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LAYING SEASONS OF THREE INSECTIVOROUS SONG-BIRDS AT KOWHAI BUSH, KAIKOURA

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In this note we compare three native insectivorous songbirds — the Robin (*Petroica australis*), the Grey Warbler (*Gerygone igata*) and the Fantail (*Rhipidura fuliginosa*) — the laying seasons of which we studied at Kowhai Bush, Kaikoura, from July 1977 to January 1978. These three species occupy much the same habitat at Kowhai Bush, which is kanuka forest (*Leptospermum ericoides*) with a mixed hardwood understorey. Hunt & Gill (1979) described the study area in detail.

Figure 1 shows the dates (grouped into weeks beginning 21-27 July) on which all eggs under study were laid. All three species were multi-brooded and showed more than one peak of laying. Robins had the longest egg-laying season (24 weeks), whereas Grey Warblers and Fantails laid for a shorter period (15 weeks each). Robins began laying first, followed five weeks later by Warblers. Fantails started laying three weeks after Warblers. Grey Warblers stopped laying three weeks before the other species.

Robins had four peaks of laying. The mean date of laying of the first eggs of first Robin clutches was 16 August 1977. Thus the first peak represents almost entirely the laying of first clutches for the season. The second peak (in September) represents mainly the laying of replacement clutches for first nestings that failed. Second clutches laid after the fledging of a first brood generally appeared in mid-October, as indicated by the third peak of the histogram. The broad fourth peak of laying in November mainly represents replacement of the large proportion of second clutches and broods destroyed by

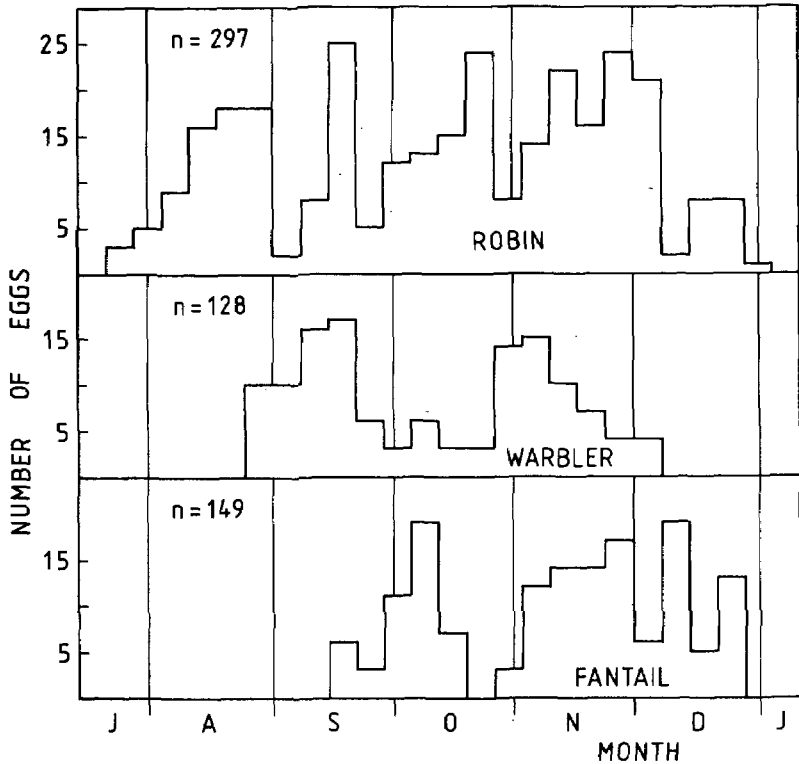


FIGURE 1 — Numbers of eggs laid per week by Robins, Grey Warblers and Fantails at Kowhai Bush, Kaikoura, in the 1977-78 breeding season

predators after September. If the second clutch hatched and the nestlings fledged, a third clutch was laid about mid-December, as shown by a fifth and minor peak.

The two peaks of laying by Grey Warblers simply reflect the laying of first clutches and then second clutches (after the successful raising of a first brood). The average day of initiation of first clutches was 8 September 1977, and the earliest egg of a true second clutch appeared on 23 October 1977. However, some clutches in October and early November were replacements for first nests that failed.

Fantails show two main peaks of laying, one in early October representing mainly first clutches, and a second extended peak in November-December. Fantails can raise to fledging up to three broods in a breeding season, but in 1977-78 the maximum number a pair raised was two. Most pairs had one or more unsuccessful nestings,

and a pair could build and lay up to five times a season. The second laying peak for Fantails thus represents both second and replacement clutches. Re-nesting usually began within a few days of the loss of a nest.

All three species are insectivores, but they tend to feed in different ways on different kinds of invertebrates. Robins at Kowhai Bush (weight 31.45 g; J. A. D. Flack, pers. comm.) feed almost entirely on invertebrates (Powlesland 1981). They spend 90% of foraging time on or within two metres of the ground, even though the forest at Kowhai Bush is 7-12 m tall. In winter and spring when the soil is moist, Robins feed mainly on earthworms, slugs, snails and larvae of the March Fly (*Philia negrostigma*). By late spring and early summer increasing numbers of larval and adult Lepidoptera are eaten. In January, when cicadas (*Amphipsalta zelandica*) are abundant, some Robins seem to feed on them almost exclusively.

Grey Warblers at Kowhai Bush (mean weight 6.4 g) glean invertebrates from twigs and living foliage on 94% of occasions that food is obtained (Gill 1980). They concentrate on intermediate to high levels of the forest, and glean by perching upright (55% of occasions) or by hovering (41%). Warblers almost never alight on the ground or flycatch. The food, to judge from that fed to nestlings (Gill 1983), is mainly caterpillars and spiders.

Fantails (mean weight 7.6 g; Powlesland 1982) catch most of their food on the wing and aerial insects presumably predominate in the diet. Gravatt (1971) noted that Fantails on Little Barrier Island feed mainly at middle to low levels of the forest. Ude Shankar (1977) found that Fantails at Riccarton Bush, Christchurch, forage in all levels of the forest. In winter, the birds seek out insects that their movements (or those of other birds) disturb on the ground or on vegetation. Once breeding begins (August) and aerial insects proliferate, Fantails change to feeding by fast direct flights from a perch or by aerobic manoeuvres.

We have no evidence, but it seems likely that soil-dwelling invertebrates become abundant (and/or available) at Kowhai Bush before foliage-dwellers (especially caterpillars) reach their peak, and also that caterpillars are plentiful before the peak in flying insects. If this is so it may explain the staggered start to laying by the three birds concerned, assuming that their laying is timed to coincide with the maximum availability of food for their nestlings. Clearly, data on the abundance and activity of invertebrates in New Zealand forests are needed to test these ideas.

In this interpretation we follow Lack (1950), who postulated that the diet of two garden songbirds of similar size near Halifax, England, accounted for the difference in their laying seasons. He found that the Robin (*Erithacus rubecula*), which feeds its young on caterpillars, had its peak of laying seven weeks before the Spotted Flycatcher (*Muscicapa striata*), which feeds its young on adult insects.

Caterpillars were abundant in the habitat before winged insects, and so the observations suggest that this induced the Robin to lay before the Flycatcher.

Another factor that may contribute to early and prolonged laying by South Island Robins is their ability to cache food (Powlesland 1980). Robins frequently store invertebrates, especially earthworms, during autumn and winter, mostly for retrieval within three days. By storing food, Robins can better exploit a temporarily abundant supply and help overcome the bad effects of short periods of adverse weather. Grey Warblers and Fantails are not known to cache food.

Many areas of New Zealand commonly experience serious droughts in summer (Hurnard 1978) and the Kaikoura Plain is no exception. At Kowhai Bush in mid to late summer, the dominant tree (kanuka) undergoes its greatest loss of leaves, and broad-leaved species often show signs of serious wilting. Grey Warblers at Kowhai Bush feed mainly from kanuka (Gill 1980) and a reduction in foliage-dwelling invertebrates caused by drought may be why Warblers stop laying relatively early. One would expect dry conditions to reduce the Robin's supply of soil-dwelling prey but Robins are able to exploit cicadas and stick-insects (phasmids) in late summer (Powlesland 1981). Fantails should be least affected by the influence of drought on soil and vegetation.

The Robin is subgenerically endemic to New Zealand and one might expect this relatively archaic form to have a lower breeding potential than the Warbler and Fantail, which are only specifically and subspecifically endemic (respectively) and which are much better at exploiting man-modified habitats. The long laying season of the Robin seems to contradict this expectation, but consideration of potential productivity gives a trend closer to expectation. The maximum number of broods raised per season multiplied by the average clutch-size is 8.1 for Robins (3×2.7), 7.8 for Warblers (2×3.9) and 10.5 for Fantails (3×3.5).

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SHORT NOTE

FIRST SIGHTING OF CHESTNUT-BREADED SHELDUCK IN NEW ZEALAND

On 11 December 1982 Canterbury region members of OSNZ visited the western shore of Lake Ellesmere. While watching a group of predominantly male Paradise Shelduck (*Tadorna variegata*), Kathleen Harrison drew our attention to one bird that had a chestnut breast instead of a black breast.

It was suggested that the bird might be a Chestnut-breasted Shelduck (*Tadorna tadornoides*) and so we made detailed observations before the bird flew off with the Paradise Shelducks. None of us was already familiar with the species.

At first sighting the bird was viewed from about 300 m using telescopes and gave frontal views only. The bird seemed slightly smaller than most of the Paradise Shelducks in the flock and seemed slightly finer in the neck. Description: Head, neck, back and underparts black; breast and mantle chestnut brown and well demarcated from the black neck and underparts; legs and bill black, and a prominent white ring around the base of the bill and a narrow white ring around the eye. In flight, the bird showed a similar wing pattern to that of the Paradise Shelduck with large white shoulder patches and white underwing.

Some of us saw it again later in the day, a rear-end view showing that the chestnut tertials formed a coloured patch on the lower back when the wings were folded.

The following day PS, KH, B. R. Armstrong and C. F. J. O'Donnell returned to the area and soon saw the bird on a shallow brackish pond, again accompanying Paradise Shelducks. Both species fed alike, by swimming slowly with head in the water.

Frith (1967) reported that in a sample of 200 Chestnut-breasted Shelducks all females, both adult and juvenile, had white at the base of the bill but so had 21% of males. Nearly all females, of all ages, had white eye rings but no males did and so he concluded that this