CLUTCH OVERLAP BY A NEW ZEALAND PIGEON

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ABSTRACT

The nesting behaviour of a New Zealand Pigeon (*Hemiphaga novaeseelandiae*) fitted with a radio transmitter was closely monitored in lowland forest at Pelorus Bridge Scenic Reserve. The bird and its mate nested in January 1985, and a single chick fledged in early March. At least one week before this chick left the nest the radio-telemetered parent started incubation on a second nest c. 100 m away. This second nest, and a subsequent one in late March, failed because of disturbance by predators. Clutch overlap as a breeding tactic by New Zealand Pigeons is discussed in relation to possible constraints on reproduction.

INTRODUCTION AND METHODS

New Zealand Pigeons are large (c. 650 g) colourful fruit pigeons which inhabit lowland forests throughout New Zealand. Their diet of fruits, leaves, buds and flowers has been well documented (McEwen 1978), but their behaviour and breeding biology are poorly known.

During a study at Pelorus Bridge Scenic Reserve, Marlborough (41°18'S, 173°35'E), we have gathered information on the breeding of New Zealand Pigeons equipped with radio transmitters. The transmitters on most birds either ceased working or fell off after a few months, and usually we could not retrap specific birds to attach new transmitters. However, one bird (known as Red C) was easily recaught and it carried two successive functioning transmitters for a continuous period of over 14 months. It was the only breeding bird to be monitored throughout an entire nesting season.

Red C, which was resident in our study area, was thought to be a male bird from its general behaviour. It was first mist-netted and marked on 11 October 1982, and it was recaptured on 4 October 1983 and 19 September 1984 at the same site. On the last capture it was fitted with a back-mounted radio transmitter (weighing c. 20 g). This functioned until 4 April 1985, when Red C was caught again and fitted with a new transmitter, which lasted until November 1985.

MOVEMENTS AND DIET

From September 1984 to November 1985 Red C was radio-tracked on at least 3 days per month. It had a well-defined home range of about 7.5 ha in tawa/podocarp forest and adjacent willows (*Salix fragilis*) and poplars (*Populus* sp.) by the Pelorus River (c. 30 m a.s.l.) but made occasional sallies of up to 600 m outside this usual range. Red C fed mainly on young leaves of willow and poplar from September to December; ripe

fruits of wineberry (*Aristotelia serrata*), fuchsia (*Fuchsia excorticata*), tawa (*Beilschmiedia tawa*) and *Coprosma areolata* in January; ripe fruit of tawa and rimu (*Dacrydium cupressinum*) in February and March; ripe fruit of miro (*Prumnopitys ferruginea*) from March to July; and leaves of *Coprosma* species, *Schefflera digitata*, *Paratrophis microphylla*, and *Parsonsia heterophylla* from July to September.

NESTING CHRONOLOGY

Nest 1

Red C showed no breeding activity from 19 September to 13 December 1984. However, when next radio-tracked, on 15 January 1985, it was incubating on a nest in the canopy of a small tawa, c. 12 m above the ground. From 15 to 26 January, Red C incubated from at least 9.15 a.m. until about 6.30 p.m., when it was relieved by its mate (unmarked). We built an observation platform in an adjacent tree, from which we first saw the single chick on 29 January. It was fed twice and was brooded by Red C over the three hours it was under observation (11 a.m. to 2 p.m.). With a routine apparently similar to that during incubation, both parents brooded the chick until at least 1 February. From 7 February (when observations began again) until 6 March 1986, the chick was fed on the nest by both parents, but it was left unattended for most of the time. We observed it being fed only once a day by Red C, usually between 10 a.m. and 12.30 p.m. On 26 February the chick was caught on the nest at 9.30 a.m., weighed (400 g), fitted with a radio transmitter and replaced. It was fed by Red C at 12.30 p.m. and by the other parent at 4 p.m.

Nest 2

On 27 February, Red C was seen gathering nesting material and carrying it to a second nest c. 12 m up in a young totara (*Podocarpus totara*), c. 100 m from the first nest. When next radio-tracked, between 10 a.m. and 12.30 p.m. on 5 March, Red C was feeding on rimu fruit. It returned briefly to the first nest at 11.45 a.m. and may have fed the chick. At 2.15 p.m., when next located, Red C was incubating on the second nest. On 6 March, Red C was tracked continuously from 7.30 a.m. to 4.30 p.m. It was active throughout the morning, fed the chick in the first nest tree at midday, relieved its mate at the second nest at 12.30 p.m., and incubated there for the rest of the afternoon.

On our next visit, 11 March, we found that the chick had flown from the first nest and that the second nest had recently been preyed on. The egg was smashed on the ground, the nest was disturbed, and several contour feathers from a pigeon's back lay on the ground beneath the tree. Both parents apparently survived this attack because Red C was seen with presumably the same mate later that day. On 13 March, both Red C and the chick were radio-tracked and Red C was seen to feed the young bird at midday close to the site of the destroyed second nest. By 19 March the young bird from nest 1 had moved c. 200 m from its nest to an area just outside the normal range of Red C, where it fed on tawa fruit with at least three unmarked pigeons. On 26 and 29 March, the young bird

fed on rimu and totara fruit on the margin of Red C's range, but it was also located 600 m south and 350 m north of the nest from which it had fledged. It was not seen with Red C after 13 March and had shed its transmitter by 1 April.

Nest 3

On 19 March, Red C and its mate were seen building a third nest 5 m up in a small tawa only 30 m from the first nest site. Red C performed display dives above this third site between 10 and 11 a.m. on 20 March, while its mate was sitting on the nest. By 27 March, incubation was being shared by both birds, the unmarked mate sitting in the morning and early afternoon and Red C taking over incubation at 2.15 p.m. This third attempt for the season by Red C ended when the egg was preyed on. Fragments of eggshell were found beneath the nest tree on 29 March with rat tooth marks on them. After this nesting failure no further breeding activity was detected in 1985. Red C fed alone on miro fruit until the fruiting season ended in July and then on foliage (sometimes with another bird) until its transmitter failed in November 1985.

DISCUSSION

Our observations are the first to demonstrate clutch overlap for New Zealand Pigeon and to suggest that some pairs could raise more than one chick per year.

Clutch overlap has been recorded in several bird families (Burley 1980), including the Columbidae (Robertson 1984), but its significance has received little attention. Burley (1980) concluded that it is used as a tactic to raise reproductive success when clutch size itself cannot be increased. By overlapping clutches during less demanding phases of offspring development, parents can increase the number of offspring reared per unit time. For example, Burley concluded that in Rock Pigeons (*Columba livia*) the clutch size is set at two because pairs cannot rear more than two young through the first week of life, when the parents produce a high-energy crop milk to feed their chicks. After this energetically limiting phase, pairs are able to start another clutch, while continuing to feed the chicks from the first clutch on normal foods such as seeds.

New Zealand Pigeons also feed their young nestlings on crop milk (Moon 1975). They lay only one egg, incubate it for 28-30 days and take a further 36-45 days to fledge their chick (Guthrie-Smith 1927, Wilkinson & Wilkinson 1952, Moon 1975). Egg-laying has been recorded in all months (OSNZ Nest Record Scheme, *Notornis* Classified Summarised Notes; pers. obs.) but mostly from November to March, perhaps timed so that young birds fledge in the fruiting season. The one-egg clutch is typical for a fruit pigeon, but Goodwin (1983) commented that the developmental period is remarkably long. He speculated that this was a response to low predation pressure in prehistoric New Zealand and the "possibly rather poor quality foods available". It seems unlikely that New Zealand Pigeons, in response to low predation levels, have evolved slow chick development to reduce

further their already low reproductive rate. It is much more likely that the second speculation is correct, that slow development is a direct result of their entirely herbivorous, low-protein diet. Clutch overlap is a means of increasing reproductive output under a combination of constraints, namely the need to feed young nestlings on crop milk, the slow growth of the older chick, and the need to fledge young in the fruiting season. Red C saved at least one week by starting a second clutch before the first chick had fledged.

Although we have only this one example of clutch overlap, Red C was the only breeding bird to be monitored throughout an entire breeding season. We do not know if this was an isolated occurrence or the usual pattern for successful breeders. More research is needed into how common clutch overlap is among New Zealand Pigeons, whether it increases their reproductive output, and whether it is influenced by variations in the food supply provided by fruiting trees.

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