the UK.**
- **Lagoons should be fed by regular inputs of sea water to maintain high salinity levels.**
- **Avoid freshwater inputs such as ditches or streams. Locate lagoons in low intensity catchments to reduce inputs of nutrients and other pollutants.**
- **Create shallow lagoons less than 1m deep. Maintain water levels using control sluices.**
- **Reduce disturbance using designs which maximise edge habitat and reduce wave wash. Soft sediments should develop to support abundant floating mats of Spaghetti Algae *Chaetomorpha linum*.**
- **Monitor sites after creation to prevent threats such as changes in salinity, eutrophication and undue disturbance from recreation.**

Box 1. Coastal saline lagoons

Lagoons are large waterbodies in comparison with ponds – ponds are defined as permanent or seasonal waterbodies between 1m² and 2ha, whilst many lagoons are typically larger than 2ha in surface area - Gilkicker Lagoon, Hampshire is 3.7ha; The Fleet in Dorset is 480ha. However in common with ponds, lagoons are shallow waterbodies often less than 1m deep (Figure 2).

Lagoons are separated from the sea by a natural or manmade barrier, but get regular inputs of salt water through percolation, via one or more inlets, or during high tides when waves overtop the barrier. Their salinity is also dictated by freshwater inputs from streams and groundwater inputs. The shallow nature of the habitat and the influx of salt and freshwater mean that individual lagoons are very variable in terms of temperature, salinity, pH, dissolved oxygen and nutrient levels throughout the year. For example, high salinity with high temperature in the summer and low salinity with low temperatures (and additional freshwater inputs from rain) in the winter.

These extreme conditions limit the number of species which can survive in saline lagoons and as a result they develop a specialist flora and fauna which is restricted to this habitat type. Saline lagoons are also uncommon features in their own right and are listed as priority habitats under the European Union Habitats Directive. In spite of this protection they face a number of threats including sea-level rise, coastal development, pollution and nutrient enrichment from agricultural run-off and sewage outlets, invasive non-native plants and changes in water and salinity levels (Figure 3).

Coastal saline lagoons are naturally transient habitats but are often prevented from forming because of development pressure along the British coast. Lagoon creation has been successfully achieved as part of coastal realignment schemes (e.g. Freiston Shore RSPB reserve, Lincolnshire) and following aggregate extraction (e.g. Cliffe Pools in the Thames Estuary, Kent).



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Figure 2. Eight Acre Pond, Lymington is 2.9ha but less than 1m deep across almost its entire surface area. This is an important site for many saline lagoon species including Lagoon Sand Shrimp *Gammarus insensibilis*, Starlet Sea Anemone *Nematostella vectensis* and Foxtail Stonewort *Lamprothamnium papulosum*.



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Figure 3. Keyhaven-Lymington lagoon system. Following seawall construction the western section became hypohaline (low salinity due to dilution from freshwater and disconnection from the sea). This led to the loss of Lagoon Sand Shrimp *Gammarus insensibilis* from the lagoon.



3. Lagoon designs for Lagoon Sand Shrimp

Locating lagoons

The exact method of dispersal for Lagoon Sand Shrimp is unknown but it has been suggested that they may be transported on the legs of wading birds or floating mats of algae which are washed into the sea and move along the coast. To allow colonisation of specialist lagoon invertebrates by spread from existing sites, new lagoons should be created near to existing populations (visit the *BAP Species Map* for more information on current distribution). Reintroduction may need to be considered in some locations if natural dispersal seems unlikely, however as the Lagoon Sand Shrimp is a protected species, a license will be needed to do this.

There are a number of plant and invertebrate species that the Lagoon Sand Shrimp is commonly found with such as the green Spaghetti Algae *Chaetomorpha linum*, which has been recorded at nearly all of its sites. Other associated species with which it often occurs include lagoon specialists such as the isopod crustacean *Idotea chelipes* and *Sphaeroma hookeri*, the Lagoon Cockle *Cerastoderma glaucum* and the gastropod *Hydrobia ventrosa*. Presence of these species may indicate suitable areas for further lagoon creation or reintroduction for the Lagoon Sand Shrimp.

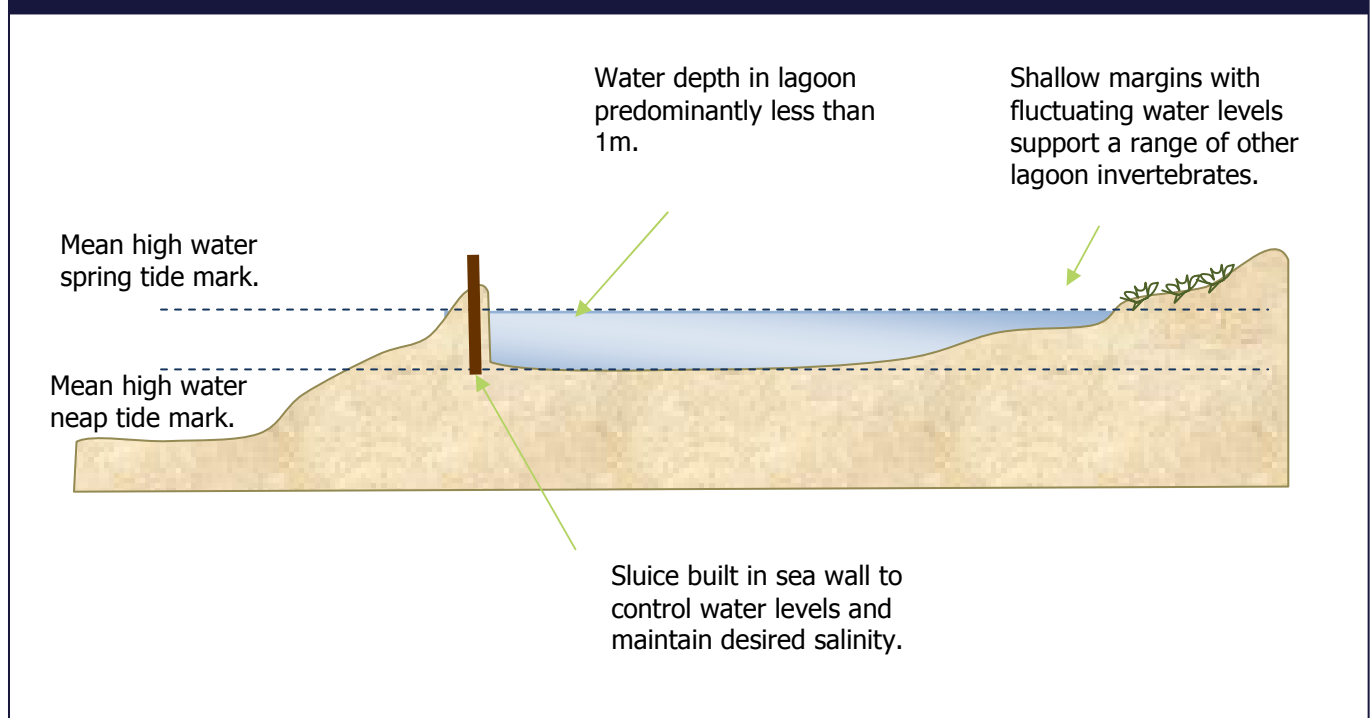
Lagoons that accommodate the needs of another BAP lagoon specialist the Starlet Sea Anemone *Nematostella vectensis* can also be included as part of creation plans for Lagoon Sand Shrimp due to the overlap in the two species ecological requirements (see the [Starlet Sea Anemone Species Dossier](#) for more information).

Water source

A key component of suitable saline lagoon habitat for the Lagoon Sand Shrimp is a favourable salinity range. The species will tolerate 10-58 ‰ but it prefers 15-40 ‰. Sea water has a salinity of around 35 parts per thousand (‰). To achieve the correct salinity range new lagoons should be fed by regular inputs of sea water and receive no direct inflows of freshwater, other than rainfall or run-off from surrounding land, or any inflow should be a very low volume relative to seawater input.

The lagoons need to be permanent, i.e. water needs to be retained at all states of tide and at all seasons. Channel fed lagoons are more stable and less prone to changes in salinity and drying out, but the turnover of water in the lagoon should be less than 40%. The lagoon should be created below the high water spring tide mark but above the mean high water neap tide mark (Figure 4).

Figure 4. Location of lagoons for Lagoon Sand Shrimp



Lagoon design

The Lagoon Sand Shrimp is limited to sheltered, shallow saline-water habitats with soft sediments which can support abundant macrophyte growth.

- **Shallow pools** less than 1m deep will support abundant macrophyte growth, but inclusion of some deeper water 1.5-2m will provide protection against complete loss of water in very dry periods.
- **Sheltered pools** will develop a layer of fine sediments. Limit wave wash on some shores by creating linear ponds at right angles to the prevailing wind direction or by creation of bays and low energy backwaters (see [Pond Creation Toolkit Factsheet 4](#) for more information). However, wave wash along some shores can be beneficial for other lagoon species such as Foxtail Stonewort *Lamprothamnium papulosum* which colonises bare mineral substrates kept clear from organic sediments by wave action (see the [Stoneworts Species Dossier](#) for more information).
- **Maximise the amount of edge habitat.** Where space allows include broad and shallow margins (<10cm deep for at least 2m or 1:20 (3°)), these may not be particularly beneficial to Lagoon Sand Shrimp which prefers permanently inundated substrates, but will help to diversify the habitat for other species such as the RDB rove beetle *Philonthus punctus*. These species favour the bare substrate created by fluctuating water levels in the drawdown zone of saline lagoons.

4. Management for Lagoon Sand Shrimp

Once created coastal lagoons need little management and should be allowed to develop naturally with new habitat created as existing lagoons mature. However, due to the number of pressure on coastal habitats there are a number of issues which should be monitored and resolved (see Box 1).

- **Changes to the salinity regime** of sites should be noted, because extended periods outside the Lagoon Sand Shrimps preferred salinity range can easily lead to the loss of this species.
- **Eutrophication** resulting from nutrient run-off from adjacent agricultural land or golf-courses, and sewage should be avoided. Locate lagoons in low-intensity catchments where they can be fed by clean water.
- **Recreation** which increases disturbance to the soft sediments of coastal lagoons should be avoided. Consider creation of lagoons with different end uses – those for recreation and those for wildlife.

5. Further reading

MarLIN: Lagoon sand shrimp - *Gammarus insensibilis* www.marlin.ac.uk/speciesfullreview.php?speciesID=3372

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Cadbury, J., Shardlow, M. and Buisson, R. (2001) 10. Saline Lagoons: A Scarce Habitat of Biodiversity Importance. *RSPB Conservation Review* 13, 75-84.

Gates, AR. (2006) The physiological ecology of the specialist lagoon amphipod *Gammarus insensibilis*. University of Southampton, School of Ocean and Earth Sciences, PhD Thesis.

Gilliland, PM. and Sanderson WG. (2000) Re-evaluation of marine benthic species of nature conservation importance: a new perspective on certain 'lagoonal specialists' with particular emphasis on *Alkmaria romijni* Horst (Polychaeta: Ampharetidae). *Aquatic Conservation*. 10: 1-12.

This factsheet was prepared by Buglife with the advice and expertise of Dr Roger Bamber.

For further information about the Million Ponds Project and to consult other factsheets in the Pond Creation Toolkit, please visit www.freshwaterhabitats.org.uk or email enquiries to info@freshwaterhabitats.org.uk

