Department of Conservation
Te Papa Atawhai

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Date: 9 December 2022

To: Sue Reed-Thomas (NNI Director Operations) and Amber Bill (Director Biodiversity Systems and Aquatic)

CC: Evan Davies (Marine Reserve Ranger, Northland); Francis Toko (Pou, NNI); Kirsten Rodgers (Technical Advisor Marine, MET); Monique Ladds (Technical Advisor Marine, MET)

From: Joel Lauterbach (Operations Manager, Whangarei) and Kirstie Knowles (Manager, Marine Ecosystems Team - MET)

Subject: Decision on conducting a trial Urchin removal programme at the Poor Knights marine reserve

Purpose

1. To seek a decision on conducting a trial Urchin removal programme at the Poor Knights marine reserve, in partnership with Ngatiwai.

Background

2. The Poor Knights Islands marine reserve was established under the Marine Reserves (Poor Knights Islands) Order 1981. This was made under the Marine Reserves Act 1971, which provides the core statutory responsibilities and powers relevant to the Department's management of the reserve.

3. The reserve is an internationally renowned diving and snorkelling destination due to its unique ecosystems and incredible biodiversity. It is most renowned for its vertical reef walls and caves that are covered with an amazing diversity of flora and fauna including sponges, bryozoans, ascidians, anemones and encrusting algae.

4. Through the Marine Reserve Monitoring and Reporting Programme, delivered at the Poor Knights marine reserves by the University of Auckland Marine Science Department, we have been notified of a significant increase in the number of urchins in the reserve.

5. The long spine black urchin - *Centrostephanus rodgersii* – (the urchin) is classed as "kina" for the purpose of the Fisheries (Amateur Fishing) Regulations 2013 and occurs throughout the South Pacific. It is found naturally in northeastern New Zealand, usually in low numbers.

6. Australia has seen significant urchin range expansion from the Great Barrier Reef, which has devastated kelp forests in Tasmania and is showing similar patterns in Victoria and New South Wales.

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7. Monitoring at Poor Knight marine reserve since 1999 has shown a 2.7x increase in urchin density between 1999-2022[1]. It is thought that this is a result of there being few natural urchin predators[2] in the reserve and the urchins reproductive rate increasing because of climate induced sea temperatures rises.

8. The urchins have been grazing on algae, seagrass, tunicates, and encrusting invertebrates, such as bryozoans and sponges[3], all key species of the Poor Knights marine reserve, resulting in the formation of urchin "kina" barrens (see Figure 1). This poses a risk of extensive ecological destruction to this unique ecosystem.

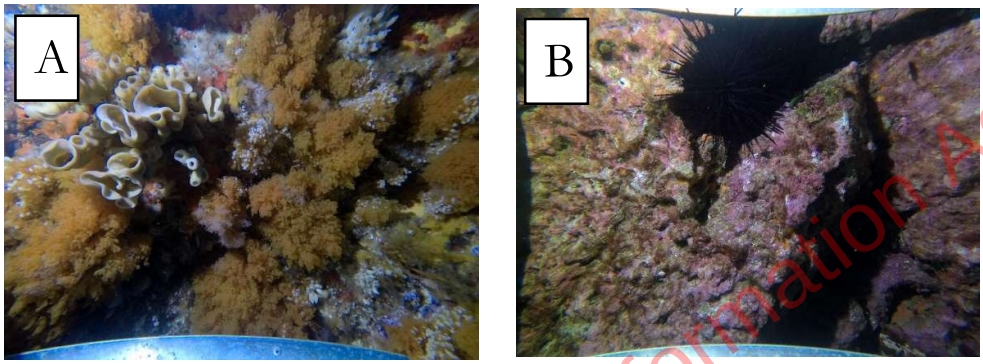

Figure 1. Example of an area where urchins have not grazed (A), and after urchins have grazed (B).

9. As the urchin is not an invasive species in New Zealand, this expansion is best categorised as a "native pest" or "species irruption" scenario. It is not a biosecurity issue requiring action from the Ministry for Primary Industries or Northland Regional Council under the Biosecurity Act 1993.

Legal and Regulatory considerations

10. The purpose of marine reserves under the Marine Reserve Act 1972 is to undertake scientific study. The urchin barrens forming at the Poor Knights and on other offshore islands in Northern New Zealand are not well understood, nor is the potential to use active restoration to restore the lost biodiversity. It is important this research is conducted inside a marine reserve to understand the driving forces of the increased densities.

11. Under the Fisheries (Amateur Fishing) Regulations 2013, there is a catch limit of 50 kina per person per day, which binds the Crown as well. We are proposing to kill 3000 kina in situ in three 50 x 20 m (1000m^2). A special permit application has been drafted with Ngatiwai and University of Auckland.

12. The marine reserve is classed as a significant ecological marine area for the purposes of the Northland Regional Plan, with high ecological values. There don't appear to be specific rules in the Northland Regional Plan that would be relevant but we have engaged with Northland Regional Council anyway.

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[1] Balemi C. & Shears N. (unpublished) Subtropical sea urchin proses novel threat to diverse rock wall assemblages in northern New Zealand. Report to the Department of Conservation.

[2] Urchins are largely nocturnal and their only known predators in New Zealand are large rock lobsters *(Jasus edwardsii)* and packhorse crayfish (*Sagmariasus varreauxi*). Harvesting has greatly reduced these species populations in northeastern New Zealand.

[3] https://www.imas.utas.edu.au/research/fisheries-and-aquaculture/fisheries/Long-spined-sea-urchin-Centrostephanus-Rodgersii

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13. There are no specific references to this type of work in the Northland Conservation Management Strategy 2014-2024, nor is there a specific management plan for the marine reserve.

Management Options

14. Management options (**Attachment 1**) have been considered in partnership with DOC's Treaty partners - Ngātiwai.

15. This particular species was removed in Tasmania demonstrating that it is possible to recover relatively large areas of habitat provided sufficient resources were available to reduce urchin numbers[4].

16. A Ngātiwai representative has informed us that they support Option 1 (**Attachment 1**), and provided the following comments:
    a. Tawhiti Rahi and Aorangi are islands of cultural significance in the Ngātiwai rohe. From an iwi perspective, what does this species impact mean holistically for the reefs and ecosystems, some species that DOC have classified (e.g in the threat classification system), might not be what Ngātiwai consider a pest or a threat to our Tai Ao.
    b. The lack of research and data in Aotearoa about the long spined urchin, it would be more suitable to find out more about the species as Aotearoa has different ecosystems and habitats to Australia.
    c. There needs to be more research into the initiatives about managing barren reefs. Reviewing what the initiatives would be around the long spined urchin in Aotearoa could look very different to what has been proposed in the video[5] from a cultural and science perspective.

Recommendation

17. In consultation with the Marine Ecosystem Team, we recommend Option 1 – a trial removal programme to test feasibility of removal, re-invasion and ecosystem response.

18. This option would be led by the Department in collaboration with Treaty partners and University of Auckland Marine Science Department researchers who have been monitoring the urchin.

19. Given the programme is to be undertaken in a marine reserve and led by the Department, this option is considered a part of the Director-General's management functions and powers under sections 9 and 11 of the Marine Reserves Act 1971 and does not require permitting under that legislation.

Timeline and resourcing

20. Key stages in this process, and current timelines are summarised below.

Key task	Date
MET informed of monitoring results showing significant urchin increase	20/06/2022
MET reported findings to Regional Operations	20/08/2022

[4] https://www.imas.utas.edu.au/research/fisheries-and-aquaculture/fisheries/Long-spined-sea-urchin-Centrostephanus-Rodgersii
[5] https://youtu.be/FF_4URQ1MrI

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Team process	22/09/2022
Treaty partner engagement	28/09/2022
Northland Regional Council (RC) and Fisheries New Zealand (FNZ) engagement	01/11/2022
Decision	NOW
Operational planning (with iwi and RC)	February 2023
Implementation	May 2023
Monitoring (as per contract with University of Auckland)	May 2023 (before removal) November 2023 July 2024

21. Resourcing (**Attachment 2**) is largely based on staff time and will be led by Northern North Island Operations, supported by the Biodiversity Systems and Aquatic Unit (Marine Ecosystems Team).
22. The cost of the program is expected to be covered predominantly by ongoing collaborative projects already underway at Auckland University. DOC will continue to contract the University to run the monitoring programme in the marine reserve. DOC fund the programme and provide resources (boat) and time (technical advice and rangers).
23. There are three monitoring events planned, before the removal and 6 and 12 months after removal. Removal this financial year will be covered by shared costs from Operations ($11k), Biodiversity Systems and Aquatic ($4k) and University of Auckland (in kind costs – divers and data analysis). Year 2 and 3 monitoring will be covered by Biodiversity Systems and Aquatic budget as planned.

Risks

24. As outlined in Attachment 1, there are some reputational and precedent setting risks to DOC and government. We are working with the Public Affairs group to minimise these.

Opportunities

25. Operating a trial (Option 1) will help us to achieve Goals 10.2.2-3, 11.3.1-3 and 13.3.1-3 of Te Mana o Te Taiao around managing and protecting native biodiversity. It will also help us to achieve TB4 implementation of adaptation actions from DOC's Climate Change Adaptation Action Plan.

Next Steps

26. We would welcome the opportunity to meet with you to answer any questions you may have and discuss our resourcing.

27. To continue engaging with iwi, MPI and the Regional Council regarding implementation and any other permitting requirements.

Attachments

1. Management options
2. Resourcing
3. Supplementary information

Decision

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Agree/~~Disagree~~
As per discussion 15/12/22

Director Northern North Island Operations
Sue Reed-Thomas

Agree/~~Disagree~~

Director Biodiversity System and Aquatic
Amber Bill

If disagree, please indicate preferred alternative option 2-4

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Attachment 1: Management Options

Option	Benefits	Risks	Likelihood of success
1. A trial removal program is designed and implemented to assess feasibility and the recovery of biodiversity (see next section for details)	Is feasible to do in the current financial year in partnership with the University of Auckland Marine Science Department This option has the potential to allow us to work with Treaty Partners in a meaningful and productive work stream Will give us a realistic idea of how to manage the changing ecosystem Will be in a relatively small control area DOC can utilise local resources already in place, such as, vessel, vehicles and local marine ranger time/experience Low cost due to resources already in place and utilising partnerships	If the program works, ramping up removal throughout the marine reserve could be expensive This would be the first time that active management has occurred inside a marine reserve so expectations would need to be managed carefully Reputational for DOC, FNZ and regional council for marine reserve/fisheries/environmental management	High – the effectiveness of this approach has been demonstrated in Tasmania Results are expected to be seen within 1-2 years
2. More monitoring	Add to the wealth of knowledge gathered about the issue	Supplementary funding/resourcing required Delaying action could result in irreversible loss Delaying action has reputational risk in that DOC did nothing given the evidence	Med – it is feasible to do more monitoring, but not necessarily required to inform understanding of the issue Urchin barrens are already well understood across the country and have a high public awareness
3. Do nothing	No immediate cost to the department in time or resources	Delay in action will likely result in spread throughout Poor Knights Islands marine reserve With no intervention, and continuing ecological damage from this species, there is risk to DOC's reputation as the management agency charged with protecting and preserving biodiversity Reputational risk. Failure to carry out any action given what the evidence shows.	Poor – the urchin population will likely continue to increase
4. Complete eradication	Protect the biodiversity values of one of New Zealand's most unique places	DOC staff are not resourced to deal with this incursion in addition to BAU work	Unknown – The cause of the incursion has to be determined. Evidence from Australia shows some success but a lot of effort

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Attachment 2: Resourcing

Who	Role	Task	Time
Sue Reed-Thomas (Director NNI)	Decision maker	Sign memo and provide advice/guidance	1-2 hours
Amber Bill (Aquatic Director)	Support decision maker	Understand the task and provide advice/ guidance	1-2 hours
Joel Lauterbach (Operations Manager)	Implementation lead	Liaison with iwi and provide advice/ guidance	5-6 hours
Evan Davies (Marine reserve ranger)	Operational lead	2 x trips to Poor Knights with Ngatiwai and University of Auckland to scope the potential sites 1 x removal trip	18 hours 56 hours
Monique Ladds (Technical advisor)	Technical lead	Support implementation plan development Support comms plan development Liaise with regional council and MPI Organise monitoring contract	20 hours 8 hours 4 hours 4 hours
Kirsten Rodgers (Technical advisor)	Support technical lead	As above	
Fancis Toko (Pou)	Treaty partner advisor	Liaison with iwi and provide advice/ guidance	2-3 hours
Abigail Monteith	Comms advisor	Prepare comms plan	7-8 hours
Casey Spearin	Support comms advisor	Awareness of the programme and support where needed	3-4 hours

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Attachment 3 – Supplementary information

Details of Option 1 – trial removal programme

- To (1) better understand the impact of ***the Urchins*** on rock wall communities and (2) investigate how controlled removals can be used to protect and restore rock wall biodiversity from the impacts of ***the Urchins*** we propose undertaking controlled removals at 3 rock wall sites at the Poor Knights Islands.
- The Urchins will be removed from a 50 x 20 m (1000m^2) rock wall area at each site and subsequent changes in the rock wall biodiversity will be compared to adjacent control locations on a six-monthly basis (up to 2 years). The area will typically include a 50 m length of rock wall to 20 m depth.
- The Urchins will be culled by SCUBA divers by piercing the urchins in-situ. Based on an average density of 0.7 m-2 on rock walls at the Poor Knights, ~700 urchins will be crushed at each site. Culling of sea urchins in-situ has been found to be 1.9-4.4x faster than collection and ensures that the resources from the sea urchins stay in the same system and can provide food for other organisms. Collecting of the Urchins would be particularly difficult given their large size and difficulties handling.
- Removal at a site is estimated to take 2 dives by 4 divers, providing minimal disruption and only a short-term disturbance. This would be carried out discretely in areas not frequented by the public. The short-term and one-off nature of the removal is also expected to only have a temporary effect on fish behaviour.
- The Urchins are extremely unlikely to reinvade these removal areas due to the large size of the area, strong homing nature and limited movement of these urchins. It is expected post removal that the sessile invertebrate community will recover quickly, followed by a recovery of associated species such as nudibranchs.
- Monitoring of the areas in the treatment (urchin removal) and appropriate control sites will be conducted by Auckland University.
- The cost of the program is expected to be covered predominantly by ongoing collaborative projects already underway at Auckland University. DOC has contracted the University to run the monitoring programme in the marine reserve. DOC fund the programme and provide resources (boat) and time (technical advice, rangers).

Additional information about the problem

- The Poor Knights Islands (Tawhiti Rahi Island and Aorangi Island) lie slightly west of the East Auckland Current, and are more strongly affected by this southward-flowing current of tropical water than any other offshore islands or mainland north-eastern coast
- As ocean temperature continues to warm there is the threat that other non-native sea urchin species will be able to establish at the Poor Knights Islands. This year, a sea urchin tentatively identified as the tropical Indo-Pacific species *Diadema savignyi* has been observed at the Poor Knights Islands. The threat from any future arrivals cannot be known, but any knowledge gained from monitoring and managing the threat from *Centrostephanus rodgersii* will be extremely valuable to managing any potential future threats.
- It is found at locations influenced by the warm waters of the East Auckland Current, ordinarily in low numbers without producing urchin barrens
- *Centrostephanus rodgersii* numbers are expected to rise with oceanic warming, and in recent years this has been evident in the increasing density at the Poor Knights Islands
- *Centrostephanus rodgersii* has demonstrated the capacity to overgraze temperate reef habitats, creating barrens habitat devoid of macroalgal growth with negative impacts on ecosystem health[3]
- In Australia *Centrostephanus rodgersii* populations have expanded in number and range over the past two decades as the ocean has warmed, causing widespread ecological damage to marine ecosystems and industries that depend on them. For example, *Centrostephanus*

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rodgersii populations expanded into eastern Tasmania following oceanic warming and overfishing of rock lobsters (their natural predators)[4], which has been described as "the single largest biologically mediated threat to the integrity of important shallow water rocky reef communities", due to its destruction of Tasmanian rock lobster and abalone habitats

- Urchin barrens are generally deeper (~10-15m) than kina barrens that are present on the mainland coast and other offshore islands. At the Poor Knights Islands the number of kina have decreased, become more cryptic, and urchin barren habitat associated with this species has largely decreased because of the higher abundance of predatory fish (mainly snapper) inside the marine reserve that prey on kina.
- It is unlikely that natural predators will be able to slow the growth of these new urchin barrens:
    - The increase in numbers of predatory fish like snapper inside the Poor Knights marine reserve have had no apparent influence on urchin populations
    - The only known predators of these urchins, rock lobsters and packhorse crayfish, are uncommon in the Poor Knights Islands Marine Reserve

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