DOC-7537844

Department of Conservation
Te Papa Atawhai

Thermal camera trial with drone to identify estuarine birds – Dec 2023

Background:
Initiated in 2019, the Te Hoiere Restoration project is a multi-partner project which seeks to revitalise Te Hoiere/Pelorus catchments from the mountains to the sea (ki uta ki tai) and to be a leading example of community-driven environmental restoration. Te Hoiere/Pelorus River is the largest river catchment which flows into the Marlborough Sounds, spanning 107,403 km2. The current environmental quality of Te Hoiere catchment is good but is deteriorating. Through partnerships, this Project aims to tackle issues before the state of the catchment deteriorates further.

The catchment is also one of 14 priority catchments in Department of Conservation's Ngā Awa River Restoration Programme and an exemplar catchment as part of Ministry for the Environment's At Risk Catchments Programme.

The programme involves many partners e.g. Marlborough District Council, Government agencies, several organisations, and the community. Ngāti Kuia are celebrated and respected as Mana Whenua and kaitiaki of Te Hoiere, and likewise, Rangitāne o Wairau as Mana Whenua of the Kaituna sub-catchment.

The Trust and project, is aligned with Kotahitanga mō te Taiao Alliance, a wider effort to promote collective action towards enhancing and protecting biodiversity in Te Tauihu, the top of the South Island.

One of the first major actions for this project was to create an Integrated Catchment Enhancement Plan (ICEP) (https://storymaps.arcgis.com/stories/db492eaf502d40b0a7ae57a9c8b570d6). Out of this plan a number of actions evolved. One, covering habitat and species population and enhancement was “E10. Community restoration projects are supported and expanded”. Specifically, “E10.1 Predator control of estuarine habitat between Mahakipawa and Te Hoiere estuaries, to protect Fernbird and Banded Rail populations”.

As part of this project it has been identified that to understand the implications of predator control it is vital that outcome monitoring of the benefiting species is also undertaken and understood.

Many estuarine bird species tend to be very secretive coupled with an estuarine environment being difficult to search. As a result, current survey techniques for such species are both labour-intensive and limited in their accuracy, and consequently, any outcome monitoring to measure the effects of predator control on wetland bird populations needs further development to provide reliable measures of success. The idea of a thermal camera mounted on a drone was proposed as a possible survey technique to more easily and potentially repeatedly compare bird numbers following predator control.

Map 1: trial site

The trial:

Trap and Trigger had confirmed they had a suitable drone fitted with a thermal camera that could be made available for our trial (DJI Mavic 3T, with a 640 x 512 Thermal sensor and 4K visual camera with 56x Hybrid zoom - https://enterprise.dji.com/mavic-3-enterprise/specs).

Image 1: Mahakipawa estuary 22st Dec, 2023 approx. 6am

Image 2: Drone controller

Image 3: Drone controller in thermal camera setting, note potential banded rail bottom left of centre cross, within green square. Also note drone GPS tracking in bottom left corner.

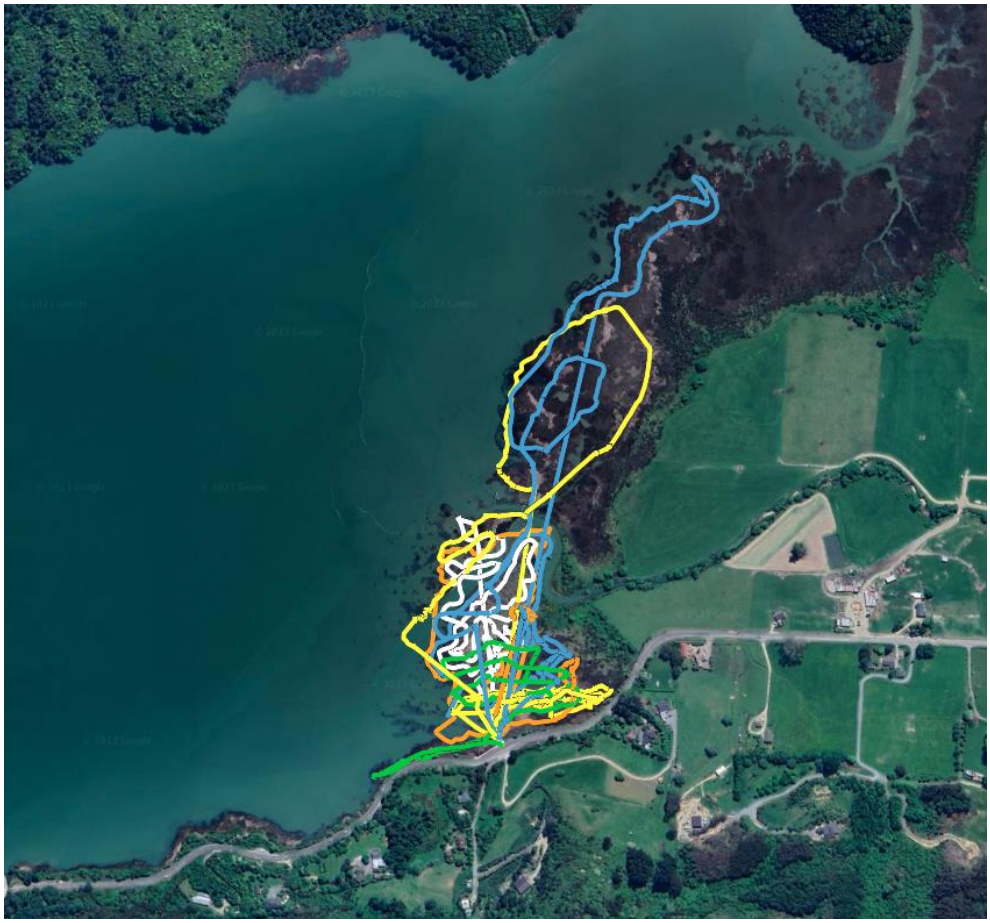

Image 4: Area grid searched over the two trial sessions – the drone maintained a track log as it flew.

Image 5:

Image 5 & 6: Two examples of confirmation images captured from the drone

Oliver Fey from Trap and Trigger was arranged to provide and pilot the drone on his way up north for Christmas.

Late afternoon/evening on 21st December, 2023 was the first trial. Weather conditions were favourable with some wind and an incoming tide (high tide for Havelock about 1700hrs).

Oliver positioned himself close to the estuary in a location we knew banded rail occupied and we would also be able to still see the drone operating. We had also described the habitat type that we wanted searched (mainly rushes and lower stature vegetation at the head of the estuary).

Oliver then proceeded to search the area selected in a grid fashion with the drone approximately 15-20m from the ground.

There were about 5 batteries for the drone, each providing about 20-30min run time. The drone would signal when battery levels were running low and a change was required.

Due to the small target size (i.e. banded rail) and the fact that banded rail could also be obscured by vegetation, I felt the drone could not operate at a higher altitude (i.e. camera would cover a wider area) without compromising the ability to pick-up small targets (see image 3 above for size of target requiring to be detected).

That evening a selection of wildlife was identified with the thermal camera including: one banded rail, several pukeko, mice, various finches, a black backed gull nest with chick (visited the next day to positively identify) and a rabbit or hare.

Once a heat signature from a live animal had been identified and zoomed in on, the 4K visual camera was then used to positively identify the subject. Still colour images could also be taken if required (the first banded rail seen was positively identified this way).

Once it began to get dark, being able to positively identify objects of interest with the visual camera became problematic. This was a limitation, unless the heat signature was so unique that species could be confirmed off this (at this stage not the case for banded rail).

Oliver returned around 0600hrs on the morning of 22nd December, again searching a similar area. High tide was approximately 0530hrs, tides were close to neap, so exposed mud still existed around estuarine rushes, likely concentrating any banded rail to the edge of these rushes. As the tide receded more clear mud areas were exposed.

Early on in this search a pair of banded rail were seen close to the road with a chick (the chick was slightly smaller than the adults and had darker overall plumage – these birds were all seen, not identified by the drone which was operating elsewhere at the time). Three adults were then seen together, one chasing the other in the same general area. The drone was then flown over these birds, with all adults easily being seen with the thermal camera and being positively identified using the visual camera.

Interestingly, a stoat was then observed chasing one of the rails (this wasn't seen with the drone, just observed with the naked eye). Initially a pair of banded rail came out into the open from the rushes on the far side of the creek close to where the drone was being operated. It then disappeared into

the rushes near the road. A shorth time later one of the adult banded rail ran out from the same vegetation near the road, across the creek and into the rushes on the far side of the creek. Seconds later a stoat came bounding out and into the same area of rushes where the rail had just gone into. A short while later an adult rail appeared again and looking like it was agitated, it went back into the rushes where the stoat was last seen, almost like it was pursuing it. Several minutes later the rail appeared again but no more was seen of the stoat. This whole interaction probably took less than 5 minutes from the initial banded rail sighting.

A second nest with eggs was spotted, the size indicated it was likely to be a pukeko nest. Various finches were again spotted (not positively identified).

Without looming darkness, the morning search seemed more productive compared to the previous evening, with most thermally detected species being able to be identified with the visual camera.

A quick drone search further north then identified a group of 5 -6 banded rail (all positively identified using the visual camera).

In total, 13-14 individual banded rail were positively identified during the morning search.

Discussion:
A drone of the quality used and a suitably skilled operator appeared to provide a very useful tool to assist with estuarine surveys for banded rail and probably pest/predator species as well.

Flown at approx. 15-20m the drone appeared to slightly agitate most species seen. In saying this, most also stayed around long enough to enable positive identifications to be made with the visual camera (drone either needed to be in thermal or visual camera mode, with an instantaneous change possible between the two). The banded rail would slowly move away from under the drone, often retreating to cover, but also looking towards the drone.

It is assumed there will be a trade-off between flying the drone higher and potentially surveying a wider area but then having heat signatures being smaller and potentially missed if the desired targets are themselves small.

With time some species may be able to be identified by their thermal image alone due to their size and the way they moved, particularly larger pest species.

During this trial, the taller vegetation surrounding the estuary edge was not flown over (manuka, flax etc). It is still unknown how the thermal camera would perform over this vegetation type.

No fern bird were observed during this survey. This may have been due to the habitat type mostly flown over i.e rush beds rather than the scrubby estuary margins which are probably more likely to hold fern bird.

Future drone surveys should ideally target early spring when banded rail should be holding territories and nests may be reliably detected, without the confounding presence of fully-grown chicks. It appeared an early morning search with a suitable tide would be most productive (outgoing for approx. 1-2hours depending on whether the tides were neaps or spring tides).

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From the area covered during this trial, I would anticipate two favourable mornings of 3hrs each would provide sufficient time to survey the head of Mahakipaoa estuary.

A site specific search protocol using a drone of this quality could be prepared that was repeatable for a given area offering a useful comparison over time (i.e. outcome monitoring). Data gathered could also further be supported with existing methods such as responses to taped calls or just surveying for calls which may further support data gathered by the drone

Certainly a technique, worthy of further exploration.

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