Translocation of wild-caught and captive-reared blue duck *Hymenolaimus malacorhynchos*

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Published by
Department of Conservation
Head Office, PO Box 10-420
Wellington, New Zealand

This report was commissioned by the Biodiversity Recovery Unit.

ISSN 1171-9834

Reference to material in this report should be cited thus:

Holmes, T.; Caskey, D., 2001.
Translocation of wild-caught and captive-reared blue duck *Hymenolaimus malacorhynchos.*
Conservation Advisory Science Notes No. 331, Department of Conservation, Wellington.

Keywords: blue duck, *Hymenolaimus malacorhynchos*, endangered species, translocation, Egmont National Park.

Abstract

Further to releases of blue ducks into Egmont National Park in 1987, 1989 and 1991, a continuation of efforts to establish a population in the Park has begun. Eleven captive-raised and four wild-caught birds were translocated to the park in December 1999 and January 2000. All birds were fitted with harness transmitters, and survival and dispersal was monitored. In addition, data was collected on behaviours and information on diet from faecal analyses. Four months after the release, 33% of the birds were still alive and data from the experiment were sufficient for a number of recommendations to be made to refine future translocations.

1. Introduction

There are references to sightings of blue ducks, *Hymenolaimus malacorhynchos,* within Egmont National Park, including birds observed on the Stony River by the Egmont Subdivision Geological Survey (Gibson & Morgan 1927), a pair observed on the Waiwhakaiho River over a three year period up to 1948 by a park ranger (Cotton & Molloy 1986), and some unconfirmed sightings up to 1987 (Hutchinson 1998). However, M.Williams (pers. comm.) suggests that while there have possibly been a few survivors there is no real evidence of a significant population. Williams proffers the idea that a significant population of blue ducks has not been on the mountain since the last major eruption of 1655AD. In addition, there are no populations of blue ducks near Egmont National Park and thus no likelihood of birds being recruited naturally from elsewhere. A possible explanation for the loss of blue duck from the Park over the past 50-80 years might be the loss of riparian vegetation, an important component of blue duck habitat, through introduced goats and possums. Regeneration of riparian vegetation has now been achieved, through the intensive management of goats and possums in the park. Introduced predators, including rats, stoats, ferrets and feral cats, are likely to have had an impact on blue ducks by preying on nesting females, ducklings and eggs. Against this suggestion, there are self-sustaining populations of blue ducks in other parts of the country that have to contend with these predators and there is no indication that they occur in higher densities in the Park than elsewhere.

Prior to the release of blue ducks documented in this report, 12 blue ducks were liberated in Egmont National Park on three separate occasions. These were: in 1987, six captive-reared juveniles, comprising three males and three females; in 1989, one captive-reared male; and, in 1991, five wild adult birds, comprising two pairs and a single male, from the Manganui a to Ao River. Birds released in 1991 were used to test whether adult birds would remain after having been translocated a significant distance (140 km) from their original territories. The experiment showed that some adult birds returned to their original territories.

So far, the transfer of blue ducks into Egmont National Park has met with limited success. However, it is known that released blue ducks can survive in the Park, as a male bird from the original release in 1987 was last seen on 24 December 1999 and, prior to this, at least two other male birds were present in November 1998. Breeding has been recorded in the past but there are no females among the present known individuals. In addition, all birds in the assumed current population are old (one is 13 years of age) and, with an average life span for a territory-holding bird being 7-8 years, this population is aged. Nevertheless, a quarter of all birds are likely to live longer than ten years (Adams et al. 1997). Also in their favour, is the fact that blue duck are capable of breeding throughout their life span.

In December 1997 the Blue Duck Recovery Group (BDRG) met to review blue duck management and make recommendations for the future. From this meeting came a recommendation that releases of blue ducks should continue in Egmont National Park to supplement the ageing population and to continue the trial of methods for the establishment of new blue duck populations. Part of the BDRG recommendations was that, in 1998/99, a release of eight near-fledged wild juvenile blue ducks be conducted to determine survival and dispersal and also trial the effectiveness of mortality transmitters. A repeat release of birds was also recommended for the following year, 1999/2000 (Hutchinson 1998). The release of birds in 1998/99 was not undertaken because of a lack of available wild birds resulting from the poor breeding season. This was caused by excessive flooding of the Manganui a to Ao and Whakapapa Rivers (Holmes 1999). The BDRG supported the continuation of the project and recommended the transfer be undertaken in the 1999/2000 and 2000/2001 seasons.

2. Objectives

One of the objectives identified in the Blue Duck Recovery Plan is to re-establish at least one blue duck population. The achievement of this would fulfil a long-term goal of the plan of "increasing the number of blue duck populations, and increasing the overall number of blue ducks in the wild."

While both wild-caught and captive-reared birds have been used in past releases, there has been limited collection of data to determine the suitability of these two different groups.

In keeping with the objectives of the recovery plan, the specific objectives of the translocation experiment are:

- To establish a viable population of blue ducks in Egmont National Park.
- To refine techniques for translocating blue ducks using both wild-caught and captive-raised birds.

3. Methods

3.1 SOURCE POPULATION FOR WILD-CAUGHT BIRDS

It was decided that the wild-caught birds, ideally comprising two entire broods, would be obtained from the Manganui a to Ao and/or the Whakapapa Rivers. An even sex ratio or with a slight female bias was sought, but could not be predetermined. Several surveys of each of the rivers were undertaken to identify potential broods for capture. The initial surveys found good numbers of ducklings but numbers decreased over time. However, closer to the time of fledging, suitable broods were identified. A brood of four birds from the Whakapapa River and a brood of three from the Manganui a to Ao were identified for capture. These birds were at the recommended stage of development (M. Williams, pers. comm.), near fledged, Class IV (from shelduck age and growth information)/600-700 g juveniles. Unfortunately, immediately prior to the planned capture of the Manganui-a-te-Ao brood there were complications with local iwi representatives that resulted in the capture being aborted.

Faecal samples were taken from all the birds to test for parasites; none were found.

3.2 SOURCE POPULATION FOR CAPTIVE-REARED BIRDS

Captive blue ducks are held at 17 locations and include zoos/wildlife parks and private holders. Most holders have not been very successful at breeding birds, but there have been changes in management by some holders. This has resulted in more ducklings being produced in the 1999/2000 breeding season, the most successful season in the history of blue duck captive management. The Recovery Group recommended releasing as many females as possible, with the proviso that it did not compromise the captive-breeding programme. Peter Russell, the Blue Duck Captive Co-ordinator, identified 11 birds, six males and five females, for release, to come from the following institutions:
Palmerston North Council Aviaries
Staglands Wildlife Park
Hamilton Zoo

The rearing regime varied slightly between the institutions. Palmerston North took eggs from the adult birds after 32 days' incubation and put three eggs in an incubator and three eggs under a bantam for the remaining three days of incubation. All hatched ducklings were reared with the bantam for seven weeks, after which they were kept on their own in a sand/gravel-based enclosure with shrubs and a small pool. Staglands' management involved leaving the parents to incubate the eggs, and the ducklings were taken for hand-rearing three days after hatching. The hand-rearing was done in a brooder initially, followed by placing the birds in a small coop measuring 2.5 m x 1 m on grass, and culminated in keeping the ducklings in a larger aviary on grass

with shrubs. At Hamilton, the eggs were incubated by the parents and, three days after hatching, were moved to a brooder then an enclosure of 2.4 m x 2.4 m and finishing up in a sand-based aviary with shrubs and a pool measuring 3m x 12m.

All captive-reared birds were subjected to thorough pre-release examinations and a 30-day quarantine period, as described in the previously prepared blue duck release protocols (Boardman 1998). Prior to the quarantine, all birds were found to have parasites, namely round worms including *Capillaria* but subsequent treatment was effective.

3.3 RELEASE SITE

A site on the Manganui River, 3-5 km inside Egmont National Park, was chosen as the release site. The river was identified as being suitable because blue ducks had been observed using most of this river, during past monitoring. In addition, recent studies had revealed that suitable blue duck prey species were widespread, including members of the insect groups Ephemeroptera, Trichoptera and Diptera (Caskey 1998). The section of river from the Park boundary to State Highway 3 (7.5 km downstream) also provides excellent habitat, comprising steep banks and heavy riparian vegetation, which ensure water quality remains high. Invertebrate communities at the Taranaki Regional Council sampling site at State Highway 3 are still very diverse (Chris Fowles pers. comm.).

Waterways rising on Mt Taranaki are characterised by relatively steep gradients, making flood events short but sharp. Collier & Wakelin (1996) have shown that the response of blue ducks to large flood events, which appear to have caused considerable bed movement, was to increase the amount of time grazing at shallow depths from submerged surfaces of exposed boulders. They also observed that invertebrate densities were low following a flood event, but that recolonisation of stable boulder surfaces by larval Chironimidae was occurring. Thus, despite short-term reduction of the amount of food available, blue ducks are able to alter their feeding patterns to take advantage of other in-stream food sources.

3.4 TRANSFERS

Wild-caught birds

On 20 December 1999 the four ducks (two males and two females) were captured on the Whakapapa River. They were given brief health examinations and placed individually in cardboard boxes designed for transporting pets. They were then flown by fixed-wing plane directly to Stratford Aerodrome where iwi representatives from Ngati Ruanui welcomed the birds to Taranaki with a karanga. The birds were then transferred by car to the Department of Conservation (DOC) Stratford Area Office, where each bird was individually blessed by a leading kaumatua. Each bird was weighed, fitted with metal numbered leg bands and unique colour combination leg bands for remote identification. Harnesses with transmitters were then fitted to the birds.

The birds were flown by helicopter to the release site where the blessing continued and the birds were released with another karanga at about 17:00. The birds were monitored from a distance and were observed moving about 100 m downstream, where they all settled on rocks, preened and dozed. The observer left the birds a short time before dusk.

Captive-bred birds

The captive-bred birds were transported by road from the three captive facilities on the morning of 26 January 2000 to the DOC Stratford Area Office. Once all the birds had arrived they were taken by helicopter to the release site. After the birds had been blessed by a Ngati Ruanui kaumatua before midday, the birds were released.

3.5 MONITORING

The aims of the monitoring were to build on the current limited knowledge of translocating blue ducks and included collecting data on the following:

survival of released birds;

dispersal of released birds from the release site and their subsequent movements;

impacts of transmitter harnesses;

behaviours from casual observations;

diet from faecal analyses.

The monitoring regime for the released birds was daily for the first week, then weekly for the first two months, followed by monthly for four months. Having birds fitted with transmitters enables individuals to be tracked to exact locations, but the range of the receiver is very limited, particularly in mountainous terrain. The tracking was from fixed-wing plane, which was costly but enabled much larger areas to be covered than by walking along rivers. The data allowed comparisons to be made between wild-caught and captive-raised birds.

Observations on birds' behaviours, data on impacts of transmitter harnesses and collection of faecal samples of known birds were undertaken on an opportunistic basis.

Transmitters

A decision was made to fit all birds with mortality transmitters on harnesses as described in Cunningham (1995) and their application was supported by the successful use of the same type of transmitter on juvenile blue ducks being monitored in Hawkes Bay (J.Adams & P .Abbott pers. comm.). In the Hawkes Bay study, the lightest bird fitted with a transmitter was 565 g, while the light-

est bird in the Egmont National Park release was 560 g. Transmitters emit 40 'blips' per minute on living birds. If the bird has not moved for seven hours, which happens only if a bird is dead, the frequency of 'blips' reduces to twenty per minute.

The captive birds' transmitter harnesses were a slight modification of the successful Cunningham design of Adams and Abbott that utilised a 45 mm length heat-shrink tube that was shrunk until it was quite tight and had limited movement. The harnesses of the wild-caught birds that were fitted by Cunningham had shorter pieces of heat-shrink tube that was shrunk only a little, resulting in the cord moving more freely through it than the Adams and Abbott harnesses.

Wild-caught birds were fitted with transmitters on the day of capture and release, and the captive-bred birds were fitted with transmitter harnesses a few weeks prior to release. For the captive birds, this provided the opportunity of monitoring the birds' behaviour and identifying other signs of impact from the harnesses such as weight loss and feather wear prior to release. There appeared to be no adverse effects to the birds from wearing the transmitter.

3.5 MORTALITIES

Any birds found dead were sent, as quickly as possible, to the Institute of Veterinary, Animal and Biomedical Sciences, Massey University, where the bodies were autopsied.

4. Results

4.1 POST-RELEASE SURVIVAL

Four months after the last birds were released on 20 January 2000 there were five birds remaining, one wild-caught bird and four captive-raised birds (Table 1).

Of those that died, three birds appeared to have starved, a conclusion that was supported by the findings from the autopsies. All three birds were in poor condition with no fat reserves and no food found in the crop, proventriculus or gizzard.

Five birds most probably succumbed to predation by stoats/ferrets based on the remains of the carcass.

The body of another bird appeared to have been eaten by a falcon or harrier, but it may have been killed by a stoat/ferret and scavenged by a raptor.

One bird was run over by a motor vehicle 3-4 km outside Egmont National Park near the Kapuni River.

Of the ten birds that died: 20% of the total birds released died of starvation (27% of the captive birds); 33% of the total birds released were preyed on by stoat/ferret (45% of the captive-raised birds)

Once transmitters were removed from all the birds, monitoring became much more difficult and often during monitoring trips birds were not encountered. Fresh faecal evidence was often the only sign that birds were still present on the rivers.

Assuming the remaining five birds (33% of the total number released) are still alive, they constitute 25% of the wild-caught birds and 36% of the captive-raised birds.

4.2 POST-RELEASE MOVEMENTS

Wild-caught birds

Three of these birds moved significant distances within the Park, flying readily between catchments. From the monitoring work on wild juvenile blue ducks undertaken in Hawkes Bay, their movements appear to be normal for young birds. It is possible that the young birds were exploring the area to identify a suitable or available territory in which to settle.

One bird was found dead four days after the release in the catchment in which it was released.

Captive-raised birds

Interestingly, all these birds remained in the same catchment in which they were released, but birds moved up and down the river significant distances. The greatest movement of any one bird was 10-11 km. Two birds moved down river and outside the Park, where they appeared to be established as a pair. Only one bird moved out of the main river and settled in a small tributary.

Subsequent to transmitters being removed it was necessary to invest considerably more effort to monitor birds.

4.3 POST RELEASE BEHAVIOUR

Wild-caught birds

These birds appeared to behave normally. They were observed foraging, preening, sleeping, and flying, and when birds noticed observers they displayed typical flight responses.

Captive-raised birds

After release, most of the Palmerston North birds remained on the small gravel beach close to the release site and it was quite evident that they were unstable on their feet as they traversed the unfamiliar and uneven terrain of rocks. They also appeared to have poor swimming skills and had problems negotiating fast-flowing water. In the first two weeks a number of birds were often found away from the river, clearly being more comfortable foraging in the undergrowth. Some dabbling was observed in a small backwater.

There are no quantifiable data on behaviours but initially all of the Hamilton birds appeared to be more confident in their new environment, displaying a more balanced array of behaviours.

One Palmerston North bird had deformed legs and was clearly at a distinct disadvantage to the other birds when walking or swimming and hence likely to have found foraging more problematic.

Two of the Hamilton Zoo birds and one of the Palmerston North birds developed grazes, some quite severe, on the outer sides of their feet and it is assumed they were caused by the birds not being hardened to life in the wild.

One individual spent considerable time preening and twitching his wings much like moulting birds and this might have been caused by new feather growth.

A number of birds seemed to develop increasingly sensitive flight responses to people, which may have been the result of being caught to have transmitter harnesses removed. It could also be attributed to experiences providing them with opportunities to refine behaviours.

4.4 TRANSMITTERS

The transmitters have enabled considerable information to be collected on mortalities of birds that would otherwise have been impossible to collect. However, the loss of weight among captive-raised birds led to harnesses becoming loose. As soon as this problem was identified, all birds were caught to check their harnesses, and all but one of the captive-reared birds had their harnesses removed to avoid complications.

There appeared to be no difference between the two subtly different harness designs.

4.5 DIET

Most of the captive-raised birds lost weight initially at a time when weight gain would be expected in young, growing birds. Subsequently supplementary feeds of pellets, as fed to the birds in captivity, were offered to individuals on up to four occasions each. Nine of the 11 captive-reared ducks were offered pellets, the two exceptions being the two Staglands birds. These birds

were not fed because the female had died prior to any feeding being done (30 January) and the male was seen in the bush, i.e. away from the river, on 31 January. He also ran away from the provider of food and it was felt that he would not find food if it was left for him plus it would also have attracted vermin. No birds ate pellets on every occasion they were offered and three birds, two from Hamilton and one from Palmerston North, did not eat any.

Birds were handled briefly when transmitter harnesses were checked and an assessment was made on their physical condition. A number of captive-raised birds were seen to have brittle, frayed feathers. This damage is unlikely to have been caused by the transmitter harnesses because it occurred on feathers away from the harness. It might have been the result of malnutrition caused by birds living on a sub-optimal diet during the initial weeks of life in the wild.

From an analysis of faecal samples collected from captive-reared and wild-caught birds, the key findings of Briggs & Henderson (2000) were:

Captive-reared birds showed greater variety of diet components than wild-caught birds. This may be the result of captive-reared birds trying various possible food sources when their normal pellet food was unavailable.

Several captive-reared birds showed an increase in the proportion of insects eaten over time. Through trial and error these birds may have become more efficient at feeding.

Overall, no significant difference in diet was found between captive-reared and wild-caught birds.

Confounding factors such as the small number of samples for wild-caught birds and excess sand from the collection procedure may have affected results.

There was no significant difference in the average amount of insect material in these samples compared to samples from resident birds on other North Island rivers. However, it appears that some birds were having difficulty foraging for insects immediately after release.

5. Discussion

Despite the losses of birds, the translocation has been very productive in terms of achieving its objectives.

There was a distinct difference in post-release movements of the wild-caught and captive-reared birds. Three of the four wild-caught birds moved between different river catchments while all the captive-raised birds remained in the river catchment in which they were released. If significant numbers of captive-reared birds survive and go on to breed, then being able to 'fill up' catch-

ments with birds might be advantageous from a management point of view. It is possible, however, that the wild-caught birds, by spending time moving between catchments, will identify optimum territories that will lead to increased survival of those individuals and increased productivity.

Four days after the release of the captive-reared birds there was heavy flooding in the upper Manganui River, resulting in the flow rate being 63 times the median rate, and this would have had significant impact on the riverbed. The scouring of the river bed is likely to have temporarily reduced available prey items for the blue ducks. Future release sites for captive birds could target catchments with a lower likelihood of floods. One site with this potential is the Little Maketawa Stream, and an invertebrate sample collected on 28 August 2000 showed an abundant and very diverse range of species, including many taxa that are preferred by blue duck.

Because the wild juveniles dispersed within weeks of being transferred it is not necessary to target a specific release site.

Three captive-raised birds died as a result of starvation, and we suggest that this was because the birds lacked the foraging/feeding skills of wild birds. In captivity, these birds had been fed on artificial pellets that were developed for waterfowl and catered for the nutritional requirements of ducks. There were no opportunities for these ducks to forage for larvae of caddis fly, mayfly and stone fly that make up the bulk of the diet of wild blue ducks. Their only opportunities to forage for insects were the occasional invertebrates entering their enclosure. Some individuals raised in captivity, however, were able to adapt and rely on innate behaviours to forage for natural blue duck prey. All three broods of ducks that were released contained birds that appeared to have starved to death and two broods included birds that are still alive. It seems some birds raised in the same environment can cope and others cannot.

It is possible that harnesses had an impact on the birds, compounding the problem of birds not being able to forage fully, but it seems unlikely that would have prevented foraging completely; two of the birds had no food present in the crop, proventriculus or gizzard. One of these latter birds included the individual with congenitally deformed legs, and this disability is likely to have contributed to its demise. The third bird lost significant weight resulting in the transmitter harness becoming loose and the bird getting one of its legs through the harness. This could have restricted mobility, resulting in loss of foraging opportunities, although invertebrates were plentiful in the immediate area.

In January 1999, staff from East Coast/Hawkes Bay Conservancy fitted transmitters to six wild juvenile blue ducks to monitor their movements, and at the time of writing only one bird is known to be alive. Unfortunately, there is no information on the causes of death but it indicates low survival of young birds (P.Abbott, pers. comm.).

The high number of birds that were taken by stoats and/or ferrets is not necessarily a reflection on the inability of captive-raised or wild-caught birds to cope with these introduced predators. Some birds seem to rely on innate be-

haviours to avoid predators, albeit native predators, including New Zealand falcon on adults and young and Australasian harrier, black shag, black-backed gull and eel on young (Adams et al. 1997). Interestingly, some of the captive-raised birds developed their flight responses to people over time and some of the individuals alive now are very wary of people and take flight when approached to within 50-100 metres. A study on social and demographic characteristics of blue ducks on the Mangaui a to Ao revealed the survival of birds over the first 12 months of life as being 44% to end of year one (Williams 1991).

The study of juvenile blue ducks in Hawkes Bay showed high mortality of wild birds.

Stoats have a significant impact of survivorship of blue ducks and there may be benefits from undertaking pest control. Stoat control could be undertaken by way of a system of traps along particular rivers. This is likely to be more effective for birds that frequent a single river, as was seen with the captive-reared birds that remained in their release catchment. Stoats often use waterways as travelling routes, and intensive trapping at several locations along the river might take some of the predator pressure from the birds. Another possibility is to release the birds immediately after the forthcoming 1080 operation over Egmont National Park, relying on secondary poisoning of stoats from 1080. The 1080 operation could be followed by intensive stoat trapping on specific rivers at the boundary of the Park. In the long term, the current stoat research programme may turn up effective ways to manage this efficient predator.

The carcass of the blue duck that had signs of being eaten by a raptor could be attributed to a natural predator but it might also have been preyed on by a stoat and later scavenged by an Australasian harrier.

It is evident that some captive-raised birds were better prepared for life in the wild than others. Deaths occurred in all broods from the different captive institutions, but the fact that there are surviving birds from both Hamilton Zoo and Palmerston North aviaries shows that birds under their management regime can survive. Initially, all the Hamilton birds showed signs of better adaptation to their new environment. Two are still alive and a third bird that survived 29 days had put on good weight unlike the Palmerston North birds at that time. The two birds from Staglands both died. Their behaviour had been different from that of wild blue ducks, including leaving the river. They appeared intimidated by the water and neither lived for very long. If birds were screened for such behaviours prior to release it is likely that the survival of released birds would be greater. It is believed that survival of captive birds would be enhanced significantly by releasing fit birds only (e.g none with disabilities) and birds that have displayed appropriate behaviours, including negotiating rocks and fast-flowing water and foraging for aquatic invertebrates. This could be achieved by creating enclosures that are more similar to natural habitat of blue duck by incorporating flowing water, rocks and providing aquatic invertebrates. There are obviously financial and logistical constraints that will limit the extent to which an enclosure can be modified. Ultimately, however, there is a need to check that birds to be released have the appropriate behaviours. Observing birds placed in a temporary enclo-

sure that encompasses a section of a relatively fast-flowing stream with rocks and aquatic invertebrates might identify these behaviours. The birds could be observed for a specified period of time and behaviours recorded. While it might be impossible to quantify the preparedness of birds for release, it would be feasible to identify birds that possessed known behaviours that were essential for survival. Birds that seem to have died from starvation are assumed to have not foraged, or not foraged for long enough or in a successful manner. Therefore, by watching for specific behaviours in birds prior to release an informed decision can be made on the behavioural fitness of the bird. Birds could also be tested for their swimming skills, preferred habitats and anti-predator behaviours. The temporary enclosure could be constructed of netting and semi-circular supports over a section of a suitable stream.

Another tactic that might assist in increasing survival of birds is to release the captive-reared birds when they are a little older, when the birds have put on more weight and are not at a crucial stage in their development. If new feather growth were the reason that released blue ducks spent a considerable time in preening and wing-twitching, much like moulting birds, then releasing older birds would avoid this problem.

On the other hand, released older birds might attempt to return to their natal sites, particularly if they had spent more of their formative development there. A pair of adult, territorial blue ducks that were taken from the Manganui a to Ao River to Egmont National Park in 1991 flew back to their territory on the Manganui a to Ao River, a distance of 140 km. Most wild juvenile birds seem to home to their natal sites after some initial wandering (M. Williams, pers comm). None of the released birds in the 1999/2000 release attempted to return to their natal sites. However, it is possible that captive-born birds behave differently from wild-born birds.

It is impossible to determine the impact on birds of transmitter harnesses, but even if the harnesses were not directly causing problems for the birds it is a further complication that could exacerbate stress. Birds that lose significant weight at a time when an increase is expected might be particularly vulnerable and any added complication might be magnified. Releasing captive-raised birds that are six months old should address this issue. While the transmitters provide very useful data on birds' movements and cause of death, the potential risks are too great to merit putting transmitters on all birds.

It would also be worth experimenting with the heat-shrink tubing to determine if there is any difference between the length used and/or how tightly it is shrunk. If the heat-shrink tube is loose, the transmitter can move and allow birds to adjust its position.

The faecal samples from three of the captive-reared birds showed a progressive increase in the amount of insect matter over time. Observations of captive birds before release at the different institutions might enable a comparison to be made on the efficiency of feeding. Further investigation into diet differences between wild-caught and captive-reared birds would also be useful.

The recent release proved to be a unique and interesting experience for local Iwi and the release process was helped by discussions in the early stages of project development.

6. Recommendations

The 1999/2000 release of wild-caught and captive-reared blue ducks has provided very useful information for refining future releases. Following the performance measures for released birds identified in the minutes of the December 1997 Blue Duck Recovery Group Meeting it is recommended that a further release be undertaken. It states that a second release be undertaken, after which survival of birds is determined: if more than 50% of birds survive, a further release should occur, but if fewer than 50% survive a thorough evaluation of the translocation project is undertaken. Although the performance measures do not make mention of refinement of the release technique after the first attempt, it is clear that minor adjustments could be made that are likely to enhance the technique.

The proposed release should aim to replicate the numbers of the previous release, i.e. two broods of wild-caught birds from the Manganui a to Ao River and the Whakapapa River plus as many captive-raised birds as possible, without compromising the captive breeding programme.

Evidence suggests that survival could be enhanced by ensuring released birds are better prepared and/or have the skills to survive in natural blue duck habitat and to cater for this the following actions are recommended:

Ensure released birds are not physically deformed.

Ensure captive-raised birds are held in enclosures that simulate more closely the natural environment, by including flowing water, rocks and access to aquatic invertebrates.

Obtain a 'warrant of fitness' for all captive-bred birds. This would require the construction of a temporary enclosure that is mobile and can be erected on a suitable section of a stream that is relatively fast flowing and contains rocks and aquatic invertebrates.

The captive-reared birds should be released into the Maketawa catchment (mainly Little Maketawa) where flood events are less severe, good invertebrate communities occur and riparian vegetation extends well outside the National Park boundary. The 'big' Maketawa is also a good potential site. Both rivers join at the boundary, thus much habitat is available.

Release the captive-reared birds at an older age, possibly late March when birds are fully fledged and at a greater weight (closer to 800 g).

Transfer the wild juvenile blue ducks at the latest time possible, after they have parted company with their parents.

Release the wild juveniles in the mid Manganui River again.

Catch all captive birds fitted with transmitters after five days and assess harness tension.

Remove harnesses from all individuals with significant weight loss.

Fit all wild juveniles with transmitters.

As far as possible, monitor the birds by plane to remove pressure on the birds from surveyors on foot surveys.

Diet analysis should be refined to include:

faecal samples taken at regular intervals (possibly fortnightly);

post-release to monitor diet changes over time;

sampling of invertebrates at release and establishment sites to compare what is present in the streams with what is being eaten;

turbulence of streams compared with diet;

diet samples from wild birds in their own territory prior to translocation to look for changes in diet composition in a new environment.

7. Acknowledgements

We would like to thank the following for their assistance: Peter Abbott, John Adams, Caragh Briggs, Ian Henderson, Colin Ogle, Peter Russell, John Simister, Peter Smit, Murray Williams. We would like to express our appreciation to staff and volunteers at the Stratford Area Office who assisted with the release and monitoring. We are also grateful to representatives of Ngati Ruanui iwi for their asistance and support with the release.

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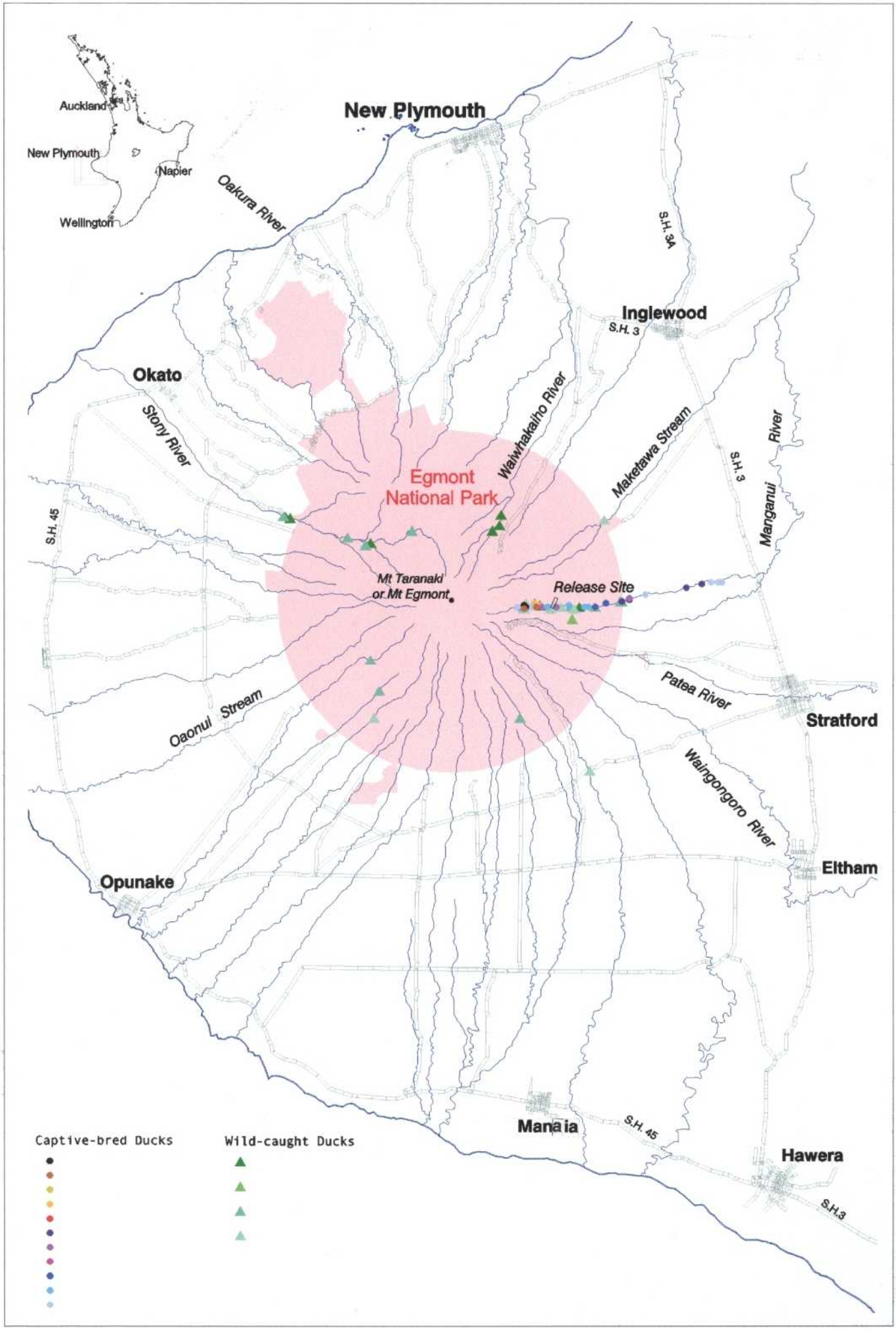
Table 1. Status of both wild-caught and captive-raised blue ducks released in Egmont National Park (see attached map) in December 1999/January 2000.

Bird ID	Origin of bird	Sex	Weight on release	Fate of bird
L 33102	Wild-caught, Whakapapa River	M	710 g	Bird has been moving significant distances between catchments. Bird caught on 16 Mar 00 weighed 800 g, put on 90 g since release. Subsequently bird remained in Waiwhakaiho River for 5 weeks or so but continues to move between catchments.
L 33103	Wild-caught, Whakapapa River	F	660 g	Dead - carcass found on 24 Dec 99 500 m from the Manganui River. Evidence suggests falcon or harrier preyed on the bird. Survived for 4 days.
L 33104	Wild-caught, Whakapapa River	M	715 g	Dead - bird had been moving around the mountain a great deal. Last time `live' transmitter heard was on 3 May 00 Found dead on 21 Jun 00. Survived for 184 days.
L33105	Wild-caught, Whakapapa River	F	655 g	Dead - last time `live' transmitter heard was on 5 Feb 00. Carcass found on 11 Feb 00 - Road kill 3-4 km outside park near the Kapuni River. Survived for ±50 days.
L30034	Captive-raised, Palmerston North	M	795 g	Dead - bird was given supplementary feed that it ate in good quantities on several occasions. Likely killed by stoat on 19 or 20 Feb 00. 'Dead' transmitter heard on 21 Feb 00. Survived for 25 days
L30035	Captive-raised, Palmerston North	F	695 g	4 May 00 - faecal evidence found in tributary of Manganui River, where the bird was last seen, indicating the bird is still alive.
L30036	Captive-raised, Palmerston North	F	590 g	Dead - 30 Jan 00 bird found dead, very skinny and weighed 400 g (on 7 Jan 00 weighed 540 g). Cause of death: starvation. Survived for 4 days.
L30037	Captive-raised, Palmerston North	F	575 g	3 May 00 - bird was seen with L30042, had clearly been in area for some time (faecal evidence). Birds were wary and took flight.
L30038	Captive-raised, Palmerston North	F	560 g	Dead - Live transmitter `blip' but found dead on 22 Feb 00. Cause of death: stoat/ferret. Survived for 27 days.
L30039	Captive-raised, Hamilton Zoo	M	795 g	Dead - bird was given supplementary feed that it ate in good quantities on several occasions Found dead on 17 Feb 00 (died a few days before). Cause of death: starvation, bird had lost considerable weight causing harness to slip and bird got a leg caught, possibly restricting movement. Survived for 20 days.
L30040	Captive-raised, Hamilton Zoo	M	725 g	Dead - captured bird on 22 Feb 00 it weighed 625 g and appeared healthy. Found dead on 24 Feb 00. Cause of death: stoat/ferret. Bird weighed 400 g (minus head and neck). Survived for 29 days.
L30041*	Captive-raised, Hamilton Zoo	M	760 g	17 May 00 - bird caught to have transmitter removed. Bird weighed 750 g
L30042	Captive-raised, Hamilton Zoo	M	710 g	3 May 00 - bird was seen with L30042, had clearly been in area for some time (faecal evidence). Birds were wary and took flight.
L30043	Captive-raised, Staglands	M		Dead - 30 Jan 00 bird found dead, very skinny and weighed 450 g (on 26 Dec 99 weighed 570 g). Cause of death: starvation. Survived for 4 days.
L30044	Captive-raised, Sta lands	F		Dead - 3 Feb 00. Cause of death: probably stoat. Survived for 7 days.


Auckland
New Plymouth
Napier
Wellington
New Plymouth
Oakura River
S.H. 3A
Inglewood
S.H. 3
Okato
Stony River
Waiwhakaiho River
Maketawa Stream
S.H. 3
Manganui River
S.H. 45
Egmont
National Park
Mt Taranaki
or Mt Egmont
Release Site
Patea River
Stratford
Oaonui Stream
Waingongoro River
Eltham
Opunake
Manaia
S.H. 45
Hawera
S.H.3
Captive-bred Ducks
Wild-caught Ducks