Department of Conservation
Te Papa Atawhai

TONGARIRO FOREST KIWI SANCTUARY ANNUAL REPORT

July 2010 – June 2011

RUAPEHU AREA OFFICE, TONGARIRO / WHANGANUI / TARANAKI CONSERVANCY

bnz SAVE THE KIWI
KIWI ENCOUNTER
NATIONAL KIWI TRUST
Tongariro Natural History Society

Ngati Hikairo ki Tongariro

Report Compiled by: Nicole Sutton, Jerome Guillotel, Renee Potae

Ruapehu Area Office, P.O. Box 71029, State Highway 48, Whakapapa Village,
Mt Ruapehu

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Contributors to Report: Rob Hood, Alison Beath, Antonia Dix, Kristina Thompson, Tony Lawson, Dean Flavell, Bubs Smith, Jessica Scrimgeour

Cover Photo: Bubs Smith, Department of Conservation. Release of three sub-adult kiwi from Maungatautari Ecological Island Trust into Tongariro Forest Kiwi Sanctuary

PARTNERSHIPS

Partnerships between the Department of Conservation and Ngati Hikairo, The National Kiwi Trust at Kiwi Encounter, Maungatautari Ecological Island Trust, Tongariro Natural History Society, and the Bank of New Zealand Save the Kiwi Trust continue to be an essential part of the work in the Tongariro Forest Kiwi Sanctuary.

THE NATIONAL KIWI TRUST AT KIWI ENCOUNTER

The National Kiwi Trust at Kiwi Encounter plays an important role in the success of the Tongariro Forest Kiwi Sanctuary, through incubating and hatching lifted eggs. Twenty four eggs were taken to Rainbow Springs this season, allowing us to reach our sample size of 25 chicks.

NGATI HIKAIRO

Ngati Hikairo plays an important part in the Tongariro Forest Kiwi Sanctuary and has a role and responsibility as kaitiaki for the enhancement of Western North Island brown kiwi within their rohe. Ngati Hikairo fully support recovery efforts by the Tongariro Kiwi Team and are intent on kiwi conservation goals and objectives being met within Tongariro Forest.

TONGARIRO NATURAL HISTORY SOCIETY

TNHS are involved in ecological projects throughout Tongariro National Park and surrounding areas. Their volunteers assist the Tongariro Forest Kiwi Sanctuary regularly with work such as tracking tunnels and transporting kiwi eggs to The National Kiwi Trust at Kiwi Encounter.

MAUNGATAUTARI ECOLOGICAL ISLAND TRUST

Maungatautari is a forested volcanic cone in the Waikato, and is the site of an ecological restoration project headed by the Maungatautari Ecological Island Trust, aiming to eliminate all mammalian predators and re-introduce native species, including kiwi. Tongariro Forest Kiwi Sanctuary and Ngati Hikairo gifted kiwi to Maungatautari and Ngati Koroki-Kahukura to be part of a founder population there. Since 2010, 14 kiwi (the offspring of some of the original founders) have been released from Maungatautari into Tongariro Forest.

EXECUTIVE SUMMARY

Tongariro Forest Kiwi Sanctuary (TFKS) was established in 2000 for the development of kiwi protection techniques, namely the use of BNZ Operation Nest Egg™ (O.N.E) and aerial 1080. TFKS aims to achieve and maintain a representative sample of 200+ pairs of Western North Island brown kiwi by 2017, and to involve the community and enhance public awareness.

Twenty three adult male kiwi and five adult female kiwi were monitored in TFKS in 2010/11. There were nine monitored adult deaths this season; three of these were confirmed as ferret predation. This brings the total number of monitored dead adult kiwi in TFKS since 2009 to 24.

There were 31 nests this season and a total of 43 eggs. Twenty four of these eggs were taken to The National Kiwi Trust at Kiwi Encounter to help ensure a sample size of at least 16 kiwi chicks was achieved.

A call survey was carried out for four nights from the 30th of May 2011 to the 2nd of June 2011. The ratio of males heard to females was 2.5:1, an average of 0.9 calls per hour was heard in 2011, and there were seven known and eight unknown kiwi heard in total.

Eighty eight O.N.E sub-adult kiwi have been released into TFKS since 2000. Seventy seven of these were monitored, along with 34 wild hatched sub-adults. Fourteen sub-adult kiwi were released into TFKS from Maungatautari Ecological Island Trust. Twenty three sub-adults are currently monitored. The survival rate is 61%, the main cause of mortality being predation. The mean age at first breeding is 3.98 years old. The mean age of territoriality is 1.62 years old. Approximately 10% of sub-adults dispersed out of TFKS.

Kiwi chicks were monitored in the TFKS as part of an ongoing major study seeking to assess whether aerial 1080 possum control operations can benefit kiwi populations through secondary poisoning of stoats. An aerial 1080 operation is planned for August/September 2011. Twenty five chicks were monitored this season. The survival rate was 19%.

Tracking tunnels for small mammal indexing of rodent and mustelid abundance were run in January, February, August and November and results showed a slight decrease in rat numbers to approximately 60% during the season while stoat numbers increased to a peak of 27% in January 2011.

Fantail nesting success in TFKS in the 2010/11 season was 24%. Five-minute bird count monitoring was also carried out in 2010/11.

INTRODUCTION

Tongariro Forest Kiwi Sanctuary (TFKS) is a 20,000ha area in the central North Island (Figure 1) established in 2000 for the protection and recovery of Western North Island brown kiwi (*Apteryx mantelli*). It is one of five sanctuaries set up throughout the country to maintain significant populations of the different kiwi taxa and to develop and improve techniques in kiwi protection, specifically aiming to increase the survivorship of young kiwi (Robertson 2004). TFKS is unique from the other sanctuaries in that it aims in particular to use BNZ Operation Nest Egg™ (ONE) and to establish if aerial 1080 is effective at protecting kiwi.

One of the key current research projects in TFKS is the assessment of the effect of a large scale 1080 operation on kiwi chick survival. This involves determining survival rates of wild hatch kiwi chicks before and after an aerial 1080 operation carried out in September 2006. This was an Animal Health Board operation as part of their regional TB-vector/possum control regime, but done in conjunction with the Department of Conservation for kiwi protection research. This research will have national importance, indicating whether 1080 can be used as an effective tool for maintaining kiwi in large and/or relatively inaccessible areas throughout the country (McLennan 2006).

In addition to the 1080 research, other work within TFKS involves ongoing monitoring of adult kiwi for survival and breeding purposes, as well as a sub-adult kiwi survival, dispersal and breeding monitoring study. Additionally, monitoring of mustelid and rodent numbers through tracking tunnels, and passerine monitoring (including fantail monitoring and five-minute bird counts) are all part of the ongoing monitoring carried out within the sanctuary. This report presents results from these key areas of work within TFKS for the 2010/11 period.

FIGURE 1: LOCATION MAP FOR TONGARIRO FOREST KIWI SANCTUARY, TONGARIRO-WHANGANUI-TARANAKI CONSERVANCY

SANCTUARY OBJECTIVES

1. To achieve and maintain a representative sample of 200+ pairs of western North Island brown kiwi in Tongariro Forest by 2017.

2. To answer three important management questions
- Do aerial 1080 operations benefit kiwi chick survival?
- If so, what frequency of aerial 1080 application is needed to maintain and expand the kiwi population?
- Can aerial 1080 operations (at the required frequency) benefit other forest birds preyed upon by rats?

3. To involve local communities and associates in the management of the TFKS where practical.

4. To enhance public awareness and support for kiwi conservation.

ADULT KIWI MONITORING AND NESTING

Tongariro Forest Kiwi Sanctuary aims to keep 30 breeding males monitored for breeding outcomes. These male kiwi are fitted with 'smart' mortality transmitters, known as chick timers. These transmitters provide an 'output' (signal of information of kiwi activity levels which can be graphed) which informs the user if a kiwi is incubating or not, and for how long, in addition to other information such as when there is a hatch event and what time the male emerged from the nest the previous night. This technology lets us make very accurate assessments as to when to lift eggs or intercept chicks. Once a male kiwi had been nesting for 20-30 days his nest was located, using a GPS (<10m), so an outcome could be determined if he abandoned.

Egg lifts took place at 55 days. Lifted eggs were taken to The National Kiwi Trust at Kiwi Encounter. This was done to help ensure a sample size of at least 16 chicks was achieved (kiwi eggs have a higher hatch rate in captivity than in the wild). The resulting chicks were fitted with chick mortality transmitters and returned to their natal territory in TFKS at hatch weight (approximately two weeks of age).

Chick interceptions are timed to intercept both chicks if there are two (this can usually be ascertained by assessing the birds activity output), and aims to intercept the oldest chick between 5 and 10 days (a second chick will usually hatch within one week of the first). Chicks intercepted in the wild were fitted with chick mortality transmitters.

ADULT SURVIVAL

A total of 28 adult kiwi were monitored in TFKS in 2010/11, consisting of 23 males and five females. There was a high adult mortality this season (Table 1), with nine monitored adult deaths; three of these were confirmed as ferret predation, but in five cases the cause of death was unknown. This brings the total number of dead adult kiwi since 2009 to 24; twelve of these were confirmed ferret predations. Carcasses were sent to Massey University for autopsy and, although we suspect the majority of the "unknown" deaths were due to ferret predation, in some cases the condition of the carcass meant this was unable to be confirmed. Table 2 shows the change in adult kiwi mortality and survivorship since 2009 (calculated using Kaplan-Meier procedure). This change in survivorship has led to a significant reduction in the average life expectancy of kiwi in TFKS. See Appendix 1 for ferret predation event locations.

Two other adult kiwi were lost this season, one due to a transmitter failure and one due to a dropped transmitter. We will attempt to re-catch them. One new male was caught with a radio tagged female in June.

TABLE 1: DEAD MONITORED ADULT KIWI 2008-2011

Frosty	Feb-09	Storm	Feb-10
Toetwo	Feb-09	Trev	Apr-10
Seagull	Feb-09	Te Aukaha	Jul-10
Brownie	Feb-09	Tahi	Jul-10
Lundi	Mar-09	Hemi	Sep-10
Tae	Oct-09	Te Maari	Nov-10
Waione	Dec-09	Freddie	Dec-10
Ash	Jan-10	Mani	Dec-10
Muffet	Jan-10	Jack	Jan-11
Slick	Jan-10	Koru	Jan-09
Mondy	Jan-10	Daryl	Mar-11
Horrace	Feb-10	Cough	Apr-11

TABLE 2: CHANGE IN ADULT SURVIVORSHIP AND LIFE EXPECTANCY

	Pre-2009	2009-2011
Annual survival rate	98%	91%
Annual mortality rate	2%	8%
Life expectancy	46 years	12 years

NESTING AND EGG OUTCOMES

There were 31 nests this season (Table 3), with 28 chicks hatching in total (three died while still in captivity; Fl9 and Fo1 died within 24 hours of hatching, and Ltm2 had to be euthanised, all due to complications). Six of the 31 nests were unconfirmed (chick timer transmitter indicated the kiwi had been nesting but the kiwi abandoned before the nest was located).

TABLE 3: NEST AND EGG OUTCOMES FOR 2010/11

Kiwi	Eggs (not hatched)	Number of chicks	Confirmed nests	Unconfirmed nests*	Current status
LoggerRoss		4	2		Alive
Dino	1	1	2	1	Alive (mate dead)
Daryl	3		2		Dead
Rocket	1	1	1	1	Alive
Te Aukaha				1	Dead
Rocky	3	1	2		Dropped tx
Taika	1	3	2		Alive
Peter Pan				1	Alive
Lucky	2	1	2	1	Alive
Fluke	1	1	1	1	Alive
Doug		1	1		Alive
Te Whare		2	1		Alive
Mani		2	1		Dead
Murphy	1	1	1		Alive
Kratos		1	1		Alive
Fozzie		3	2		Alive
Max		4	2		Alive
Little Moa		2	1		Failed tx
Pumpkin	2		1		Alive
Totals	15	28	25	6	

*An unconfirmed nest was when the transmitter output indicated that the bird was nesting, but the nest was abandoned prior to the nest being located at 20-30 days

There were a total of 43 eggs this season (Table 3). Twenty four of these eggs were taken to The National Kiwi Trust at Kiwi Encounter and 12 were left in nests in the wild. The 12 left in the wild were either intercepted as chicks, or eggs that were not viable when encountered in the nest. Seven eggs were infertile and were not included in Figure 2. Even though the sample of eggs left in the wild was low (n=12), the 42% hatch rate (Figure 2) is consistent with the normal hatch rate for North Island brown kiwi (which is 30-50%). Hatch rates at Rainbow Springs are over 90%. Eggs which failed prior, and those which are clearly not viable (rotten or infertile) at the time of the nest visit, were not taken to Rainbow Springs.

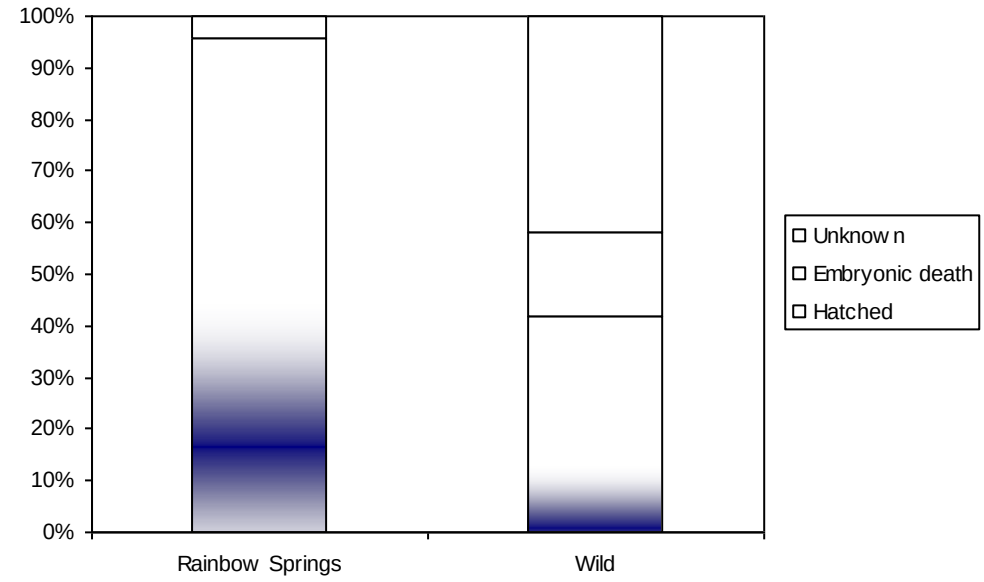

FIGURE 2: EGG OUTCOMES IN 2010/11

Fifteen of the 43 eggs did not hatch this season. Of these; seven were infertile, two were broken on the nest, three suffered embryonic death, and three were too rotten to tell if they had once been viable or not. This season's number of broken eggs was less than previous seasons; probably due to the fact that the majority of eggs were removed from the wild at around 55 days (reducing their chance of being broken on the nest). There was a noticeable increase in the number eggs that hatched in 2010/11; this is due to viable eggs being lifted from the nest at 55 days to hatch at Rainbow Springs. In 2008/09 and 2009/10 eggs were mainly left to hatch in the wild.

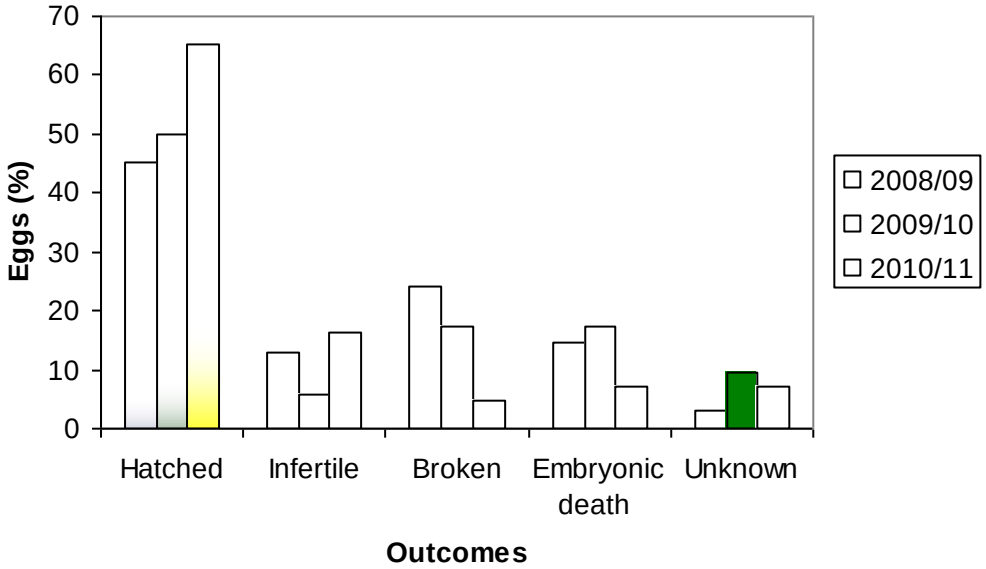

FIGURE 3: COMPARISON OF EGG OUTCOMES 2008/09- 2010/11

KIWI CALL COUNT MONITORING

Call surveys were done in Tongariro Forest in 1993-1997, 2001, 2004-2007 and 2011 (Figure 4). The objective was to detect trends in the population. In 2009 Jessica Scrimgeour reviewed results (DOCDM-471080) to determine whether this objective was being met. The outcome to this review was a recommendation the western stations should be disestablished, or at the very least more stations should be created on the eastern side of TFKS to increase the sampling effort to 50 hours. This could better allow any major changes in the population to be statistically determined.

The Kiwi Best Practice Manual (2003) recommends call surveys be done annually for three years, and then once every five years after that as part of the National Call Count Monitoring Scheme. No call monitoring was going to be done in TFKS until 2012. However due to the deaths of 24 radio tagged adult kiwi since 2008 it was considered advantageous to do a call survey to better understand population dynamics, in order to repeat the 2008 territory mapping exercise. The 2008 territory mapping gave us a conservative population estimate of 180 kiwi. The western stations were not disestablished due to the presence of newly released sub-adults.

The 2011 call survey was carried out for four nights from the 30th of May to the 2nd of June. Six observers undertook 48 hours of listening in total. There were three sites on the western side of the forest and three on the east. A fourth site had been planned for the east but the fourth observer could not participate due to illness. The weather was mainly fine with calm to moderate wind.

Table 4 shows total numbers of kiwi heard during the 2011 call survey (for the full data set see DOCDM-791875). The ratio of males heard to females was 2.5:1 (Table 5); this is similar to ratios from call surveys in the early 1990's. This raises a question as to whether males are more prone to ferret predation, due to their smaller size, leading to a higher male mortality rate. It also raises the question about whether a similar predation event occurred in the early 1990's. An average of 0.9 calls per hour was heard in 2011; this is similar to the number of calls heard in 2005 and 2006. Figure 4 shows the proportion of known kiwi to unknown kiwi at each listening site. There were seven known and eight unknown kiwi heard in total.

TABLE 4: 2011 CALL SURVEY DATA TOTALS

Area	Calls heard	Individual kiwi heard
East	37	11
West	6	4
Total	43	15

TABLE 5: RATIOS OF MALE KIWI TO FEMALE KIWI HEARD IN CALL SURVEY'S SINCE 1993

Year	Male: Female
1993	3:1
1994	2.5:1
1995	4.5:1
1996	4.2:1
1997	3.7:1
2001	6:1
2004	4:1
2005	4:1
2006	8:1
2007	6:1
2011	**2.5:1**

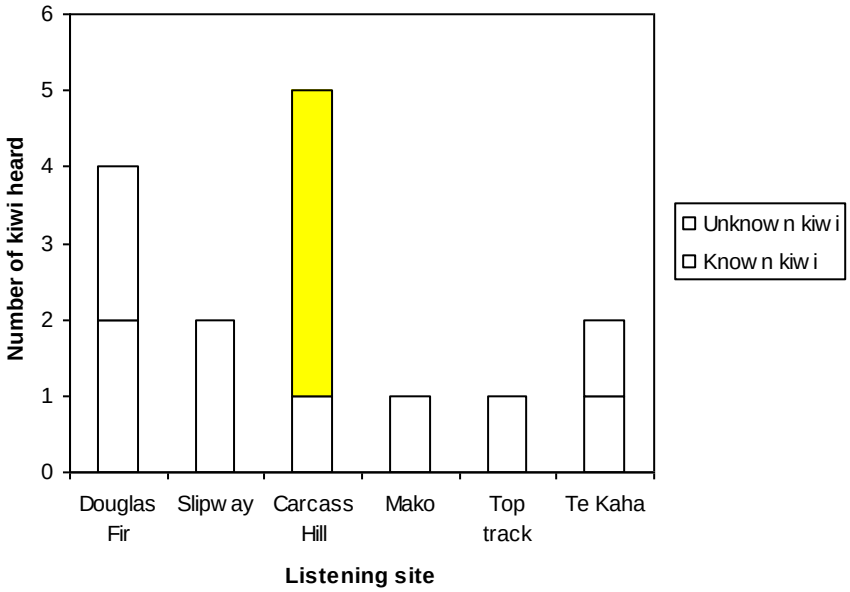

FIGURE 4: PROPORTION OF KNOWN KIWI TO UNKNOWN KIWI HEARD

SUB-ADULT KIWI MONITORING

Juvenile[1] and sub-adult[2] kiwi produced through BNZ Operation Nest Egg™ (O.N.E) are released back into the Tongariro Forest Kiwi Sanctuary (TFKS), between 1100g-1200g. A number of them have been radio-tagged to give data on the overall picture of population dynamics of kiwi (Robertson 2004), providing information on age at first breeding, survival and dispersal.

Eighty eight O.N.E sub-adults have been released since the creation of TFKS in 2000 (122 since the launch of O.N.E in the 1990's). Of these, 77 have been closely monitored, as well as 34 wild hatched sub-adults, which have been followed and treated as a separate sample in the study to determine if they behave differently. Thanks to the release of 14 kiwi from Maungatautari Ecological Island Trust (MEIT) this season (some of them offspring of kiwi with TFKS origins). Twenty three sub-adults are currently monitored.

[1] 50 days < age > 183 days
[2] 183 days < age > 4.5 years

SURVIVAL RATE

Of the 116 (77 O.N.E., 34 wild hatched, 5 caught) continuously monitored sub-adults, 28 have died since 2000 (30 if counting two which were found dead after having been lost for a while). The causes of mortality were predation (n=11), natural causes/misadventure (n=9) and unknown causes (n=10).

This season one sub-adult kiwi died from an unknown cause, one lost its transmitter and one vanished. Four O.N.E sub-adults died from misadventure. The results still show the survival rate of sub-adult females is comparatively low. We have been able to confirm 19 males reached adulthood as opposed to only three females. The current O.N.E female survival rate is 21% (using Kaplan-Meier procedure; Table 6). Interestingly, there is a higher survival rate amongst wild-hatched kiwi compared to O.N.E kiwi (Table 6).

TABLE 6: SURVIVAL RATE OF SUB-ADULT WITHIN THE TONGARIRO FOREST

	Survival Rate (SR %)	Female SR (%)	Male SR (%)	Sample size in transmitter years*
O.N.E (n=77)	58.5	21	70.5	110
W.H. (n=34)	62.3	49	78	60
Wild caught (n=5)	N/A	N/A	N/A	9
Overall (n=116)	**60.9**	**30.5**	**74.6**	**179**

* Cumulated monitoring time from 2001 to 2011

TERRITORIALITY AND AGE AT FIRST BREEDING

We have sufficient information on territoriality for 39 kiwi and age at first breeding for 19 kiwi (twelve O.N.E. and seven wild hatched). We currently monitor 23 sub-adults and 2 adults (that are part of the sub-adult experiment but have not started breeding yet).

Overall, we have a sample size of 44 kiwi (32 O.N.E and 12 wild hatched kiwi) that give us information on age at first breeding, as long as we keep on monitoring the remaining 25 which have yet to breed.

At present, the mean age at first breeding is four years old (3.98 years, ± 0.64) with a small difference between O.N.E (4.13 ± 0.46) and wild hatched kiwi (3.71 ± 1.20). This is probably an underestimate for O.N.E kiwi, as seven of them (five have died), which are over 4.5 years old,

have not yet started breeding. This could be an indication of low numbers of females as they might not be able to find partners despite being in the core area

The mean age of territoriality (n=39) is two years old (1.62 years, ±0.25) with a small difference between wild hatched (1.57±0.39) and O.N.E (1.65±0.34) kiwi and a slightly higher age for females (1.75±0.22) than males (1.57±0.34). See Appendix 2 for more details.

Twelve out of 14 MEIT kiwi (from 0.7 to 2.6 years of age), which were released this season as O.N.E. kiwi, are still alive but not settled in territories, and three chicks from this non-treatment season have survived to sub-adulthood so far.

DISPERSAL PATTERNS

The study of O.N.E sub-adult movements has shown most kiwi remain within an approximate 5000 ha area, situated in the eastern side of the forest, which is where O.N.E kiwi were initially released between 2002 and 2006 (see map in Appendix 3). Approximately 10% of kiwi have dispersed out of TFKS (all the kiwi that are still alive have now become adult and are not likely to disperse widely anymore).

Last season, twenty-one sub-adults (fourteen from MEIT) were released from a new location on the western side of TFKS (away from the adult kiwi predations on the eastern side of TFKS) and have been monitored. Their dispersal pattern confirms the forest on that side contains few kiwi and that there are four main areas where the kiwi are more likely to disperse to (Appendix 3).

The southwest corner of the western side of the forest, around Quartz Creek, seems to support a good kiwi population as it has attracted a few sub-adults coming from the east (Appendix 3). Four kiwi (two O.N.E. and two wild hatched) have settled there (the two O.N.E kiwi have nested). Three O.N.E. females released last season have moved into the area. Another wild hatched male, possibly settled, dropped his transmitter in 2003.

No movements out of TFKS have been recorded this season, except one O.N.E bird that was located (but was unable to be retrieved) in the Whanganui River in Kakahi, which probably drowned upstream near Owhango and was then washed down.

KIWI CHICK MONITORING

Kiwi chicks have been monitored in the Tongariro Forest Kiwi Sanctuary (TFKS) to answer the following Sanctuary management questions:

- Do aerial 1080 operations benefit kiwi chick survival?
- If so, what frequency of aerial 1080 application is needed to maintain and expand the kiwi population?

Kiwi chick survival was monitored for one season before (2005/06) and three seasons after (2006/07, 2007/08, 2008/09) the aerial 1080 operation in September 2006. While this operation was primarily for possum control, aerial 1080 can also target rats and thus stoats (the main predators of kiwi chicks) through secondary poisoning.

In 2010/11, an aerial 1080 operation planned for August/September 2011 provided the opportunity to collect another season of data on kiwi chick survival without predator control.

MONITORING METHODS

Chicks had radio-transmitters fitted and were monitored by obtaining a signal for them at least weekly. They were captured every three to four weeks to have their transmitter strap replaced (as they grew) and to be weighed and measured.

If a mortality signal was received from the transmitter during the weekly check, the carcass was located and cause of death ascertained through scene investigation and examination of the remains by staff. Necropsy of the carcass was done when possible at Massey University Wildlife Centre.

CHICK OUTCOMES

This season, a total of 25 chicks were monitored. Four wild-hatched chicks were intercepted and radio-tagged at the nest. The remaining 21 were taken from the nest as eggs to be incubated at Kiwi Encounter, Rainbow Springs. The chicks successfully hatched were released back into their natal territories in TFKS when they had reached their hatch weight (approximately 14 – 21 days old). The first chick was intercepted on the 16th September 2010 and the last chick was released on the 3rd March 2011. There were 20 chicks from 1st clutch nests and five from 2nd clutch nests.

Sixteen chicks were found to have been preyed upon. Five of these were confirmed killed by mustelids. In the other 11 cases it was not possible to identify whether the chicks were killed by a member of the mustelid family or another predator such as a cat. In these instances there were only a few pieces of the kiwi remaining (bone, skin, and/or feathers) and/or other circumstantial evidence present such as predator sign (faeces, fur, footprints). This was most often the case for the chicks that were living on the eastern side of TFKS. One chick is thought to have drowned as it was recovered from a stream, and there were three cases where only transmitters were found (Figure 5). See Appendix 4 for further details.

There are four kiwi from the sample still being monitored. Three of these are now considered to be sub-adults (older than 183 days).

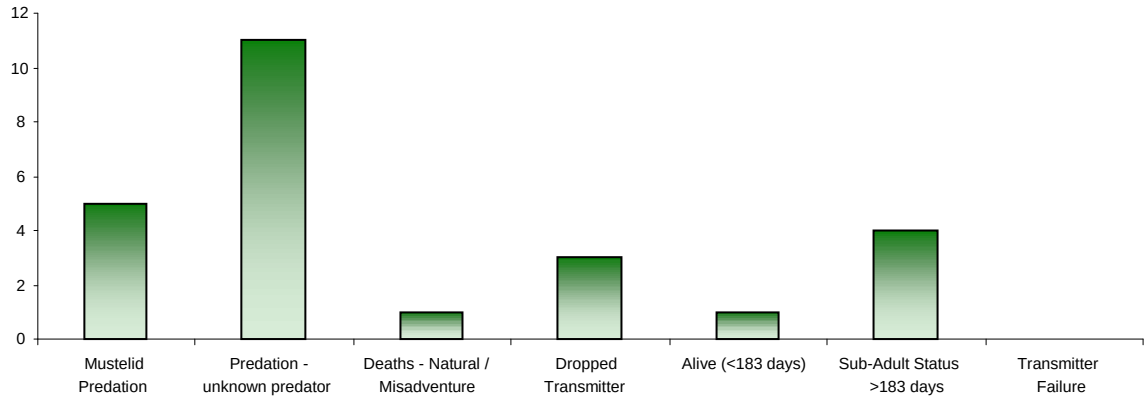

FIGURE 5: TFKS KIWI CHICK OUTCOMES 2010-11

CHICK SURVIVAL

In order to compare chick survival over five seasons, survival rates to 183 days were calculated for each season using the Kaplan-Meier procedure (Table 8), as recommended by Robertson and Westbrooke (2005), with 95% confidence intervals.

Chick survival rates are compared with chick outcomes for each season in Table 8. There has been a steady decrease in the survival rate each season since the 2006 1080 operation. The 2010/11 kiwi chick survival rate was 19%

TABLE 8: A COMPARISON OF KIWI CHICK OUTCOMES AND KAPLAN-MEIER SURVIVAL ESTIMATES FOR THE FIVE BREEDING SEASONS, 2005-2011*

	2005-2006	2006-2007	2007-2008	2008-2009	2010-2011
	Pre - 1080	Immediately Post 1080	1 Year Post 1080	2 years Post 1080	Pre - 1080
Total Number Monitored	**11**	**21**	**19**	**23**	**25**
Survival to sub-adult status >183 days	1	12	5	5	4
Alive (currently <183 days)	0	0	0	0	1
Deaths - predation	6	7	4	15	16
Deaths - Natural / misadventure	1	0	3	2	1
Dropped transmitter	1	2	5	0	3
Transmitter failure	1	0	2	1	0
Removed from forest due to injury	1	0	0	0	0
Kaplan-Meier Survival Estimate (95% Confidence Intervals)	**0.267** (0.048 - 0.563)	**0.690** (0.435 - 0.848)	**0.589** (0.320 - 0.782)	**0.215** (0.077 - 0.398)	**0.188** (0.066 - 0.356)

**Data from the 2009-2010 season is not included as chicks were crèched in Warrenheip, a 16ha predator proof fenced area of bush near Cambridge, Waikato.*

FUTURE DIRECTIONS

Tongariro Forest Kiwi Sanctuary will continue to undertake kiwi chick survival monitoring after the aerial 1080 operation scheduled for August / September 2011. Wild-hatched chicks will again be monitored for at least two seasons to determine the rate of kiwi chick survival and establish if the results replicate those seen in the seasons following the 2006 aerial 1080 operation.

SMALL MAMMAL INDEXING USING TRACKING TUNNELS

Tracking tunnels for indexing rodent and mustelid abundance were run on the 'Operation Ark' timing (i.e. January, February, August and November) to catch the peak in stoat abundance. Methodology follows current DOC best practice (Gillies & Williams 2001). There are a total of 15 lines within TFKS, each line is 450m long and consists of 10 tunnels, giving a total of 150 tunnels. Tracking tunnels have been run in TFKS since 2001.

TRACKING TUNNEL RESULTS

Prior to the 2006 aerial 1080 operation, rats were tracking at 70% (i.e. 70% of tunnels had rat tracks in them). After the operation rats, were knocked down to just 0.9%. Mustelids were tracking at 18.7% prior to the 1080 operation and after the operation no mustelids were detected in any of the tunnels (0% tracking rate) (Figure 6).

This year, for the first time, rat tracking rate has significantly decreased from about 80% to about 60% since September 2010. The stoat tracking rate has steadily increased over the years since the 2006 1080 drop and reached its highest peak in January 2011 with 27%. It is possible that a threshold in stoat abundance has been reached which is having a control effect on rat population. The mouse tracking rate has been low since rats returned to pre 1080 tracking rate levels (Figure 6).

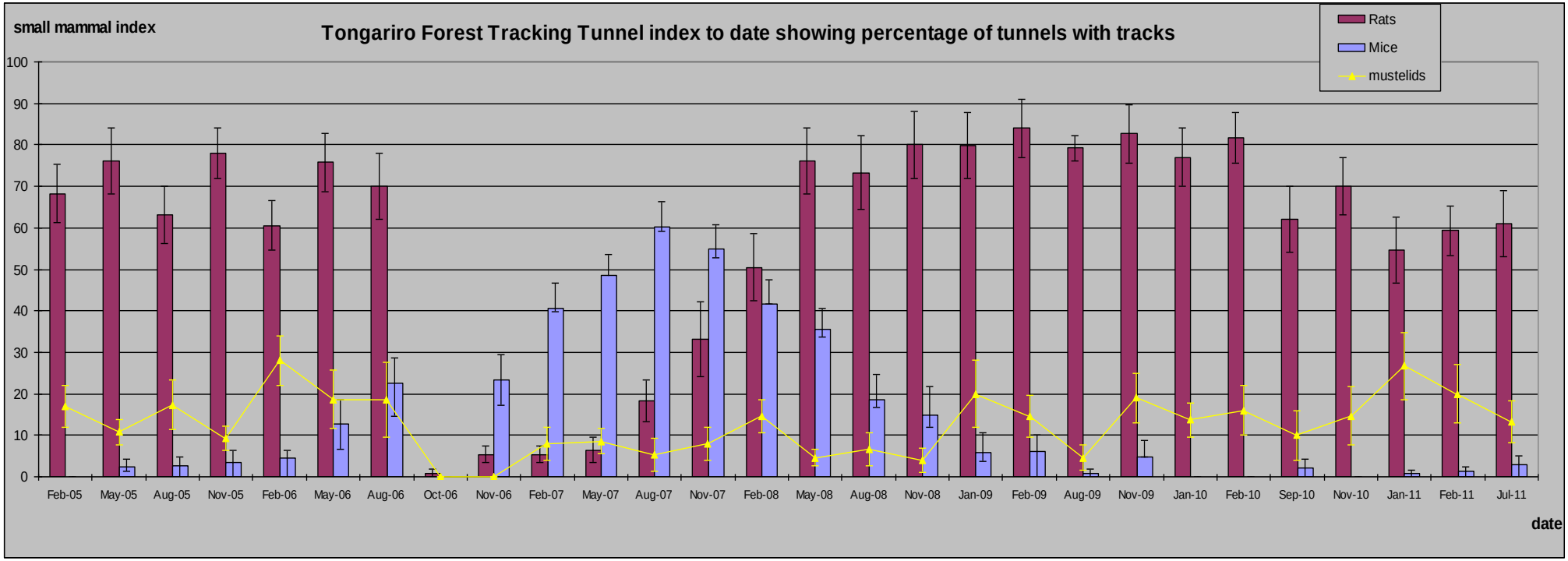

FIGURE 6: PERCENTAGE OF TUNNELS WITH TRACKS, TONGARIRO FOREST. FEBRUARY 2005 – JULY 2011

FANTAIL MONITORING AND FIVE MINUTE BIRD COUNTS

Fantail nesting success is part of the outcome monitoring of pest management within Tongariro Forest Kiwi Sanctuary (TFKS). Rats take passerine eggs and nestlings, and are also large enough to kill adults of forest birds (King 1990). Fantail nesting success has been correlated with predator indices from tracking tunnels in TFKS. Five minute bird counts were also carried out as a measure of bird abundance within TFKS.

It was hypothesised that the aerial 1080 operation in September 2006 would benefit fantails and other forest birds preyed upon by rats. Fantail nesting success increased from 16% in the 2005/06 season to 42% in the 2006/07 season, and 49% in the 2007/08 season. But decreased again to 24% in the 2008/09 season and stayed low the following two seasons (Table 9). The 2010/11 nest success rate was 24%.

TABLE 9: TFKS FANTAIL NESTING SUCCESS RATES PER SEASON

Season	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	**2010-2011**
Success rates	46%	12%	13%	16%	42%	48%	24%	16%	**24%**

This season (2010/11), a total of 24 nests were found in TFKS, and no nests were found in the New Treatment (NT) area of OPC and Pukepoto Forest, which was treated with aerial 1080 in September 2007. The first nest of the season was found on 4 October 2010 and the last on 13 January 2011.

TFKS consisted of two survey areas in the forest; the eastern and western sides of the 42 Traverse. Fantails were difficult to locate on the eastern side, as they were less vocal and possibly had larger territories than their western counterparts. As a result more nests in TFKS were found in the west than the east (Table 10). This outcome is consistent with last season (2009-10) where relatively fewer nests were found east.

TABLE 10: NEST OUTCOMES FOR TONGARIRO FOREST KIWI SANCTUARY

	West	East
Abandoned after laying	0	2
Abandoned before laying	0	1
Failed	14	2
Successful	4	1
Total	**18**	**6**

FAILURES

As reported in previous years, nesting failures occurred more frequently at the egg stage than the nestling stage. The causes of failure were, at times, difficult to determine due to the limited evidence of predation left behind. Causes of nest failure are summarised in Table 11.

TABLE 11: CAUSES OF NEST FAILURES IN 2010-11

Cause	Number of nests
Rat	4
Long-tailed Cuckoo (Video)	3
Unknown (clean take)	4
Unknown (unable to reach nest)	5
Total	**16**

Long tail cuckoo numbers appear to have increased during the last three seasons. It is possible the increase could be caused by increased protection of cuckoo in their wintering areas (the Pacific islands) as suggested in the (2008-09) Fantail Nest Monitoring Report. Continued fantail nest monitoring, following the 1080 aerial operation in September 2011, should give a better indication of the significance of cuckoos as a nest predator.

Cuckoos are however not likely the main nest predator, as trends in fantail nesting success strongly correlate with pest control operations. The main nest predators are likely rats and other mammalian predators.

SUCCESSES

As expected, fantail nesting success was low for this season in TFKS. A low number of nests were observed successfully raising chicks past the nestling stage, to the time at which the fantail chicks fledge and leave the nest. Only five nests were successful, representing 21% of the total nests monitored in TFKS this season. Observations in the field suggested several unobserved nests were successful. Fantails were found at fledgling and juvenile stage throughout the season.

FIVE-MINUTE BIRD COUNTS

Five-minute bird count monitoring began in 2001/02. Methodology is as per Dawson & Bull (1975). There are 51 listening stations spread over the eastern and western sides of TFKS, these are divided into four loops with stations every 200m along them. In the past 100 counts were carried out in September and 200 in February. This season (as with last season), bird counts were only carried out in February. Bird counts fluctuate widely between years and the most abundant bird species in TFKS appears to be Tui, Bellbird, Whitehead, Grey Warbler, Silvereye and Tomtit (Appendix 5). As previously discussed, the beneficial effect of an aerial 1080 operation appears to last for two seasons. Surprisingly, this did not translate into a poor bird count in February 06 and good counts in February 07 and 08. This is particularly true for fantails, where the two years of good fantail nest success after the 1080 operation did not seem to translate into a good count in February, while the year prior to the 1080 operation, when rat density was at its highest, had the highest call rate per station (Appendix 5). This is possibly due to observer bias, or the bird counts are not sensitive enough to pick up small changes in the population.

TONGARIRO FOREST KIWI SANCTUARY 2006 AERIAL 1080 OPERATION RESULT AND OUTCOME MONITORTING

Figure 7 shows a benefit for two years, following the 2006 aerial 1080 operation, to kiwi and other native species including whio and fantails.

The kiwi chick survival and fantail nest success rates increased dramatically in the 2006/07 season, and stayed high the second season after 1080 (2007/08). In the third (2008/09), fourth (2009/10) and fifth seasons (2010/11), the rates dropped down to pre-1080 levels as mustelid and rat populations recovered.

The number of whio (blue duck) pairs successfully hatching ducklings increased following the 1080 operation, and then increased further as trapping began on Tongariro Forest Security Site rivers (2007/08). In the 2008/09 season, this success stayed reasonably high, with the continuation of the river trapping network. The productivity this year was very low (despite intensive trapping), due to flooding in October and December washing away nests and young ducklings.

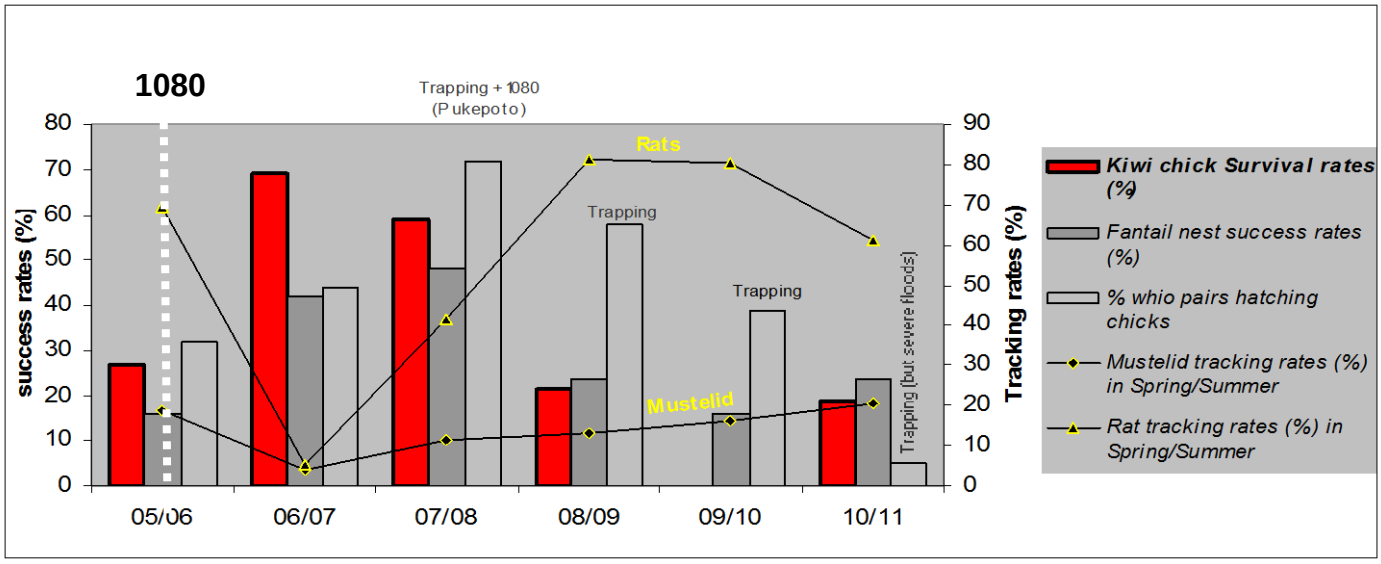

FIGURE 7: TRACKING RATES WITH KIWI CHICK SURVIVAL, FANTAIL NEST SUCCESS, AND PERCENTAGE OF WHIO PAIRS HATCHING CHICKS, BEFORE AND AFTER 1080.

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