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The use of wing remains to determine condition before death in brown teal (*Anas chlorotis*)

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Abstract Little is known of the causes of mortality in captive-bred brown teal (*Anas chlorotis*) released to the wild. To test whether feeding difficulties have contributed to the poor survival of released birds, we developed a method to detect starvation using the wing fat content of brown teal. We extracted the lipids from 4 outer wing components of 17 intact brown teal carcasses. The lipid content of each component reflected the birds' nutritional condition (based on body mass and size, and visible fat). Lipids were also extracted from the outer wing components of 7 partial brown teal carcasses, 6 of which were from captive-bred released birds whose cause of death could not be determined. All of the released teal were found to have been in very poor nutritional condition immediately before death, implicating starvation as a factor in their deaths. Improving the feeding regime of captive-bred brown teal (pre- and post-release) is likely to increase their survival.

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INTRODUCTION

New Zealand's brown teal (*Anas chlorotis*) has recently been recognised as an endangered species (Birdlife International 2000). Efforts to save the species include releases of captive-bred birds to establish new populations. Between 1968 and 1999 more than 1,700 captive-bred brown teal were released into the wild (Dumbell 2000), but few self-sustaining populations were established (Moore, unpubl. data). The failure of the releases has been variously ascribed to predation by introduced mammals (Greene 1996; Hayes 1994), dispersal (Hayes & Williams 1982; Dumbell 1987; Dumbell 1996), shooting (Hayes & Williams 1982; Dumbell 1987; Hayes 1994), and poor habitat at release sites (Hayes 1994).

In 2000, 2001, and 2002, 66 captive-bred brown teal were released at 4 sites that are free of introduced mammalian predators and where shooting is prohibited: Karori Wildlife Sanctuary (41°18'S, 174°44'E), Kapiti Is (40°50.5'S, 174°56'E), Mana Is (41°05'S, 174°47'E), and Tiritiri Matangi Is (36°60'S, 174°90'E). All birds released on Kapiti and Mana island and in Karori Wildlife Sanctuary were wing-clipped or pinioned to reduce dispersal. Between 6 and 10 of the 20 teal released on Kapiti died within the 1st 2 months post-release, as did either 2 or 3 of the 17 birds released on Mana (Moore 2002), and at least 3 of the 11 teal released on Tiritiri Matangi. Most of the recovered carcasses were partial because of predation or scavenging before recovery and the cause of death could not be established. Of the 2 intact carcasses recovered, 1 bird had become trapped in *Muehlenbeckia* spp. and starved; the other bird had not been entangled but had also died of starvation. Three carcasses were recovered from the Karori Wildlife Sanctuary; 1 carcass was intact and a necropsy found that this bird had also starved (Empson 2001).

Poor nutritional condition could also have been a factor in the deaths of other released teal, for which only partial carcasses were recovered. Poor condition may lead to death directly by starvation, or indirectly by increased risks of predation and exposure as birds with depleted fat reserves become

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lethargic (Ringelman *et al.* 1992) and eventually immobile (Cherel *et al.* 1988).

Newton (1993) defined condition as the current status of an animal's metabolic reserves relative to likely demands. Birds store nutritional fuel as fat, protein and carbohydrate, but by far the largest body fuel reservoir is fat (Cherel *et al.* 1988) which thus is often used as an indicator of condition (Woodall 1978; Owen 1981; Gauthier & Bédard 1985; Ringelman & Szymczak 1985). As a bird fasts it increases its use of fat, sparing its protein stores, but in the final stages of a fast, when most fat stores are exhausted, protein is increasingly used (Thouzeau *et al.* 1997). It is this final loss of protein (which is needed for body structure, muscle function, and enzymes) that limits survival in starvation (Cherel *et al.* 1998).

Strong relationships between the fat content of the wing and overall body condition have been demonstrated in waterfowl (Hutchinson 1984; Jeske *et al.* 1994; Ringelman *et al.* 1992) and waders (Guglielmo & Burns 2001). This study investigates the use of wing remains as indicators of condition in brown teal, and uses these indicators to estimate the condition of captive-bred released teal recovered as partial carcasses from Tiritiri Matangi, Kapiti, and Mana islands and Karori Wildlife Sanctuary. Determining whether poor condition was implicated in the deaths of these released teal could help identify the relative importance of starvation in the failure of previous releases, allowing managers to refine release techniques and improve teal survival at future releases.

METHODS

The brown teal is a protected species and this research was done under a permit from the New Zealand Department of Conservation. All carcasses used were from birds found dead by members of the public or by Department of Conservation staff.

Morphology

Morphometric data were collected from the carcasses of 56 wild-bred adult brown teal from Great Barrier Is (44), Little Barrier Is (2), and Northland (10). Morphometric data were also gathered from 24 captive-bred adult birds, both from live birds before release (12), which were measured by Mt Bruce National Wildlife Centre staff, and from the intact carcasses of birds that had died in captivity (5) or after release (7). As some carcasses were not intact, a complete set of measurements could not be collected for all birds, so sample sizes vary in different analyses.

We sexed the carcasses by plumage and inspection of the gonads. National Wildlife Centre staff sexed the live captive birds by cloacal examination. Two females were gravid and were excluded from the analysis, as was a female with a brood patch. Bill length and tarsus were measured with calipers (± 0.1 mm), wing length of the straightened and flattened wing was measured with a steel rule (± 1 mm), and body mass with a Pesola® balance (± 1 g). Wing lengths of birds with broken wing tips or moulting primaries were excluded from the analysis.

As well as using single morphometric measures in analyses, we also calculated an index of body size (the size Principal Component) using the 1st factor from a Principal Component Analysis of the correlation matrix of bill length and tarsus (an accurate wing length could not be obtained for one of the intact carcass birds used in wing fat analyses). This 1st factor explained 74.3% of the size variance (component loadings; 0.862 bill length, 0.862 tarsus).

We assessed the condition of the carcasses visually, noting the amount of subcutaneous and abdominal fat, and size and shape of the pectoral muscle. We assigned teal to one of 3 condition categories: good (visible subcutaneous fat, ranging from little to very much), poor (no visible fat), and starved (no visible fat, shrunken breast muscles with a protruding keel).

Wing fat analysis

Seventeen intact adult brown teal carcasses and 7 partial carcasses were used for wing fat analysis (Appendix 1). All of the intact carcasses were obtained from Department of Conservation freezers, except the 2 captive birds which were supplied by brown teal breeders. The amount of information about the carcasses varied, so we did not know the date found or cause of death for some birds. We selected the carcasses to include equal numbers of males and females. There were few intact carcasses of birds with no visible fat deposits, so all found were included for analysis to ensure that the indicators developed would be applicable to birds with little carcass fat. Carcasses and wings were stored frozen. Although all of the wild birds included in the analysis were fresh carcasses, 2 of the released birds (individuals 19 and 22) were recovered in a state of partial decomposition.

For each bird, we plucked the contour feathers and the alula from both wings, and separated the outer wings from the carcass at the junction of the metacarpals with the radius and ulna (including the carpals with the outer wing). We dissected out both ulnae and removed any adhering tissue. Each ulna was then broken into 3 sections using wire-cutting pliers to gain access to the bone marrow. The outer wings were prepared in 2 ways: 1, *plucked wing* – the primary flight feathers were plucked; 2, *cut wing* – the flight feathers were trimmed away where they met the wing flesh

Table 1 Significance values from multiple linear regressions of percentage wing fat against body mass and various size measurements for brown teal (*Anas chlorotis*). Size PC is the 1st factor from a Principal Component Analysis on the correlation matrix of bill length and tarsus. Strongest relationship for each wing fat measure in **bold**.

Variable				
Dependent	Independent	P	R^2	n
Ulnar fat	Mass + Bill length	0.004	0.571	16
	Mass + Tarsus	0.008	0.526	16
	Mass + Wing	0.078	0.371	14
	Mass + size PC	**0.004**	**0.577**	**16**
Plucked wing fat	**Mass + Bill length**	**0.012**	**0.467**	**17**
	Mass + Tarsus	0.033	0.385	17
	Mass + Wing	0.154	0.268	15
	Mass + size PC	0.029	0.398	17
Cut wing fat	**Mass + Bill length**	**<0.001**	**0.714**	**17**
	Mass + Tarsus	0.003	0.567	17
	Mass + Wing	0.018	0.486	15
	Mass + size PC	0.001	0.647	17
Shafts fat	**Mass + Bill length**	**0.004**	**0.545**	**17**
	Mass + Tarsus	0.009	0.491	17
	Mass + Wing	0.033	0.434	15
	Mass + size PC	0.010	0.482	17

using scissors, and the embedded shafts were removed by cutting along the line of their bases in the tissue with a scalpel. The cut shafts were kept separately for weighing and fat extraction, and are referred to as shafts in the analysis.

We alternated whether the left or right wing was cut or plucked for each bird, using a list of specimens ordered by the source location of the birds, ensuring an even spread of left and right wings across the plucked and cut wing samples.

This provided us with 5 samples (left ulna, right ulna, plucked outer wing, cut outer wing, cut feather shafts) for 22 of the birds. Two of the released birds had been pinioned (individuals 21 and 22) so only 3 samples could be obtained for these birds (left and right ulnae, plucked outer wing).

Samples were weighed fresh (± 0.0001 g) in labeled, pre-weighed aluminium foil dishes, then dried in 60°C ovens. After cooling in a desiccator, samples were reweighed, and the process was repeated until all had achieved a constant mass (10-18 days, mean 13).

During the final reweighing we noted which ulnar samples had left greasy marks on their paper labels, making the paper appear transparent (similar to Ringelman *et al.*'s 1992 blot test). An ulnar paper-fat score of 0 was given if there was no visible fat on the label, 0.5 for 1 bird with a tiny fat spot, and 1 for birds that had extensive spotting or pooling on the label. The ulnar paper-fat score was recorded for 21 individuals.

Samples were then packed into individual filter-paper 'envelopes' and the fat was extracted using a Soxhlet® apparatus, with petroleum ether as the solvent. The Soxhlet® apparatus was run during the day, and samples were left soaking in ether overnight, before flushing at least 4 times the following morning. The fat extractions ran for 20 h or longer. After extraction, samples were redried for 18-24 h at 60°C, cooled in a desiccator, and weighed. Tray weights were subtracted from the fresh and dry weights, and fat mass was calculated as the difference between the dry mass and the fat-free dry mass. Percentage fat was calculated as fat mass/dry mass × 100, and was arcsine transformed before analysis. Data were analysed using Systat 10 (SPSS Inc.).

Four birds (from road accidents) had 1 ulna broken before analysis. For these birds only the fat values from the unbroken ulnae were included. One bird had both ulnae broken, and was not included in the ulnar fat analyses. For the remaining 19 birds, percentage fat values for right and left ulnae were highly correlated (Pearson's r = 0.98), so we used the average value for the left and right ulnae.

RESULTS

Body mass and size

Across all the complete carcasses, body size had a significant influence on body mass (regressions of body mass against size measurements; v. tarsus $P < 0.001$, $R^2 = 0.221$, $n = 57$; v. wing $P = 0.003$, $R^2 = 0.170$, $n = 51$; v. size PC, $P < 0.001$, $R^2 = 0.221$, $n = 54$; v. bill $P = 0.019$, $R^2 = 0.102$, $n = 54$). Log transforming the mass and size measurements did not improve the relationships. It was not surprising that relatively little of the variation in body mass was explained by body size, as the samples included captive-bred and wild individuals, from throughout the year and with a wide range of nutritional condition. There was also some evidence that captive-bred birds may grow differently from wild birds. Although female teal are generally smaller than males (Dumbell 1987), we found that the tarsus lengths of captive-bred female teal were as large as those of male captive teal (means 40.9, 41.0 mm, female and male captive birds, respectively, as against 39.7 and 41.5 mm for wild birds; ANOVA, sex*source status interaction, $F_{1,69} = 5.632$, $P = 0.020$), suggesting that tarsus length is not a good size measure for captive teal. The other size measures were not affected by the source of the birds. Nevertheless, in wing fat analyses (below) we repeated analyses with all 4 body size measures (bill length, tarsus, wing length, size PC), as not all measurements were available for all birds.

Wing fat

To determine whether the fat content of the four wing components reflected the relative body mass of the complete carcass birds, we performed

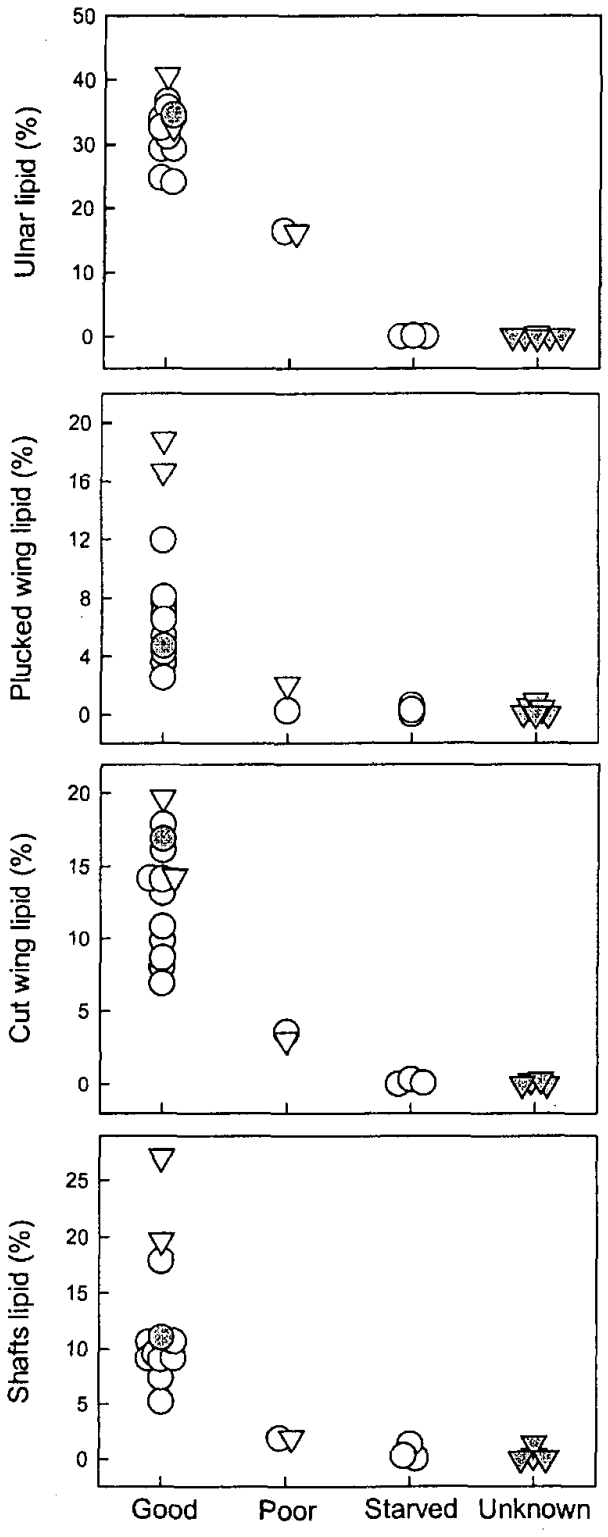

Fig. 1 Wing fat content of brown teal (*Anas chlorotis*) in relation to visually-assessed body condition. Hollow circles, complete carcass wild birds; filled circle, partial carcass wild bird; hollow triangles, complete carcass captive-bred birds; filled triangles, partial carcass captive-bred birds. Unknown, partial carcasses of captive-bred brown teal released into the wild whose condition could not be assessed visually. As 2 captive-bred released birds had been pinioned, sample sizes are smaller for cut wing and shafts lipids.

multiple linear regressions of wing fat against body mass plus each of the size measurements (Table 1). All 4 wing fat measures were positively related to body mass, and the best model for each component explained between 47% and 71% of the total variation in wing fat content. Bill length and mass explained the highest proportion of variation for 3 of the 4 wing fat components (and came a very close 2nd for the 4th component).

Even when size is accounted for, body mass is only a coarse indicator of nutritional condition (Gauthier & Bédard 1985). There is substantial variation in mass for a given body size among teal, and individuals in poor condition may not always be detectable from a simple analysis of body mass and body size. Accordingly, we used ANOVA and Bonferroni post-hoc tests to determine whether wing fat reflected the apparent condition of brown teal based on our visual assessments of carcass condition (as either good, poor, or starved). Visual fat assessments, based on subcutaneous fat, are frequently used in studies of small to medium sized birds (see Rogers 1991). These 'condition' categories alone explained between 37% and 91% of the variation in wing fat content (Table 2), confirming that wing fat content is a good indicator of the nutritional status in brown teal (although the 3 categories could not be distinguished using the fat content of the plucked wing component). Ulnar fat content varied between all 3 categories. For cut wings, the poor and starved categories did not differ in wing fat, whereas shaft wing fat content differed only between the good and starved categories.

Finally, we plotted the wing fat content for the 6 released birds whose partial remains were retrieved from the field (numbers 19-24, Appendix 1), alongside the individuals in the 3 condition categories (Fig. 1). The fat content of the released birds corresponded unequivocally with birds in starving or poor condition. An incomplete carcass (a road-kill) from Great Barrier Is (individual 7) grouped with birds in good condition.

Given the strength of the relationship between ulnar fat and body condition based on visual fat, we also tested whether the presence of fat spots on the paper labels used when drying the ulnae related to the actual fat content in the bones. This basic assessment proved to be highly related to the true fat content of the ulna ($F_{2,18}$ = 191.5, P < 0.001, R^2 = 0.955; Fig. 2).

DISCUSSION

Bone marrow fat has been used or suggested as an indicator of whether birds are under severe nutritional stress (Hutchinson 1984; Ringelman *et al.* 1992; Thouzeau *et al.* 1997). Bone marrow fat, however, is one of the body's last fat reserves to be used during a fast or starvation, so reasonable

Table 2 Analysis of variance tests of wing fat content in relation to visually-assessed condition categories for brown teal (*Anas chlorotis*). Bonferroni post-hoc tests were used to determine which categories differed in wing fat content. Different categories, categories in parentheses did not differ from each other.

Wing component	*df*	*F*-ratio	*P*-value	R^2	Different categories
Ulna	2,14	68.351	< 0.001	0.907	good + poor + starved
Plucked	2,15	4.382	0.032	0.369	none
Cut	2,15	19.582	< 0.001	0.723	good + (poor + starved)
Shafts	2,15	7.381	0.006	0.496	good + starved

marrow fat levels do not necessarily prove that a bird was in good condition (Mech & DelGiudice 1985). Hutchinson (1984) found that waterfowl that were not dying of starvation had 20-40% marrow fat, but that once total body fat dropped below 20% ulnar fat was rapidly used and that levels of 1% ulnar fat or less indicated starvation. Our results (Fig. 1) fit with Hutchinson's findings with birds we classified as in good condition having 24-41% ulnar lipid, while poor and starved birds had 16% or 0%, respectively. This suggests that the birds we visually classified as in "poor condition" (including a captive-bred bird released in Northland), were in the early stages of starvation.

We also analysed the fat content of the other outer wing components to see whether they would provide additional information (Guglielmo & Burns 2001). Although fat content of the cut wing had the best relationship with body mass (Table 1), all 3 outer wing fat measures showed the same pattern of change with relative condition as ulnar lipid (Fig. 1). The 2 birds with by far the largest visual fat deposits (individuals 16 and 17, 2 captive-bred birds that died in captivity) had the highest plucked wing and shaft fat content. Individual 17 also had the highest ulnar and cut wing fat content (Fig.1, hollow triangles, good condition). The results of all of the wing fat components indicate that the 6 "unknown" released birds were in very poor nutritional condition at the point of death.

Starvation is not the only cause of extremely low lipid levels in waterfowl. Lead poisoning can cause chronic weight loss and death within weeks (Sanderson & Bellrose 1986). However, waterfowl shooting is not permitted on Great Barrier Is (one of the teal used in our wing fat analysis had been illegally shot by a visiting high school student, but this was an isolated incident) and no recreational shooting is permitted on Tiritiri Matangi, Kapiti, and Mana islands or in the Karori Wildlife Sanctuary, so it is very unlikely that the low lipid levels we observed were caused by lead poisoning.

The results of the wing fat analysis on the partial remains of released birds indicate that all 6 birds starved. However, 2 of the partial carcasses (individuals 19 and 22) were partially decomposed, which could have affected their lipid levels. Individual 19 was seen alive on 6 Aug 2001; when next checked on 26 Aug the desiccated scavenged remains were found, so the carcass may have been up to 20 days old. Individual 22 was found in a stream, and although the flesh was intact and feathers were still attached to the body, feathers slipped off when the carcass was handled and it had a strong, unpleasant smell. Ringelman *et al.* (1992) found that percent ulnar lipid was not related to the apparent freshness of wings in mallards (*A. platyrhynchos*), in winter in the cold dry San Luis Valley, Colorado. These conditions are not likely to be applicable to individual 22. When we opened individual 22's ulnae, they contained a watery reddish material, as did the ulnae of the "starved" condition birds (also observed by Hutchinson 1984 in starved waterfowl). The apparent similarity in ulnar contents suggested to us that individual 22's ulnae were suitable for analysis and should be included. However we cannot rule out the possibility that this was a result of decomposition.

Other evidence that individual 22 was in poor nutritional condition before death came from the carcass itself. When the bird was released it weighed 556 g; when the carcass was retrieved (minus its head) it weighed 408 g. We weighed the only brown teal head available to us at the time, that of a large male (40 g), and even if individual 21 had an equivalently large head, its total carcass weight at death would have been 448 g, which indicates a loss of 19% of its body weight in the 24 days since release.

All 7 of the captive-bred released teal used in the wing-fat analysis (6 incomplete carcasses, 1 complete carcass) were in poor nutritional condition immediately before death. Autopsies on the carcasses of 2 other captive-bred released teal indicated that they had starved to death (Empson 2001; Moore 2002). It is most likely that some sort of feeding difficulties caused the deaths of these birds. Although female waterfowl may become extremely emaciated or even starve during incubation (Ankney 1977) none of the teal was believed to be breeding. Eight of the 9 were recovered dead within 6 weeks of release (the date of recovery for individual 18 was not recorded).

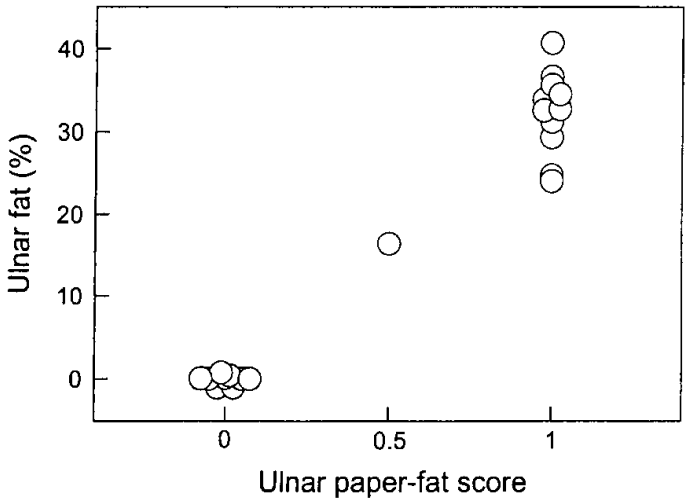

Fig. 2 The relationship between brown teal (*Anas chlorotis*) ulnar fat and ulnar paper-fat score (n = 21). See Methods for details.

For 5 of the 7 captive-bred released teal used in the wing fat analysis, it is not known if starvation or predation was the immediate cause of death. The carcass of individual 24 was still warm when it was recovered from a feeding harrier (*Circus approximans*) (R. Thorogood, pers. comm.), while the bird released in Northland had neck wounds likely to have been caused by a predator. Nevertheless, poor condition is implicated in the deaths of all 7 birds. Wing fat analysis on the partial carcasses of 5 wild juvenile brown teal, recovered during a drought on Great Barrier Is in late 2002, indicated that the wild juveniles were also in extremely poor condition (S.J.M, unpubl. data).

Captive-bred animals released to the wild may have feeding difficulties as a result of behavioral deficiencies (Snyder *et al.* 1996), or may be unable to adequately absorb the nutrients available from wild foods. Several studies have found differences in gut morphology of birds fed predominantly soft foods in captivity, compared with the same species (or even the same birds) when on a higher fibre or wild diet (Miller 1975; Piersma *et al.* 1993). Liukkonen-Anttila *et al.* (1999) suggested that because of the physiological and morphological differences between captive-reared and wild grey partridges (*Perdix perdix*), an abrupt change from a commercial to a natural diet affected the captive-reared partridges' survival, and a previous study (Putaala & Hissa 1993) found that captive-reared partridges were vulnerable to starvation after release to the wild. Whether released captive-bred teal are more likely to die of starvation than wild teal could be tested by capturing wild birds and releasing them plus captive-bred birds at a new site, and comparing the survival of the 2 groups. If feeding difficulties cause higher mortality in captive-bred teal, providing captive teal with a diet that more closely resembles that of wild teal, trialing soft release methods, and providing released teal with suitable supplementary food could all help increase their survival.

We found a very strong relationship between ulnar paper-fat score and percentage ulnar fat (Fig. 2). For future recoveries of brown teal carcasses, retrieving the ulnae and using them to obtain an ulnar paper-fat score is likely to provide the information required for management purposes in an easy and inexpensive manner. For fuller analyses of the type carried out here, weighing wing samples to 0.001 g or 0.01 g would be sufficient. Shafts were the smallest component used in our analysis; the minimum dry weight of the smallest shaft was 0.2817 g, of which 0.0001 g was fat. Thus using 0.01 g would have affected only a small number of values and not changed the overall conclusions.

Finally, although ulnar lipid levels have proven a useful tool for assessing brown teal nutritional condition, they cannot be used for all bird species. In some bird species, the marrow of various bones has been replaced by air sacs (Hutchinson 1984). However, fat levels in other outer wing or leg components could still prove useful as condition indicators for these species.

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Appendix 1 Source details and morphometrics for brown teal (*Anas chlorotis*) used in wing fat analyses. Birds from Great Barrier Is were wild-bred; all others were captive-bred. See Methods for definitions. Mass, body mass (g); VS, visual score.

						Length (mm)				
Bird	Carcass	Location	Date	Sex	Mass	Bill	Tarsus	Wing	VS	Comments
1	Whole	Great Barrier Is	3 Dec 95	Female	615	41.5	42.0	191	Good	Shot
2	Whole	Great Barrier Is	2 May 99	Female	455	42.1	40.8	190	Good	Road fatality
3	Whole	Great Barrier Is	6 Jun 00	Female	595	42.4	40.3	206	Good	Throat wound
4	Partial	Great Barrier Is	14 Dec 00	Female		40.9	38.9	205	Good	Road fatality, abdomen missing
5	Whole	Great Barrier Is	5 Oct 01	Female	468	39.1	39.7	198	Good	Road fatality
6	Whole	Great Barrier Is		Female	285	42.2	40.9	201	Starved	No visible fat, keel protruding, extremely thin
7	Whole	Great Barrier Is		Female	395	39.4	39.6	206	Poor	Road fatality
8	Whole	Great Barrier Is	21 Dec 96	Male	415	46.5	43.1	173	Starved	Road fatality. No visible fat, keel protruding, very small breast muscles
9	Whole	Great Barrier Is	24 Jan 97	Male	490	38.2	39.2	215	Good	Road fatality
10	Whole	Great Barrier Is	17 May 00	Male	600	42.2	41.8	207	Good	Road fatality
11	Whole	Great Barrier Is	19 May 00	Male	590	45.6	42.2	211	Good	Road fatality
12	Whole	Great Barrier Is	7 Nov 00	Male	612	41.6	41.2	208	Good	Road fatality
13	Whole	Great Barrier Is	12 Jan 01	Male	630	42.4	42.9	197	Good	Road fatality
14	Whole	Great Barrier Is	25 Jul 01	Male	575	43.1	39.6	210	Good	
15	Whole	Great Barrier Is		Male	540	42.9	40.8	216	Starved	Deformed leg (badly broken), no visible fat, keel very prominent
16	Whole	Captive		Female	525	38.6	41.3	198	Good	Died in transit between breeders
17	Whole	Captive		Male	679	42.8	43.4		Good	Sudden death in captivity
18	Whole	Released Northland		Female	469	42.9	41.7		Poor	Neck injury, released 1 Apr 1998
19	Partial	Released Mana Is	26 Aug 01	Female		41.4	40.9	202		Released 25 Jul 2001
20	Partial	Released Kapiti Is	10 Aug 01	Female		43.2	41.2	199		Released 24 Jul 2001
21	Partial	Released Kapiti Is	10 Aug 01	Male		41.6	40.4	201		Released 24 Jul 2001
22	Partial	Released Karori	8 May 01	Male			41.0	206		Released 14 Apr 2001
23	Partial	Released Tiritiri Is	1 Aug 02	Female		43.1	40.8	192		Released 25 Jul 2002
24	Partial	Released Tiritiri Is	27 Jul 02	Male						Released 18 Jun 2002