NOTES ON THE SHINING CUCKOO (Chrysococcyx lucidus) IN NEW ZEALAND

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ABSTRACT

Thirty-one records from Kowhai Bush and the Nest Record Scheme show that Shining Cuckoos laid from mid-October to early January. At Kowhai Bush a cuckoo was seen to "freeze" while it apparently watched a pair of Grey Warblers (its host), and warblers were distressed when a stuffed cuckoo was put near their nest. Dissection of a female cuckoo disclosed an egg-shell (probably a warbler's) in its gizzard. The newly hatched Shining Cuckoo bears natal feathers (trichoptiles) and is thus unusual among Cuculinae. The physical and behavioural development of nestlings is described, and weights and tarsal lengths are given. Fledgling cuckoos were fed by their foster parents for up to 28 days.

INTRODUCTION

The Shining Cuckoo *(Chrysococcyx lucidus)* is a common and widespread summer migrant to New Zealand, where it parasitises the Grey Warbler *(Gerygone igata)*. For three breeding seasons, starting in 1976-77, I studied the cuckoo's brood-parasitic activities by finding nests of the warbler at Kowhai Bush, Kaikoura. The main study-area of 30 ha at the seaward end of Kowhai Bush is described in Gill (1980a). The Grey Warbler's breeding is reported separately (Gill 1982 and in prep.), and many aspects of brood-parasitism are covered elsewhere (Gill, in press). In this paper I report some of the more descriptive parts of the study — in particular the cuckoo's breeding season in each year, several topics involving eggs and laying, and the physical and behavioural development of nestlings.

METHODS

I used a dental mirror 3 cm in diameter mounted obliquely on a handle to view the Grey Warbler's clutch in the enclosed nest and check for the presence of the Shining Cuckoo's egg. Artificial lighting was unnecessary. Nestling cuckoos showed little tendency to fly prematurely and were easily handled and returned to the nest throughout their nestling period. I banded them as soon as their legs were strong enough — at 12-15 days old. Size-B bands are recommended but in some cases size-C coloured bands would have fitted less tightly. When Shining Cuckoos perch, little or no leg is visible, and reading colour-combinations is difficult.

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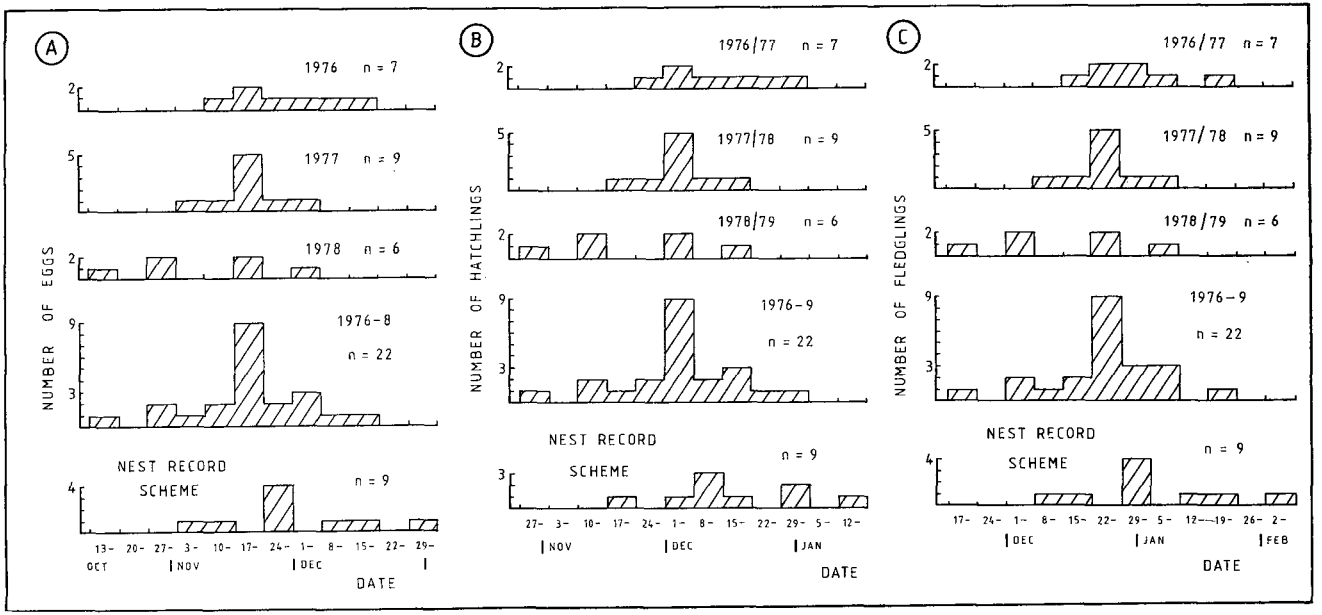

FIGURE 1 — Dates (grouped by week beginning 13-19 October) of (A) laying, (B) hatching and (C) fledging of eggs and nestlings of the Shining Cuckoo at Kowhai Bush (three seasons) and as reported to the OSNZ Nest Record Scheme.

BREEDING SEASON

Figure 1 shows the dates (grouped into weeks) of laying, hatching and fledging of 22 eggs and nestlings of the Shining Cuckoo at Kowhai Bush. Also given are nine records (1923-1967) from the OSNZ Nest Record Scheme. If a record was incomplete — a date of laying, hatching or fledging was not observed or the egg or nestling failed to survive — then I estimated the missing date or dates.

Figure 1A shows that Shining Cuckoos laid from mid-October (earliest egg 14 October 1978 — Kowhai Bush) to early January (latest egg 1 January 1924 — Nest Record Scheme). The modal time of laying was the second half of November. In addition to the records shown, two female cuckoos that I dissected each had an egg in the oviduct ready for laying. One bird died on 28 November 1968 and the other in the second week of December 1975.

Cuckoos apparently laid successively earlier at Kowhai Bush from 1976 to 1978 (Fig. 1A). This agrees with the observation that the host bred earlier in 1977 than in 1976, perhaps because winter and spring were milder in 1977 (Gill, in prep.). The record of laying in mid-October 1978 is perhaps exceptional, but there was another record of early laying that year. On 6 November 1978 I found an abandoned nest at Kowhai Bush containing a dehydrated cuckoo's egg presumably laid in mid-October or earlier. Excepting these two records, the cuckoo parasitised only the warbler's late clutches — initiated on or after 23 October (see Gill 1982). Clutches produced by warblers in mid-October probably follow the loss of an earlier clutch, so it remains unlikely that first clutches are ever parasitised. In Western Australia *Ch. lucidus* may lay as early as in late August (Ford 1963).

Shining Cuckoos hatched (Fig. 1B) from 29 October (Kowhai Bush) to 17 January (Nest Record Scheme), and fledged (Fig. 1C) between 19 November (Kowhai Bush) and 5 February (Nest Record Scheme). The modal times of hatching and fledging were early and late December respectively. There is a record (Class. Summ. Notes 1972) of "flying young being fed Kaitaia, early November 1965." Such a fledgling must have hatched from a very early egg laid in early October.

A summary of the reproductive activities of Shining Cuckoos and their host for the six months during which the latter breeds is as follows (see Cunningham 1955, Gill 1982).

August (late winter): Warblers build first nests and begin laying; a few cuckoos arrive in New Zealand.

September (early spring): Building becomes less frequent, laying reaches a peak and warblers start hatching; cuckoos apparently arrive in greatest numbers.

October (mid-spring): Warblers rarely build and seldom lay, but most of their early broods hatch and fledge; cuckoos lay first eggs.

November (late spring): Warblers re-build, re-lay and continue to hatch and fledge; laying by cuckoos reaches a peak and some cuckoos hatch and fledge.

December (early summer): Building stops; laying by both species tails off; late warbler broods and most cuckoos hatch and fledge.

January (mid-summer): The last nestlings (warbler and cuckoo) fledge.

EGGS

Behaviour associated with laying

Females of many brood-parasitic birds find nests in which to lay by watching the hosts build (Payne 1977). For example, European Cuckoos *(Cuculus canorus)* may remain still for up to several hours at a time watching their hosts (Chance 1922). In November 1976 I saw an adult Shining Cuckoo (sex unknown) suddenly sleek its feathers and stiffen, head in line with body at 45° to the horizontal, as two foraging warblers approached to within a few metres. The cuckoo remained perfectly still but for a slight rotation of its head, which kept the warblers in view. The warblers apparently did not notice the cuckoo. Later I found the warblers' nest 30 m away, and the clutch was parasitised 12 days after the above observation. It suggests that direct and unobtrusive scrutiny of its host may be important to the Shining Cuckoo in locating nests. The barred underparts and iridescent green dorsal colours of the Shining Cuckoo, although gaudy in a museum skin, are remarkably cryptic in the field, and may help the cuckoo to watch its host unobserved.

Many British song-birds respond aggressively if a stuffed European Cuckoo is placed near their nest (Edwards *et al.* 1949). In September 1977 I flushed a female Grey Warbler from a partly incubated clutch and fixed a stuffed male Shining Cuckoo about half a metre behind the nest. When the female returned she moved in circles within a few metres of the cuckoo, twittering constantly. This drew the male, who reacted in a similar but more vigorous way. There was no physical contact with the model. The commotion attracted Silvereyes *(Zosterops lateralis)* and provoked alarm calls from a Blackbird *(Turdus merula)*. I removed the cuckoo after a few minutes. The male began to sing continuously and the pair took 15 minutes to settle down. It remains to be seen whether warblers respond in this way to a stuffed bird of any species placed near their nest.

The way by which Shining Cuckoos lay in the Grey Warbler's enclosed nest is not known, but there seem to be three possibilities.

1. *The cuckoo enters the nest.* This is plausible because Shining Cuckoos tend to be slimmer, and entrances to nests larger, than one imagines. Adult cuckoos weigh 23 g (Gill 1980b), but nests held nestling warblers with a combined weight of up to 30 g, and

single nestling cuckoos weighing up to 25 g. Oliver (1955) gave the account of a person who allegedly saw a Shining Cuckoo laying by forcing itself in through the entrance and out through the opposite wall, the damage being repaired by the warbler. However, of the six nests I examined up to a few hours after the cuckoo laid, none was damaged. I doubt the warbler's capacity to repair nests since I saw no evidence of it, even though weakening of the nest's entrance, attachment or body was common as the nestlings grew.

2. *The cuckoo clings to the outside and inserts its cloaca through the entrance.* This is suggested by the fact that the female European Cuckoo has a protrusible cloaca and hard-shelled eggs (Baker 1942, cited by Lack 1963), which allow direct laying, even from a small height, into difficult nests. However, eggs of the Shining Cuckoo at Kowhai Bush seemed to be about as thin-shelled as the host's.

3. *The cuckoo lays elsewhere and carries its egg to the nest.* Fulton (1910) considered this method " almost certainly " employed by Shining Cuckoos, and Andersen (1926) quoted a manuscript alleging that it was seen often by early Maoris. Several species of cuckoo, including *Ch. lucidus* in Australia (Morris & Catchpole 1978), have been seen carrying eggs of their hosts away from nests, but never carrying their own eggs to nests. I tried fitting a Shining Cuckoo's egg into the bill of a dead adult. The lower edge of the broad maxilla followed the curve of the egg perfectly, and the mandible pressed upwards in such a way as would hold the egg easily in place. Thus, it seems possible that the female Shining Cuckoo could carry her egg to the nest.

A female Shining Cuckoo collected in Christchurch on 6 November 1977 had about a third of an egg-shell in its gizzard. The egg was white with brownish speckles and so was probably a Grey Warbler's, suggesting that eggs removed during parasitism (or at other times) are swallowed. In Australia, Morris & Catchpole (1978) saw *Ch. lucidus* eating an egg of its host, but the shell was discarded. In Northland, Michie (1948) saw on separate occasions a Shining Cuckoo swallowing the contents of a Chaffinch's egg *(Fringilla coelebs)* and a Grey Warbler's egg, then dropping the shell.

Colour, shape and size

Oliver's description (1955), repeated by Falla *et al.* (1970) and traceable to Buller (1888), that eggs of the Shining Cuckoo are " greenish or bluish white to olive brown or dark greenish brown," lacks clarity. The 16 eggs I saw at Kowhai Bush (shells from six collected) were olive-green. On close examination they seemed to have a basal colour of pale grey-green overlaid with a finely-mottled olivaceous pigment. Some eggs were darker than others because this superficial colouring varied in intensity. A few eggs lost patches of the superficial pigment, perhaps after rubbing against eggs of the host.

The olivaceous pigment is said to be water soluble in this species (Serventy & Whittell 1976).

Most Shining Cuckoo eggs were almost elliptical — the narrower end was nearly as blunt as the wider — but the smallest egg in my sample (17.3 x 12.0 mm) was the same shape as a song-bird's egg. Other eggs that I measured were as follows: 20.1 x 13.1 mm, 18.8 x 12.3 mm, 18.6 x 13.1 mm.

NESTLINGS

The newly hatched cuckoo

Shining Cuckoos at hatching (Fig. 2A) had dark grey skin, apart from a dorsal pink area at the base of the neck which sometimes extended on to the back and belly. The head and back were sparsely covered in coarse, white, hair-like natal down-feathers (trichoptiles), and the rictal flanges were white. The bill was pink at its base but otherwise grey, and the buccal lining and tongue were pink. The legs were grey with pale soles and white claws, and there were bristles less than 1 mm long on the caudal and alar tracts. The toes were facultatively zygodactylous.

The natal down of Shining Cuckoos (Fig. 2A-C) was restricted to the occipital, and especially coronal, regions of the head, and to the two dorsolateral areas of the back. There were about 40 long trichoptiles on the head and about 20 on the back, plus many shorter thinner trichoptiles on head and back. The natal down-feathers (neossoptiles) of passerines are arranged in regular rows, whereas the Shining Cuckoo's trichoptiles were more scattered. Figure 3 shows the Grey Warbler's branched fluffy neossoptile and the filamentous trichoptile of the Shining Cuckoo.

Nestlings in several cuculid subfamilies (e.g. Coccyzinae, Centropodinae) have natal feathers (Miller 1924). For example, Shelford (1900) coined the term " trichoptile " for the hair-like feathers up to 4 cm long on nestlings of *Centropus sinensis.* However, it has been supposed that all parasitic cuckoos (Cuculinae) are naked at hatching. Miller (1924) stated that nestlings of *Cuculus* lack natal down, and this was confirmed for the African *Chrysococcyx* by Jensen & Jensen (1969) and Jensen & Vernon (1970). Naked nestlings of the European Cuckoo and of Klaas's Cuckoo *(Chrysococcyx klaas)* are illustrated in Wyllie (1975: plate 48) and in Jensen & Clinning (1974: Fig. 13A) respectively. In Australia, nestlings of Horsfield's Bronze-cuckoos *(Ch. basalis)* and of *Ch. lucidus* are said to be naked at hatching (McGilp 1941, Courtney & Marchant 1971), but nestling Gould's Bronze-cuckoo *(Ch. russatus)* have " four white tufts on the rear of the crown and no other down elsewhere " and nestling Little Bronze-cuckoos *(Ch. malayanus minutillus)* have " pale yellowish plumules on the crown and along the back " (McGill & Goddard 1979).

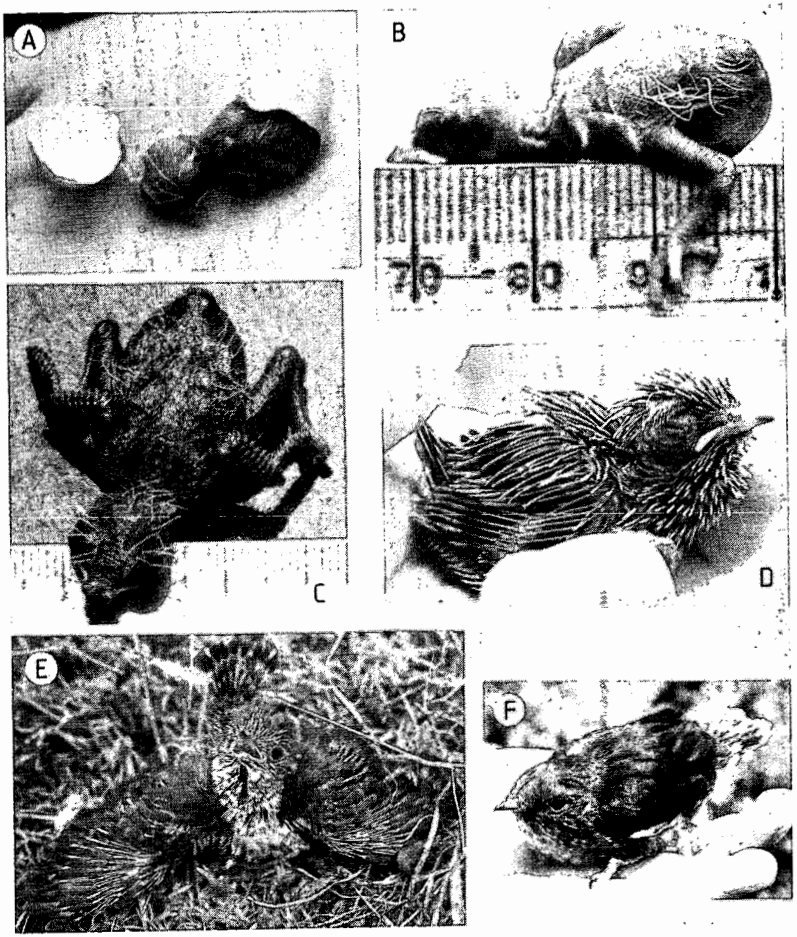

FIGURE 2 — Developmental stages of the nestling Shining Cuckoo (scales in mm): (A) At hatching; (B) 1 day old; (C) 6 days old; (D) c. 14 days old; (E) c. 15 days old, in defensive display; (F) c. 19 days old

Physical development

I described changes with age in the superficial morphology of Shining Cuckoos from regular examination in the field of 16 nestlings. The following description is generalised because the rate of development varied greatly among individuals — compare, for example, the nestling in Fig. 2D with that in Fig. 2E. The names and positions of major feather-tracts in the cuckoo are the same as for song-birds (for the Grey Warbler see Gill, in prep.), except that song-birds have a median spinal pteryla, whereas the Shining Cuckoo has paired spinal

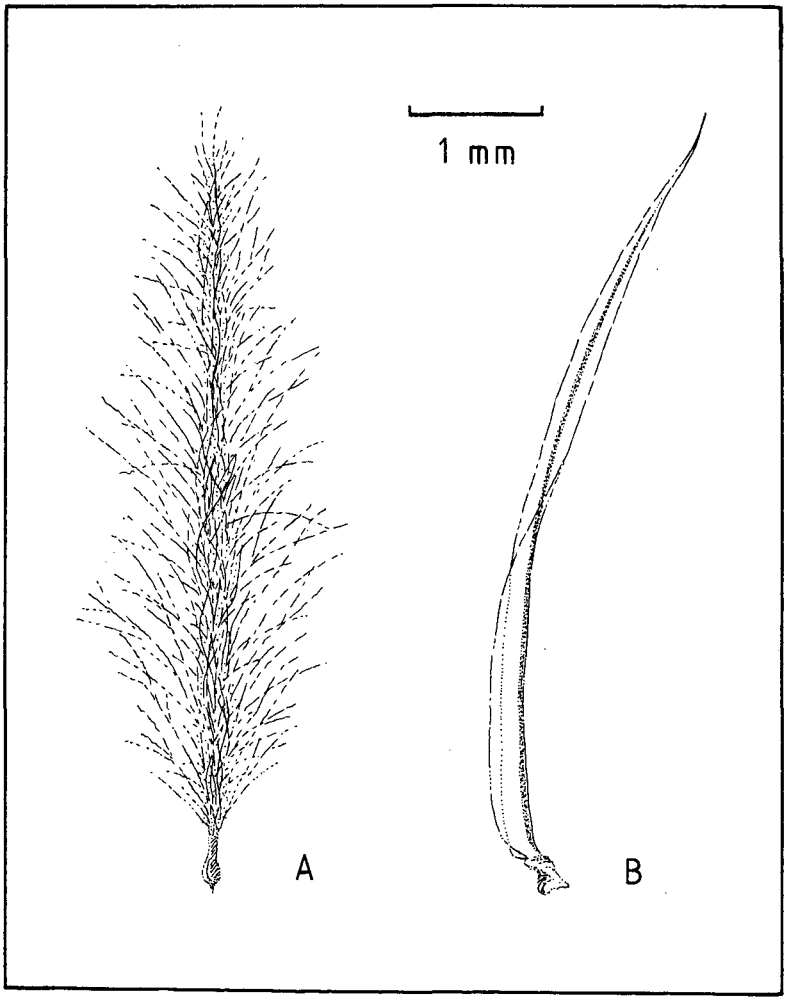

FIGURE 3 — (A) Neossoptile from a nestling Grey Warbler. (B) Trichoptile from a nestling Shining Cuckoo

pterylae separated by a median dorsal apterium and united posteriorly. Day 0 was the day of hatching. The nestling period was 19-22 days.

Day 1-5 (Fig. 2B): The skin darkened to deep grey or black, especially dorsally; claws turned grey. The bill darkened, especially dorsally and terminally; the tongue developed a grey tip. Eyes partly opened, revealing dark brown irides; rictal flanges turned pale yellow in most cases.

Day 6-9 (Fig. 2C): The skin became dull orange where ventral pterylae were forming. Pin feathers (or at least the bristles terminal to them) were visible on all tracts and reached up to about 7 mm on the alar. Pin feathers of the pectoral and crural pterylae were bright orange-yellow; all others were dark grey or black, except those of the sterno-abdominal and femoral pterylae, which were mixed. By day 9 at the earliest, the tips of many pin feathers had admitted air and turned pale. The legs became blue-grey with pale yellow soles. Eyes opened fully.

Day 10-14 (Fig. 2D): Humeral and alar feathers were often first to erupt from their sheaths, on day 10 at the earliest. By day 14 most feathers were erupting in all pterylae and nearly all natal down had been shed. Dorsal plumage was iridescent brownish-green; feathers of the breast and belly were yellowish. Most of the bill was dark grey; rictal flanges, which did not change beyond pale yellow, were regressing. The edges of the buccal lining were sometimes yellowish.

Day 15-19+ (Fig. 2E,F): The first iridescent green bar on the otherwise yellow ventral feathers was visible from about day 15. Sheaths became less conspicuous externally as the plumage developed, and the ventral apterium was occluded before fledging. As with most altricial birds, rectrices did not develop fully in the nestling. The egg tooth was shed at 15-17 days.

The physical development of Shining Cuckoos is similar to that described for *Chrysococcyx klaas* (Jensen & Clinning 1974) and for the Didric Cuckoo (*Ch. caprius;* Jensen & Vernon 1970). Apart from lacking natal down, nestlings of these species appear to differ from *lucidus* only in minor details such as coloration.

Behavioural development

Soon after hatching, Shining Cuckoos gripped the nest, and from an early age they struggled against handling by flexing the wings and legs, and by clenching and unclenching the toes. Young nestlings held the wings out stiffly from the body, but once the cuckoo was clothed in pin feathers (the " porcupine " stage; Fig. 2D) the wings flopped limply to the side, and the head flopped forward when the nestling was placed on a flat surface.

Nestlings first cheeped soon after hatching, and the cheeping of larger nestlings, audible 10-20 m away, reached a crescendo when-

ever the foster-parents arrived with food. The begging call was similar to that of young warblers, and mimicry may be involved, as apparently occurs in some Australian *Chrysococcyx* (Courtney 1967).

From day 7, cuckoos screeched loudly and rhythmically *(eee-eee-eee-eee)* on removal from the nest and if provoked during handling. After day 11-14, they responded to visual stimuli and gave a defensive display in or out the nest (Fig. 2E). The cuckoo would lift its head high, gape widely or incline the bill downwards, and raise the crown and throat feathers. It would lunge and snap at passing objects and rotate the head almost a full circle to follow the source of annoyance. If placed on the ground the cuckoo spread the wings, bringing them forward. Jensen & Clinning (1974) reported a similar display in *Ch. klaas.* Older nestling Shining Cuckoos often responded to handling by discharging from the cloaca a dark brown, sticky (but not foul-smelling) fluid. Jensen & Clinning considered this to be defensive in *Ch. klaas* since the fluid was nauseating. Not until a few days before fledging could Shining Cuckoos perch and support their own weight.

Growth

Once daily, between 1000 h and 1500 h, I weighed nestling Shining Cuckoos and measured their right tarsus (diagonally from the notch at the tibiotarsal joint to the bend of the folded foot). The mean values for three years' data pooled are graphed as a function of age by Gill (in press), and the data are given in Table 1 for their value in ageing. Day 0 was that on which daily visits first revealed the nestling.

FLEDGLINGS

Newly fledged Shining Cuckoos had a dark grey bill (black in adults) with the base pink ventrally and blue-grey legs (black in adults). The dorsal plumage lacked the deep copper sheen of adults, and the bill and tail were shorter. Fledglings had pale yellowish underparts (white in adults). The iridescent green ventral barring was slightly less pronounced than in adults but was essentially the same. The sides and flanks were strongly barred, the belly was unbarred, and the breast was irregularly barred (appearing almost longitudinally striped from a short distance). Friedmann (1968) and Marchant (1972) were not entirely correct in stating that the young of Indo-Australian *Chrysococcyx* are not barred below.

Newly fledged Shining Cuckoos, which were weak fliers, behaved secretively and perched silently and immobile for long periods. Later, however, when flying well, cuckoos cheeped loudly, begged vigorously by fluttering the wings, and followed their foster-parents, cheeping in flight. They were aggressive towards the warblers and often pecked at them immediately after the delivery of food.

I saw cuckoos being fed for up to 28 days after fledging, but they may be fed for longer. Cuckoos caught prey from about their

16th day free of the nest. For the first 3-4 days both foster-parents cared for the fledgling, but thereafter the cuckoo was nearly always the male's responsibility. Fledglings of *Chrysococcyx klaas* are fed for at least 25 days (Jensen & Clinning 1974); those of *Ch. caprius* for up to 38 days (Reed 1968).

A juvenile Shining Cuckoo collected in Christchurch on 12 February 1979 had a layer of subcutaneous fat several millimetres thick on the lower abdomen and other depositis along the gizzard and intestine. An adult taken in Greymouth on 8 February 1973 also had massive deposits of abdominal fat. These observations indicate preparation for migration of both adults and juveniles during late summer.

IDENTIFYING THE SEXES

According to Mayr (1932), females of *Ch. lucidus lucidus* differ from males in coloration of the crown, hind-neck, ventral bars and fourth rectrix. Oliver (1955) and Falla *et al.* (1970) repeated Mayr's account. However, I saw no obvious sexual dimorphism in the plumage of 19 dead adults from New Zealand. The average weight

TABLE 1 — Weights (g) and tarsal lengths (mm) of nestling Shining Cuckoos. Age in days.

	Weight				Tarsus			
Age	Mean	n	SD	Range	Mean	n	SD	Range
0	1.60	7	0.22	1.2-1.9	7.26	7	0.43	6.6-7.7
1	2.24	7	0.29	1.7-2.6	8.30	7	0.35	7.6-8.6
2	3.09	7	0.43	2.4-3.7	9.49	7	0.49	8.8-10.3
3	4.38	6	0.66	3.1-4.9	10.54	7	0.55	9.8-11.2
4	5.25	4	1.84	3.3-7.1	11.55	4	0.93	10.4-12.4
5	6.58	6	1.51	4.5-7.7	12.52	6	0.96	11.4-13.9
6	7.82	6	1.82	5.2-9.2	13.23	6	1.09	11.8-14.5
7	9.62	6	1.75	7.3-11.3	14.08	6	1.00	12.7-15.6
8	11.80	3	2.46	9.0-13.6	15.50	3	0.89	14.5-16.2
9	12.78	4	1.90	10.8-14.5	15.55	4	0.58	15.0-16.3
10	15.40	5	2.45	12.4-17.4	16.50	5	0.90	15.1-17.4
11	17.28	5	2.04	14.9-18.9	17.78	4	0.79	16.7-18.6
12	18.46	5	1.89	15.9-20.1	18.18	5	0.74	17.4-19.0
13	19.78	4	1.47	17.9-21.0	18.38	4	0.87	17.7-19.6
14	21.00	4	0.72	20.3-22.0	19.10	4	0.61	18.5-19.8
15	21.58	4	1.08	20.6-23.0	19.63	4	0.28	19.3-19.9
16	22.15	4	0.37	21.8-22.6	20.18	4	0.22	19.9-20.4
17	21.97	3	1.07	21.3-23.2	20.93	3	0.32	20.7-21.3
18	21.73	3	1.32	20.3-22.9	21.23	3	0.40	20.8-21.6

and measurements of males and females in this sample did not differ significantly (Gill 1980b) and I was unable to sex them except by dissection. I therefore agree with MacDonald (1973) who stated that the sexes are alike in *Ch. lucidus*. Which of the sexes calls is not known.

COMMUNAL DISPLAY INDUCED BY TAPES

Watson & Bull (1950) and Fitzgerald (1960) reported a communal display of uncertain social meaning, in which up to 10 Shining Cuckoos gather at a site, calling and flying from perch to perch. Twice in December 1976 while luring cuckoos by playing a tape recording of their calls (in an unsuccessful attempt to net the birds), I induced what seemed to be a communal display. Soon after I set the tape to play, three or four cuckoos appeared and remained for up to an hour, flying about and perching in the canopy above the tape recorder. They called repeatedly, giving the terminal down-slurred part of the call, and flicking out their wings partly or fully.

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SHORT NOTES

FIJI'S SEDENTARY STARLINGS

Hill (1952) was the first to report the arrival of the Starling *(Sturnus vulgaris)* in Fiji. In 1951 he found it numerous on the island of Ono-i-lau (28° 48'S, 178° 45'W), the isolated southernmost island of the Fiji archipelago. Although not seen by Hill at the time, it was also resident on three offshore islands of Ono-i-lau (Parham 1955) and on Vatoa I., 130 km NNE of Ono-i-lau (Manson-Bahr 1953). Hill (1952) was told by the local inhabitants that the Starlings had arrived about 20 years previously following a hurricane, but some villagers told Carrick & Walker (1953) that the Starlings had arrived since 1948.

Mayr (1945) made no mention of the presence of Starlings in Fiji, apparently overlooking six skins in the collection of the Whitney South Sea Expedition. These had been collected by Jose Correia, the expedition's assistant collector at the time, when he visited Vatoa I., 17-19 June 1925, en route from Suva, Fiji, to Tongatapu, Tonga. The expedition's principal collector, Rollo H. Beck, missed this leg of the expedition.

In his journal, Correia (17-18 June 1925) identified the Starling (*Esturino* in his native Portuguese) and recognised it as a species not previously collected in Fiji. Apparently it was uncommon on Vatoa, only one flock being seen and it was very shy. Local villagers told him that the Starlings had arrived only about 6 months previously. On his subsequent visit to Ono-i-lau (20-24 June 1925), Correia did not mention seeing Starlings and did not collect any. Therefore, the