THE BREEDING OF THE FERAL PIGEON (Columba livia) IN HAWKE'S BAY NEW ZEALAND

By P. J. DILKS

ABSTRACT

Feral pigeons bred in all months of the year but did less well in March when food was short. The most common clutch size, two, was also the most productive, 50% of eggs producing flying young. Clutches of one and four had significantly lower productivity. Clutches of one accounted for 15% of total clutches, three for 1% and four for 3%. Man seemed to be the only important predator of adult birds.

INTRODUCTION

The feral pigeon *(Columba livia)* has become widely established in New Zealand, breeding and roosting on bridges, cliffs and buildings. This study of the breeding of pigeons was carried out when investigating their diet in Hawke's Bay (Dilks 1975).

METHODS

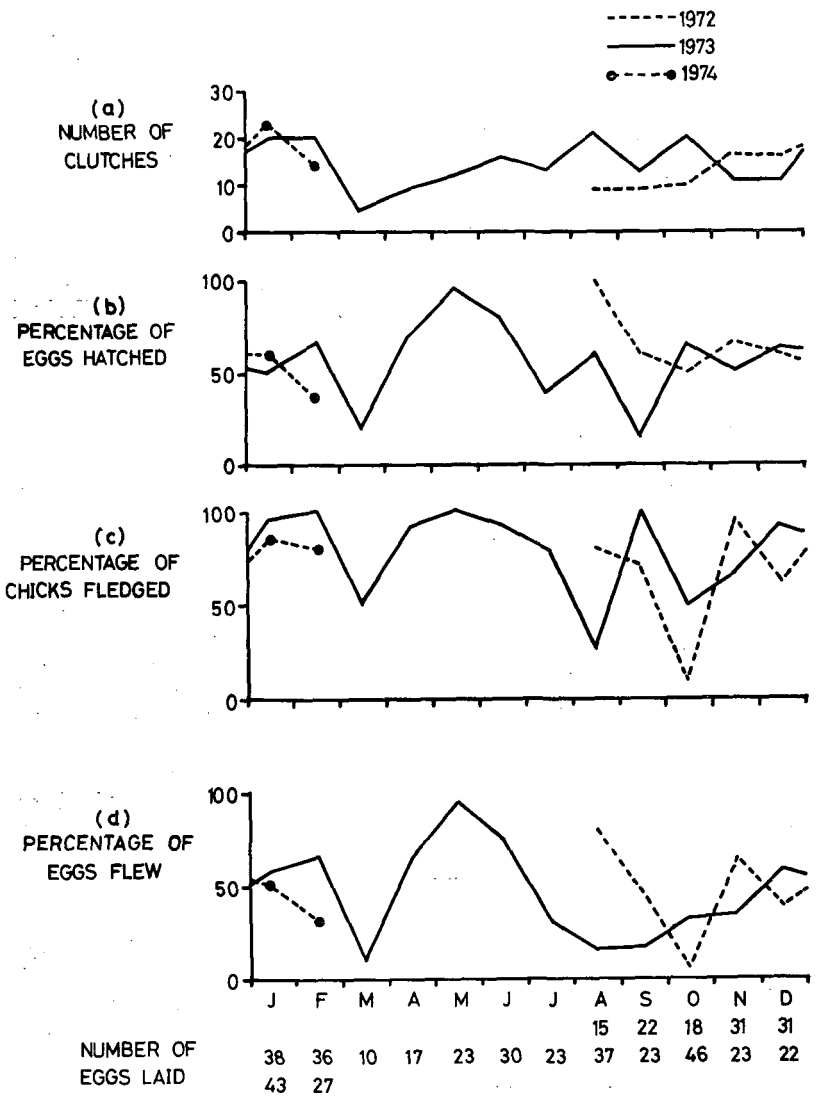
"Feral" pigeons were kept in a loft at the DSIR Research Orchard in Havelock North. Initially the birds were confined and fed on maize *(Zea mays)* and poultry pellets but as soon as they had dependent chicks they were freed. One month later supplementary feeding was discontinued and the birds foraged over surrounding farmland. These pigeons returned to the loft to roost and breed, but they were not fed, and could be regarded as a feral population. The loft was raised three feet above the ground which prevented predation by cats, rats or mustelids on birds inside. Thirty-eight nesting platforms were provided and the state of nest construction and contents were recorded at least once a week, often daily. Adult birds were banded and captured on the nest to ascertain nest ownership. Some chicks were killed to provide information on the birds' food but usually one chick was left alive in each nest. In calculating breeding success, birds sacrificed for food analysis were assumed to have fledged as almost all were healthy birds killed during the week before fledging.

RESULTS

Population

In August 1972, 41 marked pigeons (descendants of six feral birds) were transferred from an aviary to the loft. They commenced breeding immediately. Nineteen birds reared in the loft were banded on 16 October 1972 and 14 more on 11 July 1973. Three strayed

racing pigeons had permanently joined the flock by 11 July 1973 but other strays left after staying a few days. By 11 July 1973, 73 nestlings had been killed for food studies (10 birds per month) and 68 marked birds plus 14 newly fledged juveniles remained. Of the 77 marked birds, only 35 (46%) remained in the loft at the final census on 30 January 1974. The 41 birds originally introduced to



the loft increased to a peak of 68 in July 1973 but numbers then declined to 38 in January 1974. During the 19 months of the study 240 chicks were reared; six banded adults and 114 unmarked chicks were killed for a study of their diet between December 1972 and November 1973.

Breeding

Eggs were laid throughout the year with a peak in spring and summer and a low in March followed by a recovery during winter (Fig. 1a). Young were successfully reared in all months of the year but success was significantly lower in March and between July and October ($p<0.005$*) when a lower percentage of eggs gave rise to

* All probability values derived from chi-squared tests

flying young (Fig. 1d). The high breeding success in August and September 1972 was probably a result of the birds being fed.

The most common clutch size was two (213 of 261 clutches) with 38 clutches of one, 3 of three and 7 of four (most of the latter clutches were probably laid by two females). Clutches of one egg had a significantly lower hatching success than larger clutches ($p<0.005$) (Table 1). Some one-egg clutches were probably two-egg clutches from which one egg was lost without being noted. The owners of such clutches were perhaps inexperienced birds and, if so, the remaining egg would probably have a lower chance of survival. The high failure rate of four-egg clutches may have been caused by the incubating bird having difficulty covering all the eggs and resultant chilling. This happened with poorly constructed nests where the eggs could roll out; and in two of the four-egg clutches eggs rolled out from under the incubating bird. The percentage of eggs resulting in flying young was significantly lower for clutches of one and four than for those of two or three ($p<0.01$). Broods of one or two were reared equally well. Three broods of three were hatched (two from four-egg clutches) but in all cases no more than two chicks were reared.

The incubation period was about 18 days (from last egg laid to the last chick hatched) and the chicks spent approximately four weeks in the nest before fledging. Fledglings spent another week in and around the loft before foraging with the adults. Adult birds sometimes fed chicks that were not their own, especially newly fledged young or nestlings on the floor. Returning adults, mobbed by begging chicks, would feed the most persistent individual — not necessarily their own. Many females relaid, usually in another nest, while still feeding well-grown young. Figure 2 records breeding observations of seven marked pairs (A-G) showing that the birds can breed almost continuously. Clutches are shown as overlapping when a

TABLE 1 - The success of different clutch and brood sizes of *Columba livia*

HATCHING SUCCESS

Clutch size	Number of clutches	% Eggs hatched	Average brood size	Standard* error of brood size
1	38	26.3	0.26	0.07
2	213	64.8	1.30	0.05
3	3	55.5	1.67	0.50
4	7	28.6	1.14	0.34

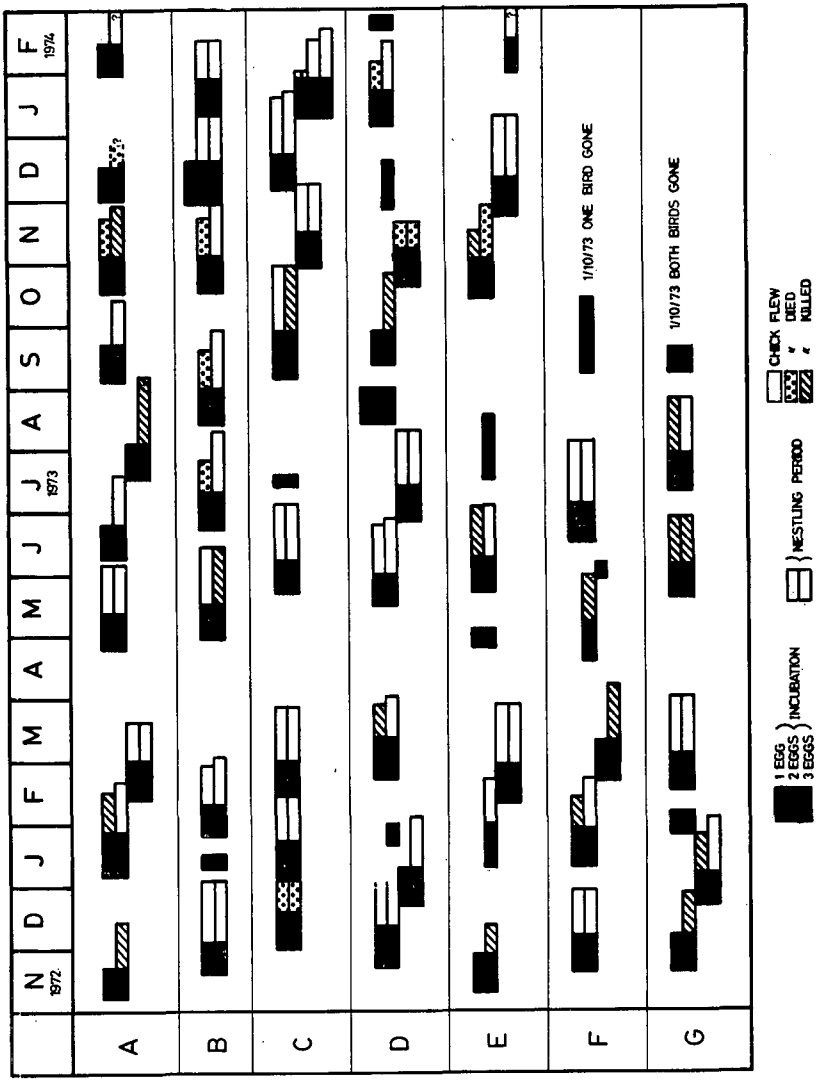
FLEDGING SUCCESS

Brood size	Number of broods	% of nestlings fledged	Average no. fledged	Standard* error of number fledged
1	50	74.0	0.74	0.06
2	121	78.1	1.56	0.05
3	3	44.5	1.33	0.49

BREEDING SUCCESS

Clutch size	Number of clutches	% of eggs fledged	Average no. fledged	Standard* error of number fledged
1	38	23.7	0.24	0.07
2	213	50.2	1.00	0.05
3	3	44.4	1.33	0.49
4	7	7.1	0.29	0.19

* These standard errors are from the formula for a binomial proportion



pair had two active nests simultaneously. This may have occurred quite commonly but was unrecorded as many breeding adults were so wary they could not be identified regularly.

Mortality

Losses of part of a brood were caused by competition between nestlings for food or by interference by other adults. Failure of whole broods was uncommon and probably resulted from the death of one

or both adults. Only 10 fledged juveniles and 7 adults died in the loft; one of these (a fledged juvenile with a wound on its back) may have been attacked by a N.Z. Falcon *(Falco novaeseelandiae)* which was seen nearby several times. In observed chases the pigeons escaped into trees or outpaced their pursuer in level flight. Pigeons often fed on fields bordered with long grass and among weeds where they were vulnerable to predation by cats.

Of the 17 pigeons that died in the loft, 10 died during September. The disappearance rate of marked adults was also high then (Table 2). This period coincides with the sowing of peas *(Pisum sativum)* for canning, which were an important part of the pigeons' diet (Dilks 1975). During September four birds injured by shot were handled, so this heavy mortality was probably largely caused by shooting to protect newly sown crops.

TABLE 2 — Disappearance rate of marked birds from the loft

	11/9/73	1/10/73	30/1/74
Number remaining of 68 alive on 11 July 1973	60	45	35
% loss in the interval	12	25	22
% loss per day	0.19	1.25	0.18

DISCUSSION

Killing of some chicks for the study of their food may have influenced the breeding rate but some birds demonstrated an ability to breed continuously. Two breeding populations of *Columba livia* were recently studied in Britain; a rural population at Flamborough Head (Murton & Clarke 1968) and an urban population at Salford Docks (Murton, Thearle & Thompson 1972). As in Hawke's Bay, breeding at Salford Docks continued throughout the year with only slight seasonal peaks. At Flamborough Head breeding was markedly seasonal, although some eggs were laid in each month. The similarity of the Hawke's Bay breeding pattern to that of an urban population in England was probably caused by the lack of seasonal variation in food supply. At Salford Docks ample food was always available and in Hawke's Bay newly sown peas and pea and maize stubbles were important in most months (Dilks 1975). The period between the exhausting of pea stubbles (March) and harvesting of maize (April) was the only time when the birds were obviously so short of food that their breeding was seriously affected. At this time breeding adults may also have been moulting, and these two factors combined could reduce the breeding success. High breeding success in April, May and June may be a result of abundantly available maize stubble less than 400 metres from the loft.

In general, the results supported Lack's (1968) hypothesis that "clutch-size corresponds to the brood size from which the parents can, on average, raise most young, the limit being set by the amount of food which they can collect for them." An exception was provided

by three-egg clutches which were only slightly (and statistically insignificantly) less successful than broods of two. However, their scarcity suggested strong selection against them.

Man seemed to be the major predator on feral pigeons. This agrees with Riddle's (1971) findings where 76% of adult pigeons found dead during his study in Britain had been shot. Overcrowding in the loft may have caused some birds to leave the flock as many birds were forced to breed and roost on the loft floor as a result of lack of space.

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