

BEHAVIOUR OF NEW ZEALAND KINGFISHERS FEEDING CHICKS

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ABSTRACT

Behaviour of Kingfishers (*Halcyon sancta vagans*) was studied at three nests in Canterbury. Courtship feeding was observed. Chicks were fed by both parents, predominantly on lizards, crabs and insects. No difference was found in the proportion of prey sizes fed to chicks of different ages ($X^2=0.02$, $p>0.05$). Chicks were fed about every 20 min in the first week, the rate increasing to every 10 min in the latter stages of nesting. Kingfishers were aggressive during nesting and attacked a wide variety of species as well as other Kingfishers. Mortality during nesting of adult Kingfishers was heavy in suburban habitats.

INTRODUCTION

Relatively little information is available on the breeding biology of New Zealand Kingfishers (*Halcyon sancta vagans*). During my studies of Kingfisher feeding behaviour, I found several nests and observed Kingfishers feeding their young.

Kingfisher chicks fledge about 24 days after hatching. Juvenile plumage is similar to that of adults except that the breast feathers have a dark edging, giving the chest a mottled look, and the upper wing-coverts are tipped with cream. Chicks remain with their parents for several weeks after leaving the nest and then disperse to winter habitats (Stead 1932).

Information about the diet of nestlings is largely restricted to analyses of food pellets and droppings, which have shown that Kingfisher chicks are fed a wide variety of invertebrates and some vertebrates (O'Donnell 1981, Fitzgerald *et al.* 1986). In a direct observation of Kingfisher chicks being fed by their parents, Guthrie-Smith (1927) found that chicks were fed mainly lizards and dragonflies and occasionally cicadas and locusts. I examined the following questions about the feeding of nestlings:

1. What are New Zealand Kingfisher chicks fed on ?
2. Does the size of prey given to chicks vary with the age of chicks ?
3. Do both parents feed the chicks ?
4. How often are the chicks fed ?

STUDY AREAS AND METHODS

Four nests were found. One nest was in a clay bank at Allandale, the most southern point of Governors Bay in upper Lyttelton Harbour (Fig. 1). Here large areas of mudflat are exposed at low tide, and the surrounding steep hillside is farmland with small pockets of native bush. Two nests were found in successive years in a clay bank beneath a pole house at Ferrymead, on the lower Heathcote River in eastern Christchurch (Fig. 1). At Ferrymead the hillside is being developed for housing, and at the bottom of the hill the mouth of the Heathcote River has mudflats exposed at low tide.

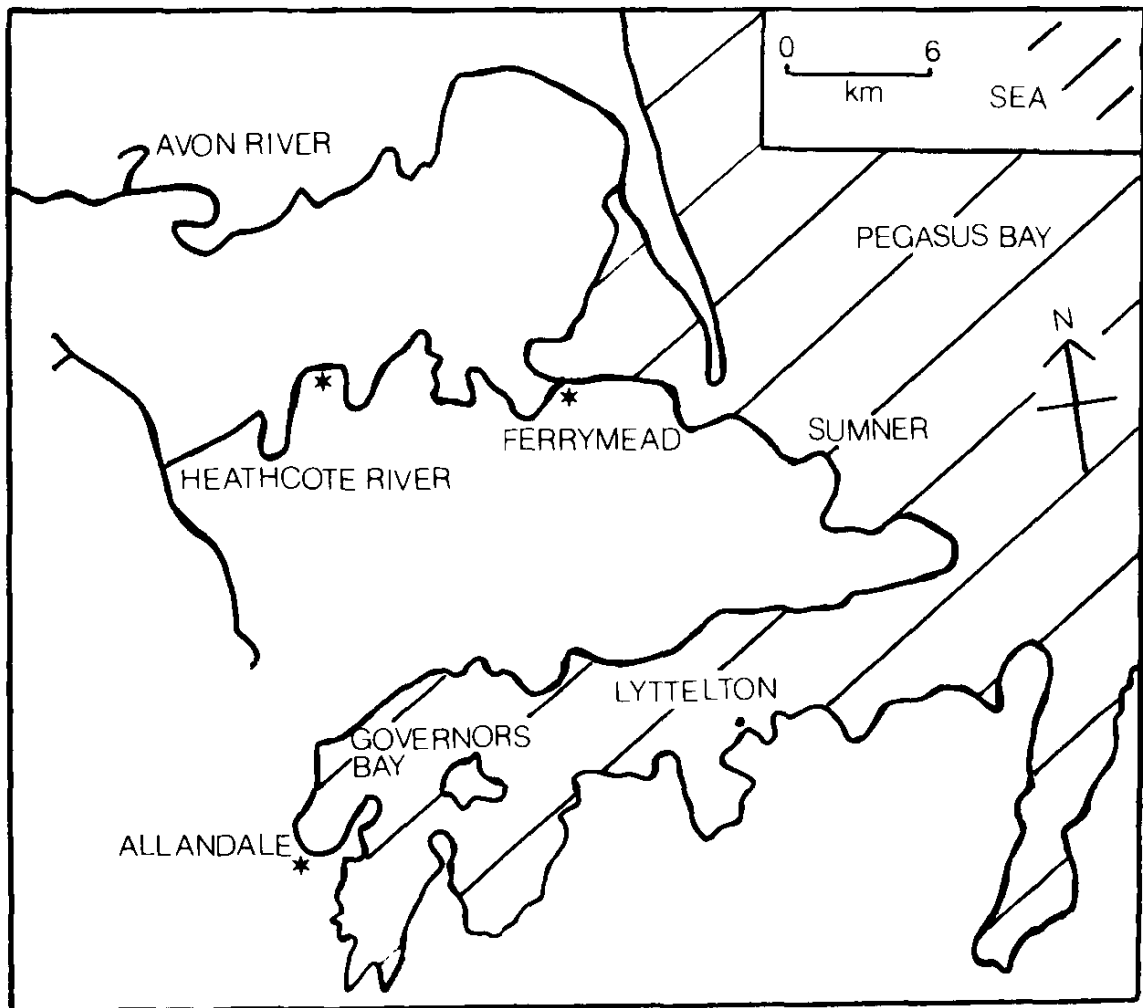


FIGURE 1 — The location of Kingfisher nest sites studied (marked with an asterisk)

A fourth nest was found in a suburban area. This nest, from which chicks had recently fledged, was in a willow tree on the banks of the Heathcote River, in Riverlaw Terrace (Fig. 1). I observed the first three nests at different times of the day using a 25x spotting scope or 12x50 binoculars from distances of 10-30 m. I recorded food items brought to the nest, which parent brought the food (sex can be determined by plumage), the time interval between feeding visits, and any interesting behaviour by the parents such as aggression or courtship feeding. After the chicks had fledged, I collected and identified food remains from the ground beneath the first three nest holes, as well as inside the fourth nest hole.

RESULTS

The first nest I found at Ferrymead on 18 January 1988 had parents taking food to the nest hole, and within a few days the chick(s) had begun rasping. The female parent disappeared on 29 January and was not seen again, presumed dead. The male parent continued to attend to the nest on his own, and on 13 February 1989 one male chick fledged. The second nest I found, at Riverlaw Terrace on 11 February 1989, was empty. Neighbours informed me that two chicks had fledged successfully, but the father had been caught and killed by a cat.

I discovered a pair of Kingfishers courting at Ferrymead on 21 November 1989. By 20 December both parents were taking food to their young. On 20 January the female flew into a window, smashing her beak, and was not seen again. The male was seen in the area for a few more days before disappearing, but no chicks were seen to fledge from this nest. I found a fourth nest at Governors Bay on 13 December 1989. The parents had already begun to feed their chicks and on 22 December one male and one female chick fledged.

What food items were fed to chicks ?

Chicks were fed mainly on lizards, crabs and insects, especially beetles (Table 1). Parents were seen to eat the same kinds of food items that they fed to the chicks ($n = 76$).

Did the size of food items vary with age of the chicks ?

I found no difference between the proportion of small (crabs and insects) and large (lizards) prey items fed to newly hatched chicks, to chicks 1-2 weeks old, and to chicks close to fledging (Table 2).

Which adults fed the chicks ?

Both parents fed the chicks and provided similar proportions of food types (Table 3). At the two nests where both parents survived to feed the chicks, these parents provided similar numbers of prey items. At Governors Bay, the male and female parents brought 19 and 20 items respectively, and at Ferrymead 38 and 34 items each during a total of 60 hours of observation. Parents continued to feed their chicks for a week after fledging; then the chicks began to catch food for themselves.

How often were chicks fed ?

Chicks were fed about every 20 min in the first week after hatching, which increased to about one visit every 10 min in the last two weeks before fledging (Table 4). At the nest where one parent died and the other parent raised the chick alone, the rate remained at about once every 20 min. Chicks were fed throughout the day, lizards being brought to the chicks during warm parts of the day, crabs at low tide, and other invertebrates at any time.

Aggression

Kingfishers were very aggressive during the nesting period. Other adult Kingfishers were rarely seen near a nest. Intruders were attacked and quickly chased out of the area, usually by the male, accompanied by loud shrieking. Juvenile Kingfishers were tolerated by adults. Groups of 4-5 chicks from 2-3 families commonly joined together to feed when the chicks were several weeks old and becoming independent.

Other species were attacked and harassed by nesting Kingfishers. At Governors Bay five Starlings (*Sturnus vulgaris*), a White-faced Heron (*Ardea novaehollandiae*) and two South Island Pied Oystercatchers (*Haematopus ostralegus finschi*) were attacked on separate occasions. At Ferrymead seven Starlings, two Blackbirds (*Turdus merula*), two House Sparrows (*Passer domesticus*), three dogs and three people were attacked when they came too close to the nest. Attacks were most likely just before the chicks fledged.

TABLE 1 — Food items given to chicks (nest remains and observations)

Food	Nest Location			
	Ferrymead 1988	Ferrymead 1989	Riverlaw Tce	Governors Bay
Vertebrata				
Reptilia				
Scincidae				
<i>Leiopisma</i> sp.	23	37	1+	2
Crustacea				
Decapoda				
Grapsidae				
<i>Helice crassa</i>	15+	16+		31+
Insecta				
Coleoptera				
Carabidae				
<i>Megadromus antarcticus</i>	10+	6+	5+	
Lepidoptera				
Noctuidae				
Unid. sp.	2	2		
Diptera				
Unid. sp.			0	
Odonata		1		
Unid. sp.				
Hemiptera				
Unid. sp.		1		
Arachnida				
Araneidae				
Unid. sp.		1		
Mollusca				
Helicidae				
<i>Helix aspersa</i>	0			
Annelida				
Unid. sp.		1		2

0 = nest remains only

TABLE 2 — Numbers of large and small items fed to chicks combined from the three nests which had chicks, $X^2 = 0.02$, N.S.)

	Large food items	Small food items
Week 1	7	7
Week 2	18	17
Week 3	10	9

TABLE 3 — The number of main food types given to chicks from two nests with both parents ($X^2 = 3.79$, N.S.)

Food	Males (n=93 visits)	Females (n=65 visits)
Lizards	32	25
Crabs	38	32
Insects	23	8

TABLE 4 — Interval between feeding visits by parents (minutes)
(n = 153 visits)

Location	Week 1	Week 2	Week 3
Ferrymead 1988*	20	17.9	19.7
Ferrymead 1989	22.8	8.6	8.6
Governors Bay	-	6	10

* Female parent died at the end of the first week

Courtship feeding

I observed courtship feeding twice. At Governors Bay the male gave the female four lizards and one crab over a period of 1.5 hours before mating with her. The male approached the female with food in his beak and calling loudly. Both birds made a purring noise and moved towards each other, and the male gave the female the food. After mating the birds flew off in different directions. At Ferrymead the male arrived outside the nest hole with a small fish and called to the female that was sitting on the eggs inside. The female flew out, received the fish, and both birds flew off together.

DISCUSSION

Kingfisher chicks in my study area were fed mainly on lizards, crabs and insects, especially beetles. This list agrees well with other information available on chick diet. Beetle wing cases were first recorded in nest castings more than 100 years ago at Governors Bay (Potts 1882). Pellets cast by nestling Kingfishers in forest habitats have contained a wide variety of invertebrates and some vertebrates. O'Donnell (1981) recorded freshwater crayfish, dragonflies, cicadas, beetles, weevils, one stick insect and one skink in food remains at nests. Fitzgerald *et al.* (1986) recorded a long list of invertebrates from pellets and droppings, in which cicadas, dragonflies and

chafers were especially important. Although few lizards, small birds and mice were given to nestlings, they were an important part of nestling diet because of their size. Guthrie-Smith (1927) observed Kingfisher chicks in his garden being fed on lizards, dragonflies and occasionally cicadas and locusts. As some foods such as moths and worms do not have hard parts which are discarded, a comprehensive food list can be compiled only by watching Kingfishers bringing food to the nest, in addition to collecting nest castings. The New Zealand Kingfisher seems to have a mixed diet typical of forest kingfishers (*Daceloninae*), which contrasts with the more specialised diet of the fishing kingfishers (*Alcedininae*).

The size of food items fed did not vary with chick age in my study. Pied Kingfishers (*Ceryle rudis*) in Uganda fed chicks smaller fish than those eaten by adults, and the chicks were fed progressively larger fish as they grew (Douthwaite 1976); Skutch (1957) also reported the same for Amazon Kingfishers (*Chloroceryle amazona*). That the chicks were fed fish of an increasing size is not surprising because adult Pied Kingfishers took fish up to 10.8 cm long, which is probably too large for a young chick to deal with. By comparison the largest food item I saw fed to New Zealand Kingfisher chicks in this study was a skink 7-8 cm long, and most food items were much smaller.

Both members of New Zealand Kingfisher pairs fed the young, as is typical of all kingfisher species (Fry 1980). The rates recorded in this study were higher than recorded for the feeding of Giant Kingfisher (*Megaceryle maxima*) chicks, which were fed every 108 min (Arnell 1978), but similar to that for Belted Kingfishers (*Megaceryle alcyon*), which fed their young every 17 min in the morning, the period of greatest activity (Cornwell 1963). The number of visits made to nests is likely to depend on the number of chicks in the nest and the size and availability of prey items.

Mortality was high among the nesting Kingfishers that I studied in suburban habitats. One adult was killed flying into a window, another adult was killed by a cat, and another disappeared. Mortality is also high in the European Kingfisher (*Alcedo atthis*), estimated to be around 75% each year (Morgan & Glue 1977). Common causes of death were being hit by cars, caught by predators and flying into windows. Human interference was cited as the cause of nest desertion in four out of six Belted Kingfisher nests in Minnesota (Cornwell 1963). Of 173 European Kingfisher nests, 11 failed because people took eggs or tampered with the nest (Morgan & Glue 1977). New Zealand Kingfishers may have poor breeding success in suburban habitats.

Courtship feeding was observed in this species and has also been described in two other kingfisher species, the Senegal Kingfisher (*Halcyon senegalensis*) and the European Kingfisher (Milstein 1962, Boag 1982).

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CORRECTION

Correction to Hayes 1989 "Feeding behaviour of New Zealand Kingfishers at an estuary in winter", *Notornis* 36: 107-114. The equation in Figure 3 $Y = 0.58 + 0.0677x$ should read $Y = 13.084 + 3.443x$.



SHORT NOTE

Bitterns using mangroves

At 4.40 p.m. on 23 September 1990 we were canoeing down the Pataua Estuary on the East Coast of Northland near Whangarei at low tide, when a Bittern (*Botaurus poicilopterus*) flew out of the mangroves on the side of the river that we were on, across the estuary and landed on the mud among the mangroves on the far side. We canoed on for another 150 m and another Bittern did the same thing. Presumably they were feeding on the crabs, shrimps and other small animals that live in the mangroves. We have spent quite a lot of time canoeing along mangrove creeks in the last five months but have not seen Bitterns in the mangroves before. Presumably they use them only when their normal habitat is adjacent to them and even then only at low tide. Low tide on 23 September was at about 4.30 p.m.

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