



Field Study of bird foraging and roosting sites in lower Otago Harbour

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Reviewed by:



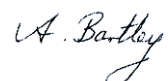
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1. Introduction

Large numbers of intertidal shore birds (comprising mainly South Island Oystercatchers, Variable Oystercatcher, Bar-tailed Godwits, Lesser Knots, Banded Dotterels, and Pied Stilts) feed within Otago Harbour and on sand flats at Aramoana. (Sagar et al. 2002; P.M. Sagar, *unpublished data*). The largest numbers of wading birds in the Harbour have been recorded in the Aramoana region, and most of these species use the area for feeding rather than breeding.

The majority of these species feed on intertidal invertebrates (including molluscs, polychaete worms and crustaceans). Increases in suspended sediments in the water column and sedimentation due to dredging of the harbour channel has the potential to decrease the abundance and distribution of these benthic communities which in turn could effect foraging of intertidal bird species. However, harbours and estuaries are naturally turbid and most of the invertebrates are adapted to episodic high turbidity events.

In their feasibility study of the proposed Port Otago channel deepening programme, James et al. (2008) suggested that there are potential direct effects of dredging through noise, and increased turbidity that may impact on feeding of intertidal birds, and physical disturbance. They identified knowledge of foraging behaviour and areas as an information gap in Otago Harbour, and so suggested that an observational behavioural study be undertaken on bird feeding and roosting behaviour.

The main aims of this current study were to address the key issues around foraging area and behaviours, identified in James (2008), specifically:

1. to undertake foraging studies of wading birds, and so determine baseline data of the foraging areas used in the vicinity of the Aramoana Ecological Area; and
2. to assess the significance of roosting sites on high shell banks in the vicinity of Port Chalmers.

2. Methods

2.1 Foraging areas

To determine the foraging areas of intertidal birds within the area of mudflats adjacent to the dredging operation at Aramoana we mapped the locations of foraging birds, by species, each hour over a tidal cycle (ebbing tide-incoming tide). This field work was completed during the period 08.30-16.30 h on 27 March 2008; the weather was foggy at 08.30h, but began lifting by 10.15h and did not affect viewing conditions. High tide was at 07.47 h (tide height 0.52) and low tide at 13.59 h (-0.56) at the Otago Harbour entrance on the day of the observations.

The locations of the foraging birds were determined from vantage-point observations made using binoculars or spotting scope, as required; this way disturbance to foraging birds was avoided. Observations were made from two vantage points sited at 2331025E 5488810N and 2331518E 5488818N (Figure 1), with the observer (GK) moving between sites during each observation period to obtain the best views of the intertidal flats. In addition records were kept of the movements of any vessels in the adjacent channel and any reactions of feeding or roosting birds to them.



Figure 1: Otago Harbour study area, showing locations of vantage points from which observations were made hourly 08.30-16.30, 27 March 2008.

2.2 Roost sites

Sand banks in the vicinity of Port Chalmers were scanned, using a spotting scope, by Russell Cannings (Ornithological Society of New Zealand) from the vicinity of Harwood and Portobello on various dates January- July 2008, and the species present were recorded.

3. Results

3.1 Foraging areas

A total of 16 species of waterbirds were recorded in the Aramoana area during the period 08.30h to 16.30h (Table 1). During this period the tide ebbed and the birds moved from roosts to feed over various parts of the exposed mudflats. The numbers of each species observed each hourly observation period are listed in Table 1 and the distribution of each species is shown in Figures 2-10. The numbers on these figures provide a general indication of the abundance and distribution of each species at hourly intervals. The following is an account of the foraging and movements of each species.

Black shag

These were observed only at Otalefo Point, where 0-35 roosted during the observation period. No observations were made in the deep-water channel off the point, and so it was not recorded whether this species foraged there when not at the roost.

White-faced heron

The number of herons varied from 3 to 14 during the observation period. During the high tide periods they tended to occur in small groups high on the shore (Figure 2). However, as the tide ebbed they dispersed and fed mostly as individuals along the edge of the receding waterline and along exposed channels.

Black swan

During high tide black swans occurred as a single flock of 16 birds near the edge of the water (Figure 2). As the water ebbed more swans flew in from elsewhere and all dispersed and fed in smaller groups just offshore, along the margins of the deep-water channel (e.g., Figure 6), before moving to the shore and roosting along the water's edge (Figures 7-10).

Paradise shelduck

A single pair occupied dry land above the high water mark throughout most of the observation period.

Mallard

A flock of about 100 birds occurred on shallow water near the spit at Aramoana during high tide (Figures 2-3), but then dispersed out of the study area for the rest of the observation period.

Grey teal

During high tide a flock of 105 birds occupied an island near the tip of the spit at Aramoana (Figures 4-5). When the tide had receded the entire flock then moved to feed on exposed sand/mud near the water's edge (Figures 6-7) before roosting on the exposed mud until the end of the observation period (Figures 8-10).

Pied oystercatcher

At high tide most pied oystercatchers roosted in flocks on islands near Aramoana and Otalefo Point (Figure 1). As the tide ebbed they moved off the islands to feed along the edge of the receding tide and along exposed channels exposed (Figures 3-10), although about 34 had returned to roost well before the rising tide covered the sand/mudflats during mid-late afternoon (Figures 9-10).

Variable oystercatcher

Few (12-17) variable oystercatchers foraged within the study area, with most roosting elsewhere at high tide and then arriving to feed along the receding water line (Table 1, Figures 2-10).

Pied stilt

The few (7-12) pied stilts that roosted in the study area did so in pairs or small flocks at the edge of the vegetated shoreline (Figures 2-4). As the tide ebbed more stilts entered the study area and up to 59 fed along the edge of the receding water and exposed wet sand/mud higher on the shore (Figures 4-10). From about low water, most began roosting on intertidal islands (Figures 7-10).

Banded dotterel

Banded dotterels roosted on islands during high tide (Figures 2-3) and then moved out to feed on the wet sand/mud as the tide receded (Figures 4-5). By 12.30h they had finished feeding and returned to roost on a vegetated intertidal island, but by 15.30h

they had moved off this roost and begun to feed again in sheltered sandy bays near the islands (Figures 6-10).

Spur-winged plover

Most spur-winged plovers fed in areas of exposed sand well above the waterline (e.g., Figures 3-10) and generally spent their time near vegetated intertidal islands.

Bar-tailed godwit

Bar-tailed godwits roosted in small flocks on intertidal islands, but most godwits entered the area under observation as the tide ebbed (Figure 2, Table 1). Most of the godwits fed along the edge of the water, moving with the tide as it receded. By 15.30h 26 godwits had finished feeding and formed a flock on the exposed sand/mud above the water line; the remaining godwits continued to feed in shallow water (Figures 9-10).

Black-backed gull

Most black-backed gulls roosted on an island until the tide had ebbed (12.30h), when they moved to roost on exposed sand/mud near the water's edge where they were joined by birds from outside the observed area (Figures 2-10).

Red-billed gull

Red-billed gulls roosted on 2 islands during high tide (Figures 2-4), and then a few birds moved off to feed along the shoreline as the tide ebbed (Figure 5). From 12.30 to 14.30h red-billed gulls moved off the roosts, with most moving outside the observed area while those that remained feeding on recently exposed sand/mud above the water (Figures 5-8). By 15.30h more birds had gathered in the flock to feed just above the water's edge (Figures 9-10).

Black-fronted tern

Black-fronted terns were mostly absent from the study area until near low tide when a flock of 86 birds roosted on exposed sand/mud above the water's edge (Figures 2-6), where they remained until the end of the observation period (Figures 7-10).

White-fronted tern

White-fronted terns were absent until near low tide, when a flock of 400 came to roost in an area adjacent to the black-fronted terns on exposed sand/mud, where they remained until the end of the observation (Figures 2-10).

Table 1: Numbers of wetland birds observed each hour 08.30-16.30h at Aramoana, Otago Harbour, 27 March 2008.

Species/Time	08.30	09.30	10.30	11.30	12.30	13.30	14.30	15.30	16.30
Black shag	0	30	30	35	35	27	27	27	0
White-faced heron	8	14	8	6	4	5	6	4	3
Black swan	16	16	16	16	23	37	37	37	37
Paradise shelduck	0	0	0	2	2	2	2	2	0
Mallard	100	100	0	0	0	0	0	0	0
Grey teal	18	0	113	111	127	127	127	127	127
Pied oystercatcher	161	166	183	273	238	215	215	229	225
Variable oystercatcher	1	2	0	17	14	14	14	12	12
Pied stilt	9	7	12	39	52	59	59	56	56
Banded dotterel	114	109	104	104	100	100	100	100	100
Spur-winged plover	0	10	5	2	6	6	22	20	16
Bar-tailed godwit	33	57	12	91	48	45	45	56	56
Black-backed gull	143	140	141	141	274	274	274	274	274
Red-billed gull	267	267	230	264	62	62	52	250	250
Black-fronted tern	0	36	0	0	86	86	86	86	86
White-fronted tern	0	0	0	1	400	400	400	400	400

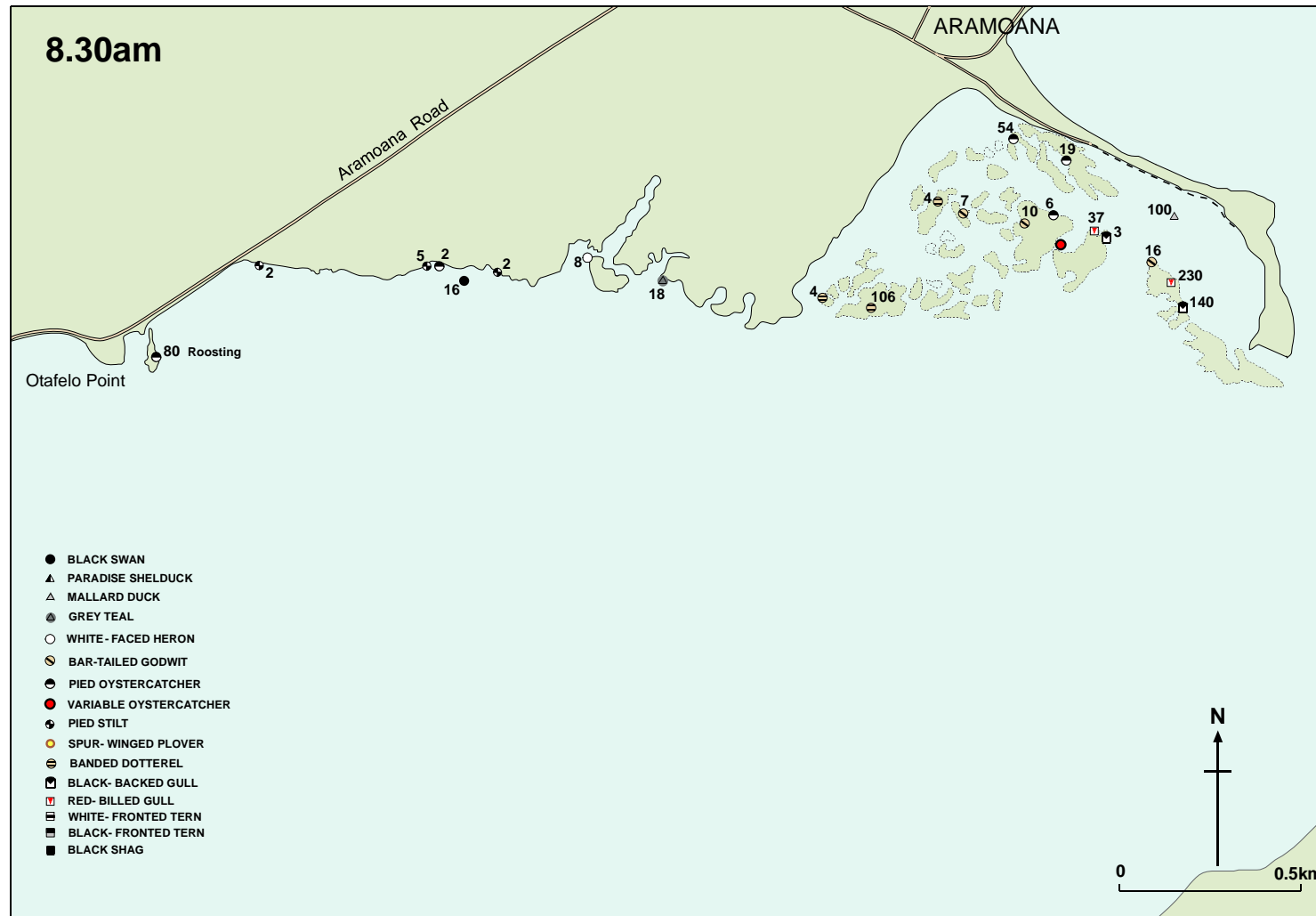


Figure 2: Distribution and abundance of waterbirds near Aramoana, Otago Harbour, 08.30h 27 March 2008.

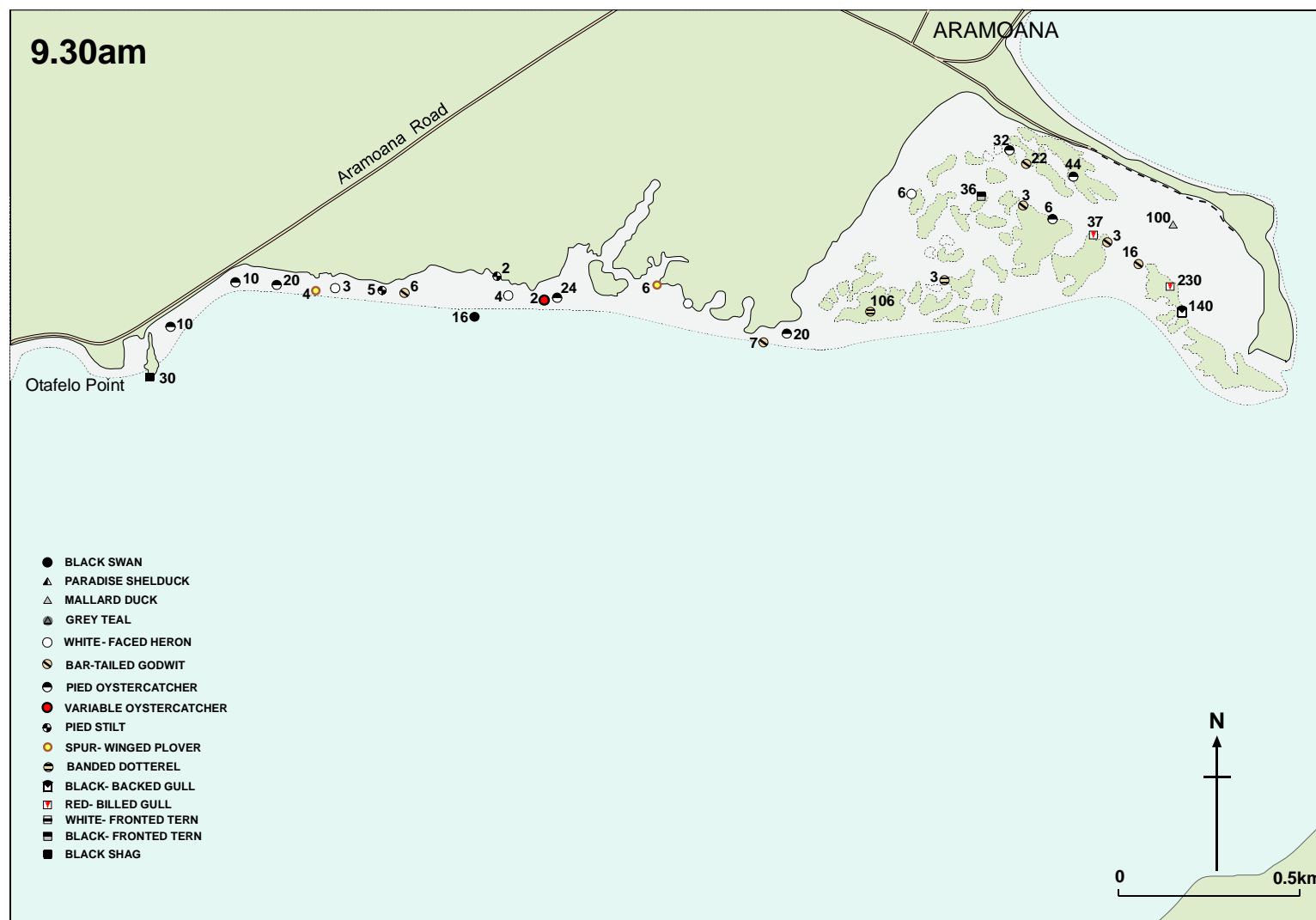


Figure 3: Distribution and abundance of waterbirds near Aramoana, Otago Harbour, 09.30h 27 March 2008.

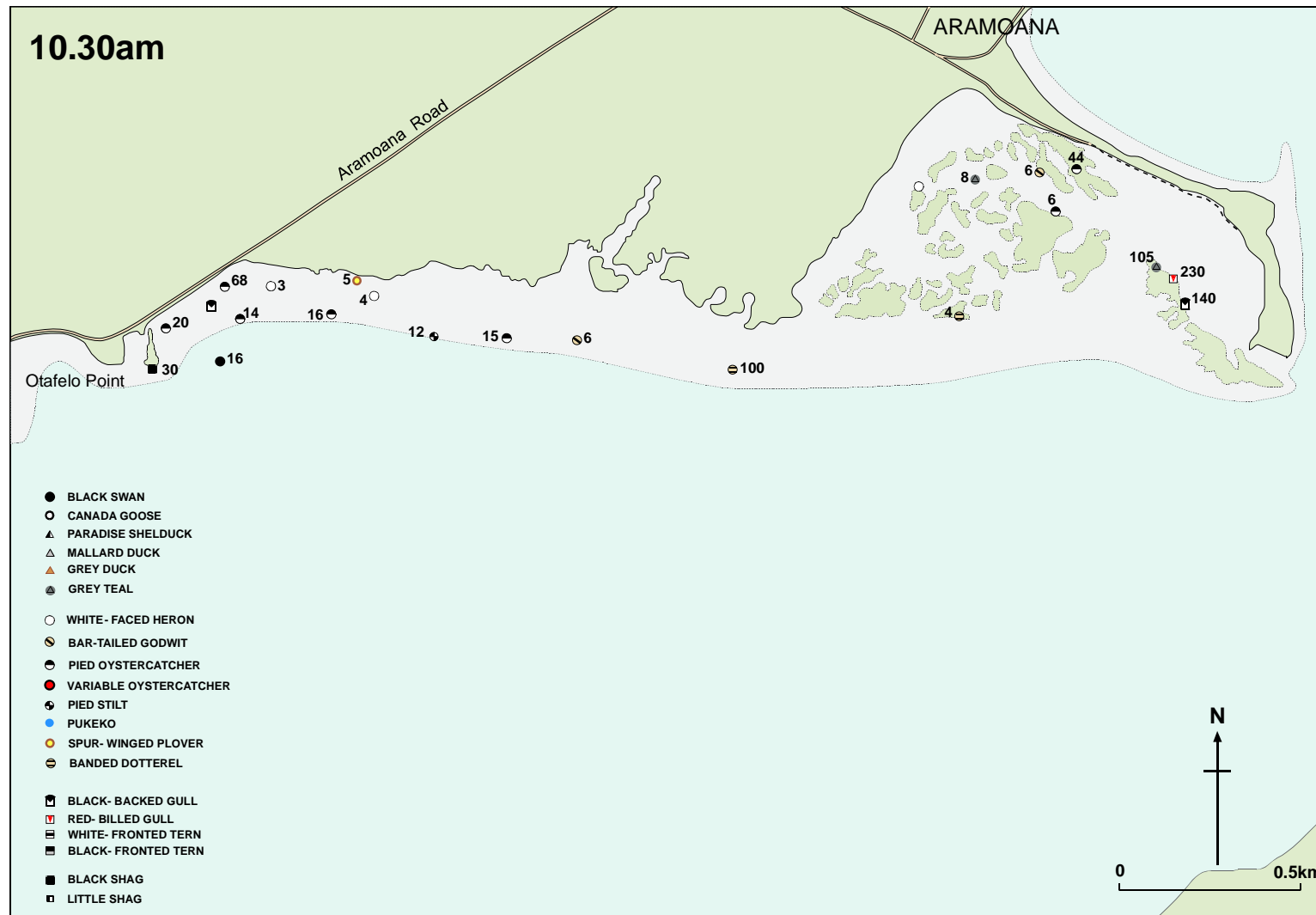


Figure 4: Distribution and abundance of waterbirds near Aramoana, Otago Harbour, 10.30h 27 March 2008.

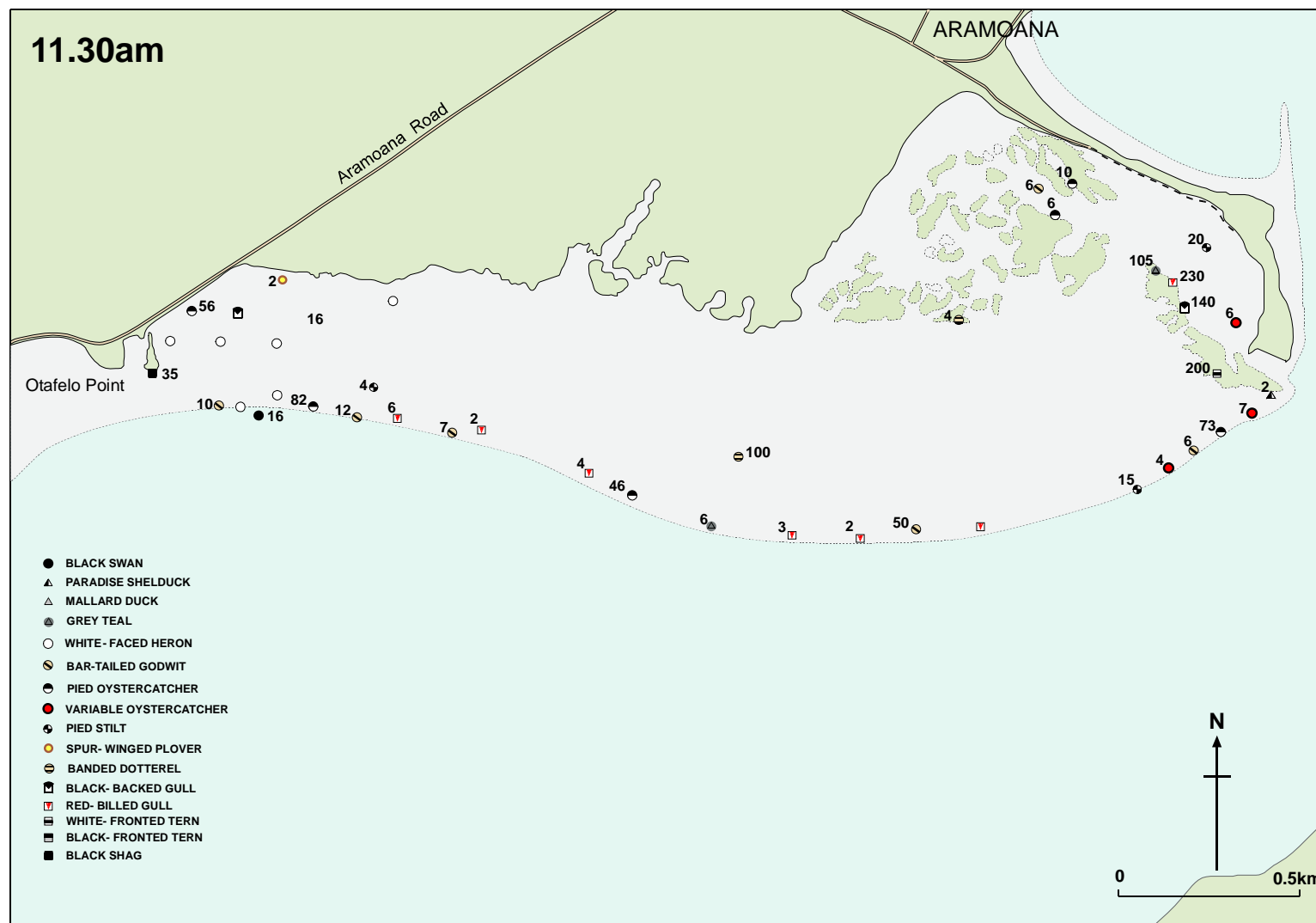


Figure 5: Distribution and abundance of waterbirds near Aramoana, Otago Harbour, 11.30h 27 March 2008.

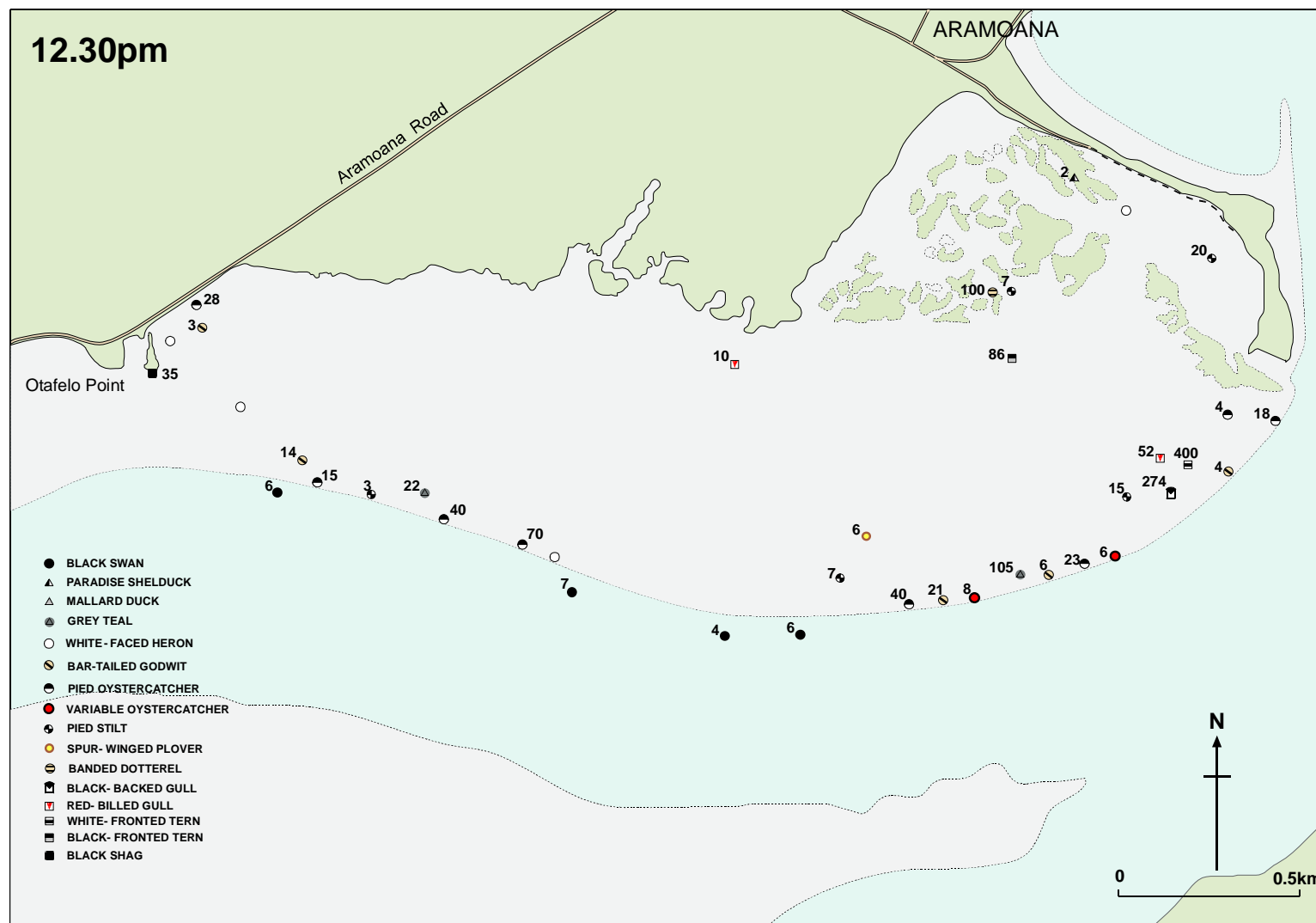


Figure 6: Distribution and abundance of waterbirds near Aramoana, Otago Harbour, 12.30h 27 March 2008.

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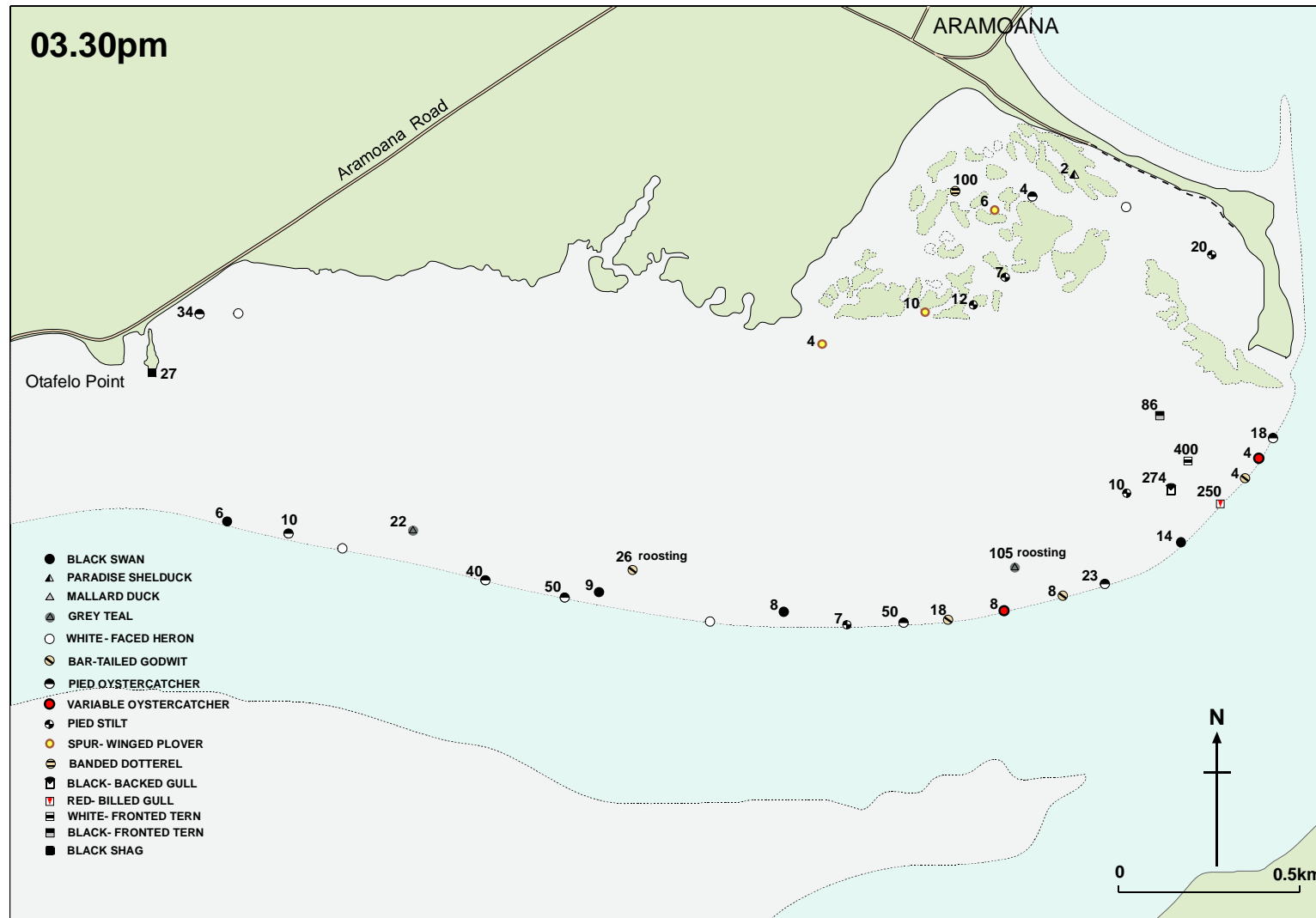


Figure 9: Distribution and abundance of waterbirds near Aramoana, Otago Harbour, 15.30h 27 March 2008.

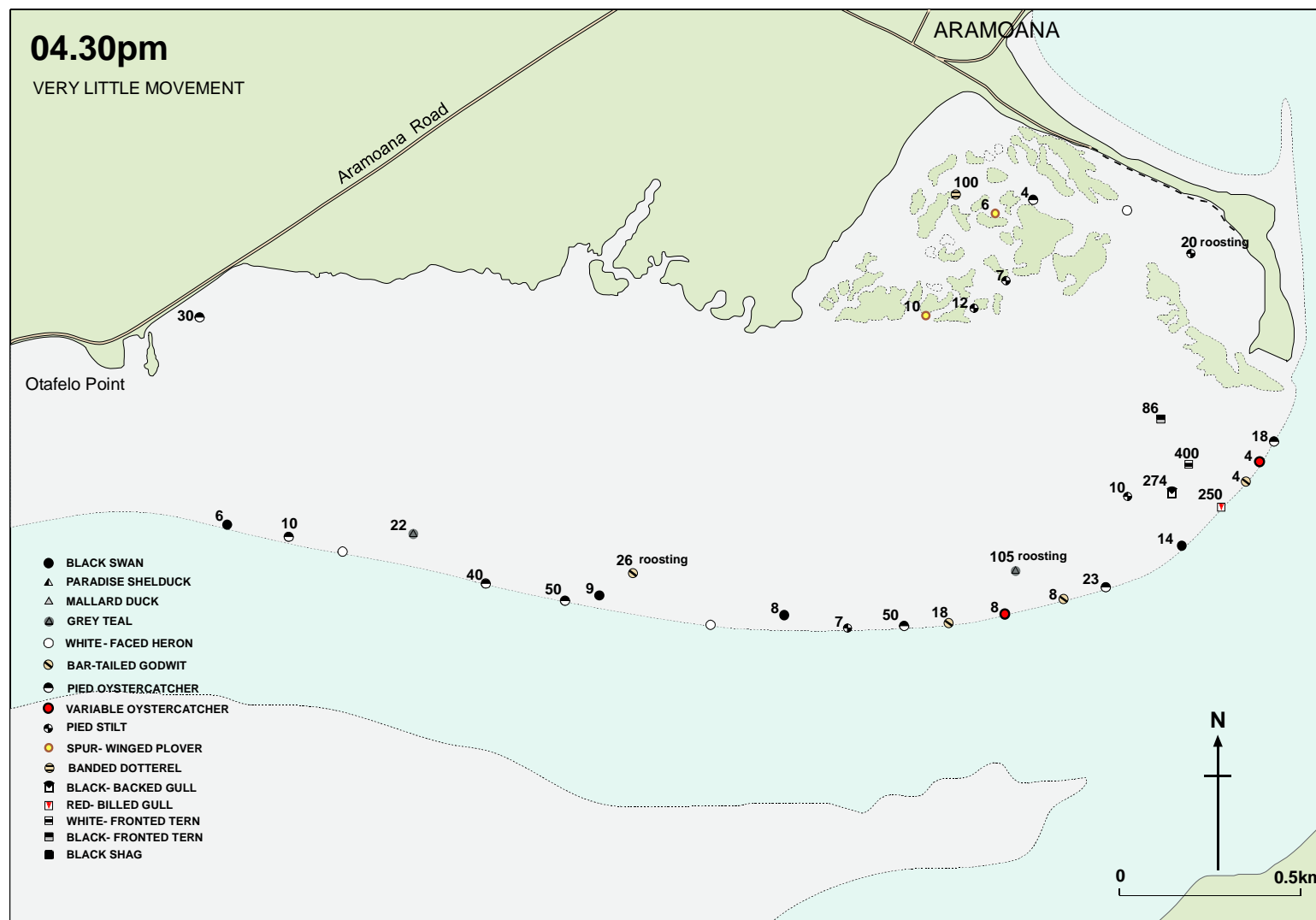


Figure 10: Distribution and abundance of waterbirds near Aramoana, Otago Harbour, 16.30h 27 March 2008.

3.2 Effects of passing vessels

During the period 08.30-16.30h several vessels passed by in the channel adjacent to where birds were feeding. Two small vessels and a large, noisy trawler passed within 400m of the birds without disturbing them. At 11.30h the container ship *Patrica Schulte* departed, but the 11 variable oystercatchers and 70+ pied oystercatchers showed no response to the wake of the vessel which comprised a series of small waves which broke some distance from the feeding birds (Figure 11). Likewise, at 13.30h the birds were not disturbed by the arrival of the *Rainbow Warrior* (Figure 12), nor a large container vessel that arrived about 15.30h (Figure 13).



Figure 11: Container vessel *Patrica Schulte* departing Otago Harbour; note unaffected roosting birds in the foreground.



Figure 12: *Rainbow Warrior* entering Otago Harbour, with no apparent effect on nearby roosting gulls.



Figure 13: Large container ship entering Otago Harbour, with no apparent effect on birds feeding along the adjacent shoreline.

3.3 Roost sites

The sand banks just off Port Chalmers were used by a variety of birds as roost sites during high tide and as feeding grounds at lower tides (Table 2). At low tide on the afternoon of 9 July 2008 there were 46 pied oystercatchers, 6 variable oystercatchers, 2 spur-winged plovers, 4 Australasian shovellers, plus many mallards, black shags, little shags red-billed gulls and black-backed gulls roosting or feeding on the shellbank east of Ravensbourne (at the end of Athol Place). In addition, 2 white-faced herons, 58 pied oystercatchers, 5 variable oystercatchers, 4 spur-winged plovers, plus many mallards, little shags, black shags, spotted shags, black-billed gulls, red-billed gulls, and black-backed gulls were feeding or roosting on the shellbank south of St Leonards. Also, a black-fronted tern was foraging over the shellbanks.

Table 2: Birds observed feeding or roosting on the shellbanks off Port Chalmers on various dates in 2008.

	Shellbanks off Port Chalmers 13 Jan. 2008	Shellbanks off Ravensbourne 8 Mar. 2008	Shellbanks off Ravensbourne 9 Jul. 2008	Shellbanks off St Leonards 9 Jul. 2008
Black shag	0	0	Many	Many
Little shag	3	1	Many	Many
Spotted shag	1	0	0	Many
White-faced heron	0	0	0	2
Australasian shoveler	0	0	4	0
Mallard	0	36	Many	Many
Pied oystercatcher	0	8	46	58
Variable oystercatcher	0	0	6	5
Spur-winged plover	0	0	2	4
Black-backed gull	18	2	Many	Many
Red-billed gull	38		Many	Many
Black-billed gull	4	6	0	Present
White-fronted tern	8	1	0	0
Black-fronted tern	0	0	0	1

4. Discussion

4.1 Foraging areas

As expected, the majority of the birds foraged along the water's edge and followed the ebbing tide. Black swan fed mostly whilst swimming in shallow water and white-faced herons fed whilst wading in water up to 25 cm deep. The remaining species fed in shallower water or on wet sand/mud recently exposed by the ebbing tide. The main exceptions to this were the banded dotterels and spur-winged plovers, which tended to feed over drier areas of sand/mud and in lightly vegetated areas.

Most waterbirds are visual predators, and so detect their prey by sight, with each species specialising in consuming particular invertebrates. Larger wading birds, such as bar-tailed godwit and oystercatchers use their long bills to extract their prey from deep sand/mud. Because many invertebrates require access to the sediment surface or water column for breathing, feeding and excretion most are accessible to feeding waders for only short periods, mostly when they have a covering of water. Hence the preference of waders to feed in shallow water as the tide ebbs or at least on substrates with a thin film of water.

4.2 Roost sites

Islands provide roosting birds with greater protection from disturbance and predation, so it is not unexpected that the sand banks off Port Chalmers are used by a variety of bird species both as high-tide roosts and feeding sites. The importance of these shellbanks to the birds inhabiting Otago Harbour is indicated by the variety and numbers of birds counted at different times of the year.

5. References

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Scientific names of species mentioned in the text.

Common name	Scientific name
Black shag	<i>Phalacrocorax carbo hollandiae</i>
Little shag	<i>Phalacrocorax melanoleucos brevirostris</i>
Spotted shag	<i>Stictocarbo punctatus</i>
White-faced heron	<i>Aredea novaehollandiae</i>
Black swan	<i>Cygnus atratus</i>
Canada goose	<i>Branta canadensis</i>
Paradise shelduck	<i>Tadorna variegata</i>
Mallard	<i>Anas platyrhynchos</i>
Grey duck	<i>Anas superciliosa</i>
Grey teal	<i>Anas gracilis</i>
Australasian shoveler	<i>Anas rhynchotis variegata</i>
Pukeko	<i>Porphyrio porphyrio melanotus</i>
Pied oystercatcher	<i>Haematopus ostralegus</i>
Variable oystercatcher	<i>Haematopus unicolor</i>
Pied stilt	<i>Himantopus himantopus leucocephalus</i>
Banded dotterel	<i>Charadrius bicinctus</i>
Spur-winged plover	<i>Vanellus miles novaehollandiae</i>
Lesser knot	<i>Calidris canutus</i>
Bar-tailed godwit	<i>Limosa lapponica</i>
Black-backed gull	<i>Larus dominicanus</i>
Red-billed gull	<i>Larus novaehollandiae scopulinus</i>
Black-billed-gull	<i>Larus bulleri</i>
Black-fronted tern	<i>Sterna albobriatai</i>
White-fronted tern	<i>Sterna striata</i>