SOME MORPHOLOGICAL DATA ON THE AUSTRALASIAN HARRIER (Circus approximans gouldi) IN NEW ZEALAND

By N. C. FOX

ABSTRACT

51 Australasian Harriers were trapped in North Canterbury during the winters of 1974 and 1975. Data on wing, tail and tarsus length, and weight, are presented. Trends in colour barring of the wings and tail are correlated with age as expressed by iris colour. Some questions are raised from these data concerning possible morphological and behavioural changes in the New Zealand population. Moult sequences are briefly described together with some notes and figures on disease and injuries.

INTRODUCTION

Although considerable numbers of harriers have been trapped and banded in New Zealand, not a great deal of information is available on their morphology. In the absence of competitors the harrier has adapted to fill a wide range of ecological niches in New Zealand, no longer being confined mainly to swampy areas as it still is in Australia. It is probable that recruitment of harriers from Australia is small and therefore that the New Zealand population could be evolving along different lines from the Australian population.

METHODS

Most harriers in this study were trapped incidently during a study of the New Zealand Falcon *(Falco novaeseelandiae)*. Traps used were two sizes of Bal-chatri (Mueller & Berger 1959) which are small cages, covered with nylon running nooses and baited with Feral Pigeons *(Columba livia)*, House Sparrows *(Passer domesticus)* or mice *(Mus musculus)*. Automatic bownets baited with carrion (specifically for harriers) were also used.

Sexing was done by examination of the legs and feet, which are considerably more massive in the female than in the male. This method appears to be reliable for experienced observers, especially if comparative material is available (Olendorff 1972). There were no problems sexing the birds in my sample and subsequent analysis of the data revealed no anomalies. Four birds sexed by dissection and the specimen skins in Canterbury Museum confirmed the reliability of this method. In adult harriers body coloration was also an aid in

sexing, males being more ashy grey dorsally and paler ventrally. However, juveniles of both sexes are similar in colour and it is quite feasible that aberrant adult coloration could occur due to shot damage or other injury.

The only ageing attempted was simply into ' juveniles ' or ' adults.' Newly-moulted young adult females were easily distinguished from juveniles by fault bars (Fig. 1) or stress marks (Hamerstrom 1967). Careful examination of the lesser primary coverts revealed one or two that had failed to drop at the last moult, indicating an adult.

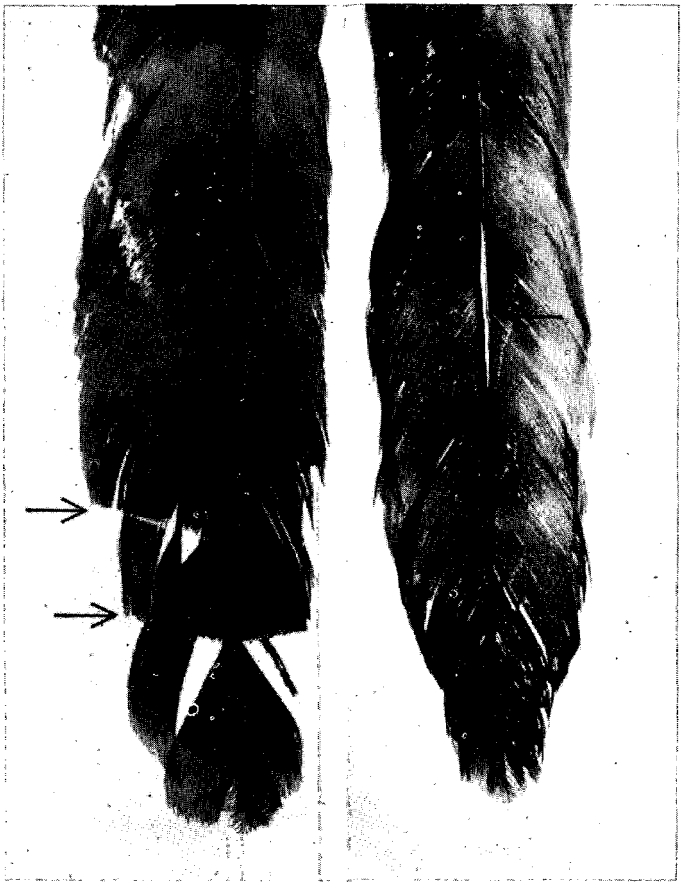

FIGURE 1 — (Left) Fault bars causing vane damage in a tail feather. (Right) Tail feather with a longitudinally split rachis.

The wing measurement was taken as the straight distance between the carpal flexure and the tip of the longest primary, without flattening the wing unduly. Specimens with the appropriate primary or central rectrix incomplete were excluded. Tarsal length was measured with vernier calipers and taken to exclude the overlapping portion of the tibio-fibula (Baldwin *et al.* 1931). Weights were obtained indoors by placing the hooded bird on a single-beam balance accurate to 1 g. Hood and crop weight were subtracted on the basis that 120 g is the weight of a full crop as found in a captive harrier.

Counting of colour barring tended to be slightly subjective in that some of the bars were very faint, often consisting of only a spot on one side of the rachis; these were included in the count, as was the broad terminal tail bar. The long black tip of the primary feather was not counted as a bar. Counting was done on the longest primary (number 8) and one of the central rectrices.

All 51 birds were obtained from North Canterbury apart from two from Marlborough and two from South Canterbury. No trapping was done during spring and summer.

RESULTS

Mean figures for the four main body measurements are shown in Table 1. By wing, tail and tarsus lengths males are about 94% of the size of the females, but by weight only 74%. The average weight of North Canterbury birds was slightly less than that recorded by Redhead (1969) in Otago. This may be due to differences in collecting techniques and seasons. Juveniles tended to be lighter in weight than adults and there is also a correlation in wing and tail length. This means that juveniles were not just lighter but also smaller in overall size than adults, a surprising result although not significant in my small sample ($p = 0.18$ t-test), but which, when considered with similar findings from Redhead, may indicate a definite trend. There is no further increase in size in this species after the age of about 8 weeks so it may well be that only the larger sizes of harriers are reaching adulthood. Perhaps ecological factors are selecting for larger size. Most *Circus* species have a wing loading (taken as wing area divided by body weight) of about 0.2-0.3 g/cm^2 (Brown & Amadon 1968) which makes them buoyant enough to perform the slow, flapping hunting flight so characteristic of the genus. *C. approximans,* with a wing loading of about 0.39 g/cm^2 (males) and 0.41 g/cm^2 (females), are much less buoyant and tend to hunt like buzzards *(Buteo),* circling and soaring at heights of about 20-100 m. This is in line with findings on hunting behaviour data by Schipper *et al.* (1975) on hunting methods in the harriers. They found that the Marsh Harrier *(C. aeruginosus)* with a wing loading of about 0.30 g/cm^2, tended to fly more slowly and at higher altitudes, with a correspondingly reduced surprise effect, than the Hen Harrier *(C. cyaneus)* which has a wing loading of 0.24-0.27 g/cm^2.

TABLE 1. VARIATION OF FOUR MAIN BODY MEASUREMENTS OF THE HARRIER. (JUVENILES, J. ADULTS, A. MALES, M. FEMALES, F.)

	CLASS	NO.	MEAN	S.DEV.	S.ERR.	RANGE
WING LENGTH (mm)	J.M.	5	407.5	9.5	4.3	393-418
	A.M.	17	408.4	11.7	2.8	390-430
	TOTAL M.	22	408.2	10.4	2.3	390-430
	J.F.	6	422.5	6.7	2.7	412-431
	A.F.	23	430.0	10.2	2.1	414-450
	TOTAL F.	29	428.5	10.0	1.8	412-450
TAIL LENGTH (mm)	J.M.	5	226.0	4.6	2.0	220-234
	A.M.	17	230.0	5.9	1.4	220-240
	TOTAL M.	22	229.2	5.8	1.2	220-240
	J.F.	6	237.8	6.3	2.6	231-248
	A.F.	21	246.5	8.1	1.8	230-255
	TOTAL F.	27	244.5	8.4	1.6	230-255
TARSUS LENGTH (mm)	J.M.	5	89.9	3.1	1.4	84-92
	A.M.	17	88.8	1.9	0.5	87-91
	TOTAL M.	22	89.0	2.3	0.5	84-92
	J.F.	6	92.8	2.5	1.0	89-96
	A.F.	23	94.9	3.5	0.7	88-106
	TOTAL F.	29	94.5	3.5	0.6	88-106
WEIGHT (g)	J.M.	4	597.5	78.4	39.2	568-665
	A.M.	17	612.2	47.8	11.6	525-697
	TOTAL M.	21	609.4	45.6	9.7	525-697
	J.F.	6	784.7	55.9	22.8	724-880
	A.F.	23	829.8	68.7	14.3	700-1016
	TOTAL F.	29	820.5	68.7	12.8	700-1016

Although the New Zealand Harrier has become much more buteonine in its hunting behaviour, its selection of hunting perches — fence posts etc. — is still strictly circinine. It does not use high perches, such as telegraph posts or open trees, as hunting perches, as do the buzzards.

Very few pale adult male harriers were seen; it may be that this species is losing its extreme sexual dichromatism as it uses circinine hunting techniques less and less (Niebohr 1973).

TABLE 2. PERCENTAGES OF ADULTS (A), JUVENILES (J), MALES (M) AND FEMALES (F) WITH LISTED NUMBER OF BARS ON TAIL (TOP) AND PRIMARY FEATHERS (BOTTOM).

	NUMBER OF BARS							
TAIL	0	1	2	3	4	5	6	7
A.M.	5.9	11.8	5.9	11.8	17.6	29.4	17.6	-
J.M.	-	-	-	-	-	20.0	80.0	-
A.F.	-	-	-	4.8	4.8	14.2	71.4	4.8
J.F.	-	-	-	16.7	16.7	50.0	-	16.7
PRIMARIES								
A.M.	-	-	5.9	5.9	11.8	41.2	35.3	-
J.M.	40.0	-	40.0	-	-	20.0	-	-
A.F.	14.3	19.0	33.3	4.8	4.8	9.5	14.3	-
J.F.	100	-	-	-	-	-	-	-

Differences in barring are shown in Table 2 and the main trends illustrated in Figure 2. The underwing bars are more numerous and well-defined in adults than in juveniles and may possibly be used in territorial displays, as in the Buzzard *(Buteo buteo)* (see Weir & Picozzi 1975).

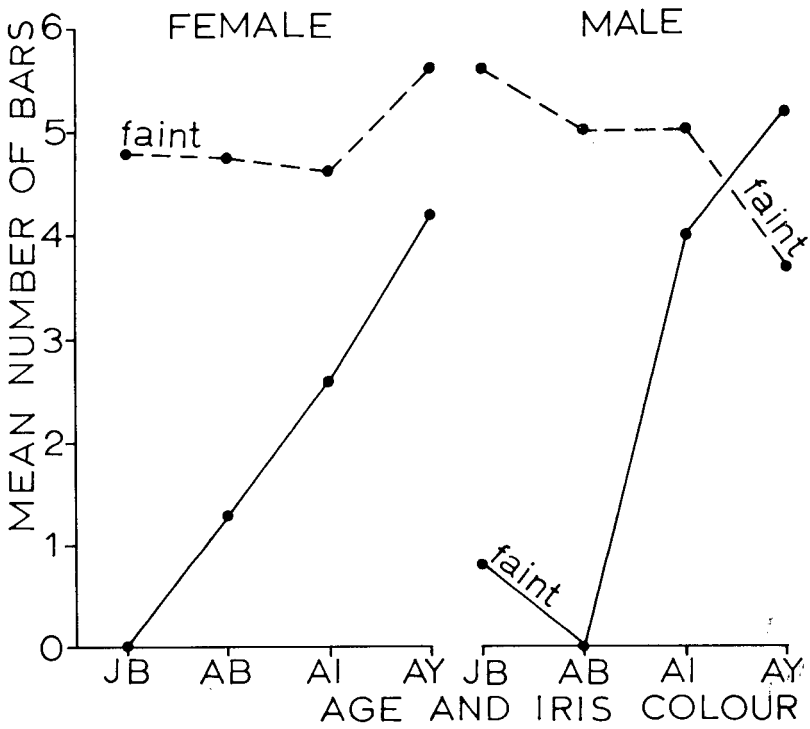

FIGURE 2 — Trends in tail barring (broken lines) and primary barring (solid lines) correlated with age (juveniles, J, and adults, A) and iris colour (brown, B, intermediate, I, and yellow, Y).

Iris colour was recorded simply as brown, intermediate or yellow (Table 3).

TABLE 3 — PERCENTAGES OF AGE AND SEX CLASSES WITH STATED IRIS COLOUR

	Brown	Intermediate	Yellow
Adult male	5.5	5.5	89
Adult female	39	39	22
Juvenile male	100	–	–
Juvenile female	100	–	–

No figures are available on the age at which iris colour changes in this species. Two captive females in Hawkes Bay still have brown eyes at 4½ years old (J. Powell pers. comm.) but diet or environment may well affect eye colour, possibly through gonad development. Female *C. cyaneus cyaneus* in Orkney, Scotland, retain the brown irides for 3-4 years (Balfour 1970) whereas in Wisconsin most female *C. c.*

hudsonius change in the second year (Scharf & Hamerstrom 1975). Data from known age *C. approximans* may reveal differences between the New Zealand and Australian populations.

62% of Redhead's sample of adult female harriers had yellow eyes and only 24% had brown eyes. This differs quite markedly from my sample and could indicate differences in age structure of the two populations. Additionally, 2 of my 17 adult males had brown or intermediate coloured irides.

MOULT

Data on moult are far from complete because harriers were only trapped between February and August. Numbering primaries from the carpal flexure outwards, secondaries from the carpal flexure inwards and rectrices (1-6) from the centre outwards, the following results were obtained:

February. Moult had progressed from the carpal flexure to P5 and inwards to S4. Tails averaged 2 old and 2 new complete feathers on each side. (n=4 birds).

March. Wing moult had reached P6 and S5, tails about the same as February. (n=3).

April. Primaries replaced to P8, secondary moult completed but with an irregular scattering of old feathers, tails had their last feathers growing. (n=4).

May. No sample.

June. About 60% had P9 and P10 still to moult but were otherwise completed. Tail moult completed. (n=17).

July. (n=4). and *August.* (n=7). Four had P10 still in sheath, the others were finished. Desultory body moult continued right into August.

No juveniles trapped in this study were moulting and there was no noticeable difference in completion dates between the sexes of adults. Tail moult was most irregular; usually the first feather to drop was T1 or occasionally T6. Intermediate feathers then moulted with T5 or T2 usually being the last to drop. About three feathers were involved with moulting at any one time at each moult centre; there was no evidence that three moult centres operated in the secondaries, as suggested by Miller (1941), but these may only be detectable at the beginning of the moult.

DISEASES AND INJURIES

Blood smears were obtained by puncture of the brachial vein. After bleeding, the puncture was disinfected with alcohol. This method proved satisfactory for this size of raptor once a little proficiency was reached. Blood smears from 14 harriers were examined by Professor A. M. Fallis, a visiting Erskine Fellow at the University of Canterbury, but no blood parasites were found.

Ectoparasites were identified by Mr R. Palma, National Museum of N.Z., Wellington. All proved to be a louse *(Degeeriella fusca)* which has been found on 5 other *Circus* species (Clay 1958) and is probably specific to the genus.

Two of the harriers were suffering from bumblefoot, one only mildly (Type 1. Cooper 1972), the other chronically (Fig. 3); the main lesion, about 14 mm in diameter, was removed surgically and the bird released after about two months, but with a poor prognosis.

FIGURE 3 — Chronic bumblefoot in an adult male Harrier.

Two other specimens were suffering from a peculiar complaint which looked at first glance like trichomoniasis (frounce), but no trichomonads could be identified microscopically. The base of the

FIGURE 4 — A ring of tissue constricting the base of a Harrier's tongue. At a later stage the tongue becomes so swollen that the tissue ring is barely visible.

tongue was extremely swollen and covered with caseous material which extended as foul-smelling lesions throughout the mouth. Probing eventually revealed a tight ring of tissue behind the backward pointing tips of the tongue in the region of the first copula (Fig. 4). This made the tongue swollen and necrotic by restricting circulation. The tissue ring was cut away and the mouth cleaned and treated with antiseptic. After 6 weeks the bird was fully recovered and was released. The next season another bird was trapped in a similar, but less advanced condition and was released immediately after treatment. On both occasions the constricting ring appeared to be animal tissue and, in the second case at least, probably consisted of a length of coarse tendon and muscle sheath about 8 cm long, which had become tightly wound round the base of the tongue. With the increased dependence which this species has in New Zealand on large carrion (Redhead 1968,

1969), this unusual problem could become fairly common (2% in this sample) and would probably eventually cause the deaths of the individuals concerned.

The only natural causes of death recorded in this study were a banded adult female recovered drowned in a waterhole and a juvenile male which starved to death. This bird weighed only 378 g when found just before death, only 64% of the expected weight of 597 g for a harrier of this size, sex and age.

Mechanical feather damage was quite extensive in some specimens, but usually confined to the tail. Two harriers had badly deformed tail feathers, possibly due to catching the tail in a rabbit trap so that several feathers were wrenched out. Forcibly removed main feathers almost always result in deformed or stunted replacements in the Falconiformes.

Some rectrices were split longitudinally about halfway down the rachis (Fig. 1); this type of damage was also seen in some of the New Zealand Falcons examined and may perhaps be due to the dry climate. The feathers appeared to be dry and brittle.

Two harriers had keyrings on their legs when trapped. Judging by the scarred and luxated toes of one bird it had been caught in a rabbit trap, tended in a cage for a period (damaging its cere in the process) and then released, only to be re-trapped and banded by me a month or two later.

ACKNOWLEDGEMENTS

Thanks are due to Professor Fallis for examining blood smears, to Mr Palma for identifying the lice, and to the staff of the Animal Health Laboratory, Lincoln, for solving the problem of the tissue ring round the harrier's tongue. I am most grateful to my wife, Sarah, and to members of the Raptor Association for assistance, and to Dr McLay and Dr Warham of the Zoology Department, University of Canterbury, for critically reading the manuscript.

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SHORT NOTE

AUSTRALASIAN SEABIRD GROUP

In order to foster further Trans-Tasman co-operation in the study of seabirds, our Group has increased its sphere of interest to include the seas around Australia, New Zealand, New Guinea and their oceanic islands. Hence the change of name from Australian to Australasian Seabird Group of the Royal Australasian Ornithologists Union. Two New Zealanders have been co-opted to our organising committee and they will also act as regional representatives for New Zealand.

Subscriptions for New Zealand members will be payable in NZ$ to our Wellington address (P.O. Box 12397, Wellington North) and for all other members in Aust. $ to our Canberra address (P.O. Box 65, Civic Square, ACT 2608). Correspondence should continue to go to our Canberra address where material for the Newsletter will be assembled. *Matters pertaining to the Seabird Mapping Scheme will continue to be dealt with by the New Zealand Wildlife Service in Wellington. The Newsletter will be printed and distributed from Wellington.*

Survey forms for birds washed up on Australian beaches, and for Australian seabird island surveys are available from our Canberra address and should be returned there on completion. Beach patrols are organised regionally and the initial results are published in the local bird journals. Copies of the completed beach survey forms will be held for further analysis by the regional organisers and at Canberra. The island survey forms should assist the preparation and updating of the Seabird Island Reports which are being published by the Australian Bird Bander. Copies of the completed island reports will be held by the regional organisers, the Editor of the Australian Bird Bander, and at our Canberra address.

We hope to improve the recording of offshore movements of seabirds from land, sea and air, and of prehistoric deposits of seabird material. We would appreciate comments from our readers in a form suitable for publication in our Newsletter, of which No. 7 has recently appeared (September 1976).

Brian Bell
Peter Fullagar
Chris Robertson
Jerry van Tets