Senate Inquiry on Climate-related Invasive Species

A joint submission by the Nature Coast Marine Group Inc, the Nature Conservation Council of NSW, the National Parks Association of NSW and the Coastwatchers Association Inc

13 October 2022

Climate change induced impacts on the East Australia Current are creating severe imbalances in marine ecosystems and are detrimentally affecting biodiversity in a wide range of areas. Average temperatures recorded over the last 20 years are already showing increases in sea surface temperatures of as much as 4°C in some locations along the NSW coastline. The historical deterioration of shallow reefs as a result of the spread of urchin barrens is now compounded by the impact of climate change and the phenomenon of tropicalisation, as a result of which kelp forests are contracting southwards, to be replaced by marine life more characteristic of sub-tropical and tropical waters.

Our Submission's Key Points

1. Shallow rocky reefs in southern New South Wales waters have been seriously degraded by high numbers of long-spined sea urchins and the consequent displacement of kelp forests by urchin barrens.
2. The problem is exacerbated by climate change. Impacts now extend as far south as Tasmania.
3. Environmental, social, economic and cultural values are adversely affected.
4. There are gaps in the understanding of the reasons for such high numbers of urchins in NSW, whether and to what extent the situation is getting worse and the design and feasibility of measures to manage the problems and promote healthier kelp forests and reefs.
5. Although the impact on the marine environment of southern NSW is severe, governments are doing little or nothing to address the problem.
6. It is time for a significant investment of funding and energy into managing the problem with a view to preventing any further spread of barrens. This should involve a multi-stakeholder, multi-jurisdiction approach, looking at the problem as

one of national significance and recognising that scientists, governments, communities, Aboriginal people, conservation groups, resource exploitation industries and the media all have a role to play.

7. Marine protected areas (MPAs), including 'no take zones', play a key role in protecting urchin predators and keeping ecosystems balanced.

Submitting organisations

- The Nature Conservation Council of NSW (NCC) is NSW's peak environment organisation. Representing over 170 environment groups, NCC is dedicated to protecting and conserving the wildlife, landscapes, and natural resources of NSW.
- The Nature Coast Marine Group Incorporated (NCMG) is a community organisation that focuses on the protection, study and enjoyment of the marine environment. Based on the NSW Far South Coast, NCMG was established in 2006 and has around 800 members and supporters. It has a particular interest in the Batemans Marine Park.
- The National Parks Association of NSW is a member-driven organisation with a proud history. It has played a key role in the establishment of many of NSW's national parks and nature reserves over the past 60 years. It has 3,800 members and 12,000 subscribers.
- The Coastwatchers' Association Incorporated (Coastwatchers) is a leading community environmental conservation group on the Far South Coast of NSW. For over 30 years the Association has worked to protect the local environment and raise awareness around environmental and climate change issues.

The Inquiry's terms of reference

The spread of urchin barrens

Long spined sea urchins are enormously abundant in NSW waters, and the barrens they can create affect about 50% of nearshore reefs in central and southern areas[i]. Barrens are considerably less biodiverse than macroalgal forests, as well as less productive[ii], and so represent a serious degradation of environmental value. Barrens also degrade social, economic, and cultural values, which impacts local communities directly. The opportunity to enjoy the appreciation of the natural world and to participate in recreational fishing is reduced. The loss of productivity has adverse impacts on the NSW South Coast abalone and urchin fisheries. Importantly, urchin barrens make it more difficult for Indigenous people on the NSW South Coast to care for and benefit from sea country.

Because the urchin barrens are visible only to divers, the severity of the problem is barely recognised – they are the 'hidden deserts' of our environment. The problem has been largely ignored by governments. As a result, little has been done to manage the problem, far less to develop proposals to rehabilitate degraded habitats.

Technically, long spined sea urchins are endemic, and not 'invasive', in NSW waters. However, the present NSW situation is that climate change is making an already bad situation worse. In addition, the problems in Tasmania result from and are

exacerbated by the climate change-driven transport of urchin larvae originating in NSW. Unless urgent action is taken at a scale appropriate to that of the problem, the future of the Great Southern Reef in NSW and elsewhere is at risk.

Research and knowledge

There is uncertainty around some of the basic questions. It may be that some level of urchin barrens in NSW is a natural feature. However, scientists speculate that their present vast extent was triggered by the removal of urchin predators through past fishing practices [iii]. This probably began many years ago, as long as a century or more. One view is that the extent of barrens has been stable for the past 40 years, but this is hardly reassuring and risks leaving the problem unaddressed. Uncertainty around the baseline situation is inevitable because modern methods of assessment were not available prior to the beginning of the exploitation of marine resources in NSW. Looking to the future there is also a question as to whether climate change renders unfeasible any return to a pre-exploitation state and whether innovative approaches to adaptation need to be considered. In any work aimed at expanding the knowledge base, the experience and expertise of local people should be incorporated, whether that should be from those involved in commercial fishing, scuba diving, Aboriginal culture, citizen science, ecotourism or other fields.

Management options

The Nature Coast Marine Group has been expressing its concerns about the extent of urchin barrens in southern NSW for some years, both in communication with the NSW State Government and in social and traditional media. A Symposium was held in Narooma in June 2021, which brought together a wide range of interested parties. Importantly the Symposium demonstrated a consensus around the nature of the problem and on the need for all sectors to work together to come up with solutions. The theme of the Symposium was ‘restoration through harvest’, reflecting a recognition that it is important to seek out management options that incorporate economically sustainable approaches to tackling the problem. A committee representing those involved in the Symposium has been working to implement the major recommendations, particularly the need for research on how commercial urchin fisheries can contribute to a reduction in urchin numbers and potentially reverse the spread of urchin barrens.

NCMG strongly supports this work. It sees the Far South Coast NSW community as having a significant stake in addressing the urchin barrens problem. Local urchin fishers, abalone divers and kelp harvesters have first-hand experience and an economic stake, Aboriginal people have rights and opportunities to share in control of marine management, while ecotourism operators, conservationists and the wider community want to see a healthy environment preserved into the future, for its own sake and for the sake of our social and economic well-being. It is important that the community works alongside scientists and governments to tackle the problem.

It is likely that a variety of management options would need to be implemented to address the problem, with a view to satisfying multiple objectives, such as

strengthening local urchin and abalone fisheries and kelp harvesting, protecting sites that are important for nature appreciation, ecotourism, and recreational fishing, along with protecting the biodiversity of the marine environment. As there are state-managed marine parks within the area of concern, they have an obvious role as potential coordinators of action and should be strengthened and tasked with appropriate funding and staffing.

Alongside intervention and research, we strongly support management options aimed at promoting natural controls. Experimental studies have shown that if sea urchins are removed, algae recovers quickly[iv]. However, the affected area in NSW is so great that any realistic approach to reducing urchin numbers by harvesting and culling will need to be supplemented by measures to strengthen natural controls. In Tasmania, work is proceeding on rebuilding populations of rock lobsters as a natural means of increasing predation on urchins. In New Zealand, the establishment of 'no take' marine reserves has enabled populations of lobsters and predatory fish such as Snapper *(Chrysophrys auratus)* to recover, with the eventual result that kelp forests have 'expanded dramatically over a 20 year period into areas that were formerly urchin-grazed rock flats.'[v] The expansion and strengthening of marine protected areas has an obvious role, as well as promoting the numbers of urchin predators, particularly the Eastern Blue Groper (*Achoerodus viridis*), which is the chief predator of long-spined urchins in NSW. In addition to strengthening marine protected areas, full protection of the Blue Groper is desirable as a basic control measure. No take marine protected areas would not normally allow the culling of a native species such as the long-spined sea urchin. Any culling or harvesting in marine protected areas aimed at the rehabilitation of kelp forests and reef ecosystems would have to be subject to strict planning and conditional permitting, alongside scientific monitoring to ascertain the local need for such treatment, the scope and methodology adopted, its effectiveness and time frame.

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[i] Andrew, Neil, *Under Southern Seas*, UNSW Press 1999, p 131

[ii] Ling, S.D., 2008. Range expansion of a habitat-modifying species leads to loss of taxonomic diversity: a new and impoverished reef state. *Oecologia*, *156*(4), pp.883-894; Ling, S.D. and Keane, J.P., 2018. Resurvey of the longspined sea urchin (Centrostephanus rodgersii) and associated barren reef in Tasmania.;"Sea Urchin Invaders", ABC Science, comments by Professor Craig Johnson, Institute of Marine and Antarctic Studies, University of Tasmania, file:///Users/mac1/Documents/Environment/Marine/Urchin%20info/Sea%20urchins2.webarchive, retrieved 12 February 2017

[iii] Ling, S.D. and Keane, J.P., 2021. Decadal resurvey of long-term lobster experimental sites to inform Centrostephanus control. *Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, Tasmania*; Ling, S.D., Johnson, C.R., Frusher, S.D. and Ridgway, K., 2009.

Overfishing reduces resilience of kelp beds to climate-driven catastrophic phase shift. *Proceedings of the National Academy of Sciences*, *106*(52), pp.22341-22345; Professor Craig Johnson, 'Sea Urchin invaders', *op cit*; Andrew, N L and Byrne, M, 'Ecology of Centrostephanus', in John M Lawrence, *Edible Sea Urchins, Biology and Ecology*, Elsevier Science 2007, p 196: 'The presence of expansive barrens areas in south eastern Australia may be due to a reduction in abundance, or lack, of sea urchin predators. It could be argued that present-day populations of predators, particularly the rock lobster *Jasus* (now *Sagmariasus*) *verreauxi*, *Achoerodus viridis* and *Heterodontus portusjacksoni*, are greatly diminished from fishing and that they historically played a greater role in limiting sea urchin numbers.'

[iv] Ling, S.D., 2008. Range expansion of a habitat-modifying species leads to loss of taxonomic diversity: a new and impoverished reef state. *Oecologia*, *156*(4), pp.883-894; Ling, S.D., Scheibling, R.E., Rassweiler, A., Johnson, C.R., Shears, N., Connell, S.D., Salomon, A.K., Norderhaug, K.M., Pérez-Matus, A., Hernández, J.C. and Clemente, S., 2015. Global regime shift dynamics of catastrophic sea urchin overgrazing. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *370*(1659), p.20130269; Hinde, Rosalind, 'Seaweeds and other algae', in Underwood A.J. and M.G. Chapman, *Coastal Marine Ecology of Temperate Australia*, UNSW Press, Sydney 1995, p 130

[v] Babcock R.C. et al 'Changes in community structure in temperate marine reserves', *Marine Ecology Progress Series, Vol 189, 1999*, p 132