

NOTORNIS

is the journal of the Ornithological Society of New Zealand (Inc.)

Editor: E. W. Dawson,
P.O. Box 41-002,
EASTBOURNE

VOLUME 25

PART 1

MARCH, 1978

WADERS OF THE MANUKAU HARBOUR AND FIRTH OF THAMES

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ABSTRACT

The Manukau Harbour and Firth of Thames are considered to be among the richest wading bird (sub-order Charadrii) habitats in New Zealand. Annually large numbers of four species of New Zealand's endemic waders migrate to these, and other, northern harbours for the winter. Thousands of arctic breeding waders winter here during our summer. Small numbers of non-breeders of both these groups of waders remain here during their respective breeding seasons. There are also small numbers of two non-migratory species present. The results of twice yearly censuses of these birds during the period 1960-1975 are summarised, combined with other data where appropriate, and trends in the wader population shown. Although there has been an increase in the total number present, this has been caused by only some species, others remain stable. One species — the Wrybill (*Anarhynchus frontalis*) — has, on the Manukau Harbour only, fluctuated significantly due to changes to its chosen winter habitat. The general habitats are described and major modifications noted. Lists of waders recorded at times other than censuses are also given. There is a paucity of long-term data on most aspects of the ecology of these species.

INTRODUCTION

New Zealand has a number of harbours and estuarine areas which provide good habitat for waders (sub-order Charadrii). The Manukau Harbour and Firth of Thames are among the richest of these and due to the enthusiasm, particularly in the earlier years, of a few dedicated ornithologists, are also the best documented.

Annually a large number of four species of New Zealand's endemic breeding waders (South Island Pied Oystercatcher (*Haematopus ostralegus finschi*), Banded Dotterel (*Charadrius bicinctus*), Wrybill (*Anarhynchus frontalis*) and Pied Stilt (*Himantopus himantopus leucocephalus*)) migrate northward to winter on northern harbours. A portion of the Banded Dotterel population also migrates to Australia. Small numbers of these endemic birds remain behind and are joined by thousands of arctic breeding waders, wintering here during our summer. A small non-breeding portion of these arctic birds remains here during our winter (overwinter). Small numbers of resident wading birds (Variable Oystercatcher (*Haematopus unicolour*) and New Zealand Dotterel (*Charadrius obscurus*)) are present throughout the year.

This paper summarises the results of twice-yearly censuses undertaken by members of the Ornithological Society of New Zealand. Nomenclature follows the *Annotated Checklist of the Birds of New Zealand* (OSNZ 1970).

HABITAT DESCRIPTION

The Manukau Harbour, on the west coast of the Auckland isthmus, (Figs 1 & 2) at low water spring tide exposes approximately 18 000 hectares of intertidal area. The majority of this is presumed to be suitable for waders to feed on. However, a relatively small portion seems too sandy, an even smaller portion is rocky, and the upper reaches of most of the tidal arms have areas of mangroves (*Avicennia resinifera*). Pollock Spit, Seagrove, Karaka Shellbanks, Wiroa Island (Airport), Puketutu and Onehunga (Fig. 1) are principal high tide roosts, other areas included in the censuses, also shown (Fig. 1) may sometimes have high numbers of birds. Land use around the harbour ranges from city and forest in the north to predominately mixed farming in the south.

Major modifications to the Manukau Harbour and its environs have been:—

1. Clearance from forest and scrub to farmland during the latter part of the 19th century. Since 1943 there has been an average annual increase of 10% in the rate of fertiliser application (*Agricultural Statistics*) with a presumed increase in nutrient runoff.
2. A continual increase of farm stocking rates. This has resulted in an increase of effluents from stock, stock sheds and silage pits.
3. Increasing urban development and associated runoff of pollutants into the harbour.
4. Direct discharge of sewage and industrial effluent from the greater Auckland area. Since 1960 this has been treated in a sewage treatment plant (Fig. 1) which covers some 400 hectares of former mudflat. From here some 300 million litres of treated effluent are discharged per day into the Manukau Harbour.

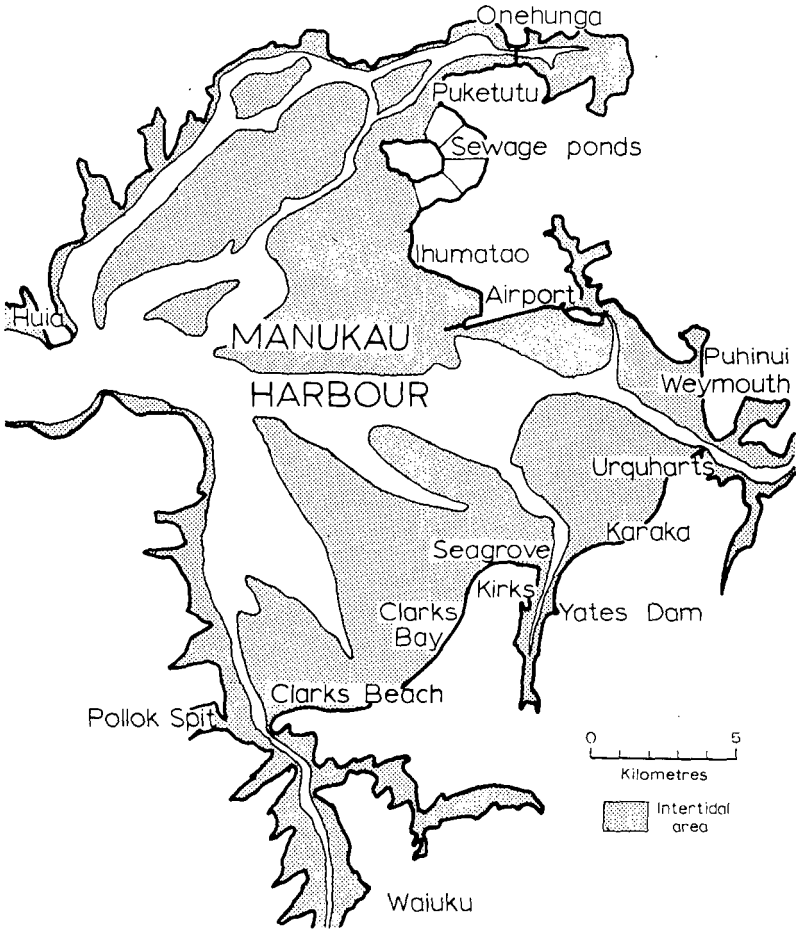


FIGURE 1- WADER HABITAT IN THE MANUKAU HARBOUR

The places named are known roosts or census counting areas.

5. In the course of constructing Auckland International Airport some 100 hectares of mudflat were covered with solid fill. Here, the runway protrudes from the former shore in such a way that the natural movement of sediments, and/or changed water and wave action, has altered the intertidal area immediately to the south from soft mud to firm sand.
6. Large beds of the marine grasses *Zostera muelleri* and *Z. capricorni* have disappeared. This is presumed to be due to a fungal disease but the effect on waders is not known.
7. The grasses *Spartina alterniflora* and *S. townsendii*, which grow in the intertidal zone, have been introduced to the Manukau Harbour during the past fifteen years. This is spreading but at present occupies less than 3 hectares of mudflat.
8. There is a continually increasing level of human activity. Speed boats, some of which are capable of travelling in very shallow water, are common. At low tide people shellfishing and setting fish nets are common. Recently, small hovercraft have occasionally been travelling over the mudflats.

The Firth of Thames is east of Auckland and lies between the Hunua and Coromandel Ranges (Fig. 2). Mudflat areas extend along all of the south and south western sides. At low water spring tide there are approximately 8 500 hectares of exposed intertidal area, most of which appears suitable for waders to feed on, although more than 800 hectares are covered by mangroves. There are no tidal arms but two major rivers and other small streams, draining an area of approximately 360 000 hectares, flow into the Firth. The main high tide roosts are:—

Taramaire, Miranda, Piako, Karito and Waitakaruru. Other areas, included in the census (Fig. 2) sometimes have high numbers of birds. The land surrounding the mudflat area is all farmland.

Major modifications to the Firth of Thames and its environs have been:—

1. The clearing of forest and drainage of swamps within the Hauraki Catchment, which began in the early 19th century, is continuing today. A presumed consequence is a change of river flows and silt loads being carried into the Firth. Since 1940-45 there has been an increased rate of fertiliser application and a presumed increase in nutrient runoff from the land.
2. A continual increase of farm stocking rates. This has resulted in an increase of effluents from stock, stock sheds and silage pits.
3. Treated and untreated sewage is discharged into the Firth of Thames and its catchment.
4. The area of mangroves has increased from less than 50 hectares in 1952 to more than 800 ha in 1973 (Fig. 3).

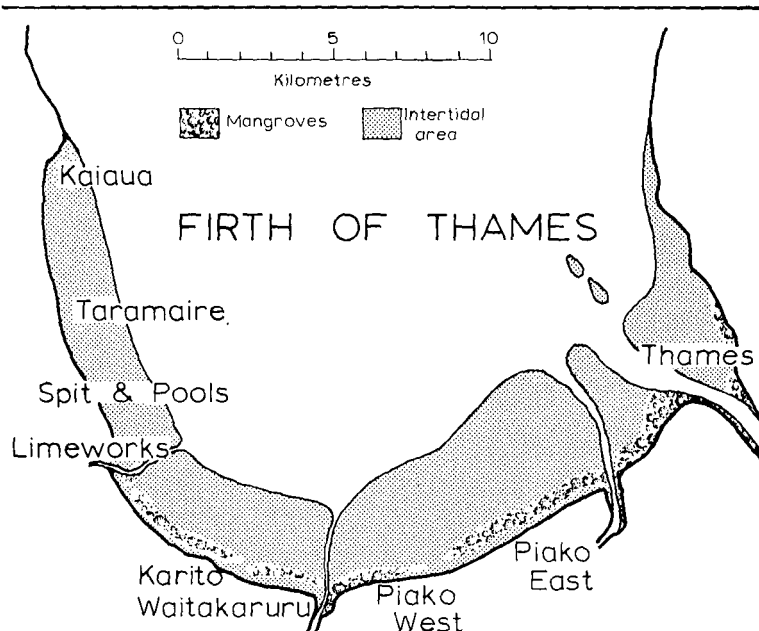
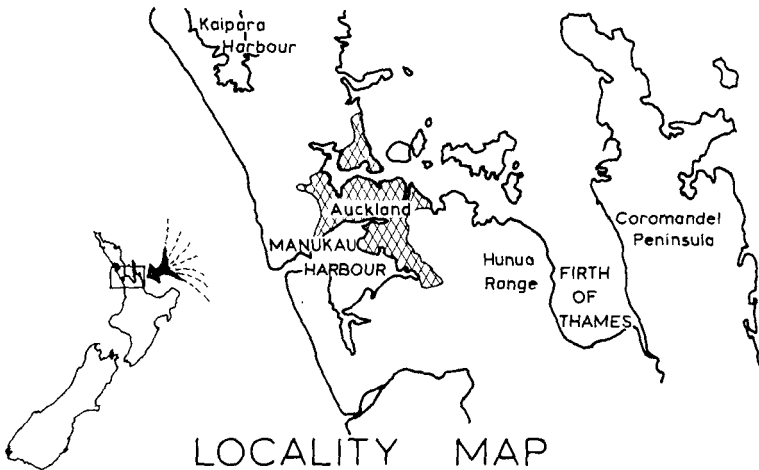


FIGURE 2-WADER HABITAT IN THE FIRTH OF THAMES

The places named are known roosts or census counting areas.

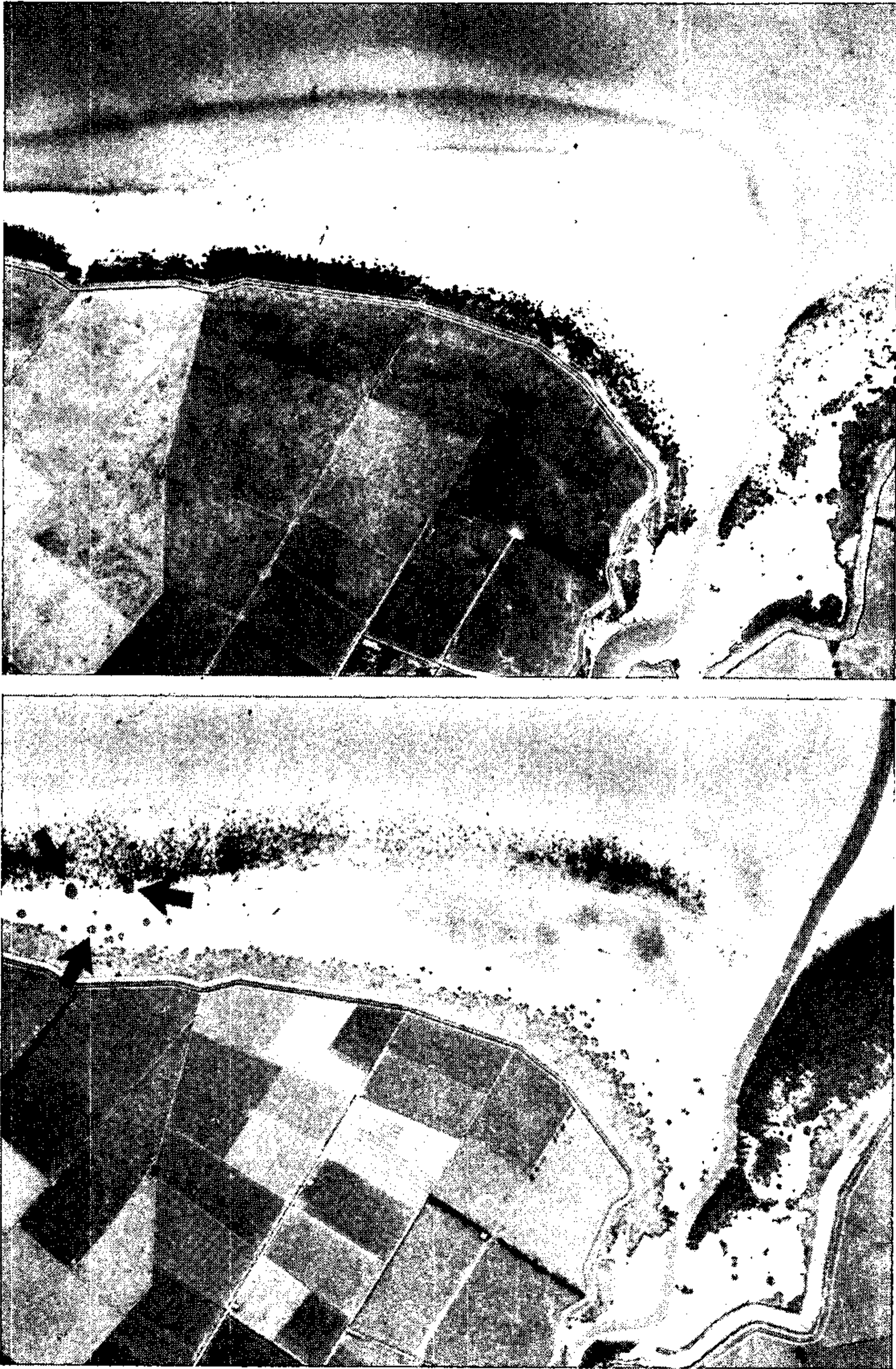


FIGURE 3 — The Firth of Thames Shoreline near Waitakaruru. Upper 1952. Lower 1973. Showing the increase of mangroves and introduction of *Spartina* (arrowed). Photographs printed with permission from Lands & Survey Department.

5. The grasses *Spartina alterniflora* and *S. townsendii*, which grow in the intertidal zone, have been introduced to the Firth of Thames during the past fifteen years. These now occupy less than two hectares of mudflat and are spreading.
6. Human activity is increasing but remains small compared with that in the Manukau Harbour.

CENSUS METHODS

The Manukau Harbour and Firth of Thames wader censuses are done twice yearly. The intent is to count the population when migration is at a minimum and numbers are stable, i.e., for summer censuses mid-November to mid-December and for winter censuses mid-May to mid-August. The system followed is to choose a day with a suitable spring tide. Observers watch each known high tide roost and patrol other areas where birds roost occasionally. The birds are counted at a predetermined time. However, as some census areas are long shallow stretches of water or beach which take a long time for an observer to cover and count, it is necessary for all observers to note arrival and departure of birds at the roosts for a period before and after census time, so that, if necessary, corrections can be made.

Censuses, principally as described, have been made on the Manukau Harbour and Firth of Thames since 1951. However, in the period between 1951 and 1959 counts were irregular and on some occasions not all species were counted or not all areas were covered. Data from 1960 to 1975 have been regular and complete and forms the basis of this paper.

RESULTS

The annual totals for summer and winter censuses in each harbour are shown in Figs 4, 7 & 9. The data show a general increase in the number of waders present.

Total numbers of waders in both harbours appear to fluctuate with more similarity in winter (Fig. 5) than in summer (Fig. 6). During both seasons the exceptions to this similarity are shared by the two harbours. The most notable exception is the winter of 1971 when there was a large increase of birds on the Manukau Harbour. A close study of the data for that year shows that there were many more S.I. Pied Oystercatchers and Knots (*Calidris canutus canutus*) and smaller extra numbers of Bar-tailed Godwits (*Limosa lapponica baueri*) and Pied Stilts present (Fig. 9). This is one occasion when a movement of birds from another harbour might be considered. However, as the increase in numbers of the major species (10 000 more S.I. Pied Oystercatchers and 4 000 more Knots) is more than are present on any other harbour, such a movement seems unlikely.

The relationship between winter and summer counts from year to year is irregular (Fig. 7) although both show a general trend of increasing numbers.

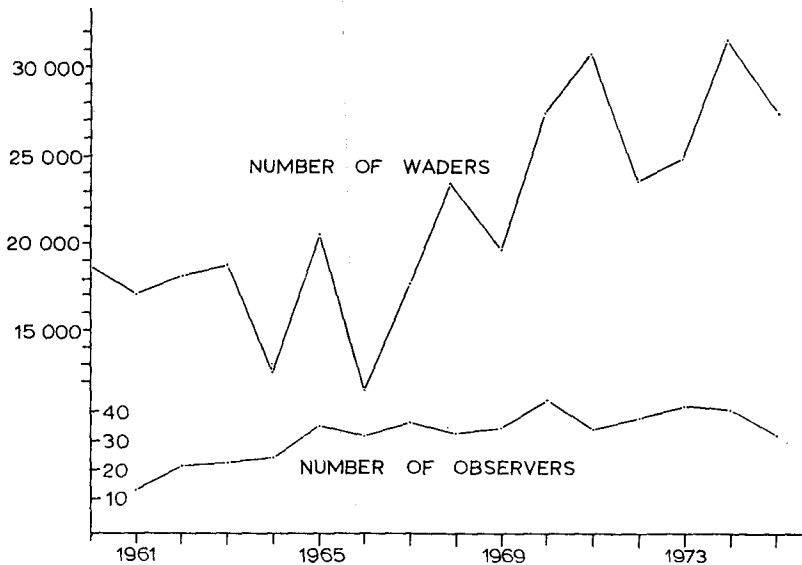


FIGURE 4 — MANUKAU HARBOUR SUMMER CENSUSES

The average number of waders in relation to exposed intertidal area is markedly different between the two harbours in both summer and winter (Table 1). However the difference between summer and

Table 1. AVERAGE NUMBER OF WADERS PER HECTARE OF INTERTIDAL AREA

	Summer	Winter
Firth of Thames	2.04	1.23
Manukau Harbour	1.19	0.95

winter is more marked in the Firth of Thames than the Manukau Harbour. There is a difference between the substrate types of these two harbours, the Manukau having more sand and the Firth of Thames more mud but there are no qualitative data available to suggest that this is a reason for the differences in bird numbers. The high tide roosts and, at least seasonally, the food supplies are known to be temporarily capable of catering for many more birds than are present at census time; for example, when high numbers are present immediately prior to the northward migration of arctic waders.

The distribution of different species between the two harbours is varied (Fig. 8). In summer, Knots show a marked preference for the Firth of Thames while Godwits are more numerous, but less dense,

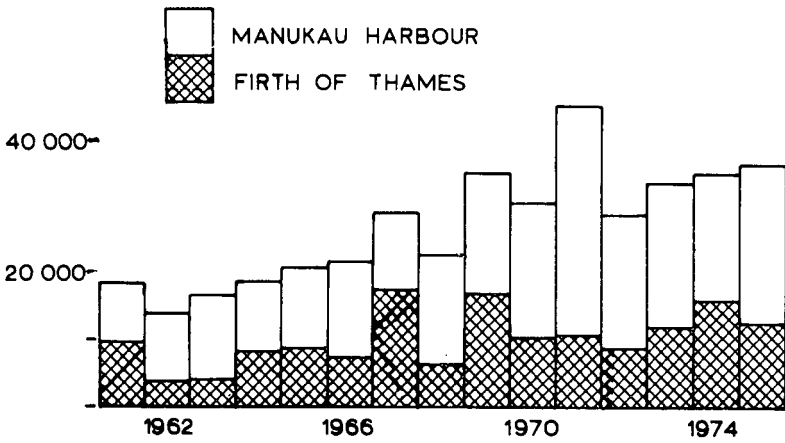


FIGURE 5 — WINTER CENSUSES
TOTAL NUMBER OF WADERS

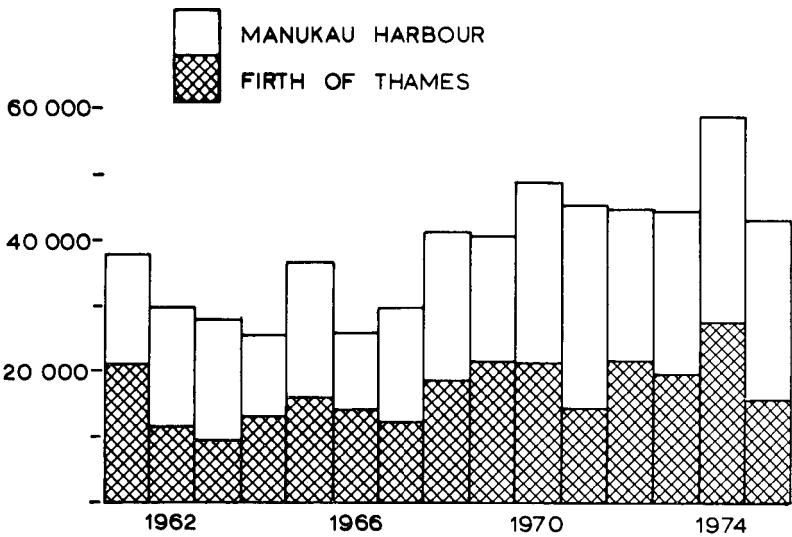


FIGURE 6 — SUMMER CENSUSES
TOTAL NUMBER OF WADERS

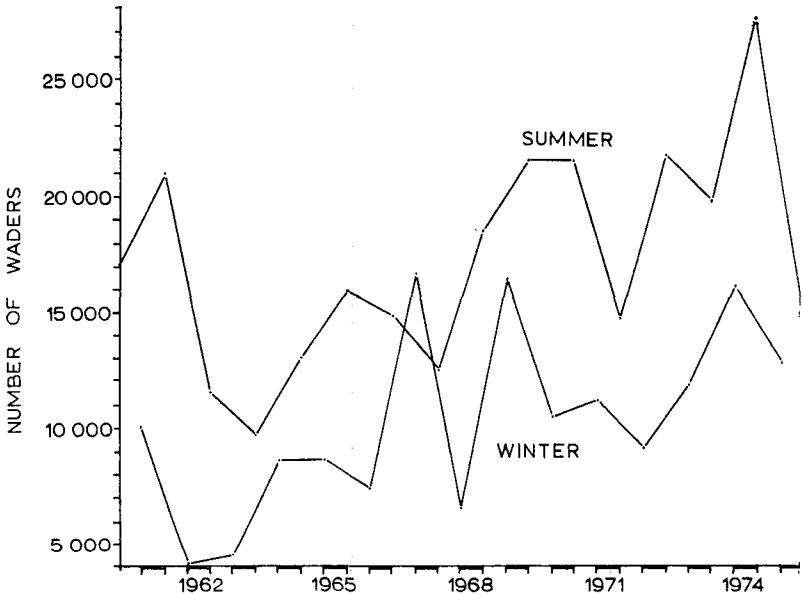


FIGURE 7—COMPARISON OF SEASONS
FIRTH OF THAMES

(Table 4) on the Manukau. However, in winter Knots are more evenly distributed while Godwits show a preference for the Manukau. There is no evidence to give reasons for these differences. The overall abundance of food appears to be good, as the birds appear to satisfy their needs easily and remain on the high tide roosts for some time after the tide has receded.

The numbers of each species on the Manukau Harbour in winter are shown in Figure 9 as an example of the complex fluctuations that make up the totals. I can find no specific data to explain these fluctuations. It is reasonable to expect that food supplies might vary to such an extent that a number of one species is forced to shift to another harbour. However, this does not appear to be so as numbers on one harbour do not rise and fall in sympathy with losses and gains on the other (Figs 5 & 6).

The number of young birds reared each year in arctic regions is known to vary greatly for species which have been studied (Frank A. Pitelka pers. comm.). Knots have been observed to increase about 500% in one part of Alaska during spring migration (M. E. Isleib pers. comm.). In recent years a general increase in numbers of the genera *Limosa* and *Arenaria* has been observed on the forest-steppe of

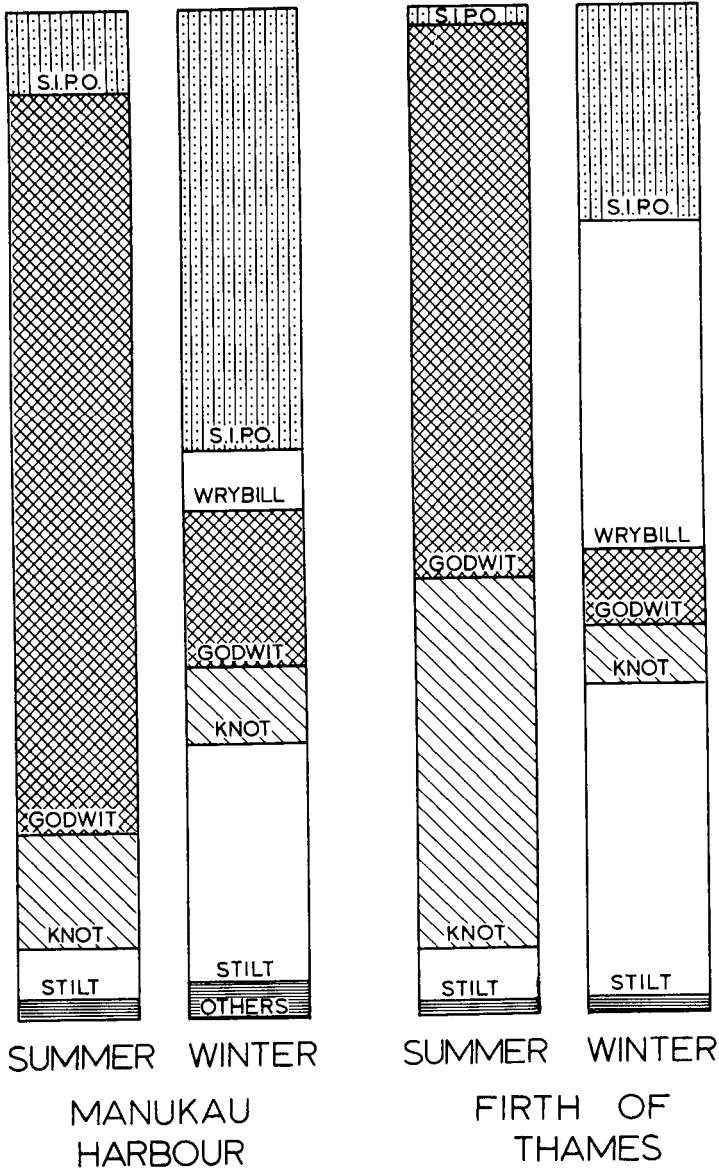


FIGURE 8 — RELATIVE ABUNDANCE OF WADERS 1960-1975

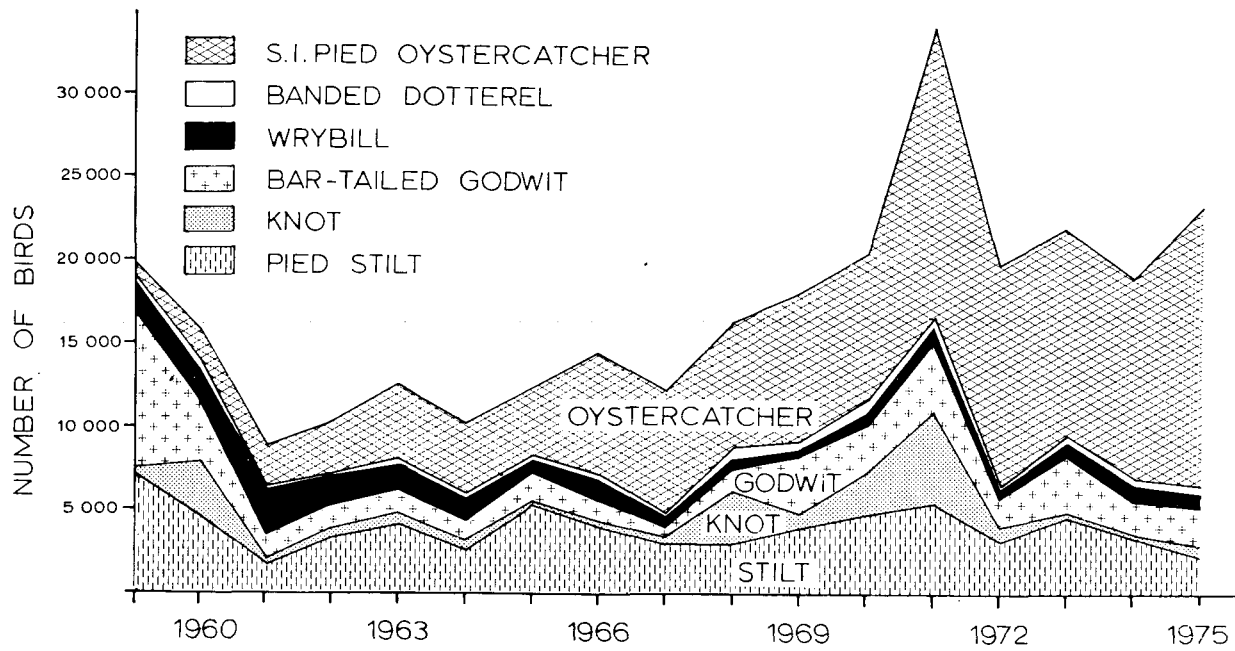


FIGURE 9—MANUKAU HARBOUR WADER POPULATION IN WINTER

West Siberia (K. T. Yurlov pers. comm.). Presumably the breeding success of other arctic species, and our endemic species, must also vary, and cause fluctuations in the number of wintering birds.

A number of casual readers of these census data have suggested that the number of observers present at each census could have a bearing in results obtained. I have therefore included the number of observers present on the Manukau Harbour during summer censuses in Figure 4.

MIGRANT ENDEMIC WADERS

SOUTH ISLAND PIED OYSTERCATCHER (*Haematopus ostralegus finschi*)

Soon after this species was protected by law in 1940 Sibson (1966) noted total winter numbers on the Manukau Harbour and Firth of Thames to be less than 300. He then recorded a subsequent steady increase in the numbers on both harbours between 1941 and 1965. This paper (Fig. 10) records a continuing increase for the period 1961-1975. The increase in numbers of this species is a major factor contributing to the overall increase of waders in winter on both harbours (Figs 7 & 9).

Baker (1973) calculated that in 1972 the total New Zealand population of this species was 59 000. During the winter of that year the Manukau and Firth of Thames total was 16 909 or 34.5%

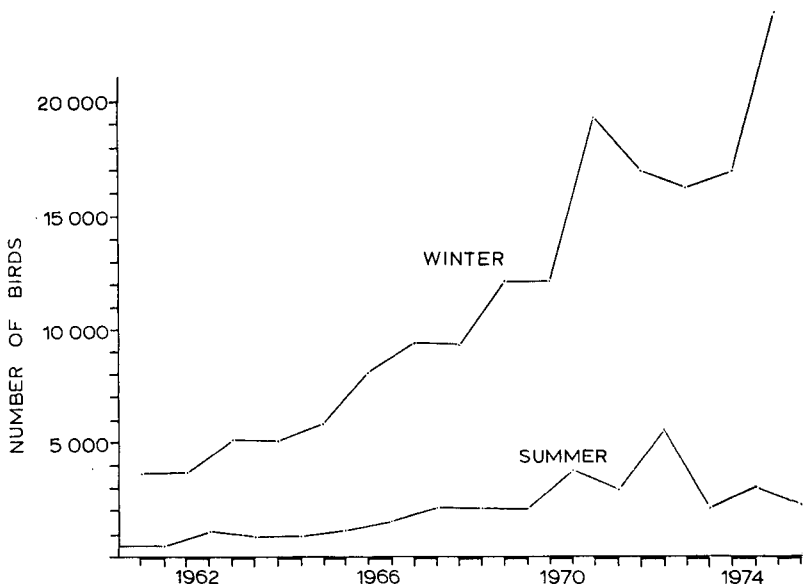


FIGURE 10—PIED OYSTERCATCHER TOTALS
FIRTH OF THAMES & MANUKAU HARBOUR COMBINED

of the total. During summer an average of 20% of the wintering population remain here though the proportional distribution of birds between the Manukau and Firth of Thames at 4.6:1 in summer is greater than during winter when it is 3.1:1 (Table 2). This is the only abundant species which occurs in greater density, in terms of birds per hectare, on the Manukau Harbour at all times of the year.

Table 2. DISTRIBUTION OF SOUTH ISLAND PIED OYSTERCATCHERS

	Summer		Winter	
	Average number of birds	Average birds per hectare	Average number of birds	Average birds per hectare
Manukau Harbour	1736	0.10	7821	0.43
Firth of Thames	377	0.04	2535	0.30

BANDED DOTTEREL (*Charadrius bicinctus*)

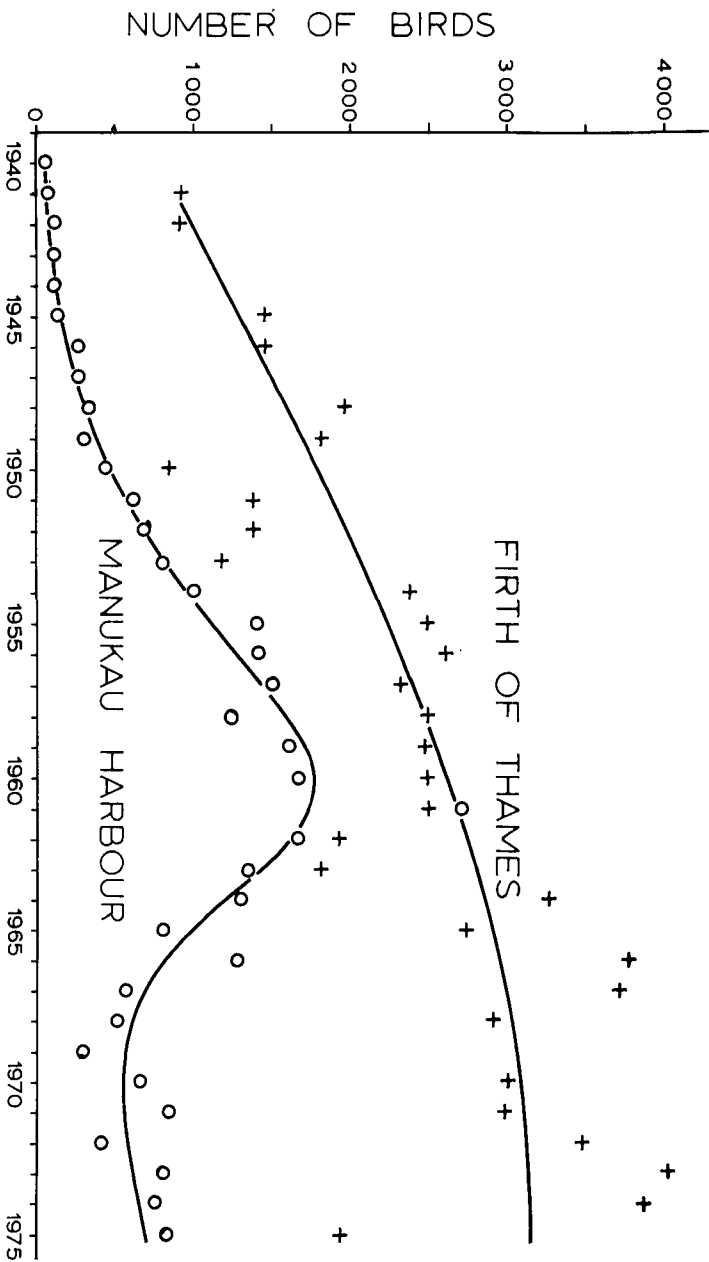
Census results indicate that Banded Dotterels have a marked preference for the Manukau Harbour in winter but are not entirely dependent on the estuarine habitat. Large numbers are frequently seen on fields some distance inland. H. R. McKenzie (pers. comm.) has recorded as many as 3 000 on a paddock near Waitakaruru. On both harbours and during both seasons counts record large fluctuations in numbers.

A portion of the Banded Dotterel population migrates during January-May to Australia, presumably returning to New Zealand for the next breeding season. "The Bird Observer" (1972) recorded that numbers in Australia are never high, with seldom more than 200 being seen in one place; however, they are widely distributed. At Karaka between 1963-1974 Banded Dotterels have maintained an average annual increase in mean numbers from about 200 in February to 400 during May in "good" years. (B. Brown pers. comm.).

WRYBILL (*Anarhynchus frontalis*)

Wrybills show a marked preference for the Firth of Thames where they have been steadily increasing (Fig. 11). Sibson (1963) noted that prior to 1940 the Wrybill population was very low but since then the prohibition of shooting of waders has allowed them, and other species, to live undisturbed. Sibson (1962) showed Wrybills increased during the years 1940 to 1960 on both the Manukau Harbour and Firth of Thames. The Puketutu area of the Manukau Harbour was a favoured feeding and roosting area. However, this area of

FIGURE 11—THE WRYBILL WINTER POPULATION



mudflat was inundated when the Auckland sewage treatment plant was constructed in 1960 and, presumably because of this loss of habitat, there has been a marked decline in numbers of Wrybills on the Manukau while they continued to increase on the Firth of Thames (Fig. 11). Less than four per cent of the winter population stays during summer, these non-breeding birds again favouring the Firth of Thames (Table 3).

Table 3. DISTRIBUTION OF WRYBILLS

	<i>Summer</i>		<i>Winter</i>	
	Average number of birds	Average birds per hectare	Average number of birds	Average birds per hectare
Manukau Harbour	19	0.001	1053	0.06
Firth of Thames	108	0.01	3281	0.39

Patterns of residency for Wrybills on the Manukau Harbour have been reconstructed from data recorded by Urquhart & Sibson (1952) and Sibson (1963) (Fig. 12). Because numbers have fluctuated widely, the maximum count for each year has been designated at 100% and other counts of each year a percentage of this. These data show the maximum population to be present during May-July.

PIED STILT (*Himantopus himantopus leucocephalus*)

Sibson (*in Falla et al.* 1970) noted that in the mid nineteenth century Pied Stilts seemed to have been relatively rare in northern New Zealand; now they are the most numerous of the larger waders which breed in New Zealand. During the period of this study numbers of Pied Stilts on both harbours have fluctuated greatly from year to year. However, there is no indication of any long term trend and these fluctuations are probably a measure of their occurrence from time to time in other equally acceptable habitats.

BLACK STILT (*Himantopus novaezealandiae*)

Census data record Black Stilts only during the latter half of the census period. However, they have probably been present in low numbers for many years. It is only relatively recently that the "smudgy" stilt has been identified as the sub-adult plumage phase of this species (R. J. Nilsson pers. comm.).

COMMON MIGRANTS TO NEW ZEALAND FROM ARCTIC REGIONS

PACIFIC GOLDEN PLOVER (*Pluvialis dominica fulva*)

Pacific Golden Plovers occur in similar numbers on both harbours indicating, in terms of birds per hectare of mudflat, a marked preference for the Firth of Thames. Total numbers are small — ranging from

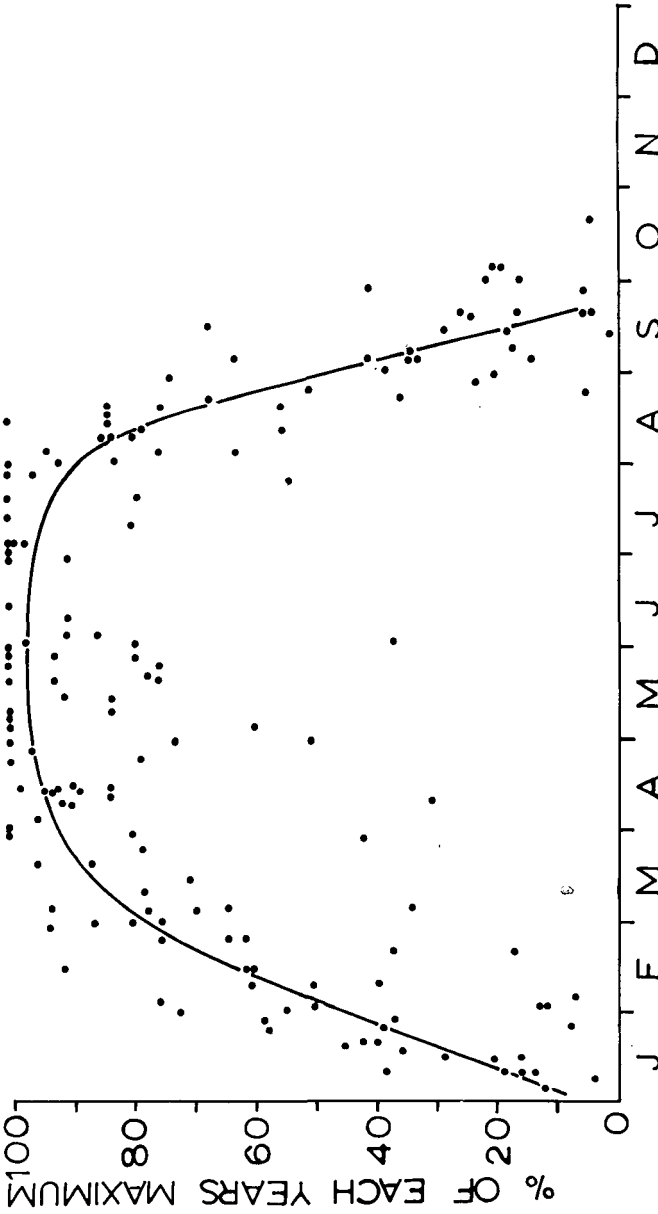


FIGURE 12-AVERAGE ANNUAL WRYBILL CYCLE
MANUKAU HARBOUR 1940-1950

0 to 120, and are highly irregular. However, on the Manukau they have a habit of frequenting fields some distance from the harbour. Sibson (1946) recorded them on fields about 1 kilometre from the shore at Karaka when the tide was full. H. R. McKenzie (pers. comm.) has seen them flying away to the south of the Manukau Harbour, presumably to roost on fields. Golden Plovers in the Firth of Thames have not been recorded behaving similarly. Low counts during some censuses could be related to migration time. Sibson (1946) stated that Pacific Golden Plovers do not usually arrive in numbers in this region until late October or November. However, data given by McKenzie (1967 c) indicate an earlier arrival time of mid-September to mid-November.

A detailed search of the census records shows that this species, when present, usually frequents the same roosts: Waitakaruru in the Firth of Thames and Karaka in the Manukau. Puketutu causeway, now part of the Auckland sewage ponds, used to be a regularly used roost (R. B. Sibson pers. comm.).

The Golden Plover rarely over-winters; it has been recorded only during three Manukau winter censuses (1961, 1965 and 1973).

LONG-BILLED CURLEW (*Numenius madagascariensis*)

Although few in number the Long-billed Curlew has been a regular visitor to the Firth of Thames in summer. It has only once been recorded during summer censuses of the Manukau Harbour, when in 1975 four birds were found. Single birds have been seen there on at least three occasions during September and October (B. Brown pers. comm.). The census records show that some 22% of the summer population remains on the Firth of Thames during winter. They have been recorded on only three occasions during winter censuses of the Manukau (1962, 1974 and 1975). The apparent preference this species has for mangrove areas (Falla *et al.* 1970) may be a reason for their high use of the Firth of Thames.

EASTERN BAR-TAILED GODWIT (*Limosa lapponica baueri*)

The Eastern Bar-tailed Godwit is by far the most numerous arctic wader to visit New Zealand. Stidolph (1954) estimated the total summer population to be in the vicinity of 200 000. However, more recent estimates derived from more accurate data (Veitch 1977) suggest a figure closer to 100 000. Numbers recorded during censuses of the Firth of Thames and Manukau Harbour during summer range from 16 200 to 37 600 (a mean of 24 800). These counts may be misleading as those responsible for the larger total were made on 20 October and 17 November. At this time the southward migration may still be in progress and hence there could have been large numbers of birds in northern harbours prior to dispersal to the south.

The census figures show many fluctuations and a general increase in the number of birds present during the period covered by this paper

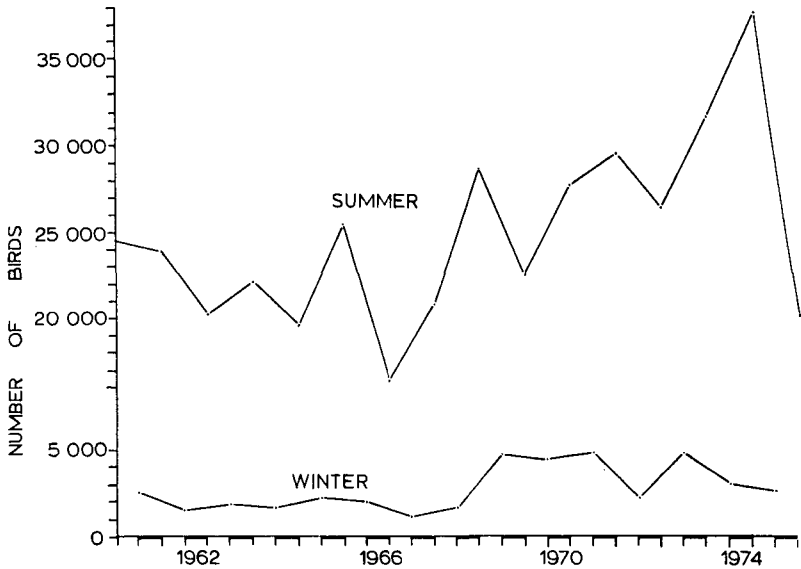


FIGURE 13—BAR-TAILED GODWIT TOTALS
FIRTH OF THAMES & MANUKAU HARBOUR COMBINED

(Fig. 13). Data presented by McKenzie (1967 a) for 1951-1966 indicate an even greater rate of increase during that period.

McKenzie (1967 a) recorded large Godwit flocks flying across country. All except one of his records relate to periods close to the northward migration time. On 1 March 1964 one flock of about 10 000 birds was seen to leave the Manukau Harbour, one and three quarter hours before high tide. They flew 20 kilometres to Whitford on the east side of the Auckland isthmus, where the tide is some three hours earlier, and rested on the sandy flats before flying back to the Manukau in time to feed after the outgoing tide. Sibson (pers. comm.) reports that large flocks of Godwit are commonly seen during March over Otahuhu (east of Puketutu/Ihumatao, Fig. 1) before and after high tide on the Manukau. Similar flights are also sometimes seen at the time of spring tides.

The pattern of distribution of Godwit between the Manukau and Firth of Thames is similar to that for most other species; that is, they are far more dense, in terms of birds per hectare, on the Firth of Thames (Table 4). Of note here is that, on average, more Godwit stay on the Manukau during winter (16% of the summer total). The total winter population has increased, but in recent years not in proportion to the increase in the summer population (Fig. 13).

Table 4. DISTRIBUTION OF BAR-TAILED GODWITS

	<i>Summer</i>		<i>Winter</i>	
	Average number of birds	Average birds per hectare	Average number of birds	Average birds per hectare
Manukau Harbour	15 472	0.86	2 563	0.14
Firth of Thames	9 310	1.10	751	0.09

Examination of seven birds killed during May showed five to be apparently sexually mature but thin, and therefore presumably not ready to migrate; the other two were not sexually mature. A portion of overwintering birds do appear to achieve sexual maturity, as indicated by their breeding plumage, but do not join the northward migration.

TURNSTONE (*Arenaria interpres interpres*)

Turnstones have been present on the Manukau Harbour from earlier than 1880, but were not recorded on the Firth of Thames until 1941 (McKenzie 1968). Since then the populations on both harbours have increased at similar rates. A noticeable gap in the census data is the nil record for the Manukau in the summer of 1964. H. R. McKenzie (pers. comm.) recorded 300 Turnstones at Karaka during November 1964 and January 1965. Probably an occurrence such as that described by Sibson (1964), when Turnstones were roosting at Karaka nearly a kilometre from the shore, took place at the time of the 1964 census.

The winter population is about 26% of the summer population and in general shows a similar distribution and increase in number. This is a high proportion of birds to stay during winter and may be related to a change of this species' distribution in New Zealand during winter or to some undetected aspect of its breeding biology.

KNOT (*Calidris canutus canutus*)

Census data for Knots show considerable fluctuations but there is no noticeable increase of average numbers present. Summer data may have been affected by counts which took place during the migratory period, as the two highest counts, both of more than 11 000 birds, were recorded in mid October. McKenzie (1967) noted that the arrival of this species continues from late September to early November.

Total winter populations show even larger fluctuations than those of summer — 268 in 1966 to 7 598 in 1971. The latter figure is significantly higher than usual, although obtained at a time of year when numbers should have been relatively stable. In this year (1971) other species were also recorded as being more numerous (Fig. 9). The nil record for this species on the Firth of Thames during the winter

census of 1968 could well be reliable. During that winter H. R. McKenzie (pers. comm.) on three other visits recorded 0, 1 and 30 Knots.

According to McKenzie (1967 b) — “ The Firth of Thames and Manukau summer counts are, on the whole, very similar, but in spite of this the winter counts are very much in favour of the Manukau.” The 1960-75 data (Table 5) extends this to show Knots to be far more numerous in the Firth of Thames during summer and in winter to be more numerous, although similar in terms of birds per hectare,

Table 5. DISTRIBUTION OF KNOTS

	<i>Summer</i>		<i>Winter</i>	
	Average number of birds	Average birds per hectare	Average number of birds	Average birds per hectare
Manukau Harbour	2 858	0.16	1 237	0.07
Firth of Thames	6 548	0.77	587	0.07

on the Manukau Harbour. About 19% of the total summer population is present during winter.

CURLEW SANDPIPER (*Calidris ferruginea*)

Although few in number Curlew Sandpipers have, during the census period, been a regular summer migrant, particularly to the Firth of Thames. Its status in New Zealand up to the summer of 1969-70 has been fully documented by Sibson (1971). These data show a steady increase in numbers, particularly on the Firth of Thames. Curlew Sandpipers, and many other small waders, show a marked preference for feeding and roosting with Wrybills and this may be a reason for the higher numbers of small waders found on the Firth of Thames which is the preferred wintering habitat of the Wrybill.

Curlew Sandpipers have not been found on the Manukau Harbour during winter censuses. H. R. McKenzie (pers. comm.) informed me that occasional sightings have been made on the Firth of Thames in winter in years when it has not been recorded during censuses. The high figure of nine birds — all in breeding plumage (McKenzie pers. comm.) — during the census of 17 May 1964 indicates that this census may have included northward migrating birds.

RED-NECKED STINT (*Calidris ruficollis*)

Red-necked Stints are regular migrants to New Zealand even though numbers are small. Sibson (1968) recorded a marked increase in numbers on both the Firth of Thames and Manukau Harbour during the 1950s. During the census period numbers have fluctuated but there is no obvious trend. Winter numbers have been low except

in 1964 when the census may have been early enough to include some late migrants. This species likes to accompany Wrybills, but this affinity is not as marked as with some other species. This is shown by the more even distribution between the two harbours instead of more being in the Firth of Thames, the preferred Wrybill habitat.

NON-MIGRATORY NEW ZEALAND WADERS

VARIABLE OYSTERCATCHER (*Haematopus unicolor*)

This species is not known to nest within the census area. The few birds which have been irregularly recorded during censuses are probably typical of the small flocks which sometimes gather (Falla *et al.* 1970).

NEW ZEALAND DOTTEREL (*Charadrius obscurus*)

New Zealand Dotterels nest along the shores of both harbours and the summer census figures are, in all probability, an accurate assessment of the breeding population. The slightly higher winter numbers may be due to the presence of young of the year or flocking of birds which nest elsewhere.

BLACK-FRONTED DOTTEREL (*Charadrius melanops*)

A single bird was seen on the Manukau Harbour during the 1970 winter census and there are two other records of single birds there during the winters of 1971 (Sibson 1972) and 1972 (McKenzie pers. comm.).

OTHER MIGRANTS

There are 14 species of waders which reach New Zealand irregularly and have been included in census counts on the Manukau Harbour and Firth of Thames:

Red-capped Dotterel (*Charadrius alexandrinus ruficapillus*)

Mongolian Dotterel (*C. mongolus*)

Large Sand Dotterel (*C. leschenaulti*)

Asiatic Whimbrel (*Numenius phaeopus variegatus*)

American Whimbrel (*N. p. hudsonicus*)

Asiatic Black-tailed Godwit (*Limosa limosa melanuroides*)

American Black-tailed Godwit (*L. haemastica*)

Lesser Yellowlegs (*Tringa flavipes*)

Greenshank (*T. nebularia*)

Marsh Sandpiper (*T. stagnatilis*)

Terek Sandpiper (*Xenus cinereus*)

Sharp-tailed Sandpiper (*Calidris acuminata*)

Pectoral Sandpiper (*C. melanotos*)

Western Sandpiper (*C. mauri*)

Baird's Sandpiper (*C. bairdi*)

Broad-billed Sandpiper (*Limicola falcinellus sibirica*)

In quantity these birds account for 0.03% of the waders using

the Firth of Thames and Manukau Harbour throughout the year. In quality they have attracted a good deal of attention and notes about many have appeared in *Notornis*.

The Firth of Thames appears to be the place where these irregular migrants are seen more frequently. This may be due, in part, to the way these birds are attracted to the large flocks of Wrybills which are present there from January-February to August.

A further 9 species of waders have been recorded on the Manukau Harbour and Firth of Thames but have not been seen during censuses. These are:—

- Grey Plover (*Pluvialis squatarola*)
- Oriental Dotterel (*Charadrius veredus*)
- Ringed Plover (*C. hiaticula*)
- Little Whimbrel (*Numenius minutus*)
- Upland Plover (*Bartramia longicauda*)
- Siberian Tattler (*Tringa brevipes*)
- Great Knot (*Calidris tenuirostris*)
- Dunlin (*C. alpina*)
- White-rumped Sandpiper (*C. fuscicollis*)
- Sanderling (*C. alba*)
- Ruff (*Philomachus pugnax*). Probable sighting only.

To complete the list of waders the following species have been recorded in the New Zealand region but not on the Firth of Thames or Manukau Harbour:

- Bristle-thighed Curlew (*Numenius tahitiensis*)
- Wandering Tattler (*Tringa incana*)
- Common Sandpiper (*T. hypoleucos*)
- Least Sandpiper (*Calidris minutilla*) Probable sighting only.
- Semipalmated Sandpiper (*C. subminuta*) Probable sighting only.
- Australian Avocet (*Recurvirostra novaehollandiae*)
- Grey Phalarope (*Phalaropus fulicarius*)
- Red-necked Phalarope (*P. lobatus*)
- Oriental Pratincole (*Glareola maldivarum*)

CONCLUSION

These censuses show some species to be increasing, some to be stable, and others to fluctuate. Except for rare occasions (e.g., Wrybills on the Manukau) there is no evidence to give reasons for these changes.

The breeding areas of some wader species are diverse and it is not known exactly which portion of these populations migrate to New Zealand. The breeding success of some wader species, but not those which migrate to New Zealand, have been studied and their numbers observed to fluctuate (Frank A. Pitelka pers. comm.).

Migration routes are not known accurately; therefore the effects of habitat changes on migrating birds cannot be deduced.

The food available to waders and the food taken by them in New Zealand is not known accurately, nor are the occurrence or effects of changed water salinity, temperature, nutrients, etc., and the variability of substrates is not recorded. All these factors are known to effect wader populations elsewhere (Wolff 1969, Perkins 1974).

Therefore, the data presented here stand on their own as a basis for further studies. It is hoped that censuses can be continued in their present form or even expanded to be more frequent and include other harbours. Regular New Zealand-wide censuses would help to clarify the wader distribution pattern.

ACKNOWLEDGEMENTS

The major credit for these censuses must go to Mr H. R. McKenzie who originated this work and organised it for many years. His foresight has made available a unique and increasingly significant record. This work is now organised by Mrs B. Brown, South Auckland Regional Representative for the Ornithological Society of New Zealand, with assistance from the Auckland Regional Representative and members of the OSNZ. Thanks are also due to the landowners who have allowed access over their properties.

My personal thanks is due, firstly, to Mr T. Caithness who made this paper into a readable document and, secondly, to the many people who have commented on and criticized my work and added valuable data to the existing records.

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