

SHORT NOTE

Seasonal use of farmland by shorebirds on the south Kaipara, North Island, New Zealand

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Ngapuke is a dry stock farm with approximately 150 hectares of harbour flats situated on the southeastern shores of the Kaipara Harbour (Figure 1). It lies just to the south of Jordan's Island, which was one of the earliest and most important sites for shorebird studies on the Kaipara (McKenzie 1978; Riegen 1999). Farmland in this part of the harbour provides roosting areas for shorebirds because there are few suitable natural sites such as shell banks or areas of exposed sand available in the southern Kaipara at high tide. The present study is the result of 50 visits to the farm at high tide between June 2015 and December 2019, during which numbers of birds were recorded.

Table 1 shows the mean number of individuals and mean number of shorebird species present at the site during the year. There are inferred seasonal patterns in both numbers and diversity of shorebirds, which results from an interaction between migration, behaviour, and seasonal changes in soil-moisture conditions. Shorebirds use the site primarily when the paddocks are wet and they can feed as well as roost. The main prey item of the larger species, such as South Island pied oystercatcher (*Haematopus finschi*) and bar-tailed godwit (*Limosa lapponica*), are earthworms

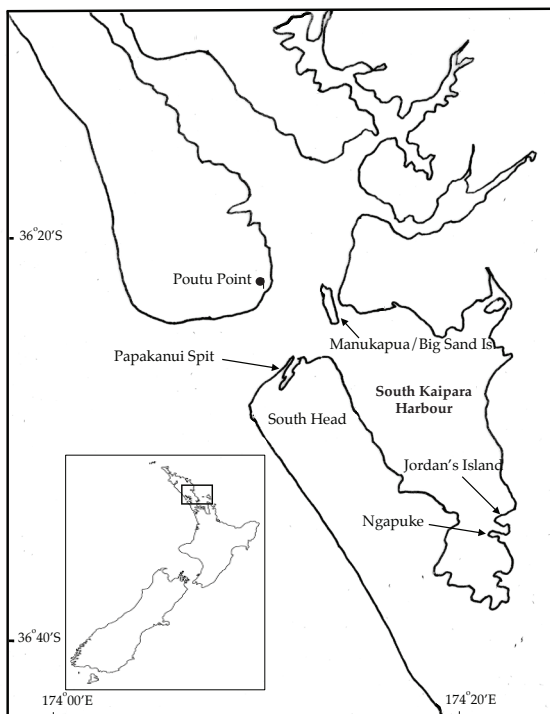


Figure 1. Location of Ngapuke and other major roosting sites in south Kaipara.

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Table 1. Average numbers of birds and species (range given in parentheses) observed each month (n = number of observations) during the period June 2015 to December 2019 (n = 50). Description of interaction between migration patterns and soil moisture conditions also shown.

Month	J n=3	F n=2	M n=2	A n=3	M n=6	J n=8	J n=2	A n=5	S n=4	O n=6	N n=6	D n=3
Number of birds	64 (6–170)	466 (55–867)	190 (121–259)	893 (170–1,320)	570 (348–870)	805 (469–1,163)	680 (630–729)	632 (311–953)	488 (224–826)	1,234 (13–2,494)	111 (34–224)	81 (9–187)
Number of species	2.7 (2–4)	3.0 (2–4)	4.0 (3–5)	9.7 (5–13)	8.0 (6–12)	8.0 (5–10)	9.0 (8–10)	8.6 (7–9)	9.0 (8–10)	10.3 (3–14)	6.8 (5–10)	2.7 (1–5)
Description	Generally not used by shorebirds in dry summer months			Winter migrants arrive and last of summer migrants leave			Winter migrants only		Summer and winter migrants overlap		Pied oystercatcher numbers decline rapidly, winter flocks disperse	

Birds observed feeding on wet paddocks

that birds probe for in the wet soil. Smaller species such as banded dotterel (*Charadrius bicinctus*) feed off the surface, presumably for a wide range of invertebrates. Once the paddocks dry out, normally between November and February, birds usually (but not always) abandon the site as prey items are no longer available. Peak numbers and diversity at Ngapuke therefore occur during the late autumn, winter and early spring when there is sufficient rainfall to allow feeding.

Winter bird numbers are dominated by South Island pied oystercatcher (Table 2) that breed on the braided rivers and surrounding pastures east of the main divide in the South Island and a few rivers south from Hawkes Bay in the North Island, but which disperse to coastal areas after breeding with many wintering in the north (Sagar 2013). South Island pied oystercatcher return to the Kaipara in large numbers by January or February, although they are usually only found in small numbers at Ngapuke until April when there has been sufficient rain to soften paddocks to allow feeding. Although birds start to return southwards in late-June from North Island sites such as the Firth of Thames, significant numbers of birds can be present as late as early October at Ngapuke. Whether these birds are non-breeders or use breeding sites in the far south of the South Island is uncertain. Internal migrants found in smaller numbers during autumn and winter include banded dotterel and wrybill (*Anarhynchus frontalis*). Other species present during this period are local birds that form post-breeding flocks, notably black swan (*Cygnus atratus*), Canada goose (*Branta canadensis*), paradise shelduck (*Tadorna variegata*), variable oystercatcher (*Haematopus unicolor*), and pied stilt (*Himantopus h. leucocephalus*). These flocks form after breeding is completed and break up again as the birds pair up in the spring in preparation for breeding. Pied stilts start breeding as early as August, but the other flocks break up in October and November, coincidental with the departure of the internal migrants. Several pairs of Pied stilts breed each season at the site.

At Ngapuke, both the maximum number of individuals and maximum shorebird diversity occur in October, with the main arrival of Arctic migrants before significant migration south of South Island pied oystercatcher or dispersal of post-breeding flocks. Large numbers of bar-tailed godwit (maximum 1,250) use the site to feed and recover from their long journey from breeding grounds in Alaska (Woodley 2012). Diversity at this time is high as many species of Arctic waders can be found at the site in small numbers (Appendix 1). In some seasons there is also a secondary maximum at Ngapuke in both numbers and diversity in early autumn because of the overlap between departing Arctic migrants and the arrival of internal migrants.

Table 2. Average numbers of shorebirds observed per month for the period June 2015 to December 2019 for the ten commonest species. 1 = internal migrants, 2 = species forming post-breeding flocks, 3 = Arctic migrants, 4 = species showing no observable pattern. Ranges for each month given in parentheses; number of observations per month given in Table 1, * = overwintering birds.

	J	F	M	A	M	J	J	A	S	O	N	D
<i>Haematopus finschi</i> ¹	32 (0-93)	375 (0-750)	69 (0-138)	589 (0-1,020)	429 (203-685)	593 (290-859)	328 (316-340)	488 (220-802)	247 (30-490)	534 (0-1,250)	42 (0-165)	0
<i>Charadrius bicinctus</i> ¹	0	0	43 (0-86)	77 (0-146)	13 (0-78)	0	0	3 (0-16)	0	0	0	0
<i>Himantopus h. leucocephalus</i> ²	0	1 (0-24)	0	114 (0-270)	40 (0-81)	90 (10-225)	219 (181-257)	18 (0-42)	9 (0-35)	8 (0-41)	2 (0-4)	0
<i>Haematopus unicolor</i> ²	0	0	0	10 (0-22)	17 (4-27)	12 (0-31)	16 (6-25)	14 (1-27)	7 (0-20)	8 (0-18)	2 (0-10)	0
<i>Branta canadensis</i> ²	0	0	0	33 (0-98)	0	37 (0-132)	2 (0-3)	3 (0-15)	18 (2-56)	6 (0-24)	21 (4-43)	0
<i>Cygnus atratus</i> ²	0	0	0	0	3 (0-4)	8 (0-46)	13 (8-17)	15 (4-27)	12 (0-42)	13 (0-62)	2 (0-10)	0
<i>Tadorna variegata</i> ²	0	0	15 (5-24)	3 (0-4)	16 (2-36)	19 (0-69)	52 (15-88)	61 (35-136)	56 (15-154)	25 (0-43)	23 (0-44)	2 (0-7)
<i>Limosa lapponica</i> ³	0	0	0	0	0	7* (0-58)	0	1 (0-5)	105 (0-189)	596 (0-1,250)	0	45 (0-137)
<i>Vanellus nilies</i> ⁴	9 (4-18)	11 (3-18)	9	16 (8-21)	10 (0-19)	10 (3-16)	21 (14-28)	9 (0-18)	12 (4-23)	11 (5-18)	5 (2-9)	1 (0-2)
<i>Egretta n. novaeollandiae</i> ⁴	22 (0-53)	6 (0-12)	53 (21-88)	44 (12-106)	35 (4-66)	17 (0-42)	18 (10-26)	12 (1-25)	6 (0-9)	3 (0-5)	6 (4-12)	19 (2-46)

Some species occupy the site at all times of the year, notably white-faced heron (*Egretta novaehollandiae*) and spur-winged plover (*Vanellus miles novaehollandiae*). While spur-winged plover do not form winter flocks as such, there is an increase in the number of birds over the winter and those observed at other times probably represent breeding pairs and their offspring, although juveniles have not been observed. The white-faced heron is the only species that increases its numbers during the dry summer period (Table 2), which may be related to feeding opportunities as the paddocks become infested with black field crickets (*Teleogryllus commodus*) during these months.

The development of large tracts of farmland through reclamation in the south Kaipara is a recent development that has occurred during the last 100 years or so (Stevens 1956), and its utilisation as a feeding resource by waders during high tide when their inter-tidal feeding grounds are covered shows an important behavioural flexibility. This new resource allows Arctic migrants to feed almost constantly on their return to New Zealand speeding their recovery from their long return journey. Newly arrived bar-tailed godwits can be observed feeding vigorously during the early spring. This resource is also important for South Island pied oystercatcher as they prepare for breeding in the spring. While the negative effects of human population growth on roosting and feeding areas of waders is well documented (e.g. Yang *et al.* 2011; Woodley 2012), the incidental positive effect of farming in providing additional food sources has not been discussed in a New Zealand context, although studies highlighting the importance of grasslands in providing secondary food resources for overwintering waders have been reported for the lapwing (*Vanellus vanellus*) and golden plover (*Pluvialis apricaria*) in the UK (Townshend 1981; Milsom *et al.* 1998), and for buff-breasted sandpiper (*Calidris subruficollis*) and American golden plover (*Pluvialis dominica*) in South America (Aldabe *et al.* 2018).

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