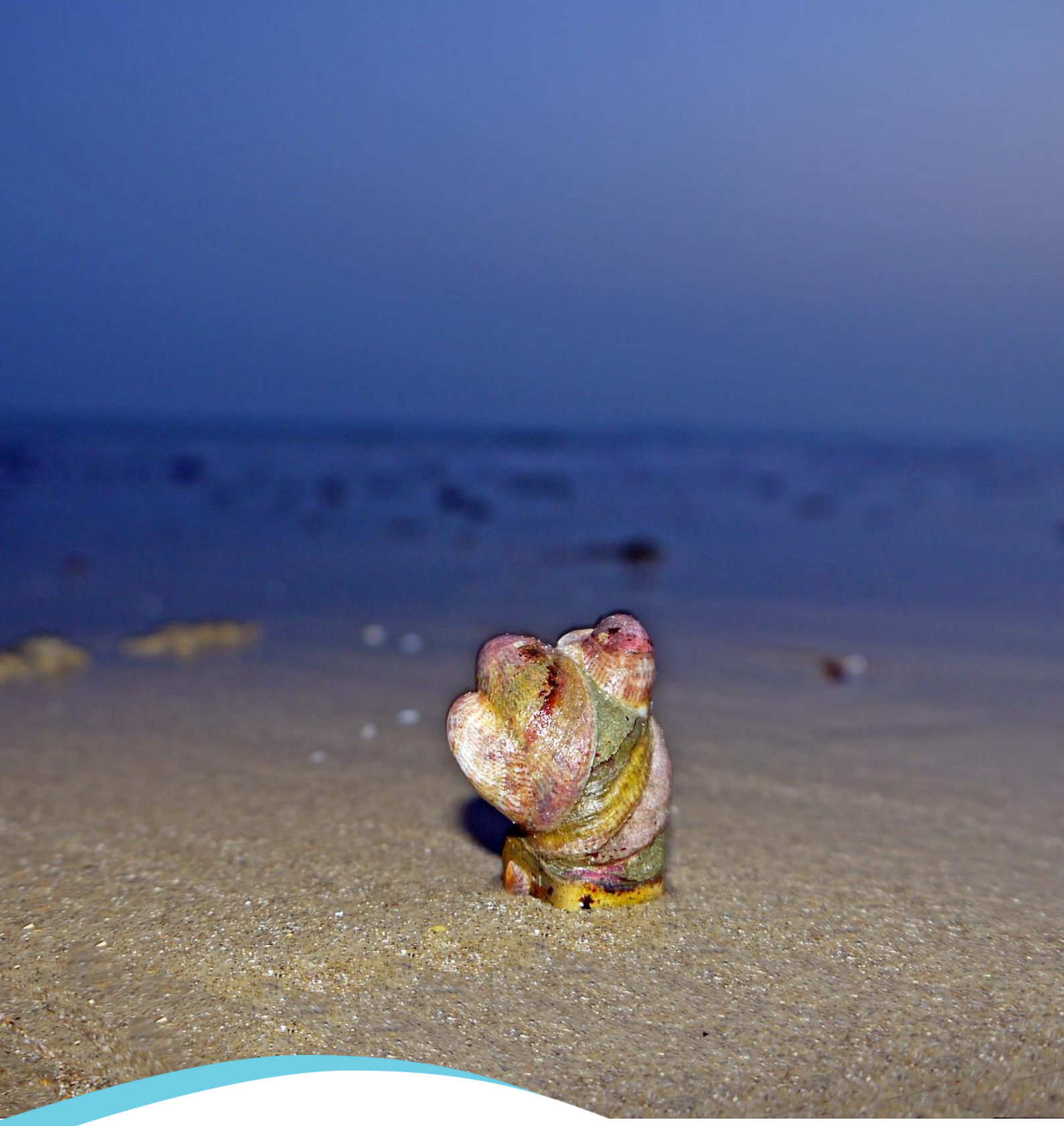

GOOD PRACTICE MANAGEMENT

Slipper limpet (*Crepidula fornicata)*

RAPID

Reducing and Preventing
Invasive Alien Species Dispersal

GOOD PRACTICE MANAGEMENT GUIDE

Slipper limpet (*Crepidula fornicata*)

Other names: common Atlantic slippersnail, boat shell, quarterdeck shell, fornicating slipper snail, Atlantic slipper limpet

For ID guides and more information:
http://www.nonnativespecies.org/index.cfm?sectionid=47

Slipper limpet *(Crepidula fornicata)*

Images above and right:

Groups of individuals are often found fastened together in 'stacks' or 'chains'

Version 1: August 2018

MANAGEMENT SUMMARY

Ecology and impact of Slipper limpet

The slipper limpet is a filter-feeding, asymmetrical smooth-shelled sea snail often found in curved chains or stacks made up of several individuals. The species is a protandrous hermaphrodite, that is, an organism that is born male and at some point in its lifespan changes sex to female. The older, larger members at the base of a stack are female, the younger, smaller members at the top are male; the central portion comprises individuals changing sex. The planktonic larva can move themselves, but are mostly carried by water movement. Larvae settle in isolation or on top of an established stack. A long, planktonic larval stage means that settlement may occur after removal of adults if timed badly. Adults live on the sea bed on a variety of surfaces, including the shells of dead and living hard-shelled invertebrates, such as scallops, crabs, whelks and mussels.

A competitor for food and space with other filter-feeding invertebrates. *C. fornicata* has the ability to smother species and alter the nature of sediment substrata, smothering areas previously dominated by bivalves. It is considered a pest of commercial shellfish operations, such as scallops, mussels and oysters, where it can reduce growth rates of shellfish through direct attachment and/or through smothering from the biodeposition of faeces and pseudo-faeces.

Effective management: summary

There is currently no easy way to manage slipper limpets and complete eradication is impossible with current techniques. Dredging and smothering have been used effectively, if done rapidly before establishment, and can be used for control. Good biosecurity practice is highly recommended to prevent transfer of slipper limpet (and other marine/coastal IAS) from infected to uninfected areas.

MANAGEMENT METHODS

Prevention

Undertake good practice biosecurity, to prevent transfer of slipper limpet (and other marine/coastal IAS) from infected to uninfected areas, including:

- Regulation and regular monitoring of transfers of oysters and mussels, in particular, not transporting seed from areas infected with *C. fornicata* for stocking to uninfected areas.
- All fisheries workers and participants should thoroughly clean and disinfect all external clothing and footwear, fisheries equipment/implements and allow to dry (including cockle and mussel bags to be re-used in another fishery).
- Effluent from washing and grading live cockles and mussels should be boiled prior to discharge.
- Do not pump non-sterilised water out in harbours where possible.
- Annual haul-out and anti-fouling of vessels; use of quarantine berths.
- Good housekeeping of port infrastructure.
- 'Check, Clean, Dry' all relocatable structures and equipment before transferring from one area to another.
- 'Check, Clean, Dry' all equipment and clothing (recreational fishing and boating) used in marine and inter-tidal between use and before moving from one area to another.
- Power-washing of boats (deck and hull) and launch vehicles in-between use in different marine/coastal areas.
- Promote awareness and knowledge of biosecurity (particularly Check, Clean, Dry), identification of marine INNS, including slipper limpet, and the importance of reporting any sightings amongst stakeholders, with a focus on professional and recreational water-users.

"Check, Clean, Dry" campaign: http://www.nonnativespecies.org/checkcleandry/

MANAGEMENT METHODS

Mechanical

Dredge and spoil disposal

Method: The construction and maintenance of coastal infrastructure involves the disposal of dredged material at designated sites. *C. fornicata* is poorly adapted to adjust its vertical in sediment position and has limited scope to survive the dredge and spoil disposal process. Laboratory experiments and field surveys indicate that *C. fornicata* did not survive burial deeper than 6cm. As *C. fornicata* stacks may be up to 7cm high, the layer of deposits should be increased accordingly (Powell-Jennings and Callaway, 2018).

Dredging and smothering

A reportedly successful local rapid response and eradication was undertaken in the Menai and Conwy Bay Special Area of Conservation, North Wales, in 2006. A consignment of seed mussels had been laid on the sea bed prior to the discovery of their contamination with slipper limpets. The rapid response involved removing the mussels with dredgers, followed by smothering the area with a dense layer of uncontaminated mussels (sourced from another area). Subsequent monitoring did not reveal any live limpets. The Bangor Mussel Growers Code of Practice recommends that this procedure is adopted as an appropriate response to any future unintentional introductions of *C. fornicata* (or any other INNS) into the mussels lays (Wilson, and Smith. 2008).

Dredging and dumping above high water mark

For clearance of large beds, dredging and disposal above high water mark has been applied.

Constraints: Potential odour problems.

MANAGEMENT METHODS

Mechanical (cont)

Collection by suction dredge

In St Brieuc Bay and Mont St Michel Bay, France, for a limited period each year, slipper limpets are removed from the seabed via a modified 2m wide dredge head which removes the surface sediment. Significant quantities of slipper limpets have been removed from the two operating areas over a number of years with 43,000 tonnes alone being taken from Mont St Michel Bay.

Constraints:

Water quality impact: Fine sediment is removed with the slipper limpets and returned to the sea, with concerns over resuspension in restricted water bodies and potential impacts on dissolved oxygen and the resuspension of ammonia and hydrogen sulphide.

Substrate disturbance: Bathymetry or boulder fields can cause the dredge to bite deeper than necessary to remove living slipper limpets (<10cm of sediment) than if the bed is level and obstruction free.

Extraction efficiency in marginal areas: There are diminishing returns (and hence disincentive) in working partially cleared and muddy areas.

Limited depth: The suction dredge can only operate in <20m depth due to the length of the dredge pipe.

Covering with bags of oysters

Cultivation of oysters in bags laid on trestles is said to reduce impacts as small slipper limpets often become crushed. If removed from ships or other floating structures in dry-dock, all removed fouling biota should be destroyed and not returned to the water.

MANAGEMENT METHODS

Chemical

Dipping small quantities of "cultch" (cultch is material such as old oyster shells, stones, etc., used to form a spawning bed for oysters or shellfish) with hypersaline solutions are reported to be effective in controlling newly settled slipper limpets. Brine immersion for over 5 minutes resulted in 100% mortality.

Manual

Collection by Fishermen

In low levels of infestation, collection by oyster fishermen can be one of the most effective management techniques.

Constraints: At a larger scale of slipper limpet infestation, issues of fishing vessel capacity and bounty/subsidy rates render collection non-financially viable. Disposal of biological waste also incurs significant cost and at the moment no government organisation or harbour authority has committed to paying.

Collection by Harbour Authority

Where the capacity exists, Harbour Authorities could continue removal by dredging over a brief period following the closure of the oyster fishery season but prior to the onset of spat settlement. Slipper limpet removal could be incorporated as part of a wider maintenance of oyster beds. All considerations for maintaining the oyster beds will require an 'Appropriate Assessment' in negotiations with Natural England and the Environment Agency.

MANAGEMENT METHODS

Biological

Not known. Although number of common predators (hermit crab *Pagurus longicarpus*, shore crab *Hemigrapsus sanguineus*, and drilling gastropods *Nucella lapillus* and *Urosalpinx cinerea*) have been shown to predate juvenile slipper limpets, with the potential to limit recruitment into adult populations, the application of any means of biological control is untested.

Ineffective methods

Chain harrowing

Chain harrowing is a technique used in order to remove soft sediment from the oyster beds exposing the hard substrate for oyster spat settlement. The technique involves towing chains behind a powered vessel over the beds which re-suspends the surface layer of sediment (unlike harrowing with a 'toothed' dredge which is designed to break up the hard bed). The technique can break up *C. fornicata* stacks. However, the unintended consequences are that increased numbers of viable stacks can be created and individuals may be dispersed further afield.

Legislation

Slipper limpet is listed under Schedule 9 of the Wildlife and Countryside Act in England and Wales 1981 making it an offence to release or allow this species to escape into the wild.

Health and Safety

The link below is to a useful webpage on the GBNNSS website which provides resources and guidance on health and safety when planning a project working with invasive species:

http://www.nonnativespecies.org/index.cfm?pageid=266

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RAPID

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Where To Go For More Information

http://www.europe-aliens.org/
http://www.nonnativespecies.org/home
http://www.nonnativespecies.org/rapid
http://jncc.defra.gov.uk/page-1711

RAPID

RAPID is a three year EU funded LIFE project led by the Animal and Plant Health Agency (APHA), with Natural England and Bristol Zoological Society as key partners that piloting innovative approaches to Invasive Alien Species (IAS) management in freshwater aquatic, riparian and coastal environments across England. The project is supported by a number of further Technical Partners.

http://www.nonnativespecies.org/rapid

Animal & Plant Health Agency

NATURAL ENGLAND

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