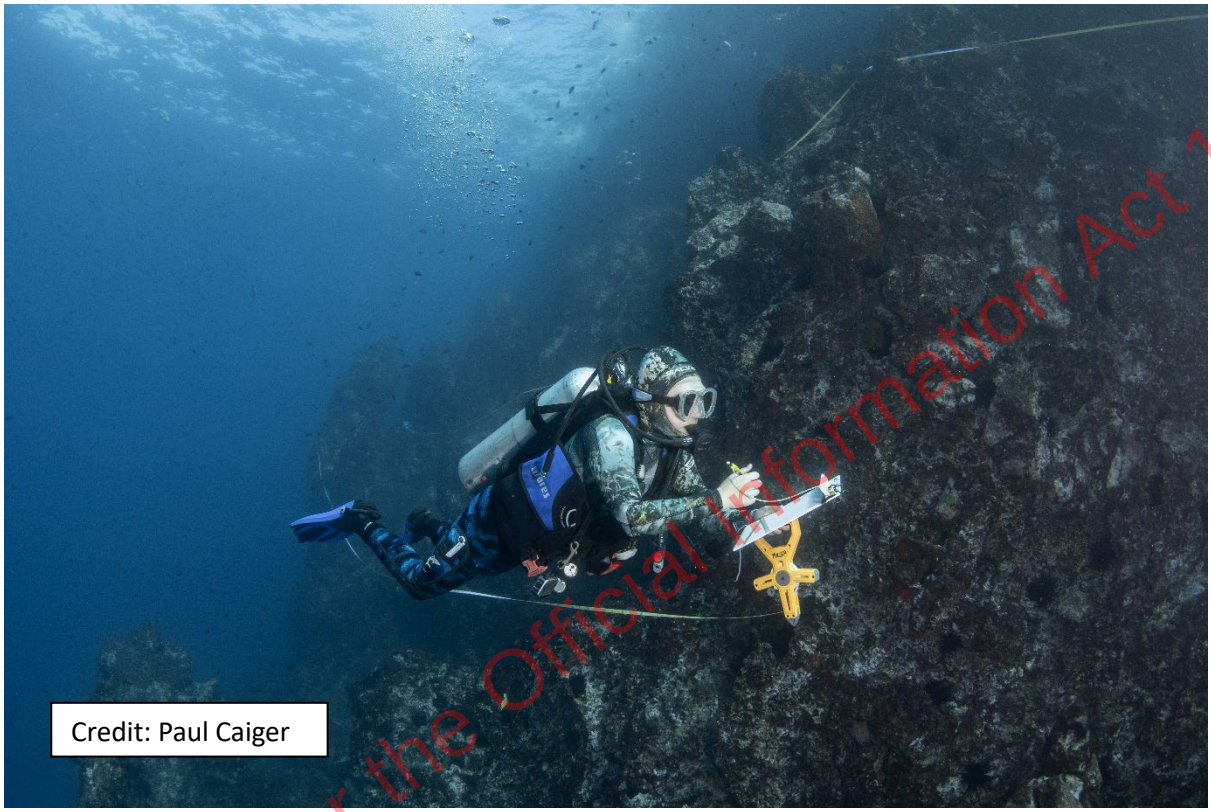
In the last week of April 2023 Te Whanau a Rangiwhakaahu (Ngātiwai), the Department of Conservation (DOC) and the University of Auckland Waipapa Taumata Rau (UoA) returned to the Poor Knights to complete the experimental removal of the subtropical sea urchin *Centrostephanus rodgersii.* The aim of this removal is to understand the urchins' grazing impacts on rock wall communities at the Poor Knights Islands Marine Reserve and investigate the potential for urchin removal as a means of actively managing these impacts. Monitoring carried out by University of Auckland has revealed that the number of *C. rodgersii* in the marine reserve has almost tripled since 1999 and is suggesting these urchins are impacting the unique biodiversity of the Poor Knights.

The dive team, from DOC and UoA, were joined by mana takutai moana for two days on and in the water. The teams met at the islands, with DOC traveling on Rako from Tutukaka and the UoA crew traveling up from Leigh on R.V. Te Kaihōpara. Three dive teams set up and surveyed the experimental removal area at one of the sites: Rikoriko cave. Photogrammetry (mapping the area using photos) of selected areas along with fish transects and urchin measurements were completed to enable comparisons of reef wall communities and how fish behaviour was impacted before and after the experimental removals. Time-lapse cameras were deployed to record the urchin grazing behaviour overnight. After the removal areas were designated, the teams set to work removing the urchins. To investigate the feasibility of removal, the team collected the urchins instead of culling. To do so, UoA researchers designed a system in which weighted baskets attached to buoys were lowered to the seafloor. Divers used hooks to collect the urchins into the baskets. A snorkeler at the surface helped move the baskets from the walls to the boat where they were lifted on board and tipped into bins. The urchins were then crushed, and their remains disposed inside the marine reserve in deep water to ensure they remain a part of the ecosystem. While this method was effective, it took twice as long as culling. A total of 842 urchins were removed from an area ~35 x 20 m within Rikoriko cave.

Credit: Arie Spyksma

The team then returned to Ngoio (not Ngaio) rock to observe the site three weeks after removal and remove any remaining urchins. Sandra informed us that the correct name for Ngaio rock was Ngoio. Prior to any follow up removals, fish transects were undertaken to see if there was any change in fish

behaviour in association with divers. The fish appeared to have resumed normal behaviour, cruising out in the pelagic and around the rock. A visual assessment confirmed there was minimal urchin material left with the tests having broken down. Some accumulations of urchin spines were present in depressions on the reef. A further 450 urchins were culled at the site, indicating that around 25% of urchins were missed in the initial removal event. This was likely because during the initial removal many urchins were only being pierced with a narrow rod so it was difficult to tell whether all urchins had been pierced or not due to the small hole. Three weeks post initial removal, there was already evidence of an increase in red filamentous algae .



Credit: Paul Caiger

The team moved onto the final removal site after lunch – Middle Arch. After following the same protocols of monitoring and laying out the site with boundary transects, the team set to work removing the urchins. With some new specially made devices (more effective in culling and easily to tell if crushed), and some more experience, the team efficiently removed 948 urchins from an area of ~30 x 20 m on the northern side of Middle Arch.

We will now take some time to review the work that has been done so far, and what is left to be done. Follow-up monitoring is planned for October/November to assess how the recovery of the wall communities is doing and the degree to which *C. rodgersii* is recolonising the removal areas.

If you have any questions, please contact Evan Davies (edavies@doc.govt.nz) or Monique Ladds (mladds@doc.govt.nz).