SPECIES DOSSIER

Creating ponds for the Starlet Sea Anemone *Nematostella vectensis*

MILLION PONDS PROJECT

Freshwater Habitats Trust

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

1. The Starlet Sea Anemone

The Starlet Sea Anemone *Nematostella vectensis* is a small worm-like anemone, with a body about 15mm in length and 1mm in diameter. At one end of its tubular body there is an oral disk containing the mouth which is surrounded by two rings of 16 to 20 tentacles, each about 5mm long. It is translucent and colourless in appearance except for patterns of white on its body which give it a star-like appearance. The anemone has a bulbous base and contracting muscles, which enables it to burrow into soft mud (Figure 1).

Owing to its restricted distribution, the Starlet Sea Anemone is classified as Vulnerable on the IUCN Red List and as Rare in Britain. It is also protected under the Wildlife and Countryside Act. Increasing the amount of suitable saline lagoon habitat within the Starlet Sea Anemone's distribution will help to increase the number of healthy populations in England and reduce its overall decline, maintaining UK populations into the future.

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Figure 1. The Starlet Sea Anemone is usually found buried in the soft sediments of saline lagoons where it uses its very sticky tentacles to catch small invertebrate prey.

2. Key habitat requirements

The Starlet Sea Anemone is found in both saltmarsh creeks and coastal saline lagoons (Box 1), usually buried in the mud but also attached to vegetation. When conditions are right populations become very dense - thousands of individuals per square metre.

It has a preference for small, shallow lagoons, where organic muds build up on the undisturbed lagoon margins.

British populations are entirely female, forming a clonal colony. This should increase the chance of individuals starting new populations as potentially only one individual is needed to start a new population.

Key messages

- **Create lagoons within the current and historical distribution of Starlet Sea Anemone 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. Oxygen levels in the water column need to remain high even if sediments are anoxic.**
- **Create small lagoons, between 1-10ha. In larger lagoons include small backwater pools.**
- **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.**
- **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 1m^2 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).

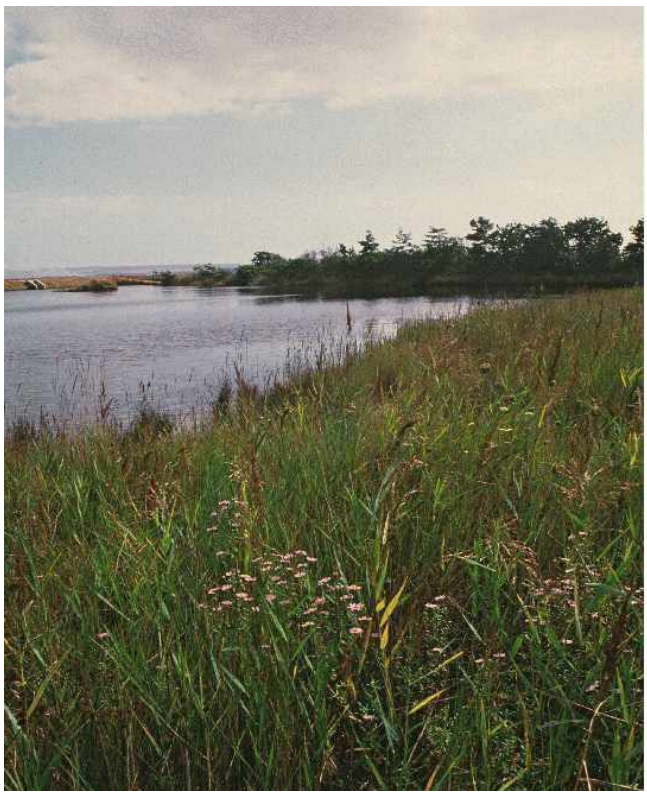


Figure 2. Eight Acre Pond, Lymington is 2.9ha but less than 1m deep across almost its entire surface area. This is an important site for many saline lagoon species including Lagoon Sand Shrimp *Gammarus insensibilis* , Starlet Sea Anemone *Nematostella vectensis* and Foxtail Stonewort *Lamprothamnium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

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).

3. Current distribution and reasons for decline

The Starlet Sea Anemone has been recorded along the coast from Dorset to the Humber Estuary but clustered in two regions, central southern England (Isle of Wight, West Sussex, Hampshire, Dorset) and East Anglia (Suffolk, Norfolk and Essex), both of which are noted for their brackish wetlands.

One reason for the decline of the Starlet Sea Anemone has been the loss and damage of lagoons and other sheltered brackish water habitats by pollution, drainage, in-filling and other anthropogenic activities. Mismanagement and disruption of inflows from the sea and from the land are particularly detrimental, causing depressed salinity as a result of freshwater retention. Coastal defence works are also partly responsible for some of the Starlet Sea Anemone's habitat loss.

Because many individuals congregate into the same localities, pollution, human intervention or habitat destruction can wipe out entire populations.

4. Pond designs for Starlet Sea Anemone

Locating lagoons

New lagoons need to be created near to existing populations to allow colonisation and spread from existing sites. The exact method of dispersal for Starlet Sea Anemone is unknown, however sea anemones are largely sedentary, moving occasionally by creeping extremely slowly or by inflating slightly and allowing currents to move them, so distances between lagoons should be small (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 Starlet Sea Anemone is a protected species, a license will be needed to do this.

There are a number of plant and invertebrate species that the Starlet Sea Anemone is commonly found with such as the Lagoon Cockle *Cerastoderma glaucum,* the isopod crustacean *Idotea chelipes,* the amphipod crustacean *Corophium insidiosum,* the green Spaghetti Algae *Chaetomorpha linum* and the Foxtail Stonewort *Lamprothamniun papulosum*. The presence of these species may indicate suitable areas for further lagoon creation or reintroduction of Starlet Sea Anemone. However, some of these species are protected by law, so introducing the starlet Sea Anemone which is a top-predator, may not be a good idea. Seek expert advice before considering lagoon creation projects for Starlet Sea Anemone in areas with existing biodiversity value.

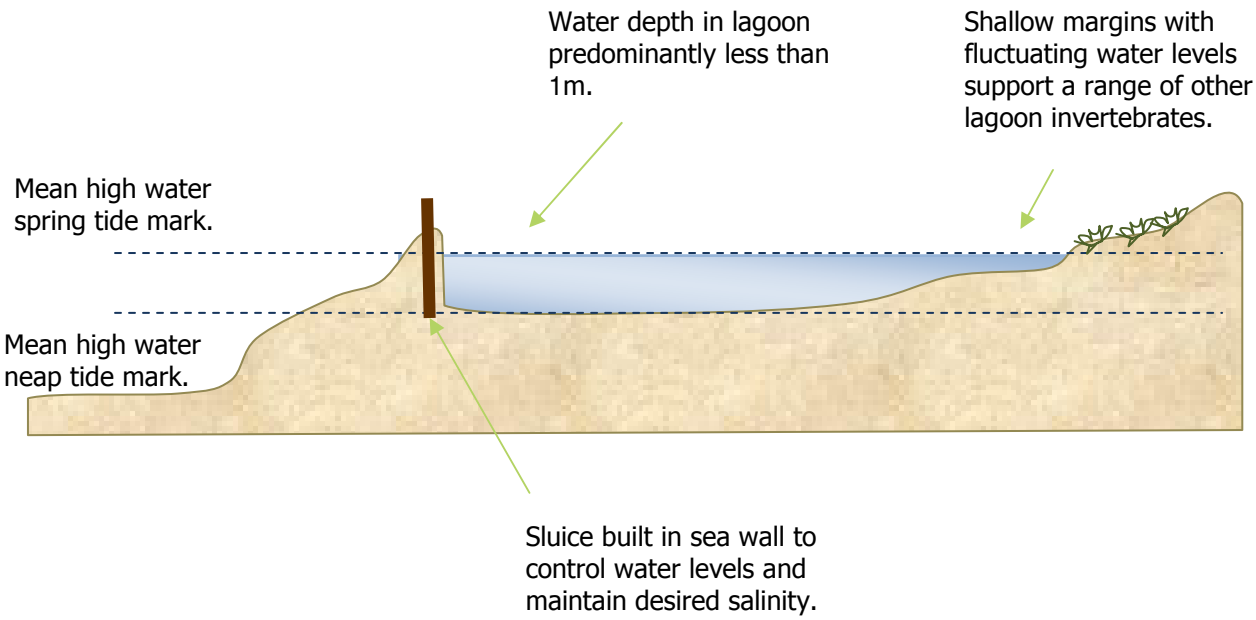
Lagoons that accommodate the needs of another BAP lagoon specialist the Lagoon Sand Shrimp *Gammarus insensibilis* can also be included as part of creation plans for Starlet Sea Anemone due to the overlap in the two species ecological requirements (see the *Lagoon Sand Shrimp Species Dossier* for more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

Water source

A key component of suitable saline lagoon habitat for the Starlet Sea Anemone is a favourable salinity range. The species will tolerate 2-52 parts per thousand (‰) but the greatest abundances are found at 16-36 ‰. Sea water has a salinity of around 35 ‰, and so to achieve the correct salinity range new lagoons should be fed by regular inputs of sea water and receive no direct freshwater input (i.e. no streams or ditches), other than rainfall or run-off from surrounding land, or at least very input of freshwater relative to seawater.

Lagoons need to be permanent so 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 to 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 Starlet Sea Anemone



Lagoon design

Lagoons for Starlet Sea Anemones need to have the following characteristics:

- **Small surface area.** The majority of sites supporting the Starlet Sea Anemone in England are small (1-10ha) but it has been recorded in The Dorset Fleet, which is 470ha.
- **Shallow depth.** Lagoons less than 0.5m deep will support Starlet Sea Anemone, but inclusion of some deeper water 1- 1.5m will provide protection against complete loss of water in very dry periods.
- **Maximise the amount of edge habitat.** Where space allows include broad and shallow margins (<10cm deep for at least 2m or 1:20 (3^{o})). At some sites Starlet Sea Anemones favours very shallow areas of mud occurring in just a few cm of water. Shallow margins also encourage development of a broad drawdown zone, where bare substrates are created by fluctuating water levels. These may not be particularly beneficial to Starlet Sea Anemones which prefers permanently inundated substrates, but will help to diversify the habitat for other species such as the RDB rove beetle *Philonthus punctus.*
- **Create sheltered pools.** The Starlet Sea Anemone favours fine muds to muddy sands which develop over bare shingles in sheltered pools. It also requires a bottom flow rate less than 0.18cm.s. 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).
- **Anoxic substrate but oxygenated water column**. Sediment and near-bottom water can occasionally become anoxic, but the oxygen concentration in the water column should remain high. These conditions are best achieved by abundant macrophyte growth in clean water. Create lagoons in low intensity catchments to limit inputs of excessive nutrients which would cause algae blooms resulting in deoxygenation of the water.

5. Management for Starlet Sea Anemone

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 pressures 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. Although this species is comfortable with fluctuating salinity within its preferred range, extended periods outside this range can easily lead to the loss of Starlet Sea Anemone.
- **Eutrophication** resulting from nutrient run-off from adjacent agricultural land or golf-courses, and sewage should be avoided. Locate ponds 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: Starlet sea anemone - *Nematostella vectensis*
http://www.marlin.ac.uk/speciesfullreview.php?speciesID=3860

Bamber, RN., Gililand, PM. and Shardlow, MEA. (2001) Saline Lagoons: A Guide to their Management and Creation (interim version). Peterborough, English Nature.

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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.

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.

Shaeder, M., Suwailem, AM. and Rowe, GA. (1997) The anemone, Nematostella vectensis, in Britain: Considerations for conservation management. *Aquatic Conservation*. 7: 13-25.

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*

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