

# Longspined Sea Urchin



Towards a national five year business plan  
for collaborative management

SEPTEMBER 2023

THIS PROJECT IS SUPPORTED BY:



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*In the spirit of reconciliation we acknowledge the Traditional Custodians of country throughout Australia and their connections to land, sea and community. We pay our respect to their Elders past and present and extend that respect to all Aboriginal and Torres Strait Islander peoples today.*

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The Task Force has worked hard on developing this plan over the past months to ensure it reflects the needs of each jurisdiction and its stakeholders, and it considers existing industry, research, modelling, and monitoring projects. We welcome ongoing feedback or comments, as the Plan will remain agile. Please contact the report coordinator Belinda Cay, to share any additional ideas which can then be sent to the Task Force on: [belinda.cay@agcommunicators.com.au](mailto:belinda.cay@agcommunicators.com.au)

The Task Force consists of key national players as follows:

- Travis Dowling, CEO, Victorian Fisheries Authority (VFA)
- Dr Ian Dutton, General Manager – Marine Resources, Department of Natural Resources and Environment, Tasmania (NRE Tas)
- Dr Alistair Hobday, Senior Principle Research Scientist, CSIRO
- Dr Patrick Hone, Managing Director, Fisheries Research and Development Corporation (FRDC)
- Dr Chris Izzo, Senior Research Portfolio Manager, FRDC
- Luke Osullivan, Director of Fisheries Management, Policy, Science and Licencing, VFA
- Dr Rachel Przeslawski, Research Leader, Marine Ecosystems – NSW DPI
- Sharna Rainer, Senior Fisheries Management Officer, NRE Tas
- Thor Saunders, Director Fisheries Research, NSW DPI
- Sean Sloan, Deputy Director General, NSW DPI
- Damian Young, Senior Fisheries Manager Commercial Fisheries, NSW DPI

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Photo: Matt Testoni

## Executive Summary

The southward range extension of the native longspined sea urchin (*Centrostephanus rodgersii*, or 'Centro') is a threat to traditional values, marine biodiversity and the livelihoods of coastal communities in the eastern part of Great Southern Reef (GSR) region.

The Great Southern Reef covers 71,000 square km, and hosts significant marine biodiversity, supporting Australia's endangered Giant Kelp Forest communities, thousands of species of seaweeds, sponges, crustaceans, chordates, bryozoans, echinoderms and molluscs and contributes over AU \$10 billion to the Australian economy annually (Wernberg et al. 2015, Keane and Ling 2022). This reef underpins the blue economies of NSW, Victoria and Tasmania and has sustained cultural wellbeing for more than 60,000 years.

The ecological functioning, health and productivity of the Great Southern Reef (GSR) is increasingly threatened by marine warming. Ocean temperatures throughout the East Australian Current are now 2 degrees warmer, which has facilitated the southward range-extension of Centro. Centro is endemic to NSW waters but has significantly extended its range and abundance over the past four decades through southern NSW, eastern Victoria and as far south as Port Davey in south-western Tasmania.

It is estimated that around 2,000 km of Great Southern Reef coastline, an area comparable to the length of the Great Barrier Reef (Verges et al. 2023), is now impacted by Centro overgrazing. This is evident in a vast expanse of barrens, grazed kelp beds and depleted reef-dependent species like abalone, rock lobster, and fish (IMAS, 2023). The transformation of kelp-reef habitats into urchin-barren rocky reefs also alters ecosystem services such as wave buffering and nutrient cycling, affecting the overall inshore ecosystem (FRDC, 2023).

The climate-driven southward range expansion of Centro is one of the largest and most immediate threats to kelp-dominated reef ecosystems in south-eastern Australia (Keane and Ling 2022). In fact, researchers state that 'across Australia's temperate reefs, no other benthic herbivore has as large an effect on shallow reef communities as the Longspined Sea Urchin' (e.g. Fletcher 1987; Andrew 1991; Andrew & Underwood 1992; Ling 2008; Keane and Ling 2022). For example, the flow-on impacts of over grazing have caused a local loss of over 150 species that live amongst Tasmanian kelp beds (Ling 2008, Keane and Ling 2022). Amongst these are significant commercial industries such as the Blacklip Abalone (*Haliotis rubra*; total annual gross value of production ~\$50 million) and Southern Rock Lobster (*Jasus edwardsii*; total annual gross value of production ~\$100 million) (Johnson et al. 2005; Strain & Johnson 2009; Johnson et al. 2011 cited in Keane and Ling 2023).

Centro also impacts Aboriginal people significantly. It's range expansion and invasion into Sea Country impacts and threatens cultural practices and spiritual/lore.

Centro populations in the South-east marine region of Australia, which encompasses Tasmania, Victoria, and the far south coast of New South Wales, are expected to continue to increase over the next 100 years (Davis et al 2023). Projections suggest that without a meaningful response, approximately half of all reefs in eastern Tasmania could become urchin barren grounds by the mid-2030s (Keane and Ling 2022).

To address this issue, the Centro Task Force proposes an immediate national investment of \$55 million over five years into research, monitoring, modelling, removal (sustainable commercial and cultural removal, and harvesting) and processing opportunities, plus development of coordinated management, policy and communication. This investment aims to ultimately monitor, protect and rehabilitate marine habitats and culturally significant Sea Country, conserve natural capital, and boost socio-economic and ecological benefits.



The Centro Task Force, which is comprised of representatives from the three state fisheries agencies (the Victorian Fisheries Authority (VFA), Marine Resources – Department of Natural Resources and Environment Tasmania (NRE Tas) and NSW Department of Primary Industries – Fisheries (NSW DPI)), the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Fisheries Research and Development Corporation (FRDC), has conducted consultation meetings with over 30 stakeholders in June, July and August. These meetings, coupled with findings from the National Centrostephanus Workshop in February 2023, have gleaned insights into the collective need for co-ordinated national management across all three States and adjacent Commonwealth waters, as a matter of urgency. To guide this coordinated management, the Centro Task Force has developed this Business Plan (the Plan). The Plan reflects the key aims, actions and priorities required to drive a unified national approach to tackling the varying challenges presented by Centro across its range.

Through this plan, we will create a flexible and agile investment framework that allows tailored solutions to be applied at the regional level, considering the specific needs and challenges

faced in each state and jurisdiction. Whilst the level of threat and risks posed by Centro differ greatly between each State and within specific areas of each State, the solutions will be most effective if unified. We recognise the importance of working together, bringing together representatives from state fisheries agencies, local, State and Federal government departments, research institutions, Aboriginal people, the dive and processing industry and community stakeholders.

We are committed to implementing rigorous research, including consistent approaches to monitoring and modelling, to gain deeper insights into the dynamics of the Great Southern Reef and its threatened kelp-dominated habitats, while supporting local stewardship initiatives in concert with a commercial urchin diving and processing industry. We will strike a balance between conservation efforts and economic prosperity, and have offered a plan which is agile and scalable allowing for the specific needs of each jurisdiction. The plan also emphasizes the importance of cultural values in marine conservation while incorporating community engagement for wider support and acceptance.

### Priority Recommendations:

- 1) An immediate national investment of \$55 million into Centro control, guided by this Plan’s action areas and priorities.
- 2) Continuation of the national Task Force to govern the national investment delivery, and drive the coordination, implementation and reporting (via a small secretariat hosted by a Task Force member).
- 3) Establishment of a National Centro Advisory Group including representatives from Aboriginal community controlled organisations, industry, researchers, commercial dive, processing and the recreational dive sector, to provide guidance, co-design, coordination and delivery of actions at a State and regional level.

## Our Approach

### VISION

Our vision is that the diverse ecosystems of the Great Southern Reef supports the wellbeing of future generations.

### MISSION

Work collaboratively to deliver targeted longspined sea urchin management activities to protect and rehabilitate the ecological integrity and productivity of the Great Southern Reef, support the cultural heritage and traditional values of Sea Country, and create sustainable and prosperous commercial opportunities for industry and communities.

AIMS	ACTION AREAS	PRIORITY ACTIONS
Identify and manage priority areas  Monitor Reef recovery and measure impact	1. Reef Monitoring and Modelling	1.1 Determine historical reef baselines (prior to ocean warming and predator exploitation) across the distribution of Centro to, where possible, define desired reef state.
		1.2 Develop standardised reference surveys of urchin abundance, biomass surveys, mapping and modelling of historical baselines to identify national areas for priority control.
Prevent Barren Formation	2. In Water Centro Control and Rehabilitation Strategies	1.3 Develop sustainable fishing and density targets / benchmarks / abundance guidelines to inform decisions and establish a common framework for impact reporting for reef health. Partner with Aboriginal people to develop monitoring and management strategies, which recognise their knowledge and responsibilities to care for sea country.
		1.4 Review and utilise marine spatial planning and other optimisation tools to develop a nationally integrated approach to management and guide priority areas of investment.
		2.1 Develop strategic harvest strategies to manage Centro across Tas, NSW and Victoria.
		2.2 Investigate targeted urchin removal for habitat protection and restoration of reefs of priority (as informed by Action Area 1).
Restore Sea Country  Protect, Restore and Rehabilitate Reef Health  Foster Sustainable Enterprises	3. Support Harvesting and Processing	2.3 Habitat restoration of biologically, culturally, and economically important areas to recover biodiverse and productive kelp forests.
		2.4 Development of a Tri-State incentivised Centro fishing strategy.
		3.1 Support Centro processing businesses.
		3.2 Explore the bottlenecks for expansion of the fishery where relevant.
		3.3 Drive innovative whole of product use.
		3.4 Drive new national and international markets for Australian Centro.
4. Management of Sea Country	4. Management of Sea Country	3.5 Support circular economy initiatives in processing businesses.
		3.6 Support for State Industry Associations to deliver national Centro initiatives.
		4.1 Ensure that Aboriginal organisations are effectively represented in the Southern Centro Advisory Group. Ensure that representative community controlled Aboriginal organisations are included.
		4.2 Support the establishment of Sea Country Restoration projects, which support and recognise cultural obligations to care for Country and values knowledge.
		4.3 Ensure opportunities for Aboriginal entry into the commercial fishery and management of the resource outside of traditional fisheries.
		4.4 Establish training and capacity building programs centred around Centro removal.

Research and Development: Knowledge to underpin a national management approach.

Communication and Engagement: Building community awareness and acceptance.

Collaboration and National Approach: Robust partnerships and coordinated management.

Development / review of cross jurisdiction policies that promote cross sector collaboration and efficient Centro control.

### OUTCOMES

#### Reduced urchin barrens leading to thriving reef ecosystems:

- Improved reef health, marine ecosystems and Sea Country which is valued and utilised by community.
  - Successful and supported fisheries, with national and international markets.
- Aboriginal people involved with management of sea country and benefit from urchin control.



Photo: Matt Testoni

## Background

This paper presents our Plan, and provides clear aims, priority actions and a pathway for effective management.

In February 2023, a National Centrostephanus Workshop was convened by NRE Tas, with co-sponsorship from the FRDC. The workshop brought together 130 representatives from industry, government, research, organisations, Aboriginal communities, recreational fishing groups, and the general community to:

- Identify challenges and opportunities related to Centro across regions.
- Identify the R&D gaps across the Centro range.
- Foster cross-jurisdictional and inter-sectoral relationships, as well as information sharing for improved management outcomes.
- Contribute to the design of a coordinated regional approach for the sustainable management of longspined sea urchin – the ‘Regional Management Strategy’.

A key outcome of the Workshop was the commitment to establish a Centro Task Force comprising representatives of the three state fisheries agencies, the VFA, NRE Tas and NSW DPI, and the CSIRO and FRDC. A key role of the Centro Task Force was the development of this business plan (the Plan) for collaborative, best practice management of Centro. The Plan’s charter was to reflect key actions and initiatives required to effectively monitor and manage Centro, and to identify research, projects and actions required to achieve improved coordination and management of Centro management across its native range in New South Wales and Victoria, and its extension into Tasmania.

The Task Force consulted and engaged with national stakeholders to gain input and feedback on management priorities and actions. All stakeholders were invited to be part of the consultation process. Over 30 consultation meetings with stakeholders including researchers, commercial divers, recreational divers, Aboriginal people, industry, and businesses were held to seek feedback, insights and recommendations for the development of the Plan. The submissions to the Senate Inquiry (which can be viewed online at: [Climate-related marine invasive species – Parliament of Australia \(aph.gov.au\)](https://www.parliament.gov.au/inquiries/committee/2023-04-06-climate-related-marine-invasive-species)) were also reviewed, along with the findings and feedback from the National Centrostephanus Workshop. This approach enabled the review of:

- The current state, and impact, of Centro range expansion.
- Marine ecosystem health across Tasmania, Victoria and NSW.
- Management and research needs to ensure marine ecosystem health across Tasmania, Victoria, and NSW.
- Potential controls and interventions to manage Centro densities below key ecological thresholds.
- Strategies to rehabilitate damaged ecosystems.
- Potential new markets for Centro as a food product.
- The need to support the dive and processing sector.
- The need to empower Aboriginal communities to manage Centro on sea country.
- Productive utilisation of waste from food processing.
- Governance, project co-design, communication.
- Risks, opportunities, actions and research priorities.

The costs of range-extending species, if unchecked, can represent a significant drag on local and regional economies. Effective management requires a coherent strategy and appropriate level of financial commitment to support both strategy development and “in the water” control efforts over a meaningful time frame. Well-targeted efforts can generate a significant economic return for fisheries, tourism and related marine industries and their dependent coastal communities, as well as promote the recovery of ecologically critical species such as kelp, and economically important species like abalone and rock lobster, whilst also improving the long-term resilience of marine habitats.

Stakeholders are committed to the development of a new nationally coordinated Centro strategy which respects the different cultural, ecological and economic factors that influence Centro management objectives across all jurisdictions. They stressed the need for improved political alignment, coordination, commitment, cross jurisdictional funding, and continuity of the investment. There was broad agreement that the lack of national funding was a major factor limiting more effective control. They also declared a need for political investment in ecosystem recovery and maintenance for the Great Southern Reef, with coordination of activities to manage the impacts/expansion of urchins and the development of clear policy which gives direction on urchin control strategies. Such coordination will also inform future responses to other range-extending species that cause ecological shifts, as such extensions are only expected to increase with climate change.

It is essential that this funding consider the distinctive needs of Centro control and management in Tasmania, Victoria and New South Wales, with consideration given to the various sectors and rights-holders. The Centro Task Force wish to acknowledge from the outset that the starting point, values and requirements for each region differ, and the approaches developed and employed through this program need to be flexible enough to accommodate these differences. Although Centro control practices and targets will vary from State to State – and indeed may vary between areas within a State – the overall approach will be unified and strategic under one business framework.



### Did you know:

*“The flow-on impacts of kelp bed overgrazing by this urchin are dramatic, with local loss of over 150 species that live amongst Tasmanian kelp beds (Ling 2008), which threatens parts of the lucrative fisheries for Blacklip Abalone (*Haliotis rubra*; total annual gross value of production ~\$50 million) and Southern Rock Lobster (*Jasus edwardsii*; total annual gross value of production ~\$100 million)”.*

(JOHNSON ET AL. 2005; STRAIN & JOHNSON 2009; KEANE AND LING 2022)

“Our community has a strong connection to Sea Country and a cultural responsibility to keep it healthy. We must participate in management strategies to control long-spined sea urchins, including through community-based management programs and the commercial fishery. We need to be involved so that our knowledge and people can help to avoid the collapse of our cultural resources, which are critical to our cultural practices, identity, and health.”

ANDRY SCULTHORPE,  
LAND AND HERITAGE MANAGER,  
TASMANIAN ABORIGINAL CENTRE.

## Plan Aims



### Vision:

Our vision is that the diverse ecosystem of the Great Southern Reef support the wellbeing of future generations.



### Mission:

Work collaboratively to deliver targeted longspined sea urchin management activities to protect and rehabilitate the ecological integrity and productivity of the Great Southern Reef, support the cultural heritage and traditional values of Sea Country, and create sustainable and prosperous commercial opportunities for industry and communities.



### Plan Aims:

#### 1. Identify and Manage Priority Management Areas:

Identify priority management areas and implement targeted urchin management programs.

#### 2. Monitor Reef Recovery:

Continuously monitor and assess Centro range extensions and the outcomes of management activities.

#### 3. Prevent Barren Formation:

Mitigate Centro range extension and prevent the formation of new barrens in ecologically, socially and culturally important and productive reef areas.

#### 4. Protect, Restore and Rehabilitate Reef Health:

Reduce and recover existing Centro barrens in ecological, economic, social and culturally important and productive reef areas.

#### 5. Foster Sustainable Enterprises:

Grow sustainable and innovative Centro harvesting and processing businesses, which support ecosystem health and generate economic benefits for industry, and cultural and coastal communities.

#### 6. Restore Sea Country:

Empower and support Aboriginal people to manage Centro and barrens recovery in culturally significant areas using traditional knowledge and practice, and build, where appropriate and feasible, commercial businesses. This Plan also seeks to benefit Aboriginal people and communities, and help them fulfill cultural obligations and drive employment.



### Action Areas

Four key management areas have been identified as core to the national management of Centro. These include:

- **Action Area 1:** Reef Monitoring and Modelling
- **Action Area 2:** In-Water Centro Control and Rehabilitation Strategies
- **Action Area 3:** Support for Harvesting and Processing
- **Action Area 4:** Management of Sea Country



### Pillars for Success

**Research and Development:** Knowledge to underpin a national management approach.

**Communication and Community Engagement:** Strategic communication and engagement to ensure stakeholders are supportive of Centro management approaches, the product and opportunities for engagement in stewardship of the GSR.

**Collaborative National Approach:** Robust partnerships with state fisheries agencies, local, State and federal government departments, research institutions, industry stakeholders, Aboriginal representative community controlled organisations, and coastal communities to drive the implementation of national management.

**Policy:** Development / review of cross jurisdiction policies that promote cross sector collaboration and efficient Centro control.

## Action Areas

Four key management areas have been identified as core to the national management of Centro, and delivery against these will form the basis of the plan. These key action areas include:

**Action Area 1:** Reef Monitoring and Modelling

**Action Area 2:** In-Water Centro Control and Rehabilitation Strategies

**Action Area 3:** Support for Harvesting and Processing

**Action Area 4:** Management of Sea Country



Within each action area sits a number of priority actions. It is important to note that over 90 actions were collected in the stakeholder engagement phase, and these were distilled by the Centro Task Force into 21 priorities. Stronger weighting was given to concepts which represented the best value and highest impact at the national level. Consideration was also given to gaps in delivery and current investment.

The success of these action areas will be underpinned by the pillars of:

**Centro Research and Development:** Knowledge to underpin the national management approach will be essential to effective management of Centro. Research and Development will inform the drivers of barren areas, priority areas for removal, habitat recovery, and restoration, and consider the approach to managing deep sea Centro populations.

**Collaborative National Approach:** Robust partnerships with state fisheries agencies, government departments, research institutions, industry stakeholders, Aboriginal representative community controlled enterprises, and coastal communities are essential to drive the implementation of national management.

**Communication and Community Engagement:** Strategic communication and engagement to ensure stakeholders are supportive of Centro management approaches, the product, and opportunities.

**Development of Cross Jurisdiction:** Examine current policies to consider conservation vs preservation approaches, and to generate a more cohesive habitat policy which is embedded into national Fisheries Policy.

### Did you know:



*“Of the approximately 77 marine range-extending species recently documented to have undergone climate-driven extension across Australia, the Longspined Sea Urchin is the most ecologically important due to its ability to overgraze kelp habitats and maintain an alternative and hyper-stable barren grounds”*  
(HILL ET AL. 2003; LING 2008, 2013; LING ET AL. 2009A; REVIEWED BY LING ET AL. 2015; BYRNE & ANDREW 2020 CITED IN KEANE AND LING 2023).



## Action Area 1: Reef Monitoring and Modelling

### About

Coastal water temperatures around south-eastern Australia have increased by 2 degrees Celsius over the past 100 years. This is three times the average increase in global ocean temperatures. This change has impacted southern-eastern marine ecosystems, altering habitats and species distribution. One of the major changes in species distribution has been the range extension of Centro, which now extends through southern NSW into eastern Victoria and as far south as Port Davey in Tasmania, and east from NSW into northern New Zealand. This has resulted in depleted kelp forests and seagrasses, increased disease and habitat shifts. Researchers now estimate that the ecological integrity of 2000 km<sup>2</sup> of the eastern part of the Great Southern Reef has been impacted.

### Rationale

Establishment of adaptive and robust monitoring, modelling and control strategies which prioritise control methods at the local scale and then aggregate these regionally to deliver maximum value for money will be key to the delivery of all Actions. The use of nationally coordinated predictive models will inform annual work priorities. Priority must be given to build on work already undertaken by CSIRO on Centro control in Tasmania<sup>1</sup> e.g. population dynamics, distribution and movement of sea urchins, behavioural ecology, and forecasting future range expansion in a changing climate (e.g. Davis et al 2023). These tactics will enable informed decision-making and proactive management, will guide the setting of sustainable fishing and density targets, and demonstrate effectiveness of

control options. Stakeholder engagement aligns with the views of the Task Force that:

- Preventing barren formation and reducing urchin density is essential, as once kelp forests are overgrazed they are hard to recover.
- There is a need to track the ongoing movement of Centro, and the impacted reefs considering weed edges, biomass and barren formation/expansion.
- Consideration of integrated ecosystem-based management approaches based on sound monitoring and modelling is essential to identify areas of priority management, with regards to ecological, societal, economic and cultural importance.
- There is a need to define what an achievable reef state is across the Great Southern Reef.
- There is a need to develop nationally consistent approaches to monitoring and modelling.
- Restoration and rehabilitation of priority areas of the Great Southern Reef and kelp forests are a priority.
- Modelling must consider stock and predator dynamics, removal strategies and ecosystem conditions, such as biomass, kelp, depth, location, and species mix (i.e. whole ecosystem modelling and flow-on effects of urchin control).
- Modelling the stock dynamics and removal strategies will enable the testing of different management strategies before management actions are undertaken. This improved knowledge can help guide the efficacy of sustainable fishing and density targets, and demonstrate effectiveness of control options.

There is already a large body of research work that underpins our knowledge of appropriate and cost-effective management actions across the range of Centro. This action area would synthesise the existing data and learning from experience with this Plan to inform emerging research needs.



Photo: Matt Testoni

<sup>1</sup> Westcott DA, Fletcher CS, Chades I (2022) Strategies for the management of *Centrostephanis rogersii* in Tasmanian Waters. CSIRO, Australia

## Action Area 1: Priority Actions for National Management

ACTION	CONSIDERATIONS
<p><b>1.1</b> Determine historical reef baselines (prior to ocean warming and predator exploitation) across the distribution of Centro to, where possible, define desired reef state.</p>	<ul style="list-style-type: none"> <li>• Conduct strategic baseline / biomass surveys in NSW, Vic and Tas to develop clear reef baseline data, and understand the extent of barrens.</li> </ul>
<p><b>1.2</b> Develop standardised reference surveys of urchin abundance, biomass surveys, mapping and modelling of historical baselines to identify national areas for priority control.</p>	<ul style="list-style-type: none"> <li>• Development of standardised national monitoring techniques and protocols for data sharing across all organisations involved in this Plan.</li> <li>• Conduct monitoring and mapping to identify management priorities for areas with significant ecological, societal, economic and cultural importance.</li> </ul>
<p><b>1.3</b> Develop sustainable fishing and density targets / benchmarks / abundance guidelines to inform decisions for reef health and predator rebuilding.</p>	<ul style="list-style-type: none"> <li>• Develop national guidelines, including Target Reference Points for urchin abundances and acceptable extent of barrens habitat at appropriate spatial scales, encompassing the varied ecological/social/cultural/economic values across the urchin's endemic and extended ranges. Partner with Aboriginal people to develop monitoring and management strategies, which recognise their knowledge and responsibilities to care for sea country.</li> </ul>
<p><b>1.4</b> Review and utilise marine spatial planning and other optimisation tools to develop a nationally integrated approach to management and guide priority areas of investment.</p>	<ul style="list-style-type: none"> <li>• Define the areas which we want to avoid establishment at all costs.</li> <li>• Identify and prioritise high value reefs and ecosystems for management.</li> <li>• Define areas and approach for the targeted removal of urchins and priority locations considering functional importance, greatest risk of becoming barrens, and appropriate control approaches or provide the greatest return on investment.</li> <li>• Refine urchin removal practices to promote harvesting for the roe market (and other potential commercial uses) while also facilitating targeted removal in areas that would otherwise not be commercially viable – thus balancing ecosystem restoration and commercial fishing objectives. Consider stock dynamics, removal strategies and ecosystem conditions, such as biomass, depth, location, and species mix to inform the different management strategies, and ongoing impact.</li> </ul>

### Did you know:



Current “modelled projections of observed rates of Centro population increase and overgrazing indicate that unless there is meaningful response to this threat, half of all reefs in eastern Tasmania are likely to become urchin barren grounds by mid-2030s.”

(LING & KEANE 2018)

## Action Area 2: In-Water Centro Control Strategies

### About

Key to the Plan and Centro control are targeted in-water diver control and mitigation strategies that limit the spread of Centro, prevent new barrens from forming, and prevent existing barrens from extending.

In-water control may take a range of forms – from commercial divers undertaking contracted removal or subsidised harvesting in priority control areas, through to volunteers and recreational divers operating under a code of conduct, or Sea Country Rangers undertaking Centro control as part of Sea Country stewardship.

Control must also consider the role of natural predators populations to limit incursions. When predators occur at naturally large levels, they can mitigate the incursion of sea urchins and overgrazing in the first place (Ling & Keane 2021). It is noted that predator rebuilding and active rehabilitation strategies can improve resilience.

### Rationale

The implementation of targeted, in-water control and mitigation strategies to directly impact Centro populations is essential. Research shows that the productivity of commercial reef-based fisheries, and kelp-associated biodiversity can collapse once extensive barrens are formed (Keane and Ling, 2022) and extensive barrens are very difficult to rehabilitate, requiring drastic, maintained and expensive intervention to achieve kelp recovery at meaningful scales (Keane and Ling 2022). The overarching aim from the start must be to limit the formation of new barrens.

The type and intensity of in-water control methods that an area requires are best determined by considering the properties of the area. There is a need to formally identify and monitor priority at-risk areas, and to identify the areas of highest economic, social, cultural and commercial value across the States. These areas and the types of control most appropriate in each will be identified in regional control strategies such as the one developed by CSIRO for Tasmania (Westcott et al 2022), which also draws from the Great Barrier Reef experience) and the work conducted in Action Area 1.

Once identified and prioritised, areas can then be targeted for proactive action to prevent or mitigate barren formation by removing urchins, followed by remediation of barrens through rehabilitation activities such as kelp and biodiversity restoration including rebuilding urchin predator populations to limit re-incursions (Ling et al. 2009, Westcott et al 2022). This process needs to be underpinned by research and modelling which considers the impending impacts of climate change.

It is recognised that the commercial dive fishery and key partners in the processing sectors have been the primary means of controlling urchins in Tasmania, and that a subsidy (paid through the Abalone Industry Reinvestment Fund) was essential to incentivise the harvest and drive down urchin abundance. Harvesting programs, such as those initiated by the Tasmanian Abalone Council and Tasmanian Government in 2017/18, provide a low-cost product to processors, while effectively removing and rejuvenating reef ecosystems (and Abalone habitats). It also created a viable fishery and contributes to job and market creation.

Considering existing commercial dive programs it is suggested that fundamental to the success of In-Water Control actions will be providing support for divers, processors, aboriginal organisations and other entities involved. It is also important to support the commercial dive sector, and support Aboriginal participation in the commercial fishery (recognising the importance of this on job creation in remote areas, jobs on country and combines Aboriginal knowledge and responsibilities with commercial enterprise).

Feedback from stakeholders consistently agreed that it is especially important to build and support the commercial dive sector, as they are fundamental to providing a longer term in-water presence; a sustainable Centro fishery guarantees a level of in-water control into the future, subject to the economics of the activity.

Subsidies and other economic incentives (e.g., contracting for take-all harvests which remove all size classes, and not just processable sizes, of Centro) have been an essential management tool in Tasmania to direct effort, and similar incentivised models could be considered across Victoria and NSW if appropriate. Concern was raised that without economic incentives, the pace of processing and market developments will slow and restrict Centro fishing, allowing Centro numbers to thrive. Support for other forms of in-water control can also be developed, for example, by drawing on examples of successful incentivised recreational harvest building on existing targeted removal programs in Victoria and drawing programs like Caribbean Lionfish.

## Action Area 2: Priority Actions for National Management

ACTION	CONSIDERATIONS
<p><b>2.1</b> Develop strategic harvest strategies to manage Centro across Tas, NSW and Victoria.</p>	<ul style="list-style-type: none"> <li>• Ensure the flexibility to enable each jurisdiction to place the necessary emphasis on aspects of most importance to each jurisdiction.</li> <li>• Review zones and protected marine habitats across states to determine areas where harvest can be expanded.</li> <li>• Review State and federal marine park sanctuaries and fishing grounds so zones can be developed up and down the coast where different strategies apply.</li> <li>• Review priority areas for Take-All harvests, and/or culling and consider the support required to implement these locally and regionally.</li> <li>• Consider approaches to stimulate and drive catch targets, where appropriate.</li> <li>• Review policy and facilitate Aboriginal Community control (protect, monitor, manage) in culturally significant Sea Country areas and marine parks, linking to Action Area 4. Subsidies should also target Aboriginal participation in the fishery and other control operations.</li> <li>• Consider current quotas and licencing arrangement across States.</li> </ul>
<p><b>2.2</b> Investigate targeted urchin removal for habitat protection and restoration of reefs of priority (as informed by Action Area 1).</p>	<ul style="list-style-type: none"> <li>• Prevent barren formation.</li> <li>• Remove Centro down below the ecological threshold so it is not deleterious to habitat formation.</li> </ul>
<p><b>2.3</b> Habitat restoration of biologically, culturally, and economically important areas to recover biodiversity, predator population and reestablish productive kelp forests.</p>	<ul style="list-style-type: none"> <li>• Consider stock rebuilding strategies.</li> <li>• Develop a restoration prioritisation strategy for reaching ecological targets at priority reefs or zones. This must consider multiple control options, i.e., harvesting coupled with kelp restoration and reseedling, and rebuilding native species populations such as lobsters and fishes at priority areas.</li> </ul>
<p><b>2.4</b> Development of a Tri-State incentivised fishing strategy.</p>	<ul style="list-style-type: none"> <li>• Consider expanding targeted harvest subsidies to reduce the degradation of significant habitats in Tasmania and Victoria, with consideration given to NSW once informed by mapping of populations to understand range extension and population densities.</li> <li>• Consider harvest subsidies nationally to enhance fisheries and/or spatially target problematic urchin populations.</li> </ul>

**Did you know:** “In eastern Tasmania, the Longspined Sea Urchin has undergone a population explosion from first records of two positively identified individuals in 1978, to 11 million in 2002, to an estimated ~20 million in 2018.” (LING & KEANE 2018).





Photo: Matt Testoni

## Action Area 3: Industry Support for Commercial Harvests and Processing

### About

Unlike many other over-abundant marine species such as the Crown-of-Thorns Starfish on the Great Barrier Reef, Centro presents an economic opportunity. The successful harvest of Centro has created a new fishery which provides product to the Australian and international premium seafood market, delivering economic and employment benefits while reducing the overall impact of Centro on reefs and fisheries.

### Rationale

During consultation with stakeholders, many provided strong feedback that support for processing facilities to be commercially competitive and more innovative is essential. Feedback suggested that support is needed to adhere to eco-

friendly principles, minimize waste, adopt innovative processing techniques, staff recruitment, training and retention, establish value-added products, value-added food products, use of waste (the potential of synthetic biology etc), and encourage / enable more innovative use of all of the components of the urchin.

There is a significant opportunity to brand Centro as a luxury seafood product, and to expand its markets both nationally and internationally. Work is required to ensure the trade pathways and agreements are in place to support access to these markets. Support is also sought to drive training opportunities in compliance, safety, product development and value adding.

Participants expressed the need for a strategic communication campaign that positions Centro as a luxury food while considering the negative impacts of its southern range expansion, and its status as native species in NSW.

## Action Area 3: Priority Actions for National Management

ACTION	CONSIDERATIONS
<p><b>3.1</b> Support Centro processing businesses.</p>	<ul style="list-style-type: none"> <li>• Support businesses to innovate, adapt and capitalise on the opportunities presented by Centro (i.e. product development, business innovation, staff recruitment and retention).</li> <li>• Consider a national approach to subsidies to help support businesses (i.e. generate an employment boost) until the sector is self-sustaining.</li> <li>• Drive commercial value chains.</li> <li>• Support for improvement in Centro logistics to maintain roe quality.</li> <li>• Support value adding opportunities that will expand the range of Centro roe products in consultation with processors.</li> <li>• Support for recruitment and training.</li> </ul>
<p><b>3.2</b> Explore the bottlenecks for expansion of the fishery where relevant.</p>	<ul style="list-style-type: none"> <li>• A strategy is needed to encourage more divers to enter the industry, i.e., support for workforce recruitment and training.</li> <li>• Support for licence holders / incentives for divers to target priority areas.</li> <li>• Support for ongoing training and professional development for Aboriginal people and commercial divers.</li> </ul>
<p><b>3.3</b> Drive innovative whole of product use.</p>	<ul style="list-style-type: none"> <li>• Continued research into the utilisation of centro waste into other applications - such as, but not limited to, fertiliser.</li> <li>• Encourage the development of value-added products from Centro, expanding its market beyond traditional seafood channels, such as cosmetics, pharmaceuticals, and aquaculture feed.</li> <li>• Conduct a desktop review of innovative waste utilisation.</li> <li>• Consider novel processing innovations such as onboard processing, noting biosecurity and waste management risks.</li> </ul>
<p><b>3.4</b> Drive new national and international markets for Australian Centro.</p>	<ul style="list-style-type: none"> <li>• Develop an international trade strategy which considers trade access, policy and relationships, market risks and opportunities for growth.</li> <li>• Conduct market research to identify domestic and international demand for Centro products, highlighting its potential benefits as a sustainable seafood choice.</li> <li>• Develop a product development strategy which builds Australian Centro as a luxury brand product.</li> </ul>
<p><b>3.5</b> Support circular economy initiatives in processing businesses.</p>	<ul style="list-style-type: none"> <li>• Support for processors to invest in circular economy activities i.e. support to reduce their carbon footprint, waste management, use of 100 % of Centro and explore linkages with relevant R&amp;D initiatives.</li> </ul>
<p><b>3.6</b> Support for State Industry Associations to deliver national Centro initiatives.</p>	<ul style="list-style-type: none"> <li>• Consider the delivery of coordinated training in compliance, WHS, data tracking and reef management / monitoring.</li> <li>• Establish a group which helps collect and record diver observations on reef condition, urchin population densities and where removals and harvests should occur. Ensure representation on the National Centro Advisory Group.</li> <li>• Drive national networks and knowledge sharing.</li> </ul>



## Action Area 4: Management of Sea Country

### About

Sea Country in the Great Southern Reef region holds immense significance for Aboriginal people, encompassing not only the physical waters but also the spiritual and cultural connections woven through generations. The waters of the Great Southern Reef are repositories of knowledge, identity, and tradition, intertwined with culture and way of life.

Engagement, inclusion and co-design with Aboriginal community controlled organisations is essential to the success of Centro control and ecosystem restoration in Sea Country. They have a longstanding knowledge of Sea Country and are keen to implement programs which honour culture, build young sea stewards, and generate employment opportunities through viable businesses and industry, such as dive and processing.

This action area presents opportunities to increase Aboriginal led management projects and programs. It presents opportunities to integrate traditional knowledge into national Centro management.

### Rationale

Engagement with representative community controlled organisations and Aboriginal people reported that over-grazing by Centro is impacting Sea Country, cultural connections and activities. Many Aboriginal communities reported population declines in native *Elenchus* spp. maireener shells and seagrasses (both used in the creation of Aboriginal jewellery and customary items), altered ecosystems and impacts on native marine food species like abalone, lobster, and fish, plus an impact to social values and culture.

Engagement with Aboriginal people emphasised the immense impact Centro range expansion is having on Sea Country and stressed the need for nationally coordinated

management which is inclusive, recognises the stewardship rights of Aboriginal people and works to Close the Gap by providing employment and access to commercial opportunities. It was also emphasized that national management must:

- Include Aboriginal people / Aboriginal representative community controlled organisations on the National Centro management committee(s) to ensure there is shared stewardship from the start.
- Create opportunities to bring together Aboriginal people from Tas, NSW and Victoria to drive collaborative Centro management and drives strategies/opportunities for building young Sea Stewards, the use of traditional removal and management practices (such as trapping), building commercial opportunities for Aboriginal businesses in partnership with the Indigenous Land and Sea Corporation and consider strategies for community control efforts.
- Review and consider policies which better enable Community to practice Centro control in Sea Country, and work on effective removal and restoration. This may include a review of regulatory and economic measures to support management in culturally significant regions.
- Create capacity building opportunities for Aboriginal people to connect with Sea Country through diving programs, training, and inclusion in research and industry initiatives including processing and marketing, plus restoration.
- Ensure both the Advisory Committee and Task Force appreciate the importance of holistic ecosystem management, thinking objectively about the sustainability of Sea Country and consider the ecosystem as a resilient living system.
- Explore opportunities to link Centro management with broader to the restorative programs delivered through the Great Southern Reef region.

Feedback was clear in that management needs to consider holistic management of the marine environment and ecosystem in partnership with Aboriginal people.

## Action Area 4: Priority Actions For National Management

ACTION	CONSIDERATIONS
<p><b>4.1</b> Ensure that Aboriginal organisations are effectively represented in the Southern Centro Advisory Group.</p>	<ul style="list-style-type: none"> <li>• Ensure effective engagement, in planning and design of interventions at regional/State/local levels and in monitoring their effectiveness.</li> <li>• Ensure representatives from Aboriginal community controlled organisations.</li> <li>• Ensure engagement through the Community controlled representative organisations, and allocate and leverage funding support to ensure effective operation.</li> </ul>
<p><b>4.2</b> Support the establishment of Sea Country Restoration projects which support and recognise cultural obligations to care for Country and values knowledge.</p>	<ul style="list-style-type: none"> <li>• Conduct a feasibility study to support Aboriginal community controlled post-harvest production opportunities. This will work to investigate dive removal (considering licences and subsidies), processing opportunities in culturally important regions), training (of divers and processors) and market opportunities (local, national and international).</li> <li>• Centro population mapping around culturally important areas.</li> <li>• Explore developmental fishing methods, such as trapping supported by training opportunities (safety, dive techniques and habitat restoration and reseeded).</li> <li>• Develop platforms for effective data collection incorporating Aboriginal knowledge into the broader Centro modeling, monitoring and reporting systems.</li> <li>• Establish community removal and restoration projects which allow community to take Centro out of important Sea Country. Must consider the licence to operate, potential subsidies for regional access, and restoration.</li> </ul>
<p><b>4.3</b> Ensure opportunities for Aboriginal entry into the commercial fishery and management of the resource outside of traditional fisheries.</p>	<ul style="list-style-type: none"> <li>• Support Aboriginal community controlled enterprises to participate in the fishery and incentivise this with subsidies.</li> <li>• Establish new study and career pathways for Sea Country Stewards, working alongside research and Government agencies.</li> <li>• Address Closing the Gap – creating new industry opportunities potentially in partnership with commercial operations and new investors such as the Indigenous Land and Sea Corporation.</li> </ul>
<p><b>4.4</b> Establish training and capacity building programs to facilitate Aboriginal engagement in Centro removal.</p>	<ul style="list-style-type: none"> <li>• Instigate culturally led training programs which address commercial dive, safe removal strategies, under water monitoring, reef restoration and maintaining the cultural integrity, health and commercial outcomes of Sea Country.</li> </ul>



# PILLAR 1: National Research, Development & Planning

## About

Investment in cutting-edge research to support and underpin Action Areas 1-4 is crucial and will help to better understand the drivers of Centro range expansion, its ecological impacts, and effective management strategies.

Ongoing research is essential to provide up-to-date information, improve our understanding of the Centro range expansion, barren formation drivers, and to develop effective conservation and management strategies to address potential ecological impacts.

This pillar considers priority research required to predict and respond to changes in marine ecosystems influenced by Centro range expansion.

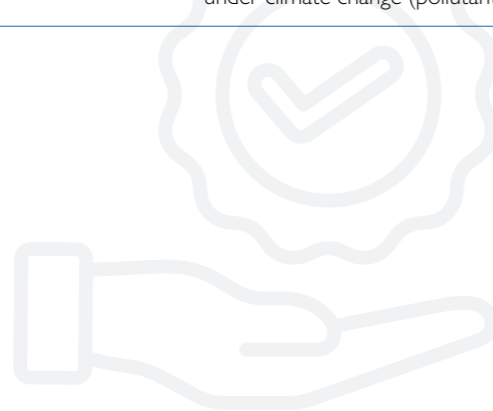
## Points to note

There is a growing body of work already contributing to our understanding of Centro across its range and into neighbouring New Zealand, where Centro is also a range-extended species originating from New South Wales. However, there is a need to collate and review the often State-based work to identify gaps and opportunities.

While this Plan has identified the gaps and priorities for national management, there is still a need to synthesize and collate all known research (some of which is not well known as it was conducted as part of Honours and Masters thesis), and identify further knowledge gaps and areas for extension. It is critical that design of future research be guided by the previous work and not duplicate effort. The Task Force will lead the synthesis of this review.

The following research projects are considered priority to underpin national management:

ACTION	CONSIDERATIONS
<b>Development of a national management plan for climate-drive redistribution of marine species, which coordinates strategic management of Centro across jurisdictions.</b>	<ul style="list-style-type: none"> <li>Review mapping and modelling to set assigned control measures to the reefs.</li> <li>Identify priority management areas and implement informed urchin management programs, with monitoring of reef recovery.</li> </ul>
<b>Monitor Habitat Recovery</b>	<ul style="list-style-type: none"> <li>Develop monitoring programs which track control efforts by location over time and enable reporting of Centro removal and habitat recovery habitat recovery post restoration.</li> <li>Consider spawning, roe quality, and habitat functioning.</li> </ul>
<b>Research into automation or alternative management options for urchin control in deeper water.</b>	<ul style="list-style-type: none"> <li>Review deep water habitat removal options.</li> <li>Develop 3D models, barren data, quantification of kelp cover and review of harvest options considering post-harvest potential.</li> </ul>
<b>Research to inform divers of barren areas</b>	<ul style="list-style-type: none"> <li>Consider predation, sea surface temperatures, larval dispersal, connectivity, colonisation approach, how to predict the level of risk under climate change (pollutants, run off, warming temp).</li> </ul>



# PILLAR 2: Community Engagement

A comprehensive and strategic approach to stakeholder engagement, public awareness campaigns, and transparent communication will support Action Areas 1-4.

Ownership and active participation in Centro management will be fostered in local communities, Aboriginal communities, fishing industries, environmental NGOs, and research organisations via engagement in regular workshops, forums, and community days.

Additionally, public awareness campaigns will be developed and implemented to educate the wider community about the significance of managing Centro, aiming to protect marine habitats and preserve cultural values while also promoting the benefits of urchin as a 'nature positive seafood'. Transparent

communication channels will be maintained with stakeholders, ensuring updates on research findings, correct identification, monitoring results, and management actions are shared, with the goal of garnering societal acceptance and support for active reef management.

In New South Wales, OceanWatch ran a successful 'Ultimate Urchin Challenge' which offered the public a chance to get involved in the catch, culinary preparations, and tasting of Centro roe. Similarly in Tasmania, renowned local chefs have publicly prepared and served Centro roe at large community events and festivals, notably the Wooden Boat Festival 2023. Events such as these can inform future community engagement activities to raise the local profile of Centro roe and drive domestic demand.

ACTION	CONSIDERATIONS
<b>Stakeholder Engagement</b>	<ul style="list-style-type: none"> <li>Engage with local communities, Aboriginal people / Aboriginal community controlled organisations, fishing industries, environmental NGOs, and scientists through regular workshops, forums, and consultations to foster ownership and active participation an active online (website and social media) presence, in Centro management.</li> </ul>
<b>Public Awareness Campaigns</b>	<ul style="list-style-type: none"> <li>Develop and implement public awareness campaigns that educate the wider community about the importance of managing Centro to protect marine habitats and preserve cultural values. Risks associated with removal campaigns must also be considered (e.g. Centro is just one urchin species of many).</li> </ul>
<b>Transparent Communication</b>	<ul style="list-style-type: none"> <li>Maintain a suite of well targeted communication channels with stakeholders, providing updates on research findings, monitoring results, and management actions, fostering societal acceptance and support for active reef management.</li> </ul>
<b>Recreational Dive Sector</b>	<ul style="list-style-type: none"> <li>Development of programs to underpin safe recreational harvest activities.</li> <li>Promote urchins as a culinary target for recreational fishers.</li> <li>Consider targeted harvest/ culling events in local areas around favorite dive sites/ culturally important reefs with a focus on education in terms of the different urchin species and safe practices for culling/ harvest. Recreational diver training in urchin control/ kelp restoration measures and voluntourism to be supported.</li> </ul>

## PILLAR 3: Collaboration and National Approach: Robust partnerships and coordinated management

Robust partnerships with state fisheries agencies, government departments, research institutions, industry stakeholders, Aboriginal people / Aboriginal community controlled organisations, and coastal communities are essential to drive the implementation of national management.

The continuation of the Task Force is proposed in its current form to drive policy, oversee implementation of the plan, and govern the expenditure in compliance with any head agreement.

Clear feedback was received of the need to improve the national communication and linkages with Aboriginal people / Aboriginal community controlled organisations, the commercial dive sector, the processing sector and the recreational dive sector. It is proposed that an Advisory Committee Group be established with key representatives to drive great collaboration, implementation, and delivery.

The following principles were identified through the engagement process, and will thus form the basis of the Plan.

### Principles for Collaborative Tri-State Operations

- a) **Coordination:** It is proposed that a single organisation will provide the backbone for the delivery and implementation of the Plan. A Secretariat organisation will be established by the Centro Task Force to act as a focal agent, coordinate between the various implementing organisations and deliver all key knowledge sharing, contracting and reporting activities.
- b) **Collaboration:** The Secretariat, under the direction of the Task Force, will prioritize and actively engage in collaboration with industry, Aboriginal people / Aboriginal community controlled organisations, community, government, and research entities throughout all stages of the project.
- c) **Co-Design & Engagement:** Projects and activities will be co-designed in partnership with industry, government, Aboriginal people / Aboriginal community controlled organisations, community, and researchers, taking into account regional and local nuances to ensure comprehensive and inclusive decision-making.

- d) **Best Available Science & Knowledge:** Informed decisions will be made by utilising the most reliable and up-to-date scientific and community-based knowledge, including insights from industry and Aboriginal people.
- e) **Ecosystem & Reef Health:** All decisions and actions will be guided by the central goal of preserving and enhancing the optimal health, balance and resilience of the Great Southern Reef and its surrounding ecosystems.
- f) **Sustainable Communities:** Decisions will acknowledge and recognise the Great Southern Reef's cultural heritage, and community significance, and ensure decisions consider the well-being of communities.
- g) **Recognising and Respecting Distinctions:** The team will diligently acknowledge and respect the differences between the native and range-extension regions of Centro; in NSW, urchin barrens are broadly recognised as an established stable-state in most areas, whereas in Victoria and Tasmania the expansion of urchin barrens is causing loss of biodiversity and productivity. Understanding these distinctions will inform appropriate actions and measures for each context.
- h) **Sharing knowledge:** Core to the success of this national approach to management will be sharing research, knowledge and best practice management information. Stakeholders are committed to open and transparent information sharing for the betterment of the Great Southern Reef.

## PILLAR 4: Overarching Policy to Underpin National Centro Management

The development of cross jurisdictional policies will be essential to the success of national management and coordination. The Centro Task Force proposes that a key role will be to examine current policies to consider conservation vs preservation approaches, and to generate a more cohesive habitat policy which is embedded into national Fisheries Policy. Such a policy must balance the prescriptiveness needed to ensure consistency among some methods with the flexibility needed to allow each jurisdiction to meet its discrete management and legislative requirements. Priority activities of the Task Force will include:

- A review of the Commonwealth Fisheries Management Act.
- A review of NSW, VIC, and TAS Fisheries Management Acts
- A review of Harvest Strategies considering reform of habitat performance indicators.

- A review of the Sustainable Ocean Plan to identify how Centro activities may support the high-level ocean strategy for Australia.
- A move to Holistic Management across jurisdictions for more collective Reef Health management (and link into Sustainable Ocean Plans).
- A review and coordination of the NSW Marine Estate Management Strategy (MEMS) and associated Marine Integrated Monitoring Program to facilitate consistent approaches among Commonwealth and states regarding threats to social, economic, cultural, and environmental values.
- A review of the National Fisheries Plan.
- Consideration for development of new Marine Habitat Management plan.



Photo: Matt Testoni



## Indicative Budget

The following funds are sought to implement the Plan over a five year period:

ACTION AREA	INVESTMENT DESCRIPTION	TOTAL 5 YEAR INVESTMENT
Action Area 1: Reef Monitoring and Modelling	\$6M for Ecosystem Monitoring and Modelling which includes baseline surveys, density target development and marine spatial data monitoring.	\$6M
Action Area 2: In-Water Centro Control and Rehabilitation Strategies	\$30M for in In-water control to support the development of targeted and spatially optimal harvest strategies, commercial and Aboriginal fishery development / removal programs, recreational stewardship, etc. Also support for select rehabilitation and stock rebuilding strategies.  <i>** Note the breakdown equates to \$10M per state (NSW, Tas, Vic) over 5 years. Average spend of \$2M per year. This will be leveraged by State and private investment.</i>	\$30M
Action Area 3: Commercial Industry Support	\$8M to drive innovation in processing, market development, business support.	\$8M
Action Area 4: First Nations Support	\$2.5M to support the establishment of Sea Country Restoration projects. Note leverage to Action Area 1 to support baseline surveys and monitoring and Action Area 2 to support harvest strategies and restoration.	\$2.5M
Research and Development	\$4M to drive key research priorities, planning, deep water and monitoring.	\$4M
Community Engagement & Communication	\$2M for implementing communication and stakeholder engagement, marketing and trade development	\$2M
National Management, Planning and Policy	\$2.5M for Secretariat, Task Force and Advisory Committee coordination and management of National Plan activities	\$2.5M
		\$55 million

## Outcomes

The primary outcomes of this Plan are:

- *Reduced urchin barrens leading to thriving reef ecosystems:*
- *Improved reef health, marine ecosystems and Sea Country which is valued and utilised by community.*
- *Aboriginal people involved with management of sea country and benefit from urchin control.*

The secondary outcome is:

- *Successful and supported fisheries, with national and international markets.*



### OTHER OUTCOMES OF THE PLAN WILL INCLUDE:

- 1. Centro Population Management:** Management of Centro numbers to a predetermined balance point in the ecosystem and maintaining numbers within that range.
- 2. Structured Fishing Effort:** A coordinated and targeted approach to fishing effort in different areas, with defined outcomes tailored to each region.
- 3. Improved climate resilience:** Building resilience to climate induced range shifting species on the Great Southern Reef, providing a management model for other ecosystems.
- 4. Ecosystem Rehabilitation:** Rehabilitate ecosystems by repopulating them with kelp and native species, particularly predators of sea urchins, leading to improved marine ecosystem health and resilience in Tasmania, Victoria, and NSW.
- 5. Productive Utilization of Urchin Waste:** Maximized the productive utilization of urchin waste, turning it into a valuable resource.
- 6. Balancing Harvesting and Economic Opportunities:** Balance harvesting and economic opportunities with effective management and conservation goals.
- 7. Local Capacity Building:** This Plan provides numerous pathways for training and workforce development in regional communities.
- 8. Sea Country Protection:** Recognize and protect the importance of Sea Country, and incorporation of Traditional knowledge into conservation plans.
- 9. Community Engagement:** Community engaged in the management process, gaining societal acceptance and support for active reef management.
- 10. Consistency Across States:** Establish agreed methods and approaches across states for harmonized and effective range-wide Centro management.

## Conclusion

The management of the longspined sea urchin (*Centrostephanus rodgersii*) range extension has become a pressing concern due to the grazing pressure of urchins causing the formation of reef barrens. Continued range extension poses significant threats to marine ecosystems and biodiversity, as well as the livelihood and wellbeing of the industries and the cultural and coastal communities that rely on the Great Southern Reefs healthy marine environments.

Investing \$55 million to manage *Centrostephanus rodgersii*, through the Actions and Pillars presented in this Plan, represents a strategic opportunity to safeguard marine habitats, support sustainable economic growth, honour cultural communities' traditional values, and create a harmonized policy approach across states.

In summary, this Plan provides a roadmap of Actions to achieve effective management of longspined sea urchins impacts on the Great Southern Reef marine habitat. The actions will work to ensure balanced ecosystems. After many years of discussing the need to implement Centro control on a regional scale, the three involved States, Federal agencies, industry, Aboriginal research and community organisations have now come together to co-design a five year Business Plan that will deliver that control via a multi-faceted program.

It is essential that this funding consider the unique needs of Centro control and management in Tasmania, Victoria and New South Wales, engaging and incentivising the various sectors and rights-holders. The Centro Task Force wish to acknowledge from the outset that the starting point, values and requirements for each region differ, and the approaches developed and employed through this program need to be flexible enough to accommodate these differences. Although Centro control practices and targets will vary from State to State – and indeed may vary between areas within a State – the overall approach will be unified and strategic under one business framework to maximise the return on this investment.

By integrating research, monitoring, sustainable harvesting, and community engagement in a national management approach, we will collectively achieve a thriving marine ecosystem, and ensure the preservation of natural and cultural heritage, and economic value, for generations to come.

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