

**Waiau Toa/Clarence and
Wakaputawatea/Acheron rivers
tarapirohe/black-fronted tern monitoring project
- 2025/26 operational report**



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Waiau Toa/Clarence and Wakaputawatea/Acheron rivers tarapirohe/black-fronted tern monitoring project – 2025/26 operational report.

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Document Quality Assurance:

This report was prepared by Wildlife Management International Limited for the Department of Conservation in fulfilment of the contract the Black-fronted tern outcome monitoring component (DOC-6301990).	
Citation: Otis et al. (2026). <i>Waiau Toa/Clarence and Wakaputawatea/Acheron rivers tarapirohe/black-fronted tern monitoring project - 2025/26 operational report</i> . Unpublished client report prepared for the Department of Conservation and Environment Canterbury by Wildlife Management International Ltd, Blenheim.	
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Version History:

Version	Authors	Date	Reason for edition
1	Myrene Otis, Samantha Ray, Campbell Maclean, Stella Solasz	20 May 2026	First iteration.
2	Myrene Otis, Samantha Ray, Campbell Maclean, Stella Solasz	1 July 2026	Second iteration after client review (DOC).
3	Myrene Otis, Samantha Ray, Campbell Maclean, Stella Solasz	8 July 2026	Third iteration after client review (ECan).

Cover Image:

Tarapirohe/black-fronted tern (*Chlidonias albobriatus*). © Sarah Gabites 2025.

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EXECUTIVE SUMMARY

This report provides a summary of results from the fifth and final monitoring season of the current five-year (2021/22-2025/26) tarapirohe/black-fronted tern (*Chlidonias albobriatus*) Phase 2 collaborative monitoring project with Wildlife Management International Limited (WML), Environment Canterbury (ECan), and the Department of Conservation (DOC).

Monitoring began from October through to February, with a helicopter survey being conducted on 20 November 2025 to locate tarapirohe colonies and complete aerial counts. The monitoring area extended from Lake Tennyson to the end of the trapping zone downstream of the Waiau Toa/Clarence River and Wakaputawatea/Acheron River confluence, and from the Severn Shelter on the Wakaputawatea down to the Waiau Toa confluence. Active nests were first detected on the Waiau Toa on 17 October 2025 and on the Wakaputawatea on 19 November 2025.

The monitored area remains divided into two zones: the treatment zone (a continuous stretch of river under predator control containing seven enhanced islands and with chick shelters placed at two colonies) and the non-treatment zone (no trapping, chick shelters, or enhancement work carried out). This season there was a revival in tarapirohe numbers and nests on the Wakaputawatea, suggesting that previous declines may partially reflect inter-seasonal movement within a dynamic river system rather than a true population-level decline, a theory supported by the resighting of banded individuals on different rivers.

Throughout the 2025/26 tarapirohe breeding season, the maximum number of nests estimated to be active was 267, representing at least 534 breeding birds on the Waiau Toa and Wakaputawatea rivers, although a lesser number of 402 tarapirohe were counted on the helicopter survey. A total of 371 nests across 15 colonies were found this season, of which 360 nests within 12 colonies were monitored with 99% (n=355) having a known outcome. Of these 360 nests, 73% (n=262) were situated on the Waiau Toa, and 27% (n=98) on the Wakaputawatea. Overall hatching success reached 62% (n=221), the second-highest rate in project history. Hatching success was very similar between the non-treatment zone natural islands (66%) and the treatment zone enhanced islands (65%), but when including mainland nests in the treatment zone, hatching success in the treatment zone dropped to 59%. Between 59 and 286 chicks fledged (0.16 and 0.79 fledglings per nest) from monitored colonies, a wider range than in the previous season. The uncertainty in this season's fledgling counts likely stems from the conservative calculation method that does not account for multi-modal fledging peaks, compounded by high rates of unidentifiable chick predation.

The leading cause of nest failure this season was predation, closely followed by desertion, impacting 19% (n=66) and 15% (n=54) of nests, respectively. River hydrology also caused some nesting failures; while the core part of the breeding season was relatively stable, flooding events in late October and late January bookended the season, with the initial October flood likely wiping out freshly laid nests at colonies that had not yet been surveyed. Unlike the previous season, river channels around monitored island sites did not dry out, which likely contributed to the overall higher hatching success observed.

Predation events occurred across both treatment and non-treatment zones, though identification of specific culprits was difficult, as many nests were predated at the chick stage once monitoring equipment was removed and chicks had left the nest. At the egg stage, predation was responsible for 43% (n=32) of nest failures in the treatment area and 58% (n=34) of nest failures in the non-treatment area. Trail cameras were deployed on 43% (n=153) of monitored nests and recorded predations from kāhu/Australasian harrier (*Circus approximans*), a matuku/hedgehog (*Erinaceus europaeus*), as well as tarapirohe adults themselves. There appeared to be a resurgence in kāhu activity, as compared to the last four seasons, with five active egg or egg/chick predations captured

on camera. In the treatment zone, disturbance by ungulates i.e. cattle/kau or deer/tia and hea/hare (*Lepus europaeus occidentalis*), was an ongoing issue resulting in egg trampling or desertion.

A notable observation this season was the high performance of natural islands on the Waiau Toa and Wakaputawatea, many of which appeared to be of higher quality than those enhanced within the treatment zone. These natural sites were characterized by a lack of vegetation, substantial island height, clean gravels, and strong, deep channels that effectively safeguarded colonies from predators and flooding. While management interventions like island enhancement are beneficial and correlate with higher colonization rates, this season's results suggest they cannot always replicate the defensive strength of high-quality natural sites. Furthermore, seasonal variation in predator dynamics, such as a hedgehog predating the majority of eggs from nests on a natural island in the non-treatment zone, highlights the vulnerability of otherwise high-quality islands.

This season was unique in that an intensive chick shelter trial was run to test the role of chick shelters in influencing chick survival and fledging success. Within the treatment zone, cameras and chick shelters were placed at each nest across two breeding colonies while a separate colony was used as a control site with cameras at each nest but no chick shelters. Although the core chick-rearing period did not coincide with the sustained high temperatures (i.e. $\geq 30^{\circ}\text{C}$) seen in earlier years, footage confirmed that shelters were frequently sought out by chicks as they aged and mobility increased. A total of 40 chick shelters were deployed at every nest at each of the two selected treatment colonies and of these nests, 65% ($n=26$) hatched chicks. One to seven days after hatching, 81% ($n=21$) of chick shelters were used by chicks and after eight days, 78% ($n=7$) of chicks at the remaining nine nests still used shelters at least once.

Temperature data loggers were used for the first time to establish a deeper understanding of chick shelter efficacy and the thermal environment experienced by chicks. This pilot study revealed how impactful ground radiation is in contributing to higher temperatures at the nest site, and when ground radiation is kept constant, chick shelters provide a cooler environment than the open gravels outside the shelter, particularly at temperatures $\geq 30^{\circ}\text{C}$. Chick shelters remain a valuable management tool to mitigate the impacts of thermal stress, a threat likely to intensify with climate change. However, a localized chick predation event at the control site confounded efforts to produce a direct statistical comparison of fledging success between sheltered and unsheltered colonies.

Results from the current season continue to highlight the challenges of tarapirohe conservation in a dynamic environment where river levels, predator incursions, a changing climate, and land-use interact. WMIL has the following recommendations:

- Helicopter surveys continue to take place during the first half of November and be extended past Severn Shelter to track population shifts outside of the monitored area.
- Monitor 8–10 colonies across both rivers, ensuring a mix of treatment and non-treatment sites based on helicopter survey results. Still attempt one-two checks of non-monitored colonies at key stages of the breeding season.
- Resume the trapping, banding, and monitoring of kāhu.
- Continue targeted leg-hold trapping at colonies during peak nesting and chick-rearing.
- Continue to use chick shelters within the treatment zone. If another comparison study is conducted in future, splitting the shelter treatment versus control across a single, suitably large island should be attempted for a more accurate comparison of chick survival.
- Place tactical cameras at colonies around the late chick-rearing to fledging period where chicks are mobile, and predation events often go undetected.
- Intensive monitoring of fledglings is established to decrease the level of uncertainty in fledging counts.
- Prioritize increasing island height during enhancement works to provide resilience against the increasing frequency of summer floods.

Waiau Toa/Clarence and Wakaputawatea/Acheron rivers tarapirohe/black-fronted tern monitoring project – 2025/26 operational report

1. INTRODUCTION

Environment Canterbury (ECan) and Department of Conservation (DOC) have co-funded a five-year project aimed at monitoring and improving the breeding success of tarapirohe/black-fronted tern (*Chlidonias albostratus*) on the Waiau Toa/Clarence and Wakaputawatea/Acheron rivers. This season marked the final year of the project and concluded the second phase of the collaborative research and management partnership between ECan and DOC.

The present report produced by Wildlife Management International Ltd. (WMIL), delivers a summary of the 2025/26 tarapirohe breeding season. This season included a particular focus on assessing the efficacy of chick shelters in promoting tarapirohe chick survival and fledging success. The results of various enhancement measures carried out at treatment zone colonies over the past 12 months are reported on, and recommendations for future tarapirohe conservation are also provided.

For ease of reading, repeated information from previous seasons' reports regarding introduction and methods have not been included. Please refer to the 2022/23 report (Connor-McClean et al. 2023) for these sections (available upon request from WMIL or online on the [BRaid](#) website).

Te Reo names are used when referring to bird species after the first use (e.g. tarapirohe/black-fronted tern) while common English names are used to refer to all mammalian predator species after the first use (e.g. matuku/hedgehog).

2. METHODS

2.1 Treatment and non-treatment zones

The monitored area is divided into two zones:

Zone 1: Treatment zone: a continuous stretch of the Waiau Toa under introduced mammalian predator control, where manipulations such as chick shelters deployment and island enhancement have taken place. Enhanced islands have had work done to enhance water flow around the island, increase island height, and/or suppress weeds.

Zone 2: Non-treatment zone: other areas of the Waiau Toa and Wakaputawatea rivers with no predator control or island enhancement.

Historical information regarding island enhancements is detailed in Connor-McClean et al. (2023).

2.2 Tarapirohe/black-fronted tern monitoring

Please refer to the 2022/23 report (Connor-McClean et al. 2023) for further details on tarapirohe survey methods, monitoring, and chick shelter use. For the most recent 2025/26 season, the project deviated from previous seasons by not monitoring all colonies. This year a subset of 12 colonies was selected for monitoring throughout on the Waiau Toa and Wakaputawatea rivers, consisting of six treatment and six non-treatment colonies. A further three colonies were identified on the Waiau Toa but were not monitored after their initial surveying due to the capacity limits of the project. Those not monitored were excluded based on either low nest numbers, location, and/or early failure. Two potential colonies (*Topo* and *Grader*) were identified during the helicopter survey but not surveyed due to either difficulty of

access or capacity limitations while a third colony, *Heli* failed very early in the season and was deserted before nest-finding occurred.

Figure 1 shows the surveyed areas and locations of all tarapirohe colonies along the Waiau Toa and Wakaputawatea rivers and the configuration of the predator control.

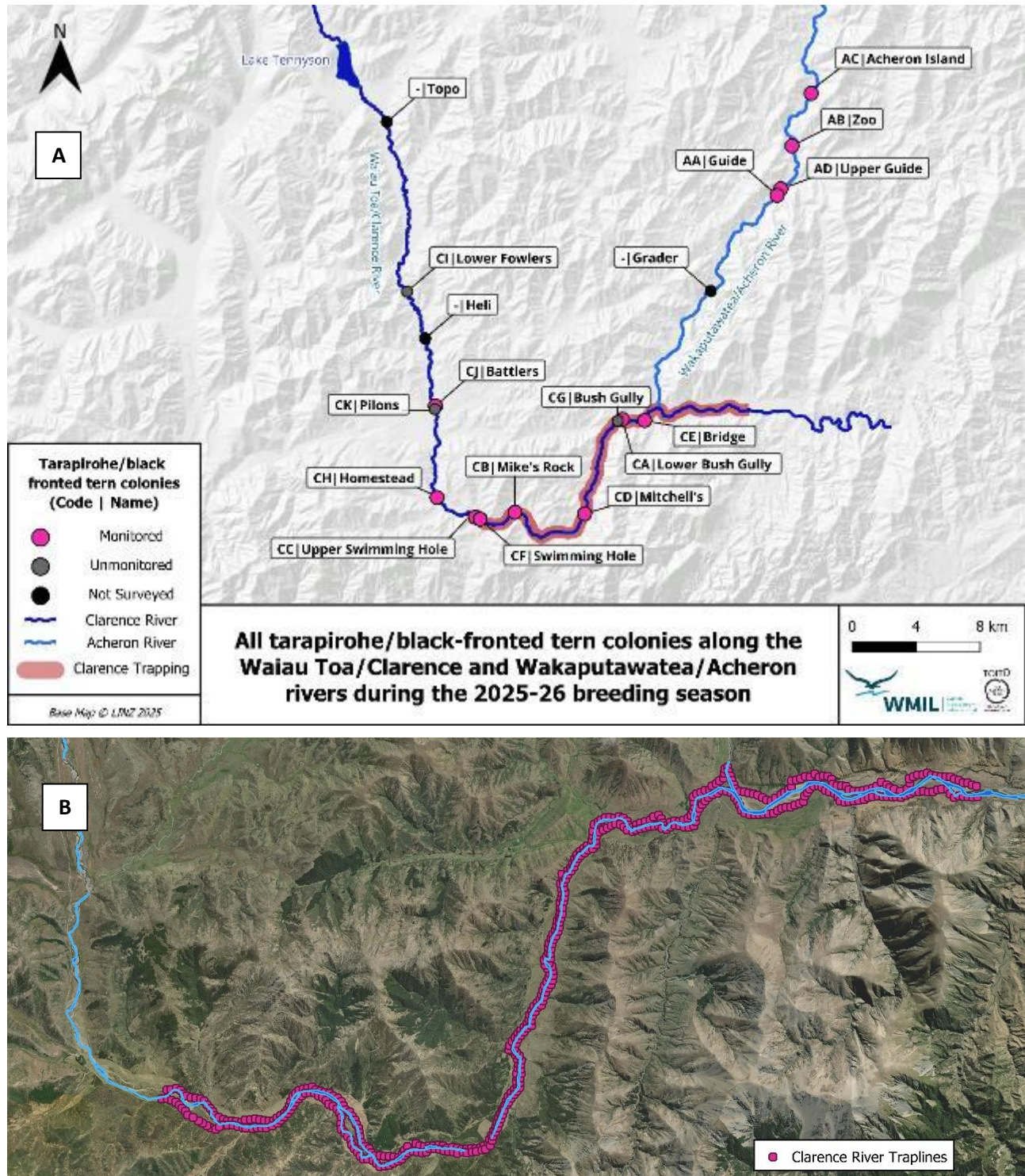


Figure 1: A) Tarapirohe/black-fronted tern colonies along the Waiau Toa/Clarence and Wakaputawatea/Acheron rivers during the 2025/26 breeding season (identified from helicopter and walking surveys). *Heli*, *Grader* and *Topo* colonies were not given a Colony Code and instead are marked by “-”. **B)** trap configuration on single line each side of river (source: TrapNZ).

2.2.1 Chick shelter deployments

In the past, chick shelters have been deployed across all colonies monitored in the treatment zone. For the 2025/26 season, a collaborative decision was made with DOC and ECan to choose one to two colonies to completely saturate with chick shelters and monitoring cameras. An additional colony was chosen as a control site to fully saturate with cameras but without chick shelters. Full saturation entails chick shelters and/or cameras being placed at every nest found within the colony, so long as the nesting tarapirohe return to their nest and display no adverse reactions. Colonies for saturation had to meet the criteria of being islands colonised by tarapirohe within the treatment zone and were chosen based on their suitability in terms of size, timing, and lack of vegetation that could provide alternative shelter for young chicks. However, this could not always be controlled as many islands experience rapid growth of weedy plants and grass at the peak of the breeding season. Even after chicks had grown and left the nest, chick shelters were left in place in case they continued to influence fledging success.

2.2.2 Temperature loggers

This season, ibutton (<https://www.ibuttonlink.com/>) temperature loggers were installed across chick shelter set ups to measure temperature differences under shelters compared with adjacent open habitat. Through this paired measurement, it was hoped to empirically determine the impact that chick shelters have on the temperature/heat environment experienced by young chicks. Three loggers were also placed across the control colony to record ambient temperature at different points along the island (e.g. the centre, upper and lower ends). Each logger was placed in a small pottle painted with a tinted white colour (i.e. Opera, Wattyl paints) to lessen the chances of tarapirohe being bothered by a very bright and reflective device. Ibuttons were programmed using the software ExactLog to set them on a sampling regime recording temperature at 12-minute intervals, allowing them to last in the field for up to 14 days. At or before the end of their sampling period, the loggers were collected and the data downloaded to clear the device's memory before redeployment. Before deployment, each pottle containing an active logger had T-Rex waterproof tape affixed along the seam of the pottle to create a waterproof housing for each logger unit.

Ibuttons were attached to the underside of a-frame and flat roofed chick shelters via a staple and a cable tie (**Figure 2A**). For the camera stand set up, stands of equal height were chosen and loggers were tied via cable ties, onto a piece of wire stretched across two nails hammered into the top of each stand (**Figure 2B**). This design was chosen to avoid an unequal distribution of solar radiation hitting the logger if attached elsewhere on the stand and shaded out. However, this design was later recognised as sub-optimal as its height allows for a higher level of air flow and a lack of ground radiation, thereby inaccurately capturing the ambient temperature that unsheltered chicks experience (see Sections [3.2.8](#) and [4.4](#) for further discussion).

To develop an understanding of the level of contrast in temperatures across each breeding colony, 10 of the 12 monitored colonies had at least one temperature logger actively recording until most chicks become mobile and left their nests. Non-treatment colonies CA and CH did not receive any loggers due to limitations in the number of devices available. Paired chick shelter logger set ups were prioritised over general temperature monitoring at each colony.



Figure 2: How temperature loggers were attached to A) chick shelters to measure temperature under the shelter and B) camera stands to measure ambient temperature during the 2025/26 tarapirohe season.

2.3 Predator control

Predator trapping is now undertaken by J&S Mears Contracting between August and February each year. Trapping results are available on Trap NZ under the [Upper Waiau Toa/Clarence Trapping Project](#) and are not reported on in this report.

OSPRI did not carry out any aerial sodium fluoroacetate (1080) operations to target paihamu/common brushtail possum (*Trichosurus vulpecula*) this season but have in previous seasons (2021-2023) and DOC trialled a new 1080 bait for ngeru/feral cats (*Felis catus*) in the Edwards Valley in 2024. Details can be obtained from the annual reports for those periods.

3. RESULTS

3.1 Enhanced Islands

Prior to the beginning of the 2025/26 season, weed spraying and island enhancement were carried out by DOC at seven islands in the treatment zone, following recommendations from the January 2025 progress report (Figure 3). During winter 2025, river flow rates were relatively consistent and not as variable as the extreme flow events in winter 2024. However, there were still a few incidences of significant flooding events with the flow rate spiking to around 140m³/s in early May and over 100m³/s in June. Naturally, these floods may have altered the channels around enhanced islands and reversed some of aspects of the earlier work put into their improvement.

Out of the seven enhanced islands, the only one not colonized by nesting tarapirohe this season was Cow Island.

At Upper Swimming Hole, parts of the island were graded and raised, and vegetation was removed, while Swimming Hole only had gravel turned over and vegetation removed. These enhancements, likely contributed to the early success of egg-laying and hatching on these two islands in the 2025/26 season whereas tarapirohe colonies elsewhere fell behind as their chosen islands, including the enhanced islands of Bush Gully and Mike's Rock, were flooded in October. The substrate of Mike's Rock was noticeably changed after the October flood, where at least eight nests failed, although the island was eventually recolonised later in the season.

Bush Gully, an island that had its height raised, appeared to be popular with the tarapirohe until the flooding in October caused most terns to abandon, with only three tarapirohe re-nesting post flood. After October, the remaining enhanced islands of Bridge and Mitchell's were quickly colonised.

Despite enhancements, as the season developed, weeds and grasses including common broom (*Cytisus scoparius*) and rūpini/tree lupin (*Lupinus arboreus*) became particularly prevalent on Bridge and Swimming Hole islands, as well as sections of Upper Swimming Hole (Figure 3).



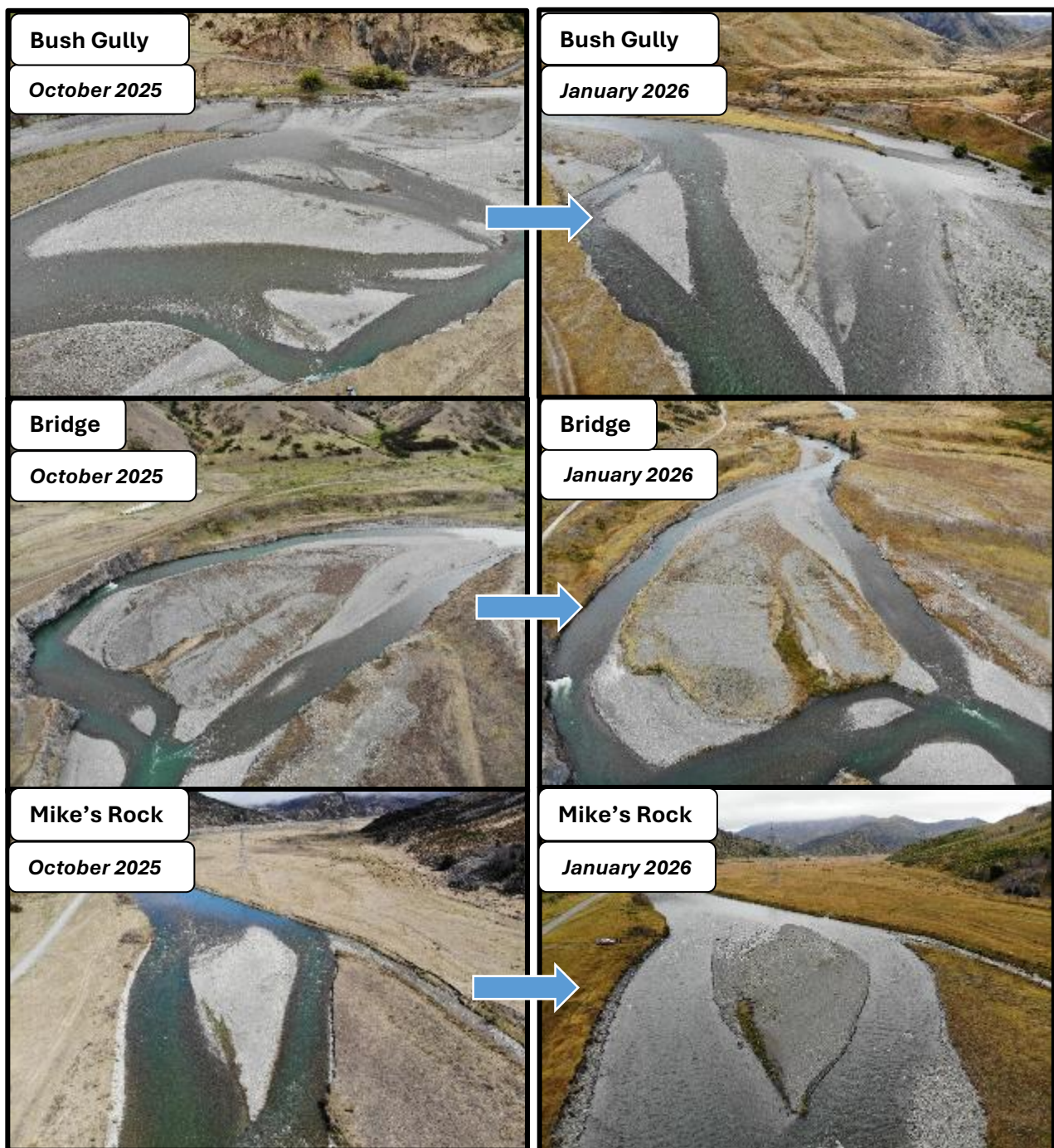


Figure 3: Enhanced islands with comparison photos from the beginning (3 October 2025) and the end (20 January 2026) of the 2025/26 tarapirohe/black-fronted tern season.

3.2 Tarapirohe/black-fronted tern monitoring

3.2.1 Walkthrough surveys

Initial walkthrough surveys on the Waiau Toa began during the week of 6 October 2025. No tarapirohe nests were found, however, there was evidence of scrapes and multiple tarapirohe displayed agitated behaviour. For the Wakaputawatea, tarapirohe appeared to be more scattered and often changed their

distribution around potential nesting islands, so walkthrough surveys took place later (1st week of November) to give the birds time to settle without disturbance.

Eggs were first recorded on the Waiau Toa on 17 October 2025 at the Lower Bush Gully colony and then on 20 October 2025 at Mike's Rock. On 20 October, it was also discovered that Heli colony (which was yet to be surveyed but had the largest consistent grouping of tarapirohe activity, on the Waiau Toa outside of the treatment zone) had been abandoned with evidence of predation of at least one egg. The channel had shallow areas and stepping stones that may have enabled incursions. On the Wakaputawatea, the first eggs were found at Zoo colony on 19 November 2025. Dates for the first detection of eggs for the Waiau Toa colonies has been very consistent over the past four seasons (16 or 17 October) while on the Wakaputawatea, first eggs tend to be found later, either in late-October or mid-November. Last season, the birds nesting on the Wakaputawatea were thought to have had a delayed lay date whereas this season, since chicks had hatched at three of the four Acheron colonies by 29 November, it is clear that eggs were laid by at least early November, if not late October, and the delayed detection this season was a result of flooding and high flow rates preventing access to colonies as well as prioritising nest-surveying and management actions at treatment zone colonies.

Between 21–24 October, the Waiau Toa experienced significant flooding, reaching a peak flow rate of $173 \text{ m}^3 \text{ s}^{-1}$ (mean flow is $15 \text{ m}^3 \text{ s}^{-1}$). All nests were lost to flooding at the previously surveyed colonies such as Lower Bush Gully and Mike's Rock, and access to other colonies was limited until the beginning of November. Tarapirohe affected by flooding in the treatment zone of the Waiau Toa appeared to shift downstream and colonised Bridge and Mitchell's Islands relatively quickly. Eventually, a smaller population of birds returned to Lower Bush Gully and Mike's Rock. Upper Swimming Hole and Swimming Hole did not appear to lose many nests during the flood due to their greater height and corresponding channel configurations, increasing their capacity to withstand flooding, with the earliest chicks found at Upper Swimming Hole on 11 November.

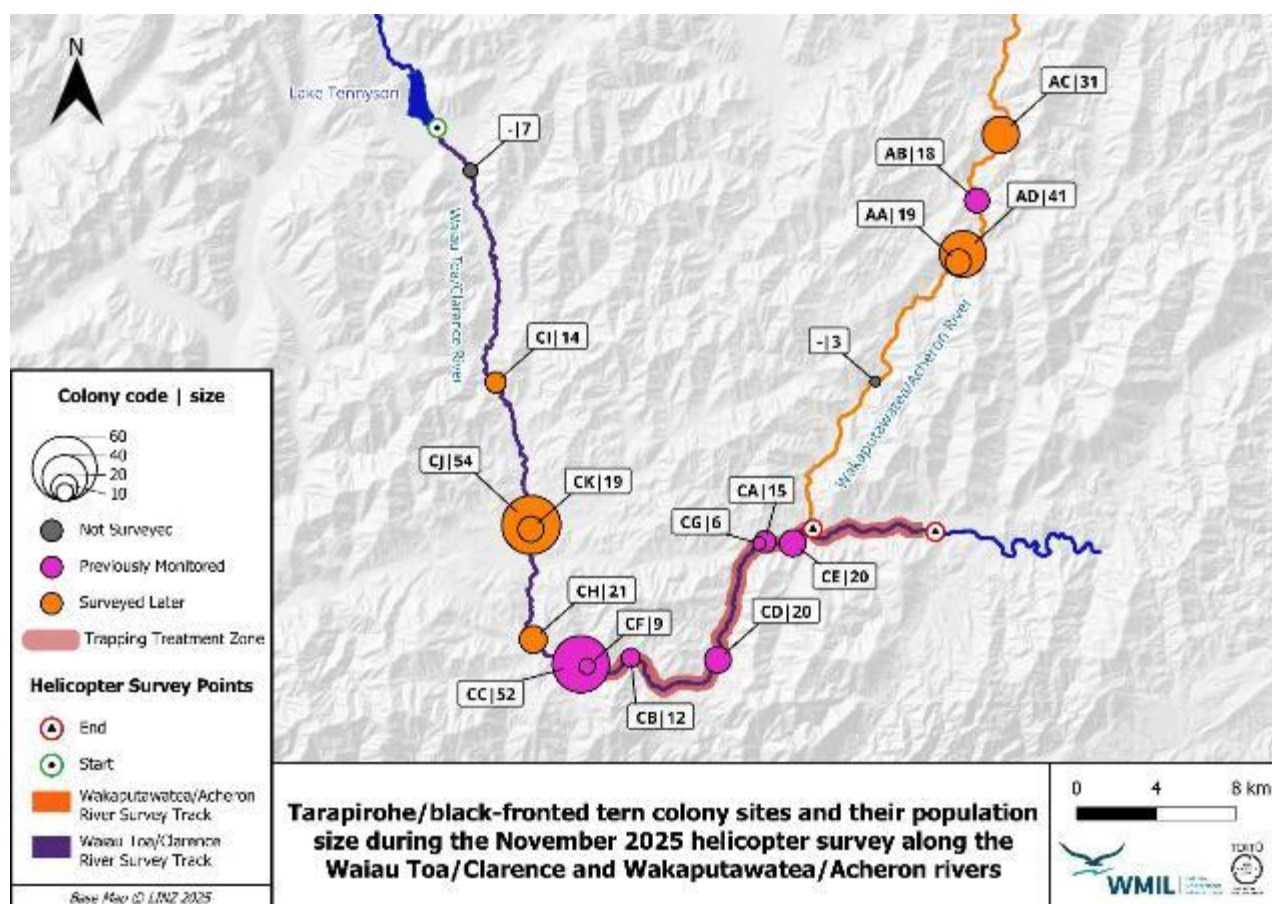
3.2.2 Helicopter survey

A helicopter survey was conducted on 20 November 2024 from Lake Tennyson to just downstream of the Wakaputawatea and Waiau Toa confluence (the downstream edge of the treatment zone). The Wakaputawatea was surveyed from the same confluence north to the Severn Shelter ([Figure 4](#)). A total of 403 tarapirohe were counted within 17 potential colony sites across both rivers during the helicopter survey ([Table 1](#)). Helicopter surveys continue to be valuable for detecting the colonisation of islands as nine of the sites found were new (four of which the team were aware of but had not had the time or suitable river conditions to conduct walkthrough surveys). After the helicopter survey was complete, nest-finding was conducted at seven of the new colonies, but two were never surveyed on account of difficulty of access, low tarapirohe numbers, and capacity limitations. Of the 15 colonies surveyed, 12 were selected to be part of the monitored colonies (see [Section 3.2.3](#)).

There were 12 (five new) potential colony sites found on the Waiau Toa and 281 tarapirohe were seen, 32 of which were detected between sites. On the Wakaputawatea four new potential colony sites were recorded, and 122 tarapirohe were seen, of which 10 were detected between the sites. The helicopter survey confirmed that the number of tarapirohe within the Wakaputawatea survey area ($n=122$) was considerably higher than in previous years ([Table 1](#)). In contrast, the Waiau Toa had lower numbers more in line with those counted during the 2021 and 2022 breeding seasons. It is important to note that in 2011, 2013, 2015, and 2018 monitoring covered longer stretches of the Wakaputawatea River than from 2021 onwards (Connor-McClean et al. 2024). For consistency these values are not included in this year's report. While aerial surveys are highly productive for clarifying colony locations and estimating the number of birds within the surveyed sections of each river, further monitoring and modelling is needed to interpret population trends. It is worth noting that the timing of the 2025/26 season's helicopter survey occurred 1-2 weeks later than previous seasons' which usually took place in the first week of November. This was partly a result of giving the tarapirohe more time to settle post-flood, but high winds on earlier dates also delayed survey timing.

Table 1: Number of tarapirohe/black-fronted terns counted during helicopter surveys from 2021 to 2025.

Year	Wakaputawatea/Acheron River	Waiau Toa/Clarence River	Combined Total
2021	72	269	341
2022	98	252	350
2023	82	370	452
2024	33	393	426
2025	122	281	403

**Figure 4:** Tarapirohe/black-fronted tern colony sites and their population size during the November 2025 helicopter survey along the Waiau Toa/Clarence and Wakaputawatea/Acheron rivers. The colony code is shown with two letters and the population size of the colony (colony code | population size)

3.2.3 Size and distribution of monitored breeding colonies

Of the 12 monitored colonies, size ranged from 12 to 72 nests (**Figure 5**), with an average size of 30 nests per colony. The maximum number of nests monitored throughout the 2025/26 season reached 360. However, not all of these nests were active concurrently and several nests would have been second attempts after previous attempts were sabotaged by flooding, abandonment, or predation. Including the three unmonitored colonies that were surveyed for nests at least once, the total nest count across the season was 371 with the smallest colony being CK with one nest. CK was initially labelled as a potential nest site with a concentration of 19 tarapirohe in the helicopter survey, but ground surveys later found a mostly deserted group of islands with just a single nest, indicating that either a predation event had taken place or the birds chose to nest elsewhere.

The maximum number of monitored nests that were active (at the egg or chick stage with no signs of failure) at the same time on both rivers during the season was 267 (representing 177 breeding pairs on the Waiau Toa and 90 breeding pairs on the Wakaputawatea), with the highest number of active nests from 25 November to 2 December. On the Waiau Toa alone, the maximum number of monitored nests active at the same time was 192 between 17 November and 24 November.

More tarapirohe breeding pairs were recorded on the upper Waiau Toa than on the Wakaputawatea which has been the case since the 2016/17 breeding season ([Table 2](#)). It is worth noting though, that the number of breeding pairs on the surveyed section of the Wakaputawatea has increased since 2023/24 (a 75% increase in total nests) and 2024/25 (almost five times as many nests).

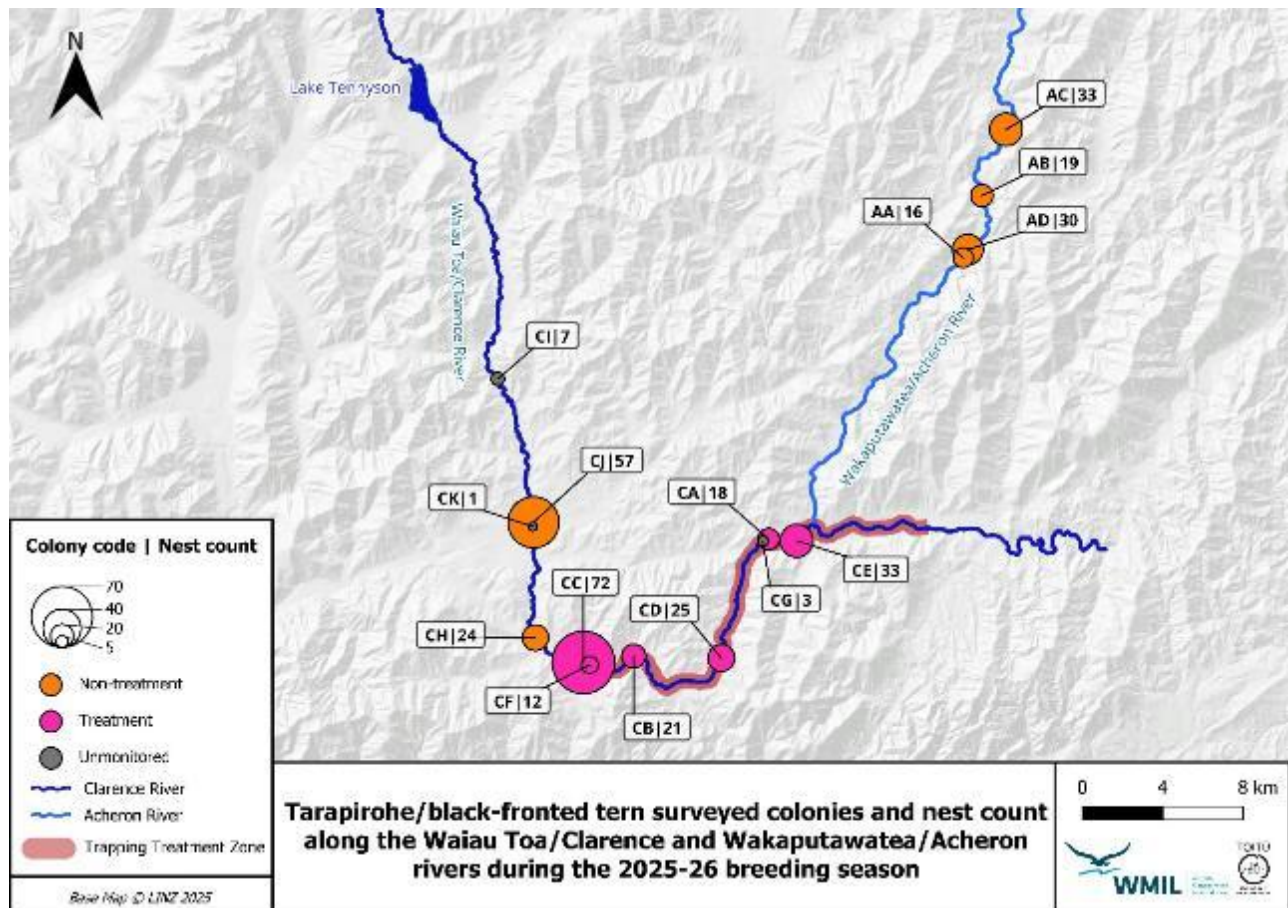


Figure 5: Tarapirohe/black-fronted tern colonies and nest counts along the Waiau Toa/Clarence and Wakaputawatea/Acheron rivers during the 2025/26 breeding season. The colony code is shown with two letters and the total nest counts (colony code | number of nests). Treatment and non-treatment colonies are shown, as well as colonies where monitoring was discontinued after initial nest-finding.

Table 2. Maximum number of active nests and adult tarapirohe/black-fronted terns present on the Waiau Toa/Clarence and Wakaputawatea/Acheron rivers at peak breeding season (within a one-month period), 2012/13 to 2025/26. Colonies where the timing of nest-laying was a result of re-colonisation after a mass failure event were excluded from the active nest count. The total number of nests monitored each season is also displayed.

Season	Active nests (Waiau Toa)	Active nests (Wakaputawatea)	Combined active nests	Max number of breeding birds	Total nest count
2012/13	177	202	379	758	568
2013/14	151	209	360	720	508
2014/15	154	149	303	606	434
2015/16	92	93	185	370	480
2016/17	275	118	393	786	382

Season	Active nests (Waiau Toa)	Active nests (Wakaputawatea)	Combined active nests	Max number of breeding birds	Total nest count
2017/18	170	137	307	614	525
2018/19	211	52	263	526	555
2019/20	180	32	212	424	267
2021/22	131	41	172	344	241
2022/23	160	99	259	518	310
2023/24	166	47	213	426	325
2024/25	211	20	231	462	315
2025/26	177	90	267	534	360

- 2020/21 has been excluded due to no monitoring being carried out that season.
- The darker shade of blue marks the beginning of the second 5-year study. The number of active nests and thus maximum breeding birds was recalculated for years 2021/22 to 2024/25 as past reporting for these years were found to be recording the total number of nests rather than the number of nests active across the peak breeding period within the same time-frame of c. 3 weeks.
- Monitoring was carried out at 10 of 16 colonies during 2024/25 and at 12 of 15 surveyed colonies during 2025/26, so total numbers are not a complete representation of the total tarapirohe population on these rivers.

3.2.4 Breeding outcomes

Table 3 summarises tarapirohe breeding success during the 2025/26 season along both the Waiau Toa and Wakaputawatea rivers. Of the monitored tarapirohe nests, 62% hatched at least one egg, which is higher than the 53% observed in the 2024/25 season and 47% observed in the 2023/24 season. Of the nests that failed to hatch (n=134), 50% were predated (n=66). Split between the treatment and non-treatment areas, predation represents 43% (n=32) of the cause of failure in the treatment area and 58% (n=34) of the cause of failure in the non-treatment area. Predation was the primary cause of known nest failures with 19% of total nests being predated, followed by abandonment at 15% then flooding at 4%. The fates of five nests and nine eggs were unknown as they could not be monitored through to hatching due to high numbers of young, mobile chicks preventing access to these sites (without risking the safety of the chicks). No eggs were candled this season, so it is possible that a small percentage of abandonments were due to egg infertility. The one nest classified as infertile was done so on the basis that the egg was clearly too small/oddly shaped to be viable.

A total of 373 chicks successfully hatched from the 360 monitored nests. Of these, only 59 fledglings were confirmed. A further 227 chicks were thought to have left the nest and may have fledged. Slightly more fledglings were observed in the non-treatment zone (n=31) than in the treatment zone (n=28). No nests within the monitored colonies experienced significant changes in their colony type throughout the season, unlike the 2024/25 season which had 145 nests begin the season classed as islands before drying up to become mainland nests. Lower Bush Gully was a mainland site (n=16 out of 18 nests) for most of the season but occasionally became an island after flooding events, such as when the first two nests were found at this colony while it was a natural island, only for them to flood shortly after. Sections of Upper Swimming Hole were also classed as mainland sites (n=14 out of 72 nests) from the very beginning. Homestead colony began to dry up towards the end of the season but at this point, most chicks were close to fledging.

It can be challenging to determine the fledging success of chicks as they can be highly mobile even just a few days after hatching, making it difficult to identify with certainty which nests fledglings have come from. To assign fledglings to nests, chicks would need to be marked with temporary colour bands while still in the nest. This would then introduce the requirement of finding and re-banding every chick before fledging, which would be extremely difficult as chicks can camouflage, freeze, and hide under rocks very well. Therefore, fledgling counts should be treated as a minimum number of successful fledglings, with the maximum number reflecting the number of chicks that were last seen alive after hatching but have since hidden and/or moved away from the nest during colony checks.

Table 3. Tarapirohe/black-fronted tern breeding success during the 2025/26 season along the Waiau Toa/Clarence and Wakaputawatea/Acheron rivers separated by habitat and treatment type.

*For mainland nests within the treatment zone, 14 were part of the Upper Swimming Hole colony that also contained a central enhanced island, thus making it impossible to attribute observed fledglings to mainland or island nests. Thus, the minimum number of mainland chicks fledged is representative of the confirmed fledglings observed at the solely mainland colony of Lower Bush Gully while the maximum number covers all possible chicks from mainland nests (including the four chicks that successfully hatched from mainland nests at Upper Swimming Hole) that were assumed alive upon the final nest check.

Tarapirohe breeding outcomes 2025/26	Overall	Treatment			Non-treatment
		Natural Island	Enhanced Island	Mainland	Natural Island
Egg stage					
Total no. of nests (A)	360	2	149	30	179
No. nests with known outcome (B)	355	2	149	30	174
No. nests in B that hatched ≥ 1 egg (C)	221	0	97	9	115
No. nests that failed	134	2	52	21	59
Total no. of eggs	639	3	266	56	314
Of the nests in (B):					
No. eggs laid where fate known (D)	630	3	266	56	305
No. eggs where fate unknown	9	0	0	0	9
Of the eggs in (D):					
Total number of eggs that hatched	375	0	164	17	195
Total number of eggs that died in incubation/infertile	1	0	0	0	1
Number of eggs that failed from other causes	254	3	102	39	109
Hatching success (per nest) (E) = C/B	0.62	0.00	0.65	0.30	0.66
Nest Failure					
Total number of nests that failed	134	2	52	21	59
Nest failure because of:					
Predation	66	0	17	15	34
Desertion (fertile eggs)	54	0	25	6	23
Died during incubation/infertile	1	0	0	0	1
Flooding	13	2	10	0	1
Chick stage					
Fledging Success					
No. nests that hatched ≥ 1 egg	221	0	97	9	115
No. nests that lost all chicks	29	-	20	1	8
No. nests with unknown fledgling outcome	182	-	77	8	97
No. chicks fledged as min/max (F)	59-286	0-0	24-122	4-14*	31-150
Fledging success (per nest, as min/max) (G) = F/A	0.16-0.79	0-0	0.16-0.82	0.13-0.47	0.17-0.84

Figure 6 shows overall tarapirohe egg stage outcomes by colony location and treatment type for the 2025/26 breeding season. Natural islands in the non-treatment area had almost identical hatching rates to enhanced islands in the treatment area, although eggs on non-treatment islands were 8% more likely to be predated than they were on treatment islands. There were also much larger predation percentages for mainland colonies compared to island colonies, with 50% of mainland nests in the

treatment zone being predated compared to 11% of nests predated on enhanced islands. Instances of nest failure due to flooding occurred on both enhanced and natural islands, with the only two nests present on a natural island in the treatment zone being flooded early in the season. In general, abandonment proportions were similar across colony types with mainland nests exhibiting slightly higher rates of abandonment than islands.

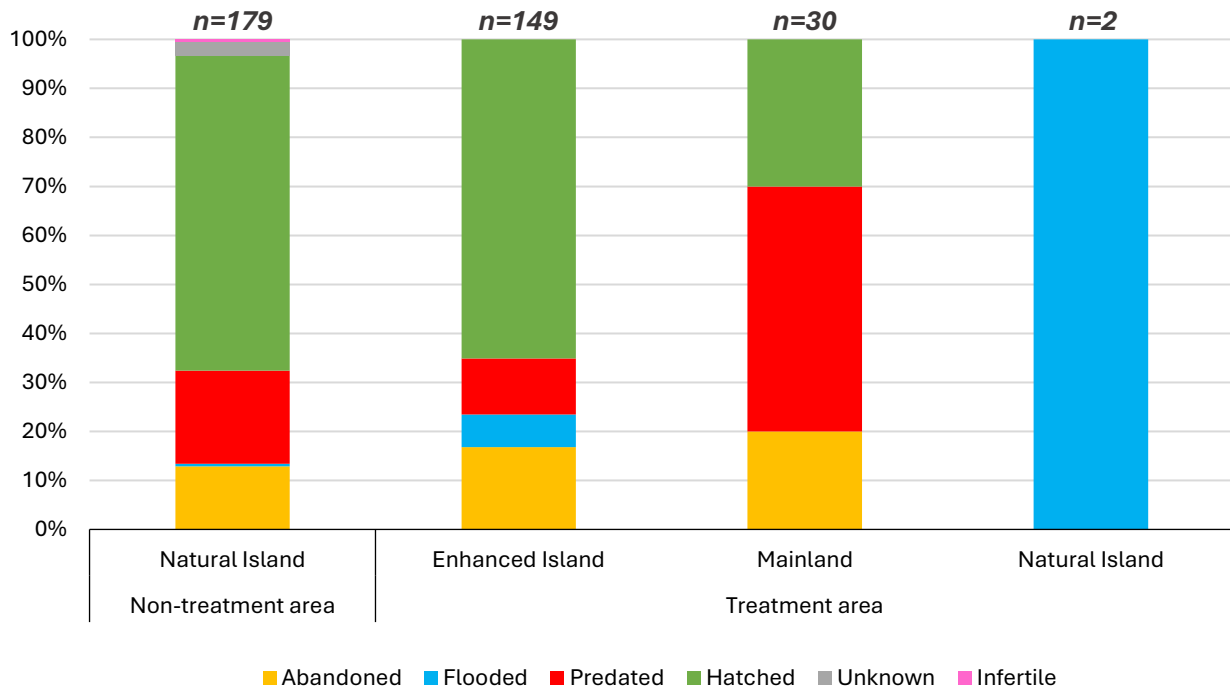


Figure 6: Tarapirohe/black-fronted tern egg stage outcome (%) by colony location and treatment type (2025/26).

3.2.5 Camera monitoring of nests

Trail cameras were deployed on 43% (n=153) of total monitored nests this season. Coverage varied from 25% to 97% between colonies depending on location, accessibility, discovery date, and whether the colony was chosen for full saturation of cameras and/or chick shelters ([Appendix 1](#)). A total of 10 cameras did not remain to film a nest until hatching, as they were either moved before high rainfall events to mitigate the risk of flooding or their SD card filled up before they could be accessed again due to high numbers of mobile chicks in the area. An additional eight cameras were placed on nests that had already hatched chicks so did not capture any predation attempts at the egg stage.

3.2.6 Predation and disturbance

An additional predation event is reported on in [Table 4](#) compared to [Table 3](#) as there was one case of a predation captured on camera of both an egg and an on-nest chick by a kāhu/Australasian swamp harrier (*Circus approximans*) (meaning the nest was not marked as a hatching failure in [Table 4](#) even though an egg predation had occurred). Of the 67 nest predation events, 81% were classed as unknown (n=55), with 47% (n=32) occurring in the predator control treatment areas compared to 53% (n=36) in the non-treatment areas. However, when only including introduced mammalian predators such as the matuku/hedgehog (*Erinaceus europaeus*) as well as unknown predation events, 62% (n=34) occurred within the non-treatment area. Of the 67 nests predated at the egg stage, 12% (n=8) of them were filmed at the time of predation, and 100% (n=8) of those were able to be identified to a specific predator.

Kāhu were responsible for most recorded predation events on monitored nests this season. Kāhu were likely the reason for failure of at least six other mainland nests where the predator was unknown, but

the eggs went missing around the same time as other nests were predated by kāhu. Similarly, hedgehogs were likely responsible for the predation of 17 other nests at the non-treatment natural island of Upper Guide.

Tarapirohe were twice observed predating their own eggs, at another nest this occurred a third time, but only after the egg had already been abandoned. One mouse and one kāhu were also observed predating an egg that had already been abandoned.

Although not a predation event, destruction of eggs and nests through trampling by ungulates occurred at least five times. One occurrence of a deer trampling eggs was captured on camera ([Appendix 4](#)), while cows were assumed to be responsible for the other four trampling events as they were known to frequent the nesting area. There were likely more nests that were impacted by cows but went by undetected through being classified as an unknown predation or an abandonment.

No ngeru/cat (*Felis catus*) predations were detected this season, although there was one case of a cat sniffing but not consuming two previously abandoned eggs from the mainland section of treatment colony Upper Swimming Hole. Eight dead chicks were found at the enhanced island of Mitchell's with six out of eight having had their heads removed and only their wings or bodies left. This event could be attributed to either cat or a mustelid predation. The predations occurred at the top of the island, where chicks were creching by the water, and unfortunately the predator(s) was not detected on camera at the few nests still active at the lower end of the island. One potential weasel was observed running past a camera at Mitchell's a few days after this time, indicating that flow around the island was becoming low or slow enough to encourage some predators to approach, although the channels were never close to drying out completely.

Table 4: All predation events at the egg stage by predator species, habitat, and trapping treatment type for the 2025/26 tarapirohe/black-fronted tern breeding season.

Colony Location		Predator species					
		Kāhu	Hedgehog	BFT	Ungulate	Unknown	Total
Treatment (Trapping)	Enhanced island	2	0	2	0	13	17
	Mainland	2	0	0	5	8	15
	Total	4	0	2	5	21	32
Non-Treatment (No Trapping)	Natural island	1	1	0	0	33	35
	Total	1	1	0	0	33	35
Combined Total		5	1	2	5	54	67

NB: Ungulate refers to egg destruction/nest trampling by cows or deer, BFT refers to black fronted tern/tarapirohe

Hea/hare (*Lepus europaeus occidentalis*) interactions with nests were prevalent this season with hares observed visiting 14 nests ([Table 45](#)). 11 of these interactions took place in the treatment zone and hare disturbance was the direct cause of abandonment at three treatment zone nests. The case of egg abandonment occurred after a hare directly stepped into the nest between two eggs ([Appendix 5](#)) while the two chick abandonments took place after a hare visited a nest and the parents did not return, leaving their chicks exposed overnight, resulting in death.

Table 5: All disturbance events captured where hares either visited tarapirohe/black-fronted tern nests and/or were implicated as the direct cause of chick or egg abandonment in the 2025/26 breeding season.

Colony location		Visit	Cause egg abandonment	Cause chick abandonment	Total
Treatment (Trapping)	Enhanced island	7	1	2*	10
	Mainland	1	0	0	1
	Total	8	0	2	11
Non-Treatment (No Trapping)	Natural island	3	0	0	3
	Total	3	0	0	3
Combined Total		11	1	2	14

*One nest also had an egg present that was subsequently abandoned

3.2.7 River hydrology

There were two key flooding events this season that impacted colony selection, nest failure, and the timing of nesting for some tarapirohe along the Waiau Toa (

Figure 7).

Though flooding was only responsible for 4% (n=13) of nest failures, there were likely several other nests flooded at colonies that had not yet been surveyed. For example, the Waiau Toa had higher flow rates than usual at the start of the season from the 2nd week of October, preventing access to survey nests at the Bush Gully colony until the 21–24 October flooding event occurred and wiped out any nests that may have been established on the island. The 21–24 October rains flooded 10 nests on Mike’s Rock and Lower Bush Gully with the Waiau Toa reaching a peak flow rate of $173 \text{ m}^3 \text{ s}^{-1}$ and a peak average daily flow rate of $96 \text{ m}^3 \text{ s}^{-1}$. After the river dropped, it remained slightly elevated compared to previous years, particularly between the period of mid-November to mid-December, not dropping below a ‘dry channels’ flow rate of $4 \text{ m}^3 \text{ s}^{-1}$, unlike in 2023 and 2024.

There was an uncharacteristic spike in rain and consequently flow rates towards the end of the season from mid to late January, with a peak average daily flow rate of $63 \text{ m}^3 \text{ s}^{-1}$, on 24 January. This second flooding event at the tail end of the season resulted in the failure of the final two nests, both on Bridge Island. One of these nests was a confirmed re-lay from a bird that had previously had its nest fail on Upper Guide Island due to hedgehog predation.

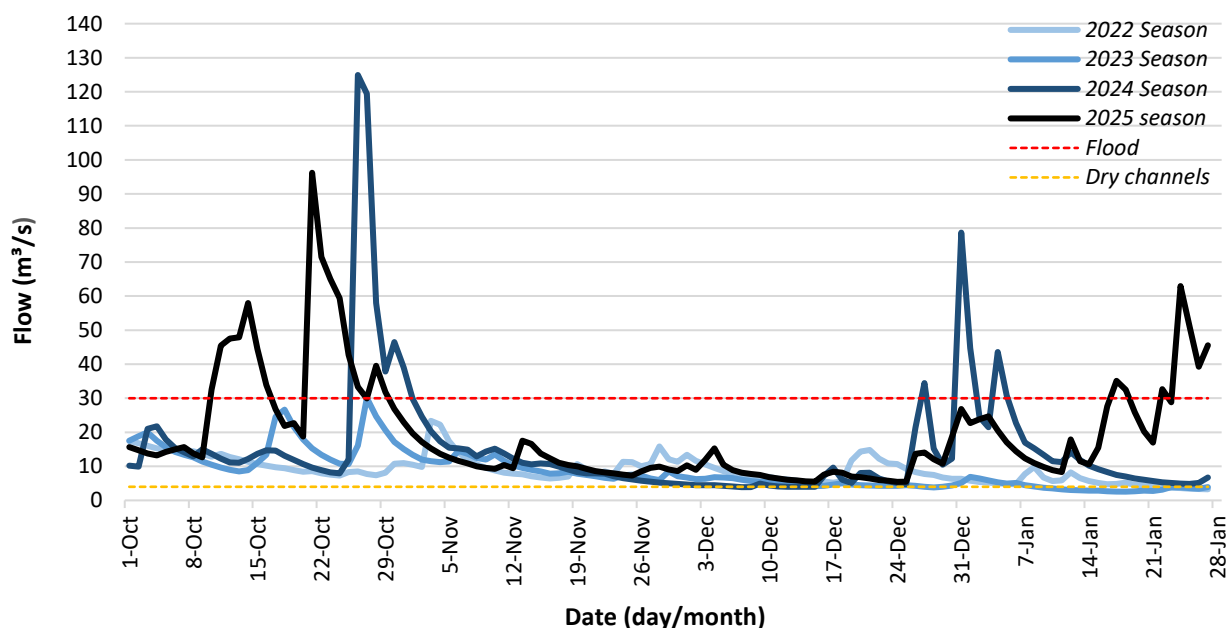


Figure 7: Average daily flow rates of the Waiau Toa/Clarence River for the 2022-2025 seasons © Environment Canterbury/NIWA Waiau Toa/Clarence River flow data at Jollies Pass (ECan 2026).

3.2.8 Chick shelter use

A total of 40 shelters were deployed across two colonies within the treatment zone on tarapirohe nests, with coverage of nests aiming for total saturation and reaching between 83% to 91% in these colonies (Appendix 2). The enhanced islands of Bridge (CE) and Swimming Hole (CF) were chosen for shelter saturation as both began nesting at similar times to the comparison control colony, Mitchell’s Island, and their colony sizes were manageable for full chick shelter deployment. Bridge had a total of 33 nests over the course of the season while Swimming Hole was a smaller colony with 12 nests. A total of 30 chick shelters were deployed at Bridge and 10 at Swimming Hole. The five nests that did not receive chick shelters had already failed. Of those 40 nests with a shelter, 100% (n=40) were monitored by a

trail camera with 65% (n=26) of these monitored nests hatching. Of the 14 chick shelter nests at Bridge that did not hatch, two were predated by kāhu, five were revealed to contain old eggs that were long abandoned, four did not hatch and were eventually abandoned, and one was flooded at the end of the season. All 26 nests were analysed for chick shelter use but the camera at one of these nests malfunctioned and did not capture hatching date, but judging from chick size and appearance, the chick was assumed to be two days old at the beginning of shelter use analysis.

Chick shelter use analysis was split into two periods:

1. Interactions of the chicks from day one (hatching) to day seven, and
2. Interactions of the chicks from day eight and beyond.

WMIL analysed 96% (n=25) of the nests for interactions in period one, one nest was excluded from further analysis as the chick died two hours after hatching. In period two, 35% (n=9) of the nests were analysed for interactions. The drop in the number of nests analysed between the two periods is due to chicks dying at five of the nests, and chicks leaving the nest and not being sighted on camera again at a further 10 nests. At one nest, chick shelter data could not be recovered after the initial four days but was still included in use analysis for period one.

In the 1st period 81% (n=21) of shelters were used by chicks. However, some of this use was for a few seconds to just under a minute. In the 2nd period, 78% or seven of the remaining nine nests still used their chick shelters at least once. Only two nests had chicks that used the shelter on the day of hatching, and the frequency of shelter use appears to steadily increase up until the time that chicks are one week old, with day four being the turning point where over 50% of monitored nests had chicks that used their shelter (**Figure 8**). The sample size of chick shelter nests decreases notably over time as chicks either died or disappeared.

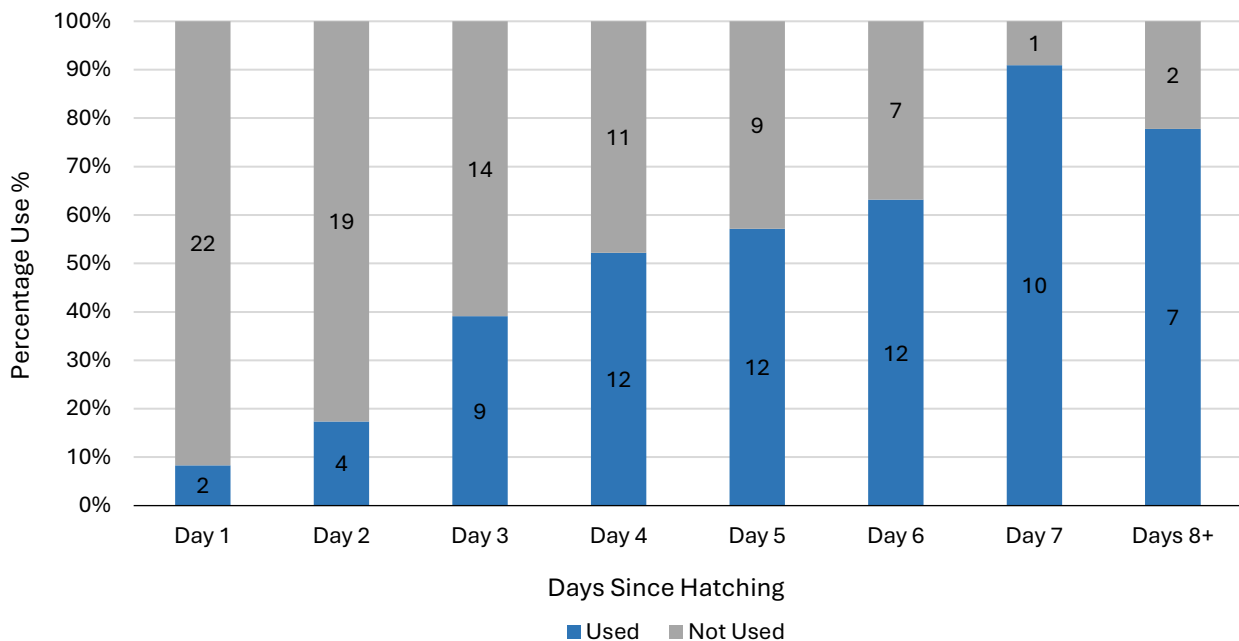


Figure 8: Tarapirohe/black-fronted tern chick shelter percentage use per nest (each nest with 1-2 chicks) per day since chick hatched, over the 2025/26 season. Day 1 = the day of hatching. Days 8+ are grouped together and range nests with chicks still present from Day 8 to nests with chicks present by Day 17. Total sample number of active nests are in the centre of each stacked column.

This season it was noted what types of shelters – A-frame or flat roofs, were used at each nest and the team aimed to evenly distribute the shelter types across colonies. There was a balanced set of shelter types present at each of the monitored nests that successfully hatched and were included in analysis with 13 A-frame nests and 12 flat roof nests analysed in period one while five A-frame nests and four

flat roof nests were still active for analysis in period two. There were no noticeable differences in overall frequency of usage by chicks between the two different shelter types. [Appendix 6](#) provides further details on chick shelter use from the analysis.

The chick shelters were used by tarapirohe adults and chicks in varied environmental conditions, from high temperatures to heavy rain. Adults were occasionally observed going under the shelter or brooding and feeding chicks under the shelter, highlighting how shelter presence does not alter normal chick-rearing behaviours. Chicks were also observed using the shelters at normal temperatures and/or when parents were present, although young (1-3 days old) chicks seem to prefer being brooded by a parent rather than seeking out the shelter. In both periods there were instances of chicks seeking shelter by rocks or grass nearby to the nest, rather than by the shelter ([Figure 9](#)).

There were three nests where old chicks near or at fledgling stage were seen interacting with shelters. In two cases, fledglings chose to sit directly under the chick shelter. At two of these nests, the chicks that used chick shelters were confirmed as not being from the original nest due to age discrepancies or the presence of the original chick also in the frame.

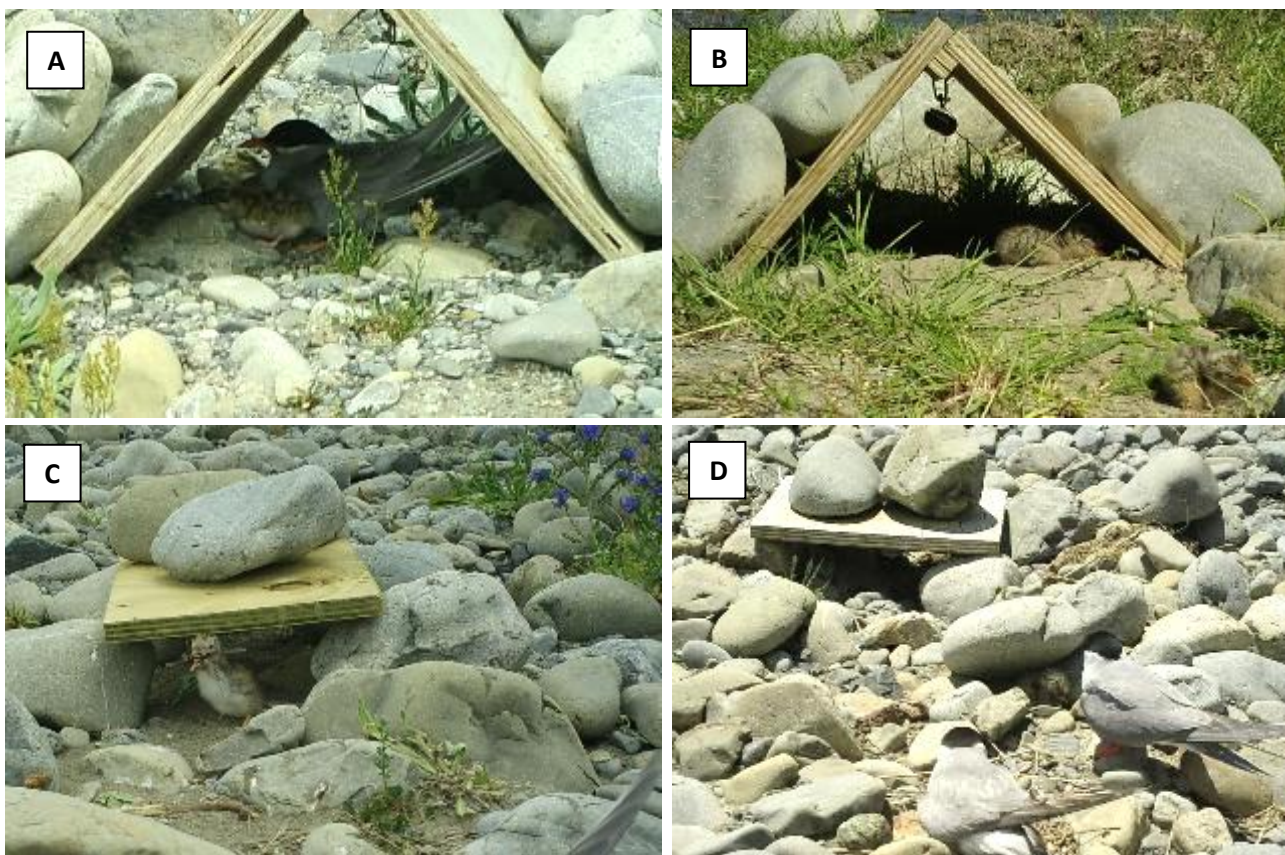


Figure 9: Tarapirohe/black-fronted tern chick shelter use series A) chick sheltering with parent, B) tern sleeping under shelter while other chick stays in nest, C) chick eats dragonfly under shelter, D) chick chooses rock over shelter.

Chicks were exposed to a large range of temperatures this season – more so than any other season in the past five years ([Table 6](#)). The minimum temperature of -1°C , which was reached overnight at multiple nests with active chicks for the 2025/26 season, was lower than any previous season. These low temperatures may have contributed to the six chick deaths (at five nests) that occurred overnight, aided by disturbance and/or a lack of brooding by the parent which likely led to deaths through overexposure. As the minimum/maximum temperatures were taken from different monitoring camera displays across seasons and are not official temperature data loggers, a level of inaccuracy may be present (See section 3.2.10.1 for a brief comparison of camera and data logger temperature readings).

Table 6: Monitored tarapirohe/black-fronted tern nests with chick shelters and their use over the past five seasons. Minimum and Maximum temperature (°C) readings taken from nest monitoring cameras are also displayed although these only read temperature upon detecting movement and capturing an image so they may not be representative of the absolute maximum/minimum temperatures.

Breeding season	Monitored nests with chick shelters	Chick shelters used by tarapirohe	Use %	Temperature Min (°C)	Temperature Max (°C)
2021/2022	14	12	86%	8	42
2022/2023	14	13	93%	6	41
2023/2024	17	15	88%	3	35
2024/2025	19	13	69%	11	37
2025/2026	25	21	84%	-1	41
Total	87	72	84%	-1	42

3.2.9 Chick shelter comparison study

Productivity in terms of chick survival and fledging success, was compared across the two chick shelter colonies and the control colony of Mitchell's, to evaluate the efficacy of chick shelters. One of the chick shelter colonies, Bridge Island had several nests abandoned prior to the deployment of monitoring gear (eggs were sun bleached upon initial location and no tern presence was later recorded on camera). This, in combination with other failures such as predation events, flooding at the end of January, and further abandonments, led to only 14 of 33 nests hatching (Table 7). Whereas Mitchell's had a very high hatching success, with only one nest failing to hatch chicks. Thus, the sample size of 24 hatched nests was equal between the control colony and the chick shelter colonies when hatched nests at Bridge and Swimming Hole were combined. Of the 45 chicks at Mitchell's, 31% (n=14) were found dead, and eight of these deaths were attributed to a single predation event, likely by a mustelid. Across the two chick shelter colonies, there were no mass predation events and of the 41 chicks that hatched, 23% (n=9) were confirmed to have died.

There were no clear signs of death from heat stress at either colony – only three day-time deaths of unknown cause occurred at the control colony, and two between the two chick shelter colonies. Minimum fledging success per hatched nest was higher at the chick shelter colonies (0.38) than the control colony (0.04), with only one fledgling observed flying above the control colony, however this result was disproportionately influenced by the predation event at Mitchell's. It is highly likely that the predator(s) returned to the colony for multiple visits and preyed upon more chicks, but their bodies were either taken off island or washed away in the river and so were not added to our total count, leaving the maximum fledging success per hatched nest overinflated at 1.29 chicks per nest. Minimum fledging success per hatched nest was higher at Bridge Island chick shelter colony than Swimming Hole colony as more chicks were confirmed to have fledged relative to the proportion of hatched nests, whereas the maximum fledging success was higher at Swimming Hole as less chick deaths were recorded at this colony than at Bridge Island.

Table 7: Comparison of productivity in terms of chick numbers, chick deaths and fledging success between the control colony (Mitchell's) and the two colonies that had chick shelters deployed (Bridge Island and Swimming Hole). *These chicks died overnight after a hare disturbance led their parents to abandon them overnight and they likely died from exposure.

Tarapirohe breeding outcomes 2025/26	Control Colony	Chick Shelter Treatment Colonies		Two Colonies Combined
	Mitchell's (CD)	Bridge (CE)	Swimming Hole (CF)	Bridge + Swimming Hole
Nests & egg stage				
Total no. of nests (A)	25	33	12	45
No. nests that hatched ≥ 1 egg (B)	24	14	10	24
Chick stage				
No. of chicks	45	24	17	41
No. of confirmed chick deaths	14	7	3	10
<u>Chick death due to:</u>				
Predation (kāhu)	-	1	-	1
Predation (cat/mustelid)	8	-	-	-
Kicked out/abandoned by parent BFT	-	1	-	1
Disturbance/abandonment*	-	-	3*	3
Apparent starvation (receiving less food than siblings)	1	-	-	-
Unknown (died overnight, potentially due to exposure/lack of brooding)	2	3	-	3
Unknown (died in nest)	1	1	-	1
Unknown (left nest, found nearby)	2	1	-	1
<u>Fledging Success</u>				
No. chicks fledged as min/max (C)	1-31	6-17	3-14	9-31
Fledging success (per nest, as min/max) (D) = C/A	0.04-1.24	0.18-0.52	0.25-1.17	0.2-0.69
Fledging success (per hatched nest, as min/max) (E) = C/B	0.04-1.29	0.43-1.21	0.3-1.4	0.38-1.29

3.2.10 Temperature data

Despite being within the same river system, there was variation in the maximum daily temperatures recorded at each colony during chick rearing (Figure 10). Swimming Hole colony is 11.9 km away from Bridge colony while Mitchell's lies 6.6 km from Bridge Island and 6.7 km from Swimming Hole. Although each colony showed similar trends in maximum temperature from day to day, maximum temperatures at each colony varied by day. The hottest maximum daily temperatures during chick rearing of 34-34.5 degrees occurred at Mitchell's (the control colony) on the 21st of November and at Swimming Hole and Bridge Island in mid-December.

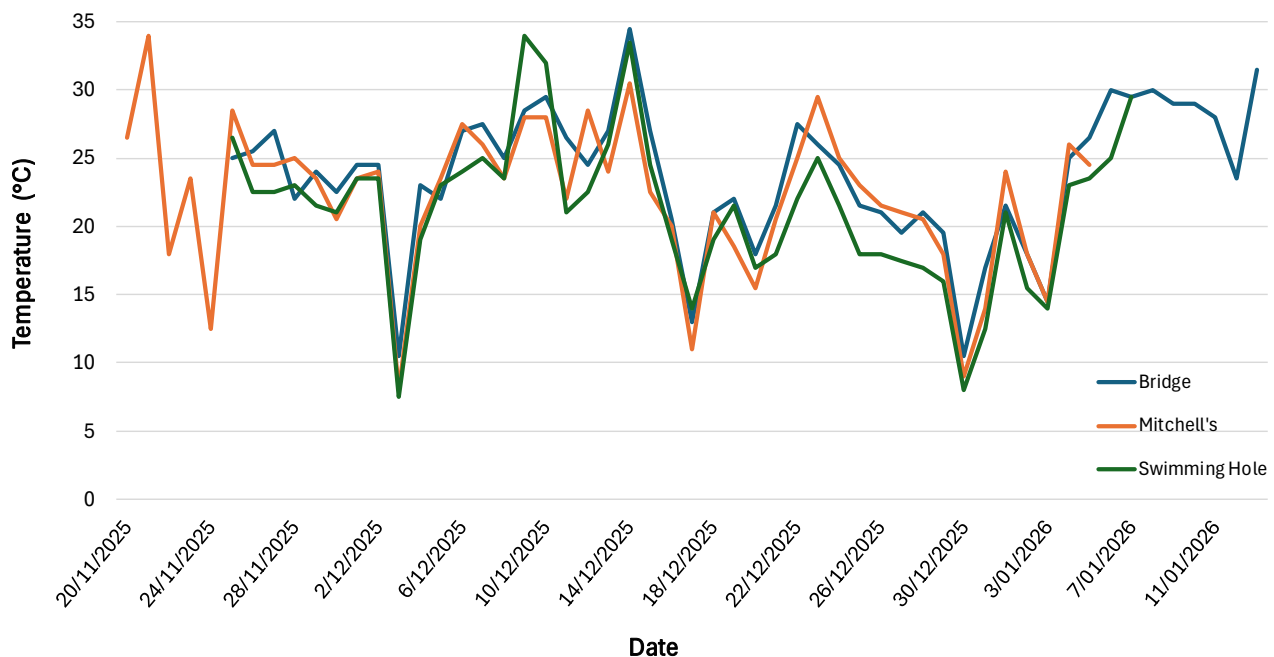


Figure 10: Maximum daily temperatures during the chick rearing period of the 2025-2026 season for three colonies (Bridge, Mitchell's and Swimming Hole) of black-fronted terns/tarapirohe on the Clarence/Waiau Toa river. Temperatures were recorded from temperature loggers attached at the top of a camera stand from a randomly selected sample of nests at each colony.

For each nest with active chicks at chick shelter colonies, temperature readings also varied between the different instruments used (**Figure 11**). Maximum daily temperatures could be retrieved for each nest by recording the maximum temperature seen on camera footage from a monitoring camera on a stand placed facing a nest. A subset of nests at each colony also had a temperature logger at the top of a camera stand and a temperature logger hanging under the chick shelter roof, in addition to the monitoring camera (**Appendix 3**).

Excluding one outlier, the temperature readings logged by monitoring cameras consistently read higher maximum temperatures and lower minimum temperatures than both the chick shelter temperature logger and the camera stand logger. It is important to note, that while the temperature loggers sample temperature consistently every 12 minutes, the cameras are only triggered to take a photo with a corresponding temperature reading when there is movement and thus, they are biased to not capture every change in temperature, particularly overnight where chicks and parents are not often moving. Out of the nests with paired temperature loggers, 59% recorded a higher maximum temperature under the chick shelter as opposed to outside the shelter on the camera stand, however, this is likely due to wind chill and the absence of ground radiation due to the higher placement of the camera stand temperature logger. Overnight when minimum temperatures were recorded, 94% of chick shelter temperature loggers recorded warmer temperatures under the shelter than at the camera stand, reflecting the impact of ground radiation and a lack of wind chill warming the temperature environment under the shelter.

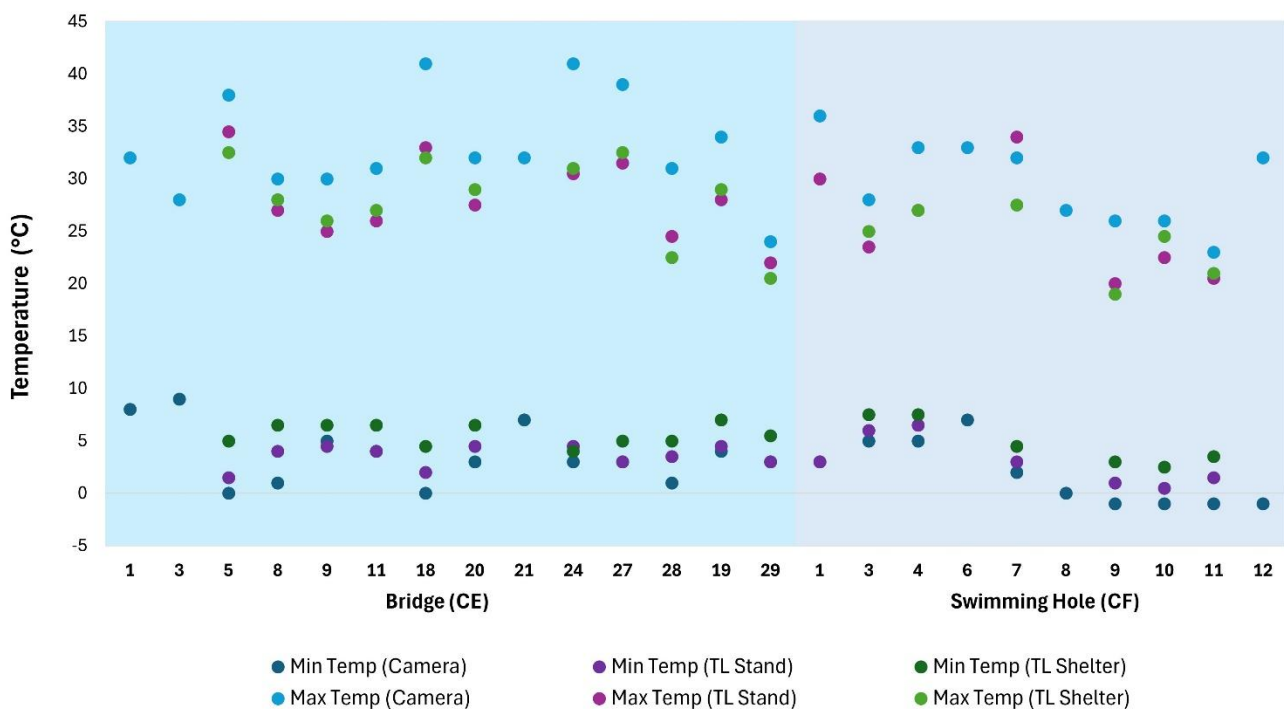


Figure 11: Variation in minimum/maximum temperature readings recorded when chicks were present at chick shelter nests from the Bridge colony ($n=14$) and Swimming Hole colony ($n=10$). Temperatures were recorded on one to three devices at each nest - from the monitoring camera set on a stand facing the nest, from a temperature logger placed at the top of the camera stand or from a temperature logger set up under the chick shelter. NB: at CF4, most Max Temp (TL Shelter) and Max Temp (TL Stand) were equal at 27 degrees.

In general, the results from the paired temperature loggers show that temperatures under chick shelters were warmer than at the camera stand outside the chick shelters (**Figure 12a**). As mentioned earlier, this was likely due to the placement of the camera stand logger too high above the ground to capture the ground radiation that the chick actually experiences. During the first trial of paired temperature loggers set up at a chick shelter nest, a single camera stand logger was placed only ~5 cm from the ground (at a similar height to the internal chick shelter logger) and these results captured a more accurate reading of the contrast between the two environments. When height from the rocky substrate remained constant between temperature loggers, the temperature under the chick shelters was consistently lower by 4-6°C at the hottest time of the day (between 1PM and 6PM) than the temperature outside of the chick shelter (**Figure 12b**). The strength of this difference appeared to differ depending on the day, with hotter days ($\geq 30^{\circ}\text{C}$), exhibiting more extreme variation where temperatures under the shelter were much cooler than temperatures outside.

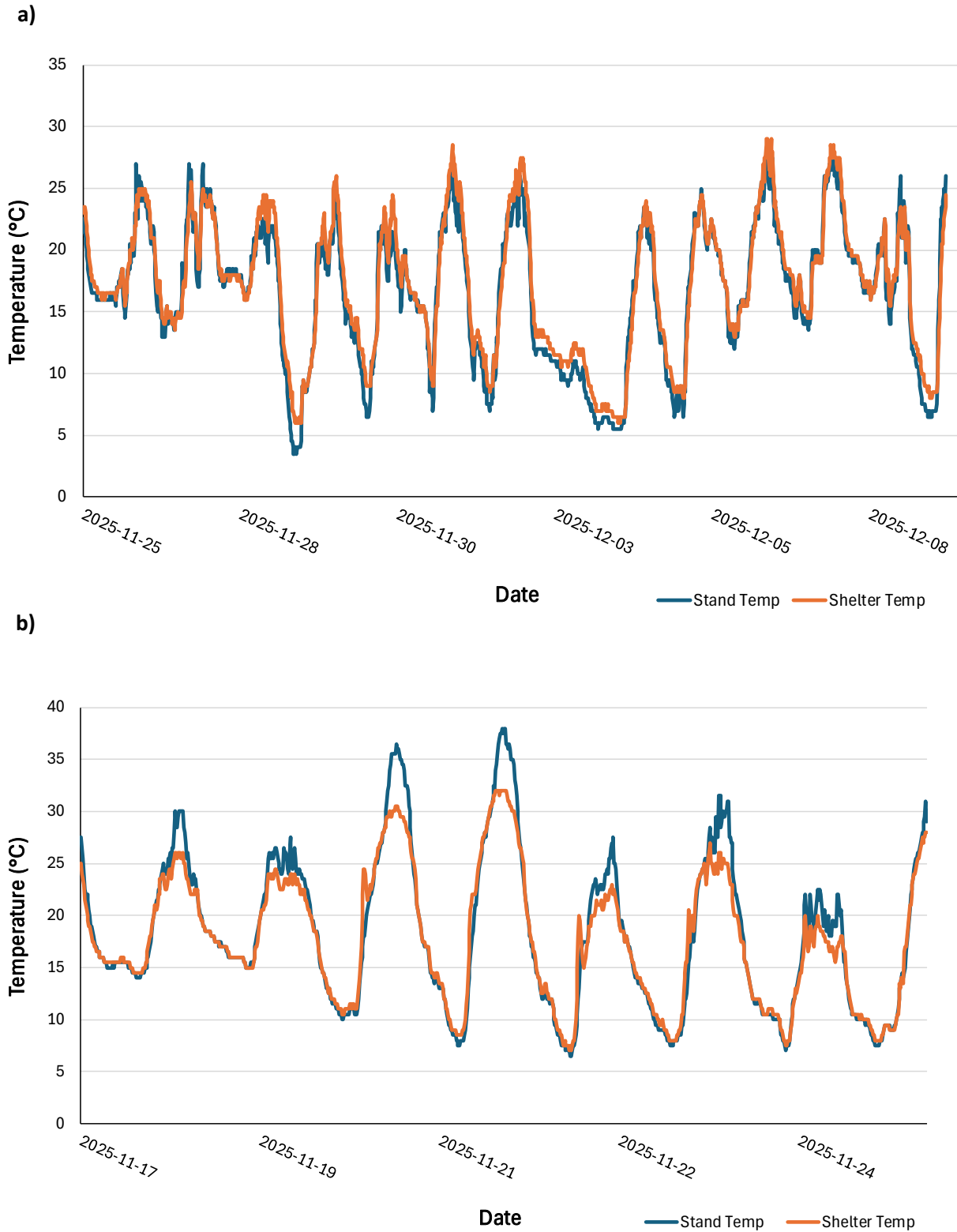


Figure 12: Temperature readings captured from paired temperature loggers (one under the shelter and one outside the shelter) set up at chick shelter nests where a) the temperature logger outside the shelter is set ~5cm from the ground, attached to the side of the camera stand from 17 November 2025 to 25 November 2025; and b) the temperature logger outside the shelter is set at the top of the camera stand ~80cm from 25 November 2025 to 9 December 2025.

3.3 Tarapirohe/black-fronted tern banding and resighting

3.3.1 Tarapirohe/black-fronted tern banding

Tarapirohe banding was undertaken during December and January 2025. Using the drop trap to capture adults was not attempted this season due to limitations with training and capacity, however, seven unbanded adults were successfully caught in a hand net. Two of these birds received a flag and a metal band while five received metal bands only, as there were issues with the glue drying out.

Tarapirohe chick banding was completed between 12-14 December with additional WMIL staff, DOC, and volunteers attending. Five chicks were banded on the Wakaputawatea, 24 were banded on the Waiau Toa, and 14 at Shark Tooth colony on the Waiau Uwha river, bringing the grand total to 43 chicks banded over three days. As a number of chicks at productive colonies on the Waiau Toa were too small to band, opportunistic banding resumed in the new year, with an additional 13 chicks banded across the Waiau Toa in January 2026. Banding totals over the past four years are shown in [Table 8](#). All banding data can be retrieved from the DOC FALCON banding database under the ‘*Black-fronted tern study*’ project.

Table 8. Tarapirohe/black-fronted tern banding totals between the 2021/22 – 2025/26 seasons.

	2021/22	2022/23	2023/24	2024/25	2025/26
Adults	31	20	10	3	7
Chicks	18	93	41	80	56
Total	49	113	51	83	63
Total banded (2021-2025):					359

3.3.2 Tarapirohe/black-fronted tern band re-sights

There were 32 unique band and/or yellow flag resights made this season. Most resights were extracted from trail camera images (94%, n=30), while two were gathered from personal photography of flying or standing tarapirohe. Two birds were resighted twice on nest cameras throughout the season, after their first nesting attempt had failed. One tarapirohe moved from Mike’s Rock in October after its nest was destroyed by flooding, to Bridge colony in January ([Figure 133](#)). Another bird changed rivers for its second nesting attempt, moving from Upper Guide on the Wakaputawatea after a hedgehog predated its nest in December, to Bridge colony on the Waiau Toa in January. Six other birds with yellow flags were seen on trail cameras but their numbers/letters could not be deciphered (three were poor quality and another three appeared to be either broken or very old so the code was cut off).

All of the resighted tarapirohe were banded over the course of the project: 2013 (n=1), 2014 (n=3), 2015 (n=1), 2016 (n=4), 2017 (n=7), 2020 (n=2), 2021 (n=5), 2022 (n=2), 2023 (n=5), and 2024 (n=2). Three individuals were resighted this season on a different river from where they were originally banded.

One chick banded on the Acheron in December 2025 was resighted on 17 March 2026 at Aramoana in Otago.



Figure 13: A returning tarapirohe/black-fronted tern adult with yellow flag (PA) captured on nest cameras at two points in the season. Left shows first resighting at Mike's Rock colony where its nest was flooded in October 2025. Right shows PA at Bridge Colony where it re-laid in January 2026 but eventually abandoned its new nest.

4. DISCUSSION

4.1 Local population size and distribution of breeding colonies

Despite previous seasons indicating local population declines of tarapirohe on the Wakaputawatea River from 2014-15 onwards, this season saw a significant increase in their numbers, both as individuals sighted during the helicopter survey and in the number of active nests. Tarapirohe, like other *Chlidonias* spp. living in dynamic environments, are known to exhibit considerable plasticity and low nesting site fidelity (Palestis 2014), with some individuals and colonies moving between neighbouring river systems (Keedwell 2002, Hamblin 2017). Therefore, it is possible that individuals that once bred on the Wakaputawatea have switched to the Waiau Toa or sections of the unmonitored upper Wakaputawatea, reflecting inter-seasonal movement rather than true population level declines. This is supported by how two banded individuals this season were resighted on different rivers than those they were originally banded on. However, colony site selection in tarapirohe is not well-understood and studies have suggested that only through long-term datasets do trends of colony site-fidelity emerge (Bell 2017; Hamblin et al. 2019). Further analysis of banding and resighting data from nesting tarapirohe on the Waiau toa and Wakaputawatea rivers across the full dataset (2013-2025) is currently underway to examine the level of inter-annual site fidelity.

A similar increase in tarapirohe numbers on the Wakaputawatea was observed in the 2022-23 season where the number of birds increased by almost two-fold from the previous season, only to decrease again the following year. Consistent surveying and monitoring in the future will determine whether this pattern is observed again in the next breeding season.

In total, the maximum number of nests estimated to be active at same time this season was 267, representing 534 individuals. The maximum number of breeding birds has not been this high since 2018/19 when 526 were estimated from the total number of active nests, though this represented a decline from earlier numbers of over 750 birds in past seasons. Future monitoring is required to determine whether this positive trend for the local population lasts, as tarapirohe numbers within individual river systems fluctuate from year to year. These fluctuations may be indicative of the high level of gene flow between tarapirohe in different river systems, indicating a strong level of connectivity between local populations (Schlesselmann et al. 2020) which has the potential to mask wider declines at the population level. Although it is a colossal task, the importance of assessing population size and distribution throughout the entire breeding range of tarapirohe cannot be understated.

4.2 Tarapirohe/black-fronted tern breeding outcomes

The 2025-26 season began with flooding and predation events leading to a re-selection of colony sites and re-nesting in late October to early November. In late January, another flooding event wiped out the few late nests (most of which were re-lays) that remained active. Aside from these events, river hydrology was relatively stable during the core part of the breeding season and unlike the previous season, river channels around the monitored island colony sites did not dry out and become attached to the mainland. This likely contributed to the higher hatching successes observed this season.

The 62% hatching success this season was greater than in 2024/25 and 2023/24 (53% and 47%, respectively). In fact, this year's 62% represents the second highest overall hatching success in project history, second only to the 68% success rate in the first year of Phase Two, 2021/22. Hatching success was higher in the non-treatment zone (66%) than the treatment zone (59%), however, this was mainly due to mainland nests within the treatment zone having a hatching success of only 30%. For comparison, the hatching rate of nests on treatment zone enhanced islands was comparable to that of non-treatment zone islands (65% and 66%, respectively). Hatching success this season was also greater than the highest average of 47% reported as the combined average for the Waiau Toa and Wakaputawatea in 2013 (Bell 2017), prior to predator control and island enhancement being undertaken. While this comparison indicates how predator suppression and habitat enhancement can offer clear management benefits, hatching success in treatment zones did not significantly outperform natural islands this season or in previous years (Conner-McClean et al. 2023–2025). This suggests that management interventions, though helpful, cannot always replicate the strength of natural sites characterized by substantial island height, clean gravels and strong, deep channels safeguarding colonies from predators and flooding.

Still, detailed analysis of both Phase 1 and Phase 2 data from this project is required to further our understanding of the relative benefits and impacts of different management tools within the treatment zone. It is also interesting to note that four of our six non-treatment islands were on the Wakaputawatea this season and in the initial baseline monitoring period (2012/13-2014/15), overall hatching success was found to be significantly higher on the Wakaputawatea than the upper Waiau Toa (Bell 2017). It appears that the calibre of natural islands on the monitored stretch of the Wakaputawatea are stronger and of higher quality than those enhanced within the treatment zone. This was also the case for one of the non-treatment islands (The Battlers or CJ) of the Waiau Toa. Seasonal variation in predator dynamics and river hydrology shaping island morphology is important to consider, though, as while The Battler's presented a high-quality natural island that performed well this season, in 2023-24, almost half of the nests on this island were predated by a ferret (Conner-McClean et al. 2024).

Fledgling success had a wider range this season with a lower minimum but a higher maximum at 0.16-0.63 (min-max) fledglings per nest compared to 0.24-0.50 in the 2024/25 season. The lower minimum may be partly due to colonies this season having multi-modal peaks in the timing of chicks fledging, where even though the fledglings seen weeks prior are almost certainly different to those observed later, our calculation of the minimum number of fledglings is aimed to be as conservative as possible by taking the maximum number of fledglings seen at any one colony check across the season as the minimum number of fledglings confirmed from the colony. Furthermore, there were also two colonies (Guide and Mitchell's) that experienced heavy predation during the chick stage and one at the egg stage (Upper Guide), resulting in only one fledgling being detected from each of these islands. Fledgling success was similar across the non-treatment area (0.17-0.66) and the treatment area (0.16-0.61) and is likely due to colonies both within (Mitchell's, Upper Swimming Hole, Lower Bush Gully) and outside (Guide, Upper Guide) the treatment zone having substantial nest failure due to predation or disturbance.

It is very difficult to attribute fledglings to a particular nest as they would have to be banded when they are still very young and less mobile. Hence, there is a lot of uncertainty in nest productivity, and to

decrease ambiguity in fledgling identification, new chicks would need to be assigned coloured bands and/or more intensive observational monitoring would need to occur at the fledging stage.

4.3 Nest predation and disturbance

Predation was the leading cause of failure this season and was responsible for 49% of nest failures at the egg stage. For the first time in project history, a hedgehog was recorded on an island colony where it likely destroyed over half of the active nests. Hedgehogs are prolific egg predators (Sanders & Maloney 2002), and although they are less likely to occur on braided river islands than the mainland, they can swim across small channels (Moss & Sanders 2001) and maintain large home ranges (up to 94 ha; Moss 1999). Given the relatively large size and shape of Upper Guide, it is also possible a hedgehog was washed down during a flooding event, stayed on and predated the nests.

A large proportion of mainland nests failed due to predation (50%), however, many of these nests were not predated by introduced mammals, but rather by kāhu, or trampled by ungulates. Although not technically a predator, this season, “predation” through trampling by cows or deer was a re-occurring issue and likely also contributed to the abandonment of several nests in the treatment zone, where cows were frequently observed. Terns were observed, both in person and on camera footage, leaving nests to mob cows. In one instance a nest was abandoned seemingly for no reason other than cow disturbance. Abandonments are not categorised, but we can assume that a substantial number occurred and were caused by ungulate and hare disturbance. As the Molesworth is a working station where cattle grazing overlaps with tarapirohe breeding colonies, managing these interactions and developing viable solutions remains a complex challenge. In addition to cows, hares, particularly at night, were often spotted running into or near tarapirohe nests. While many tarapirohe are robust to the occasional visit of a hare in the night, others have proven sensitive with nests being abandoned, even at the chick stage.

Considering the seven recorded interactions of kāhu with tarapirohe nests, five of which were active predations, there appears to be a resurgence in kāhu numbers and predation activity this season. These predations marked the first that have been recorded since 2021/22, although this season was also the most intensively monitored in terms of nest camera deployment. Despite a total of 132 kāhu being banded between 2021-2024 (Ray & Burgin 2024), none of the kāhu captured on camera were banded and at least one was an older individual (with pale feathers).

Barring hedgehogs, no predation events by introduced mammalian predators were captured on camera this season, and instead key depredations took place at the chick stage, after the removal of monitoring equipment or away from the remaining monitored nests meaning that the identity of the predator remained a mystery. At Mitchell’s on the Waiau Toa, predated chicks showed classic signs of mustelid or cat predation although evidence suggests a stoat was the most likely predator (S. Mears, J&S Mears Contracting, *pers. comm.*), especially since channels were still flowing at a reasonable height when the predation occurred. This aligns with treatment zone trapping which caught numerous cats, toriura/stoats (*Mustela erminea*), wītara/weasels (*Mustela nivalis*), and a few tori hura/ferret (*Mustela furo*), but weasels are likely too small to cause such damage to larger chicks. On the Wakaputawatea, after strong hatching success throughout the colony, we had to assume that most of the chicks at Guide (AA) died as the colony was found deserted, one week after most young chicks had become mobile but were still too young to have fledged. No evidence of carcasses or predation sign were found but the two remaining nests with eggs had also disappeared and there was no sign of adult or chick activity further downstream from the colony in the case that chicks had been swept away. To resolve ambiguity in cases such as these, deploying a few strategically-placed cameras is recommended.

4.4 Chick shelters

This season, chick shelters were only placed to completely saturate two colonies and were more intensively monitored than in past seasons. Although this season’s main chick-rearing period did not

often coincide with extreme temperatures to the degree that other seasons have, camera footage shows that chick shelters are often sought out by chicks and that their likelihood of usage increases as chicks age and their mobility increases while brooding from their parent decreases, making them an effective management tool to lessen the impact of heat stress. Using tools like chick shelters may become increasingly valuable as climate change intensifies along with the likelihood of extreme temperatures and weather events (Bodeker et al. 2022).

The chick shelter colonies showed much clearer instances of fledging success than the control colony, where only one fledgling was definitively sighted. However, this discrepancy was likely due to a predation event at the control colony that skewed the results, as chick deaths and the lack of fledging success stemmed from predation rather than heat stress. When comparing the maximum numbers of fledglings in the case that all chicks assumed to be alive did fledge, productivity between the control colony and the combined shelter colonies was identical at 1.29 fledglings per hatched nest. In general, across all colonies this season, we found no chicks that we could confidently identify as having died from heat stress. Direct comparison between a shelter colony and a control colony is difficult, as varying island characteristics, environmental conditions, timing of laying/hatching and predation events prevent a standardized assessment of chick shelter efficacy for chick survival and fledging success.

4.5 Temperature data loggers

For the first time, temperature data loggers were used to better understand how measurable of a difference shelters make to chicks that use them. This season acted as an initial trial/pilot study and revealed how impactful ground radiation is in contributing heat to the temperature environment. Future monitoring will aim to pair temperature loggers under shelters with loggers that are separated from camera stands and placed on a plaque at an equal distance from the ground.

4.6 Island enhancement

High quality islands, whether natural or enhanced, are beneficial for tarapirohe breeding success (Pickerell 2015; Schlesselmann et al. 2018). Enhancing islands is a cost-effective management tool but islands do require periodic upkeep depending on flooding regimes and changes in river morphology. Vegetation removal also presents a management trade-off: while plant cover can harbour and sustain predator populations, it can also provide shelter for chicks and lessen the impact of heat stress.

This season, every enhanced island in the treatment zone, apart from one (Cow Island) was colonised by breeding tarapirohe, suggesting that enhancement works are correlated with a higher likelihood of colonisation. This is especially apparent when considering the relatively small size of the treatment zone versus the rest of the monitored river system where tarapirohe colonise a seemingly wide and ever-changing array of islands, shifting their distribution and site-selection from year to year. By enhancing islands, we may be ensuring a greater level of breeding site fidelity within the treatment zone and attracting tarapirohe to an area that is more protected than the rest of the catchment. To assess whether island enhancement and seasonal predator suppression are essential for the recovery of this Nationally Endangered species, detailed analysis of Phase 1 and Phase 2 datasets is required (Robertson et al. 2021; Bell 2023).

5. RECOMMENDATIONS

Firstly, it is recommended that the tarapirohe project is continued for at least the next five years to track population dynamics and build on the long-term dataset we have developed. Considering the last ten years of monitoring, WMIL has the following recommendations:

5.1 Tarapirohe/black-fronted tern monitoring

- Helicopter surveys continue to be carried out during the peak of the breeding season, ideally during the first week or early second week of November, before early hatching occurs at some colonies.
- To expand our insight into the status of the local population on the Wakaputawatea, it may be prudent to extend the helicopter survey into the upper Wakaputawatea, beyond the Severn Shelter where colonies were known to nest historically, and remove the section of the lower Waiau Toa treatment area from the survey, as colonies are rarely found there.
- Continue to select a maximum of 8-12 colonies to monitor throughout the season. The exact number should depend on size, location and accessibility, and how these align with WMIL's capacity. Colonies should be split between non-treatment and treatment and be determined by the helicopter survey.
- When time demands allow, undertake a check of non-monitored colonies at least once during chick rearing and fledging periods to better understand re-nesting and relocation events.
- As a number of predations are missed at the chick rearing-fledging stage, it would be valuable to set up cameras at key spots near the head/end or riverbanks of suitable colony in order to capture large-scale predation events or disturbances and attribute these to a particular predator. Investing in a few high-quality thermal cameras may be particularly helpful for detecting predator crossings.

5.2 Chick shelters & temperature data loggers

- Temperature data loggers paired with chick shelters should be trialled again, but the temperature loggers situated close to the ground to absorb ground radiation and more accurately capture the heat environment that the chick is experiencing when not under the shelter.
- Continue to use chick shelters to help chicks within treatment areas as an additional treatment type but the full colony level saturation and determining a control colony may not be necessary. Potentially, a single island should be split into control vs. chick shelter deployment and used for a chick shelter efficacy comparison at the early chick stage.

5.3 Tarapirohe/black-fronted tern banding

- Continue to band both adults and chicks. Adults could be captured both on the nest using a drop trap, as well as through the new and efficient method of hand-capture in a net.

5.4 Predator suppression/monitoring

- No kāhu were banded this year. However, considering the seven recorded interactions of unbanded kāhu with tarapirohe nests, five of which were active predation events, trapping, banding and monitoring of kāhu should resume.
- Given the success of feral cat trapping this season, leg-hold trapping during peak nesting and chick rearing periods should continue, especially at larger colonies.
- As flow rates drop around enhanced or natural islands that are known to be more vulnerable to predator incursions, targeted predator control could be set up pre-emptively.

5.5 Advocacy

- Any significant predation events or follow-ups should continue to be flagged for media release to spread awareness of the plight of tarapirohe and the harm done by introduced mammalian predators. The reception to the article and media release (Department of Conservation, 2025) chronicling the capture of the feral cat that previously decimated Bridge colony was positive, and the team encountered multiple members of the public on the Waiau Toa who had read the news story of the initial predation event back in 2024 and wanted to inquire about the health of the tern population this season.

- There was one area in the treatment zone where 4WD vehicles were clearly being used to drive onto the riverbed at a location where terns would occasionally display breeding interest. If terns had ended up nesting here, signage would have been necessary to discourage disturbance.
- Increasing advocacy signage at key locations such as the Cobb Cottage campsite to increase awareness and encourage visitors to report band sightings to WMIL and/or DOC. This could be an opportunity for local iwi to participate and influence the interpretation design, ensuring te ao Māori inclusion.

5.6 Island enhancements

- As climate changes intensifies, there is an increased likelihood of heavy rain events and flooding, even in Summer and this has been evident over the past two years of monitoring. This season, there were multiple severe weather events (wind, snow, rain) where the team could not access the Molesworth itself, let alone the tern colonies. Therefore, when enhancing islands that have a history of flooding during high flow rates, a consistent focus should be placed on raising island height.
- See [Appendix 7](#) outlining the recommendations for islands enhancements to be undertaken before the potential 2026/2027 season.

6. ACKNOWLEDGMENTS

This is a collaborative project between Environment Canterbury (ECan), the Department of Conservation (DOC), and Te Rūnanga o Kaikōura. Funding for the tarapirohe monitoring aspect was provided by DOC and ECan.

Special thanks go to:

- Ellery Mayence (DOC), Frances Schmechel (ECan), and Patrick Crowe (DOC), for their support.
- WMIL personnel, for their assistance with fieldwork, chick banding and reporting. In particular, huge thanks go to Toni Bell for her support with reviewing trail camera footage.
- Lincoln University MSc candidate, Sarah Gabites for her contribution to tarapirohe fieldwork and research.
- All chick banding volunteers.
- Amuri Helicopters for their collaboration on the river helicopter surveys.

The predator trapping aspect of this work along the Waiau Toa/Clarence River was completed by J & S Mears Contracting. This trapping aspect was funded by ECan and DOC and managed by DOC and Boffa Miskell (Pete Caldwell and Robin Pieper). WMIL thanks these groups for their commitment and support for the tarapirohe work.

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8. APPENDICES

8.1 Appendix 1: Trail camera deployment

Appendix 1: Tarapirohe/black-fronted tern nest trail camera deployment coverage by colony on the Waiau Toa/Clarence and Wakaputawatea/Acheron rivers during the 2025/26 season. Only monitored colonies shown. *Colonies chosen for camera saturation. NB: 10 of the 153 camera deployments did not capture the entire period from laying to hatching as they were either removed from a nest due to risk of flooding or placed on a nest late while chicks were still young.

River	Colony	Total Nests	# Cameras Deployed	Colony Coverage
Waiau Toa/Clarence River	Lower Bush Gully	18	5	28%
	Mike's Rock	21	8	38%
	Upper Swimming Hole	72	19	26%
	Bridge*	33	32	97%
	Swimming Hole*	12	10	83%
	Mitchell's*	25	24	96%
	Homestead	24	9	38%
	Battlers	57	19	33%
	Total	262	126	48%
Wakaputawatea/Acheron River	Zoo	19	4	21%
	Guide	16	5	31%
	Upper Guide	30	9	30%
	Acheron Island	33	9	27%
	Total	98	27	28%
Combined Total		360	153	43%

8.2 Appendix 2: Chick shelter deployment

Appendix 2: Tarapirohe/black-fronted tern chick shelter deployment by colony in treatment area.

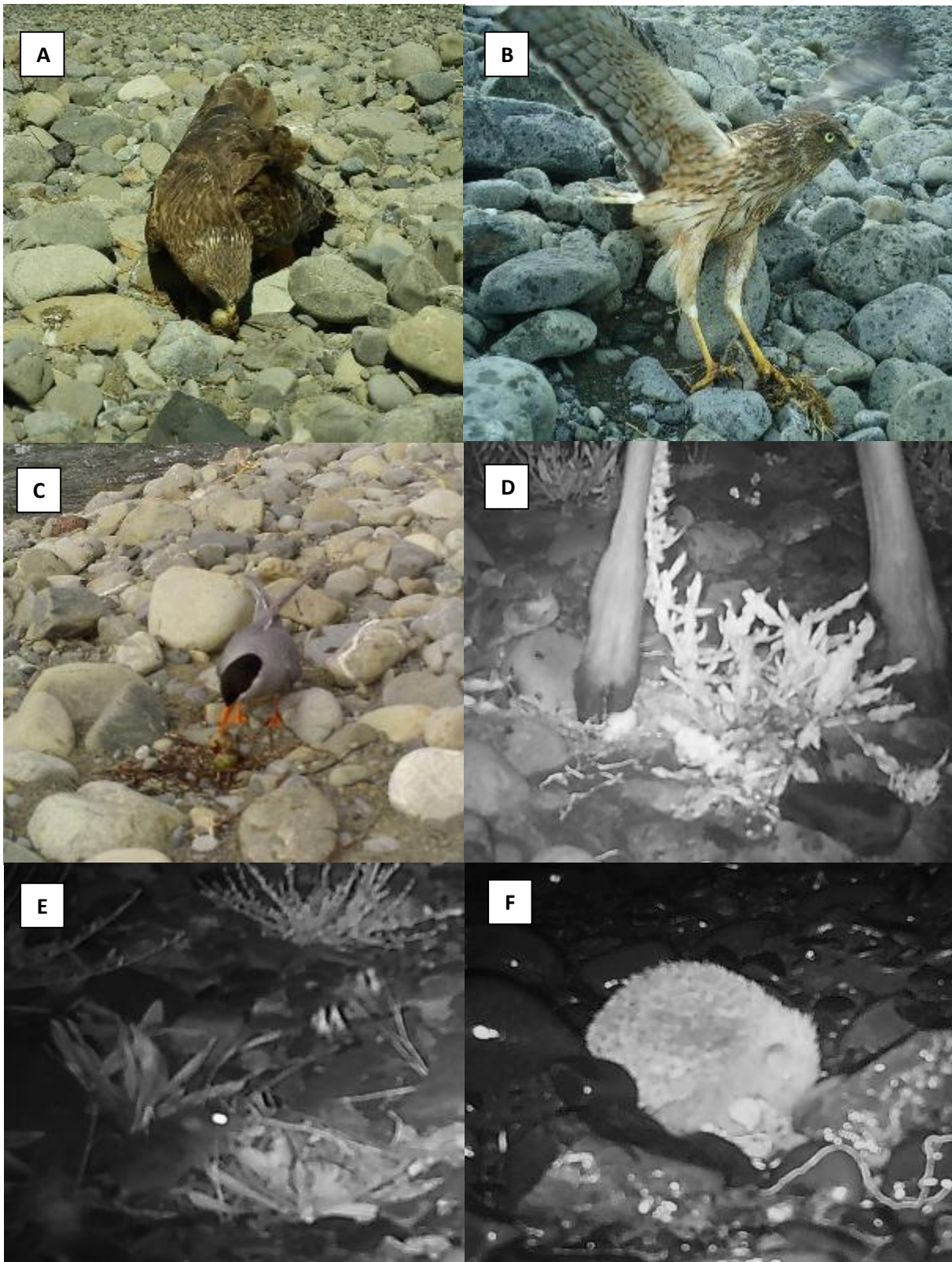
Colony	Colony Chick Shelter Deployment	Total Nests	Chick Shelter Coverage
Bridge	30	33	91
Swimming Hole	10	12	83
Total	40	45	87%

8.3 Appendix 3: Temperature logger deployment

Appendix 3: Tarapirohe/black-fronted tern temperature data logger deployment by colony in treatment area. Each temperature logger deployment represents a paired set of loggers – one on a camera stand and one under a chick shelter.

Colony	Temperature Logger Deployment	Total Nests	Temp Logger Coverage on Shelter Nests	Temp Logger Coverage General
Bridge	24	33 (30)	80	73
Swimming Hole	9	12 (10)	90	75
Total	33	45 (40)	85%	74%

8.4 Appendix 4: Predation events



Appendix 4: Predation events during the 2025/26 tarapirohe breeding season. A) Kāhu/Australasian swamp harrier B) Kāhu predates chick and egg C) Tarapirohe/black-fronted tern D) Deer E) mouse predates an abandoned egg F) Hedgehog.

8.5 Appendix 5: Hare interactions



Appendix 5: Example of deleterious hare interactions during the 2025/26 tarapirohe breeding season. A) Hare steps in nest and causes abandonment B) Hare steps up to nest with egg and chick leading to the parents deserting and the chick dying of exposure overnight while the egg was also abandoned

8.6 Appendix 6: Chick shelter use

Appendix 6: Chick shelter use over two periods (1-7 days and 8+ days).

Nest Code	Type	Chicks hatched	Use	1-7 days			8+ days		Assumed reason(s) for shelter use
				# of chicks	# of days used (total at nest)	Status	Use	# of chicks	
CE 1*	A	1	Yes	1	4 (5)	Unknown	No^	-	Heat / GC
CE 3	A	1	Yes	1	2 (2)	Unknown	No^	-	GC / Heat
CE 5	F	1	Yes	1	2 (7)	Active	Yes	2	Heat / GC / Rain
CE 8	A	2	Yes	2	3 (7)	Active	Yes	1	Heat / GC
CE 9	F	1	Yes	1	3 (5)	Unknown	No^	-	Heat / GC
CE 11	F	2	Yes	2	4 (6)	Unknown	No^	-	Heat / GC
CE 18	F	2	Yes	2	2 (5)	Unknown	No^	-	Heat / GC
CE 19	A	2	Yes	2	3 (7)	Active	Yes	2	Heat / Rain / GC
CE 20	F	1	Yes	1	5 (7)	Active	Yes	≥1	Heat / GC / Rain / Pred Avoidance
CE 21	F	1	Yes	1	5 (7)	Active	Yes	1	Heat / GC / Rain
CE 22	A	1	Yes	1	1 (4)	No data	N/A	-	Heat / GC
CE 24	F	2	Yes	2	2 (7)	Active†	No^	-	Heat / GC
CE 27	A	2	Yes	2	3 (7)	Active	Yes	2	Heat / GC / Rain
CE 28	A	1	Yes	1	3 (7)	Died	-	-	Heat / Rain / GC
CE 29	A	1	Yes	1	1 (4)	Died	-	-	GC
CF 1	A	2	Yes	2	4 (5)	Unknown	No^	-	Heat / Rain / GC
CF 3	F	2	Yes	2	3 (6)	Unknown	No^	-	Heat / GC
CF 4	A	2	Yes	2	3 (7)	Active	Yes	1	Heat / GC / Rain
CF 6	F	1	No	1	- (6)	Unknown	No^	-	-
CF 7	F	1	Yes	1	1 (5)	Unknown	No^	-	Rain / GC
CF 8	A	2	No	2	0 (7)	Died	-	-	-
CF 9	F	1	No	1	0 (1)	Died	-	-	-
CF 10	A	1	No	1	0 (6)	Unknown	No^	-	-
CF 11	F	1	Yes	1	2 (7)	Active	No	-	GC / Rain
CF 12	A	2	Yes	2	4 (7)	Active	No	-	Rain / GC

Footnotes:

Chick shelter use is represented by 'Yes' (shelter used), 'No' (shelter not used), or 'No data' (data is missing for that period due to an unrecoverable SD card)

Type column refers to whether the nest had an A-frame (A) or Flat roof (F) shelter

The status column represents the status of the nest at the end of the first period, either active with chicks present, unknown due to the chicks leaving the nest, or the chicks had died (no predation).

^ Chicks disappeared and were not seen on camera again – it is likely that some of these chicks died or were predated off camera away from their nest as some disappeared after only a few days post hatching. Others, especially those that were highly mobile and more than a few days old, may have settled elsewhere away from the nest

*Hatching date not captured but chick assumed to be 2 days old with day 1 data missing

GC = General Cover (parent present and/or no extreme weather)

Predator avoidance at CE20 refers to an instance where the original chick was not seen for 6 days and then on day 21, just before researchers appeared, a BFT fledgling made a beeline to hide under the shelter (this fledgling could have belonged to another nest or been the original chick).

† Chick disappeared from camera monitoring after day 7 and was later found dead near to nest, 5 days after this period ended

8.7 Appendix 7: Condition of enhanced islands

Appendix 7: Condition of enhanced islands on the Waiau Toa/Clarence River at the end of the 2025/26 season and maintenance required. Note: red= highest priority, yellow= moderate priority for enhancement works. All recommendations are correct at the time of writing but are subject to change depending on river conditions.

Code	Colony Name	Condition at end of 2025/26 season	Maintenance Required
CC	Upper Swimming Hole	The island is now made up of a mixture of gravels, dense vegetation and grasses. The channel at the downstream portion of the colony became very shallow for most of the season allowing cows to walk easily from the mainland onto the colony.	Focus on enhancing parts, due to the huge size of the island. Push gravels from the middle, dried up channel up over top of the vegetation. Could try scraping the top layer, however suspected silt and grass may result in limited nesting gravels uncovered. Raise height of upper, true right edge.
CF	Swimming Hole	Island heavily vegetated with predominantly grasses. Channels robust and surrounding island. Island height great to avoid flooding.	Island is predominantly grass along edges. Spraying could be beneficial to create a larger weed-free surface area across the middle of the island.
CB	Mike's Rock	Wide channels surround island. Upstream end of island very low lying and susceptible to flooding. True left channel very wide but shallow during low flow. Vegetation in pockets along the edges. Suitable nesting gravels.	Island height to be raised at upstream end. Enhance by depending channel on true left side. Push gravels from the channel onto the island to raise island height. Clear line of thick broom from downstream end.
-	Cow Island	Very low lying, not a lot of vegetation. A channel has been created after flooding events that transects the middle of the downstream part of the island making sections highly susceptible to flooding. Suitable nesting gravels.	Build up island height with surrounding channels, focusing on the middle of the island where channel develops during flooding.
CD	Mitchell's	The island is surrounded by wide river channels, which become very low during extended dry periods, indicating they could be deeper under normal conditions. The island's elevation is sufficient to avoid flooding. Vegetation has spread extensively, with dense broom and seedlings establishing on the downstream portion of the island.	Weed management required (broom control). Weed spraying by hand is preferred to prevent altering island's robust shape and height. Island height could be raised at the upstream end (whilst maintaining even flow down both channels). Deepening channels on the true right side (roadside).
CG	Bush Gully	Natural island enhanced in 2025. Wide, deep channels surrounding island. Island clear of vegetation. Slightly low lying and at risk to high flooding events.	Could raise island height further.
CE	Bridge Island	True left channel narrow at downstream end and has become shallow on the upstream end. Periods of low flow make island easily accessible. Several stepping stones scattered in true left channel. Island densely covered in weeds and woody vegetation. Island height great to avoid flooding.	Deepen true left side (4m wide to prevent cats jumping along and avoiding water thinning out in wide areas at low flow rates). Remove stepping stones in true left channel and widen upstream and downstream end of channel. Weed management required across middle section of island.