First transfer of Campbell Island teal (*Anas nesiotis*) to Campbell Island/Motu Ihupuku

Husbandry and transfer

Helen Gummer and Raelene Berry

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First transfer of Campbell Island teal (*Anas nesiotis*) to Campbell Island/Motu Ihupuku

Husbandry and transfer

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A B S T R A C T

Fifty endangered Campbell Island teal (*Anas nesiotis*) were released on subantarctic Campbell Island (official name Campbell Island/Motu Ihupuku) in September 2004; 28 had been captive-raised on the New Zealand mainland and 22 were sourced from the temporary wild population on Codfish Island (Whenuahou) (Whenua Hou Nature Reserve). The transferred cohort consisted of 30 males and 20 females; 32 teal were juveniles < 1 year old and 18 were adults 1–7 years old. Crate trials using captive birds were initiated to test transfer crate design and identify body weight change percentages during confinement. All captive teal were put through a 24-h crate conditioning programme to familiarise them with feeding in confinement. Tube-feeding techniques were developed to prevent dehydration and excessive weight loss during transfer. Both captive and wild-sourced teal were disease-screened in line with Department of Conservation translocation quarantine protocols, and to reduce the risk of transferring erysipelas to Campbell Island, all teal were tested for and vaccinated against *Erysipelothrix rhusiopathiae*. The birds were held in individual transfer crates for a total of 62 h, including 44 h at sea. Each bird was tube-fed a minimum of four times throughout this period. Captive-sourced teal lost a mean of 8% of pre-transfer body weight whereas wild-sourced teal lost a mean of 4% during the transfer and first captive night on Campbell Island (total 72 h). The teal spent 8–12 captive days on Campbell Island in individual holding pens. All wild-caught birds were soon self-feeding, but many of captive origin required encouragement. All 50 birds were released in Perseverance Harbour. Post-release monitoring was undertaken until team departure from Campbell Island on 10 October. All 50 teal were known to be alive when monitoring ceased.

Keywords: Campbell Island teal, *Anas nesiotis*, translocation, reintroduction, captivity, husbandry, subantarctic islands, Campbell Island/Motu Ihupuku, Codfish Island (Whenuahou)

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1. Introduction

The Campbell Island archipelago is New Zealand's southernmost island group in the subantarctic region of the Pacific Ocean (Fig. 1). Birds resembling the flightless Auckland Island teal (*Anas aucklandica*), as described by Fleming (1935) and Williams & Robertson (1996), were collected from Campbell Island (official name Campbell Island/Motu Ihupuku) in 1886 and 1944. However, it was the 1975 discovery of an individual on Dent Island—a 23-ha islet 3 km off Campbell Island's west coast—that identified the bird's refuge (Williams & Robertson 1996) and confirmed, by genetic analyses (Daugherty et al. 1999; Kennedy & Spencer 2000), that the Campbell Island teal (*Anas nesiotis*) was a unique taxon, endemic to the Campbell Island archipelago. The species' conservation status was listed as 'Nationally Critical', with the qualifiers CD (survival Conservation Dependent), HI (Human Induced loss of range) and OL (restricted to One Location) (Hitchmough (comp.) 2002).

By 1984, the conservation status of Campbell Island teal was considered sufficiently precarious that four birds were taken into captivity (Williams & Robertson 1996). A further three females and four males were collected in 1990 (Goudswaard 1991; Williams & Robertson 1996) and a captive breeding programme was managed under a recovery plan with an objective to use captive-raised birds to establish an additional wild population to safeguard the species (McClelland 1993). Captive breeding eventually commenced in 1994 (Preddey 1995).

To test the efficacy of releasing captive-raised birds into the wild, two cohorts, each of 12 birds, were placed on Codfish Island (official name Codfish Island (Whenuahou)) in 1999 and 2000, and their survival and breeding were monitored (Gummer & Williams 1999; McClelland 2002). Alongside this initiative, attempts were made to rid Campbell Island of its sole remaining alien mammal, the Norway rat (*Rattus norvegicus*), and rehabilitate the island (McClelland & Tyree 2002). Campbell Island was declared 'rat free' in mid-2003 and the rehabilitation of the island had advanced to the point that teal could be reintroduced to their former home (P. McClelland, Department of Conservation (DOC), pers. comm.). Guided by a reintroduction plan (Seddon & Maloney 2003), the first release (of 50 birds sourced both from captivity and Codfish Island) took place in September 2004. This paper outlines the key events in the preparation of teal for transfer and of the management and release of birds on Campbell Island in September 2004.

2. Methods and results

Birds were sourced from two captive breeding institutions on the New Zealand mainland—Pukaha Mount Bruce National Wildlife Centre (NWC), Masterton, and Peacock Springs Isaac Wildlife Trust near Christchurch—and from the wild population established on Codfish Island (Fig. 1). They included birds raised in the preceding breeding season and adult birds of varying ages up to 7 years (Table 1). See Appendix 1 for individual details.

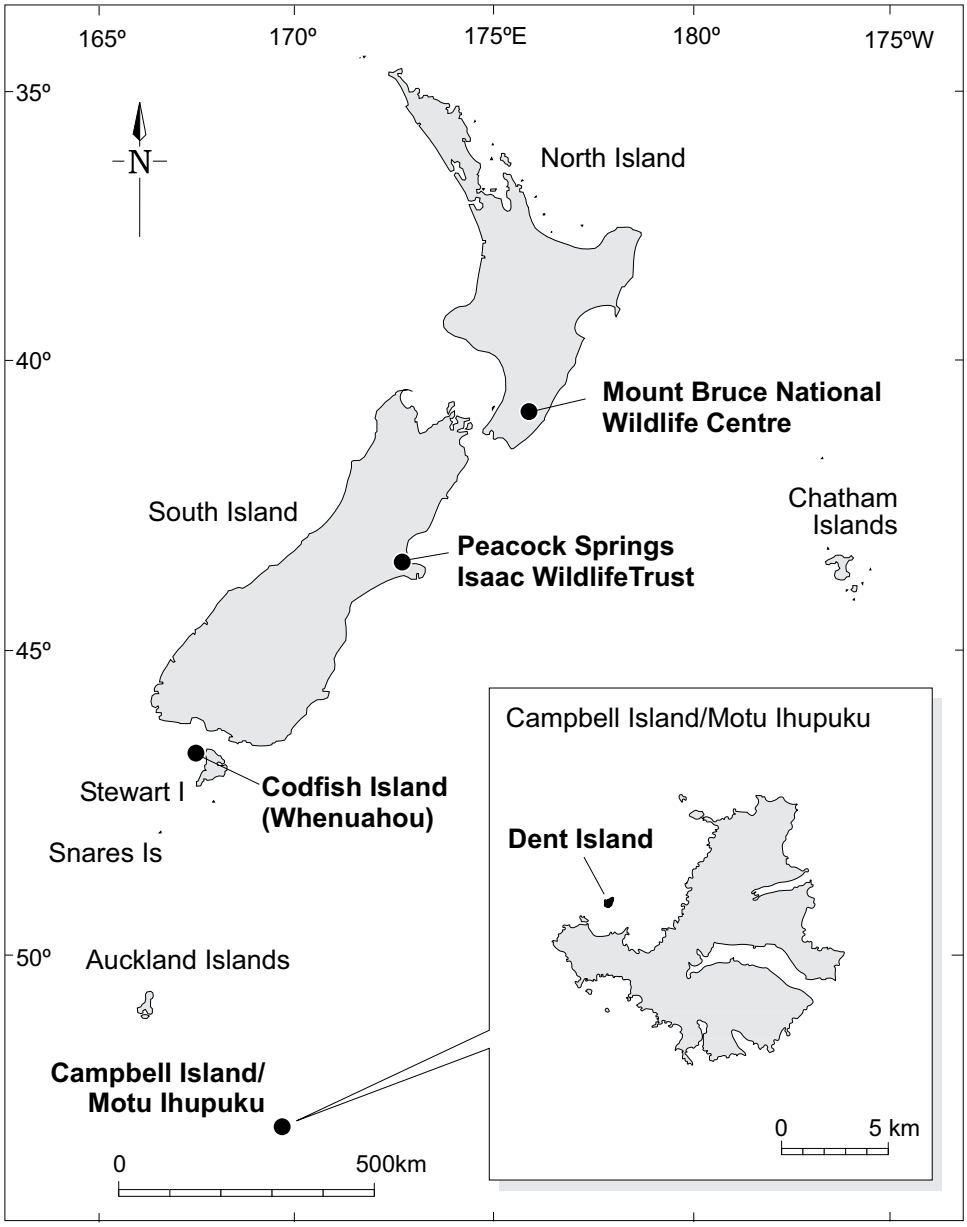

Figure 1. Map of New Zealand showing source locations of transferred captive and wild-caught Campbell Island teal (*Anas nesiotis*), and their destination, Campbell Island/Motu Ihupuku.

TABLE 1. NUMBER OF CAPTIVE AND WILD-CAUGHT CAMPBELL ISLAND TEAL (*Anas nesiotis*) OF DIFFERENT AGES TRANSFERRED TO CAMPBELL ISLAND/MOTU IHUPUKU IN SEPTEMBER 2004.

	AGE (YEARS)								
	< 1 (JUVENILES)	1	2	3	4	5	6	7	UNKNOWN
Captive	25	1	–	1	1	–	–	–	–
Wild-caught	7	3	2	–	2	2	–	4	2
Total transferred	32	4	2	1	3	2	0	4	2

2.1 PRE-TRANSFER MANAGEMENT OF CAPTIVE BIRDS

During the 2003/04 breeding season, seven pairs of teal at NWC bred successfully, producing a total of 19 ducklings; two of these were hand-reared and all others were reared by one or both parents. Three breeding pairs at Peacock Springs parent-reared a total of eight ducklings. Twenty-five of these ducklings were selected for transfer to Campbell Island. All birds were banded with metal 'S' bands (supplied by the DOC Banding Office) and were later fitted with 5-mm-wide plastic wrap-around colour bands—allowing double colour combinations to be used on one leg—bonded with solvent, for future monitoring purposes.

Once separated from parents (after 3 weeks of age), ducklings continued to be held in sibling groups right up until transfer in September 2004, during which time their behaviour was carefully observed. Hand-reared teal were moved into naturalistic surroundings and socialised as soon as possible with other juveniles. Peacock Springs reported aggressive behaviour beginning between a male and female sibling pair in the first week of September; weight change patterns reflected this behaviour change (Appendix 2, Table A2.1). At NWC, three adult males that were destined for transfer were each housed separately to avoid aggressive interactions.

Several months before transfer, food presentation was changed from dry teal maintenance pellets ('Teal Diet' from Poultry Research Centre, Massey University, Palmerston North) to a mash of equal volumes of teal maintenance pellets and water. The teal needed to be familiar with mash, as they were to be given this throughout the transfer to increase their water intake and reduce the risk of dehydration. The teal were also put on a 'diet' in August in an effort to trim them down to more natural wild weights (Appendix 2, Tables A2.1 and A2.2). Food quantities at NWC were then increased in the week prior to transfer, as the teal were losing more weight than desirable in the very cold weather conditions.

2.1.1 Transfer crate trials

The design of the crates in which the birds were to travel to Campbell Island was tested at NWC to establish that birds were able to self-feed during confinement and to determine teal body weight change patterns (predicted weight loss due to stress) during long-term confinement (up to 72 h). The initial crate design was based on that used by the Durrell Wildlife Conservation Trust, Jersey, to transport Madagascar teal (*Anas bernieri*) to Jersey Zoo (G. Young, Durrell Wildlife Conservation Trust, pers. comm. 2004).

The first trials, in June 2004, involved crates constructed with a grille separating the food/water containers from the bird—the teal were able to put their heads through the bars of the grille to reach the dishes. However, it was soon clear that the teal were not feeding properly (Appendix 3, Table A3.1). Mean 24-h weight losses in the three males and single female involved in this first trial are shown in Table 2. Two teal died approximately 72 h after the start of the trial. Post-mortem results showed that one had died from disseminated intravascular coagulation, a type of reaction seen in acutely stressful situations. The other had suffered moderate neck trauma; although this was not sufficient to cause death, changes in other organs were suggestive of a shock reaction due to this injury.

TABLE 2. WEIGHT CHANGES OF CAPTIVE CAMPBELL ISLAND TEAL (*Anas nesiotis*) AFTER 24-h, 48-h AND 72-h CRATE CONFINEMENT PERIODS PRIOR TO TRANSFER TO CAMPBELL ISLAND/MOTU IHUPUKU (2004).

Weight changes are presented for the first crate trial, during which there was a grille present separating birds from food containers, and for subsequent crate trials ($n = 6$) and 24-h crate conditioning ($n = 21$), during which the grille was absent, making food containers more accessible to birds. (Note that crate confinement of birds released at 24 h is also referred to as crate conditioning, whilst birds confined for longer periods were part of trials to test crate design.) All figures have been rounded up to whole numbers.

	FIRST CRATE TRIAL—GRILLE PRESENT			SUBSEQUENT TRIALS—GRILLE ABSENT			
	MALES		FEMALES	MALES		FEMALES	
	MEAN ± SD	RANGE	MEAN	MEAN ± SD	RANGE	MEAN ± SD	RANGE
Initial weight (g)	593 ± 66 ($n = 3$)	555 to 670	540 ($n = 1$)	476 ± 47 ($n = 17$)	374 to 575	436 ± 21 ($n = 10$)	401 to 473
24-h weight loss (%)	−6 ± 1 ($n = 3$)	−4 to −7	−8 ($n = 1$)	−2 ± 1 ($n = 17$)	−8 to +3	−1 ± 1 ($n = 10$)	−5 to +2
48-h weight loss (%)	−11 ± 1 ($n = 3$)	−10 to −12	−13 ($n = 1$)	−4 ± 2 ($n = 5$)	−5 to 0	−5 ($n = 1$)	
72-h weight loss (%)	−16 ± 2 ($n = 3$)	−15 to −18	−16 ($n = 1$)	−8 ± 3 ($n = 3$)	−5 to −10	– ($n = 0$)	–

In light of the first trials, the crates were redesigned by the authors so that they did not contain grilles, providing birds with direct access to dishes (Appendix 4). Dishes were narrow, so that although birds were likely to step into them, they were less likely to soil their plumage. Crate doors were designed with the following in mind: food dishes needed to be regularly serviced at one end of the crate throughout the journey without the risk of birds escaping, with a quick release opening/closing mechanism (bungy cord); and crates needed to have a large sliding door at the opposite end to allow full access for crate cleaning after transfer, and to allow crates to be used for crate conditioning (see section 2.1.2) and as temporary shelters in holding pens. Perforated matting was stapled to the crate floor to provide grip for the birds and allow some drainage of faeces and spilt food/water. Ventilation holes (40 mm in diameter) were covered with netting to prevent potential bill injuries.

Using the redesigned crates, further trials were conducted to determine weight loss patterns over 48 h (six birds) and 72 h (three of the same birds). Weights were recorded before confinement and at 24-h intervals (Appendix 3, Table A3.1); mean weight losses at 48 h and 72 h are presented in Table 2.

2.1.2 Crate conditioning

Following crate design trials, a crate conditioning programme was designed to familiarise all the remaining birds with feeding inside the crate and with crate confinement. Crate conditioning was achieved in two ways: by placing crates with open doors in aviaries and moving food dishes inside to 'force' birds to enter crates to feed; and by closing each individual into a crate (housed indoors) for a minimum of 24 h and simulating the husbandry attention birds would receive during the actual transfer.

Birds were generally crated in the early afternoon; food (mash) and water were topped up in the late afternoon, replaced the following morning and topped up at midday. Mealworms were provided in food and water at all feeds. Many birds

were known to be self-feeding in the crates (decreased food amounts in dishes) and it is likely that all were drinking, as they could be heard as soon as water was replaced. Birds were then removed from crates in the early afternoon of the following day and allowed the rest of the afternoon to settle back into pens during the 'warmer' part of the day. This was an important consideration, given that the weather at this time of year was particularly cold with snow and frosts. All teal in a single aviary were conditioned simultaneously, avoiding the return of stressed birds to an already occupied aviary.

In total, the weights of 27 teal were recorded before and after 24 h of confinement in the final crate design (Appendix 3). Mean weight changes are summarised in Table 2: 24-h weight change results include the six birds that were kept in crates for longer periods as part of the 48-h and 72-h weight-loss monitoring trials.

2.1.3 Tube-feeding techniques

During the second series of crate trials (grille removed), a tube-feeding technique was developed to assess the effectiveness of supplementary tube-feeding in reducing weight loss. The tube-feeding of birds that had been in crate confinement for 24 h and 48 h was considered an essential trial to ensure that there was no risk of birds suffering severe stress symptoms during handling, determine appropriate food consistency and volume, and establish delivery time to each bird.

A warm food and water mix—two parts powdered teal maintenance pellets to three parts water by weight—was delivered to each bird via a 30-mL Bovivet syringe and teflon speed-feeding crop tube (screwed directly into the syringe). This ratio of food to water provided the right consistency for syringing, although the mix needed to be slightly watered down towards the end of each batch to maintain fluidity. Males showed the capacity to take up to 30 mL of mixture and females c. 20 mL in a short period of c. 15 s (1 mL of food mix weighs c. 1 g). Particularly small birds (i.e. juvenile females) were generally given a smaller amount (e.g. 15 mL) to avoid a potential regurgitation response. Once loaded, the syringe and feed-tube was wiped clean with a fresh soft tissue before insertion into the teal's oesophagus. The delicate nature of the screw-in attachment of tube to syringe meant that disassembly for disinfection after feeding was not practical. Disinfection between birds was achieved with syringe and tube still connected: the tube was wiped clean and placed upright in a tall jug with surgical disinfectant (Microshields chlorhexidine solution) just covering the tube but not the syringe, for a minimum of 2 min. Following this, any residual food in the tube, which was now tainted with disinfectant, was discharged (i.e. the syringe emptied) into a waste container and the outside of the tube rinsed through two waterbaths. A second set of feeding equipment was in use while the first set was standing in disinfectant.

During crate trials, two birds that were tube-fed at 24 h lost less body weight over the subsequent 24-h period (–0.2% and –4.6%) than a third bird held over the same period and under the same conditions without tube-feeding at 24 h (–6.6%) (Appendix 3, Table A3.1).

2.1.4 Pen trials

A trial of the pre-release pens that teal were to be held in on Campbell Island was carried out at NWC using four birds from the first crate trial. The trial pens measured 1500 × 750 × 750 mm, were completely enclosed with a floor and roof, and contained an A-frame shelter, a small artificial pond, food and water bowls, and the travel crate. Each trial pen held a single bird. As it was planned to place the pens side by side on Campbell Island, each had at least two side walls constructed of heavy-duty weedmat that the birds were unable to see through. The other two sides were made of a shade-cloth mesh that allowed birds to observe some of the surrounding area; the floor and ceiling were also made of shade-cloth to allow rain to penetrate and keep pens as fresh as possible.

Three of the four birds used in the earliest crate trial were placed in the pens at 1630 h on 18 June. The next morning, one male—who had already lost just over 15% of his body weight during the crate trial—was found dead in his pen. The remaining two birds were kept in their pens for 4 days until bad weather was forecast; since the trial pens were not robust enough to withstand strong winds, the trial was stopped and birds were returned to the aviaries. During this time, both birds began to regain weight and were observed to be feeding. No further pen trials were conducted.

Following the pen trial, pen size was reduced to 1300 × 650 × 650 mm to improve access by staff and help reduce wind resistance and ground space requirements on Campbell Island. Pen panels were ultimately constructed of 6-mm wire frames with weedmat or shade-cloth netting sewn onto each panel. Cable ties were used to secure panels together; panels were pre-assembled in part before the transfer, so that units could be folded and stored flat in transit, and assembly could then be completed on arrival at Campbell Island. The final design is shown in Appendix 5.

2.1.5 Disease screening and vaccinations

Disease screening procedures for all teal involved in the transfer followed those used for captive-to-wild transfers of brown teal (*Anas chlorotis*), with additional screening to isolate paramyxoviruses and avian influenza virus. There was also concern regarding the possible existence of *Erysipelothrix rhusiopathiae* within the teal population on Codfish Island, since erysipelas had been identified as the cause of death of three kakapo (*Strigops habroptilus*) there in winter 2004. To reduce the risk of transferring erysipelas to Campbell Island, all teal involved in the transfer were tested for and vaccinated against this bacterium.

Screening included the following procedures: physical examination (including measurement of body weight, and check for pox lesions and external parasites); faecal sampling for internal parasites (including cestodes, trematodes, nematodes and *Coccidia*); cloacal swabs for *Salmonella*, *Yersinia* and *Campylobacter*; cloacal swab for avian influenza virus and paramyxovirus isolation; conjunctival/choanal/cloacal swab for *Chlamydophila*; and choanal/cloacal swab for *Erysipelothrix*. Blood samples (two smears and 0.25 mL whole blood in heparin) were examined for total and differential white blood cell counts, blood parasites, haematocrit and total protein to allow a more general assessment of health. Haematocrit and total protein were used (in combination with physical examination and body weight) as non-specific indicators of the presence of avian TB as there is no commercially

available TB test for use in birds in New Zealand (R. Jakob-Hoff, Auckland Zoo, pers. comm. 2004). Screening results showed that all birds were fit for release.

Birds were treated for internal parasites with oral doses of ivermectin (0.25 mL/kg) and praziquantal (20 mg/kg) after the first faecal screening and approximately 2 weeks later, and were then given a precautionary third dose of each on the day of transfer.

The erysipelas vaccination involved two subcutaneous (neck) injections of Suvaxyn E for each bird. The first injection was given while the birds were being held in captivity at their source locations. A second 'booster' shot was given to all the birds a fortnight later in their pens on Campbell Island.

2.1.6 Attachment of radio-transmitters

To facilitate post-release monitoring of teal on Campbell Island, all birds were fitted with 'back-pack' radio-transmitters as previously used with the species during translocations to Codfish Island (Gummer & Williams 1999; McClelland 2002). Transmitter attachment methods, using harnesses, were refined from techniques used initially during the DOC brown teal recovery programme (J. Fraser, pers. comm. 1999). Single-stage transmitters (supplied by Sirtrack, Havelock North) attached to Campbell Island teal had a battery life of up to 12.5 months with a tracking range of 1–2 km. Harnesses incorporated a link designed to break down with time, allowing transmitters to fall off the birds after battery life expired if units could not be retrieved during subsequent monitoring efforts.

Transmitters were fitted up to several weeks before transfer, to allow birds to habituate to them prior to release. Transmitter and harness units were ideally fitted to males weighing 450–550 g and to females of 350–450 g to avoid harnesses becoming either too tight after release once lightweight birds gained condition, or too loose (and vulnerable to being caught up in ground vegetation) once heavy birds had lost weight during transfer. Harnesses were subsequently checked at every handling event for correct fit.

2.2 CAPTURE AND HOLDING MANAGEMENT OF WILD TEAL ON CODFISH ISLAND

Twenty-four wild teal were captured on Codfish Island from 13 to 24 August, and then held in confinement on the island. Birds carrying functional transmitters were located by telemetry and an indicator dog was used to search for teal that lacked transmitters (Fraser 2004). Teal were also searched for at night along the coast using spotlights. Old transmitters were removed at the time of capture and existing colour bands were replaced if they showed signs of wear.

Individual identifications of 22 wild-caught teal transferred to Campbell Island are listed in Appendix 1, and their ages are summarised in Table 1; two teal were not transferred, as one escaped captive confinement and another was released from the enclosure on Codfish Island due to excessive weight loss after capture. Fifteen of the 22 teal were raised in the wild, while seven birds originated from captivity. Key events in the capture and preparation of wild-caught teal for transfer and release are listed in Appendix 2, Table A2.3. Table 3 shows mean weight changes of 22 birds after capture during captive confinement on the island.

TABLE 3. WEIGHTS AND % WEIGHT CHANGES OF 22 WILD-SOURCED CAMPBELL ISLAND TEAL (*Anas nesiotis*) FROM CAPTURE ON CODFISH ISLAND (WHENUAHOU) TO RELEASE ON CAMPBELL ISLAND/MOTU IHUPUKU (2004).

All figures have been rounded up to whole numbers. All weights (and weight change calculations) include 8-g radio-transmitter/harness.

	MALES				FEMALES			
	ADULT (n = 9)		JUVENILE (n = 4)		ADULT (n = 6)		JUVENILE (n = 3)	
	MEAN ± SD	RANGE	MEAN ± SD	RANGE	MEAN ± SD	RANGE	MEAN ± SD	RANGE
Codfish Island								
Capture weight (g) (13–24 Aug)	447 ± 36	393 to 495	425 ± 10	415 to 438	380 ± 37	308 to 415	329 ± 4	325 to 333
Pre-transfer weight (g) (8 Sept)	432 ± 44	385 to 505	410 ± 17	390 to 430	362 ± 38	306 to 415	325 ± 15	310 to 340
Captivity weight change (g)	−14 ± 27	−55 to +27	−15 ± 21	−35 to +15	−18 ± 55	−84 to +67	−4 ± 17	−18 to +15
Captivity weight change (%)	−10 ± 6	−12 to +6	−4 ± 5	−8 to +4	−4 ± 16	−22 to +22	−1 ± 5	−6 to +5
Transfer								
Post-transfer weight (g) (11 Sept)	423 ± 41	380 to 490	388 ± 14	370 to 400	353 ± 20	332 to 385	305 ± 9	297 to 315
72-h weight change (g)	−10 ± 21	−36 to +36	−22 ± 8	−33 to −15	−9 ± 28	−40 to +41	−20 ± 12	−28 to −6
72-h weight change (%)	−2 ± 5	−8 to +9	−5 ± 2	−4 to −8	−3 ± 8	−11 to +13	−6 ± 4	−9 to −2
Campbell Island								
Release weight (g) (18–20 Sept)	469 ± 21	438 to 512	440 ± 17	418 to 456	389 ± 23	349 to 410	346 ± 9	336 to 353
Weight change in captivity (g)	+46 ± 23	+3 to +73	+53 ± 23	+21 to +72	+36 ± 18	+17 to +64	+41 ± 10	+32 to +52
Release weight								
% of pre-transfer weight	109 ± 7	96 to 117	107 ± 7	97 to 113	107 ± 10	98 to 126	107 ± 2	104 to 108
% of Codfish I. capture weight	105 ± 6	94 to 118	104 ± 3	101 to 108	102 ± 14	90 to 130	105 ± 3	102 to 109

2.2.1 Pre-transfer holding management

The captured teal were held in 2400 × 2400 × 1200 mm plywood enclosures. All birds were held separately, except for two juvenile female siblings and one mother/son pairing. Every enclosure contained a 120-L pond and at least one wooden A-frame shelter. Enclosures were planted with grasses and ferns to provide cover, and fresh fern fronds were added every week. Bowls of teal maintenance pellets soaked in water were supplied daily along with drinking water. Mealworms (*Tenebrio molitor*) were provided daily for as long as they were available, and were then replaced with waxmoth larvae (*Galleria mellonella*) in the last week. Traps were set on the beach to catch invertebrates associating with windrowed kelp for the teal, and seaweed was collected from the beach and placed in enclosures.

A strict quarantine and hygiene regime was followed for the entire time the birds were held captive. Food bowls were disinfected on a daily basis, with fresh food provided in the afternoon, as birds were only feeding at night. A pair of gumboots was placed outside each aviary and worn each time a pen was entered.

2.2.2 Crate conditioning

Teal held on Codfish Island were not confined to transfer crates for any familiarisation period because of their limited time in captivity. Familiarisation with transfer crates (of the kind used to accommodate birds during the journey to Campbell Island) was achieved by allowing teal to feed in the open crates within their enclosures. Crates were rotated around the 22 enclosures—being cleaned and disinfected between pens—with a minimum of 5 days in each pen. All teal were feeding inside the crate by the end of their period of conditioning.

2.2.3 Disease screening and vaccinations

Screening procedures were the same as those for captive birds (see section 2.1.5). Six teal caught between 13 and 16 August were screened on 17 August; all remaining teal were screened on 22 or 24 August. The first erysipelas vaccination was given on 4 September and a 'booster' was given 10 days later during pre-release holding on Campbell Island.

2.2.4 Transmitters

All wild-caught teal held in aviaries were fitted with new transmitters prior to 25 August (see section 2.1.6). This allowed a 2-week familiarisation period for birds that had not previously carried a transmitter. Transmitters were attached to lightweight birds in such a way that further adjustments could be made to the fit of the harness at a later date.

2.3 TRANSFER TO CAMPBELL ISLAND

Transfer operations of both captive and wild-caught teal commenced on 8 September 2004.

2.3.1 NWC to Palmerston North

The teal were fed before 0800 h at NWC to ensure that food was available in all aviaries; all birds were also offered mealworms at this time. Capture of birds commenced at 0900 h. The pre-transfer weight was recorded for each bird (Table 4; Appendix 2, Table A2.2), and each bird was given a final drench for internal parasites and washed in fresh tap water to remove any weeds or seeds in line with DOC Southland's subantarctic expedition quarantine procedures (Agnew & Roberts 2004). Mean transfer day weights of all juvenile teal were lower than their August readings as a result of a planned 'diet' to trim them down to more natural wild weights (see section 2.1). The teal were placed in single compartments (four per box) in six transport boxes designed for air travel, on loan from the DOC brown teal recovery project. Live invertebrates (mealworms) accompanying the teal were placed in a vacant compartment. The road journey to Palmerston North airport commenced at 1030 h.

2.3.2 Palmerston North to Invercargill

The transport boxes were checked in at Palmerston North airport at 1145 h and loaded onto the 1310 h flight to Christchurch. The boxes were transhipped to the connecting 1500 h flight to Invercargill. Peacock Springs birds, which were also weighed before transfer (Table 4; Appendix 2, Table A2.1), were placed on an earlier flight departing Christchurch for Invercargill at 1145 h. The NWC birds reached Invercargill airport at around 1630 h and were driven to DOC's designated rodent-proof quarantine building in the city. Peacock Springs birds, which arrived earlier, were left in their air-transport boxes for the afternoon with food and water until the other birds arrived.

TABLE 4. WEIGHTS AND % WEIGHT CHANGES OF 28 CAPTIVE-SOURCED CAMPBELL ISLAND TEAL (*Anas nesiotis*) FROM PRE-TRANSFER TO RELEASE ON CAMPBELL ISLAND/MOTU IHUPUKU (2004).

All figures have been rounded up to whole numbers. All weights (and weight change calculations) include 8-g radio-transmitter/harness.

	MALES				FEMALES	
	ADULT (n = 3)		JUVENILE (n = 14)		JUVENILE (n = 11)	
	MEAN ± SD	RANGE	MEAN ± SD	RANGE	MEAN ± SD	RANGE
Pre-transfer						
Disease screen weight (2–3 Aug) (g)	469 ± 12	461 to 483	511 ± 45	434 to 600	487 ± 32	413 to 530
Pre-transfer weight (8 Sept) (g)	488 ± 6	482 to 494	462 ± 34	394 to 530	417 ± 22	373 to 448
Transfer						
Post-transfer weight (11 Sept) (g)	440 ± 9	430 to 445	426 ± 27	375 to 488	386 ± 11	369 to 408
72-h weight change over transfer (g)	–48 ± 5	–52 to –43	–36 ± 13	–67 to –18	–31 ± 19	–62 to +13
72-h weight change over transfer (%)	–10 ± 1	–11 to –9	–8 ± 2	–13 to –4	–7 ± 5	–14 to –4
Campbell Island						
Release weight (18–22 Sept) (g)	448 ± 13	438 to 463	435 ± 25	379 to 480	380 ± 19	359 to 417
Weight change in captivity (g)	+8 ± 13	–7 to +18	+9 ± 18	–24 to +33	–6 ± 16	–23 to +31
Release weight						
% of pre-transfer weight	92 ± 3	89 to 95	94 ± 3	90 to 99	91 ± 7	84 to 112
% of post-transfer weight	102 ± 3	98 to 104	102 ± 4	95 to 107	98 ± 4	94 to 108

2.3.3 Codfish Island to Invercargill

On 8 September, birds were caught from enclosures at around 1300 h and carried in cloth catch bags to the air-transport boxes (similar to those used for captive birds) at the Codfish Island Field Centre base. Pre-transfer weights were recorded (Table 3; Appendix 2, Table A2.3). The helicopter left at 1500 h and took c. 20 min to reach Invercargill airport.

2.3.4 Invercargill to Bluff

At DOC's quarantine building, all 50 teal were transferred from their air-transport boxes to individual transfer crates (Appendix 4) for the boat journey to Bluff. Processing began at 1730 h and took 2 h to complete. The boat crates were labelled with a bird band number and a crate number. On removal from its air-transport box, each teal was tube-fed (see section 2.1.3) to prevent dehydration and weight loss. Tube-feeding was considered necessary at this stage in the journey as the NWC birds had already been in boxes without food or water for 8–9 h. It was also anticipated that the teal would not be settled on the boat for a further couple of hours, and that even then many of the birds would be unlikely to self-feed immediately due to stress. All personnel travelling on the boat were familiarised with tube-feeding techniques. After feeding, the teal were rinsed for a second time in fresh tap water to remove any weeds or seeds from plumage before being secured in the transfer crates.

2.3.5 Bluff to Campbell Island

Birds and personnel were driven to Bluff port to board MV *Clan MacLeod* at around 1930 h on 8 September. The teal were all placed in a ventilated room for the journey, with all 50 crates filling both long walls of the room. Crates

were placed on custom-built shelves to stop them moving in transit. External brackets that were fixed to each crate allowed airflow around the walls, floor and ceiling of each box to prevent birds overheating (Appendix 4). Crates of captive and wild-origin birds were kept in separate groupings in case each group required different management in transit. All birds were immediately given food mash (equal volume of pellets and water) and drinking water while the boat was stable. The boat departed Bluff at approximately 2100 h on 8 September. At midnight, all food and water containers were topped up with fresh water using a squeezy bottle (dishes did not have to be removed for this).

During the initially relatively stable boat journey, all food and water containers could be left in place in the crates without creating much mess. However, when the boat motion increased, managing birds as individuals, by monitoring weights and individual food consumption, proved unrealistic. Therefore, over 9 to 10 September, all birds were managed in the same way to reduce the risks of those not self-feeding losing too much body weight. At 0700–0900 h, all birds were tube-fed and water was topped-up in the crates; up to 6 h later, fresh food mash (equal volume of pellets and water) was provided and drinking water was replaced in the crates; at 1900–2100 h, all birds were tube-fed and water was topped-up in the crates; and up to 6 h later, water was topped-up in the crates (and food was topped-up if required).

Mealworms were not given to the teal during the boat journey as originally planned because the batch provided contained small worms that were difficult to separate from the bran medium; in practical terms, the benefits were considered minimal for the labour involved in difficult circumstances, especially given that all birds were regularly tube-fed.

2.4 ARRIVAL AT CAMPBELL ISLAND

On 10 September at 1300 h, MV *Clan MacLeod* arrived in Perseverance Harbour, Campbell Island, after a 40-h journey. Food and water containers were removed from the crates prior to unloading. The last of the teal were unloaded at around 1700 h.

Construction of holding pens (see section 2.1.4 and Appendix 5) commenced at c. 1600 h and continued into the night. Pens were set up in rows behind Beeman Base with solid weedmat walls acting as visual barriers between each pen. Each pen was furnished with a washing-up bowl 'pond' filled to the top with water and a single plywood A-frame shelter, under which was placed a pet-food bowl of sloppy mash.

The teal were released into the holding pens at 2300 h. The boat crates were simply placed in the pens with the sliding doors at the back of each crate removed, and were left overnight to act as secondary shelters. Since the crates were already labelled with band numbers, pens did not need to be labelled that night. Five pairs of birds were held together because they had been previous aviary companions in captivity; this helped reduce the time required to set up pens. The majority of birds entered the ponds immediately, where they were heard vigorously bathing. Lengths of boardwalk were placed on top of all pens to weigh them down in the wind and keep lids tightly closed.

2.5 PRE-RELEASE HOLDING MANAGEMENT

All birds were weighed on 11 September, which was the day after arrival at Campbell Island and 72 h after crating for transfer (Appendix 2). Body weight change was immediately calculated as % weight loss/gain of pre-transfer weight; mean weights and weight changes are presented in Tables 3 and 4. Some teal from Codfish Island lost weight (up to 11% of pre-transfer weight) but others actually gained weight (up to 13%) during the transfer period, while captive-origin birds only lost weight (between 4% and 14%). Twenty-two birds were tube-fed because their weight loss exceeded 8% of their pre-transfer body weight and there was little sign of overnight feeding. While birds were processed, pens were furnished with scrub (*Dracophyllum* spp.) and transfer crates were removed and replaced with a second A-frame shelter. The water ponds were topped up and food was changed; food was maintained at a watery consistency—one 80-g scoop of pellets with approximately twice the volume of water—in case some birds were not drinking from ponds. Pens were labelled with the occupants' band numbers.

On 12 September, all wild-caught teal were recorded consuming food overnight. The weights of any captive-origin birds that were not self-feeding (i.e. were leaving food untouched) were recorded, as were the weights of all paired birds to confirm compatibility. All pairs were separated, as it was found that males were gaining and females were losing weight. In a single female-female pairing, weight difference was also evident. Eight birds (including the separated females) were tube-fed in the morning to minimise further weight loss over the day because they were unlikely to self-feed until night. As there was only a limited supply of mealworms, these were only distributed to birds that were not self-feeding. They were placed in the pond, since worms added to mash are wasted as they burrow beneath the food. Food was now being made in drier form—one 80-g scoop of pellets with an equal volume of water—so that consumption was more obvious and to encourage the intake of more solids now that all birds were known to be using ponds.

On 13 September, the water in all ponds was replaced. Each individual was visually checked, but no birds were handled. Some of the pen walls were showing signs of wear, probably the result of teal pacing at night, and in some cases either the shade-cloth had 'unzipped' or the weedmat was fraying and holes were enlarging. This became a potential hazard to the birds: one male was snared by a nylon thread overnight, but his leg was untangled the next morning without injury. Additional weedmat panels were inserted to prevent any escape attempts.

Food consumption was recorded every morning for each bird as either one-quarter, one-third, a half, two-thirds or three-quarters eaten. The weights (of all birds) revealed that generally, any bird eating one-third or more of its food (probably ≥ 30 g solid food per day) was found to be holding or gaining weight (all ex-Codfish Island birds and some ex-captivity birds). Birds eating one-quarter or less (probably ≤ 20 g solid food per day) were found to be losing weight. Live food continued to be distributed to these latter birds only. Only three birds (which failed to feed overnight) were tube-fed (mornings only). All pens were roughly cleaned (furnishings lifted out, and faeces and spilt food washed through the mesh floor) while birds were being removed to be weighed or given erysipelas booster vaccinations.

Between 15 and 18 September, all birds were consuming around one-quarter or more of their food and none required tube-feeding. By 19 September, it was clear that six females were still only just holding their own weight, or were slightly losing weight and taking smaller amounts of food again. In light of this, we planned to release them later than the first group, because the first releases occurred in particularly cold weather. Three of these females were tube-fed twice a day from 19 to 22 September, while others were tube-fed once per day. Birds that were tube-fed twice a day tended not to self-feed much during the night and those tube-fed only in the morning would consume a small amount of food at night, with the result that all tube-fed birds' weights stabilised in the same way (i.e. tube-feeding once per day proved sufficient).

2.5.1 Final preparation for release

Radio-transmitters were fitted to teal from Peacock Springs on 13 September and were re-fitted to a couple of other birds that had dropped them in the pens. All harnesses were re-checked on 16 September, when harness fit was scrutinised and scored (as good/moderate/poor) and any modifications were scheduled over the next few days. Colour bands were fitted to 16 remaining teal on 15 September (all Peacock Springs birds and nine Codfish Island birds). All other colour band combinations were re-checked during handling events.

Immediately before release, fine-tunings for all transmitter channels were recorded. A release weight was recorded for every bird (Appendix 2). Release weights were later calculated as % weight loss/gain of pre- and post-transfer weights for all birds, and of capture weights of birds from Codfish Island; mean release weights and weight changes are presented in Tables 3 and 4. After a final check of all bands and harnesses, each bird was tube-fed (20–30 mL depending on sex) to give it available reserves for the afternoon/evening while settling in to the new environment once released. This booster feed was excluded from the individual release weights.

2.6 RELEASE AT PERSEVERANCE HARBOUR

The teal were released on 18 September and 20–22 September at three locations in Perseverance Harbour: Camp, Tucker and Garden Coves (Fig. 2; Table 5) after spending between 8 and 12 days in pens. Individual release locations and dates are listed in Appendix 1. Birds were carried—two per box—in lightweight cardboard pet-carry boxes (380 × 210 × 250 mm) that were divided diagonally with cardboard. Old pillow-cases were placed on the bottom of each box to soak up excrement. Boxes were carried in large unsealed plastic bags to keep them dry. All releases occurred in mid- or late afternoon to reduce risks of immediate predation by skuas (*Catharacta skua lonnbergi*) and to allow birds to commence feeding after nightfall. Three skua were roosting at Garden Cove at the time of release on 20 September but showed no interaction with the teal. The releases occurred in a range of weather conditions, with 40 knot southwesterly winds, snow flurries and intermittent hail on 18 September, similarly cold conditions on 20 September plus 100% cloud cover and showers, and relatively calmer, milder (c. 9°C) conditions with rain on 21 September and without rain on 22 September.

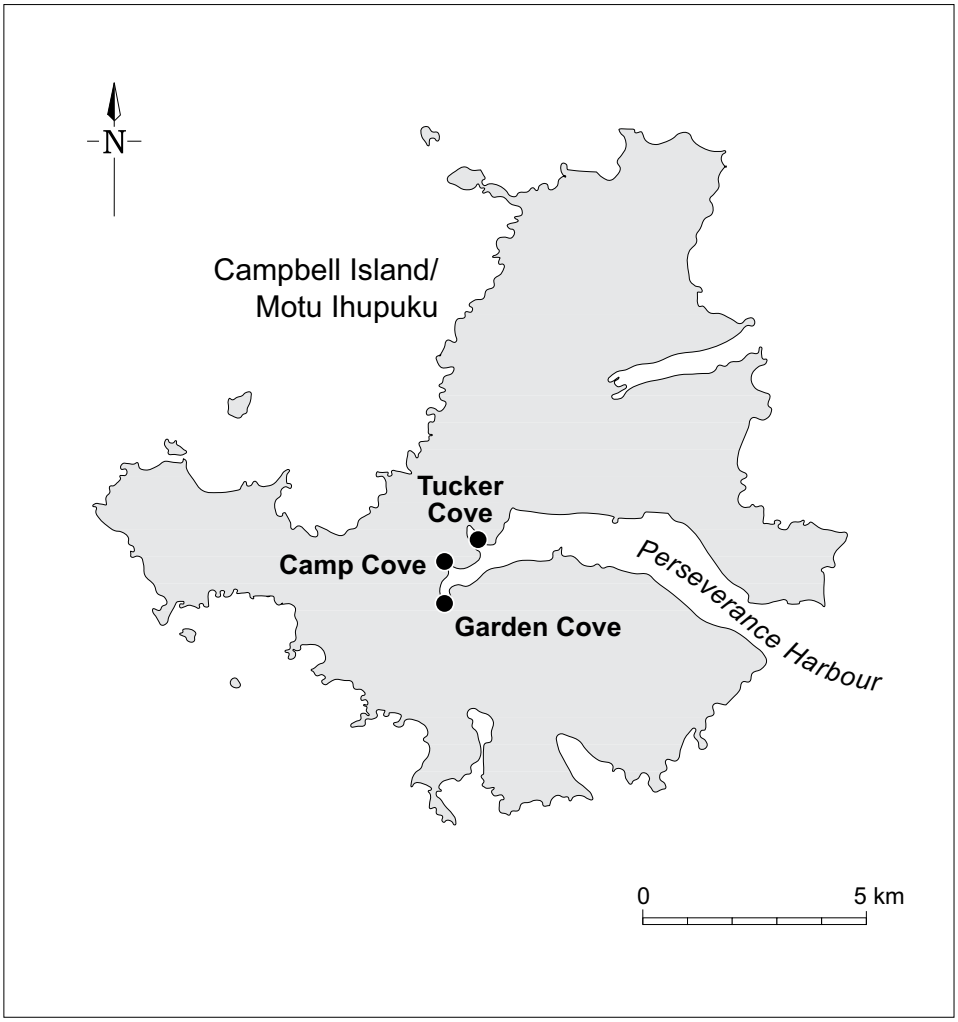

Figure 2. Map of Campbell Island/Motu Ihupuku showing three release locations—Camp, Tucker and Garden Coves—for reintroduced Campbell Island teal (*Anas nesiotis*).

TABLE 5. RELEASE DATES AND LOCATIONS FOR 50 CAMPBELL ISLAND TEAL (*Anas nesiotis*) IN PERSEVERANCE HARBOUR, CAMPBELL ISLAND/MOTU IHUPUKU (2004).

		CAMP COVE		TUCKER COVE		GARDEN COVE	
		18 SEPT (1805 h)	20 SEPT (1545 h)	18 SEPT (1530 h)	21 SEPT (1700 h)	20 SEPT (1630 h)	22 SEPT (1545 h)
Captive-origin	Males	2	–	1	6	8	–
	Females	3	–	–	2	2	4
Wild-origin	Males	–	3	6	–	4	–
	Females	–	–	7	–	2	–

2.7 POST-RELEASE MONITORING

Post-release monitoring to determine immediate survival and dispersal was undertaken until team departure from Campbell Island on 10 October. Each bird was tracked to its exact location by transmitter signal, and movement from its previous location was recorded. Birds were physically sighted if possible every second check, although the dispersal patterns of some birds meant that this was not always achievable. While most of the tracking was done on foot, a small boat was used to facilitate transport around the harbour and to allow larger areas to be checked for birds. All 50 teal were known to be alive when monitoring ceased. Two teal were recaptured on 9 October and were penned overnight at Beeman Base ready for an official (filmed) release the following morning. The pair had been released on 20 September; the male had lost 44 g (10% of release weight) and the female 45 g (12% of release weight) over the 19 days since their release (Appendix 2, Table A2.1).

A monitoring expedition was scheduled to occur in March 2005, to locate all birds released in the first transfer, and to determine survival and condition of birds, and whether breeding had occurred. In addition, it was planned that the March monitoring team would remove transmitters from all captured birds (for recycling), and colour bands if they proved of no value as a monitoring tool. Results of this and subsequent monitoring efforts will be included in a separate monitoring outcome publication.

3. Discussion

The results of the first transfer of Campbell Island teal to Campbell Island exceeded all expectations: there was no pre-release mortality and all 50 teal were confirmed as alive up to 3 weeks following release. Although weather conditions were particularly cold on Campbell Island in September, the timing of the transfer worked extremely well. Teal held in groups in captivity were just beginning to develop dominance hierarchies by early September; from this time of year onwards, aggressive behaviour intensifies and non-breeding birds need to be separated into individual aviaries, a scenario that is not feasible with a large release cohort and limited holding space. On Campbell Island, brown skuas were only just beginning to return to the island in small numbers, and hence posed less of a threat to the teal immediately after release than they potentially might have at other times of year.

Hand-reared birds were managed in the same way as parent-reared and wild-caught birds; no behavioural differences were observed in hand-reared birds during and after transfer. It can be expected that more hand-reared teal will be included in future transfer cohorts in order to maximise the number of teal released on Campbell Island. Adults of all ages included in the transfer (1–7 years) survived transfer and pre-release conditions well.

Crate trials proved essential in refining crate design to make them as safe as possible for birds and practical to service in difficult conditions. Trials were

also important to test that birds could self-feed in confinement. During trials, it was established that particularly overweight birds died after losing 15% of their pre-confinement weight over a 72-h period. Consequently, captive birds were trimmed down to more natural wild weights (closer to those recorded on Dent Island and Codfish Island) prior to transfer; this was achievable over relatively short periods of time and weights could be manipulated in most birds over periods of less than a week by altering artificial food supply.

Transmitters had already been successfully used with Campbell Island teal on Codfish Island (Gummer & Williams 1999; McClelland 2002), so there were no issues regarding their use on birds taken to Campbell Island. Every effort was made to reduce the risks associated with birds wearing the harness/transmitter. This involved some extra unplanned handling events on Campbell Island prior to release, as many harnesses had to be re-tightened to avoid units being dropped or caught up in vegetation—transmitters fitted to heavy birds tended to slacken following weight loss during transfer. This could have been avoided if all harnesses had been secured very firmly when fitted in advance of the transfer. Subsequent tracking of birds after the release expedition was scheduled to occur 5 months later; therefore, there was no cost associated with attaching transmitters (12 month battery life) up to a month prior to transfer. Colour bands had been particularly effective in providing information on survival and movements of birds released on Codfish Island (P. McClelland, DOC, pers. comm.); however, their value on Campbell Island was unpredictable and they presented an additional risk to free-ranging birds. Colour bands were, therefore, fitted to all birds with the intention that they be removed during subsequent monitoring expeditions if of no monitoring value. After the first transfer, the decision was made to avoid the use of colour bands in future transfer cohorts.

The death of kakapo on Codfish Island as a result of erysipelas raised some unexpected issues for the teal translocation project. However, with veterinary advice, the transfer proceeded with additional screening measures in place, some strict quarantine protocols during pre-transfer holding of Codfish Island teal, and the simultaneous vaccination of both captive and wild-caught teal prior to transfer. Due to these late decision-making processes, vaccinations were administered later than desirable, with boosters given on Campbell Island; however, birds did not appear to suffer in any way as a result of this extra handling so close to release. There were no issues with any of the other disease-screen tests/results.

The 24-h crate confinement of captive-origin teal prior to transfer was considered advantageous in habituating birds to conditions inside the crates. However, this kind of crate conditioning was not feasible with wild-caught teal from Codfish Island because of their limited captive period on the island following capture. On weighing birds soon after arrival on Campbell Island, it became apparent that teal from Codfish Island had on average lost less weight than the captive-sourced birds, and in some cases had gained weight. They had obviously been self-feeding during transit as well as birds that had experienced previous crate-conditioning confinement. Consequently, it was considered that such pre-transfer 24-h confinement was unnecessary for captive birds in future transfers, although familiarisation with the open crates containing dishes of food in pre-transfer aviaries was still thought to be of benefit to all teal.

Tube-feeding proved particularly effective in reducing weight loss in birds during transfer, and ensured that all birds were at least hydrated and receiving some nutrition if they were not self-feeding. As a consequence, many birds had a head start when they arrived on Campbell Island and required less time to re-condition in holding pens prior to release. Conditions for personnel were extremely challenging during the boat journey, and it appeared to be relatively easier to routinely tube-feed all birds over a 2-h period than to make decisions about which to tube-feed and which to leave. Birds were tube-fed approximately every 12 h during the journey, but given that birds did not lose as much weight as anticipated, tube-feeding events could have been reduced in number without a serious negative impact on post-transfer condition or survival of birds, particularly if there had been a more plentiful supply of mealworms available.

Pre-release holding pen specifications required that pens housed single birds only, took up as little space as possible (during travel and when occupied by birds), were light in weight, easy to service and constructed of materials that posed no risk to occupants. In addition, pens needed to allow birds to be 'exposed' to the surrounding environment for familiarisation with weather conditions. The final pen design met all these requirements, although there was one unforeseen issue. Campbell Island teal exhibit much pacing behaviour at night during confinement, so the soft weedmat and shade-cloth mesh walls were effective at preventing any injuries that can occur when birds pace beside wire netting or other harder materials. However, birds showing excessive pacing managed to unzip the shade-cloth at bill level; this problem was easily addressed by inserting an extra weedmat panel (plenty of spares had been provided) into the pen and regularly checking pens for signs of such wear. Any damaged panels were subsequently returned to the mainland for repair. Accommodating established pairings in a single pen was tried, but worked only as an interim measure until more pens could be assembled.

During the pre-release management of teal on Campbell Island, a method of assessing likely weight gain or loss without the need to handle birds on a daily basis was established by recording (through visual observation) the remaining proportion of a set volume of food given to each bird. This proved an extremely useful tool, both reducing labour and minimising stress in birds by reducing the number of weighing events. All birds were self-feeding after 1 week of captive confinement on Campbell Island, with those from Codfish Island consuming the greatest quantities soon after arrival, to the point of exceeding arrival weights. Captive-origin birds were ultimately released at very similar weights to their arrival weights on Campbell Island; small daily fluctuations aside, weights generally did not increase, probably as a result of stress (e.g. pacing behaviour) in addition to lower food consumption than the ex-Codfish Island birds. Prolonging their time in captivity and tube-feeding these bird appeared to be of little benefit in terms of weight gain. For future transfers, it was established that the optimum holding time in pens was 1 week, or less if birds began to either gain or lose significant amounts of weight. However, a minimum captive period of several days is considered necessary to allow birds to regain plumage condition following transfer.

4. Recommendations

Based on experiences and observations during the 2004 transfer and release programme, the authors make the following recommendations for future transfers of Campbell Island teal:

- Future transfers should be scheduled to occur at the same time of year (early September or earlier), before juvenile sibling aggression intensifies in captivity.
- Captive birds should be trimmed down to more natural wild weights well in advance of transmitter attachment.
- Transmitters should be fitted to the highest possible standard and re-checked before transfer, to reduce the number of handling events on Campbell Island and prevent any resulting release delays. Harnesses should be fitted on the tight side for captive-sourced birds, as these birds will inevitably lose more weight by the time they are released.
- Any vaccination courses should be completed prior to the transfer date to avoid extra handling events on Campbell Island.
- All teal should continue to be familarised with feeding inside open transfer crates placed within aviaries for a minimum 5-day period. Pre-transfer 24-h crate confinement should be discontinued, however.
- A minimum of three handlers who do not suffer from sea-sickness should be available to care for the birds during boat transfer; at least two of these should have tube-feeding experience.
- A minimum of 24-hourly tube-feeding should be considered, with 12-hourly feeds only for those birds that are clearly not self-feeding, to reduce labour during the boat journey; the live-food supply should be increased if tube-feeding events are decreased.
- All teal should be held as individuals during pre-release captive confinement on Campbell Island. A male and female, or two females (in both cases, birds that have been previous compatible aviary companions in captivity), may be held together for at most one night if there are time constraints to pen construction on arrival at Campbell Island.
- Teal should be held in pre-release pens on Campbell Island for ≤ 1 week.
- Any birds not self-feeding in captive confinement on Campbell Island should be tube-fed just once per day (morning) to stabilise weight, or should be released if weight is in decline.

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Appendix 1

IDENTIFICATION AND ORIGIN OF TEAL TRANSFERRED TO CAMPBELL ISLAND

For each Campbell Island teal (*Anas nesiotis*), identification (band number, name, colour band combination, transmitter number (Tx), sex, and age—A = adult; J = juvenile), year during which it was a juvenile, source (Codfish Island (Whenuahou); Pukaha Mount Bruce National Wildlife Centre—NWC; and Peacock Springs Isaac Wildlife Trust—P. Springs), history (captive and/or wild-caught), and release sites and dates on Campbell Island/Motu Ihupuku are shown. Birds were released in September 2004.

BAND	NAME	COLOURS	TX	SEX	AGE	JUVENILE YEAR	SOURCE	CAPTIVE/WILD HISTORY	RELEASE SITE	RELEASE DATE
S48582	Norton	R/G–M	63	M	A	J–1997	Codfish I.	Captive/wild	Tucker Cove	18 Sept
S48583	Eboule	O/R–M	59	M	A	J–1997	Codfish I.	Captive/wild	Tucker Cove	18 Sept
S48584	Col	M–R/Y	55	F	A	J–1997	Codfish I.	Captive/wild	Garden Cove	20 Sept
S70611	Morgan	R/Y–M	39	M	A	J–2000	Codfish I.	Wild	Tucker Cove	18 Sept
S73208	Terror	G/Y–M	68	M	A	J–1999	Codfish I.	Captive/wild	Camp Cove	20 Sept
S73211	Falla	M–Y/G	47	F	A	J–1999	Codfish I.	Captive/wild	Garden Cove	20 Sept
S73220	Buttercup	M–G/R	66	F	A	J–2000	Codfish I.	Captive/wild	Tucker Cove	18 Sept
S73225	Hector	W/B–M	52	M	A	J–2000	NWC	Captive	Camp Cove	18 Sept
S73232	Reischek	B/R–M	92	M	A	J–2001	NWC	Captive	Camp Cove	18 Sept
S74709	Austin	Y/Y–M	73	M	A	J–2002	Codfish I.	Wild	Camp Cove	20 Sept
S74710	Pete	W/Y–M	53	M	A	J–2002	Codfish I.	Wild	Tucker Cove	18 Sept
S74712	Mistral	R/W–M	45	M	A	J–2003	Codfish I.	Wild	Tucker Cove	18 Sept
S74716	Arwin	M–Y/W	43	F	A	J–2003	Codfish I.	Wild	Tucker Cove	18 Sept
S74720	Puiseux	M–G/W	70	F	A	J–1997	Codfish I.	Captive/wild	Tucker Cove	18 Sept
S74722	Maria	M–G/O	61	F	J		Codfish I.	Wild	Tucker Cove	18 Sept
S74723	Takutai	G/O–M	67	M	J		Codfish I.	Wild	Garden Cove	20 Sept
S74724	Pakake	M–O/R	69	F	A	J–2003?	Codfish I.	Wild	Tucker Cove	18 Sept
S74729	Fred	G/W–M	64	M	J		Codfish I.	Wild	Camp Cove	20 Sept
S74730	Tahi	W/G–M	57	M	A	J–≥2000	Codfish I.	Wild	Garden Cove	20 Sept
S74731	Sheila	M–O/O	71	F	J		Codfish I.	Wild	Tucker Cove	18 Sept
S74732	Bob	G/G–M	62	M	J		Codfish I.	Wild	Garden Cove	20 Sept
S74733	Dolly	M–W/W	65	F	J		Codfish I.	Wild	Tucker Cove	18 Sept
S74735	Titan	O/O–M	74	M	A	J–≥2000	Codfish I.	Wild	Tucker Cove	18 Sept
S74736	Buoy	B/W–M	75	M	J		Codfish I.	Wild	Garden Cove	20 Sept
S80012	Smith	R/Bk–M	54	M	A	J–2003	NWC	Captive	Garden Cove	20 Sept
S80021	Pukaha	W/Bk–M	44	M	J		NWC	Captive	Garden Cove	20 Sept
S80022	Tane	Y/Bk–M	40	M	J		NWC	Captive	Garden Cove	20 Sept
S80024	Richard	B/B–M	12	M	J		NWC	Captive	Garden Cove	20 Sept
S80025	Bernard	M–R/Bk	42	F	J		NWC	Captive	Tucker Cove	21 Sept
S80026	Joanne	M–Y/Bk	19	F	J		NWC	Captive	Camp Cove	18 Sept
S80027	McCleod	Bk/Y–M	22	M	J		NWC	Captive	Tucker Cove	21 Sept
S80028	Rangitane	Bk/R–M	24	M	J		NWC	Captive	Garden Cove	20 Sept
S80029	Laysan	M–G/Bk	27	F	J		NWC	Captive	Garden Cove	22 Sept
S80030	Whenua hou	G/B–M	90	M	J		NWC	Captive	Tucker Cove	21 Sept

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Appendix 1—continued

BAND	NAME	COLOURS	TX	SEX	AGE[a]	JUVENILE YEAR	SOURCE[b]	CAPTIVE/WILD HISTORY	RELEASE SITE	RELEASE DATE
S80031	Helen	M–OB	08	F	J		NWC	Captive	Camp Cove	18 Sept
S80032	Judy	M–W/B	11	F	J		NWC	Captive	Garden Cove	20 Sept
S80033	Geoff	B/O–M	34	M	J		NWC	Captive	Tucker Cove	21 Sept
S80034	Rakiura	O/B–M	60	M	J		NWC	Captive	Tucker Cove	18 Sept
S80035	Glen	O/Bk–M	32	M	J		NWC	Captive	Tucker Cove	21 Sept
S80036	Wendy	M–B/G	46	F	J		NWC	Captive	Garden Cove	22 Sept
S80037	Shaun	B/Bk–M	36	M	J		NWC	Captive/hand	Garden Cove	20 Sept
S80038	Maggie (2)	M–W/Bk	56	F	J		NWC	Captive/hand	Garden Cove	22 Sept
S81441	Isaac	Bk/G–M	48	M	J		P. Springs	Captive	Tucker Cove	21 Sept
S81442	Patu	R/B–M	17	M	J		NWC	Captive	Garden Cove	20 Sept
S81443	Teri	M–Bk/R	51	F	J		P. Springs	Captive	Camp Cove	18 Sept
S81444	Darren	Bk/O–M	50	M	J		P. Springs	Captive	Garden Cove	20 Sept
S81445	Canterbury	Bk/W–M	41	M	J		P. Springs	Captive	Tucker Cove	21 Sept
S81446	Diana	M–O/Bk	07	F	J		P. Springs	Captive	Tucker Cove	21 Sept
S81447	Anne	M–Bk/Y	86	F	J		P. Springs	Captive	Garden Cove	20 Sept
S81448	Ingrid	M–B/B	49	F	J		P. Springs	Captive	Garden Cove	22 Sept

Appendix 2

WEIGHTS OF CAPTIVE AND WILD-CAUGHT TEAL PRIOR TO TRANSFER AND RELEASE ON CAMPBELL ISLAND

TABLE A2.1. SUMMARY OF WEIGHTS (g) OF CAPTIVE CAMPBELL ISLAND TEAL (*Anas nesiotis*) AT PEACOCK SPRINGS ISAAC WILDLIFE TRUST PRIOR TO TRANSFER AND RELEASE ON CAMPBELL ISLAND/MOTU IHUPUKU IN SEPTEMBER 2004.

Weights in *italics* are of birds without 8-g backpack transmitters. All other bird weights (non-italics) include 8-g transmitter weights.

BAND	SEX	AGE[a]	DATE															
			AUGUST			SEPTEMBER												OCTOBER
			3	27	30	1	8	11	12	13	14	17	18	19	20	21	22	9
				24-h CRATE CONDITIONING	24-h CRATE CONDITIONING		TRANSFER DAY (MORNING)	DAY AFTER ARRIVAL ON CAMPBELL I.	ANY PAIRINGS SEPARATED		VACCINATION BOOSTER		1ST RELEASE DAY		2ND RELEASE DAY	3RD RELEASE DAY	4TH RELEASE DAY	CAPTURE FOR MEDIA VIP RELEASE
S81441	M	J	*600*	*575*			*522*	*480*	*470*[c]	460[e]	450[c]	464	–	476	–	480[c]		
S81444	M	J	*500*	*447*			*441*	*411*	*411*	410[e]	409	426	–	440	444[c]			
S81445	M	J	*500*		*480*		475	457	422[c]	–	410[c]	428	–	432	–	433[c]		389
S81443	F	J	*530*		*452*		373[b]	386	–	–	407	413	417[c]					
S81446	F	J	*485*			*434*	413	392	380[c,d]	–	371	371	378	370[c]	379[c]	370[c]		325
S81447	F	J	*520*	*473*			448	408[c]	408	–	411	422	–	405[c]	409[c]			
S81448	F	J	*478*		*427*		413	390	414	–	370	376	376	365[c]	371[c]	367[c]	370[c]	

[a] A = adult; J = juvenile.

[b] Weight decline in female likely to be due to aggression from male S81441 aviary companion (hiding behaviour observed in week leading up to release).

[c] Weights taken prior to a supplementary booster (tube) feed because birds taking little food. All birds given booster feed (20–30 g) before hard release.

[d] Weight decline in female likely to be because she was paired with another female; pair separated.

[e] Two birds fitted with 8-g transmitter/harness on Campbell Island. All other birds fitted with transmitters on 31 August.

TABLE A2.2. SUMMARY OF WEIGHTS (g) OF CAPTIVE CAMPBELL ISLAND TEAL (*Anas nesiotis*) AT PUKAHA MOUNT BRUCE NATIONAL WILDLIFE CENTRE PRIOR TO TRANSFER AND RELEASE ON CAMPBELL ISLAND/MOTU IHUPUKU IN SEPTEMBER 2004.

Weights in *italics* are of birds without 8-g backpack transmitters. All other bird weights (non-italics) include 8-g transmitter weights.

BAND	SEX	AGE[a]	DATE															
			JULY		AUGUST				SEPTEMBER									
			5	26	2	9	16	31	8	11	12	14	17	18	19	20	21	22
			BANDED (JUVENILES)	1ST DISEASE SCREEN	2ND DISEASE SCREEN	TRANSMITTTERS (TX) ATTACHED	COLOUR BANDS FITTED	VACCINATION/ TX ATTACHED	TRANSFER DAY (MORNING)	DAY AFTER ARRIVAL ON CAMBPELL I.	ANY PAIRINGS SEPARATED	VACCINATION BOOSTER		1ST RELEASE DAY		2ND RELEASE DAY	3RD RELEASE DAY	4TH RELEASE DAY
S73225	M	A	–	*471*	*483*	–	*472*	469[c]	488	445	453	446	470	463[d]				
S73232	M	A	–	*505*	*464*	*489*	481	478	482	430[d]	–	429	467	442[d]				
S80012	M	A	–	*466*	*461*	–	*489*	488[c]	494	445[d]	–	410[e]	436	–	445	438[d]		
S80021	M	J	–	*502*	*508*	–	*468*	445[c]	450	415	422	421	428	–	443	440[d]		
S80022	M	J	–	*509*	*520*	–	*490*	?	472	430	430	426	436	–	440	424[d]		
S80024	M	J	*480*	*494*	*503*	*483*	485	427	452	407[d]	421	429	424	–	441	432[d]		
S80027	M	J	*527*	*510*	*504*	*478*	471[b]	401	462	438	–	413	410	421	415	–	422[d]	
S80028	M	J	*558*	*558*	*558*	*518*	498[b]	440	454	423	435	432	440	–	441	432[d]		
S80030	M	J	*595*	*586*	*579*	*558*	549	489	520	453[d]	–	459	471	–	460	–	469[d]	
S80033	M	J	*476*	*451*	*434*	*412*	410	378	394	375	381[d]	378	383	–	361[d]	386[d]	379[d]	
S80034	M	J	*550*	*538*	*500*	*498*	493	397	445	412	414	420	427	–	431	–	429[d]	
S80035	M	J	*584*	*524*	*523*	*488*	475	465	442	405	410	410	416	–	437	–	432[d]	
S80037	M	J	*490*	*472*	*464*	–	*477*	458[c]	442	412	401[e]	419	405	418	415	409[d]		
S81442	M	J	–	*452*	*458*	*477*	493	448	482	429[d]	–	437	444	–	460	460[d]		
S80025	F	J	*444*	*461*	*460*	–	*450*	400[c]	406	387	–	370	355	365	366	369[d]	364[d]	

[a] A = adult; J = Juvenile.

[b] Weights of three birds involved in crate trials on 16 August were taken on 15 August.

[c] Weights of seven birds now include 8-g transmitter/harness. All bird weights on 31 August, therefore, include transmitter/harness weight.

[d] Weights taken prior to a supplementary booster (tube) feed because birds taking little food. All birds given booster feed (20–30 g) before hard release.

[e] Weight declines in five birds likely to be because they were paired with other birds; all pairings separated on 12 September.

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Table A2.2—continued

BAND	SEX	AGE[a]	DATE															
			JULY		AUGUST				SEPTEMBER									
			5	26	2	9	16	31	8	11	12	14	17	18	19	20	21	22
			BANDED (JUVENILES)	1ST DISEASE SCREEN	2ND DISEASE SCREEN	TRANSMITTTERS (TX) ATTACHED	COLOUR BANDS FITTED	VACCINATION/ TX ATTAHCED	TRANSFER DAY (MORNING)	DAY AFTER ARRIVAL ON CAMBPELL I.	ANY PAIRINGS SEPARATED	VACCINATION BOOSTER		1ST RELEASE DAY		2ND RELEASE DAY	3RD RELEASE DAY	4TH RELEASE DAY
S80026	F	J	*481*	*483*	*492*	*479*	476	401	434	395[d]	376[d,e]	405	400	385[d]				
S80029	F	J	*520*	*504*	*498*	*462*	456[b]	391	412	374[d]	358[d,e]	371	371	376	355[d]	360[d]	350[d]	361[d]
S80031	F	J	*539*	*509*	*510*	*498*	477	404	422	380[d]	–	403	379	388[d]				
S80032	F	J	*526*	*499*	*492*	*488*	478	432	447	385[d]	–	387	371	–	382	377[d]		
S80036	F	J	*515*	*482*	*478*	*474*	*461*	436[c]	426	383[d]	374[d,e]	357	399	359[d]	376[d]	366[d]	377[d]	381[d]
S80038	F	J	*433*	*421*	*413*	–	*424*	419[c]	397	369	351[d,e]	347	371	355[d]	363[d]	350[d]	357[d]	359[d]

[a] A = adult; J = Juvenile.

[b] Weights of three birds involved in crate trials on 16 August were taken on 15 August.

[c] Weights of seven birds now include 8-g transmitter/harness. All bird weights on 31 August, therefore, include transmitter/harness weight.

[d] Weights taken prior to a supplementary booster (tube) feed because birds taking little food. All birds given booster feed (20–30 g) before hard release.

[e] Weight declines in five birds likely to be because they were paired with other birds; all pairings separated on 12 September.

TABLE A2.3. SUMMARY OF WEIGHTS (g) OF WILD-CAUGHT CAMPBELL ISLAND TEAL (*Anas nesotis*) FROM CAPTURE ON CODFISH ISLAND (WHENUAHOU) TO RELEASE ON CAMPBELL ISLAND/MOTU IHUPUKU IN SEPTEMBER 2004.

Weights in *italics* are of birds without 8-g backpack transmitters. All other bird weights (non-italics) include 8-g transmitter weight.

BAND	SEX	AGE[a]	DATE																	
			AUGUST										SEPTEMBER							
			13–16	17	18	19	20	21	22	24	27	29	2	4	8	11	14	16	18	19	20
			CATCH DAYS	CATCH DAY (& SCREENING)	CATCH DAY	CATCH DAY	CATCH DAY	CATCH DAY	SCREENING	CATCH DAY (& SCREENING)			VACCINATION	TRANSFER DAY	DAY AFTER ARRIVAL ON CAMPBELL I.	VACCINATION BOOSTER		1ST RELEASE DAY		2ND RELEASE DAY
S48582	M	A		*470*[b]	–	–	–	*450*	–	–	470[c]	–	–	455	505	482	480	485	485[e]		
S48583	M	A	490	485[b]	–	–	–	485	–	–	465[c]	–	–	495	497	490	483	495	512[e]		
S70611	M	A	445	–	395	–	–	–	395	–	–	400	–	405	390	390	417	440	457[e]		
S73208	M	A		440	–	–	–	–	445[b]	–	–	435	–	430	409	445	463	466	–	505	478[e]
S74709	M	A				495	–	–	420[b]	–	–	375	445	450	450	414	449	458	–	481	465[e]
S74710	M	A	440	430[b]	–	–	–	445	–	–	435	–	–	400	420	410	450	456	460[e]		
S74712	M	A	435	–	–	–	–	–	410[b]	–	–	385	410	430	430	405	438	457	464[e]		
S74730	M	A	*395*	*405*[b]	–	–	–	*410*	–	–	380	–	–	400	385	380	420	435	–	424	438[e]
S74735	M	A								*385*[b]	–	425	–	410	405	389	425	455	462[e]		
S74723	M	J						425	?[b]	–	–	395	–	400	390	370	412	430	–	453	435[e]
S74729	M	J					*430*	–	410[b]	–	–	360	450	420	415	400	440	445	–	469	452[e]
S74732	M	J				*415*	–	–	*400*[b]	*415*	–	420	–	410	405	384	410	460	–	469	456[e]
S74736	M	J								415[b]	–	335	–	350	430	397	420	420	434	425	418[e]
S48584	F	A		415[b]	–	–	–	365	–	–	350	–	390	365	380	362	366	373	–	391	410[e]
S73211	F	A	390	–	355	–	–	–	350	–	–	340	350	335	306	347	385	399	–	393	386[e]

[a] A = adult; J = juvenile.

[b] Birds disease-screened on 17, 22 and 24 August. Transmitters attached on 22 and 24 August.

[c] Approximate weight, as bird and bag weight exceeded 500 g scale capacity.

[d] Transmitter dropped in enclosure.

[e] All birds given booster feed (20–30 g) before hard release.

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Table A2.3—continued

BAND	SEX	AGE[a]	DATE																	
			AUGUST										SEPTEMBER							
			13–16	17	18	19	20	21	22	24	27	29	2	4	8	11	14	16	18	19	20
			CATCH DAYS	CATCH DAY (& SCREENING)	CATCH DAY	CATCH DAY	CATCH DAY	CATCH DAY	SCREENING	CATCH DAY (& SCREENING)				VACCINATION	TRANSFER DAY	DAY AFTER ARRIVAL ON CAMPBELL I.	VACCINATION BOOSTER		1ST RELEASE DAY		2ND RELEASE DAY
S73220	F	A					390	–	385[b]	–	–	355	–	365	360	354	371	375	380[e]		
S74716	F	A			*380*	–	–	–	*320*[b]	–	–	335	355	330	335	332	369	367	349[e]		
S74720	F	A				*380*	–	–	350[b]	–	–	380	–	390	415	385	405	392	407[e]		
S74724	F	A								*300*[b]	–	250	–	350	375	335	388	383	399[e]		
S74722	F	J				325	–	–	330[b]	–	–	290	–	335	340	315	338	350	353[e]		
S74731	F	J				*325*	–	–	*330*[b]	*310*	–	310	–	*310*[d]	325	297	334	335	349[e]		
S74733	F	J				*320*	–	–	*330*[b]	–	–	310	–	310	310	304	327	340	336[e]		

[a] A = adult; J = juvenile.

[b] Birds disease-screened on 17, 22 and 24 August. Transmitters attached on 22 and 24 August.

[c] Approximate weight, as bird and bag weight exceeded 500 g scale capacity.

[d] Transmitter dropped in enclosure.

[e] All birds given booster feed (20–30 g) before hard release.

Appendix 3

WEIGHT CHANGES IN CAPTIVE TEAL DURING PERIODS OF CRATE CONFINEMENT PRIOR TO TRANSFER TO CAMPBELL ISLAND

TABLE A3.1. WEIGHTS (g) AND % WEIGHT CHANGES OF CAPTIVE CAMPBELL ISLAND TEAL (*Anas nesiotis*) DURING CRATE CONFINEMENT TRIALS PRIOR TO TRANSFER TO CAMPBELL ISLAND/MOTU IHUPUKU IN SEPTEMBER 2004.

Weights were recorded upon crating and then at 24-h intervals during 48-h and 72-h crate confinement trials. Self-feeding: Y = yes; N = no; U = uncertain.

BAND	SEX	CRATING		WEIGHT						SELF-	COMMENTS
		DATE	WEIGHT	24 h		48 h		72 h		FEEDING	
			(g)	g	% LOSS	g	% LOSS	g	% LOSS		
Crate grille present											
S80020	F	15 June	540	499	–7.6%	468	–13.3%	456	–15.6%	N	Died at c. 72 h
S80021	M	15 June	555	520	–6.3%	488	–12.1%	457	–17.7%	N	
S80022	M	15 June	555	532	–4.1%	499	–10.1%	472	–15.0%	N	
S80023	M	15 June	670	626	–6.6%	595	–11.2%	568	–15.2%	N	Died at c. 72 h
Crate grille absent											
S80021	M	8 Aug	520	503	–3.3%	502	–3.5%	469	–9.8%	Y	
S80022	M	8 Aug	535	498	–6.9%	510	–4.7%	483	–9.7%	Y	
S73225	M	8 Aug	501	475	–5.2%	483	–3.6%	474	–5.4%	Y	
S80027	M	15 Aug	471	463/483[a]	–1.2%	470/484[a]	–0.2%			Y	Tube-fed 24 and 48 h
S80028	M	15 Aug	498	492	–1.2%	465/488[a]	–6.6%			Y	Tube-fed 48 h only
S80029	F	15 Aug	456	444/464[a]	–2.6%	435/440[a]	–4.6%			Y	Tube-fed 24 and 48 h

[a] Weight before and after tube-feeding.

TABLE A3.2. WEIGHTS (g) AND % WEIGHT CHANGES OF CAPTIVE CAMPBELL ISLAND TEAL (*Anas nesiotis*) RECORDED DURING CRATE CONDITIONING PRIOR TO TRANSFER TO CAMPBELL ISLAND/MOTU IHUPUKU IN SEPTEMBER 2004.

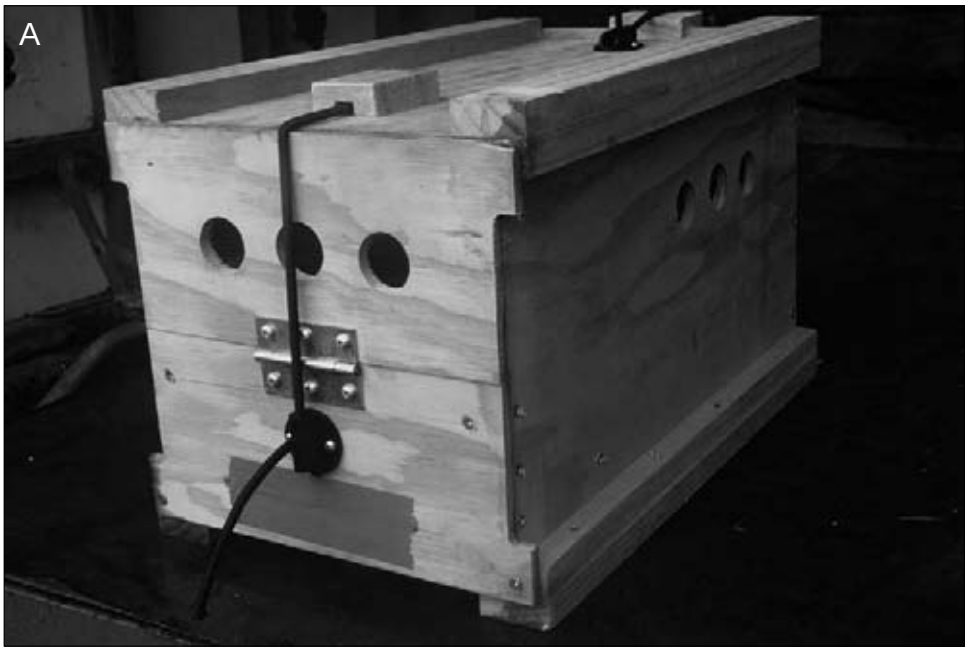
Weights were recorded upon crating and after a 24-h period of crate confinement (conditioning). Self-feeding: Y = yes; N = no; U = uncertain.

BAND	SEX	CRATING		WEIGHT AT 24 h		SELF-FEEDING
		DATE	WEIGHT (g)	g	% CHANGE	
S73232	M	29 Jul	496	472	-4.8	U
S80012	M	29 Jul	465	445	-4.3	U
S80024	M	25 Aug	454	446	-1.8	Y
S80025	F	25 Aug	439	435	-0.9	Y
S80026	F	25 Aug	437	431	-1.4	Y
S80030	M	26 Aug	519	504	-2.9	Y
S80031	F	26 Aug	418	425	+1.7	Y
S80032	F	26 Aug	439	441	+0.5	Y
S81441	M	27 Aug	575	556	-3.3	U
S81444	M	27 Aug	447	437	-2.2	U
S81447	F	27 Aug	473	460	-2.7	U
S80033	M	30 Aug	374	378	+1.1	Y
S80034	M	30 Aug	429	397	-7.5	U
S81442	M	30 Aug	437	448	+2.5	Y
S81443	F	30 Aug	452	428	-5.3	U
S81445	M	30 Aug	480	466	-2.9	U
S81448	F	30 Aug	427	421	-1.4	U
S80037	M	1 Sep	442	437	-1.1	Y
S80038	F	1 Sep	401	399	-0.5	Y
S80035	M	3 Sep	451	444	-1.6	Y
S80036	F	3 Sep	420	422	+0.5	Y

Appendix 4

TRANSPORTATION CRATES

Crates (500 × 250 × 270 mm) used to transport Campbell Island teal (*Anas nesiotis*) from Invercargill to Campbell Island/Motu Ihupuku. A. External; B. Internal.



Appendix 5

PRE-RELEASE HOLDING PEN

Pre-release holding pen (1300 × 650 × 650 mm) for Campbell Island teal (*Anas nesiotis*) on Campbell Island/Motu Ihupuku.