Translocation of North Island saddleback (*Philesturnus rufusater*) to Bushy Park, Wanganui

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Talk Outline

- Saddleback ecology, distribution, threats
- Translocation
  - Research questions & experimental treatments
  - Source site
  - Release site
  - Translocation methods
    - Catching
    - Transportation
    - Quarantine & disease screening
- Post release survival and breeding
- Conclusions and Lessons learnt

Firstly I'd like to give you a brief outline of what I'm going to talk to you about today…..

North Island Saddleback

- Endemic forest passerine belonging to the Callaeidae family
- North and South Island saddleback are geographically distinct and recently been recognised as two separate species (Holdaway *et al*. 2001)
- Primarily insectivorous with a range of foraging techniques
- Form monogamous pairs
- One – four eggs and one-four clutches each season

North Island saddleback distribution

- Once widespread throughout North Island & offshore islands
- Virtually disappeared from mainland by 1890's, existing only on Hen Island
- Total population number estimated at 6630 in 2002 (Hooson & Jamieson 2003)
- Today saddlebacks exist on 13 off shore islands and two fenced mainland sanctuaries
  - Karori Wildlife Sanctuary, Wellington (2002)
  - Bushy Park, Wanganui (2006)

Hen island east coast of northland population of 400 individuals 1930's

Early translocations from hen island began in the 1960's and have successfully established saddlebacks on many offshore islands

Reasons for decline……..

Ship rat (*Rattus rattus*)

Spread of ship rat mainland 1860s

Some characteristics make them particularly susceptible to predation

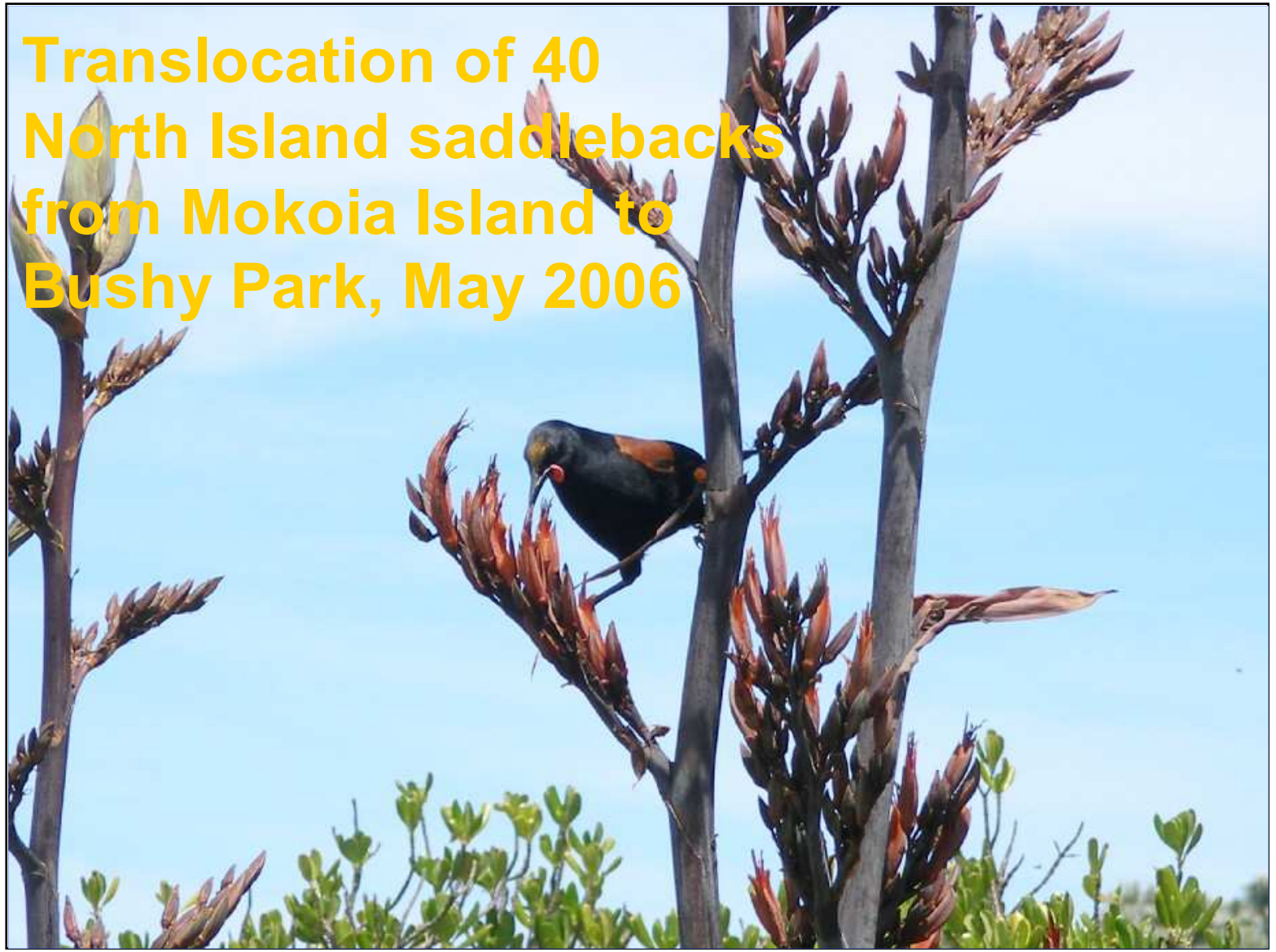
-poor flyers

-fearless, curious nature

-often roost and nest low to ground

Good Candidates for Transfer

- Limited dispersal
- High reproduction rates
- Ability to hold small territories (0.4 ha)
- Adaptable to broad range of habitats
- Noisy & inquisitive nature facilitates monitoring


Translocation of 40
North Island saddlebacks
from Mokoia Island to
Bushy Park, May 2006

- Massey University Animal Ethics Committee approval for experimental treatments
- Consultation with Tangata Whenua at both source and release site
- Translocation proposal submitted to Bay of Plenty (BOP) Conservancy (source site) and Wanganui conservancy (release site)
- Permit to capture, handle and transfer saddlebacks was sought from BOP Conservancy
- Banding permit

To carry out this translocation we required permission from a number of different groups

Disease considerations during translocation

- Increased emphasis on screening animals for disease during translocations
  - Quarantine period 14 days
  - Disease screening
    - Endoparasites – Faecal sample
    - Bacteria – Cloacal swab
    - Haemoparasites – Blood sample
      - » PCR (Polymerase Chain Reaction)
      - » Blood smear
  - Prophylactic treatment
    - Coccidia (Baycox - Toltrazuril 50g/L)
    - Aspergillosis (Sporonox - Itraconazole 10 mg/L)
- The lack of knowledge on NZ wildlife diseases means that formulating an effective disease screening programme involves some 'guess work'

Confinement of wild animals during quarantine period can cause stress from inadequate nutrition, poor hygiene, un natural social groupings, over crowding.

These elevated stress levels pre-dispose birds to diseases such as coccidia and Aspergillosis

PCR magnifies strands of DNA from the parasite

Research questions:

- What effect does quarantine have on the post release survival of birds?
- What effect does prophylactic treatment for stress induced diseases have on the post release survival of birds?
- What effect does a combined regime of quarantine & prophylactic treatment have on the post release survival of birds?

Although the number of translocations are increasing, the factors influencing the outcomes are not well understood. And approaching translocations as experiments is a way to gain this knowledge.

Set translocation up as an experiment to answer a set of questions based on the effects of the disease screening programmes now being enforced during translocations.

Table 1. Experimental Treatments

Group 1	Group 2
N = 10 Sporonox & Baycox treatments Quarantine 14 days (Bushy Park)	N = 10 No treatment Quarantine 14 days (Bushy Park)
Group 3	**Group 4**
N = 10 Sporonox & Baycox treatments Immediate release	N = 10 No treatment Immediate release

All 40 birds underwent screening for disease – blood/cloacal/faecal sample

In order to answer these questions we intended to split the 40 birds into 4 treatment groups….with each group having a sample size of 10. Then compare the post release survival of each group

Baycox treatment was given orally on capture

And Sporonox treatment was added to water and jam water dishes in aviaries

Two translocations

- Two Translocations of 20 birds each
  - Translocation 1: Groups 1 and 2 (quarantine)
  - Translocation 2: Groups 3 and 4 (immediate release)
- Second translocation 2 weeks after the first
- All birds released at Bushy Park together to prevent immediate release birds gaining advantage by being released first

We decided that to do this experiment we needed to carry out 2 translocations of 20 birds each…

Table 2. List of pathogens screened for in saddlebacks transferred to Bushy Park. CBC = Complete Blood Count, WBC = White Blood Count, PCR = Polymerase Chain Reaction. * indicates pathogens nominated as requiring a change in the experimental treatments and release protocol.

Disease	Screening method	Action if positive
Haemoparasites*	Blood smear CBC PCR	Reject as source depending organisms (e.g. avian malaria - reject
Endoparasites	Pooled faecal samples	None
Avian pox	Physical exam WBC	Reject individual if overt clinical signs
Aspergillosis	Physical exam WBC	Reject individual if overt clinical signs
Yersinia spp.*	Cloacal swab	Reject as source or treat depending on species
Salmonella spp.*	Cloacal swab	Reject as source or treat depending on species

Represents a typical disease screening programme

Source Site – Mokoia Island

- 135 hectare island in Lake Rotorua
- All mammalian pests eradicated
- Highly modified but natural regeneration occurring for last 50 years

- Saddleback introduced in 1992 from Tiri Tiri Matangi Island
- NI Robin and Stitchbird also introduced
- Kiwi crèche


Hotel Mokoia


Release Site - Bushy Park
98 hectare property located 24km north west of Wanganui
Includes 90 hectares of remnant lowland coastal forest
Administered by the Bushy Park Trust, formed in 1994

Bushy Park – mainland island sanctuary

- 4.8km Xcluder™ pest proof fence completed 2005
- Pest eradication
- NI robins introduced in 2001, 2004
- Kiwi Crèche
- LEOTEC programme

1 pellet every 3 m

Catching

- Several catching teams of three people
- 9 m and 12 m mistnets (38 mm mesh)
- Birds lured into mistnets using taped saddleback calls and soft toy saddlebacks
- Birds transported to holding aviaries in small cloth bags

Holding aviaries

- Birds processed – weighed, measured, banded, cloacal and blood samples taken
- Offered drink and released into holding aviaries

Measurements taken were head-bill, tarsus, wattle dimensions and cloacae dimensions

Took a feather sample from each bird for DNA sexing

A 0.1-0.2 ml blood sample were taken from the brachial vein in the wing

Captive Diet

- Meal worms, wax moth larvae, maggots
- Coprosma berries
- Organic fruit – oranges, apples
- Cheese
- Fruit loaf
- Jam water
- Hard boiled egg yolk mashed with insectivore Wombaroo mix
- Pre soaked sultanas
- Honey eater Wombaroo mixed with water
- Fresh drinking water
- Water for bathing

Transportation of saddleback

- Cardboard boxes with large ventilation windows
- Rubber grip mat on floor
- Food and water supplied in boxes
- Two birds per box

5 hour trip

3.5 m wide 9m long 5m high

Roost boxes plus extra vegetation for shelter

Several feeding stations

Rotton logs and leaf litter placed in aviary everyday

Wind break lined the inside walls with wire mesh behind

Important to have some knowledge of a species requirements to reduce stress – such as saddlebacks roost in cavities so we provided roost boxes and clumps of dense vegetation

Results of Disease Screening……

- Cloacal swabs showed no isolates of Yersinia, Salmonella or Campylobacter
- Faecal samples showed various levels of coccidia and tape worm
- Blood smears showed no haemoparasites

- PCR test showed…..3 weak positive and 1 positive result for *Plasmodium* spp. in first translocation group (cue PANIC)

Result was unexpected and took everyone by surprise..

Plasmodium spp. – What did we know?

- We knew it wasn't the dreaded *Plasmodium relictum*
- Level of infection probably low
  - No blood parasites found in blood smears, only PCR
  - Infected birds showed no clinical signs of disease
    - Chronic infection rather than acute?
- Unlikely to be transferred between birds by mosquitoes during quarantine due to very cold temperatures

Plasmodium relictum is the avain malaria thought to have caused the extinction of 32% endemic Hawaian bird species and has also caused mortalities in some NZ bird species such as the yellow eyed penguin

Plasmodium spp. – What didn't we know?!

- What strain of *Plasmodium spp.* or whether it was host specific
- Whether it was present at Bushy Park
- What effect it would have on existing Bushy Park fauna if released
- How to proceed with translocation
  - No guidelines were in place for this situation, ALL birds had to be quarantined while decisions were made

Plasmodium spp. - What we found out!

- Further investigation by Castro *et al*. suggests that the *Plasmodium* spp on Mokoia Island may be a native strain
  - If so, it may have a history of co-evolution with North Island saddlebacks (should it be transferred with the birds?)
- The infected birds all became ‘negative’ over time and one went on to successfully breed soon after release at Bushy Park
  - This further supports the idea that it is a chronic infection rather than acute

Detection of *Plasmodium* spp. resulted in:

- Four ‘positive’ birds sent to Auckland Zoo
- Unable to immediately release birds from Groups 3 & 4 even though all 20 birds were negative for the Plasmodium
- These birds held together in temporary aviary at Bushy Park built at short notice
- Two birds from the second translocation died during quarantine – inadequate facilities

These changes caused confounding factors in experiment:

- No immediate release birds – no control
- Treatment groups had unequal sample sizes
- Aviaries holding Groups 3 and 4 were different from aviaries holding Groups 1 & 2
  - Smaller
  - Fewer roost boxes
- Prophylactic treatment regimes were changed

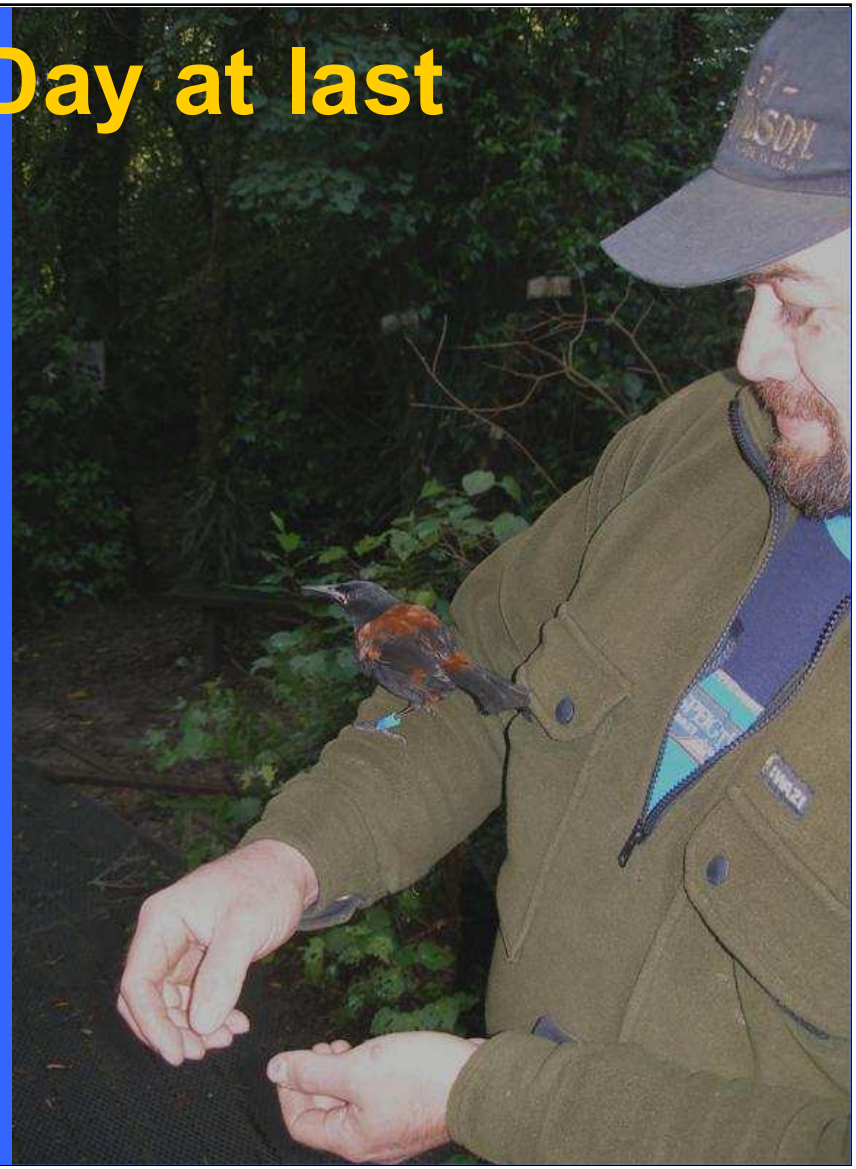
Table 3. Changes to Experimental Treatments. * indicates combined groups

Group 1		Group 2	
Original	*Actual*	*Original*	*Actual*
N = 10 Sporonox & Baycox treatments Quarantine 14 days	N = 8 Sporonox & Baycox treatments Quarantine 33 days	N = 10 No treatment Quarantine 14 days	N = 8 No treatment Quarantine 33 days
Group 3*		**Group 4***	
Original	*Actual*	*Original*	*Actual*
N = 10 Sporonox & Baycox treatments Immediate release	N = 8 Sporonox & Baycox treatments Quarantine 18 days	N = 10 No treatment Immediate release	N = 10 Sporonox treatment Quarantine 18 days

This is a table showing the original experimental treatments and the actual treatments

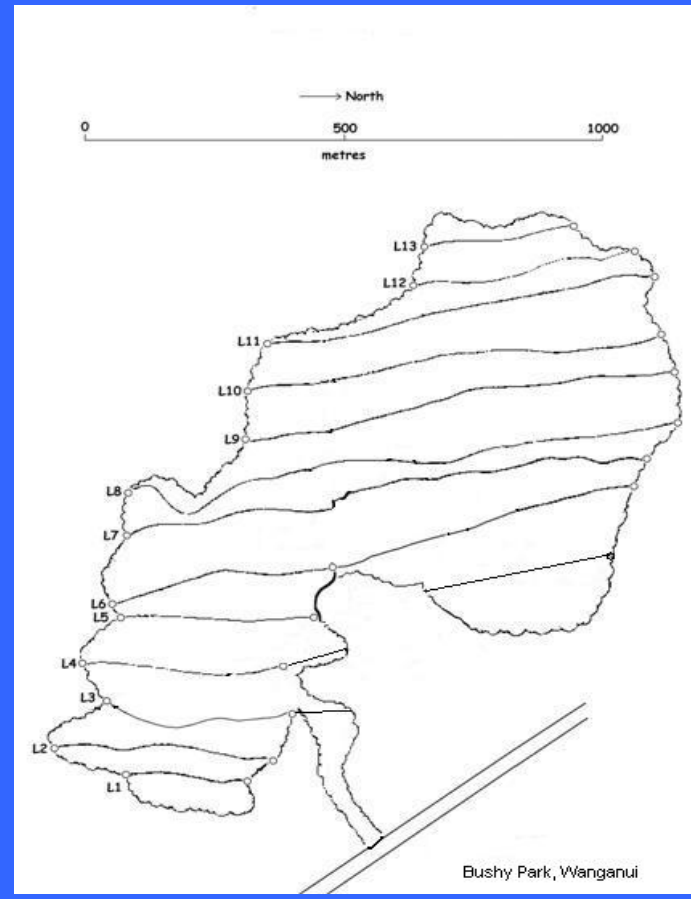
Release Day at last

- Delay in release caused by
  - uncertainty about potential threat of *Plasmodium* spp
  - extremely bad weather
- 34 saddlebacks (12 females, 22 males) released June 2006
- Remaining 4 birds cleared of infection & transferred back to Bushy Park from Auckland Zoo. Released in Dec 2006. All alive and well



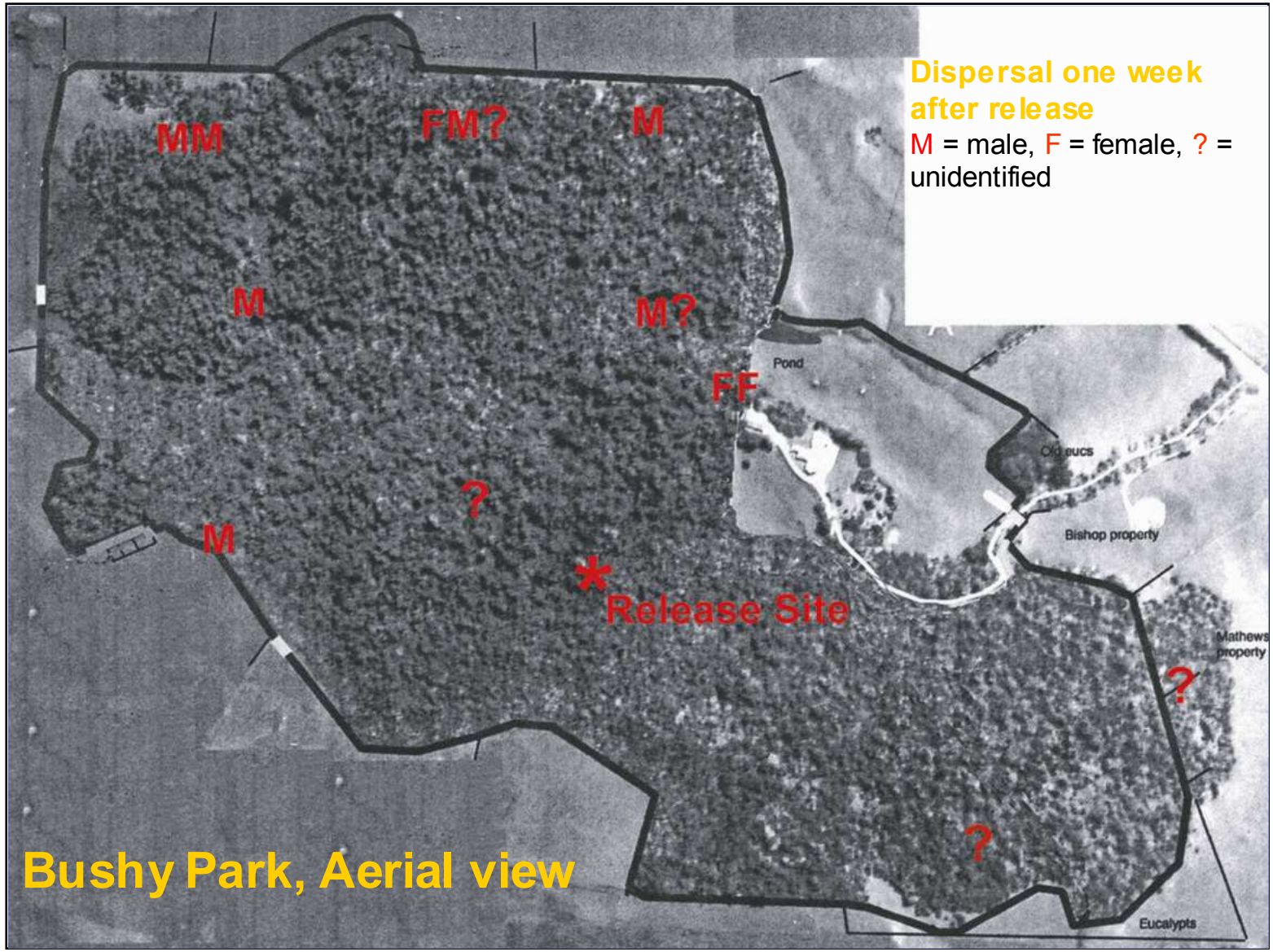
Post release monitoring

- Searches were initially conducted fortnightly then reduced to monthly
- Saddlebacks lured in with taped calls and making loud noises
- Recorded location & identity of bird



Monitoring survival after a translocation is important to determine the reasons for success or failure of a translocation…

I conducted quite intensive searches for the saddlebacks after their release



Wide dispersal after release – common feature of post release behaviour

Post release survival

- Survival data analysed in programme MARK (White & Burnham 1999)

Table 4. Estimated monthly survival probabilities with 95% confidence intervals for each treatment group under the survival model $\{\Phi_{g * m}\}$

	Survival probability during first month after release	Subsequent monthly survival probability
Group 1	**0.88** (0.44, 0.98)	**0.98** (0.89, 1.00)
Group 2	**0.65** (0.29, 0.89)	**0.97** (0.82, 0.99)
Group 3 (Combined groups 3 & 4)	**0.86** (0.57, 0.97)	**0.92** (0.86, 0.96)

MARK is a programme that analyses the encounter histories for each bird during a series of surveys and gives a survival probability and re-sighting probability for the interval between each survey

The model which produced these survival estimates assessed the effect of an interaction between each treatment group and first month after release on survival. And it had a good fit to my survey data.

The results suggest that survival was lowest for Group 2 immediately after release. This is the group that received no prophylactic treatment which indicates that this treatment may improve survival. However, the results need to be interpreted with caution as sample sizes in each group were small and there were confounding factors between experimental treatments

First breeding season after release

- Nine adult pairs formed
- Eight pairs bred between early Sep 06 and late March 07
- Pairs had 1-3 eggs/clutch & 1-3 clutches
- Nest sites included nest boxes, fallen vegetation, epiphytes, cavities
- Average of 2.9 fledglings/pair
- Minimum of 22 chicks fledged and survived > 10 days

3 Females lost their mates during breeding season

Lessons Learnt

- Clear guidelines for how to proceed must be in place should an unexpected pathogen be detected during translocation
  - Prevent delays, mortalities associated with captivity/stress and reduce extra costs
- Positive tests for particular pathogens may require extended quarantine periods during translocation
  - Greatly increases cost and expertise required during translocation e.g. Bushy Park, Boundary Stream 2004
  - Several permanent quarantine sites throughout NZ?
- Difficult for community groups to carry out translocations that require complex disease screening and quarantine

Although the experiment didn't go to plan, we did learn some valuable points

Bushy Park- Cost of extra food, building materials and transfer of birds to Auckland zoo during BP translocation estimated at $3000 and 2 birds died

Boundary Stream example – saddlebacks from Cuvier, some falsely diagnosed with Salmonella. This added approx $9000 to cost of translocation, extended quarantine period and deaths of 5 birds from injury or stress related disease during transfer or immediately after release

Conclusions

- Prophylactic treatment during translocation may increase post-release survival, especially when birds are quarantined
- Increasing the long term health monitoring of 'source' populations regularly harvested for transfer will help us gain knowledge on NZ wildlife diseases and reduce amount of disease screening required during translocation
- Investigation into disease at release sites should be equally important as monitoring disease of translocated animals e.g. Bushy Park
- Experimental testing of the effects of a typical disease screening programme still needs to be carried out

And some of the conclusions that we came to as a result of the translocation were….

Release sites – Bushy Park – plan to introduce a number of endangered bird species into the park in the future – what diseases are already at BP that may affect the newly translocated birds?

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