TRAPPING BROWN TEAL: A COMPARISON OF METHODS

By GRANT DUMBELL

ABSTRACT

Over 27 months, 335 Brown Teal were trapped and banded on Great Barrier Island. Four trapping methods were used to trap both solitary and flocking birds in all seasons. The efficiency of the trapping methods is compared, and the study areas and banding scheme are described. The computer program used to generate the colour band combinations is included as an appendix.

INTRODUCTION

The trapping and marking of individuals is an essential consideration in most biological field studies. Trapping methods should efficiently and repeatedly catch study animals, minimise stress and injury, and not selectively sample the unmarked population. These affect the interpretation of results and are problems with all single trapping methods, but using an array of methods can reduce the bias.

Capturing individuals allows morphometric, sex, age and condition data to be collected and provides an opportunity for collecting parasitic and faecal samples. When released, marked animals can be followed through space and time for estimates of many population parameters (Seber 1973).

Four methods were used to make 404 captures of Brown Teal *(Anas aucklandica chlorotis)* on Great Barrier Island (36°11′ S, 175°25′ E). The effectiveness of these methods is compared and the study areas and colour banding scheme are described.

STUDY AREAS AND METHODS

Study areas

The four study areas (Figure 1), all on the east coast of Great Barrier Island, are known Brown Teal roost sites (Ogle 1980). They were chosen for their positions in separate watersheds and for their north-south spread along the island's major axis.

The Awana Valley has large low-lying flats, crossed by shallow drains. It is drained by the tidal Awana Stream which, combined with the large, steep catchment area, promotes flooding at any time of year. The flats are mostly in pasture, with extensive areas of *Juncus* (mainly *J. sarophorus*) and *Cyperus ustulatus*. A large area of lupins *(Lupinus arboreus)* lies behind the beach while scattered clumps of manuka *(Leptospermum scoparium)*, kanuka *(Kunzia ericoides)* and larger trees occur throughout the valley. The streamside vegetation varies from grass to kanuka but is predominantly an association of *Cyperus*, *Juncus*, *Plagianthus divaricatus* and manuka. Some flax *(Phormium tenax)* occurs and a few pohutukawa *(Metrosideros excelsa)* trees are present.

The Whangapoua study area is in the Okiwi basin, a large watershed characterised by an extensive estuarine harbour. The Whangapoua Creek drains the south-eastern part of the basin, which is mostly pasture. It is fringed with kanuka, puriri *(Vitex lucens)*, totara *(Podocarpus totara)*, and kowhai *(Sophora microphylla)*, before running through manuka, *Olearia solandri* and flax scrub, which has a *Juncus* and *Cyperus* understorey. The creek then flows through rush (mainly *Juncus maritimus*), sedge *(Baumea juncea)* and mangrove *(Avicennia resinifera)* zones surrounding the estuary. It is also tidal and can flood heavily.

The Saltwater study area is at the southern end of Medland's Valley. Here the tidal Saltwater Creek is often blocked by a sandbar during summer. Shallow drains cross the largely *Juncus* and *Cyperus* covered flats, and the stream runs along the eastern edge of them with *Juncus* or manuka/kanuka right to the water in most places. Thicker vegetation on the grass areas of stream bank is being promoted by recent fencing.

Harataonga is a small grassy valley surrounded by regenerating manuka. Two tidal streams meet behind the sand dunes, both with little bankside vegetation, other than grass.

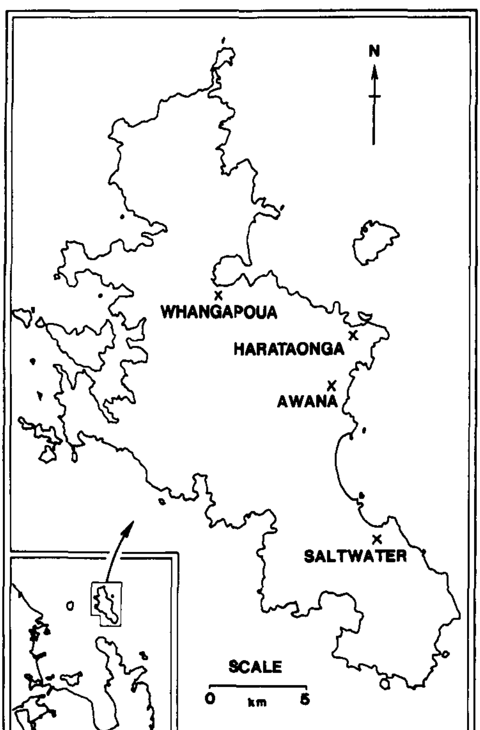

FIGURE 1 — The location of each study area on Great Barrier Island

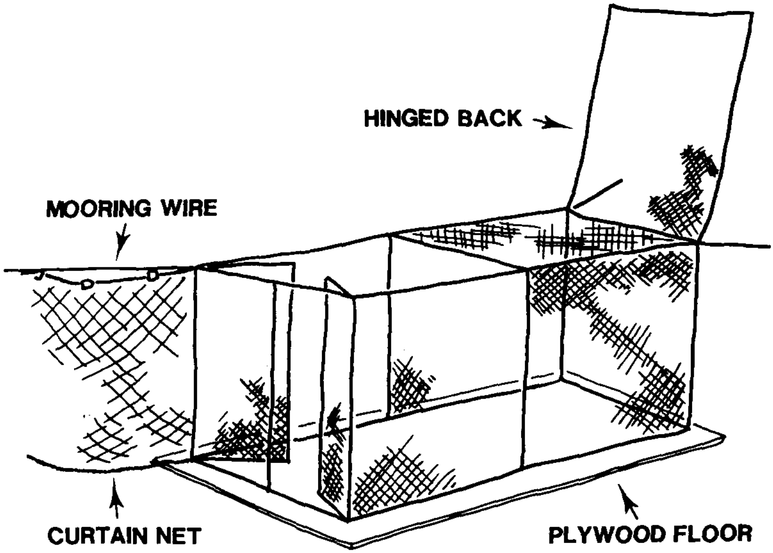

FIGURE 2 — A cage trap with curtain nets in place and back hinged open

Trapping

The main trapping method used a cage (1 m x 1 m x 2 m) moored midstream, with curtain nets angled from the doors to the banks (Figure 2). A plywood floor provided flotation while the sides, top, back and doors were steel frames covered with wire netting. The cage was moored to two taut diagonal wires crossing the stream from bank to bank. These wires also supported the curtain nets, which formed a funnel in front of the cage.

The trap was sited near the birds' roost site. Once on the water, Brown Teal will not leave it, except to take flight, and were driven into the trap by walking slowly along the bank. Trapping attempts were made when the trap floor was flooded with c.200 mm of water.

The birds were familiarised with the trap by removing the back and driving them through it the day before a trapping attempt so that they would recognise it as a thoroughfare. They found their own way back past the cage once the curtain nets were pulled away from the banks.

Next day the curtain nets were restored, the back put in place, and the two overlapping swing doors were set to leave an opening c.200 mm wide. This width opening prevented teal inside the cage from swimming out while others were swimming in. The doors were closed by a nylon monofilament run away from the trap for c.100 m. When as many birds as possible had entered the cage, a pull on the line closed the doors. A vertical steel bar acted as a doorstop and prevented the doors from bursting outward. The doors were then tied shut, the cage was released from its mooring wires and curtain nets, and moved to the bank, where the birds were transferred to bags before banding. To prevent the cage from sinking while it was being moved to the bank, a safety wire was passed through the cage and over one mooring wire.

The second trapping method was to handnet birds feeding at night on the pasture. Birds were spotlighted and caught in a wire netting handnet with a 2 m long handle and a 1 m diameter hoop attached to the end. This pinned the bird to the ground, preventing it from thrashing around and becoming entangled, as it would in a conventional net.

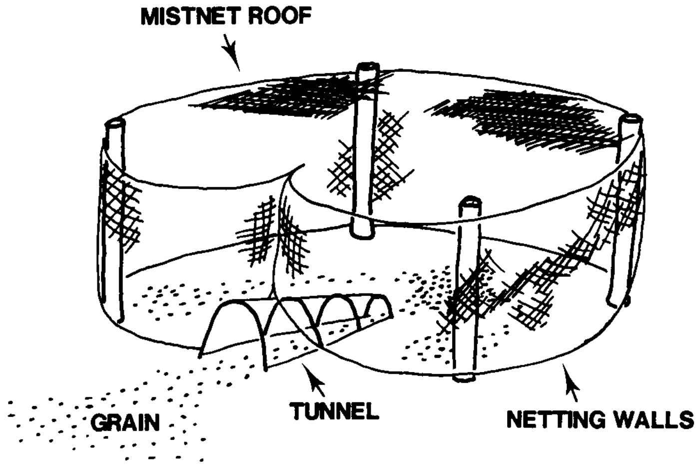

FIGURE 3 — The lilypad trap set for a trapping attempt

The third method was to use a lilypad trap constructed of wire netting walls with a mistnet roof (Figure 3). The near-circular walls enclosed an area c.2 m in diameter and were attached to stakes for rigidity. From where the netting ends were joined a 1 m long wire tunnel protruded into the centre of the trap. It had a 200 mm square entrance that narrowed to 100 m square at the exit. Light steel arches strengthened it and anchored it to the ground.

A trail of wheat led birds into the trap. It began clear of the tunnel entrance, and led to concentrations of grain away from the tunnel exit. Once inside, birds followed the circular walls around and climbed over the tunnel, unable to relocate the narrow opening through which they had entered. The trap was set before dark and cleared at dawn.

For several nights before the trap was set, the trapsite was pre-baited. The trap was gradually built over several days as the birds became used to feeding near the wire netting. Trapping was discontinued in bad weather so as not to hold the birds overnight and prevent them from feeding.

The fourth trapping method was opportunistic. Brown Teal nest very secretively, and the fastest way to find nests was to use a muzzled pointing dog. Birds were often found roosting in thick vegetation, and most were captured by hand. Where possible, sitting females were also captured.

Banding

The basis of each band combination was an L-sized stainless steel band (Cossee & Robertson 1982) on the left leg of females and on the right leg of males. The colour band position above the metal band designated the study area in which the bird had been banded. The metal band was then wrapped in reflective Scotchlite tape of the same colour so that it appeared as a colour band and could be seen at night. The double colour on one leg meant birds could be assigned to a subgroup of the banded population if the full combination could not be read. In combinations where no colour band appeared above the metal band, the metal band was wrapped in silver tape. As the metal band was heavier than the plastic colour band, the metal band was never placed above a colour band.

Each bird's second leg carried one or two colour bands. These formed a unique combination for each site colour and were repeated for each site. They were never formed by two bands of the same colour, which would have led to confusion with the double-colour site code on the other leg.

The bird's short legs prevented the use of standard 10 mm colour bands, and so all colour bands were moulded from 7 mm strips of Darvic plastic. They had an internal diameter of 10 mm with two and a half wraps and could not slip over or inside the 11 mm metal band. Band migration was further reduced by winding colour bands on the bird's leg in opposing directions. The colours used were blue, green, lime, orange, red, white and yellow, while the Scotchlite tape colours used were green, red, silver, white and yellow. Black bands were not used as they did not contrast sufficiently with the bird's slate-grey legs.

A total of 784 colour combinations was available within the limits of this banding scheme and the complete list of combinations was generated by a BASIC computer program. This program (Appendix) is easily modified to suit the boundary conditions of other banding schemes.

RESULTS

Between November 1984 and January 1987, 404 captures were made for 335 birds to be banded, including two birds that had been banded in October 1976. The cage traps allowed a large number of birds to be banded quickly, and was achieved when 90 birds were banded in 5 days, including 34 in one trapping attempt. This method (Table 1) made 220 captures (55%). However, it suffers from trap shyness as the birds learn to avoid the trapsite.

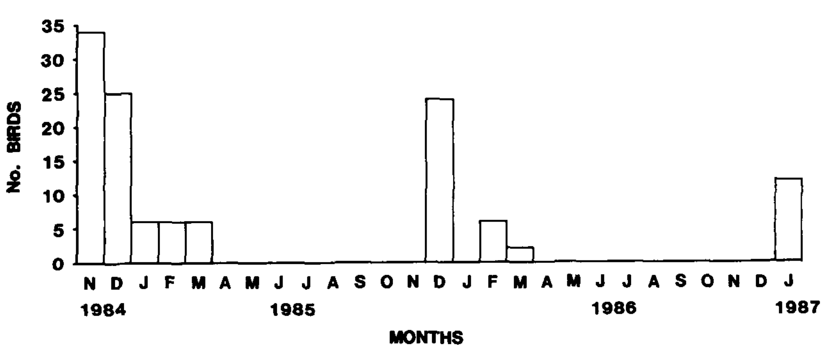

FIGURE 4 — Histogram showing the highest number of birds cage trapped each month

The highest number of birds caught each month, in any trapping attempt (Figure 4), declined rapidly each summer. Trapping success was initially high in 1985/86 but dropped more rapidly, and to a lower level, than in 1984/85. Likewise, the initial trapping success each year declined, because of experienced birds in the flock.

By spotlighting and handnetting, trapping was continued after the birds had begun to avoid the cage traps. Experienced birds again learnt to avoid being trapped, by avoiding the spotlight, and this problem is reflected in the low rate of recaptures for these two methods (Table 2).

The major value of the lilypad trap is its ability to retrap birds, and 61% of all recaptures were made in it. This is 3.5 times higher than any other method. It has also yielded the most multiple recaptures (Table 2). Trap avoidance is much less of a problem as 36% of the 42 recaptures were on successive nights while 57% were within three nights. Although this trap does not catch large numbers of birds, it does consistently catch birds, unlike the cage traps.

TABLE 1 — A breakdown of captures from each study area and each trapping method

	TRAPPING METHOD				
STUDY AREA	Cage Trap	Handnet	Lilypad	Dogs	Total
Awana	66	71	73	34	244
Whangapoua	77	0	0	0	77
Saltwater	77	0	0	2	79
Harataonga	0	0	0	4	4
TOTAL	220	71	73	40	404

TABLE 2 — A dissection of the total captures from each trapping method

	TRAPPING METHOD				
	Cage Trap	Handnet	Lilypad	Dogs	Total
Total Captures	220	71	73	40	404
No. First Captures	213	59	31	32	335
No. Recaptures	7	12	42	8	69
% Recaptures	3.2	16.9	57.5	20.0	17.1
No. Multiple Recaptures	0	1	19	3	23
% Multiple Captures	0	1.5	26.0	7.5	5.8
Sex Ratio F:M	1.1:1	1.2:1	0:4.1	1.9:1	1:1

During winter, the birds disperse from the roost to breed. Using dogs is the only practical method of capturing birds during this time, although it is time consuming and yields fewer captures. The recapture rate is, however, comparable to the rate for the cage traps and handnet.

The Lilypad trap is the only method that has captured a biased sex ratio (Table 2, $X^2 = 8.39$, $p < 0.05$). However, the overall sex ratio, for all 404 captures, does not differ significantly from 1:1 ($X^2 = 0.02$, $p > 0.05$), which is consistent with regular counts of both males and females at the Awana roost site.

None of the 65 recaptures was made outside the study area in which the first capture was made. This includes the two 1976 birds, which were not considered as recaptures for this study.

DISCUSSION

Leg bands were the only form of marking used. Nasal saddles (Patterson 1978) were rejected as birds with nasal saddles may survive less well than birds without nasal saddles (T. Caithness, pers. comm.). Patagial tags (Patterson 1978) were also rejected because they can be preened into the birds' plumage, making them unreadable. These alternative marking methods are useful when birds have their legs obscured, but leg band combinations can be accurately read on Brown Teal even when they are swimming.

These trapping methods efficiently, repeatedly, and without injury captured birds in all seasons. No resighted or recaptured bird had shed its metal band, but because colour band loss has been recorded, interpreting the resightings of birds that had only one of a possible two bands forming the combination is a problem. A bird having only one band may have been banded with one band or have lost one of its original two bands. This possible misidentification argues for the exclusion of single 1-1 band combinations, which would result in 14% fewer combinations in this banding scheme. This could be recovered by using an eighth colour.

Scotchlite tape (Carrick & Murray 1970) is not widely used. Its main advantage is to turn the metal band into a colour band, which could be very useful in banding schemes restricted by a limited range of colours, as with Saddlebacks (*Philesturnus carunculatus*, T. Lovegrove, pers. comm.) and Bellbirds (*Anthornis melanura*, J. Craig, pers. comm.). It can also be used to convert unicolour bands into bicolour bands. No resighted or recaptured bird showed any sign of losing its tape. To guard against abrasion the tape encircled the metal band twice. If the upper layer wore off, the lower layer still showed the colour. Although the tape must be removed to read the metal band, this small inconvenience is outweighed by the advantages.

The main advantage of the appended computer program is that it can be run on a home computer, unlike other published programs (Buckley & Hancock 1968). While this guarantees an error-free list of band combinations, it does not prevent the error of using combinations more than once. This leads to ambiguous identifications, and affected 3% of birds banded in this study.

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APPENDIX

This program is essentially three nested counting loops. Each loop is reset to zero after it has used all available band codes, which are the initial of each colour. With eight band codes, each loop counts in base eight. Each combination has four positions, one of which is reserved for the metal band. This invariant position (M) is used to terminate and reset each loop. The other three positions are for colour bands. The first (F) position is opposite the metal band and below the second (S) position. The third (T) position is above the metal band and is the site colour. The S and T positions can be vacant, and so a blank band code is introduced in line 30. However, if a band is always required in the S position, the S counter in lines 10 and 210 must be set to one. If a band is also required above the metal band, the T counter in line 10 must also be set to one. The combination counter (C) is included so that the number of combinations generated can be checked against any permutation calculations done. If other colours are used, the array (lines 20 to 110) must be altered, and if further positions are required, further loops can be inserted and the printing instructions (lines 150, 160) expanded. Twelve REM statements are included to help with program dissection. These can be deleted for programming economy.

```
5   REM COUNTERS SET TO ZERO
10  C=0:F=0:S=0:T=0:M=8
15  REM DIMENSION ARRAY FOR COLOUR CODES
20  DIM B$(8)
25  REM SETTING COLOUR CODES AS ARRAY ELEMENTS
30  B$(0)=" "
40  B$(1)="B"
50  B$(2)="G"
60  B$(3)="L"
70  B$(4)="O"
80  B$(5)="R"
90  B$(6)="W"
100 B$(7)="Y"
110 B$(8)="M"
115 REM FIRST BAND POSITION COUNTER
120 F=F+1
125 REM ILLEGAL COMBINATION CHECKS
130 IF F=M THEN 180
140 IF F=S THEN 120
145 REM PRINTING COLOUR COMBINATION
150 ? B$(T);B$(M);"-";B$(S);B$(F),
160 ? B$(S);B$(F);"-";B$(T):B$(M)
165 REM COMBINATION COUNTER
170 C=C+2:GOTO 120
175 REM SECOND BAND POSITION COUNTER
180 S=S+1:IF S=M THEN 200
185 REM RESET FIRST BAND POSITION COUNTER
190 F=0:GOTO 120
195 REM THIRD BAND POSITION COUNTER
200 T=T+1:IF T=M THEN 220
205 REM RESET SECOND BAND POSITION COUNTER
210 S=0:GOTO 190
215 REM TOTAL COMBINATION MESSAGE
220 ?
230 ? "THERE ARE ";C;" INDIVIDUAL"
240 ? "COMBINATIONS AVAILABLE"
250 END
```