SHOREBIRDS OF THE MIRANDA COASTLINE

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SUMMARY

The distribution and abundance of shore and aquatic birds of the Miranda coast of the Firth of Thames are reviewed. The data on which this is based originate from twice-yearly censuses carried out by the Ornithological Society of New Zealand. Of the 77 species recorded, the 8 most common transequatorial and 4 commonest local migrant shorebirds are discussed. Even with the background of 30 years of census data there is need for more research on the ecology of the birds of the area.

INTRODUCTION

The Firth of Thames is a large (25 x 30 km) embayment bounded on the east and west by the Coromandel Peninsula and Hunua Ranges respectively, and to the south by the expanse of the intensively-farmed Hauraki Plains. Prehistorically, the Waikato River flowed through the plains, emptying into the Firth and bringing with it much of the fertile alluvium of the region. The Firth of Thames is shown in Fig. 1.

Today, the Waihou, Piako and Waitakaruru are the main rivers that drain the catchment and deposit fine sediment on the shores and sea floor. Most of the water of the Firth is shallow, the inner third all being less than 6 m in depth. At low water, some 8500 ha of mud and silt flat becomes exposed (Veitch 1978), much of it providing foraging grounds for wading shorebirds (Sub-order Charadrii).

The Coromandel and Miranda coasts of the Firth are quite different in character. On the Coromandel side are found rocky shores with relatively deep water close in, while Miranda is sheltered and muddy but marked by ranks of ridges formed from millions of washed-up shells of the cockle, Chione stutchburyi. Onshore these ridges mark a series of "fossil" beaches or a chenier plain (Schofield 1960) overlaying marine sediments, and these comprise much of the land for 2 km to the base of the hills. Slightly offshore, the newly-forming shell banks are vegetation-free islands at high tide and provide favoured roosts for birds.

The Journal of Cook’s first voyage records his visit in 1769 to the Firth and describes the then heavily-wooded Hauraki Plains. Perhaps because of the difficulty in reaching and observing the shallow western
Fig. 1. Firth of Thames area showing major shorebird roosts and extent of intertidal feeding area.
shore, there is no mention of the wildlife of Miranda. It was not until the visit of the French corvette "Astrolabe" in 1827 that European naturalists, namely Messrs. Quoy and Gaimard, made any comment about the avifauna of the region. Their original description of the wrybill, _Anarhynchus frontalis_, (Quoy and Gaimard 1830), was from the "Baie Chouraki" (= Hauraki Gulf), and it seems likely that they collected the type specimen in the Firth area. In 1895 the more specific discovery by Captain Mair of "thousands" of wrybills at the mouth of the Piako River gives an indication of numbers in those times. His statement that the birds were "so tame you may knock them over with a stick" (Fide Buller 1905) gives some idea of how easily approached those birds were. Either Mair had a long stick, or he threw it, or wrybills were tamer than they are now. Nevertheless they are still the most confiding of the roosting shorebirds.

It wasn’t until the 1940s, however, that the Miranda coast received particular attention. Ornithologists R. B. Sibson, H. R. McKenzie and others then began a series of counts of shorebirds which became the now twice-yearly censuses of the Ornithological Society of New Zealand. The results of these censuses have been published and discussed previously (Bacon 1973, Sibson 1978, Veitch 1978).

The Miranda Naturalists Trust is a group formed to promote the study of natural history of the Miranda area. The members are creating and expanding facilities at Kaiaua and Miranda for observation and study of the birds.

The aims of this paper are as follows:

1. To summarise the census results for the full period from 1951 to the present.
2. To discuss these results and to propose some hypotheses concerning them.
3. To analyse in more detail the distribution and abundance in the Firth of one species, the wrybill.
4. To outline the opportunity and need for further research on the birds of this region.

**CENSUS METHODS**

The counts of birds take place twice yearly on both the Firth of Thames and the Manukau Harbour. Though some transfer of birds between harbours does occur, the two sites are assumed to contain different populations and are counted on different days. The summer census is carried out in mid-November or December when the numbers of trans-equatorial migrant species are assumed to be most stable, and before the first influx of birds of local species after breeding in the South Island. The winter one is carried out some time between May and August. Because of the number of observers involved, the census must
take place during a weekend, and the weekend must have a suitable high tide. If the high tide is too low (neap), then the roosting period is short and the birds may not remain confined for long at traditional sites where they may be counted. If, on the other hand, the tide is too high (spring) they may go inland to areas not normally used and where observers cannot locate them.

The procedure for counting is for the total number of observers (normally between 30 and 50) to divide into smaller groups each responsible for a major traditional roost and for intervening stretches of shoreline. Large-scale movements of birds between sites are timed so that any double counting can be eliminated. Essentially, therefore, a total census is made of all birds in the area at one time. Checks of the numbers of individual species are made through the numerous observations made at other dates during the year. The numbers of shorebirds are usually fairly consistent while those of species such as egrets and ducks are less reliable because of their broader habitat preferences and likely occurrence inland.

RESULTS

The results of counts reflect the different groups of birds using the habitat. In winter, the dominant species are internal migrants, the South Island pied oystercatcher (*Haematopus finschi*), the pied stilt (*Himantopus leucocephalus*) and the wrybill.

Spring sees the arrival of thousands of birds of Siberian origin and the shore is dominated by eastern bar-tailed godwits (*Limosa lapponica*), lesser knot (*Calidris canutus canutus*), and a number of others. Over 35 species of migrants originating from beyond New Zealand have been recorded on this coast (listed in Appendix I).

NUMBER OF OBSERVERS

Over the period that the counts have been made there have been between 17 and 56 observers involved each time. As recorded in other forms of census (Arbib 1981), the number of participants in a survey can significantly affect the results both in total birds and the number of species seen. This is understandable when the survey area is not defined and the greater number of observers effectively increases the range of the survey. If, however, as in the Miranda counts, the area is defined, the greater number of observers would not be expected to increase the result as long as a certain minimum number was able to cover the area adequately. Veitch (1978) presented data on numbers of observers and suggested that there was no effect.

A regression of numbers of birds on numbers of observers (Fig. 2), however, indicates a significant positive relationship for summer censuses and a non-significant one for winter censuses.
Fig 2. Relationship between number of observers and total number of birds counted during OSNZ censuses. (a) $r = 0.30$ non-significant (b) $r = 0.71$ $p < 0.01$.

For comparison, the results of the Manukau Harbour censuses were also examined. In both seasons there was a significant positive relationship between birds counted and number of observers:
- Summer $r = 0.53, 0.01 < p < 0.05$
- Winter $r = 0.74, p < 0.01$

While this result suggests that more observers will count more birds in a given area, other factors may be involved. For example, there may have been a correlation when actual build-up in bird numbers coincided with the increasing popularity of participating in such censuses. While a closer look at the data suggests that this may be so, particularly for
winter species, only experimental work would reveal the optimal number of observers. It is logical, however, that below a certain number the efficiency of counting will drop.

TRANSEQUATORIAL MIGRANTS

Though a relatively large number of species has been recorded (see Appendix I), many of these are uncommon in New Zealand, though abundant elsewhere. Species such as dunlin (*Calidris alpina*), and Baird’s (*C. bairdi*), marsh (*Tringa stagnatilis*), western (*C. mauri*), pectoral (*C. melanotos*), and broad-billed sandpipers (*Limicola falcinellis*), while providing interest when they are located, are not highly significant to the ecology of the area.

The results of counts of eight of the most common transequatorial migrants are illustrated in Fig. 3, 4 and 5.

Eastern bar-tailed godwit (*Limosa lapponica*)

The godwit is the most abundant of the arctic migrants, an estimated 100 000 spending the southern summer in New Zealand (Veitch 1978). The Firth of Thames population represents approximately 10% of this total, but this may vary, over 14 000 being counted in 1972 and 1974. Each year around 10% of these birds remain to spend the New Zealand winter and it is often assumed (e.g. McKenzie 1967) that the overwintering birds are non-breeding juveniles. Veitch (1978) examined a small number of specimens of these birds and found some of them to be sexually immature. As with the wrybill (Hay 1982), it is possible that some of the young birds remain in the winter area while others migrate with the adults.

Godwits flock densely on the major roosts shown in Fig. 1 and disperse to feed over much of the mud-flat area as the tide recedes.

Lesser knot (*Calidris canutus*)

This species breeds in Siberia and most of those in eastern Siberia migrate to New Zealand for the southern summer. The largest concentrations of knots in New Zealand occur on the Kaipara and Manukau Harbours and on the Firth of Thames and Farewell Spit.

Like those for the godwit, counts of knot show considerable variability, with numbers in some years being over 11 000 and in others less than 2 000. As pointed out by Veitch (1978), the importance of the Firth habitat is illustrated by the mean number of birds per hectare of mudflat (0.77 in summer compared with 0.16 on the nearby Manukau Harbour).

Flocks of knots often fly and roost with those of godwits and may be located on any of the major roosting sites shown in Fig. 1, but most occur on the roosts near Miranda and at Waitakaruru.
Pacific golden plover (*Pluvialis dominica fulva*)

This species breeds in northern Asia and migrates into an area between the tropical Pacific and southern New Zealand. In New Zealand, golden plovers are usually found in small flocks in a variety of localities from Parengarenga in the north to Lake Ellesmere in the south. The fluctuations in numbers over the census period may be due to a number of causes. They occasionally feed and roost inland on pasture, and in the Firth the flock is inevitably found in the southern region, either at the Waitakaruru or Piako rivermouths, which are areas less well studied than the more accessible roost sites to the north. The numbers may also reflect actual fluctuations in the number of golden plover migrating to New Zealand each year. Where a species disperses through a large wintering range, and with quite small populations arriving at the southern limit of the range wide fluctuations can be expected. Little is known of the status or precise origin of the local birds.

![Graphs](image_url)

Fig 3. Total counts of four common northern hemisphere species in the Firth of Thames during OSNZ summer censuses.
Turnstone (*Arenaria interpres*)

This is a circumpolar species. Those breeding in the northern Pacific and Siberia winter in an area from Hawaii south as far as New Zealand. The main concentrations occur in the Marshall Islands (Thompson 1973). Each year, several thousand reach New Zealand. Though normally breeding in far northern latitudes, nesting has been recorded in the southern hemisphere in New Caledonia (Hannecart and Letocart 1980).

The winter distribution and apparent local habitat preferences parallel those of the golden plover, but turnstones are found mainly in the Miranda area of the Firth. Like the plovers, they may feed inland, making accurate censusing difficult. Despite this, there has apparently been an upward trend in numbers since counting began. There is little direct information on population changes in the breeding areas, but the climatic amelioration reported for some of them in recent years (Bevan and England 1977) may account for an increase.

Curlew Sandpiper (*Calidris ferruginea*)

This species breeds in Northern Asia and migrates every year in small numbers to New Zealand at the southern extent of its range. Sibson (1971) concluded that there had been an increase in numbers up to 1971. There has since been a further increase so that between 20 and 30 individuals occur in the Firth each year, parallelling a similar increase at other estuaries. As with most of the transequatorial migrants, little is known of the origins of the local birds. On the Firth, small flocks are normally seen at Waitakaruru and at Taramaire, 2 or 3 km north of Miranda.

Sharp-tailed sandpiper (*Calidris acuminata*)

Despite having a rather restricted distribution in the north-eastern Siberian breeding grounds, this sandpiper is one of the commonest arctic shorebirds in Australia. In New Zealand, small flocks are found in suitable areas around the New Zealand coast each year. The Firth of Thames is typical in harbouring flocks of up to 20 birds. Numbers fluctuate and this may be due to birds feeding, often at high tide, in brackish and freshwater pools away from the roosts of other species. A flock of 40 birds recorded by the writer in 1976 was large by local standards; they were feeding, as is typical, in the upper reaches of a brackish estuary near Miranda. Habitat of this nature is certainly becoming less abundant in the area.

Red-necked stint (*Calidris ruficollis*)

Like the sharp-tailed sandpiper, this diminutive stint breeds in north-eastern Siberia and is one of the commonest arctic shorebirds visiting Australia. Small numbers reach New Zealand and these are found
chiefly around the north of the North Island, often associating with non-breeding wrybills on the roosts. They also feed in similar habitats, picking small crustaceans, annelids and bivalves from the surface of the inshore mud. Each year, a small number of birds appear near Miranda and it is with these that some of the less common sandpipers may occur.

Far-eastern curlew (*Numenius madagascariensis*)

In similar numbers to the red-necked stint, but at the opposite end of the size spectrum, the far-eastern curlew is characterised by its large size and markedly down-curved bill. Though numbers apparently built

Fig 4. Total counts of four less common northern hemisphere species in the Firth of Thames during summer censuses.
up before 1950 (Falla et al. 1978), they have fluctuated about a mean of about 10 since, normally being located at Waitakaruru or at Miranda.

INTERNAL MIGRANTS
South Island pied oystercatcher (*Haematopus finschi*)

Of the endemic migratory shorebirds, this oystercatcher is currently the most abundant. A spectacular increase in numbers has occurred since counting began. The increase on the Firth has been paralleled by a similar one on the Manukau Harbour. Firth populations are not as dense or numerous as those on the Manukau Harbour and represent 5-10% of total shorebirds in the Firth (Baker 1973).

The South Island pied oystercatcher breeds exclusively in inland South Island, mainly on the larger eastern riverbeds and lakeshores but occasionally in the sub-alpine zone. The increase in population may be related to their legal protection after 1940 (Sibson 1966) but could also be due to climatic factors in the breeding grounds. It may be significant that, after a period of intense cold and snowstorms between 1920 and 1940, the years since 1950 have been the warmest on instrumental record (Salinger 1979, 1982).

Pied stilt (*Himantopus leucocephalus*)

The pied stilt breeds in both the North and South Islands but is more abundant in the latter. While a migration of South Island birds to the north does occur, local movements to and from inland feeding and breeding sites make accurate censuses of pied stilts difficult. Large fluctuations in numbers near Miranda are not necessarily indicative of large population changes. The occasional occurrence of black stilts and hybrids is evidence of migration of some birds from the McKenzie Country, South Canterbury.

Stilts are found from north of Kaiaua to Thames but occur in greatest numbers in the southern area.

Banded dotterel (*Charadrius bicinctus*)

Though a very small number of banded dotterels may nest locally and up to 200 can be found near Miranda in winter, the Firth of Thames does not harbour a large proportion of the banded dotterel population. Estimates of the total number in New Zealand are difficult to make in view of the relatively wide breeding distribution and the migration of a large proportion of the population to Australia each winter.

In the Firth, most banded dotterels may be located at Kaiaua or Miranda, but larger flocks have been recorded (possibly in passage) further south (Veitch 1978).

Wrybill (*Anarhynchus frontalis*)

While not showing the same degree of increase as the oystercatcher,
the wrybill population in the Firth of Thames has risen markedly since censuses began. This area represents the most important wintering ground for this species. Birds start arriving from the Canterbury riverbed breeding grounds at the end of December to eventually comprise 50-60% of the total population (Hay 1982). Departure from the Firth occurs in August, with approximately 10% of the birds remaining until a later departure. Evidence from colour-banding indicates that this second departure is of immature non-breeders, some of which return to their natal areas mid-way through the breeding season but without attempting to nest.

Wrybills colour-banded at Miranda have been located on the Cass, Godley, Tasman and Ahuriri Rivers in the McKenzie Country and one individual was seen on the Rangitata and Ashley Rivers and another on the Ashburton and Rakaia Rivers. Of 76 adults banded on the upper Rakaia River between 1974 and 1978, 51 (67%) were later located in the Firth of Thames. Of 65 Rakaia banded juveniles, 37 (57%) also occurred there. Rakaia adults and juveniles disperse to various winter
populations in proportions not significantly different from chance. Though some individuals, particularly juveniles, move between localities, most apparently return to or remain in the same winter area.

Depending on such factors as the height of the high tide and the weather, wrybills in the Firth either occupy a series of discrete roosts or all congregate at a single site. Early in the season, before autumn, the flock is normally found near the mouth of the Miranda Stream where dry mud forms a suitable roost. Later in the season they are more likely to be found 2-3 km to the north at the Taramaire shell banks.

A variety of feeding methods account for a range of food types, e.g. the bivalve *Nucula hartvigiana*, polychaete worms and microscopic crustaceans. The latter are scooped from the film of water, which overlays the surface of soft mud, by effective use of the right handed curvature of the bill (Fig. 6). A secondary assymmetry in the vertical plane gives the bill a spoon shape when laid side down as illustrated.

Fig 6. Wrybills feeding in surface of intertidal mud at Miranda.

Wrybill flocks are conspicuous by their highly co-ordinated aerial movements (Fig. 7).

**DISCUSSION**

As indicated by Veitch (1978), the Firth of Thames area supports particularly dense populations of shorebirds for the amount of intertidal habitat available. Of the 77 species of bird using the intertidal mud and sand flats or the shallow waters of the area there are one grebe, five
cormorants, six herons, one spoonbill, nine members of the family Anatidae, one gallinule, two oystercatchers, twelve plovers, 27 members of the family Scolopacidae, two stilts, two skuas, and nine gulls and terns. Most of these species, particularly the shorebirds, are migratory, spending their winter seasons in the Firth. Most important numerically are the species reviewed above.

While the significance of the rarer visitors may reside mainly in their interest value, fluctuations in their numbers and occurrence could be a reflection of changing breeding fortunes. Little is known, however, of the precise origins of Arctic-breeding species in New Zealand, and whether there is any breeding or feeding site fidelity, as in the wrybill.

Some individual northern hemisphere migrants remain in New Zealand for the southern winter, often attaining breeding plumage. This phenomenon may be significant in considering the initial origins of some of now breeding species. The white-winged black tern, *Chlidonias leucopterus*, has been recorded breeding in New Zealand (Pierce 1974), the first such record despite past migratory visits.

The census data referred to here have provided a valuable basis for assessing any changes which may occur in the habitat of the Firth as well as population fluctuations of the birds themselves. Though the accuracy of the counts may be affected by the number of observers, sufficient participants should ensure adequate coverage of birds that
have predictable roosting sites. It would be valuable, however, to experimentally test count-accuracy by:

- assessing the range of differences between observers,
- varying the number of observers in a given period and site to determine the optimal number,
- repeating censuses at intervals to determine the amount of short-term variability of bird abundance and conspicuousness.

A considerable amount of work needs to be done before an adequate understanding of the ecology of the birds of the area can be gained. Though casual observations of the behaviour of most species have been made, there is little information on food preferences, how the resources are partitioned between species or whether in fact food is limiting on the shore. It is only with such knowledge that changes in the habitat and in the bird populations can be assessed from the census data.

ACKNOWLEDGEMENTS

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REFERENCES


Schofield, J.C. 1960: Sea level fluctuations during the last 4,000 years as recorded by a chenier plain, Firth of Thames, New Zealand. New Zealand Journal of Geology and

APPENDIX I. List of species of shorebirds and waterbirds recorded in the Firth of Thames (Nomenclature follows Falla et al. 1978).

<table>
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<td>Hudsonian godwit (L. haemastica)</td>
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Asiatic black-tailed godwit (*L. melanuroides*)
Greenshank (*Tringa nebularia*)
Lesser yellowlegs (*T. flavipes*)
Marsh sandpiper (*T. stagnatilis*)
Terek sandpiper (*T. cinerea*)
Siberian tattler (*T. brevipes*)
Wandering tattler (*T. incana*)
Common sandpiper (*T. hypoleucus*)
Turnstone (*Arenaria interpres*)
Knot (*Calidris canutus*)
Great knot (*C. tenuirostris*)
Pectoral sandpiper (*C. melanotos*)
Sharp-tailed sandpiper (*C. acuminata*)
Curlew sandpiper (*C. ferruginea*)
Dunlin (*C. alpina*)
Baird’s sandpiper (*C. bairdii*)
White-rumped sandpiper (*C. fuscicollis*)
Red-necked stint (*C. ruficollis*)
Western sandpiper (*C. mauri*)
Sanderling (*C. alba*)
Broad-billed sandpiper (*Limicola falcinellis*)
Pied stilt (*Himantopus leucocephalus*)
Black stilt (*H. novaeseelandiae*)
Arctic skua (*Stercorarius parasiticus*)
Pomarine skua (*S. pomarinus*)
Southern black-backed gull (*Larus dominicanus*)
Red-billed gull (*L. scopulinus*)
Black-billed gull (*L. bullerii*)
Black-fronted tern (*Chlidonias albostriatus*)
White-winged black tern (*C. leucopeterus*)
Caspian tern (*Hydroprogne caspia*)
White-fronted tern (*Sterna striata*)
Crested tern (*S. bergii*)
Little tern (*S. albifrons*)