



Submission to
**the Senate Environment and Communications References
Committee - Inquiry into Algal Blooms in South Australian Marine
and Coastal Environments**

Date: 22 August 2025

Submitted by:

Society for Ecological Restoration Australasia (SER-A)

SER-A represents over 200 restoration scientists, practitioners, and policy professionals committed to advancing the science and practice of ecological restoration across Australasia. In collaboration with global partners, SER develops standards and guidance to improve restoration outcomes and deliver long-term ecological and human well-being benefits. More information about our organisation is available [here](#).

Terms of Reference Addressed

- **(a)** Marine ecosystem loss as a contributing factor to the algal bloom
- **(b-iii)** Impacts of the algal bloom on shellfish, seaweeds, and seagrass habitats
- **(e- iii)** The role of ecosystem restoration in recovery planning, including the estimated scale and funding required to reinstate ecosystem function

1. Marine Ecosystem Decline and Its Role in Algal Bloom Dynamics

The decline of marine ecosystems is eroding the ocean's ability to recover and adapt. South Australia's coastal waters once supported a rich diversity of marine habitats, including native shellfish reefs, kelp forests, seagrass meadows, and saltmarsh and mangrove fringes. These ecosystems provided essential services such as water filtration, shoreline protection, carbon sequestration, and fisheries productivity.

However, since the 1800s, extensive urbanisation, agricultural development, and industrial activity have led to widespread degradation:

- **Shellfish reefs** formed by the Australian Flat Oyster (*Ostrea angasi*) have declined by over **90%**, with historical coverage spanning approximately **1,500 km** of coastline (one third of the coast!). Their loss represents a silent ecological collapse, comparable to the hypothetical disappearance of the Great Barrier Reef.
- **Seagrass meadows** have declined by approximately **6,200 hectares** along Adelaide's coast since 1949, largely due to nutrient pollution, sediment instability, and historical wastewater discharge. While there has been some recovery, algal smothering and sediment movement continue to inhibit recovery.



- **Mangrove and saltmarsh habitats** have experienced losses of **25% and 80%**, respectively, since the 1950s, driven by tidal barrier installations, land clearing, and dieback from poor sediment and water quality.

The **2021 State of the Environment Report** confirmed that foundational coastal habitats across Australia are in poor and deteriorating condition, with climate change now compounding legacy stressors. Rising sea temperatures, sea-level rise, and intensified storm surges are accelerating habitat degradation.

2. Impacts of the Current Algal Bloom

Harmful algal bloom (HAB) species, particularly dinoflagellates such as *Karenia mikimotoi*, are becoming increasingly problematic under climate change. These species thrive in stratified waters—a condition exacerbated by warming sea surface temperatures.

Preliminary observations and community reports suggest the current bloom in SA is causing significant ecological stress:

- High volumes of **seagrass and seaweed wrack** washed ashore
- Extensive **floating seaweed** detached from the seafloor
- Large numbers of **dead shellfish**, including razorfish (*Pinna bicolor*), cockles, and mussels
- **White patches on the seabed**, indicating potential seagrass dieback

Scientific analysis of the bloom's impact is ongoing. However, early assessments indicate widespread habitat degradation. These ecosystems have an incredible ability to bounce back and recover naturally once the threat is removed. Other times we need to assist them to facilitate recovery.

3. Nature-Based Allies in Mitigating Harmful Algal Blooms

The degradation of foundational marine ecosystems has significantly reduced the natural resilience of South Australia's coastal waters. However, we still have powerful allies in nature—**oysters, kelp, seagrass, mangroves, and saltmarsh**—that can help mitigate harmful algal blooms (HABs) and restore ecological balance.

Oyster Reefs: Nature's Water Filters

Eliminating oyster reefs is akin to **removing the filter from an aquarium**. These reefs are essential for maintaining water quality and ecosystem health. The Australian Flat Oyster (*Ostrea angasi*) is a filter-feeding shellfish capable of purifying up to **100 litres of water per day**—roughly a bathtub every two days.

Recent assessments of restored shellfish reefs at Glenelg (April and July 2025) have confirmed that *O. angasi* populations are **surviving the current algal bloom**, demonstrating their resilience and ecological value. These reefs will continue to be monitored to assess survivorship and performance.



Evidence suggests that oysters are actively consuming *Karenia mikimotoi*, the dinoflagellate responsible for the current bloom. Dinoflagellates have been found in oyster gut and pallial fluid, indicating direct ingestion. Given the **high filtration capacity** of native oysters, their potential to reduce bloom density is significant.

Shellfish Reef restoration has been proposed as an eligible activity under **Australia's Nature Repair Market** by The Nature Conservancy, meaning that investments could generate both biodiversity certification credits and economic benefits.

Seagrass Meadows: Stabilising and Detoxifying

Seagrasses play a critical role in:

- **Stabilising sediments**
- **Sequestering carbon**
- **Producing natural algicides**
- **Improving water clarity** by absorbing excess nutrients

These functions directly counteract the conditions that favour HAB development

Kelp Forests: Biodiversity and Nutrient Regulation

Golden Kelp (*Ecklonia radiata*) contributes to:

- **Oxygenation of coastal waters**
- **Habitat provision for marine species**
- **Nutrient cycling and regulation**

Healthy kelp forests reduce eutrophic conditions (high nutrient water) and support biodiversity, making them vital in temperate marine systems affected by HABs.

Coastal Wetlands: Natural Nutrient Sinks

Saltmarsh and mangrove ecosystems act as **natural buffers**, intercepting nitrogen and phosphorus—the primary drivers of algal blooms—before they reach open waters. These wetlands:

- **Slow water flow**, allowing nutrient uptake
- **Transform pollutants** through microbial processes
- **Sequester carbon** at rates exceeding terrestrial forests

Tidal restoration of these habitats is eligible for **Australian Carbon Credit Units** under the Emissions Reduction Fund, offering both ecological and economic incentives.

4. Restoration as a Core Component of Recovery

Restoration of marine ecosystems is not only possible—it is already underway. In the face of accelerating climate and ecological pressures, **marine ecological restoration must be a central pillar of Australia's long-term environmental response**, particularly in sensitive and economically significant regions such as Spencer Gulf and Gulf St Vincent.



Australia is home to world-leading marine restoration experts and organisations with experience in planning and delivering large-scale programs. In South Australia, key contributors include:

- **The Nature Conservancy** – coastal wetlands and shellfish reef restoration
- **OzFish** – shellfish reef and seagrass restoration
- **South Australian Research and Development Institute (SARDI)** – seagrass restoration

Proven Restoration Techniques

- **Shellfish reefs:** Restoration methods include deploying limestone substrate seeded with juvenile oysters or placing oyster shells in baskets on the seafloor. Timing deployment during spawning season is critical to ensure natural recruitment.
- **Seagrass meadows:** Techniques include biodegradable hessian bags, seed cultivation, rhizome transplantation, and community-led planting in intertidal zones.

Restoration as a Proven Mitigation Strategy

Evidence from global case studies reinforces the value of restoration. In [Shinnecock Bay, New York](#), shellfish restoration over 15 years has:

- **Eliminated algal blooms for over six years**
- **Improved water clarity**
- **Expanded seagrass beds**

Adjacent estuaries without restoration did not experience these benefits, highlighting the effectiveness of ecological restoration in mitigating HABs.

5. Why High-Quality Restoration Matters

High-quality ecological restoration aims to **rebuild the integrity, resilience, and functionality of ecosystems**. It ensures the recovery of essential services such as:

- Water filtration
- Carbon sequestration
- Soil stabilisation
- Fish productivity

Restoration must be funded at a scale commensurate with the extent of ecosystem loss and the value of services to be recovered. Band-aid solutions will not mitigate current or future algal blooms—**long-term, nature-based solutions are essential**.



Conclusion

The degradation of South Australia's marine ecosystems has reduced the coast's capacity to recover from disturbances such as harmful algal blooms. However, **nature-based restoration offers a proven, scalable, and cost-effective solution to mitigate future blooms.** By restoring foundational habitats—shellfish reefs, seagrass meadows, kelp forests, and coastal wetlands—we can rebuild ecological resilience, improve water quality, and reduce the risk of future blooms.

We urge the Senate to:

- Recognise marine ecological restoration as a core strategy in responding to harmful algal blooms.
- Recognise that investment made in repairing the marine environment in response to the algal bloom should be treated as essential infrastructure, rather than solely as an environmental expenditure.
- Support and scale up restoration efforts in South Australia and nationally.
- Allocate funding aligned with the scale of ecosystem loss and restoration potential. To deliver a meaningful state-wide restoration program that rebuilds shellfish reefs over their former extent (72 locations) and reinstate crucial filtration capacity and fish productivity, this will require funding of \$500M+ over the next 5-10 years. This is minimal money when compared to other Government funded infrastructure projects including the current South Road North-South corridor expected to cost the community \$15.4 B and insuring the economic contribution from South Australia's aquaculture and commercial fisheries.
- Recommend that the Clean Energy Regulator progress shellfish reef restoration as an eligible method under the Nature Repair market to generate biodiversity credits and a return on investment.

By working with nature, we can restore balance to our marine environments and build resilience for future generations.

Yours Sincerely,

Anita Thomas
Chair, on behalf of the SER-A Board
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