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I take this opportunity to comment on the **Senate inquiry on climate-related marine invasive species**.

I understand the inquiry is an important step in understanding impacts of the sea urchin, *Centrostephanus rodgersii*, on Australia's coastal and marine ecosystems. The southward projection of this species has been well-documented, and its impacts on kelp forests and formation of barrens are recognised. This has indeed been novel and a serious management issue for Tasmania, yet *C. rodgersii* is native to the NSW coastline where barrens have been a stable, consistent, and natural ecosystem state for decades (Glasby & Gibson 2020).

There are no data to indicate that *C. rodgersii* has changed on a regional basis in NSW (Glasby & Gibson 2020). Thus, there are no data to support culling of this species in the region. I grew up on the NSW coast and, with a keen interest in marine science, was an avid snorkeller, SCUBA diver, and spearfisher. Ecosystem mosaics from macroalgae and kelp to barrens are a usual seascape of NSW. Barrens are a natural habitat type, and many large and commercially important fishes use barrens as hunting grounds (Kingsford and Carlson, 2010). Converse to popular belief, biodiversity can high and distinct in barren habitats of the NSW coast (Curley et al. 2003; Coleman & Kennelly 2019). Yet, barrens are broadcast as the total opposite – a desert seascape – which is a major shortfall in understanding and appreciating this natural ecosystem state in NSW.

That management of *C. rodgersii* is developed cross-jurisdictionally is of the utmost importance given the expanse of its range. There are several management options underway in Tasmania including culling, fishing and/or introducing predators (e.g., lobsters), but there is no real evidence of success to date. In fact, lobsters do not appear to consume *C. rodgersii* in any meaningful amount in NSW (Day et al., 2021) or Tasmania (Smith et al., 2022). It is essential that management in NSW be guided by rigorous research so that time, effort, and funds are not wasted.

The ecological impacts of *C. rodgersii* on marine ecosystems differ in NSW, where this species is endemic, to Tasmania, where this species is a range-extender due to climate change. This alone suggests that management approaches between NSW and Tasmania are likely to differ. Given *C. rodgersii* presents no real long-term impact in NSW (Glasby & Gibson 2020), it is a wonder why expensive culling programs must be developed in the region. There are lessons to be learned from the Tasmanian system, but ultimately, no-take marine reserves may help build up native predators over time and seems the most viable management approach for *C. rodgersii* in NSW. Positive effects from marine reserves can be slow to observe, sometimes decades, but help to ensure natural systems are robustly conserved.

Climate change is a key consideration for management and kelp restoration efforts because climate-driven ocean warming, freshwater runoff and major storms can reduce the success of restoration ventures and destroy restored habitats. The impacts of La Niña have been clear in NSW over recent years, with east-coast low pressure systems bringing extensive coastal erosion, floodwater, and river runoff. A climate change risk assessment is essential given the capacity of a single storm or heatwave to impact ecosystems and restored habitats (Babcock et al. 2019; Mabin et al. 2019; Davis et al. 2022). It must be recognised that mass-impact climate events are also likely to disrupt *C. rodgersii* populations in NSW, as seen in other echinoderms in the region (e.g., Byrne & Wolfe 2019). Yet, no studies have assessed the impacts of recent climate events on *C. rodgersii*.

C. rodgersii is an important fishery resource in NSW with potential to achieve sustainable harvest, but great care is needed as with all slow-moving invertebrates, as their fishery can fast turn into a mining exercise. Indeed, virtually all sea urchin fisheries in the world have collapsed.

Please feel free to contact me for additional information as required.

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Sincerely,



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