



Submission to the Senate Inquiry into Algal Blooms in South Australia

Submitted by the Great Southern Reef Foundation (GSRF)
22 August 2025

About the Great Southern Reef Foundation

The Great Southern Reef Foundation (GSRF) provides a voice and vision for Australia's temperate reef ecosystems. Working across all five southern states, we collaborate with scientists, educators, coastal communities, and First Nations people to communicate research and advocate for science-led action to protect reef health.

Since March 2025, GSRF has been actively documenting the ecological and community impacts of the harmful algal bloom. We have supported the communication of citizen science reports of mass mortality, directly engaged with impacted communities, provided some of the first underwater vision of impacted areas and assisted in coordinating rapid-response scientific surveys. This submission reflects both our direct engagement with affected communities and our collaboration with scientists from the Great Southern Reef Research Partnership.

Executive Summary

The 2025 harmful algal bloom in South Australia represents the most extensive marine mortality ever recorded in the state. It has devastated biodiversity, damaged fisheries and tourism, and caused deep cultural and social loss. It is also a preview of climate-driven disasters that will strike more frequently without proactive national investment in preparedness and resilience.

While the ecological devastation of this bloom is evident from the high number of species washing ashore, the true extent of impacts underwater remain unknown. A chronic lack of investment for reef biodiversity monitoring has undermined the ability of science and management agencies to determine the impacts of the HAB. Australia has been a world leader in the development of biodiversity monitoring methods and maintains strong collaborative networks across science, management and government agencies throughout the Great Southern Reef. However, under-funding undermines the ability of these programs and networks to adequately monitor the impacts of the HAB and the broader implications for the Great Southern Reef. Without investment in biodiversity monitoring: 1) assessments of potentially vulnerable, threatened and endangered species cannot take place, 2) Prioritisation of at-risk species and ecological communities stall and 3) Recovery and restoration programs cannot take place.



We recommend a two-stage federal investment pathway:

1. Immediate response - \$6 million over 2 years to implement governance structure to establish a coordinated biodiversity monitoring program for the Great Southern Reef and commence coordinated and systematic biodiversity monitoring of HAB affected species and habitats throughout the Great Southern Reef.

This initial investment would:

- Establish coordinated governance arrangements for marine biodiversity monitoring on the Great Southern Reef, that consider overlapping State and Federal jurisdictions, integrate western and cultural science.
 - Enable standardised methodologies for monitoring to be implemented across jurisdictions to increase efficiency of coordinated national response to HAB and future events.
 - Leverage the initial funding announcement to assess the ecological impacts of HAB affected areas within South Australia.
 - Determine changes in the population status of South Australian marine species, throughout their distribution on the Great Southern Reef to prioritise species/habitat recovery plans in HAB affected areas.
 - Leverage existing national data facilities with a decision support platform to synthesise and tailor critical reef information for managers, policymakers, and communities.
2. Sustained investment - \$40 million over 10 years to build on the initial investment and deliver a sustained, coordinated, inclusive, and adaptive monitoring program that provides the fundamental knowledge base to support resilience-based management, protect biodiversity and inform sustainable use of the Great Southern Reef.

Australia cannot prepare for the future without this evidence base. The harmful algal bloom exposed the cost of inaction, and part of the solution is a national biodiversity monitoring framework that delivers for people, nature and the economy.



Introduction

The 2025 algal bloom in South Australian waters is a marine disaster of unprecedented scale. Driven by climate-linked marine heatwaves and nutrient enrichment, the bloom has been estimated to have devastated marine life across more than 4,000 km² of coastal waters. However, the true extent, including the depth of impacts remains unknown.

This crisis is not an isolated event but an early signal of wider climate-driven threats to Australia's temperate reefs.

The Great Southern Reef Foundation is the only national charity dedicated to protecting and restoring Australia's temperate reef systems. Our work is guided by the Great Southern Reef Research Partnership - a collective of leading scientists from across all five temperate states. This partnership ensures that our recommendations are grounded in the best available evidence, with input from experts in marine ecology, fisheries science and climate impacts.

The Great Southern Reef Foundation submits that the harmful algal bloom of 2025 exposes a fundamental national gap: the absence of long-term, integrated biodiversity monitoring of the Great Southern Reef. This submission highlights:

- The national significance of the Great Southern Reef.
- The ecological, economic, and cultural toll of the 2025 algal bloom.
- The urgent gap in biodiversity monitoring.
- Recommendations for a long-term biodiversity monitoring program to guide future-proofed restoration and coordinated national action.

The Great Southern Reef: National Significance

The Great Southern Reef (GSR) is an interconnected system of temperate reefs stretching over 8,000 km of coastline and spanning five states, from northern New South Wales to Kalbarri in Western Australia. It covers more than 631,000 km² of state and federal waters.

Key facts:

- 67% of Australians live along the GSR.
- It contributes \$11.5 billion per year to the national economy through fisheries, aquaculture, tourism, and ecosystem services.
- It supports the harvest of 20,000 tonnes of wild caught seafood annually, conservatively valued at \$400-500 million per year in landed catch and sustaining thousands of regional jobs and export markets.
- It's a tourism drawcard, attracting 18 million visitors per year.
- It is a global biodiversity hotspot, with ~70% of species found nowhere else on Earth.



Despite this significance, the GSR is chronically underfunded in monitoring and management compared to other significant marine ecosystems in Australia, like the Great Barrier Reef.

Impacts of the 2025 Algal Bloom

The current HAB is the most extensive marine mortality event recorded in South Australia.

Impacts include:

- **Marine biodiversity and ecosystem health:** To date, the majority of ecological impacts from the HAB are known from animals washing ashore, while relatively little is known about the extent of damage underwater. Currently, over 470 species have been recorded washed ashore, including dolphins, sharks, crustaceans, and echinoderms. Strikingly, more than 330 dead weedy sea dragons have been reported washed ashore and over 50 leafy sea dragons, representing severe blows to breeding populations. For the most part, the diversity and abundance of taxa washing ashore is highly unusual and points to the high mortality resulting from the HAB. Shoreline observations do not capture all species, however, as heavier species such as abalone, likely remain under-represented. Without standardised baseline data from before the HAB, shoreline observations also fail to capture the relative magnitude of impacts that are taking place underwater.

Long term diver-based biodiversity surveys of South Australian reefs in HAB affected areas do exist but to date only 14 of these sites have been resurveyed since the HAB began. The best surveyed reefs occur in Encounter Marine Park on the Fleurieu Peninsula, where fish, mobile invertebrates and habitat cover have been consistently surveyed annually or biennially for the past 20 years. These **standardised long term surveys are critical to assess the relative change in population size and community structure on reefs from the HAB**. For most other affected areas, including Yorke Peninsula and the Spencer gulf, reefs have been surveyed less frequently with 1 – 5 observations sporadically recorded over the past 20 years.

From the surveys conducted to date by the Great Southern Reef Research Partnership, the majority of commonly observed species displayed steep declines in abundance, relative to previous observations (Fig. 1). Specifically, 15 commonly observed fish species and 18 commonly observed invertebrate species were not observed at all, across the 14 reefs, while another 15 fish species and 12 invertebrate species, showed significant declines in abundance by June 2025. Further surveys this summer in collaboration with the SA Department of Environment and Water will be critical to continue to quantify the magnitude of impact by the HAB across impacted sites.

Critically, future surveys should also compare the impacts to habitat forming species such as seaweed and sessile invertebrates (e.g. sponges, ascidians, bryozoans) with historical baseline data. While impacts to these taxa have not been quantified to date,



underwater observations by Scott Bennett and Stefan Andrews, suggest that sessile invertebrates are some of the worst affected taxa.



Image 1: Jetty pylons at Edithburgh before and after bloom impacts. Photo: Stefan Andrews

- **Economic disruption:** The collapse of fisheries, aquaculture, and marine tourism has cost South Australian communities millions of dollars and eroded consumer confidence in local seafood.
- **Cultural and social impacts:** Indigenous communities have lost access to traditional fishing grounds, while regional communities report grief and eco-anxiety as local marine life perishes.
- **Public Concern:** More than 500 Australians submitted responses to a public survey coordinated by the Great Southern Reef Foundation. Of these, around 65% addressed their messages directly to federal leaders, calling for urgent investment in long-term monitoring, climate action, and proactive planning. This highlights both the depth of community concern and the strong social license for coordinated state and federal investment.

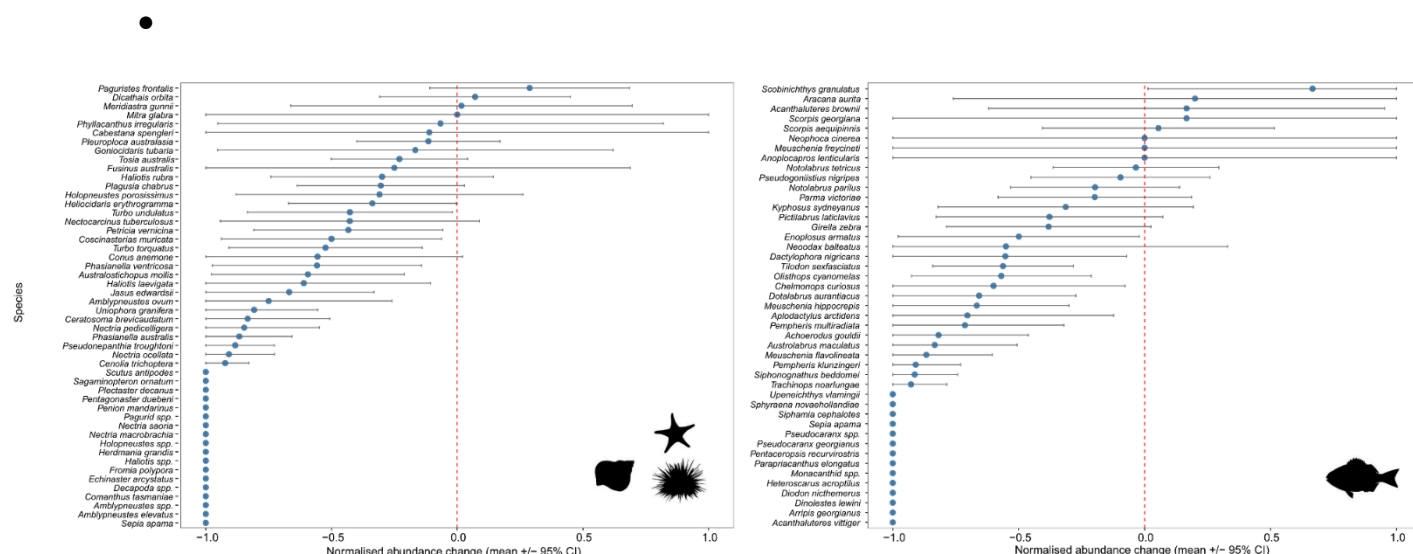


Figure 1. Normalised abundance change (\pm 95% confidence intervals) in commonly observed reef species of mobile invertebrates (left panel) and fishes (right panel) across 14 sites on Yorke Peninsula and Victor Harbour in June 2025. Normalised abundances of -1 signify complete absence of a species across all sites, relative to previous years. Values of 0 and 1 signify no change or 100% increase in abundance, respectively, relative to previous years.

The Missing Piece: Biodiversity Monitoring

E. Current support and recovery arrangements for impacted industries and communities: iii) research, monitoring and restoration

The funding package of \$28M by the South Australian and Commonwealth governments is a welcome initial investment to the HAB. Within this, we acknowledge the critical investments toward science, such as the \$8.5M toward coastal environmental monitoring and \$3M earmarked to assess the ecological impacts of the HAB on fisheries and marine parks.

When considering support and recovery arrangements to date, it is important to recognise the different types of 'monitoring' that take place. Physical environmental monitoring and forecasting (e.g. temperature, waves, currents, nutrients etc.) are critical to providing real time or advanced warnings of marine heatwaves, or conditions that could trigger HABs. Similarly early detection of the onset of HABs and monitoring the taxonomy, extent and intensity of HABs specifically, is critical to diagnosing the nature of the event unfolding and the types of impacts to be expected.



The utility of physical environmental and HAB monitoring, however, is to provide timely warnings of potential impacts to marine species, ecosystems and the flow-on effects to human society. **Biodiversity monitoring is essential for calibrating and contextualising the information provided by physical and HAB monitoring into the language of marine species and habitats, which ultimately human society depends on.** Biodiversity monitoring tells us directly what the condition of marine species and habitats are and how they are changing through time.

At the time of this submission, we are still in a phase of diagnosis and describing the nature and drivers of the HAB and the physical environmental conditions that caused it. As described in b.iii the ecological impacts of the HAB are still only emerging and the extent of *in-situ* impacts to species and habitats are yet to be fully quantified. As such, ecological recovery and restoration efforts are premature and will need to come once comprehensive underwater assessments of ecological impacts have taken place. Biodiversity monitoring of reefs and comparing the status of species and habitats before (during) and after the HAB will be essential to informing decisions on the prioritisation of recovery efforts.

Recovery and restoration of species and habitats is challenging, expensive and when successful, takes many years of sustained effort. Significant and sustained funding will therefore be critical to this process. We welcome the Federal Environment Ministers announcement to [fast-track marine life assessments](#) in a program analogous to the response to the Black Summer bushfires. The level of investment in [response to the black summer fires](#) will be critical to recovering marine species and habitats affected by the HAB.

F. the adequacy of long-term monitoring, forecasting and prevention strategies, including funding and institutional support for marine science and environmental data collection

Here we focus our submission specifically on the need for biodiversity monitoring, as our primary concern and area of expertise. In saying this, we recognise the importance of physical environmental monitoring and HAB specific monitoring to anticipate, detect and respond to HABs or other significant ecological events, as described in e.iii.

We propose that adequate long-term biodiversity monitoring programs are an essential foundation for forecasting the ecological impacts of extreme events (e.g. HAB and marine heatwaves) and determining scalable, realistic prevention/adaptation strategies. Further, we argue that in the context of South Australian marine ecosystems, which sit nested within the Great Southern Reef, biodiversity monitoring should be coordinated between state and commonwealth management and scientific agencies which share common species and ecosystems (i.e. across the Great Southern Reef).



To understanding the full impact of the HAB, placing species declines into the context of populations status and trajectory throughout the species range (i.e. across southern Australia) is crucial to understanding a) the potential for recovery, b) changes in listing status under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), and c) prioritise recovery and restoration efforts.

Currently, in South Australia, and across the Great Southern Reef there has been a chronic lack of investment for reef biodiversity monitoring that undermines the ability of science and management agencies to determine the impacts of the HAB. Australia has been a world leader in the development of biodiversity monitoring methods through programs such as the Australian Temperate Reef Collaboration (ATRC), Reef Life Survey (RLS), and Stereo-Video fish survey methods. Australia also maintains strong collaborative networks across science, management and government agencies throughout the Great Southern Reef. However, chronic under-funding undermines the ability of these programs and networks to adequately monitor the impacts of the HAB and the broader implications for the Great Southern Reef.

To address this issue, we propose the establishment of a Great Southern Reef integrated monitoring program (GSRIMP) that will provide the fundamental knowledge base to support resilience-based management, protect biodiversity and inform sustainable use of the Great Southern Reef. We recommend a two-stage federal investment pathway to achieve this, consisting of a \$6 million immediate response to establish the program within the next two years and a sustained \$40 million investment to execute the program over the next 10 years.



The strategic objectives of the GSRIMP include:

1. **Track reef trajectories:** Quantify the population status and trajectory of reef species over time across the Great Southern Reef, to inform early warning signs of ecosystem change, trigger targeted interventions and support resilient fisheries, tourism, and coastal communities.
2. **Socioeconomic synthesis of Australian values:** Collect and synthesise Australia-wide socioeconomic data about human use, values and behaviours to understand our relationship with the Great Southern Reef and how this maps to reef health and management practices.
3. **Integrate Knowledges to empower management:** Ensure integration and interoperability of biophysical and socioeconomic data streams to calibrate forecasts (e.g. MHW forecasts), synthesise realised change and provide centralised reporting of management priorities (e.g. species distribution shifts and efficacy of marine parks, fisheries management and stewardship interventions).
4. **Decision Support Platform to synthesise information:** Develop user-friendly, interactive decision support platform tailored to managers, policymakers and the public to provide ease of access and understanding of critical reef information.
5. **Indigenous Leadership:** Embed Indigenous knowledge and co-governance in monitoring and decision-making.
6. **Integrated Governance:** Coordinate multi-jurisdictional efforts across State and Commonwealth agencies and institutions.
7. **Invest in people:** Invest in training and capacity-building within the states and key organisations across the Great Southern Reef to fulfill strategic objectives of monitoring program
8. **Innovation and Technology:** Complement and calibrate established survey methods with emerging tools (e.g. eDNA, AI, AUVs) for scalable monitoring.



Recommendations

1. Immediate response: Allocate an urgent \$6 million over 2 years to implement governance structure to establish a coordinated biodiversity monitoring program for the Great Southern Reef and commence coordinated and systematic biodiversity monitoring of HAB affected species and habitats throughout the Great Southern Reef.

Outcomes will:

- Establish coordinated governance arrangements for marine biodiversity monitoring on the Great Southern Reef, that consider overlapping State and Federal jurisdictions, integrate western and cultural science.
- Enable standardised methodologies for monitoring to be implemented across jurisdictions to increase efficiency of coordinated national response to HAB and future events.
- Leverage the initial funding announcement to assess the ecological impacts of HAB affected areas within South Australia.
- Determine changes in the population status of South Australian marine species, throughout their distribution on the Great Southern Reef to prioritise species/habitat recovery plans in HAB affected areas.
- Leverage existing national data facilities with a decision support platform to synthesise and tailor critical reef information for managers, policymakers, and communities.
- Act as a proof of concept to demonstrate feasibility, coordination, and value for a long-term Great Southern Reef biodiversity monitoring program.

2. Sustained investment: staged funding for a 10-year, Great Southern Reef Integrated Monitoring Program (GSRIMP)

- Commit to developing a \$40 million, 10-year integrated biodiversity monitoring program for the Great Southern Reef to build on the initial investment and deliver a sustained, coordinated, inclusive, and adaptive monitoring program that provides the fundamental knowledge base to support resilience-based management, protect biodiversity and inform sustainable use of the Great Southern Reef.
- This initiative should be co-designed with Commonwealth and state governments, First Nations organisations, research institutions, industry, and community partners to ensure broad buy-in and national consistency. It must integrate and expand existing programs, embedding capacity building and training pathways across regions and sectors.
- The immediate response (Recommendation 1) provides the bridge for this program: generating urgent data, demonstrating feasibility and coordination, mobilising existing partnerships, and laying the foundations for this enduring program.



Outcomes will:

- Deliver the long-term, system-wide biodiversity data required to guide fisheries management, restoration planning, threatened species assessments, and climate adaptation.
- Build enduring skills and capacity in ecological monitoring and data analysis across states and communities.
- Provide transparent, publicly accessible information to strengthen community trust, industry confidence, and government decision-making.
- Unlock additional investment from state governments, biodiversity offsets, and philanthropy by establishing a robust governance and reporting framework, mirroring the model that has successfully diversified funding for the GBR.



Image 2: The holdfast of a golden kelp *Ecklonia radiata* surrounded by bare rocky reef habitat in bloom impacted waters of Gulf St. Vincent Photo: Stefan Andrews



Conclusion

The 2025 South Australian algal bloom is not an anomaly - it is a warning of future climate-driven significant ecological events. Without systematic biodiversity monitoring, Australia will remain blind to the true scale of marine crises and unable to prepare for the future.

The Great Southern Reef is a national natural asset, sustaining biodiversity, fisheries, tourism, and the wellbeing of millions of Australians across five states. Yet it lacks the very evidence base required for effective management.

We urge the Senate to recommend urgent investment in:

- **Commission an urgent \$6 million over 2 years** to implement governance structure to establish a coordinated biodiversity monitoring program for the Great Southern Reef and commence coordinated and systematic biodiversity monitoring of HAB affected species and habitats throughout the Great Southern Reef; and
- The **staged investment of a long-term, \$40 million integrated monitoring program** for the Great Southern Reef.

This is a prudent investment into safeguarding an ecosystem worth \$11.5 billion annually, and in protecting Australia's marine life and coastal communities for generations to come.