

Arawai Kākāriki

2022–2023 Programme Update



Arawai Kākāriki
Wetland restoration programme

Ōtūwharekai wetland. Photo: Jane Gosden

Highlights from the past year



Improved health of Waituna Lagoon
in 2023



Kākahi recruitment at Ōtūwharekai



Tara pirohe/black-fronted tern –
most successful fledging season to date



Inter-agency response to water quality
event at Whangamarino

Arawai Kākāriki science update

More conservation effort for matuku-hūrepo

Matuku-hūrepo/Australasian bittern monitoring has continued to expand. Over the last 4 years 50,481 boom sequences (calls) have been observed and recorded from nearly 30,000 sound files. Monitoring of the Nationally Critical species is occurring across > 100 wetland sites from Northland to Southland.

The conservation effort to understand bittern activity across our remaining wetlands is being supported by many community groups. As this programme grows, we'll need to ensure all DOC and community-led monitoring data is coordinated, user friendly and enables reporting on threatened species status over time. The national monitoring data helps track male bittern activity and inform adaptive management strategies.



Thermal drone screen projection set up in the field. Photo: Lizzie Sharp



Matuku-hūrepo eating tuna. Photo: Imogen Warren



Department of
Conservation
Te Papa Atawhai

Young kākahi making a comeback

Kākahi/freshwater mussels (*Echyridella menziesii*) are an At-Risk (Declining) species and an important feature of the Ashburton Lakes and streams at Ōtūwharekai.

Lake surveys in 2021 were concerning as they found only a few small kākahi, a potential sign of poor recruitment. But we did not know if stream-dwelling kākahi populations were successfully reproducing.

A technical and operations team undertook surveys last summer to check their reproductive status. The crew also did some electrofishing at each site to assess the fish populations and check if the resident fish were infested with glochidia, the larval form of kākahi.

It turns out that stream-dwelling kākahi in Ōtūwharekai are actively recruiting!

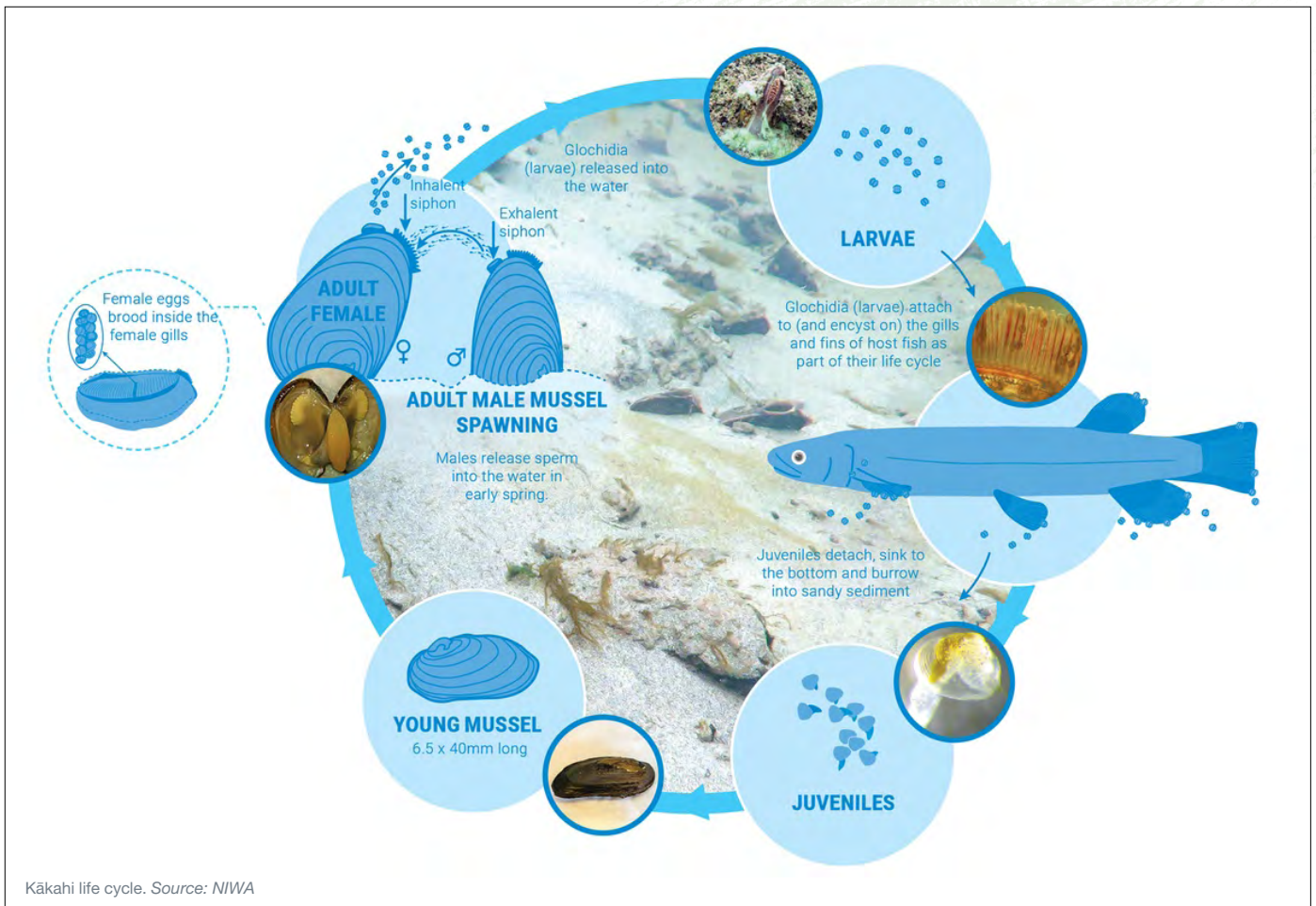
Plenty of the fish were infested with glochidia. Glochidia attach themselves to fish gills until they detach and sink to the bottom of the stream and burrow into sandy sediment. The preferred host species seem to be bullies and Canterbury galaxias, which is in keeping with findings from elsewhere in the country. Trout were found to be more prevalent at sites where relatively low numbers of native fish were recorded.

National spotlight on the status of the Ōtūwharekai lakes

The Arawai Kākāriki technical and operations teams have reported on the health of the Ashburton Lakes for several years, engaging with Environment Canterbury, Te Rūnanga o Arowhenua, Fish & Game and local landowners. Science and advocacy have been instrumental in understanding the ecological and cultural status of the lakes and identifying the need for urgent catchment action to address high nutrient inputs to the sensitive lake ecosystems.

During 2023, the Ministry for the Environment (MfE) published a [Ōtūwharekai/Ashburton Lakes lessons-learned report](#), documenting the ongoing deterioration of water quality in the Ōtūwharekai lakes.

The increased focus on Ōtūwharekai has led to inter-agency and local community commitment to address lake deterioration through lake action plans.



Kākahi life cycle. Source: NIWA



Tara pirohe 'nest cam' showing chick shelter design. Photo: DOC

Ōtūwharekai

Nesting success for black-fronted terns

Tara pirohe/black-fronted tern (*Chlidonias albostratus*) fledgling success was the highest ever recorded during the summer of 2022/23. We have monitored nesting success for six seasons and the team was delighted to observe 28 chicks successfully fledging.

Tara pirohe and ngutu pare/wrybill monitoring is critical to determine the outcome of the landscape-scale predator trapping on the Upper Rakitata River (2100 traps covering ~13,000 ha). Over the previous five seasons, we have recorded only 0–7 tara pirohe chicks fledging per season and fledgling success per nest of 0.0–0.09 chicks. The fledgling success per nest increased to 0.21 chicks in 2023.

The successful colony was more resilient due to its location on higher, more stable ground (making it less vulnerable to floods), a 'ring-of-steel' predator-trapping network and chick shelters. The ring of steel consists of a ring of traps around the core colony and additional traps on the adjacent farmland.

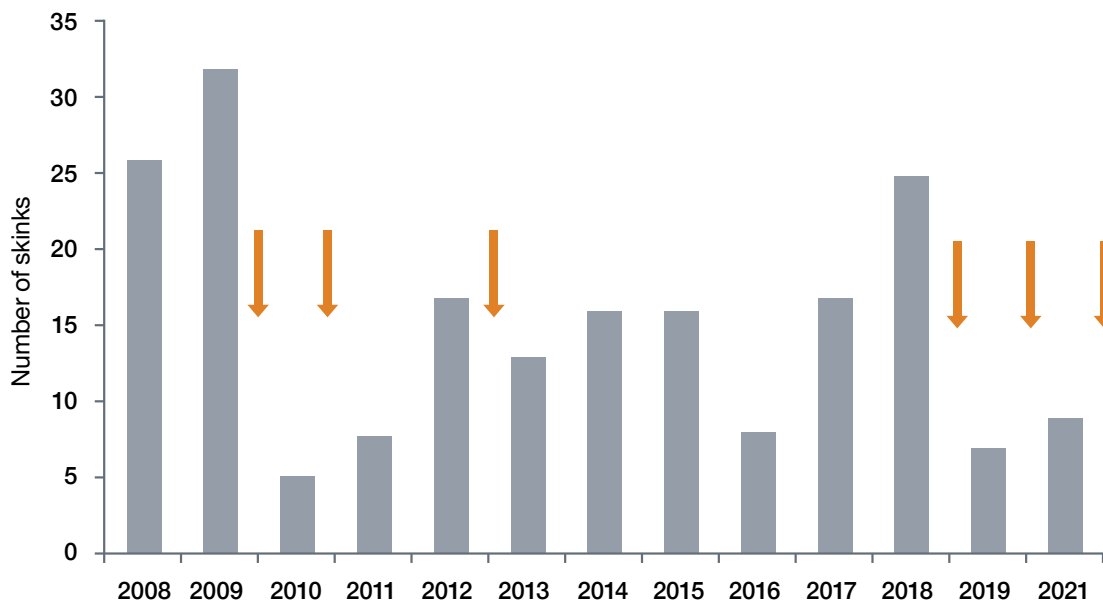
After trials with chick shelters on the Clarence River, they were trialled in the Upper Rakitata. Small pieces of plywood supported by rocks provide the chicks with shelter from the sun and harsh weather elements, particularly in the first two weeks of life when they are susceptible to heat stroke.

High-country stream health at risk

Freshwater macroinvertebrates are widely used indicators of stream health in Aotearoa New Zealand and provide a tool to evaluate the impact of land-use change on high-country streams at Ōtūwharekai. During 2022, we worked with NIWA to assess stream health across the Ashburton Basin.

It was concerning that a high proportion of streams were in poor condition based on the macroinvertebrate community index (MCI), with many sites below the national bottom line for ecosystem health. While several factors affect stream health, the 2022 data showed sites with higher deposited sediment tended to have fewer macroinvertebrates that are sensitive to pollution. Large-storms and flooding may have contributed to sedimentation, highlighting the importance of catchment-scale restoration to protect stream health.

Scree skink vulnerable to climate change



Number of scree skinks caught during annual pit-fall trapping, 2008–2021. Red arrows indicate years in which severe flood events occurred. Source: DOC / Marieke Lettink



Scree skink. Photo: M. Lettink

Scree skinks (*Oligosoma waimatense*) are one of 10 lizard species found in the wider Ōtūwharekai area and are considered threatened (Nationally Vulnerable).

Long-term monitoring of the scree skink shows a declining trend. Over 15 years the population has dropped from a total of ~440 skinks in 2008 to only one skink observed per walk-through search in 2022. The drastic decline has largely been attributed to flood events damaging the alluvial habitat. A flood in 2021 destroyed the pitfall monitoring grid and skinks have become so scarce that pitfall monitoring is no longer a useful method.

The population has recovered from past floods, but this can take more than 5 years. With flood events occurring every year since 2018 the scree skinks remaining are at risk. The 2021 flood event was a 1-in-200-year event and drastically changed the habitat, re-routing the stream, removing vegetation and depositing fine gravel and silt throughout the upper stream bed. The event occurred over the cooler months when skinks are less active, reducing their ability to move out of the stream bed during the flood.

As floods are projected to increase in frequency and severity due to climate change, it is unlikely this population of scree skinks will get a chance to recover and it is at increasing risk of local extinction at the site.

Awarua-Waituna

Protecting banded dotterel from harriers

Pohowera/banded dotterel occur on the coastal spit and wetland habitats of Tiwai Peninsula. It is an important local breeding site for the At-Risk (Declining) species. The Murihiku Operations team has been keeping tabs on the fate of pohowera nests to gauge the effectiveness of the predator-control programme and to determine the risk posed by kāhu/Australasian harriers.

They monitored 89 nesting attempts in 2022, of which 18 (20%) are known to have hatched. Trail cameras confirmed that many of the failed nests were due to harrier predation. Other predators were not detected by the trail cameras, suggesting the mammalian predator-control network along the spit is effective.

Options for harrier management will need to be integrated into the broader predator-control programme to enable recovery of banded dotterel and other threatened species at Awarua-Waituna, including māātā/fernbird and green skink.



Estimating egg-laying date by floating the eggs in lukewarm water. Photo: DOC / Sean Jacques

Recovery of Waituna Lagoon in 2023

The ecosystem health of Waituna Lagoon has been a cause for concern since comprehensive monitoring began in 2008. Frequent opening of the lagoon to the sea and poor water quality had contributed to algae proliferation and decline of the keystone aquatic plant Ruppia (*R. megacarpa* and *R. polycarpa*).

Monitoring of ecosystem health has occurred for 15 years under Arawai Kākāriki – reporting on the status of the lagoon and response to management.

This year's results show record levels of Ruppia growth and development, high species diversity and replenishment of the aquatic plant seed bank. These are the best results since our monitoring began!

At the time of the 2023 survey, the lagoon had been closed for 16 months, including two consecutive growing seasons, which clearly benefitted Ruppia and other aquatic plants. The findings support the need for the lagoon to remain closed during key Ruppia growing seasons, preferably for two consecutive years.

Catchment action to address nutrient and sediment inputs also remains critical to restore the lagoon to a healthy state.



Some impressive fruiting and seeding of Ruppia megacarpa. Photo: Aleki Taumoepeau (NIWA)

Rapid methods for replanting peatlands – action for biodiversity and climate

Extensive areas of degraded peatlands across Aotearoa New Zealand are suitable for restoration to mitigate wetland loss and enhance carbon storage. However, given the limited resources, rapid techniques for revegetation are needed. The Operations team has successfully mechanised flax planting in a former farm paddock near Waituna Lagoon. Using modified farming equipment, they planted 3000 flax plants in two days with not a single spade used!

The team wondered if farming machinery could be adapted to mechanise the planting of native plants. They approached a local agricultural contractor, who developed a specialised unit with a disc to cut through soils, a chute to guide the plants and presser wheels to close the soil around the plants. This was pulled behind a tractor and, within eight hours, 1500 small flax plugs had been planted. Further modifications, replacing discs with augers, enabled 1500 larger flax to be planted as well, while barely breaking a sweat.

Over time, the flax plants will grow, flower and attract birds that disperse seeds from the surrounding landscape, enabling wetland vegetation to restore at nature's own pace.



Planting unit in action. Photo: Pat Hoffman, Ros Cole



Flax plug being guided down the chute. Photo: Pat Hoffman, Ros Cole



Finished row of flax plantings. Photo: Pat Hoffman, Ros Cole

Whangamarino

Inter-agency response to blackwater event

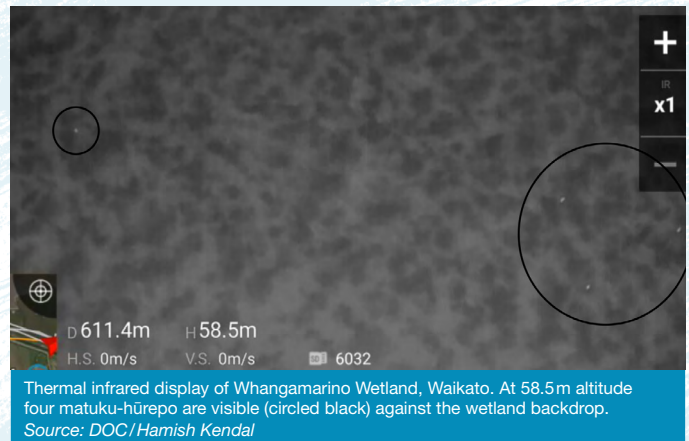
A ‘blackwater’ event occurred at Whangamarino that led to a botulism outbreak during summer 2022/23. Dissolved oxygen (DO) was recorded by DOC Rangers below 1.0 mg/L in the Whangamarino River (sometimes near 0.1 mg/L). Significant stress on aquatic organisms occurs when DO falls below 4.0mg/L.

The blackwater event had a significant impact on ecosystem health at Whangamarino, with more than 1600 bird deaths reported, including many indigenous species and fish kills. It occurred after a prolonged period of high rainfall that resulted in extensive input of contaminants and organic matter. Field assessment observed a very high algal biomass deposited in the wetland and in a state of decomposition that contributed to low oxygen levels.

The DOC Waikato team were outstanding in working with iwi, regional council and Fish & Game to recover wildlife and develop an inter-agency response plan. DOC also worked with Treaty partners to establish a rāhui over the wetland and is further advocating for urgent action on catchment issues.



Water discoloured by sediment and algae flowing into Whangamarino Wetland from Lake Waikare and surrounding catchment, February 2023. Photo: Lizzie Sharp



Thermal infrared display of Whangamarino Wetland, Waikato. At 58.5m altitude four matuku-hūrepo are visible (circled black) against the wetland backdrop. Source: DOC/Hamish Kendal

Finding matuku-hūrepo/bittern using remote sensing

Locating female bittern, nests and chicks in wetlands can be near impossible and limits our ability to determine the effectiveness of conservation actions at Whangamarino, such as predator control.

The Waikato and Fauna Science teams have refined the use of a thermal drone for finding female matuku-hūrepo and their offspring. Further trials at Whangamarino and other wetlands in 2022 confirmed the drone can easily locate nests via infrared display projected onto a screen in the field.

However, very high rainfall in 2022 led to increased flooding that impacted on the breeding season. Across Northland, Auckland, Waikato, Hauraki and Bay of Plenty, a one-to-two-month delay in breeding occurred. The delay was observed through the thermal drone surveys when five matuku-hūrepo were seen courting mid-December at Whangamarino – a time we would normally have expected nesting to be underway.

In 2023/24 thermal surveys will be repeated across Waikato, Hauraki and Bay of Plenty to add further confidence in where, when and how this method can be rolled out for wider use in Aotearoa New Zealand.

Unravelling the mysteries of *Corybas carsei*

Working with Te Papa and Ōtari-Wilton’s Bush, research is helping the Whangamarino team to unravel mysteries around the little swamp helmet orchid.

Through hand-pollination trials we discovered *Corybas carsei* can both self- and cross-pollinate. Scientific investigation also confirmed the tiny orchid relies on a mycorrhizal fungi association for at least nine months before it can photosynthesise itself – so this is very important indeed. This made the next discovery more alarming – according to soil samples, our cool burn management regime to restore orchid populations can damage mycorrhiza. Cool burn management had resulted in a 30% increase in *Corybas* flowers (initial success), but this was a clonal response and not due to sexual reproduction, which posed another problem. Research will continue and support development of a long-term recovery plan, including to understand why burning increases flowering and to test alternative management tools.

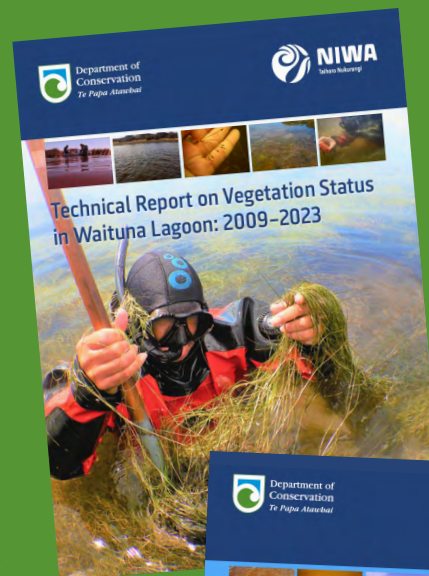


Conducting research on *Corybas carsei* – a very small orchid! Photo: Lizzie Sharp

Recent publications



- [de Winton et al. 2023. Vegetation status in Waituna Lagoon: Summer 2023. NIWA Publication.](#)
- [de Winton et al. 2023. Technical report on vegetation status in Waituna Lagoon: 2009–2023. NIWA Publication.](#)
- [Burge et al. 2023. LiDAR reveals drains risks to wetlands have been under-estimated. New Zealand Journal of Ecology, 47\(1\): 3523.](#)
- [Waters & Allen. 2023. Lake Moawhiti restoration: phosphorus sources and the importance of internal loading. Cawthron Report 3911.](#)
- [Ministry for the Environment. 2023. Ōtūwharekai/Ashburton Lakes lessons-learned report.](#)
- [Sukias et al. 2023. Jump-starting podocarp forest establishment in a wetland dominated by invasive willow. Restoration Ecology.](#)
- [Greenwood et al. 2022. An ecological survey of streams within Ōtūwharekai \(Ashburton Lakes\). NIWA Publication.](#)
- [Blyth et al. 2023. Minimum drain setback distances to protect New Zealand wetlands: Tool development. Ministry for the Environment, Department of Conservation and Greater Wellington Regional Council](#)
- [UNEP. 2022. Global Peatlands Assessment: The state of the world’s peatlands.](#)



On the horizon

- **National Wetland Symposium 2024.** We are excited the next National Wetland Trust Symposium will be held in Northland during April 2024.
- **Peatland carbon research post fires.** During the later half of 2023 DOC and a team from Manaaki Whenua will be calculating the amount of carbon lost from peatland fires at Kaimaumu and Awarua in 2022. Watch this space.
- **Lake treatment at Moawhitu.** Arawai Kākariki is supporting efforts by Ngāti Koata to restore the mauri of Moawhitu, Rangitoto ki te Tonga/D'Urville Island. Lake restoration is planned for 2024.
- **Research funding success for our partners** at the Cawthron Institute and GNS. We are very pleased that the Our Lakes, Our Future research programme has gained MBIE Endeavour funding for the next 5 years.
- **Wetlands as nature-based solutions.** The effects of cyclones and other natural disasters can have large-scale implications. Our technical team aims to examine the role of wetlands as nature-based solutions to address climate events.

