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BREEDING OF GREENFINCHES IN HAWKE'S BAY, NEW ZEALAND

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ABSTRACT

Information on the breeding of Greenfinches was collected over three breeding seasons (1979-1981) in Hawke's Bay from 104 nests, 78 clutches and 31 broods. The laying season lasted from mid-October to early February. The average clutch size was 4.60 eggs ($n=55$ clutches). Sixty percent of completed clutches consisted of 5 eggs and 35% of 4 eggs. Twenty-seven percent of 297 eggs in 78 clutches resulted in young that flew. Predators removed 40% of eggs and 31% of young. Comparisons were made with 191 Greenfinch nest record cards collected over 47 years by the Ornithological Society of New Zealand and with data from Britain. Clutch sizes and brood sizes of Greenfinches in New Zealand were significantly smaller than in Britain.

INTRODUCTION

Greenfinches (*Carduelis chloris*) were introduced to New Zealand from Britain when they were liberated in Auckland in 1865-1868 (Thompson 1926). The only information on the breeding of Greenfinches in New Zealand is that of Niethammer (1970) and that recorded on 191 Ornithological Society (OSNZ) nest record cards collected over the years 1934 to 1981. Some information is available from Britain, where Monk (1954) and Newton (1972) studied breeding success and causes of failure. In the present study, nests were observed during the course of other work in two areas in Hawke's Bay, namely, the DSIR Research Orchard at Havelock North and Turamoe, a mixed livestock/arable-cropping farm on the Heretaunga Plains 16 km south-west of Hastings. The breeding statistics were not part of a population study but represent the only information so far obtained for this bird in New Zealand. The study covered the breeding seasons of 1978-79, 1979-80 and 1980-81. In the third season, causes of predation were examined in detail and are reported elsewhere in this issue (McLennan & MacMillan 1985).

TABLE 1 — Nesting sites used by Greenfinches

Plant type used	OSNZ nest records (nationwide)	Hawke's Bay (present study)
	%	%
Holme oak (<u>Quercus ilex</u>)		39
Elaeagnus (<u>Elaeagnus pungens</u>)		14
Various conifer trees	21	7
Fruit trees (peach, plum, apricot, apple, pear)	7	13
Rose bushes (<u>Rosa</u> sp.)		4
Gorse (<u>Ulex europaeus</u>)	18	
Manuka and kanuka (<u>Leptospermum</u> spp.)	14	
Matagouri (<u>Discaria toumatou</u>)	8	
Various thorn hedges (mainly hawthorn, <u>Crataegus</u> sp.)	7	
Boxthorn (<u>Lycium ferocissimum</u>)	1	20
Other	24	3
	<hr/> 100 <hr/>	<hr/> 100 <hr/>
Total number used	183	104

TABLE 2 — Height above ground of Greenfinch nests

Breeding season	No. nests started	Mean height (m)	Range (m)
1978-79	44	2.1	0.9- 4.5
1979-80	29	2.7	1.2- 7.6
1980-81	28	2.9	1.2- 9.1
All combined	101	2.5	0.9- 9.1
OSNZ nest records	187	2.6	0.9-10.7

METHODS AND DEFINITIONS

Each week from mid-September the two study areas were searched for nests. Any found were subsequently examined twice a week. The plant species in which the birds had nested, height of nest above ground, date, clutch size, brood size, and number of young leaving the nest were recorded for each nest. Some nests in tall hedges and pines were inaccessible.

To calculate first-egg dates and hatching dates, incubation was assumed to begin when the last egg was laid and to last for 13 days (Monk 1954). Young fly from the nest 13-16 days after hatching (Newton 1972).

A completed clutch was one where the number of eggs remained unchanged between visits. A clutch or brood was termed "successful" when at least one young bird flew from the nest or had young in it beyond day 12.

Differences in clutch and brood sizes were examined by non-parametric tests; differences of $p < 0.05$ were considered significant.

RESULTS

Nest sites and height

Table 1 shows the range of nest sites found in this study and a comparison with nationwide records derived from OSNZ nest record cards. In both samples, bushes and small trees, thorny hedges and shelterbelts appear to have been preferred. Gorse, *Leptospermum*, matagauri and hawthorn do not grow on Turamoe, but there are thickets of *Elaeagnus* round the homestead and winter oaks in the shelterbelts. Nests were also built in taller trees but were difficult to locate. For example, at Turamoe, Greenfinch nests were occasionally seen high up in macrocarpa and pine trees. Clearly the birds use a wide range of structural types from thickets to trees, but the mean height above ground was very similar in the two samples (Table 2).

Distribution of first-egg dates

Figure 1 shows the distribution of first-egg dates from Hawke's Bay, and from the North Island and the South Island derived from OSNZ records. The first-egg dates were established by P. C. Bull (pers. comm.) according to a standard set of rules. The dates of the first and last eggs for each of the three seasons in Hawke's Bay are shown in Table 3; the earliest was 16 October 1978 and the latest was 5 February 1979.

In the earliest OSNZ nest records, first-egg dates for the North Island occurred about 10 days earlier than those from the South Island (Fig. 1), even though the sample sizes were similar. The Hawke's Bay sample, with its earliest first-egg date of 16 October, was in fact later than other North Island regions (with smaller sample sizes) to the south of it or at about the same latitude.

Measures of breeding success

Table 3 gives the full range of numbers and statistics for breeding, from the inception of a nest through to the young leaving the nest.

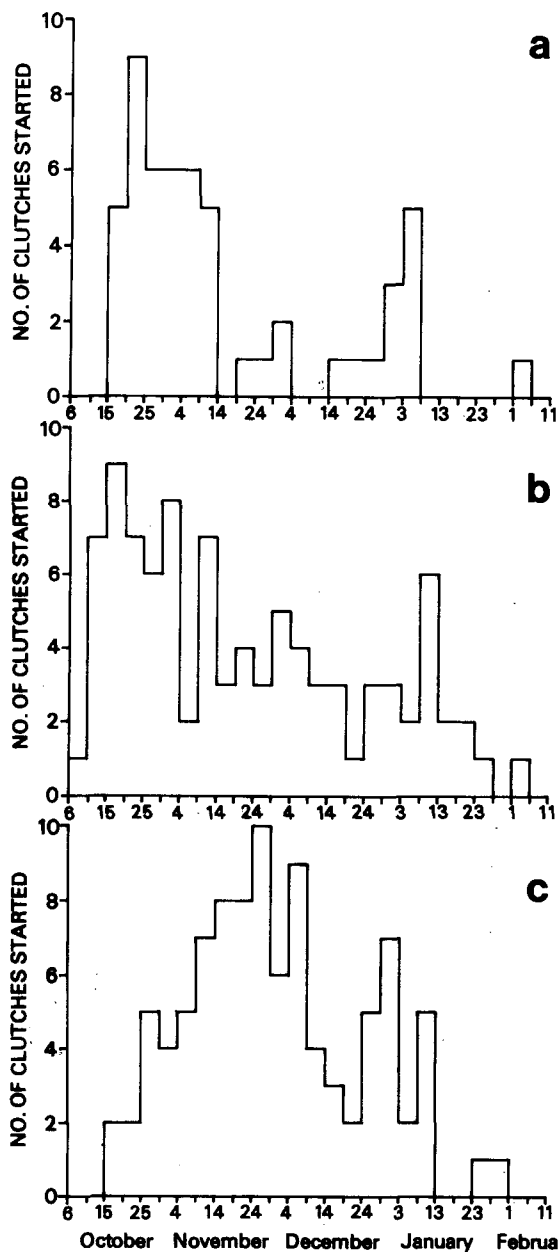


FIGURE 1 — Distribution of Greenfinch first-egg dates through the breeding season. (a) Hawke's Bay (n = 53) (b) OSNZ nest record cards, North Island (n = 93) (c) OSNZ nest record cards, South Island (n = 96)

TABLE 3 — Measures of Greenfinch breeding success in Hawke's Bay over the seasons 1978-79, 1979-80 and 1980-81

Measure of breeding success	Breeding season			
	1978-79	1979-80	1980-81	All
A. Attempts				
a. No. of partial and complete nests	44	34	28	106
b. No. (and % of a) of nests that ever contained eggs. Equals total nest attempts and total no. of clutches	26 (59)	29 (85)	23 (82)	78 (74)
c. First-egg date of the season	16 Oct	19 Oct	22 Oct	
d. Last-egg date of the season	5 Feb	5 Jan	11 Jan	
B. Eggs				
e. No. of eggs laid	107	116	74	297
f. No. (and % of e) of eggs that hatched	50 (47)	49 (42)	24 (32)	123 (41)
g. No. of eggs (and % of e) that produced young that flew	43 (40)	31 (27)	7 (10)	81 (27)
C. Completed clutches				
h. No. of completed clutches	20	21	14	55
i. No. of eggs in completed clutches	94	95	64	253
j. Mean clutch size for completed clutches (\pm SE)	4.7 \pm 0.12	4.5 \pm 0.16	4.6 \pm 0.14	4.6 \pm 0.08
D. Broods				
k. No. (and % of i) of eggs that hatched	50 (53)	49 (52)	24 (38)	123 (49)
l. No. of broods	12	13	6	31
m. Mean initial brood size (\pm SE)	4.2 \pm 0.37	3.8 \pm 0.36	4.0 \pm 0.36	4.0 \pm 0.19
n. No. (and % of m) of young that flew	43 (86)	31 (63)	7 (29)	81 (66)
o. Mean no. of young that flew per nesting attempt (\pm SE) (from item b)	1.7 \pm 0.36	1.1 \pm 0.23	0.3 \pm 0.17	1.0 \pm 0.18
E. Completely successful broods				
p. No. (and % of n) of young that flew from broods that did not suffer partial losses	39 (91)	26 (84)	7 (100)	72 (89)
q. No. (and % of b) of nests	10 (38)	8 (28)	2 (9)	20 (26)
r. Mean (\pm SE)	3.9 \pm 0.27	3.3 \pm 0.54	3.5 \pm 0.17	3.6 \pm 0.25
F. Losses				
s. No. (and % of e) of eggs lost to predators	36 (34)	43 (37)	40 (54)	119 (40)
t. No. (and % of e) of eggs lost to other causes	21 (20)	24 (21)	10 (14)	55 (19)
u. No. (and % of f) of young lost to predators	4 (8)	17 (35)	17 (71)	38 (31)
v. No. (and % of f) of young lost to other causes	3 (6)	1 (2)	0 (0)	4 (3)

The average size of 55 completed clutches was $4.60 \pm \text{SE } 0.08$ eggs. Differences between the clutch sizes for the three seasons were not significant ($p > 0.05$). Of these 55 completed clutches, 60% (33) consisted of 5 eggs, 35% (19) of 4 eggs, 4% (2) of 3 eggs and 2% (only 1 clutch) of 6 eggs. Forty-one percent of 297 eggs in 78 clutches (regardless of whether they were completed or not) hatched young, and 49% of 253 eggs in the 55 completed clutches hatched young.

Thirty-one broods averaged $3.97 \pm \text{SE } 0.17$ young for the three seasons. Differences between the brood sizes for the three seasons were not significant ($p > 0.05$). Of the 31 broods, 1 (3%) consisted of 6 young, 8 (26%) of 5 young, 13 (42%) of 4 young, 7 (23%) of 3 young and 2 (6%) of 2 young. Sixty-six percent of 123 young in these 31 broods flew, which represented 27% of 297 eggs originally laid in 78 clutches. Ninety-three percent of 87 eggs laid in 20 successful nests produced young that flew.

On average, $1.0 \pm \text{SE } 0.18$ young flew per clutch ($n = 78$ clutches) and $3.6 \pm \text{SE } 0.25$ young per successful nest ($n = 20$ nests).

Clutch size in Hawke's Bay varied throughout the breeding season in all three seasons, and in the OSNZ nest records over 20 seasons (Table 4). Whereas the OSNZ records showed an increase in clutch size from October to a maximum in December and a falling away in January, the Hawke's Bay results showed a decrease to December and an increase in January.

TABLE 4 — Mean clutch size from October to February for all three breeding seasons in Hawke's Bay and from OSNZ nest records. Sample size in brackets

	October	November	December	January	February	Mean
Hawke's Bay	4.73 (15)	4.57 (19)	4.40 (10)	4.70 (10)	4.00 (1)	4.596
OSNZ	4.43 (7)	4.45 (20)	5.00 (17)	4.18 (11)		4.563

TABLE 5 — Length of time for incubation and leaving the nest for 9 clutches and 3 broods of Greenfinches

No. of days since start of incubation or hatching	11	12	13	14	15	16	17	Median
No. of clutches hatching on each day since onset of incubation	1	2	2	3	1			13
No. of broods that flew on each day after hatching			1		1		1	15

Table 5 shows the time taken for incubation (from the time the last egg in a clutch was laid until the young hatched) and for young to fly, for nine clutches and three broods respectively. The median time for incubation was 13 days with a range of 11-15 days for clutches with known first-egg and hatching dates. The three fledging periods were of 13, 15 and 17 days for broods with known hatching and flying dates.

Nests were checked only once during a field visit. When there was a nest check the following day, all the eggs that had been recorded as about to hatch had duly done so. Thus it was concluded that all the eggs in a clutch hatched on the same day. On the same basis all the young in a brood usually left the nest on the same day. Sometimes they all flew off during a nest check; whenever this occurred young were never back in the nest on a following day.

DISCUSSION

The breeding statistics presented are the first of their kind for Greenfinches in New Zealand.

In the 158 OSNZ nest record cards only 55 full clutches were listed, of which 55% had 5 eggs and 36% had 4 eggs. The mean was 4.6 eggs (range 3-6). There were also 55 full clutches in the Hawke's Bay sample, of which 60% contained 5 eggs and 34% contained 4 eggs. In Britain, 593 clutches had an overall mean of 4.83 eggs, and 64% of clutches were of 5 eggs and 21% were of 4 eggs (Monk 1954). Niethammer (1970) showed that the mean clutch size of six passerine species introduced to New Zealand was significantly smaller than in Britain. A further four species, including the Greenfinch, showed the same trend but sample sizes from New Zealand were small. We are now able to compare a large New Zealand sample (110 clutches) with British data given by Monk (1954). Greenfinch clutch sizes were significantly smaller (Mann-Whitney U test $p < 0.001$) in New Zealand (mean = 4.58) than in Britain (mean = 4.83), the main contributions to this difference being the conspicuous shortage of six-egg clutches and more four-egg clutches in New Zealand (Table 6). Resultant brood sizes were also significantly smaller (Mann-Whitney U test $p < 0.01$) in Hawke's Bay (mean = 3.97) than in Britain (mean = 4.44) (Table 6).

Monk (1954) also found that clutch size increased from early April to a peak in the first week of June and then declined. A similar trend was found in New Zealand in the average monthly clutch sizes of the 55 OSNZ nests (see Table 4), but not for the 55 Hawke's Bay nests, where clutch size decreased from October to December and then increased in January. The Hawke's Bay sample did not have the effect of climatic variation with latitude that the OSNZ sample had, and so it was surprising that it did not show the trend of increasing clutch size with increasing daylength more strongly.

If there were a clear latitudinal cline for first-egg dates, the Northland and Auckland regions could be expected to be earliest. This was not so, although only 7 out of 158 nest record cards were from these two regions. In fact the earliest laying dates came from the Wairarapa (six between 6 and 14 October) and from Wanganui (three between 14 and 15 October).

In Britain, a higher proportion of early clutches failed than later ones, and they were followed by replacement clutches. There were also subsidiary peaks, due to the laying of later clutches, which could not be found in the small Turamoe/Research Orchard sample with its heavy egg predation. Measures of breeding success were much lower in Hawke's Bay than in Britain because of the effects of predators (Table 6). The efforts to discover the predators involved are reported separately (McLennan & MacMillan, this issue).

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TABLE 6 — Comparison of some Greenfinch breeding data in Britain (Monk 1954), Hawke's Bay, and New Zealand (OSNZ data plus Hawke's Bay)

	Britain	Hawke's Bay	New Zealand
Mean clutch size	4.83	4.60	4.58
2 eggs	4	0	0
3 eggs	17	2	5
4 eggs	124	19	39
5 eggs	377	33	63
6 eggs	71	1	3
Mean brood size	4.44	3.97	
1 chick	4	0	
2 chicks	10	2	
3 chicks	22	7	
4 chicks	87	13	
5 chicks	130	8	
6 chicks	22	1	
Hatching success (%)	74.1	41.4	
Nestling success (%)	77.5	65.9	
Nestling success (minus broods failed) (%)	95.9	88.9	
Breeding success (%)	52.9	27.3	

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SHORT NOTES

Hedge Sparrow feeding Chaffinch chicks

On 27 December 1984, I was photographing the nest of a Chaffinch (*Fringilla coelebs*) from a hide about 3 metres away. The nest, containing four chicks about 5 days old, was in an elderberry tree on the bank of Harts Creek, Lakeside, Canterbury.

At first, all seemed normal, the chicks being fed first by the cock and then the hen; but the next bird to approach the nest was a Hedge Sparrow (*Prunella modularis*), which fed the chicks and departed quickly.

This was the pattern for several feedings, until the cock Chaffinch arrived sooner than usual. He waited in the tree, and when the Hedge Sparrow arrived, he chased it away. When the cock Chaffinch had left, the Hedge Sparrow returned and fed the chicks.

When I visited the nest again on 31 December, the Hedge Sparrow was still feeding the chicks, which were feathered.

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Colour slides sent with this note clearly show a Hedge Sparrow feeding Chaffinch chicks in the nest. — Ed.