Nestling and Adult Diet of the Willie Wagtail *Rhipidura leucophrys* Near Madang, Papua New Guinea

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The Willie Wagtail *Rhipidura leucophrys* is a common species in most man-made habitats in New Guinea (Coates 1990) but its food preferences have not been studied in detail (Clapp 1982). Cameron (1985) studied habitat preferences, foraging ecology and food of adult Willie Wagtails in Australia. Our analysis of their diet is part of a more extensive study of a Willie Wagtail population in optimal (high breeding density) but highly changed habitat at the northern limit of its geographical range (Dyrcz 1994).

Study area and methods

The study was carried out from 22 November to 6 December 1990 at Jais Aben Resort, some 15 km north of Madang (5°S, 146°E). The study area was parkland with extensive lawns, scattered coconut palms and other trees, ornamental bushes and houses and was situated along the sea-shore (Fig. 1 in Dyrcz 1994).

Nestling food samples were taken by two methods: faecal analysis and neck-collar method (Kluijver 1933). After collection, fresh droppings were conserved in the field with a small amount of salt and later stored in a refrigerator. For examination, the faeces were dispersed by soaking them in water for two hours and analysed under a binocular microscope at 20x magnification. The prey remains were used to calculate the number of individuals (Flinks & Pfeifer 1987) and for comparison with neck-collar samples the length per individual was estimated approximately. The method of faeces analysis has been thoroughly validated by Davies (1976, 1977a, 1977b), Ralph *et. al.* (1985) and Jenni *et al.* (1989). The neck-collar method does not harm the nestling if applied properly (Bogucki 1964). In this study it was applied to three nestlings in two different nests. In one nest, two fledglings left the nest successfully, and in the second a healthy, 11-day-old nestling was still in the nest when our study ended.

Altogether, 34 nestling droppings with the fragments of 544 animals, nine adult droppings (63 animals), and 36 samples of nestling food (59 animals) taken by the neck-collar method, were analysed. Nestling droppings included ten taken from fledglings 15-18 days old, close to the nest; the remaining samples were taken from nestlings 6-14 days old. Both methods have some weaknesses and could be considered complementary. In faecal samples, the prey with hard chitinous parts are better preserved than other animals. In throat samples, small items can be swallowed in spite of the neck-collar and very large animals can be spat out.

An attempt was made to evaluate the size and composition of potential food present, by exposing 13 yellow trays from dawn to sunset on eight different days (4, 12, 17 and 21 October; 6, 14, 22 and 29 November) in the area with Willie Wagtail nests. These trays were 300 mm long, 240 mm wide and 120 mm deep and made from water-proof cardboard with the inside surfaces painted bright yellow. Trays were filled with fresh-water to which a small amount of detergent was added to decrease water surface tension. Insects were lured by the bright yellow colour and drowned.

Results

The food of Willie Wagtail nestlings was diverse (Table 1) which is in accordance with the different foraging methods of adult birds (Cameron 1985, Dyrcz 1994). Flying insects (true flies, winged ants and other Hymenoptera) caught mostly in the air were an important part of the prey (56.9%, 28.8%, Table 1). The list included some ground animals (millipedes and centipedes) while most of the remaining prey, including moths that were inactive during the day, was caught on plants. The largest prey were geckos and other lizards that were very numerous in the study area and were caught on the ground and on tree trunks (Dyrcz 1994). Willie Wagtails hunting reptiles were quick and skilful; this prey was killed by pounding them on hard ground.

Table 1 Food and potential food of the Willie Wagtail.

Taxon	Nestling (faecal analysis)		Nestlings (neck collars)		Adults (faecal analysis)	Yellow trays	
	n (%)	Frequency	*n* (%)	Dry weight in mg (%)	*n* (%)	*n* (%)	Frequency
Saw bugs (Isopoda)	—	—	1 (1.7)	17.0 (1.4)	—	—	—
Spiders (Araneae)	33 (6.1)	59	12 (20.3)	157.0 (13.2)	3 (4.8)	16 (0.6)	75
Millipedes (Diplopoda)	18 (3.3)	47	—	—	—	—	—
Centipeda (Chilopoda)	—	—	1 (1.7)	14.0 (1.2)	—	—	—
Bristletails (Thysanura)	4 (0.7)	12	—	—	—	—	—
Cockroach (Blattidae)	—	—	1 (1.7)	16.0 (1.3)	—	—	—
Orthoptera	38 (7.0)	74	3 (5.1)	91.2 (7.7)	3 (4.8)	3 (0.1)	62
Cicadas (Cicadidae)	—	—	8 (13.6)	287.0 (24.1)	—	—	—
Other Homoptera	—	—	1 (1.7)	0.5 (0.1)	—	—	—
True bug (Heteroptera)	—	—	1 (1.7)	5.0 (0.4)	—	—	—
Bugs (Hemiptera) (generally)	44 (8.1)	65	—	—	2 (3.2)	21 (0.8)	100
Beetles (Coleoptera)	42 (7.7)	53	1 (1.7)	36.5 (3.1)	4 (6.3)	22 (0.9)	100
Butterflies and moths (Lepidoptera), larva	8 (1.5)	24	—	—	—	—	—
Butterflies and moths (Lepidoptera), imago	34 (6.3)	62	12 (20.3)	248.5 (20.8)	3 (4.8)	21(0.8)	100
Ants (Formicidae)	214 (39.3)	100	3 (5.1)	130.2 (10.9)	34 (54.0)	—	—
Other Hymenoptera	41 (7.5)	50	1 (1.7)	12.0 (1.0)	7 (11.1)	—	—
Hymenoptera (ants + other Hymenoptera)	—	—	—	—	—	1186 (47.1)	100
True flies (Diptera)	55 (10.1)	88	13 (22.0)	141.0 (11.8)	4 (6.3)	1248 (49.6)	100
Gecko (Gecconidae)	—	—	1 (1.7)	36.0 (3.0)	—	—	—
Reptiles (Reptilia) (generally)	10 (1.8)	27	—	—	1(1.6)	—	—
Others	3 (0.6)	9	—	—	2 (3.2)	—	—
Total	544 (100.0)		59 (100.0)	1192.0 (100.0)	63 (~100)	2517 (~100)	

However, the remains of lizards in faeces were only tailbones, so that estimation of length was impossible. It may be that Willie Wagtails only captured the tail of a lizard.

The sample of adult food is small (Table 1) but large enough to suggest no essential difference in diet of adults and nestlings; however, the prey eaten by adults seemed to be on average smaller (Fig. 1).

The yellow trays attracted mainly flies and Hymenoptera, an important part of Willie Wagtail diet (Table 1). The average length of insects (mm) from yellow trays was significantly smaller ($\bar{X}$ = 3.9 ± 2.2, n = 2522) than that of the prey fed to the nestlings ($\bar{X}$ = 11.8 ± 4.6, n = 59; t = 13.2, $P < 0.001$) (Fig. 2) which suggests that Willie Wagtails selected larger food items to feed their nestlings.

Discussion

Data in the literature concerning Willie Wagtail diet are few. Our study population of Willie Wagtails showed a broad prey preference. Cameron (1985), who studied food (adult stomach analysis) of three closely related and sympatric species (Rufous Fantail *Rhipidura rufifrons,* Grey Fantail *R. fuliginosa* and Willie Wagtail),

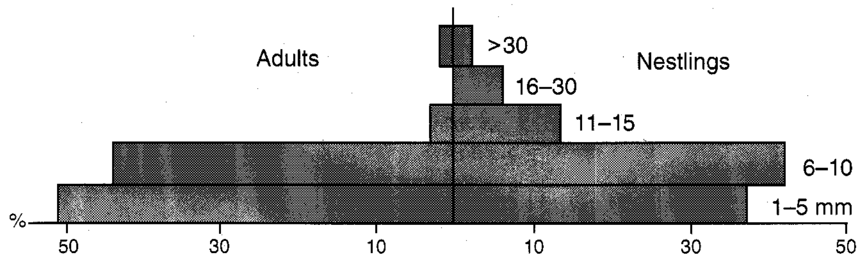

Figure 1 Distribution of the size (body length) of prey of adult and nestling Willie Wagtails.

stated that the Willie Wagtail consumed the widest range of arthropod taxa.

Clapp (1982) studied a lowland population in western New Guinea and listed dragonflies, butterflies and cicadas as Willie Wagtail food. An inland population (altitude 200 m) of the Willie Wagtail studied by Cameron (1985) in Australia ate a high proportion of wasps and winged ants, and also many muscid and tabanid flies, caterpillars, moths and butterflies. She also mentioned that between January and March 72-82% of the insects in the stomachs were hymenopterans, including a high proportion of winged ants. So it seems that the diet of Willie Wagtail in other regions does not differ greatly from the diet near Madang, except that of the latter population included a relatively high proportion of reptiles in their diet. The ability of Willie Wagtails to exploit various sources of food using different hunting techniques may be the reason for their wide geographic range in comparison to congeners.

The prey of adults was on average smaller than that given to nestlings (Fig. 1), which can be interpreted as an energy saving adaptation, since the cost of transportation is lower in terms of the number of calories delivered per flight when a nestling is fed larger prey. Small prey (e.g. swarms of winged ants) are better consumed by the adult on the spot because their transportation would be costly (few calories per flight). AD observed that during a population explosion of small aphids, adult Great Reed Warblers *Acrocephalus arundinaceus* often foraged on aphids but rarely gave them to their nestlings (A. Dyrcz unpubl. data; Dyrcz 1979). Skutch (1976) wrote that when parents forage for nestlings they seem to eat at once food that is too large or too small, only taking those of appropriate size to the nest. He also suggested that the larger the prey the less frequent the feeding visits to the nest and the fewer visits a parent makes, the less likely it is to betray the location of the nest to lurking predators (Skutch 1976). However, in the Willie Wagtail the antipredator aspect does not seem important because the birds obviously do not make efforts to conceal the nest, relying rather on nest defence.

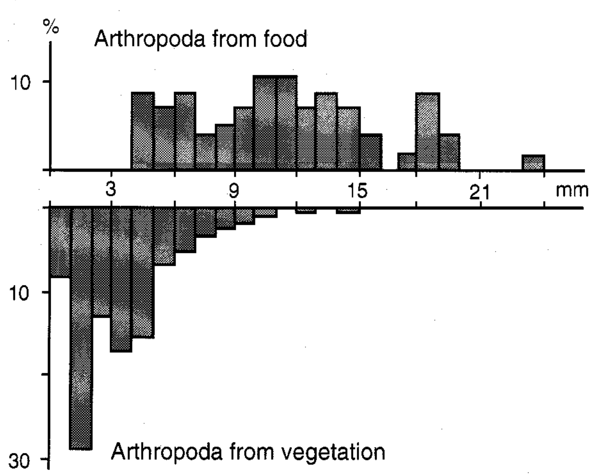

Figure 2 Distribution of the length of arthropod bodies from yellow trays and neck-collar samples.

Strong selection of larger arthropods for feeding nestlings was found in the Aquatic Warbler *Acrocephalus paludicola* inhabiting vast open Carex fen (Schulze-Hagen *et al.* 1989). Also Hespenheide (1971), investigating the food of adults in two species of swift and swallow in Central America, found that the mean size of prey was significantly larger than that of the available insects.

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References

Bogucki, Z. 1964. Investigations of the diet of small birds during the nesting period. Ekologia Polska, B, 10, 100-105 (in Polish, English summary).

Cameron, E. 1985. Habitat usage and foraging bahaviour of three fantails *(Rhipidura:* Pachycephalidae). Pp. 177-191 in Birds of Eucalypt Forests and Woodlands: Ecology, Conservation, Management. Eds A. Keast, H.F. Recher, H. Ford & D. Saunders. RAOU and Surrey Beatty, Sydney.

Clapp, G.E. 1982. Notes on the behaviour of the Willie Wagtail *Rhipidura leucophrys* in Papua New Guinea. Papua New Guinea Bird Society Newsletter 187-188, 15-21.

Coates, B.J. 1990. The Birds of Papua New Guinea, Vol. 2. Dove Publications, Alderley.

Davies, N.B. 1976. Food, flocking and territorial behaviour of the Pied Wagtail *(Motacilla alba yarellii* Gould) in winter. Journal of Animal Ecology 45, 235-252.

Davies, N.B. 1977a. Prey selection and social behaviour in wagtails (Aves: Motacillidae). Journal of Animal Ecology 46,37-57.

Davies, N.B. 1977b. Prey selection and the search strategy of the Spotted Flycatcher *(Muscicapa striata):* a field study on optimal foraging. Animal Behaviour 25, 1016-1033.

Dyrcz, A. 1979. Die Nestlingsnahrung bei Drosselrohrsänger *Acrocephalus arundinaceus* und Teichrohrsänger *Acrocephalus scirpaceus* am den Teichen bei Milicz in Polen und zwei Seen in der Westschweiz. Ornithologische Beobachter 76, 305-316.

Dyrcz, A. 1994. Breeding biology and behaviour of the Willie Wagtail *Rhipidura leucophrys* in the Madang region, Papua New Guinea. Emu 94, 17-26.

Flinks, H. & Pfeifer, F. 1987. Nahrung adulter und nestjunger Schwarzkelchen *(Saxicola torquata rubicola)* einer westfalischen Brutpopulation.Vogelwelt 108, 41-57.

Hespenheide, H.A. 1971. Food preference and the extent of overlap in some insectivorous birds, with special reference to the Tyrannidae. Ibis 113, 59-72.

Jenni, L., Reutimann, P & Jenni-Eiermann, S. 1989. Recognizability of different food types in faeces and in alimentary flushes of *Sylvia* warblers. Ibis 132, 445-453.

Kluijver, H.N. 1933. Bijdrage tot de biologie en de ecologie van den spreeuw *(Sturnus vulgaris* L.) geduvende zijn voort plantingstijd. Verslagen en mededeelingen van den plantenziektenkundigen dienst te Wageningen, 69, 1-145.

Ralph, C.P., Nagata, S.E. & Ralph C.J. 1985. Analysis of droppings to describe diets of small birds. Journal of Field Ornithology 56, 165-174.

Schulze-Hagen, K., Flinks, H. & Dyrcz, A. 1989. Brutzeitliche Beutewahl beim Seggenrohrsänger *Acrocephalus paludicola.* Journal für Ornithologie 130, 251-255.

Skutch, A.E. 1976. Parent Birds and Their Young. University of Texas Press, Austin & London.

The Type Locality of the Chestnut-breasted Quail-thrush *Cinclosoma castaneothorax* Gould, 1849

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The locality at which the Chestnut-breasted Quail-thrush *Cinclosoma castaneothorax* was first collected has always been vague and has varied from the Darling Downs to the Dawson River and has even been considered to be unknown (Gould 1849; Condon 1962; Ford 1983). This communication is an attempt to define the locality more precisely.

The problem

The Chestnut-breasted Quail-thrush *Cinclosoma castaneothorax* was described by John Gould, from a single male, at the meeting of the Zoological Society of London of 28 November 1848 (Gould 1849), giving the type locality as, 'Darling Downs, New South Wales'. In 1855 he modified this account to read: 'For a knowledge of this richly coloured and very distinct species of Ground-Thrush science is indebted to Charles Coxen, Esq. [Gould's brother-in-law], of Brisbane, who discovered it in the scrubby belts of trees growing on the table-land to the northward of the Darling Downs in New South Wales'.

In the century following Gould's description there