

Wrybill and Black Fronted Tern Nesting Success in the Upper Rangitata River for the 2016-17 Season

A report prepared by Brad Edwards and Graeme Ure for 2016-17 Rangitata Riverbed Monitoring.

Raw data and this report currently held on s: -Biodiversity- Bio Operations- OTW- Birds- Braided river bird monitoring

1 Abstract

An extensive predator control program in the Upper Rangitata was initiated for the 2015-16 Upper Riverbed breeding season by the Geraldine Office of the Department Of Conservation with Ecan and local farmer support. 1050 predator traps were established over a 33km length of the river from Mt Sunday to White Rock Station. Additionally, approximately 80% of black backed gulls were removed from the area in a targeted control operation.

To assess the effectiveness of these measures and allow adaptive management, monitoring of wrybill and black fronted tern nest productivity on an annual basis is being undertaken, with comparable baseline data available pre-predator control for wrybill monitoring, and a control monitor outside the predator control area for black fronted tern nesting.

Over the two seasons since the predator control implementation wrybill fledgling productivity, 0.6-0.76(2015 year) and 0.79(2016 year) fledglings per nest, has been significantly above the 4-year pre-predator control mean of 0.47, and exceeding Dowsing's estimate of 0.75 fledglings per pair recruitment being the threshold of population sustainability.

Pre-predator control wrybill nest predation rates averaged 16% between 2008-11. For the 2016-17 breeding season wrybill nest predation rates were calculated at 9.6% with an additional 3.8% of nests predated by South Island pied oystercatchers. It is likely a single hedgehog has caused most recorded predation events. Nest predations had a 'clumped' distribution around the Forest Ck confluence, with 4 (of the total 5 predations for 2016-17) geographically consecutive nests preyed upon, and a hedgehog caught on a nest camera eating eggs from one of these nests.

Nine nest cameras were deployed on wrybill nests once predations had been observed to give more information into predator identity. On each occasion the observed camera nest outcome

mirrored the monitoring team's observation, giving a level of confidence to monitoring outcomes.

71 black fronted tern nests were monitored in the upper riverbed and 17 in the lower. Upper river nests had 36% hatch and 11% fledge rates. Predation was observed at 11% of nests, which contrasts with the lower river where 82% of nests were predated and no eggs hatched. Staff observed suitable habitat for nesting in the lower riverbed, outside the predator control area, was rare due to heavy weed growths and black backed gull dominance.

Large variations in annual productivity of both species are expected due to environmental factors and long term monitoring is required to give robust outcomes.

2 Introduction

A proportion of nests for both species need to be monitored to determine if the predator control work is achieving the desired outcome. Past studies indicate that while in some years nest failure is primarily due to flooding, in years without flooding predation accounts for most of the failures. Introduced predators include cats, stoats, ferrets, weasels, hedgehogs and rats with native avian predators (harrier hawk and southern black backed gull) being implicated.

2.1 Wrybill background

Wrybill breed exclusively on the braided rivers of the eastern South Island. They are steadily declining in both numbers and breeding range, and are currently classified as Nationally Vulnerable (Robertson et al., 2013). The Upper Rangitata River remains one of the few strongholds for wrybill with a 2003 estimate of 2300 birds (O'Donnell, 2003), while Sullivan (2011) reports a national population (5-year average) of 5250. Wrybill productivity needs to average a fledging rate of at least 0.75 fledglings/pair to maintain a stable population (J. Dowding pers. comm. in Sullivan, 2011).

Intensive survey and monitoring of wrybill on the Upper Rangitata was conducted in 2008, 2009 and 2010 by Peter Langlands and Wendy Sullivan. Over this period 16% of nests were predated, 13% flooded, 5% abandoned/infertile, and 21% had unknown outcomes resulting in an estimated hatching success of 47 – 68%. Thirty nests were monitored each year for the 2011, 2012 and 2013 seasons with productivity of 0.97, 0.41 and 0.23 (Table 2). Low productivity was primarily attributed to flood events (Craig and Langlands, 2014). Overall results for the 2013 – 2014 season are presented in Table 1 below.

Table 1 Upper Rangitata, wrybill monitoring outcomes for the 2013 – 2014 season (Craig and Langlands, 2014)

2013 – 2014 Season

Hatching Success (H)	43 nests	11 produced a chick	H = 0.26
Egg Success (E)	83 eggs laid	19 hatched	E = 0.23
Egg Success (E DoC)	83 eggs laid	64 failed to hatch	EDoC = 0.77
Fledging Success (F)	19 chicks	7 fledglings	F = 0.37
Breeding Success (B)	H x E x F		B = 0.02
Breeding Success (B DoC)	H x EDoC x F		BDoC = 0.07
Productivity (P)	30 pairs	7 fledglings	P = 0.23

Table 2 Wrybill Productivity(fledglings/pair) prior to trapping 2010 – 2013 (adapted from Craig and Langlands, 2014)

River	Year	Productivity
Upper Rangitata	2010	0.21 – 0.25
Upper Rangitata	2011 - 2012	0.97(29fledges/30prs)
Upper Rangitata	2012 – 2013	0.41
Upper Rangitata	2013 – 2014	0.23 (7 fledges/ 30 prs)

2015-16 Year Monitoring (Last Seasons-1st year of predator control)

In 2015-16 Year Wrybill on the Upper Rangitata had a higher than average productivity in the range of 0.6 – 0.76 fledglings per monitored pair. Notably, a high proportion of eggs successfully hatched- 0.73 hatchings per egg monitored compared to the 0.47-0.68 range from three seasons of pretrapping monitoring. Nest predation was down to 10% of nests which compares favourably to the 16% average over the three years of pretrapping monitoring. The lack of large floods during the breeding season, which has traditionally resulted in higher breeding success, was probably also a factor this year.

Black fronted terns were not particularly successful in the 2015-16 year. On the upper river, predation was down with no losses attributed to predation but flooding disrupted the one major colony found. On the lower river, disturbance, predation and inter-species competition appeared to result in the abandonment of two colonies, flooding took out a third, and a fourth that established in December was disrupted by human disturbance and to some extent flooding. It seems likely that the observed difference in predation of black-fronted terns between the upper and lower Rangitata is due to the predator control work. Trend analysis of both wrybill

and black fronted tern monitoring results has a high level seasonal variability, and several years of monitoring is required before the full impacts of the predator control are evident.

2.2 Predator Trapping

Geraldine Office Dept. of Conservation started an extensive programme of trapping for mammalian predators in July 2015 using humane kill traps adjacent to, and in, the bed of the upper Rangitata River from Mt Sunday down to the start of the gorge at Whiterock (c. 33km).

Predator trapping results will be specified in the 2016-17 Trapping Report.

2.3 Monitoring objectives

Monitoring is undertaken to determine if the predator control regime is sufficient to adequately increase survival of wrybill and black-fronted tern nests and chicks. The monitoring goals were successfully ascertaining outcomes for 30 wrybill nests and 100 black fronted tern nests on the upper Rangitata River and, as a control, 100 black fronted tern nests on the lower Rangitata River.

3 Methods

3.1 Wrybill

Protocols for finding nests, monitoring nests, determining hatch/failure, banding, following chicks and banding chicks are as outlined in Leseburg et al. (2005) pp. 19 – 31. As the monitoring is to determine the outcomes of the trapping programme over the whole area treated, monitored nests need to be from several parts of the river.

Walking surveys for nesting wrybill pairs began in mid-September covering the riverbed above and below the Forest Creek fan, and above and below the confluence of the Rangitata and Potts Rivers (including the Potts R. fan above Deep Ck). Survey and monitoring was carried out by Brad Edwards and Graeme Ure of the Geraldine, DoC Office.

When a nest was found

it was assigned a number.

a small cairn was built nearby with the number marked on a rock.

the co-ordinates are recorded in a GPS.

adults are checked for bands.

If neither bird has identifying bands, on a later visit one bird from each nest is banded with a metal band and an individual colour combination to enable the following of chicks after hatching.

Nests are checked every 5-7 days, until they have either hatched or failed. Empty nests are closely inspected for very small shell fragments (1-3mm) which would indicate hatching. However, in the absence of any shell fragments and when no evidence of chicks is subsequently found, these nests are probably predated, as Steffens (2010) demonstrated that both black-backed gulls and stoats will remove whole eggs without breaking them.

Chicks counted as fledged when they can fly.

3.2 Black-fronted tern

Black-fronted tern nests were recorded with GPS when encountered on the upper Rangitata and colonies found were surveyed to find as many nests as practicable, nests were then revisited up to weekly, weather and river levels permitting. As a colony nester, most terns were found at a

single colony. Nests were recorded and marked in a similar manner to wrybill and revisited until the eggs hatched or the nest failed, however no banding was undertaken and chicks were not individually followed (except for a colony count of mobile chicks) once they moved off the nest. In addition, trail cameras (LTL ACORN, Ltl-5310A) were installed at up to 6 nests at any one time.

In the lower Rangitata River, colonies were located by walking between the State Highway One bridge and the river mouth. Experience suggests terns are highly unlikely to form breeding colonies between the Rangitata Gorge and State Highway One. Monitoring procedures are the same as for the upper Rangitata. A low level of tern nesting was recorded this year in the lower river despite whole river sweeps through this area. Habitat is generally unfavourable to colony establishment between the road bridge and the coast -with large black backed gull colonies and weed covers over much of the riverbed.

3.3 Analysis

Data collected was used to calculate the success rates for hatching, fledging and breeding and generate an overall productivity rate consistent with previous years. The following definitions are from Craig and Langlands (2011).

$$\text{Predation (\%)} = 6 \text{ predations} / 55 \text{ nests} \times 100 = 10.9\%$$

Hatching success (H) = probability of ≥ 1 eggs in a nest surviving until they hatch. Calculated as: No. of nests that hatched ≥ 1 egg / No. of nests with known outcome. $36/52=0.69$

Note: nests where eggs disappeared before the maximum hatching date but had very fine eggshell fragments and where the adults showed 'chick rearing behaviour' were assumed to have hatched.

Egg success (E) = actual probability of an egg hatching in a nest if it survives (after Craig and Langlands, 2014). Hatched eggs / No. of eggs laid where fate is known. $66/93=0.71$

Fledgling success (F) = probability of a chick fledging once it hatches (min-max). Calculated as: No. of chicks fledged / Total eggs hatched. $31/66=0.46$

Breeding success (B) = probability that an egg will successfully survive, hatch and fledge (min-max).

Calculated as: $H \times E \times F$. $0.69 \times 0.71 \times 0.46 = 0.23$

Productivity (P) = number of fledglings per pair (min-max).

Calculated as: Number of fledglings / number of pairs where fate is known. $31/39=0.79$

4 Results

4.1 Wrybill

A total of 55 nests were found between Mt Sunday and Ben McLeod, of which 3 had unknown outcomes. 36 nests hatched one or more chicks; five nests had infertile egg(s), two nest had eggs die during incubation and another was abandoned, one was lost to flooding, two to cattle trampling, six to predation, and two to SI Pied Oystercatcher. Two nests had dual outcomes.

Of the 36 nests that hatched one or more chicks; 10 could not be followed as these nests hatched before an adult of the pair could be banded or post hatch monitoring was not undertaken, leaving 26 hatched nests to follow.

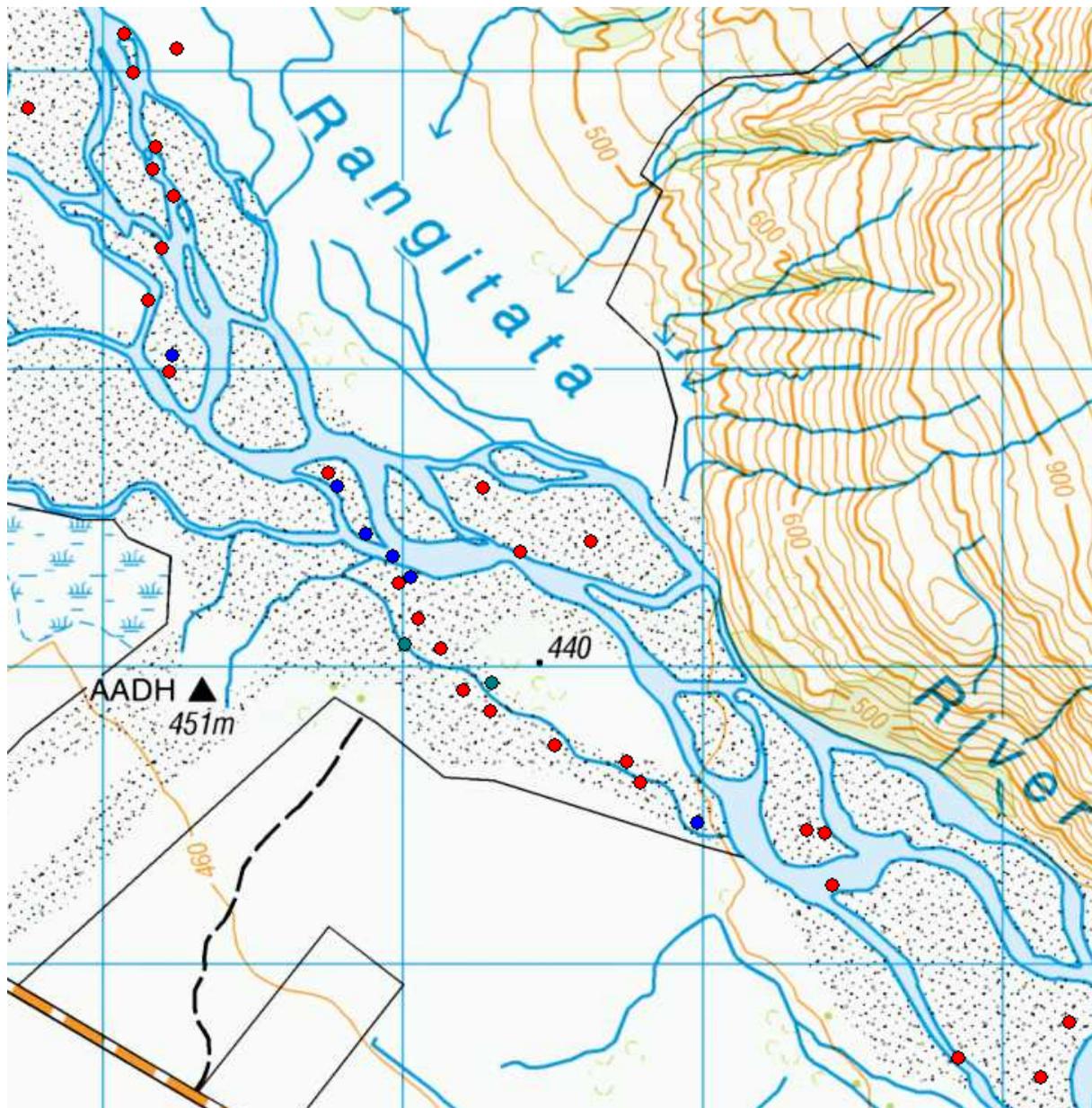
From the 26 hatched nests that where followed, 47 individual chicks were confirmed. 31 chicks were observed to fledge.

Table 3 Wrybill monitoring results from 2008 - 2017

	2008	2009	2010	2013	2015-16	2016-17
Number of nests monitored	48	83	84	43	56	55
Number of pairs followed	0	10	37	30	33	48
% nests preyed on	10 (n=31)	14 (n=56)	25 (n=72)	12	10 (n=50)	10.9 (n=52) +3.8 SIPO
% nests flooded	26 (n=31)	3.6 (n=56)	1.4 (n=72)	63	6 (n=50)	1.92 (n=52)
% nests unhatched (eg infertile or deserted)	6.5 (n=31)	5.4 (n=56)	4.2 (n=72)	5.5	4 (n=50)	13.5 (n=52)
% nests outcome unknown	35 (n=48)	33 (n=83)	14 (n=84)	0	11 (n=56)	5.8 (n=52)
No. of eggs hatched	15 - 23	32 - 65	69 - 87	19	72	66 (n=93)
Egg success E	0.96	0.97	0.96	0.77	0.82	0.71
Hatching success H	0.39 - 0.55 (n=31)	0.45 - 0.79 (n=56)	0.58 - 0.71 (n=72)	0.26	0.73 (n = 55)	0.69 (n=52)
Fledgling success F	unknown	unknown	0.19– 0.23 (15-18 fledglings)	0.37	0.31 – 0.35 (22 –25 fledglings)	0.47 (31 fledglings)
Breeding success B		unknown	0.13 – 0.16	0.07	0.18 – 0.21	0.23
Productivity	unknown	unknown	0.21-0.25	0.23 (n=30)	0.67 – 0.76(n=33)	0.79 (n=39)

n = sample size (nests where fate known)

Forest Ck Wrybill Nest Locations 2016-2017. Blue markers are predations. Green markers are cow. NB. Clumped nest predations at mouth of Forest Ck.



4.2 Black-fronted tern

4.2.1 Upper Rangitata

In the upper Rangitata two main colonies formed; on the Potts Fan and out from Forest Ck confluence. In all 71 nests where monitored in the Upper River, 20 in the Potts and 51 in the Forest Ck confluence to Ben McCloud area.

Of a total set of 71 nests that produced 144 eggs, 27 of the nests went on to produce 51 chicks and fledged at least 9. Detection of mobile chicks and fledglings has been difficult due to colony creches of chicks being in grass covers, the large extents of land the colonies have covered, and mobility of the crèche areas from week to week.

Table 4 Black-fronted tern nest outcomes

Outcome	Upper Rangitata		Lower Rangitata	
	count	percentage	count	percentage
Unknown	21	28	2	12
Fledged	9		0	0
Chick(s)*	51		0	0
Hatched*	27	36	0	0
Predation	8	11	14	82
Flood	2	3	1	6
Abandoned	3	4	0	0
Failed	2	3		
Infertile	5	7	0	0
Disturbance				
bbg vehicle, cows	6	8	0	0
Total	74	100	17	100

Note multiple outcomes are possible from any nest

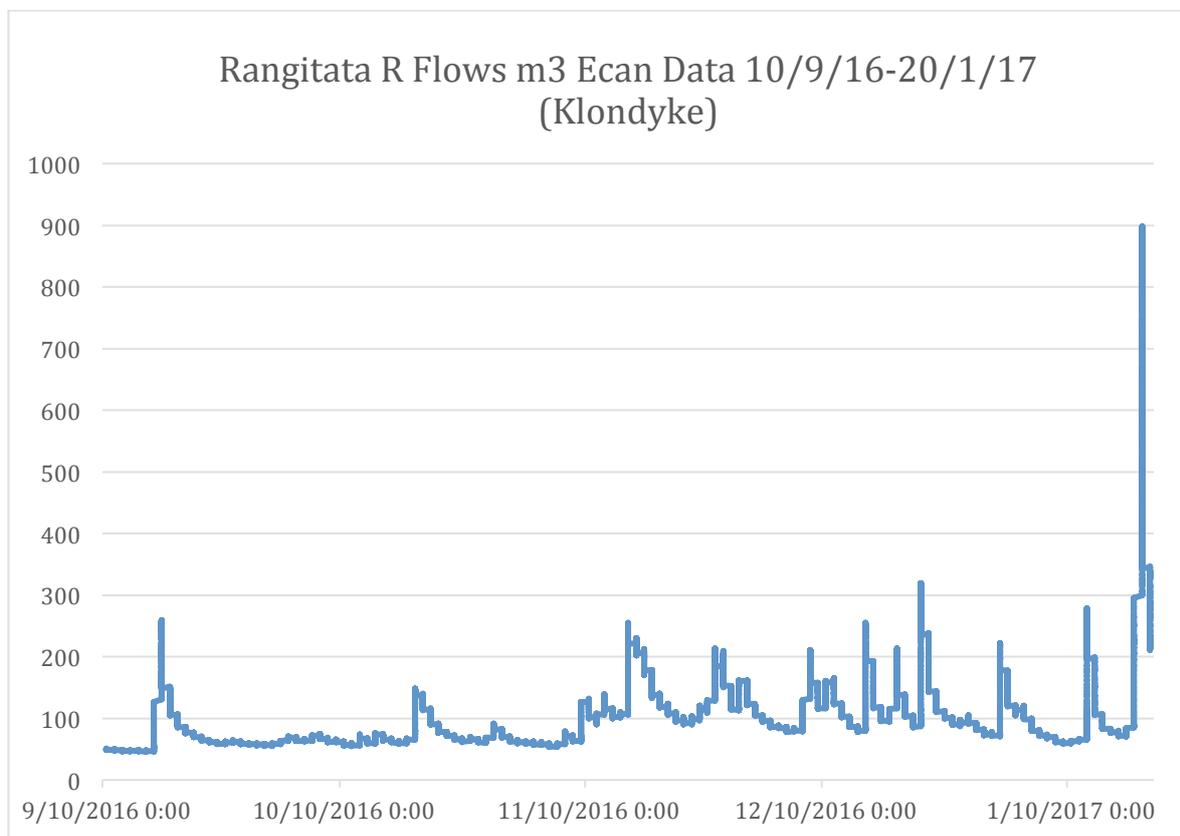
4.2.2 Lower Rangitata

Out of 17 monitored tern nests in the Lower Rangitata, no nests are known to have hatched chicks, 6% were washed away, 82% presumed to have been predated, the remaining 12% failed through non-attributed outcomes. Searches for nesting colonies were undertaken from September 2016 to January 2017 over the whole lower river length from State Highway 1 to the sea with very low success.

Nesting habitat is difficult to find between Dipp Rd and the coast, with extensive weed covers thickening (primarily broom, gorse and false tamarisk) and sprawling black backed gull colonies covering most riverside ground.

4.3 Other observations

Rangitata river flows where relatively stable over the breeding season with base flows under 100 cumecs experienced most of the time and several freshes approaching 300 cumecs but no major flood events. A flood flow of 900 cumec flow was observed on 19th January by which time all wrybill chicks followed had fledged. Flows were recorded at Ecan’s gauge at Klondyke.



Black-bill gull nesting: Rangitata River 2016 – 17 Season

During the wrybill and black-fronted tern monitoring on the Rangitata River three nesting colonies of black-billed gulls were encountered, two of which could be observed as part of the tern monitoring. From these observations, we are aware of at least 600 nests and an estimate of 100 – 180 fledglings. The observations are summarised in the table below with detail in the following site descriptions and maps and photos in the following pages.

Summary of black-bill gull observations in the Rangitata River for the 2016 - 17 season

Potts Fan	Adult	Nests	Young
October	12	10	-
November	10	6	5
December	10	6	5
Ben McLeod			
5 th December	300 - 400	-	120 some large
12 th December	300	-	140
21 st December	-	50 sitting	>150
4 th January	0	570 ±	0
	100 – 180 fledglings in mixed flock		
Badham Road			
7 th December	150	35	2

Potts Fan

The first colony encountered formed on the Potts River fan on the true left adjacent to the lower of the two groynes on the fan. It looked to have around 10 nests initially but some of these were washed away in a fresh. 5 chicks fledged and 6 nest bowls were evident after the colony dispersed.

Ben McLeod

A large colony formed on an island on the true right of the Upper Rangitata, out from and slightly above the Ben McLeod Station buildings. The colony straddled 30m of a gravel ridge with established vegetation in parts and varied from 1 - 6m wide. An initial estimate put around 400 adult birds in the colony and the highest chick count was a minimum of 150, on the 21st December some of which were close to fledging.

By the 4th of January the breeding site had been abandoned in favour of a clean shingle bar 500m downstream to form a mixed flock of adults and fledglings with 35 – 60 percent of the birds being fledglings (difficult to estimate as fledglings were not evenly distributed). A walk-through count of the breeding site revealed 570 nest bowls (± 10). The eastern most (downstream) 20 – 30 nests all had broken eggs and this area had, had around 50 birds sitting on nests on the 21st December.

On the 21st of December six predated large chicks were observed, all with similar injuries. In January the remains of a further 6 birds were found several were adults and had been eaten, bones and all, leaving just bone fragments and wings.

Badham Road, Lower Rangitata

One colony was encountered on the river below SH 1 near the Badham Road access point on the 7th December. At this time, there were approximately 150 adults, 35 obvious nests and 2 chicks seen. These gulls were not revisited as there was no reason to return to the area.

South Branch Ashburton River

While not a core part of the project, the braided section of the South Branch Ashburton River between Buick's Bridge and the Ashburton Gorge was surveyed to give Ecan a measure of the outcomes of their predator control programme in the area and maintain a history of monitoring done at this site. The goal was to carry out weekly walkthroughs.

- Banded Dotterel. There has been no formal dotterel monitoring in place except to say that for a second consecutive year, more than 100 fledglings were observed in groups from Buick's Bridge to Hakatere corner late season. This area seems to be a powerhouse of dotterel production.
- Wrybill. Three pairs had 5 nests detected between Buick's Bridge and Hakatere Corner. Of these 3 hatched chicks and one went on to fledge. Two nests were abandoned and one egg was infertile. Late season another unbanded pair was discovered above the tern crèche that successfully fledged a chick. In summary four pairs of wrybill succeeded in fledging 2 chicks from this Upper River area. Productivity $P=0.5$
- Black fronted tern. First eggs were detected on 14th October and a colony of approx. 30 adult birds stayed resident until late December. The colony formed 31 nests of which 8 nests had 14 chicks hatch, 16 nests were predated, 2 had infertile eggs, and 5 had unknown outcome. Of the 14 chicks detected, 4 observed fledges occurred with one more probable. (5 fledges from 55 eggs/31 nests). Productivity $P= 5 / 26 (31-5)$ $P= 0.19$
- Predations. A spike in tern nest predations occurred in the week preceding 9th December with 9 of the 16 detected predations occurring within that timeframe. This effectively took out almost all active nests left in the colony and coincided with maximum numbers of chicks on the ground. Almost every nest was observed to have the same egg predation technique utilised with a thin opening like a can opening, around the eggs circumference, often leaving two perfect half egg shells. This is thought to be caused by hedgehog.

5 Discussion

Wrybill

Over the two seasons since the predator control implementation wrybill fledgling productivity, 0.6-0.76(2015 year) and 0.79 (2016 year) fledglings per nest, has been significantly above the 4-year pre-predator control mean of 0.47.

Since predator control was initiated, nest predation rates have been consistent with 10.0% for 2015-16, and 10.9% recorded in the 2016-17 years. Use of nest cameras allowed a hedgehog to be implicated in the predation of one of the four geographically consecutive nests at Forest Ck from a total of six predations study wide, so it appears a single predator can have major impacts on localised productivity.

Black Fronted Tern

The large discrepancy between the numbers of birds monitored in the upper and lower rivers highlights the lack of viable habitat for nesting between Highway One and the river mouth. Between the abundance of black-backed gulls, brush weeds, confinement of the active river by willow, competition for nest sites with other species e.g. black billed gulls, and high recreation use, there are very limited opportunities for braided river birds to form colonies.

Nest predation rates in the upper river are notably lower than the lower, 11% inside the upper river protection area as opposed to 82% in the lower river. Also significant was the failure of any nests in the lower river to get any eggs to hatch when in the upper river 36% of eggs hatched chicks and chicks reaching fledging (ability to fly) numbered at 12% of nests.

Predators

Multiple predator species have been implicated in actively predating terns and wrybill.

During the 2014-15 and 2015-16 feral cats were found to be the primary predator working in tern colonies in the Rangitata, whilst this season a small 30 nest tern colony in the Ashburton was abandoned after nest predations from hedgehogs, and wrybill predations at Forest Creek where also attributed to hedgehog(s).

It would be worthwhile to explore possible strategies to reduce predations at nesting hotspots around major confluences and discuss the impacts of small mammalian predators not targeted by the current trapping infrastructure.

6 References

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Rangitata River Flow Rates 2016-17 <https://ecan.govt.nz/data/riverflow/sitedetails>

Robertson, Hugh, John Dowding, Graeme Elliott, Rod Hitchmough, Colin Miskelly, Colin O'Donnell, Ralph Powlesland, Paul Sagar, Paul Scofield, Graeme Taylor 2013. *Conservation status of New Zealand birds, 2012*. *New Zealand Threat Classification Series 4*. 22 p.

Steffens, K. 2010. *Identification of predators at black-fronted tern nests on the Wairau River and barrier management – 2009*. Department of Conservation internal report, St Arnaud. Ref. DOCDM-537635 – BFT video study 2009

Sullivan, W. 2011. *Wrybill productivity in the upper Rangitata River, 2008-2010*. Department of Conservation internal report.

7 Raw data storage

2016-17 Wrybill Nesting Data

S:\BIODIVERSITY\Bio Operations\OTW\Birds\Braided river bird monitoring\Wrybill 16_17 CURRENT\Wrybill 16-17 CURRENT.xlsx

2016-17 Banding Data Wrybill Rangitata 15-16, 2016-17

DOC-2827776.xlsx

2016-17 Black Fronted Tern Nesting Data

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S:\BIODIVERSITY\Bio Operations\OTW\Birds\Braided river bird monitoring\Black Fronted Terns 2016-17 Lower CURRENT Terns 2016-17 Upper CURRENT