

DIET OF THE WHITE-FACED HERON ON MANAWATU PASTURES

By P.L. LO

ABSTRACT

White-faced Herons (*Egretta novaehollandiae novaehollandiae*) captured a wide variety of prey from pastures with transitory surface water. A total of 34 357 prey items were recorded, mainly from regurgitated pellets but also from observations of birds feeding. Major prey groups were insects, tadpole shrimps, earthworms, tadpoles and frogs. The diet depended on the seasonal availability of prey. In spring, earthworms, cosmopolitan diving beetles, tadpole shrimps, tadpoles and frogs were major prey. During the drier conditions of summer and autumn, terrestrial insects such as flies, damselflies, and grasshoppers became important. Earthworms and tadpole shrimps were the main prey in winter.

INTRODUCTION

Hérons (Ciconiiformes: Ardeidae) feed opportunistically on a wide variety of animals. While many are specialised feeders, others such as the White-faced Heron (*Egretta novaehollandiae novaehollandiae*) are much more versatile. Recher & Recher (1980) described the White-faced Heron as a habitat generalist, found in many aquatic habitats as well as pastures and rough grazing land, hunting slowly and methodically for a variety of prey. Established in New Zealand only since the mid-1940s, it is now our most common ardeid and is found in both coastal and inland regions throughout the country (Carroll 1970).

Most studies of White-faced Herons have concentrated on the foraging behaviour of birds living on the coast (Spurr 1967a,b; Lowe 1983) or estuaries and harbours (Louisson 1972, Moore 1984). Except for three studies, dietary information consists mainly of incidental records of birds feeding. Carroll (1967) analysed the stomach contents of 89 birds most of which were collected from the Rotorua and Canterbury Districts of New Zealand, and Lowe (1983) collected 14 birds from mudflats and nearby pastures in Victoria, Australia. Moore (1982) identified animal groups in the diet of herons at Pauatahanui Inlet, Wellington, New Zealand, by direct observation and from 32 regurgitated pellets.

Little is known about seasonal changes in the diet of White-faced Herons and the relative importance of different prey, particularly for birds living inland. Moore (1982) compared the diet of herons in estuarine and farmland habitats in February and May. Lo (1982) and Lo & Fordham (1986) observed herons foraging over pasture and assessed their diet by recording the prey sought and sampling feeding areas for potential prey.

In this paper, regurgitated pellets, direct observations of prey captured and some regurgitated food and stomach contents were analysed to determine the year-round diet of herons foraging on pastures with permanent and transitory aquatic habitats.

STUDY AREA AND METHODS

Hérons living in the sand country of coastal Manawatu were studied between August 1979 and February 1981. The region comprises a complex of sand dunes, sand plains, peaty swamps and shallow lakes near the west coast of the southern North Island.

Developed pastures on the sand plains are farmed for sheep and cattle while the younger dunes are left in scrub or planted with pines (*Pinus* spp.) My main study area was the farmland around Pukepuke Lagoon, 30 km west of Palmerston North and 3 km from the sea (40°20' S, 175°16' E). The fields were interspersed with stock ponds and drains and had extensive areas of surface water during winter and spring.

In assessing diet one should use several methods of analysis because all are subject to biases (Goss-Custard 1973). My main method was the analysis of regurgitated pellets. Bird pellets contain the indigestible portion of food items, and so are usually biased towards keratinous material such as insect exoskeletons, fur, feathers, beaks and claws. This material accumulates in the stomach and the bird regurgitates it in compact masses. I collected pellets regularly from nest and roost sites in stands of pines at Pukepuke and three other farms, except between May and August 1980. Complete pellets were measured and all pellets were dried at 80 °C to a constant weight. Recognisable skeletal fragments were extracted under a dissecting microscope and identified from a reference collection.

I noted the larger prey captured by herons foraging over pasture at Pukepuke Lagoon and 3 km south of Palmerston North (Lo 1982, Lo & Fordham 1986). Prey larger than about bill length (7 cm) was identifiable by this method. These larger items were held in the bill briefly before being swallowed, whereas small prey were swallowed immediately after capture. I also collected two masses of regurgitated food found under nests and the stomach contents of one heron from Pukepuke.

RESULTS

Pellets

I examined 106 complete pellets and 48 masses of broken material. Pellets varied greatly in size, density and composition. They averaged 39 mm in length (range 29-50 mm), 4.4 g in weight (0.8-23.6 g), and contained on average 165 food items (3-600) and 7.6 genera (1-15, a minimum number because some items were not identified to genus). Most pellets consisted predominantly of animal fragments. Sand or plant material was present in small amounts, although in a few cases they predominated.

A total of 32 762 arthropods from 10 orders were recorded (Table 1, Appendix 1). Over 70% of the items were insects, comprising mainly larval and adult cosmopolitan diving beetles (*Rhantus pulverosus*) (by far the most numerous species) striped dung flies (*Hybopygia varia*), backswimmers (*Anisops* spp.), caterpillars, and adult damselflies. Tadpole shrimps (*Lepidurus apus viridus*) were the second most common species and the only major non-insect component of pellets. Less frequently recorded prey included other aquatic and terrestrial beetles, flies (larval and adult), waterboatmen (*Sigara* spp.), grasshoppers (*Phaulacridium marginale*), crickets (*Metioche maoricum*)

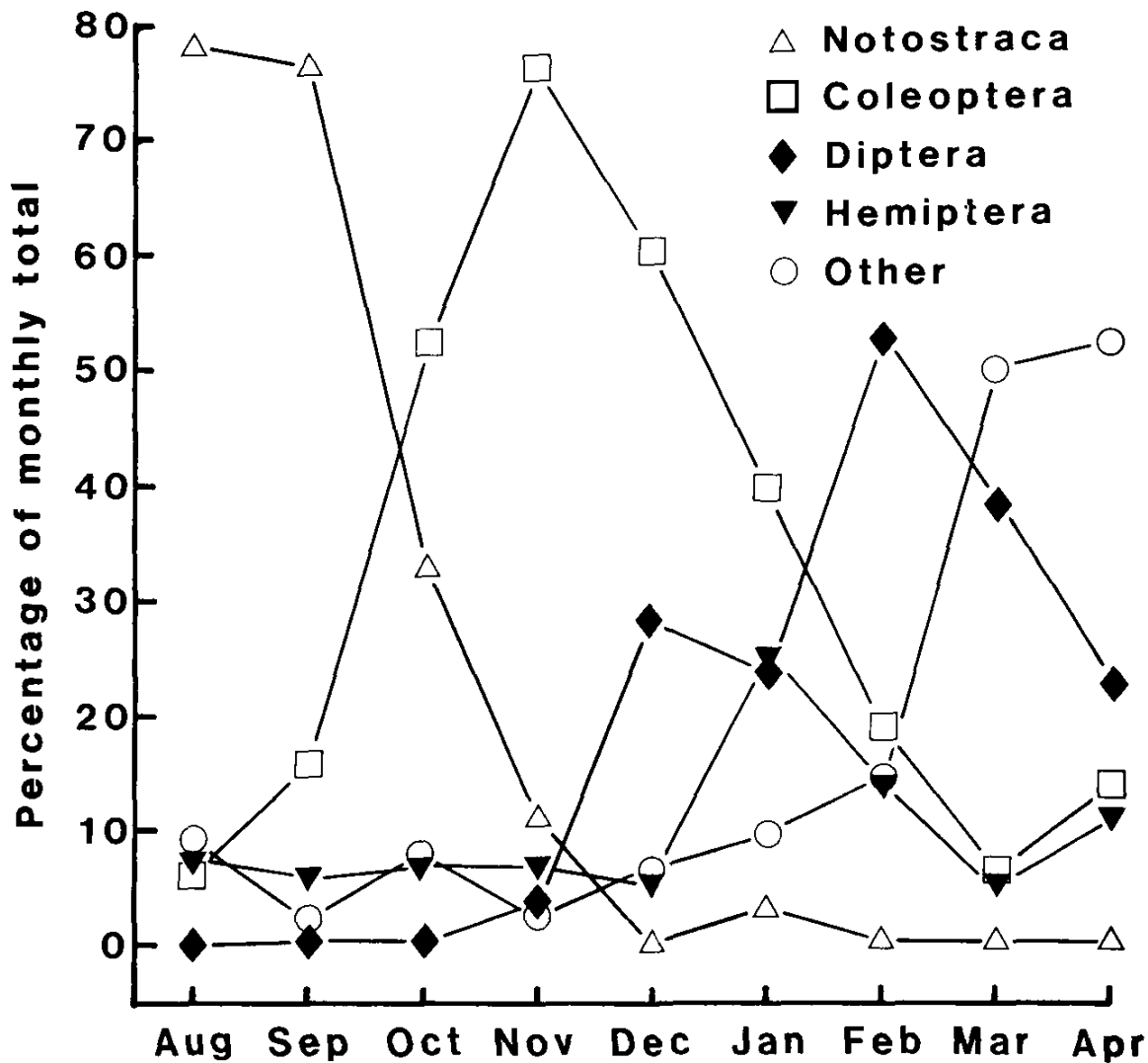


FIGURE 1 — Monthly changes in orders of prey in White-faced Heron pellets from Manawatu (August 1979-February 1981), expressed as percentages of the monthly total number of items.

and spiders. No vertebrate or soft-bodied prey remains were recorded.

Monthly changes in the diet composition are shown in Figure 1. Between August and November, 95% of the prey items were aquatic species compared with 68% in December and January and 19% from February to April. Tadpole shrimps (Order Notostraca) were the main component of pellets collected in August and September, comprising almost 80% of prey items. Subsequently their proportion declined and by late November they were virtually absent from the diet.

The larvae of the cosmopolitan diving beetle (Order Coleoptera) became the dominant prey (20-68%) in pellets from October to January, but from then on were of minor importance. Adult cosmopolitan diving beetles were in all but five pellets and comprised 4-10% of prey in most months. Other aquatic beetles were recorded throughout the year with some terrestrial species being seasonally abundant. For example, the period October to December was important for various Scarabaeidae, Carabidae and Tenebrionidae (Appendix 1).

Among other herons, the White-faced Heron is probably closest in feeding ecology to the Cattle Egret (*Bubulcus ibis*) (McKilligan 1984). Both species favour wet pastoral areas and share many foods, including grasshoppers, crickets, caterpillars, flies, beetles, spiders, earthworms and frogs (Siegfried 1971, 1972; McKilligan 1984).

Seasonality

The herons adjusted their feeding to take advantage of readily available prey as seasons and environmental conditions changed, particularly the level of the water table. The proportion of tadpole shrimps in pellets corresponded with their periods of abundance. They were common in temporary ponds within the study area during winter and spring, but died out as the pasture became dry (I. Stringer, pers. comm.). Carroll (1967) and Lowe (1983) also found tadpole shrimps were important prey items in August.

The larvae of the cosmopolitan diving beetle replaced tadpole shrimps as the main component of pellets in late spring, which presumably reflected their greater availability. Earthworms were abundant at this time of year (Lo & Fordham 1986), and were an important part of the diet while terrestrial insects were relatively scarce. Tadpoles and adult frogs were important foods for herons hunting around ponds and drains in spring and summer.

During summer, the change from diving beetles to flies, as the main food in pellets, represented a general change of diet from aquatic to terrestrial prey. The drier weather greatly reduced the extent of aquatic habitats and the availability of aquatic prey. Lo & Fordham (1986) showed that, in summer, herons sought mainly active, above-ground prey such as flies and took few earthworms, which corresponded with their relative availability. Moore (1982) also found flies to be important prey in summer whereas earthworms were more important in autumn for herons foraging on pasture. Carroll (1967) found fewest earthworms in herons collected between February and April, while Cattle Egrets similarly eat fewest earthworms during summer and most in the wetter winter months (Siegfried 1972).

By late summer, large prey had virtually disappeared and the herons were dependent on small terrestrial insects. This period may be the most difficult time of year for herons foraging over pasture to find food (Lo & Fordham 1986). Cattle Egrets, which have a similar diet, also face a food shortage at this time of year (Siegfried 1971, 1972).

Terrestrial insects continued to be a major part of the diet in autumn. As damselflies, grasshoppers and crickets were more abundant, the pellets were not dominated by one or two species as in previous months. Lowe (1983) similarly found that grasshoppers and crickets were major foods in autumn. The herons ate more earthworms than in summer, coinciding with their greater availability due to moister, cooler conditions at the soil surface.

Between autumn and winter earthworms became an important component of the diet. In winter, almost all bill strikes were aimed at slow-moving prey on or in the ground, and herons correspondingly captured the most earthworms (Lo & Fordham 1986). Pasture sampling confirmed that earthworms were readily available and that large insects were relatively scarce (Lo & Fordham 1986).

Some flies, however, are caught throughout the year (Carroll 1967, Lowe 1983).

I found no pellets between May and July, partly because I was denied access to the main roost site during the duck shooting season. Other roost sites were used irregularly and no pellets were found during this period. Herons may produce fewer pellets in winter because worms have few indigestible parts.

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APPENDIX 1 — Monthly total number of food items of White-faced Herons from regurgitated pellets collected in Manawatu, August 1979 - February 1981

		AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	TOTAL
ORDER COLEOPTERA											
Rhantus pulverosus	(1)	24	433	3601	6055	842	262	34	16	5	11272
"	(a)	47	258	629	566	501	105	124	85	30	2345
Lancetes lanceolatus		25	56	79	33	7	6	2	5	2	215
Homeodytes hookeri	(1)	0	0	1	15	12	72	129	0	0	229
"	(a)	0	0	0	0	0	0	1	0	0	1
Enochrus tritus		0	0	8	3	2	10	35	1	1	60
Antiporus spp.		0	0	0	0	0	1	6	1	0	8
Pyronota festiva		0	1	4	5	75	0	0	0	0	85
Costelytra zealandica		0	1	12	53	5	0	1	0	0	72
Pericoptus truncatus		0	4	19	5	1	2	0	0	0	31
Odontria spp.		0	0	14	8	3	0	0	2	0	27
Onthophagus posticus		0	0	21	1	1	1	0	7	0	31
"		0	0	1	0	0	0	1	0	0	2
Notagonum submetallicum		0	2	18	9	4	3	13	1	1	51
Harpalus arneus		0	0	5	6	25	0	2	0	0	38
Clivina rugithorax		0	0	0	13	0	0	0	0	0	13
Carabidae		0	1	1	4	7	3	4	2	0	22
Lonoderus exsul		0	1	0	1	27	3	4	0	0	36
Elateridae	(1)	1	1	0	8	2	3	0	0	0	15
"	(a)	0	0	0	0	0	1	0	0	0	1
Graphognathus leucoloma		0	0	0	0	0	2	2	4	0	8
Irenimus spp.		1	0	0	0	0	0	0	0	0	1
Cecyropa spp.		0	0	1	0	0	0	0	0	0	1
Curculionidae		3	1	4	3	1	13	5	0	0	30
Coccinella undecimpunctata		0	0	0	0	0	3	2	0	0	5
Saprosites communis		1	0	0	15	1	0	0	0	0	17
Neccicindela tuberculata		0	0	0	0	0	4	1	1	0	6
Thelyphassa spp.		0	0	0	0	4	0	0	0	0	4
Xylotoles spp.		0	0	0	0	1	0	0	0	0	1
Tenebrionidae		0	0	8	3	1	0	0	0	0	12
Unidentified	(1)	0	0	0	0	0	0	0	3	0	3
	(a)	10	15	42	39	70	26	18	11	1	232
TOTAL		112	774	4468	6845	1592	520	384	139	40	14874
%		5.9	15.7	52.4	76.3	60.3	39.6	18.9	6.4	13.9	45.4
ORDER DIPTERA											
Hybopygia varia		0	0	3	22	403	181	1018	561	26	2214
Lucilia sericata		0	0	1	1	2	0	1	0	0	5
Muscoidea		0	0	1	17	47	23	13	163	18	282
Calliphoridae		0	0	0	0	5	0	0	0	0	5
Stratiomyiidae	(1)	0	1	8	190	269	0	1	0	0	469
Eristalis tenax		0	0	3	1	8	101	10	9	0	132
Unidentified	(1)	0	0	0	0	0	2	3	2	1	8
	(a)	0	7	10	73	6	4	26	91	20	237
TOTAL		0	8	26	304	740	311	1072	826	65	3352
%		0.0	0.2	0.3	3.4	28.0	23.7	52.7	38.3	22.6	10.2
ORDER HEMIPTERA											
Anisops spp.		119	255	505	525	103	226	119	35	28	1915
Sigara spp.		17	24	49	30	32	38	39	78	3	310
Cermatulus nasalis		0	0	0	0	1	0	0	0	0	1
Pentatomidae		0	0	0	1	1	0	1	0	1	4
Lygaeidae		0	0	0	0	0	57	112	0	0	169
Unidentified		0	0	0	0	0	3	6	0	0	9
TOTAL		136	279	554	556	137	324	277	113	32	2408
%		7.1	5.7	6.5	6.2	5.2	24.7	13.6	5.2	11.1	7.3

ORDER LEPIDOPTERA

Wiseana spp.	(l)	165	17	130	9	0	0	0	0	0	321
" "	(a)	0	0	29	0	0	0	0	0	0	29
Unidentified	(l)	0	2	189	22	3	18	53	185	5	477

TOTAL		165	19	348	31	3	18	53	185	5	827
%		8.6	0.4	4.1	0.3	0.1	1.4	2.6	8.6	1.7	2.5

ORDER ODONATA

Austrolestes colenisonis		0	0	0	0	2	15	17	372	1	407
Xanthocnemis zealandica		0	0	1	1	0	24	53	130	3	212
Zygoptera (nymphs)		0	0	0	57	0	0	0	0	0	57

TOTAL		0	0	1	58	2	39	70	502	4	676
%		0.0	0.0	0.0	0.6	0.1	3.0	3.4	23.3	1.4	2.1

ORDER ORTHOPTERA

Phaulacridium marginale		0	0	0	2	6	1	66	53	62	190
Metioche maoricum		0	0	0	0	0	0	6	43	16	65
Unidentified		0	0	0	0	0	0	0	1	0	1

TOTAL		0	0	0	2	6	1	72	97	78	256
%		0.0	0.0	0.0	0.0	0.2	0.1	3.5	4.5	27.1	0.8

ORDER HYMENOPTERA

Apis mellifera		0	0	0	0	2	0	0	1	0	3
Epipompilus spp.		0	0	0	0	1	0	0	0	0	1
Unidentified		0	0	2	19	2	8	5	9	1	46

TOTAL		0	0	2	19	5	8	5	10	1	50
%		0.0	0.0	0.0	0.2	0.2	0.6	0.2	0.5	0.3	0.2

ORDER NOTOSTRACA

Lepidurus apus viridus		1495	3758	2814	1007	0	39	7	0	0	9120
%		78.1	76.4	33.0	11.2	0.0	3.0	0.3	0.0	0.0	27.8

ORDER ARANEAE

Unidentified		0	26	170	42	69	15	19	29	5	375
%		0.0	0.5	2.0	0.5	2.6	1.1	0.9	1.3	1.7	1.1

ORDER DECAPODA

Unidentified		0	0	7	0	0	0	0	0	0	7
%		0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

UNIDENTIFIED

		5	57	137	102	88	38	77	255	58	817
%		0.3	1.2	1.6	1.1	3.3	2.9	3.8	11.8	20.1	2.5

TOTAL ITEMS		1913	4921	8527	8966	2642	1313	2036	2156	288	32762
No. of pellets		7	17	40	38	14	14	9	12	3	154

(l) larvae (a) adult