The Australian

BIRD BANDER

Results from Banding Brown Goshawks in Australia

D. PURCHASE

The results obtained from the banding and recovery of Brown Goshawks *Accipiter fasciatus* in Australia from 1955 to 1972 are set out. The numbers banded in each state or territory are given; banding figures for each month are dissected into two groups—adults and young birds, and recovery data are discussed.

The Brown Goshawk ranges from Christmas Island in the Indian Ocean through eastern Indonesia to New Guinea, Fiji, New Caledonia and Australia, including Tasmania. In Australia it is found throughout the continent where there are trees and reaches its greatest abundance in sclerophyll forest and woodland (Calaby, 1969).

Numbers Banded

Between 4 December 1955 and 30 June 1972, 383 Brown Goshawks have been banded through the Australian Bird-banding Scheme. These were banded by a total of 64 banders, of whom C. Bennett, E. F. Boehm, N. J. Favaloro, W. D. F. Mackenzie, V. A. Roberson, R. J. Smith, M. H. Waterman, and S. J. Wilson, each banded more than 10 birds.

The number of each age group banded in each state or territory is shown in the following tabulation. (Birds recorded as being juvenile or immature have been considered as one age group as it is felt that some banders do not differentiate them and treat the two terms as being synonymous. The tabulation does not include 29 birds whose ages were not recorded at the time of banding. These will not be considered in any discussion in this paper):

	Nestling	Juvenile/ Immature	Adult	Total
S.A.	37	93	35	165
Vic.	57	16	14	87
N.S.W.	19	22	35	76
A.C.T.	10	5	8	23
Qld.			2	2
W.A.		1		1
Total	123	137	94	354

Brown Goshawks have not been banded in either Tasmania or the Northern Terirtory although the species does occur in both areas.

Nestlings. The 123 nestlings which were banded came from a total of 52 nests in south-eastern Australia (west to 135°E. and north to 32°S.). This area, which is slightly less than that shown in Figure 2, includes all of Victoria and the Australian Capital Territory as well as south-eastern South Australia and the southern half of New South Wales.

In most instances no indication was given as to the age of the nestlings when they were banded. However, this could be expected to range from about one to four weeks. After four weeks the nestlings are fully feathered and able to leave the nest and move along nearby branches (Slater 1961) and so are likely to avoid capture by banders.

At the time of banding, 5 of the nests contained one nestling; 18 contained two nestlings; 24 contained three nestlings; and 1 contained four nestlings. The number of nestlings present in the remaining four nests, from which a total of six nestlings were banded, was not recorded.

There was little variation between states in the average number of nestlings contained in the nests. In South Australia, from a total of 15 nests, the average was 2.3 (range 1 to 3); in Victoria, from a total of 25 nests, the average

was 2.5 (range 1 to 4); and in New South Wales, from a total of 8 nests, the average was 2.7 (range 2 to 3). In the Australian Capital Terirtory this information was recorded for only one nest which contained one nestling.

The earliest date on which nestlings were banded was 10 October and the latest was 26 January. The dates on which nestlings were banded in South Australia, Victoria, New South Wales and the Australian Capital Territory are shown in Figure 1. The Figure indicates that the breeding season of the Brown Goshawk is approximately the same throughout south-eastern Australia.

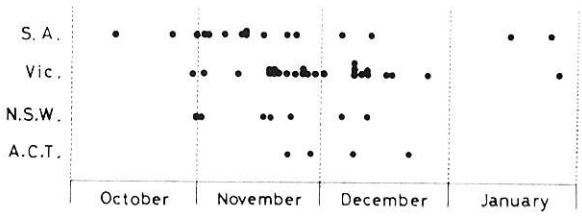
Juveniles and Immatures. The following tabulation shows the number of Brown Goshawks classified as being in either juvenile or immature plumage which were banded each month:

January	11	July	4
February	36	August	3
March	34	September	3
April	26	October	2
May	11	November	4
June	1	December	2

The large numbers banded during the period January to May reflect the large number of young birds recruited into the population after the breeding season. The figures are bolstered by the fact that since January 1970 large numbers of Brown Goshawks of this age group have been caught and banded between December and May in a pigeon house near Mallala, South Australia, by Mr M. H. Waterman. The total numbers which Mr Waterman banded at this site are: December, 1 immature; January, 8 immature and 6 adult; February, 26 immature and 1 adult; March, 17 immature and 2 adult; April, 18 immature and 2 adult; May, 3 immature and 1 adult; and June, 1 adult.

The small numbers of juvenile and immature birds caught for banding between June and December probably reflects a decrease in the number of birds of this age group present in the population during this period. This decrease is possibly due to mortality and the assumption of adult plumage.

Unfortunately no information is available from the recovery of banded birds to show how long it takes for Brown Goshawks to assume adult plumage. However, as Brown Goshawks have been caught during the winter months in juvenile or immature plumage it is suggested that they



• Figure 1. *Banding dates of nestlings.*

do not assume adult plumage until after at least one winter.

Adults. The following tabulation shows the number of Brown Goshawks classified as being in adult plumage which were banded each month:

January	9	July	12
February	12	August	5
March	11	September	3
April	8	October	4
May	10	November	4
June	14	December	2

The reduction in the numbers banded during the period August to December indicates that while the birds are breeding they are less likely to be caught. This may be due to the birds being more wary during this period, or (more likely) that few banders attempt to trap the birds in their breeding territories.

Sex Ratio. Of the 84 birds for which the sex was recorded: 46 (55%) were male and 38 (45%) were female. These comprised 21 male and 20 female juveniles and immatures, and 25 male and 18 female adults.

In two northern hemisphere species of *Accipiter*, the Goshawk *A. gentilis* and the Sparrowhawk *A. nisus*, females are more common than males (Mayr 1939). Wood (1938), in a paper referred to by Mayr, reports that of 291 Goshawks killed on migration at Pennsylvania, U.S.A., 110 (38%) were male and 181 (62%) were female. An excess of females was also found amongst Kestrels *Falco tinnunculus* studied in the Netherlands (Cavé 1968). Of the 536 Kestrels which were examined, 195 (36%) were male and 341 (64%) were female.

The reason for the excess of males among the Brown Goshawks which have been sexed in Australia is unknown. It could be that the sample is biassed by differences in the amount of trap-shyness between the sexes, or biassed by

the randomness of the sample due to few banders having caught and sexed large numbers at the one time in the one area. It is of interest to note, however, that of 29 Brown Goshawks sexed and banded during a period of four years at Riverstone, New South Wales, by Bennett (1973), 12 (42%) were male and 17 (58%) were female. These percentages agree closely with those for the Goshawks sampled by Wood (1938).

Numbers Recovered

Up to 30 June 1972, 55 (14.4%) of the 383 Brown Goshawks which had been banded were recovered. Of these, 18 were recovered at, or within 10 km of the banding place; and 37 were recovered at distances in excess of 10 km of the banding place. All were recovered within 3½ years of being banded.

Movements. Table 1 shows the distances at which Brown Goshawks were recovered from their banding places and Figure 2 shows the banding and recovery sites of those which were recovered at distances in excess of 50 km of their banding place. These recoveries show that Brown Goshawks of all ages may undertake movements of at least this distance. It is not known, however, what proportion of the total population is involved in these movements, although the data presented in Table 1 suggest that it would mainly be the younger birds (i.e. those banded as nestlings and juveniles or immatures). As there is no directional pattern apparent from the movements it is suggested that they may be random,

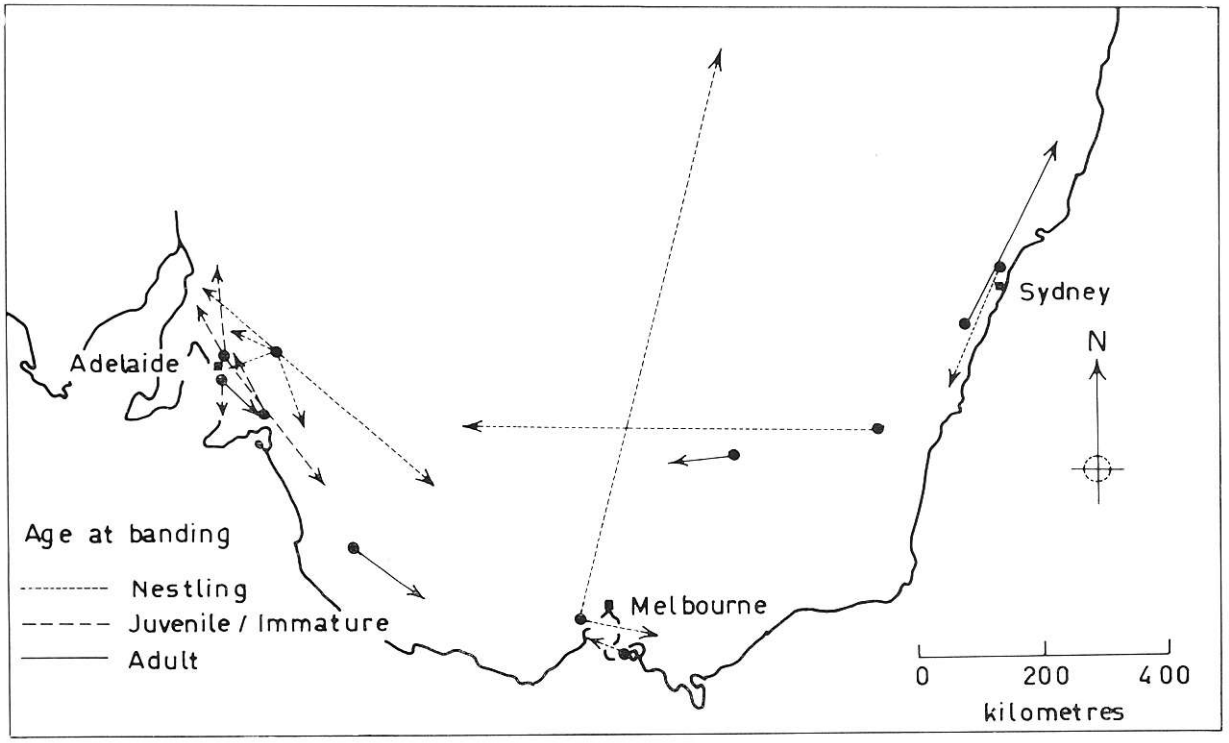
TABLE 1

Distances at which Brown Goshawks were recovered from their banding places.

Age*	Distance from banding place (kilometres) 0-10**	11-50	51-100	101-500	500+	Totals
P	3	7	3	5	2	20
J/I	7	5		5		17
A	5	1	3	2		11
Total	15	13	6	12	2	48

* Age at banding: P = nestling; J/I = juvenile/immature; A = adult.

** Includes those recovered at banding place.



● Figure 2. *Movements of Brown Goshawks in excess of 50 km.*

especially those undertaken by the younger age groups.

Random dispersal of young birds shortly after leaving the nest has been exemplified by the recovery of three Brown Goshawks which had been banded as nestlings on 2 November, 1964, and which formed the complete brood of a nest near Sutherlands, South Australia. All three were recovered the following January at widely separated localities at distances of 61 km west-north-west, 124 km north-west, and 126 km south-south-east, of their banding place (see also Boehm 1965). Another example is the recovery of two Brown Goshawks which had been banded as nestlings on 29 October 1960 from a brood of three near Geelong, Victoria. These were recovered early the following year, one in March and one in May, at distances of 16 km south-west and 129 km east-south-east of their banding place.

Further evidence for the random dispersal of young birds is the recovery of three immature Brown Goshawks which were banded during February 1970 near Mallala, South Australia. Within ten weeks of being banded these were recovered at distances of 34 km south-south-east, 105 km south, and 192 km north of Mallala.

The longest movements recorded for each age group are:

100-02005. Nestling banded near Geelong, Vic. on 28 November 1958. Recovered (shot) at Brewarrina, NSW on 15 July 1959 (910 km NNE).

100-45672. Immature banded near Mallala, SA on 12 February 1972. Recovered (sick) at Keith SA during March 1972 (240 km SE).

100-38947. Adult female banded at Glenfield, NSW on 2 October 1970. Recovered (shot) at Pembroke, NSW on 18 March 1971 (340 km NNE).

Table 2 shows the months in which Brown Goshawks were recovered (both dead and alive); only those for which the month of recovery is known have been included. This Table suggests that most of the movements are undertaken outside of the breeding season (i.e. during the period January to July).

Mortality. Table 3 shows the number of Brown Goshawks which were recovered dead each month and indicates the mortality which individuals of this species experience outside of the breeding season (i.e. January to July).

TABLE 2

The months in which Brown Goshawks were recovered.

Month	Distance from banding place (kilometres) 0-10	11-50	51-100	101-500	500+	Totals
Jan.			1	3		4
Feb.	1	2	1	1		5
Mar.	2	2	1	4		9
Apr.		3	2	1		6
May	1	1		2		4
June	1	1	1		1	4
July	3	1			1	5
Aug.	1	2				3
Sept.	2					2
Oct.		1		1		2
Nov.	1					1
Dec.						0
Totals	12	13	6	12	2	45

TABLE 3

The number of Brown Goshawks recovered dead each month.

Month	Nestling	Juv./Imm.	Adult	Total
January	4			4
February		2	2	4
March	3	3	1	7
April	4	1	1	6
May	2			2
June	2	1		3
July	3			3
August	1			1
September		2		2
October			1	1
November		1		1
December				
Total	19	10	5	34
Total Banded	123	137	94	354
% Recovered	15.4	7.3	5.3	9.6

The ones banded as nestlings had the highest recovery rate, namely, 15.4%. Juveniles and immatures had a recovery rate of 7.3% and the adults had the lowest recovery rate, 5.3%.

The high recovery rate of those banded as nestlings is undoubtedly due to the fact that after leaving the nest these young and inexperienced birds are exposed to a number of hazards with which they are not familiar. The greatest of these appear to be the risk of being shot. Being inexperienced hunters these young birds are quickly attracted to the source of easy food to be found in poultry yards and pigeon houses. As a consequence many of the young birds which attempt to utilize those food sources are shot. Of the 19 banded as nestlings which were

later recovered dead, 15 were shot (seven of which were reported to be raiding poultry—including turkey chicks and ducklings—and one was reported as attacking caged Budgerigars); three were caught and killed in pigeon houses; and one was found dead.

Of the ten banded as juveniles or immatures which were later recovered dead, four were shot (two were reported to be raiding poultry); one was caught and killed in a pigeon house; one was trapped and killed; one was apparently electrocuted when it flew into an electricity substation; one was hit by a car; one was found 'sick' and subsequently died; and one was found dead.

Of the five banded as adults which were later recovered dead, three were shot (one of which was reported to be attacking poultry); and two were found dead.

From the foregoing it can be seen that a large number of Brown Goshawks, particularly young birds, attack poultry and pigeons. This is all the more apparent when it is considered that in addition to those killed, two banded as juveniles or immatures were recovered in poultry yards and released still wearing their bands, and three banded as juveniles or immatures and three as adults were recovered in pigeon houses and released still wearing their bands.

In addition, banders caught and banded one adult in a poultry yard, and 86 juveniles or immatures and 18 adults in pigeon houses.

With the limited data it is not possible to construct a detailed table showing life-expectancy and mortality and survival rates. However, it is obvious that there is a high mortality rate of young Brown Goshawks during their first year of life. Of the 19 recoveries of Brown Goshawks which had been banded as nestlings, all were recovered (dead) within 12 months of being banded. As would be expected, those banded as adults have a lower mortality rate—of the ten recoveries of birds in this age group: seven were recovered (four dead and three alive) within one year of being banded; two (one dead and one alive) during the second year; and the remaining one was recovered (alive) during the fourth year.

A factor which must be considered in relation to the above data is that no information is available as to the number of bands which fall off the birds due to wear, or which are removed by the birds. Anderson (1969) has supplied evidence to suggest that Nankeen Kestrels *Falco cenchroides* may be able to remove aluminium bands. There is no reason to suggest that Brown Goshawks would not be able to do likewise, although the aluminium bands used on this species are considerably larger and of a heavier gauge than those used on the Kestrels.

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