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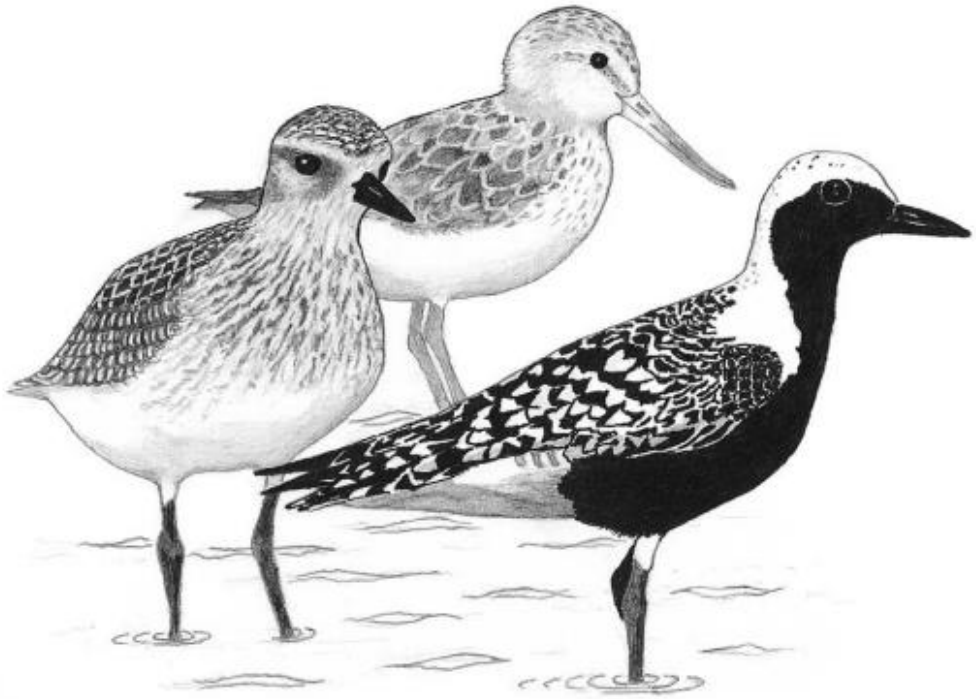

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THE AVON-HEATHCOTE ESTUARY AND THE BROMLEY OXIDATION PONDS, CHRISTCHURCH, NEW ZEALAND: AN IMPORTANT AREA FOR WATERBIRDS

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INTRODUCTION

The Avon-Heathcote Estuary/Ihutai (43°32'30''S, 172°43'30''E) is located on the eastern fringes of Christchurch City, South Island, New Zealand. The site is separated from the Pacific Ocean by a 4.5 km sand spit and comprises c.880 ha of inter-tidal flats and peripheral salt marsh. The estuary is roughly triangular in shape and fed by three small rivers (Avon River, Heathcote River and Linwood Avenue Canal) which collectively drain a largely urbanised catchment of 188 km^2(see Figure 1). Tides are semi-diurnal with a range of 2.1 m for spring tides and 1.1 m for neap tides. Over 11 million cubic metres pass through the estuary on each tidal cycle, flooding to an average depth of 1.4 m at mean high water (Crossland 1993; Cromarty & Scott 1996).

In addition to extensive areas of estuarine mudflat and peripheral salt marsh, the greater Avon-Heathcote area also includes the c.240 ha Bromley Oxidation Ponds/Te Huingi Manu Wildlife Refuge; c.100 ha of lowland wet grassland (Linwood Paddocks); and c.40 ha of human-created tidal wetlands located around the margins of the estuary (Charlesworth, Bexley & Ferrymead wetland reserves). In total, some 1260 ha of habitat is available for waterbirds and at peak times these combined habitats support upwards of 30,000 birds.

METHODS

Waterbird populations on the Avon-Heathcote Estuary and Bromley Oxidation Ponds have been the focus of a monitoring programme since the mid 1980s (Harris & Crossland 1990; Crossland 1993, 1999, 2005, 2009a). Population monitoring has included regular counts of waders, terns, spoonbills, rails and waterfowl, with irregular counts of gulls, herons, cormorants, kingfishers, swallows and birds of prey. Census techniques have followed those described in Howes & Bakewell (1989).

Seasonal abundance data covering all waterbirds using the Avon-Heathcote Estuary and environs is available for the twelve month period October 1989 to September 1990 (Table 1). This is the only period when co-ordinated counts of "all" waterbird species have been undertaken (Crossland 1993). In other years, selected species groups such as waders and terns have been regularly monitored but logistical difficulties have meant that "all-species" counts have seldom been repeated.

Since 2003 however, the Christchurch City Council has undertaken an "all-species" count most years during the peak January to March post-breeding/moult influx period. This more recent data set is given in Table 2.

RESULTS AND DISCUSSION

Waterbird numbers

In 1989-90 peak waterbird numbers exceeded 20,000 individuals from December through June (Table 1). This corresponds with the moulting, post-breeding migration and wintering strategies of many New Zealand waterbirds. These strategies involve seasonal population shifts from inland and southern breeding areas to more northern coastal lowland non-breeding areas (Marchant & Higgins 1990; Heather & Robertson 1996; Crossland 2005).

During 1989-1990, the highest total counts of all waterbirds were c.28,100 in December c.33,360 in January and c.28,620 in February. Subsequent "all-species" counts confirmed that these levels of abundance are typical during the peak period. More recent "all-species" counts include c.33,413 in February 2003; c.27,769 in February 2004; c.27,373 in February 2007; c.24,990 in March 2008; c.36,609 in January 2010 and 34,130 in February 2010 (table 2).

Shorebird species occurrence

From a total checklist of 136 bird species (Crossland 2009a), some 44 shorebird taxa (30 waders, 3 skuas, 3 gulls and 8 terns) have been recorded in the Avon-Heathcote Estuary area (Table 3). Of these, 17 species (9 waders, 1 skua, 3 gulls, 4 terns) are New Zealand natives; 5 species (2 waders, 3 terns) originate in Australia; and 22 species (19 waders, 2 skuas and 1 tern) are migrants from the Northern Hemisphere.

Six native shorebirds are resident-breeders: Black-winged Stilt *Himantopus himantopus*, Masked Lapwing *Vanellus miles*, Kelp Gull *Larus dominicanus*, Red-billed Gull *Larus scopulinus*, Black-billed Gull *Larus bulleri* and White-fronted Tern *Sterna striata*, with another three species usually present in the estuary area year-round but not breeding: Variable Oystercatcher *Haematopus unicolor*, South Island Pied Oystercatcher *Haematopus finschi* and Caspian Tern *Hydroprogne caspia*.

Of the Northern Hemisphere migrants, one species Bar-tailed Godwit *Limosa lapponica* occurs annually, while another five species: Red Knot *Calidris canutus*, Ruddy Turnstone *Arenaria interpres*, Eastern Curlew *Numenius madagascariensis*, Whimbrel *Numenius phaeopus* and Black-tailed Godwit *Limosa limosa*, occur at least once every two to five years.

Shorebird abundance

During the 1989-90 monitoring period, total shorebird numbers reached 15,000 from February to May, with a

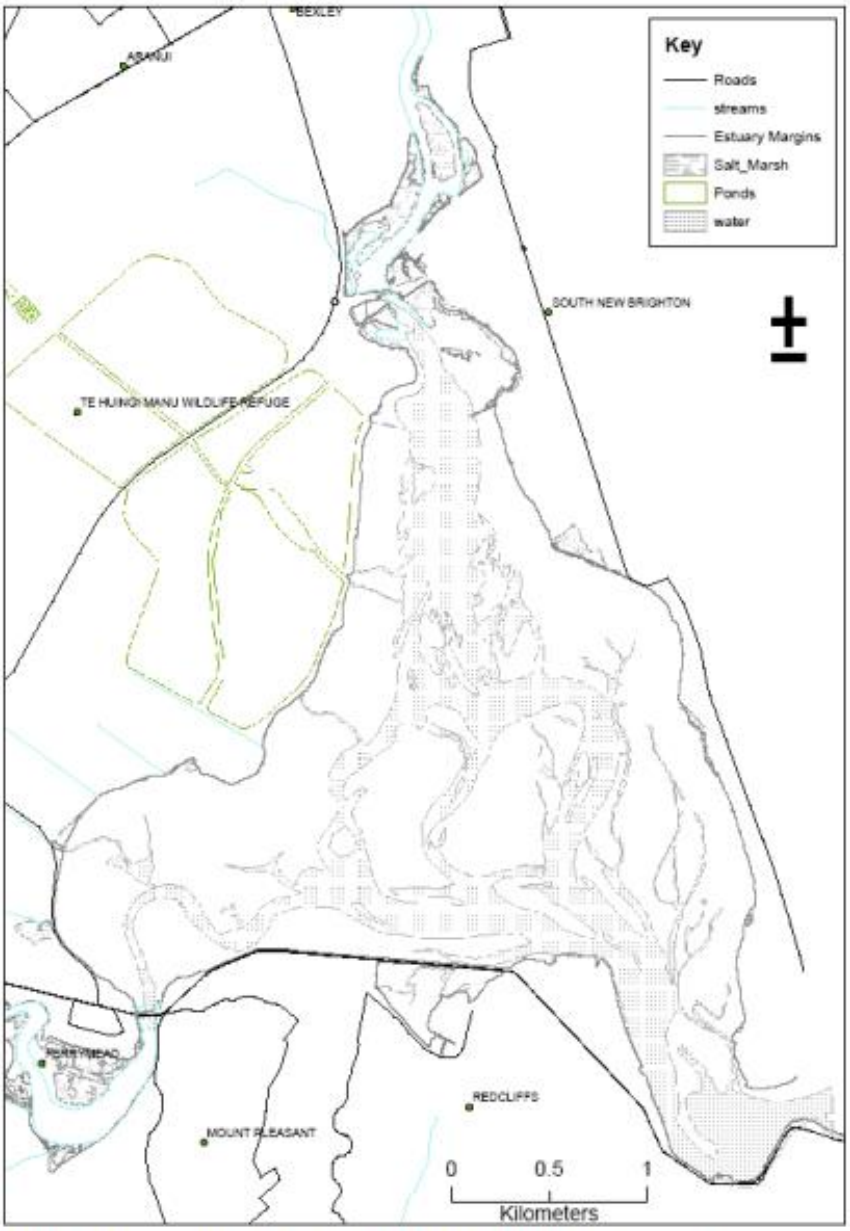

Figure 1. Map of Avon-Heathcote Estuary, Bromley Oxidation Ponds and environs.
(map copied by permission of Environment Canterbury)

maximum c.17,030 in May 1990 (Table 1). Gull numbers (principally Kelp Gull) declined during the 1990s and 2000s following the closure of refuse tips near the estuary, but total shorebird numbers still annually exceed 10,000 birds (Table 2).

Maximum wader numbers occur from late January to mid March – a period when native waders arrive back on the coast following breeding and "double-up" with over-summering Arctic waders that are yet to depart on migration. A peak count of c.7400 waders was recorded in 1989/90, while comparative counts in more recent years have included c.6674 in February 2003; c.6312 in February 2004; c.6327 in February 2007 and c.7473 in February 2010 (Table 2).

Table 1. Monthly waterbird abundance Avon-Heathcote Estuary and environs: October 1989 – September 1990.

Species Group	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Arctic Waders	1700	2050	1600	1750	2000	1700	370	370	370	370	360	350
Native Waders	750	1060	2110	4370	5400	5360	4790	4300	3360	2340	1230	740
Gulls	2500	2500	5500	6500	9000	9000	9000	12200	8000	8000	6500	6000
Terns	30	50	50	220	170	90	1050	160	170	20	30	30
Total shorebirds	**4980**	**5660**	**9260**	**12840**	**16570**	**16150**	**15210**	**17030**	**11900**	**10730**	**8120**	**7120**
Cormorants/Shags	220	310	310	410	420	370	360	290	280	220	210	280
Herons/Spoonbills	90	80	100	80	80	80	130	120	100	90	80	80
Waterfowl	1790	3910	18210	19770	11160	6550	8200	10090	7170	5190	3350	1580
Swamphen/Coots	250	200	180	220	220	220	280	400	400	400	350	200
Kingfisher/Swallow	40	40	40	40	170	330	280	330	340	180	160	80
Total other waterbirds	**2390**	**4540**	**18840**	**20520**	**12050**	**7550**	**9250**	**11230**	**8290**	**6080**	**4150**	**2220**
Combined Total	**7370**	**10200**	**28100**	**33360**	**28620**	**23700**	**24460**	**28260**	**20190**	**16810**	**12270**	**9340**

Table 2. Peak period "all-species" counts, Avon-Heathcote Estuary and environs, 2003-2010.

Species Group	Feb 2003	Feb 2004	Feb 2007	Mar 2008	Jan 2010	Feb 2010
Arctic Waders	1714	1317	1656	176	1827	2080
Native Waders	4960	4995	4671	4912	4429	5393
Gulls	6000	6000	5000	8506	4740	6488
Terns	545	166	136	242	243	384
Total shorebirds	**13190**	**12478**	**11463**	**13836**	**11239**	**14345**
Cormorants/Shags	525	524	451	475	688	554
Herons/Spoonbills	113	95	65	142	87	148
Waterfowl	19344	14429	15050	9826	24331	18838
Swamphen/Coots	151	153	254	531	264	245
Kingfisher/Swallow	90	90	90	200	n.d.	n.d.
Total other waterbirds	**20223**	**15291**	**15910**	**11154**	**25370**	**19785**
Combined Total	**33413**	**27769**	**27373**	**24990**	**36609**	**34130**

Highest annual counts for wader species are given in Table 4. This shows longitudinal data for the period 2002 – 2009. The two most abundant species are South Island Pied Oystercatcher (range 4493 – 5308; mean 4783) and Bar-tailed Godwit (range 1466 – 2110; mean 1744). Four other species (Variable Oystercatcher, Pied Stilt, Masked Lapwing and Double-banded Plover *Charadrius bicinctus* occur in numbers of between 40 and 300+ birds.

National and International significance of waterbird populations

The Avon-Heathcote Estuary and Bromley Oxidation Ponds support annual concentrations of 13 waterbird species (including six shorebirds) that meet 1% international importance thresholds as determined by Wetlands International (Delaney & Scott 2006; Li *et al.* (2009). These species are listed in Table 5.

The Avon-Heathcote area has been identified as a nationally important site for one or more species of waterbird by Crossland (1993); Cromarty & Scott (1996); Sagar *et al.* (1999); Dowding & Moore (2006); Melville & Battley (2006); Southey (2009) and Li *et al.* (2009). As yet, no formal recognition of the area's national and international importance to birdlife has occurred, but local level recognition has included the gazetting of wildlife refuge status over the Bromley Oxidation Ponds and the establishment of local nature reserves at high tide roosts and salt marshes.

Threatened species

Miskelly *et al.* (2008) updated the threat status of New Zealand birds and determined three classes of threatened species – B1 "nationally critical", B2 "nationally endangered", and B3 "nationally vulnerable". Thirteen species from this list are of regular occurrence in the study area (Table 6). These include 6 threatened shorebirds – Black-fronted Tern *Sterna albostriata*, Black-billed Gull, both nationally endangered and Double-banded Plover, Wrybill, Red-billed Gull and Caspian Tern, all nationally vulnerable.

Table 3. List of shorebirds recorded on the Avon-Heathcote Estuary, Bromley Oxidation Ponds and environs.

Common name	Scientific name	Provenance	Status
Waders			
Variable Oystercatcher	*Haematopus unicolor*	NZ native	non-breeding resident
South Is. Pied Oystercatcher	*Haematopus finschi*	NZ native	non-breeding resident
Black-winged Stilt	*Himantopus himantopus*	NZ native	breeding resident
Black Stilt	*Himantopus novaezelandiae*	NZ native	vagrant
Masked Lapwing	*Vanellus miles*	NZ native	breeding resident
New Zealand Plover	*Charadrius obscurus*	NZ native	vagrant
Double-banded Plover	*Charadrius bicinctus*	NZ native	domestic migrant
Black-fronted Plover	*Elseyornis melanops*	NZ native	vagrant
Wrybill	*Anarhynchus frontalis*	NZ native	domestic migrant
Red-necked Avocet	*Recurvirostra novaehollandiae*	Australia	vagrant
Red-capped Plover	*Charadrius ruficapillus*	Australia	vagrant
Pacific Golden Plover	*Pluvialis fulva*	N. Hemisphere	vagrant
Grey Plover	*Pluvialis squatarola*	N. Hemisphere	vagrant
Ruddy Turnstone	*Arenaria interpres*	N. Hemisphere	annual migrant
Wandering Tattler	*Tringa incana*	N. Hemisphere	vagrant
Grey-tailed Tattler	*Tringa brevipes*	N. Hemisphere	vagrant
Lesser Yellowlegs	*Tringa flavipes*	N. Hemisphere	vagrant
Red-necked Stint	*Calidris ruficollis*	N. Hemisphere	vagrant
Curlew Sandpiper	*Calidris ferruginea*	N. Hemisphere	vagrant
Sharp-tailed Sandpiper	*Calidris acuminata*	N. Hemisphere	vagrant
Pectoral Sandpiper	*Calidris melanotos*	N. Hemisphere	vagrant
Red Knot	*Calidris canutus*	N. Hemisphere	annual migrant
Sanderling	*Calidris alba*	N. Hemisphere	vagrant
Eastern Curlew	*Numenius madagascariensis*	N. Hemisphere	near-annual migrant
Whimbrel	*Numenius phaeopus*	N. Hemisphere	near-annual migrant
American Whimbrel	*Numenius phaeopus hudsonicus*	N. Hemisphere	vagrant
Bar-tailed Godwit	*Limosa lapponica*	N. Hemisphere	annual migrant
Hudsonian Godwit	*Limosa haemastica*	N. Hemisphere	near-annual migrant
Black-tailed Godwit	*Limosa limosa*	N. Hemisphere	near-annual migrant
Asian Dowitcher	*Limnodromus semipalmatus*	N. Hemisphere	vagrant
Skuas			
Brown Skua	*Stercorarius antarcticus*	NZ native	vagrant
Pomarine Skua	*Stercorarius pomarinus*	N. Hemisphere	annual migrant
Arctic Skua	*Stercorarius parasiticus*	N. Hemisphere	annual migrant
Gulls			
Kelp Gull	*Larus dominicanus*	NZ native	breeding resident
Red-billed Gull	*Larus scopulinus*	NZ native	breeding resident
Black-billed Gull	*Larus bulleri*	NZ native	breeding resident
Terns			
Black-fronted Tern	*Sterna albostriata*	NZ native	domestic migrant
Caspian Tern	*Hydroprogne caspia*	NZ native	non-breeding resident
White-fronted Tern	*Sterna striata*	NZ native	breeding resident
Fairy Tern	*Sternula nereis*	NZ native	vagrant
Whiskered Tern	*Childonias hybrida*	Australia	vagrant
Gull-billed Tern	*Gelochelidon nilotica*	Australia	vagrant
Little Tern	*Sternula albifrons*	Australia	vagrant
White-winged Tern	*Chlidonias leucopterus*	N. Hemisphere	vagrant

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Table 4. Highest annual count per wader species 2002 – 2010 - Avon-Heathcote Estuary and Bromley Oxidation Ponds.

	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
RESIDENT WADERS								
Variable Oystercatcher	102	137	151	162	173	218	139	n.d.
S.I. Pied Oystercatcher	4493	4810	n.d.	4865	4726	5308	4438	4844
Pied Stilt	278	273	159	276	248	334	273	312
Masked Lapwing	120	40	48	n.d.	45	76	84	116
Double-banded Plover	123	115	103	101	96	125	95	n.d.
Wrybill	2	7	9	2	1	1	0	n.d.
ARCTIC WADERS								
Ruddy Turnstone	1	0	0	1	0	1	0	1
Red Knot	6	1	14	0	1	0	4	2
Eastern Curlew	0	0	0	0	2	0	0	0
Whimbrel	0	0	1	1	0	0	0	1
Bar-tailed Godwit	1712	1512	1466	1537	1655	2032	1934	2110
Black-tailed Godwit	2	1	2	1	1	1	0	0

Table 5. Species or sub-species of waterbird for which the Avon-Heathcote Estuary and Bromley Oxidation Ponds meet the Wetlands International 1% population threshold (after Delaney & Scott 2006).

Common name	Scientific name	Population considered	1% threshold	A-H estuary average annual max	% of pop
Great Cormorant	*Phalacrocorax carbo*	NZ	250	>250	>1
Pied Cormorant	*Phalacrocorax varius*	NZ	250	>250	>1
Eastern Great Egret	*Ardea modesta*	NZ	1	1-Feb	>1
Paradise Shelduck	*Tadorna variegata*	NZ	1700	>1700	>1
Grey Teal	*Anas gracilis*	NZ	1000	>3000	>3
New Zealand Shoveler	*Anas rhynchotis variegata*	NZ	1000	>5000	>5
New Zealand Scaup	*Aythya novaeseelandia*	NZ	200*	>5000	>25
S.I. Pied Oystercatcher	*Haematopus finschi*	NZ	1100	>4700	>4
Variable Oystercatcher	*Haematopus unicolor*	NZ	40	>200	>5
Bar-tailed Godwit	*Limosa lapponica*	Aus/NZ/Alaska	1600	>1700	>1
Black-billed Gull	*Larus bulleri*	NZ	960	>1000	>1
Caspian Tern	*Hydroprogne caspia*	NZ	50	>50	>1
Black-fronted Tern	*Sterna albostriata*	NZ	60	>60	>1

* The New Zealand Scaup population estimate of 20,000 given by Heather & Robertson (1996) is followed here as it is more realistic than the estimate of 5000-10,000 proposed by Delaney & Scott (2006).

Table 6. Threatened species occurring on the Avon-Heathcote Estuary and Bromley Oxidation Ponds (after Miskelly *et al.* 2008).

Common name	Scientific name	Threat class	Status
Grey Duck	*Anas superciliosa rogersi*	Nationally Critical	breeding resident/seasonal visitor
Eastern Great Egret	*Ardea modesta*	Nationally Critical	seasonal visitor
Australasian Bittern	*Botaurus poiciloptilus*	Nationally Endangered	seasonal visitor
Black-fronted Tern	*Sterna albostriata*	Nationally Endangered	seasonal visitor
Black-billed Gull	*Larus bulleri*	Nationally Endangered	breeding resident/seasonal visitor
White-flippered Penguin	*Eudyptula minor albosignata*	Nationally Vulnerable	breeding resident
Great Crested Grebe	*Podiceps cristatus*	Nationally Vulnerable	seasonal visitor
Pied Cormorant	*Phalacrocorax varius*	Nationally Vulnerable	breeding resident
Double-banded Plover	*Charadrius bicinctus*	Nationally Vulnerable	seasonal visitor
Wrybill	*Anarhynchus frontalis*	Nationally Vulnerable	seasonal visitor
Red-billed Gull	*Larus scopulinus*	Nationally Vulnerable	breeding resident/seasonal visitor
Caspian Tern	*Hydroprogne caspia*	Nationally Vulnerable	resident/seasonal visitor
New Zealand Falcon	*Falco novaeseelandiae*	Nationally Vulnerable	seasonal visitor