

INTERTIDAL WADERS AT BOTANY BAY - A FIFTY YEAR RETROSPECTIVE

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ABSTRACT

In the fifty years since the end of World War 2, major engineering works in Botany Bay have drastically changed its intertidal zone, particularly on the northern shore. Over this period the abundance of waders as documented by field ornithologists has also altered. Numbers of the smaller species that feed on or just below the substrate surface - the Red-necked Stint, Sharp-tailed Sandpiper, Curlew Sandpiper, Pacific Golden Plover, Lesser Sand Plover, Double-banded Plover - have declined. The larger birds such as Eastern Curlew, Whimbrel and Pied Oystercatcher have increased in abundance. Bar-tailed Godwits increased between the 1950s and 1978. The piecemeal destruction of intertidal wader habitats of Botany Bay has reduced the species diversity. Two important areas, Boat Harbour and Woolooware Bay, remain unprotected. The long term integrity of the Towra Point Nature Reserve for wader conservation remains doubtful whilst erosion of the Towra Beach persists. The further decline of Botany Bay from being one of the most important wader estuaries on the NSW coast seems likely.

INTRODUCTION

Sydney ornithologists in the immediate post war period, whilst primarily concentrating on the description of species and their favoured habitats, were also recording the numbers of waders in Botany Bay (Hindwood 1949, Hindwood and Hoskin 1955, McGill 1972, Keast 1995). From 1970 the annual Bird Report of the NSW Field Ornithologists Club often included unusual observations of wader populations. The NSW National Parks & Wildlife Service compared wader distributions in eight of the state's estuaries, including Botany Bay (Fox 1974). This reference acknowledged that the old Cooks River site on the northern side of the bay, the Towra Point area and the rock shelf at Boat Harbour in the south, all comprised the discrete Botany Bay intertidal wader

habitat. The first regular census of waders in the bay was carried out by members of the NSWFOC from 1976 to 1978. Many of these were concurrent counts at the known roost sites. This study was followed by that of Alan Morris from 1983 to 1985 (pers. comm.). In subsequent years waders in the bay were counted biannually for the Royal Australasian Ornithologists Union. Data from these sources are here used to demonstrate how the numbers of some waders in Botany Bay have changed over these fifty years.

Accurate monitoring of wader populations in a large estuary such as Botany Bay is difficult. Ideally counts should be carried out at the high tide roost of each species. In practice many variables reduce the census capture rate. For example, king tides restrict the number of roost sites of Bar-tailed Godwits, a species that prefers to rest on sand immediately above the high water line. Neap tides allow them access to other areas. The Eastern Curlew can loaf in flocks on sand above high water, in shallow water, on samphire flats or on oyster leases. Whimbrels and Grey-tailed Tattlers commonly roost in mangroves. Pacific Golden Plovers prefer to rest amongst vegetation, often in samphire. The missing of flocks at roost can wrongly indicate major fluctuations in a population. In the NSWFOC survey a compromise was reached by not only counting at roosts but also early in the feeding cycle before the birds dispersed. Causes for changes in wader abundance at a specific site need not necessarily be of local origin. Such factors as breeding success, availability of habitat on migration routes, effects of drought or flood can also be influential (Lane 1987).

STUDY AREA

Botany Bay has seen major changes to its shoreline within the last fifty years. These have included the moving of the Cooks River entrance more than a kilometre westwards in 1951; the construction of the first extension runway into the bay in the

late 1960s and its lengthening in 1970; entrance dredging around 1970 which altered erosion and deposition patterns in the southern bay; construction of the Port Road in 1978; and the completion of the third runway in 1994. Aerial photographs demonstrate the effect on wader habitats of these works.

Northern Wader Area

On the northern shore, the Cooks River channel in 1942 curved north east over the present airport and entered the bay where now is the third runway. From its entrance ran an extensive breakwater, which in 1970 almost touched the new runway. The intertidal sands of the Botany shore deposited against most of the breakwater length. Other flats were visible in the river. By 1951, the entrance had been moved to its present position at Kyeemagh, the old channel was being filled in, and the breakwater had been breached with subsequent reduction in wader habitat. As Hindwood and Hoskin (1955) stated: "reclamation of the lower part of the Cooks River ... has obliterated considerable areas of samphire flats and marshes."

With the construction of the runway and its extension in 1970, some wader habitat was created on its eastern side. By the time of the NSWFOC survey, it was estimated that the intertidal zone used by waders on the north side of the bay covered approximately 33 ha. This was primarily firm sand substrate. The majority of the species roosted at the small, shallow cove at the Mill Pond outlet, commenced feeding there and foraged along the Botany shoreline. A second roost existed at the dry sand shoulder of the runway at General Holmes Drive, where also Red-capped Plovers nested. Double-banded Plovers principally loafed at the southern end of the runway. Some waders foraged along the dredged sand beaches of the runway and its shoulder. An accurate wader census of this northern shore was readily achieved by counting concurrently on both the Botany and runway sides within three hours of high tide.

The construction of the Port Road from 1978 covered most of the wader feeding areas at the Mill Pond outlet and the Botany tidal flats. After 1978 the birds then

commenced feeding at the Penrhyn Road inlet and the greatly reduced intertidal zone at Botany. The runway area was then unchanged. After the construction of the third runway in 1994 the only surviving intertidal wader habitat on the northern shore of Botany Bay is at the Penrhyn Road inlet and the nearby Botany Beach. The inlet also accommodates a public boat ramp and a storm water drain.

Southern Wader Areas

The wader habitats of the southern shore of Botany Bay remained free of major disturbance until the entrance dredging in 1970. This did not seem to affect the muddy bay habitats - Quibray, Woollooware, Weeney and Stinkpot - where Whimbrel and Eastern Curlew feed. But the altered wave action has been subsequently removing sand from the Towra Beach and depositing it at the end of the Elephants Trunk and towards Pelican Point. In 1990, the Elephants Trunk was finally severed. The south west end has remained as an island and is still the principal roost for both Eastern Curlews and Bar-tailed Godwits in the Towra Point area. Many birds of both species feed first on the old sand deposit of Carters Island (Pegler 1992). Small parties of godwits subsequently forage over all the sand to muddy-sand substrates in Quibray and Woollooware Bays, near Sans Souci and on to the northern foreshore wader area. In 1992, foraging took place on old sand deposits in preference to the new ones at Stinkpot Bay, Towra Beach and Pelican Point (Pegler 1992). The sandy mud habitat between Taren and Shell Points remains as a feeding area for the smaller waders of southern Botany Bay (Murray and Cunningham 1991), as does the Pimelwi Rock at Boat Harbour and nearby Merries Reef.

Superimposed upon the habitat destruction caused by the major engineering works have been persistent disturbances at most wader sites caused by recreational activities such as boating, swimming, and four-wheel driving. From as early as 1973, the NSWFOC was complaining to the Minister for Lands about the effects of motor cycles and horse riding upon the waders of Quibray Bay (Cameron 1973). The severing of the Elephants Trunk in the

North Botany Bay	South Botany Bay	Boat Harbour
Sharp-tailed Sandpiper: Up to 1000. Red-necked Stint: Up to 400. Curlew Sandpiper: Up to 200. Pacific Golden Plover: Maximum 500 Usually 50-100. Bar-tailed Godwit: Maximum 200 Usually <100. Red Knot: Maximum 110 Usually 40-50. Double-banded Plover: Maximum 70. Red-capped Plover: Numbers not recorded. Lesser Sand Plover: Numbers not recorded.	Grey-tailed Tattler: 100. Eastern Curlew: 30-70. Whimbrel: 4. Pied Oystercatcher: Nil. Bar-tailed Godwit: No numbers recorded.	Lesser Sand Plover: 100. Curlew Sandpiper: 40-50 Maximum 200. Pacific Golden Plover: 20. Red-necked Stint: 20. Double-banded Plover: 20. Ruddy Turnstone: 20. Sanderling: 8. Sooty Oystercatcher: 1.

Table 1: Relative abundance of intertidal waders at Botany Bay before 1955
North Botany Bay (Keast, 1995),
North and South Botany Bay (Hindwood & Hoskins, *ibid*),
Boat Harbour (Hindwood, 1995).

North Botany Bay		South Botany Bay		Boat Harbour	
Curlew Sandpiper	700	Bar-tailed Godwit	500	Pacific Golden Plover	90
Red-necked Stint	400	Eastern Curlew	250	Red-necked Stint	87
Bar-tailed Godwit	400	Grey-tailed Tattler	150	Double-banded Plover	70
Sharp-tailed Sandpiper	200	Sharp-tailed Sandpiper	140	Ruddy Turnstone	57
Double-banded Plover	150	Pacific Golden Plover	100	Lesser Sand Plover	50
Red-capped Plover	112	Whimbrel	80	Grey-tailed Tattler	12
Pacific Golden Plover	111	Ruddy Turnstone	49	Sooty Oystercatcher	5
Red Knot	80	Double-banded Plover	25	Sharp-tailed Sandpiper	5
Ruddy Turnstone	16	Curlew Sandpiper	23	Red Knot	3
Lesser Sand Plover	16	Red Knot	23	Great Knot	3
Black-winged Stilt	12	Pied Oystercatcher	19	Curlew Sandpiper	1
Great Knot	5	Common Greenshank	12	Greater Sand Plover	1
Pied Oystercatcher	4	Red-necked Stint	8		
Terek Sandpiper	3	Black-fronted Plover	5		
Grey-tailed Tattler	3	Red-capped Plover	4		
Masked Lapwing	3	Masked Lapwing	4		
Grey Plover	2	Grey Plover	1		
Greater Sand Plover	1	Common Sandpiper	1		
Red-necked Avocet	1	Great Knot	1		
Common Greenshank	1				
Sanderling	1				
Broad-billed Sandpiper	1				

Table 2: Relative abundance of intertidal waders at Botany Bay, 1976-1978.
Survey by Members of the NSW Field Ornithologists Club
Maximum Recorded Numbers

Towra Point Nature Reserve affords the roosting waders protection from the boat-borne visitors at Towra Beach.

RESULTS AND DISCUSSION

Wader Abundance before 1955

Arnold McGill recalled his wader watching in the 1940s on the northern shores of Botany Bay thus:

".. crossing Cooks River by a long single lane bridge .. to the old estuary area .. we found literally thousands of waders feeding busily over the extensive tidal flats" (McGill loc. cit. 1972). And similarly, Hindwood and Hoskin (1955): "... the tidal backwaters of Cooks River may attract several thousand individuals of ten or eleven species during the summer months".

The wader populations encountered at Botany Bay around the time of the diversion of the Cooks River entrance are shown in Table 1. Because the north shore of Botany Bay was more easily accessible to ornithologists, there is more information on the waders at that site compared to the southern parts of the bay. Keast (1995) has recently published data from McGill's field lists on six species commonly seen between 1942 and 1966: Sharp-tailed Sandpiper, Red-necked Stint, Bar-tailed Godwit, Pacific Golden Plover, Curlew Sandpiper and Double-banded Plover.

Wader Abundance between 1973 and 1995

The maximum wader numbers recorded during the NSWFOC survey between 1976 and 1978 are shown in Table 2. For some species those numbers represent migrating flocks, not the summer population. Species encountered, excluding vagrants (<10 birds), were as described before 1955. However the numbers of small waders - Sharp-tailed Sandpiper and Lesser Sand Plover had declined.

Small Calidrid Waders

The small calidrid waders have been described as the most numerous of the palaeartic waders in Australia and are particularly common in the south eastern states (Watkins 1993). Their abundance at the northern foreshores of Botany Bay

between 1983 and 1995 is shown in Table 3. The single summer counts are compared with the mean of the summer counts from the NSWFOC survey. The population of the Sharp-tailed Sandpiper further declined upon the construction of the Port Road. The populations of the Curlew Sandpiper and Red-necked Stint remained stable up to the 1985-6 season and declined from 1989-90.

Summer	Curlew Sandpiper	Red-necked Stint	Sharp-tailed Sandpiper
Mean of summer counts 1976-8	240	200	60
1983-84	274	350	Nil
1984-85	300	220	Nil
1985-86	242	223	Nil
1986-87	1	5	Nil
1987-88	70	200	1
1988-89	109	170	1
1989-90	Nil	14	Nil
1990-91	63	92	9
1992-93	40	90	5
1994-95	42	65	Nil

Table 3: Abundance of small waders at North Botany Bay. Single Summer Counts, 1983 to 1995

Eastern Curlew

Compared with pre-1955 the abundance of the Eastern Curlew by 1973 had approximately trebled. Whilst making allowances for the difficulties associated with monitoring this species, it seems that a summer population of two hundred birds has been a regular occurrence for the last twenty years (Figure 1). Ernie Hoskin (pers. comm.) has confirmed that the pre-1955 numbers were obtained from visits to the main roost at Towra Point.

Pied Oystercatcher

The Pied Oystercatcher made its first appearance for eleven years in Botany Bay in 1973 (Rogers 1973). Its first breeding record was at Towra Point in 1977 (Rogers and Lindsey 1978). The count of twenty six in 1987 was recorded as "the highest count for Botany Bay this century" (Cooper 1991). Pied Oystercatchers disperse to feed on the sand to muddy-sand substrates of the bay. The increase in their population

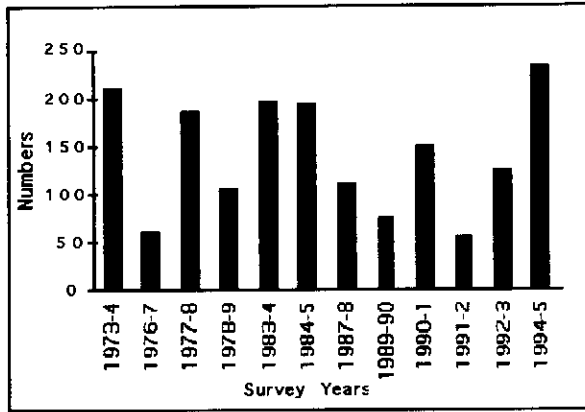


Figure 1: Eastern Curlew abundance in southern Botany Bay: summer counts.

since 1973 seems to correspond with the beach erosion and deposition around Towra Point (Figure 2). However in 1992 this species was more commonly observed feeding on old sand deposits (Pegler 1992). The Botany Bay population has been expanded by immigration from as far afield as Victoria (Murray 1994).

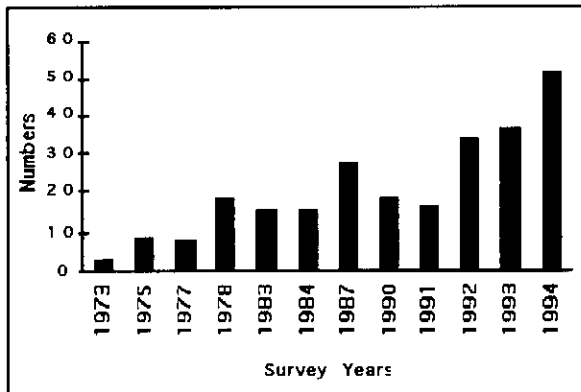


Figure 2: Pied Oystercatcher abundance in southern Botany Bay: NSWFOC annual Bird Reports & summer counts.

Bar-tailed Godwit

By 1976-8, on the northern foreshores at least, the abundance of the Bar-tailed Godwit had doubled. Alone amongst the larger waders, its flocks are known to range freely around the bay. The concurrent roost counts during 1977-8 show a Botany Bay population in excess of five hundred (Figure 3). It is curious that even the construction of the Port Road in 1978 did not appear to lower the bay population.

With the construction of the third runway in 1993 the summer count of godwits in north Botany Bay had declined to pre-1955 levels.

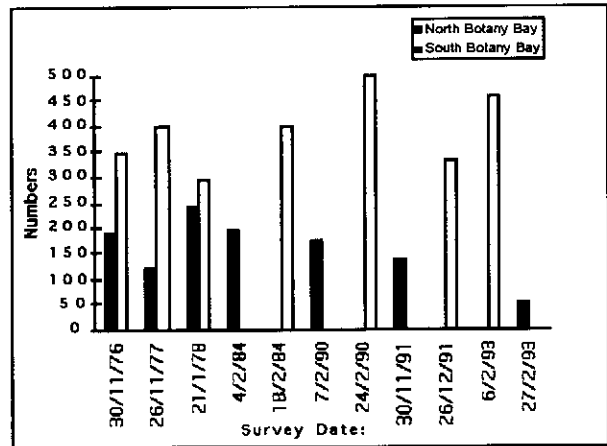


Figure 3: Bar-tailed Godwit abundance in Botany Bay: counts in north & south Botany Bay in 1977-8 were concurrent; the remainder are summer counts.

Double-banded Plover

The principal habitats of the Double-banded Plover have been the sand flats of north Botany Bay and the rock shelf of Boat Harbour. Incursions to the sandy areas in the south have usually been by a few individuals or by a transient larger group. For example, I observed one colour banded adult female, L/M; R/BGR, in a flock of thirty two roosting at Towra Point in 1987, but subsequently sighted the same bird at Boat Harbour seven times up to 1990 (R. Pierce, pers. comm.). No Double-banded Plovers were found on autumn-winter surveys at Towra Point in 1989, 1990, 1992 or 1994. Three were seen on a single visit in 1993. My highest count at Quibray Bay of seven birds was also in 1993, during the construction of the third runway. The changes in abundance of the Double-banded Plover in north Botany Bay seem to mirror each reduction of the available sand substrate. It finally deserted that site in 1993 (Figure 4). In the same year, the population at Boat Harbour also declined (Figure 5). The common factor linking these two events was the construction of the third runway. Conventional wisdom expected the population at the latter site then to increase. One adult colour-banded bird,

L/BG; R/GY, observed there in May 1994 was subsequently found at Port Hacking in June 1994 and July 1995 (Australian Bird and Bat Banding Scheme). During the Australia - New Zealand study of Double-banded Plovers from 1986 to 1992, I estimated that Botany Bay contributed 18% of the NSW coastal population (130:750).

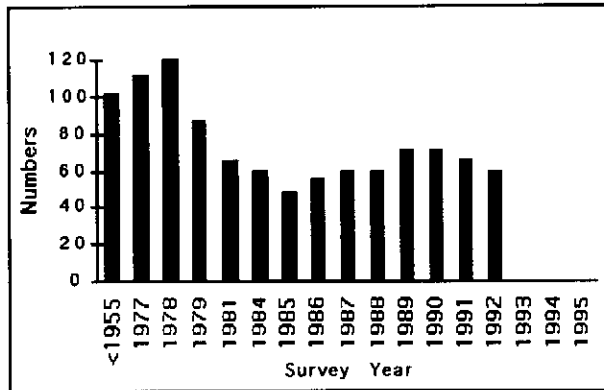


Figure 4: Mean of April-July counts of Double-banded Plover at North Botany Bay.

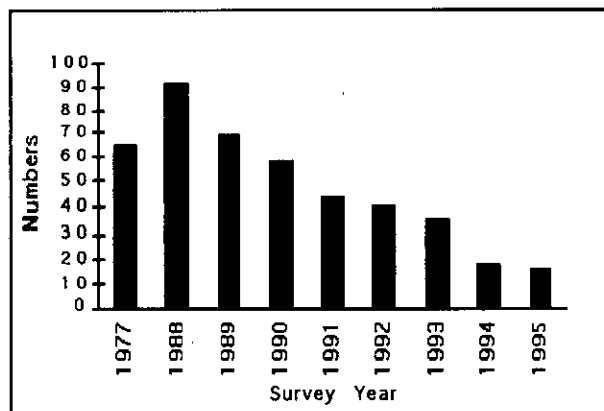


Figure 5: Mean of April-July counts of Double-banded Plover at Boat Harbour.

Sand Substrates of south Botany Bay

Apart from Boat Harbour, the sandy substrates abutting the muddy areas of Woollooware and Quibray Bays are the foraging habitats for the small waders in southern Botany Bay. Murray and Cunningham (1991) have identified the Grey-tailed Tattler, Curlew Sandpiper, Terek Sandpiper, Ruddy Turnstone, Red

Knot, Sharp-tailed Sandpiper, Red-necked Stint, Pacific Golden Plover feeding between Shell and Taren Points as well as the Eastern Curlew, Bar-tailed Godwit, Pied Oystercatcher and Whimbrel. A roost count at Shell Point in 1991 is shown in Table 4.

During the 1960s, the sand flats at Quibray Bay were often the venue for field trips by

Species	Numbers
Terek Sandpiper	8
Grey-tailed Tattler	90
Ruddy Turnstone	4
Red-necked Stint	25
Curlew Sandpiper	10
Broad-billed Sandpiper	1
Pacific Golden Plover	22

Table 4: Roost Count at Shell Point 27/12/91

the NSWFOC. It is interesting to compare the results of one such visit in 1968 (Coleman 1969) with the maximum numbers for the same species between 1992 and 1995 (Table 5). The decline in the diversity and abundance of waders at Quibray Bay corresponds with the increase in human disturbance. I recall one visit on 27 January 1992 in which the tally for half an hour was six Bar-tailed Godwits, four Eastern Curlew, one Whimbrel and one Red-capped Plover. Also seen were twelve horses and riders, two persons and dog, seven persons and three dogs. In 1995, with vehicle access from Captain Cook Drive blocked, numbers of large waders are again using Quibray Bay.

Wader Abundance in 1995

By 1995, Botany Bay no longer supports the diversity of species present in the late 1970s. During the summer counts of 1994-5 species other than vagrants (> 10 birds) were observed as follows: at north Botany Bay - Bar-tailed Godwit, Red-necked Stint, Curlew Sandpiper and Red-capped Plover; at south Botany Bay - Bar-tailed Godwit, Eastern Curlew, Pied Oystercatcher, Whimbrel and Grey-tailed Tattler; at Boat Harbour - Red-necked Stint, Turnstone and Lesser Sand Plover. Some species, e.g. the Pacific Golden Plover are principally observed as groups in transit. The

Species	Years	
	1968	1992 - 1995
Bar-tailed Godwit	90	86
Whimbrel	1	12
Eastern Curlew	4	34
Terek Sandpiper	2	Nil
Grey-tailed Tattler	32	26
Great Knot	1	Nil
Red Knot	2	Nil
Red-necked Stint	60	3
Sharp-tailed Sandpiper	16	Nil
Curlew Sandpiper	46	Nil
Pied Oystercatcher	Nil	2
Red-capped Plover	5	3
Lesser Sand Plover	12	Nil
Greater Sand Plover	4	Nil

Table 5: Abundance of foraging waders at Quibray Bay (Colemane 1969)

populations of the smaller waders, the calidrids and the smaller plovers, that feed on or just below the substrate surface have declined. The latter group in particular are now just above vagrant status.

Except for the muddy bays, the wader feeding areas of south Botany Bay are not adequately protected. Further erosion of the Towra Beach will breach the lagoons. Such an event could threaten the present integrity of Stinkpot Bay and Carters Island (M. Willoughby, pers. comm.). The conservation of the wader foraging habitat in Woolooware Bay and Boat Harbour should be urgently undertaken.

ACKNOWLEDGMENTS

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APPENDIX

Scientific Names of Intertidal Waders in Botany Bay

Bar-tailed Godwit	<i>Limosa lapponica</i>
Whimbrel	<i>Numenius phaeopus</i>
Eastern Curlew	<i>Numenius madagascariensis</i>
Common Greenshank	<i>Tringa nebularia</i>
Terek Sandpiper	<i>Tringa cinerea</i>
Grey-tailed Tattler	<i>Tringa brevipes</i>
Ruddy Turnstone	<i>Arenaria interpres</i>
Great Knot	<i>Calidris tenuirostris</i>
Red Knot	<i>Calidris canutus</i>
Sanderling	<i>Calidris alba</i>
Red-necked Stint	<i>Calidris ruficollis</i>
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>
Curlew Sandpiper	<i>Calidris ferruginea</i>
Broad-billed Sandpiper	<i>Limicola falcinellus</i>
Pied Oystercatcher	<i>Haematopus longirostris</i>
Sooty Oystercatcher	<i>Haematopus fuliginosus</i>
Black-winged Stilt	<i>Himantopus leucocephalus</i>
Red-necked Avocet	<i>Recurvirostra novaehollandiae</i>
Pacific Golden Plover	<i>Pluvialis fulva</i>
Grey Plover	<i>Pluvialis squatarola</i>
Red-capped Plover	<i>Charadrius ruficapillus</i>
Double-banded Plover	<i>Charadrius bicinctus</i>
Lesser Sand Plover	<i>Charadrius mongolus</i>
Greater Sand Plover	<i>Charadrius leschenaultii</i>
Masked Lapwing	<i>Vanellus miles</i>