

# LOSING OYSTER REEFS TO HISTORY

*Using the past to restore oyster reefs for the future*

HOW WILL WE  
CONSERVE SPECIES  
DIVERSITY?



Heidi Alleway and Sean Connell

## Oyster reefs

Oyster reefs are a critically important marine habitat. They are commonly considered to be ‘ecosystem engineers’ creating an environment that supports and encourages many other species of plants and animals to thrive. They also provide benefits to coastal ecosystems by filtering poor quality water – shellfish act like the kidneys of the marine environment – and stabilising soft sediments preventing erosion. At one time, these habitats were widespread throughout temperate seas worldwide, but their distribution and abundance has declined by more than 85% due to over fishing, disease and water pollution. Their deterioration has contributed to fundamental changes in coastal and estuarine environments.

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In Australia, native oyster species including the native flat or mud oyster *Ostrea angasi* and the Sydney rock oyster *Saccostrea glomerata* were historically fished from oyster reefs. Fishing for oysters in many areas formed the first formal commercial fishery and sizeable fleets of sailing cutters operated within bays and estuaries. Like other areas, these reefs have deteriorated significantly and very few are known to occur today. Oyster aquaculture, the artificial cultivation and growth of oysters, largely of non-native and introduced species such as the Pacific oyster *Crassostrea gigas*, now sustain the local, national and international hunger for this popular food.

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Our appetite for oysters is now often quenched by cultivated oysters from farms like this one in South Australia, which mostly grow an introduced species, the Pacific oyster.

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## The loss of reefs to history

It is commonly thought that fishing for the native flat oyster occurred along the South Australian coastline, on Eyre Peninsula at Port Lincoln and Coffin Bay, and to a lesser extent on Yorke Peninsula near Stansbury. Through a historical reconstruction using records of commercial catches from as far back as 1836, we have shown that oyster reefs were once more common than that, occurring across more than 1,500 km of the coast. Commercial fishing during early colonisation was widespread and sustained an important marine industry. This is evident in the following correspondence to the Marine Board from the Inspector of Oyster Fisheries in 1886:

*“I was engaged in Oyster dredging myself at the time referred to and it was no uncommon thing for two men in one boat to raise 23 bags of Oyster (estimated 8,050 individuals) in one day ... no less than 16,000 bags (estimated 5,600,000 individuals) of Oysters were dredged during the years 1872, 1873, and 1874.”*

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However, these oyster reefs were overexploited during the late 1800s and early 1900s, and by 1910 the commercial fishery had collapsed. The early onset of fishing and the 180 years that have now passed has contributed to a 'collective amnesia' regarding this species' past distribution and number. People have simply forgotten what the oyster stocks used to be like. This illustrates a widespread but little known issue referred to as the 'shifting baselines syndrome'. The shifting baselines syndrome is the acceptance of reference points that do not accurately reflect ecosystem status, often because we do not have knowledge or perception of the past to understand the degree of change that has happened to a species, habitat or ecosystem.

The fisheries scientist, Daniel Pauly, described this syndrome in 1995 when he identified that scientists and fisheries managers sometimes failed to acknowledge that fisheries stock sizes had already declined prior to the beginning of their careers. As generations passed, the result was a gradual acceptance and 'shift' of the accepted baseline for the ecosystem. As described by Pauly, "We have transformed the world, but we don't remember it."

» *"For such a critical habitat, the impacts of this loss would be considerable."*

## Correcting shifted ecological baselines

Currently the native flat oyster receives very little attention through community knowledge and in natural resource or conservation management, and despite the repeated introduction of legislation during the mid-to late-1800s for protected areas, minimum size limits and restoration, current legislation relates only to the licencing of commercial fishing.

By carefully mapping the location of oyster reefs based on reports in historical documents, we have uncovered the true past abundance of oyster reefs along South Australia's coast which is much higher than previously thought. These findings have re-set the level of oyster reef habitat for which we should be aiming with any conservation effort. Recovering and using these true past ecological baselines to create a more accurate model for the setting of management targets is an important first step in the restoration of this critical habitat. Without it, there is a real risk that as time passes, not only will our knowledge of oyster reef abundance be lost, but that their presence altogether might be forgotten. For such a critical habitat, the impacts of this loss would be considerable.



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Oysters filter the water. Watch them do just that in this time lapse video.

Historical ecological research - ecological investigations that explicitly consider past states of ecosystems, species or habitats - can assist us to create, retrospectively, more accurate baseline knowledge in ecology. This type of research often involves the use of historical records, including archival information such as government correspondence and reports, or newspaper articles, interviews with older generation fishers, photographs and maps, and museum collections. Incorporating historical records into ecological research requires this information to be 'treated' and analysed in a way that makes it usable but can provide, if not uncover, far more accurate baselines for the setting of targets in natural resource management. Without this understanding, management targets can be based on baselines that do not reflect the way ecosystems really look and may in some cases be ineffective.


## **Toward oyster reef restoration**

Oyster reefs are known to support a large range and high abundance of associated species, including commercially and recreationally important fishes. There is an increasing need to restore lost reef habitat to support such species and the values and services that they provide.

Oyster reef restoration programs are widespread throughout the United States of America and are being investigated in southern Australia. A trial project has just begun in Port Philip Bay, Victoria, through a partnership between the Department of Environment and Primary Industries, The Nature Conservancy and the Albert Park Yachting and Angling Club. This represents hope for oyster reefs.

Combined with increasingly impacted coastal waters, restoring oyster reefs could become one of the most important natural resource management projects for the marine environment over the coming decades.



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# ACTIVITY

## Oyster reef restoration projects

Active restoration of lost oyster reef habitat is occurring in the United States and receives substantial investment from the government, private enterprise and not-for-profit organisations. You can investigate the types of restoration projects being undertaken by visiting the National Oceanic and Atmospheric Administration Restoration Atlas.

1. Go to the Atlas website:


 <https://restoration.atlas.noaa.gov/src/html/index.html>

2. Click on the 'Data Tools' menu in the top left under the NOAA logo and select the 'Data Filter Tool' from the drop down.

3. Select 'habitat' from the filter type list and set the filter to 'oyster reef/shell bottom'. Apply the filter. This will reveal all the oyster reef restoration projects underway in the United States.

You can click on each project icon and read about what they are trying to achieve, the current status of the project and the level of funding provided. Some entries have photos of the project area.

*Download this resource:*

 [www.sciences.adelaide.edu.au/schools-resources/docs/activity-atlas-oyster-reef-restoration-projects.pdf](http://www.sciences.adelaide.edu.au/schools-resources/docs/activity-atlas-oyster-reef-restoration-projects.pdf)



## VIDEO

There are lots of great videos available which will extend your knowledge of the concepts in this article. Below we've listed just a few of those we found.

Shifting ecological baselines presents a significant issue for understanding and setting management actions and targets for natural systems. You can learn more about this phenomenon by listening to Daniel Pauly's description of the shifting baselines syndrome and the impacts that it can have in the following TED talk.

+ [www.ted.com/talks/daniel\\_paul\\_y\\_the\\_ocean\\_s\\_shifting\\_baseline](http://www.ted.com/talks/daniel_paul_y_the_ocean_s_shifting_baseline)

QUEST Science gives a great overview of the benefits of oysters in marine ecosystems in this video.

+ <http://youtu.be/iSjkQsH-QsQ>

These videos from The Nature Conservancy look at the value of oyster reefs and the restoration process.

+ [www.nature.org/science-in-action/science-features/oyster-reef-interactive-graphic.xml](http://www.nature.org/science-in-action/science-features/oyster-reef-interactive-graphic.xml)

+ <http://youtu.be/PbFQ5EndLso>

+ <http://youtu.be/r5dCMLRH6sw>

+ <http://youtu.be/PIZKkfozpjo>



## AUDIO

Heidi Alleway has been interviewed about the discovery of historic oyster reefs which has revolutionised our view of past oyster stocks in South Australia. You can listen to these interviews by visiting the websites below.

+ <https://radio.adelaide.edu.au/ostrea-angasi/>

+ [www.abc.net.au/news/2015-02-20/researchers-rediscover-lost-oyster-reefs/6160464](http://www.abc.net.au/news/2015-02-20/researchers-rediscover-lost-oyster-reefs/6160464)

