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The birds of Washdyke Lagoon revisited

J.L. BENN
Department of Conservation, Canterbury Conservancy Office, Christchurch, New Zealand

Abstract An updated list of bird species identified at Washdyke Lagoon, Timaru, New Zealand is presented, along with the corresponding threat status and references relating to individual species. The information was based on a literature search of published or readily available information. Sixty-five species were identified (plus hybrids and unidentified species), which expands considerably on previous checklists from the lagoon. Eighteen species (nearly 28%) are threatened or at risk. The number and diversity of species identified emphasises the importance of the lagoon as a coastal wetland habitat on the central east coast of the South Island. The lagoon's existence is under very serious threat from coastal erosion and a variety of human influences.

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INTRODUCTION

Washdyke Lagoon, situated on the northern margins of Timaru city (Fig. 1), has long been recognised as a significant, coastal wetland habitat for a high diversity of endemic, native, and migrant bird species (e.g., Cunningham 1947; Pennycook 1949; Sagar 1976; Steven & Meurk 1996). The importance of the lagoon for regional biodiversity was recognised as far back as 1907, when the lagoon was officially gazetted as a Wildlife Sanctuary Reserve. The present open-water area of the lagoon covers approximately 20 ha, with about the same area of marshland margins. Due to a combination of natural coastal processes and human land-use practises, such as draining and infilling, the lagoon's open water area has been reduced from approximately 235 ha since 1881. These processes have been described in Benn (1987, 2009, 2010), Kirk (1987), and Todd (1988).

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*Correspondence: *jbenn@doc.govt.nz*

Sagar (1976) published the last comprehensive list of sea- and shore-bird species found at the lagoon (passerines were also noted), based on monthly bird counts undertaken between Jan 1966 and Feb 1972. He identified 45 species, of which 35 regularly used the lagoon and 10 were considered rare visitors. It should be noted that the Cape pigeon, *Daption capense capense*, included in Sagar's list, is not counted here, as he observed this bird about 100 m offshore from the lagoon. Thus, Sagar's total species list included 46 species.

Recent research by the Department of Conservation (Benn 2010) has expanded on Sagar's (1976) species list, the results of which are presented in this paper. No attempt has been made here to analyse species abundance, frequency, migration, or breeding patterns at the lagoon; a summary of that information is given in Benn (2010). Thus, the objectives of the paper are to list the bird species whose presence has been historically identified in the lagoon, to provide the latest threat status for each species, to provide a comprehensive reference

Fig. 1. Washdyke Lagoon, surrounded by Timaru city (Photograph courtesy of the Department of Conservation 2004).

list for further research purposes, and to highlight the importance of this wetland as a habitat for threatened birds.

METHODS

The species list was based on an extensive literature search of journals published by the Ornithological Society of New Zealand (New Zealand Bird Notes; Reports & Bulletins of the OSNZ; Notornis; OSNZ news; Southern Bird) and eBird, the Society's recently established electronic database of bird sightings, along with scientific journal publications, reports and unpublished information from the Department of Conservation, local authorities, and, other organisations. More than 80 information sources were referenced. Where 'Classified summarised notes' are referred to, the compiler of the notes is given as the author: In cases where the compiler's name was not given, the contributor of the note is listed as the author. Species names and threat status are from Miskelly *et al.* (2008). Species listed in Appendix 1 are ordered according to the OSNZ (1990) pocket checklist.

Birds that are the product of hybridisation were also recorded. Hybrid ducks are crosses of the native grey duck and the introduced mallard, *Anas platyrhynchos* (Sagar 1976; DOC 2009), whilst hybrid stilts are crosses of the endemic black stilt and native pied stilt, *Himantopus himantopus leucocephalus* (e.g., Pierce 1984; Dowding & Moore 2006; DOC 2009).

RESULTS

Sixty-five species have been identified at Washdyke Lagoon (along with hybrid ducks, hybrid stilts, and unidentified species of both tattlers and godwits; these were not included in this analysis). Individual species are listed in Appendix 1, and the species are grouped into 8 suborders in Table 1. Species origins are shown in Table 2. Numbers in brackets are derived from Sagar (1976), and are shown for comparative purposes.

Eighteen (nearly 28%) of the species identified at the lagoon are listed as threatened or at risk (declining populations and/or habitat), by Miskelly *et al.* (2008). Species threat classifications are grouped in Table 3, and shown for individual species in Appendix 1.

DISCUSSION

As would be expected for a coastal wetland habitat, waders and gulls (Charadriiformes) and waterfowl (Anatiformes) dominated the species list, with 31 (48%) and 11 (17%) of species respectively (combined total = 65%). Passerines (most are introduced and naturalised) are the next most represented group with 10 (15%) species. Endemic/native birds comprised approximately half of all those recorded (30 species; 46%) and were by far, the best represented group of species, although the remaining species combined (35 species; 54%), outnumbered the endemics/natives. Migrant and vagrant species combined (21 species), made up 32% of the total, and introduced species (13) accounted for 20% of those identified.

An additional 20 species (44.4% increase) to those recorded by Sagar (1976) were identified (plus hybrid stilts and unidentified species of both godwit and tattler). These were the black stilt (*Himantopus novaezealandiae)*; erect-crested penguin (*Eudyptes sclateri*); royal spoonbill (*Platalea regia*); red-necked stint (*Calidris ruficollis*); lesser knot (*Calidris canutus rogersi*); cattle egret (*Bubulcus ibis coromandus*); sanderling (*Calidris alba*); Siberian tattler (*Tringa brevipes*); crested tern (*Thalasseus bergii cristatus*); little tern (*Sterna albifrons sinensis*); white-winged black tern (*Chlidonias leucopterus*); glossy ibis (*Plegadis falcinellus*); lesser yellowlegs (*Tringa flavipes*); Australian pelican (*Pelecanus conspicillatus conspicillatus*); chestnut-breasted shelduck (*Tadorna tadornoides*); (probable)

Table 1. Suborders of birds identified at Washdyke Lagoon.

Suborder	Number of species	% of species (this report)
Procellariiformes	1 (1)	1.5
Sphenisciformes	1 (0)	1.5
Pelecaniformes	4 (3)	6.2
Ciconiiformes	6 (3)	9.2
Anatiformes	11 (7)	17.0
Charadriiformes	31 (21)	47.7
Falconiformes	1 (1)	1.5
Passerines	10 (9)	15.4

Table 2. Origin of bird species identified at Washdyke Lagoon.

Species origins	No. of species	% of species (this report)
Endemic/native	30 (27)	46.1
Colonisers	1 (1)	1.5
Migrants	11 (5)	17
Vagrants	10 (3)	15.4
Introduced & naturalised	13 (9)	20

long-tailed skua (*Stercorarius longicaudus*); Cape Barren goose (*Cereopsis novaehollandiae*); feral goose (*Anser anser*), mute swan (*Cygnus olor*), and rook (*Corvus fruilegus*).

The 18 species listed as threatened or at risk by Miskelly *et al*. (2008) are: white heron *(Egretta alba modesta),* black stilt, and grey duck (*Anas superciliosa superciliosa)*, which are listed as nationally critical, whilst the black-fronted tern (*Chlidonias albostriatus*), Australasian bittern (*Botaurus poiciloptilus*), and black-billed gull (*Larus bulleri*) are nationally endangered. Nationally vulnerable species are the Caspian tern (*Hydroprogne caspia*), wrybill (*Anarhynchus frontalis*), banded dotterel (*Charadrius bicinctus bicinctus*), and red-billed gull (*Larus novaehollandiae scopulinus*). Naturally uncommon species include royal spoonbill, erect-crested penguin, black-shag (*Phalacrocorax carbo novaehollandiae)*, and little shag. Species classified as declining are the New Zealand pied oystercatcher, pied stilt and white-fronted tern (*Sterna striata striata*). The variable oystercatcher (*Haematopus unicolor*) population is recovering.

Comparisons of data from this investigation to those of Sagar (1976; Tables 1-3), indicate some notable changes. From Table 1, it can be seen that apart from the Procellariiformes and Falconiformes, which remained static, all suborders of birds have increased in number at the lagoon since 1976. The largest increase has been in the Charadriiformes (oystercatchers, plovers, dotterels, gulls etc.), with an increase of 10 species (or a 48% increase) since 1976. In terms of the species origins, Table 2 shows there have been significant increases in migrant and vagrant species, with an additional 6 and 7 species, respectively, being recorded since 1976 (120% and 233% increases respectively). Unfortunately, the threat status of most of the species in 1976 is, or was not known. However, applying the threat/risk status classes from Miskelly *et al.* (2008) to Sagar's (1976) species list indicates that apart from the naturally uncommon species which have increased, the number of threatened endemic and native species (as well as colonisers) has been very consistent since 1976, whilst migrants, vagrants and introduced/naturalised species have increased in number considerably (Table 3). The relatively high number of passerines (10 species; 15%) recorded in the wetland environment, may reflect the high ratio of marsh and scrub area compared to open-water area. This marsh/scrub area provides ample habitat for perching/roosting birds.

The reasons for the identified changes in species numbers and threat status, as described above, most likely results from a combination of three factors. First, the changes may be apparent, rather than actual, and may reflect increased observer effort and recording since 1976. Second, there could have been real changes in species present at the lagoon. Third, the species threat status has been updated several

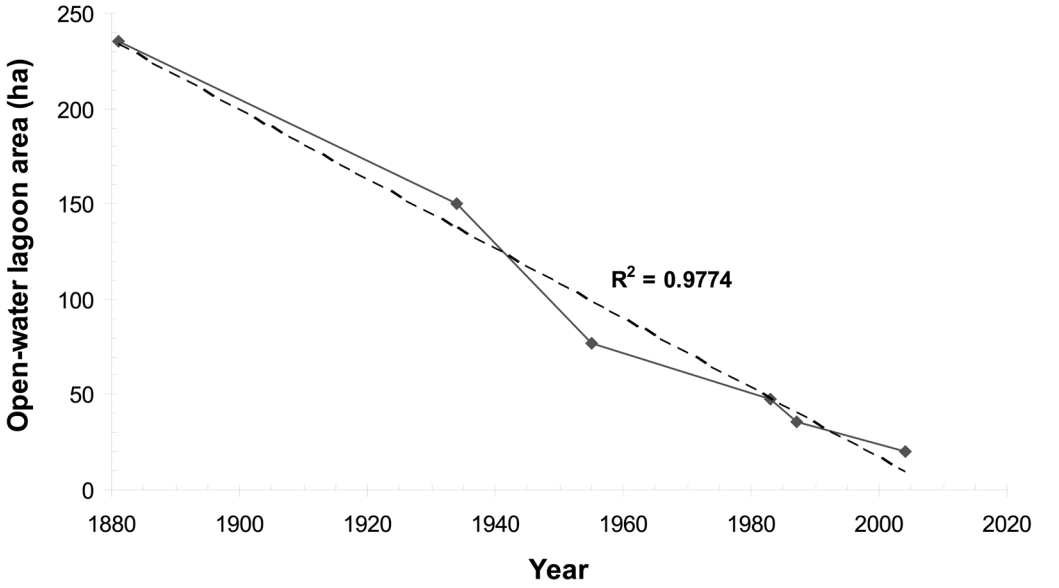

Fig. 2 Washdyke Lagoon open-water area 1881-2004, derived from orthophotogrammetric data, cadastral survey information and aerial photographs (After Benn 1987, 2009).

Table 3. Threat classifications of bird species (after Miskelly *et al*. 2008) identified at Washdyke Lagoon.

Threat classification	No. of species	% of species (this report)
Nationally critical	3 (2)	4.6
Nationally endangered	3 (3)	4.6
Nationally vulnerable	4 (4)	6.2
Naturally uncommon	4 (2)	6.2
Declining	3 (3)	4.6
Recovering	1 (1)	1.5
Not threatened	12 (12)	18.4
Coloniser	1 (1)	1.5
Migrant	11 (5)	17
Vagrant	10 (3)	15.4
Introduced & naturalised	13 (9)	20

times in recent years, with the status of a number of species changing. Further investigation and data analysis would help determine if the changes are actual or apparent.

Nonetheless, it is evident that the number of species at the lagoon has not declined over the last 34 years. This is despite the lagoon area decreasing significantly, and thus, major habitat loss occurring during this time. From the lagoon-area reduction curve in Fig. 2 (Benn 1987; 2009), the open water area of the lagoon has been reduced from approximately 55 ha in 1976, to 20 ha in 2004. This is a reduction of 64%. From 1881 to 2004 there has been a 91.5% reduction in open-water area (from approximately 235 ha to 20 ha). Most of this decline is attributable to human influences such as accelerated coastal erosion caused by the construction of the Timaru harbour, which commenced in 1878, and land-use practices such as drainage, stop-banking and infilling (e.g., Kirk 1987; Todd 1988; Benn 1987, 2009, 2010). Many authors have predicted little future for the lagoon, if the current rate of decline continues and no remedial measures are taken.

The significance of the lagoon for its bird diversity has long been recognised (e.g., Cunningham 1947; Pennycook 1949; Sagar 1976; Steven & Meurk

1996). The total number of species and the number of threatened species identified from the current research, further emphasises the significance of the lagoon as a coastal wetland habitat for a high diversity of birds, particularly the endemics/natives, migrants, and vagrants. Kirk & Lauder (2000), and Dowding & Moore (2006), have also noted Washdyke Lagoon as an important habitat link for migratory birds, in a chain-like network of coastal lagoons along the east coast of the South Island.

The results highlight the importance of Washdyke Lagoon as a coastal wetland habitat for a high diversity of bird species, particularly the waders and gulls (Charadriiformes). A number of records have yet to be examined, and these may further expand the species list for the lagoon. However, the list presented goes some way to improving knowledge of the birds that inhabit Washdyke Lagoon. As a coastal wetland habitat of national significance (wildlife refuge), the lagoon is under serious threat of being permanently lost in the very near future, due to coastal erosion and land-use practices.

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LITERATURE CITED

Adcock, H.M. 1994. *WERI (Wetlands of Ecological and Representative Importance): the New Zealand wetlands inventory user guide.* Wellington: Department of Conservation.

Allen, N. 2003a. Regional round-up. *Southern Bird 13*: 15.

Allen, N. 2003b. Regional round-up. *Southern Bird 15*: 15.

Barlow, M. 1972. The establishment, dispersal and distribution of the spur-winged plover in New Zealand. *Notornis 19*: 201-211.

Barlow, M. 1998. Movements of Caspian terns *(Sterna caspia)* from a colony near Invercargill, New Zealand, and some notes on their behaviour. *Notornis 45*: 193-220.

Barlow, M.L.; Dowding, J.E. 2002. Breeding biology of Caspian terns (*Sterna caspia*) at a colony near Invercargill, New Zealand. *Notornis 49*: 76-90.

Benn, J.L. 1987. *Erosion of the Washdyke-Seadown lowland coast – past, present and future.* MSc. thesis (Physical Geography), Canterbury University, Christchurch. 159p.

Benn, J.L. 2009. *Canterbury marine resource*. Department of Conservation, Canterbury Conservancy (Christchurch). CD-ROM.

Benn, J.L. 2010. *Intrinsic instream values of the Washdyke Creek/Lagoon catchment*. Internal report for the Department of Conservation, Canterbury Conservancy, Christchurch.

Booth, D.F. 1982. Classified summarised notes *Notornis 29*: 49-74.

Booth, D.F. 1983. Classified summarised notes: 30 June 1981-30 June 1982. *Notornis 30*: 34-68.

Booth, D.F. 1984. Classified summarised notes: 30 June 1982-30 June 1983. *Notornis 31*: 40-85.

Brown, B; Latham, P.C.M. 1978. Grey phalarope in the Bay of Plenty. *Notornis 25*: 198-202.

Caithness, T.A; Cheyne, J.W.; Neilson, J.M.; Rook, H.; Sutton, R.R; Williams, M. 2002. Post-moult dispersal of Australasian shoveler *(Anas rhynchotis)* within New Zealand. *Notornis 49*: 219-232.

Clarkson, R. 2001. Regional round-up - Canterbury. *Southern Bird 5*: 14.

Crockett, D.E. 1961. Red-necked phalarope at Washdyke Lagoon. *Notornis 9*: 266.

Cunningham, J.M. 1947. Washdyke Lagoon, Timaru. *New Zealand Bird Notes 2*: 82.

Cunningham, J.M. 1952. Classified summarised notes. *Notornis 4*: 175-197.

Cunningham, J.M. 1953. Classified summarised notes. *Notornis 5*: 85-105.

Daly, A. 2004. *Inventory of instream values for rivers and lakes of Canterbury, New Zealand.* Environment Canterbury, Christchurch. 16p plus inventory.

Department of Conservation. 2009. *Bird survey database: Washdyke Lagoon. Surveys 1986, 1987, 1988*. Accessed June 2009.

Dowding, J.E.; Moore S.J. 2006. Habitat networks of indigenous shorebirds in New Zealand. *Science for Conservation* 261. Wellington: Department of Conservation.

Edgar, A.T. 1972a. Classified summarised notes. *Notornis 19*: 339-364.

Edgar, A.T. 1972b. Classified summarised notes 1963-1970. Supplement to *Notornis 19*: 91.

Edgar, A.T. 1973. Classified summarised notes. *Notornis 20:* 346-376.

Edgar, A.T. 1975. Classified summarised notes. *Notornis 22*: 313-340.

Edgar, A.T. 1976. Classified summarised notes. *Notornis 23* : 323-356.

Gorby, A.G. 1956. Classified summarised notes. *Notornis 6*: 193-212.

Gorby, A.G. 1959. Classified summarised notes. *Notornis 8*: 61-81.

Guy, G. 1948. Classified summarised notes. *New Zealand Bird Notes 2*: 155-176.

Heather, B.D. 1957. Classified summarised notes. *Notornis 7*: 73-87.

Heather, B.D. 1978. Pelicans. *OSNZ News 6*: 5.

Heather, B.D. 1980. Cattle egret survey 1980. *OSNZ News 6*: 3.

Heather, B.D. 1982. The cattle egret in New Zealand 1978-80. *OSNZ News 16*: 5.

Heather, B.D. 1987. The chestnut-breasted shelduck in New Zealand 1983-1986. *Notornis 34*: 71-77.

Heather, B.D.; Sagar 1982. Black-fronted tern inquiry. *OSNZ News 24*: 2-3.

Howell, L. 1986. Classified summarised notes: 1 July 1984-30 June 1985. *Notornis 33*: 95-119.

Jowett, C.R. 1993. Mainland birding. *OSNZ News 69*: 7.
Keely, B.R.; Sagar, P.M. 1967. Greenshank at Timaru. *Notornis 14*: 162.
Kirk R.M. 1987. *Coastal erosion in South Canterbury – North Otago: an overview.* South Canterbury Catchment Board and Regional Water Board. Publication No. 52.
Kirk, R.M., Lauder, G.A. 2000. *Significant coastal lagoon systems in the South Island, New Zealand: coastal processes and lagoon mouth closure.* Wellington: Department of Conservation.
McLintock, R.V. 1948. Classified summarised notes. *New Zealand Bird Notes 2*: 155-176.
Medway, D.G. 2000. Rare birds committee – combined report for 1992-1999. *Notornis 47*: 64-70.
Medway, D.G. 2003. Rare birds committee – 6 monthly report. *Southern Bird 16*: 5.
Miskelly, C.M.; Dowding, J.E.; Elliot, G.P.; Hitchmough, R.A.; Powlesland, R.G.; Robertson, H.A.; Sagar, P.M.; Schofield, R.P.; Taylor, G.A. 2008. Conservation status of New Zealand birds, 2008. *Notornis 55*: 117-135.
O'Donnell, C.F.J. 1995. Classified summarised notes, South Island 1 July 1993 - 30 June 1994. *Notornis 42*: 263-279.
O'Donnell, C.F.J. 2001a. Classified summarised notes, South Island and outlying islands, 1 July 1997 - 30 June 1998. *Notornis 48*: 90-99.
O'Donnell, C.F.J. 2001b. Classified summarised notes, South Island and outlying islands, 1 July 1997 - 30 June 1998. *Notornis 48*: 100-107.
O'Donnell, C.F.J.; West J.A. 1989. Classified summarised notes, South Island, 1 July 1987 to 30 June 1988. *Notornis 36*: 223-247.
O'Donnell, C.F.J.; West J.A. 1990. Classified summarised notes, South Island, 1 July 1987 to 30 June 1988. *Notornis 37*: 236-266.
O'Donnell, C.F.J.; West J.A. 1991. Classified summarised notes, South and Chatham Islands, 1 July 1987 to 30 June 1988. *Notornis 38*: 315-341.
O'Donnell, C.F.J.; West J.A. 1992. Classified summarised notes, South and Chatham Islands, 1 July 1990 to 30 June 1991. *Notornis 39*: 211-232.
O'Donnell, C.F.J.; West J.A. 1994. Classified summarised notes, South Island, 1 July 1990 to 30 June 1991. *Notornis 41*: 167-188.
O'Donnell, C.F.J.; West J.A. 1995. Classified summarised notes, South Island, 1 July to 30 June 1993. *Notornis 42*: 53-77.
O'Donnell, C.F.J.; West J.A. 1996. Classified summarised notes, South Island and the Chatham Islands, 1 July 1994 to 30 June 1995. *Notornis 43*: 165-186.
O'Donnell, C.F.J.; West J.A. 1998. Classified summarised notes, South Island and outlying islands, 1 July 1995 to 30 June 1996. *Notornis 45*: 1-30.
O'Donnell, C.F.J.; West J.A. 2001. Classified summarised notes, South Island and outlying islands, 1 July 1996 to 30 June 1997. *Notornis 48*: 81-89.
Onley, D. 1990. Recent reports. *OSNZ News 54*.
Onley, D. 1991. Recent reports. *OSNZ News 58*.
Onley, D. 1992. Recent reports. *OSNZ News 62*.
Pennycook, C.S. 1949. Caspian tern colony. *New Zealand Bird Notes 3*: 129.
Pennycook, C.S. 1951. Summarised classified notes. *Notornis 4*: 38-59.
Pennycook, J.H. 1959. Summarised classified notes. *Notornis 8*: 61-81.
Petch, S. 1996. Regional round up – Canterbury. *OSNZ News 78*.
Pierce, R. 1971. Lesser yellowlegs at Timaru. *Notornis 18*: 366.
Pierce, R.J. 1980. Seasonal and long-term changes in bird numbers at Wainono Lagoon. *Notornis 27*: 21-44.
Pierce, R.J. 1984. The changed distribution of stilts in New Zealand. *Notornis 31*: 97-18.
Pollock, G. 2003. Classified summarised notes, South Island and outlying islands, 1 July 2000 - 30 June 2001. *Notornis 50*: 161-168.
Pollock, G. 2006. Classified summarised notes, South Island and outlying islands, 1 July 2002 - 30 June 2003. *Notornis 53*: 248-251.
Sagar, P. M. 1976. Birds of the Washdyke Lagoon area, South Canterbury. *Notornis 23*: 205-212.
Sagar, P.M. 1978. Australian pelicans in Canterbury. *Notornis 25*: 353-354.
Sagar, P.M. 1979. Mapping scheme. *OSNZ News 13*: 5.
Sagar, P.M. 1983. Influx of chestnut-breasted shelducks. *OSNZ News 26*: 7.
Sagar, P.M. 2009. *eBird database records* (http://ebird.org/content/newzealand).
Sagar, P.M.; Shankar, U.; Brown, S. 1999. Distribution and numbers of waders in New Zealand. *Notornis 46*: 1-44.
Sibson, R.B. 1978. Classified summarised notes. *Notornis 25*: 332-349.
Sibson, R.B. 1979. Classified summarised notes. 30 June 1978-30 June 1979. *Notornis 26*: 396-422.
Smith. A. 1994. Labour weekend in South Canterbury. *OSNZ News 73*: 4.
Steven, J.C.; Meurk, C.D. 1996. *Low and high plains ecological districts, plains ecological region, Canterbury. Protected natural areas programme, survey report XX.* Department of Conservation (Canterbury Conservancy, Christchurch) and Landcare Research New Zealand Ltd (Lincoln). Unpublished report: 9-10
Stidolph, R.H.D.; Cunningham, J.M. 1953. Classified summarised notes. *Notornis 5*: 85-105.
Taylor, M.J.; Champion, P. 1996. *Aquatic habitats with indigenous floristic of faunistic value in the Canterbury Region.* Christchurch: Environment Canterbury. Revised by Main, M.R. 1998.
Tily, I. 1950. Classified summarised notes. *New Zealand Bird Notes 3*: 201-221.
Todd D.J. 1988. *Annotated coastal bibliography of South Canterbury.* Timaru: South Canterbury Catchment Board and Regional Water Board. Publication No.57.
Walls, K. 2006. Nearshore marine classification and inventory - a planning tool to help identify marine protected areas for the nearshore of New Zealand. Wellington: Department of Conservation.

Appendix 1. Bird species identified at Washdyke Lagoon. Species names and threat status details are from Miskelly *et al.* (2008). Species are listed in the same order the Ornithological Society checklist (1990). Threat status abbreviations: NC = nationally critical; NE = nationally endangered; NV = nationally vulnerable; NU = naturally uncommon; D = declining; R = recovering; NT = not threatened; C = coloniser; M = migrant; V = vagrant; IN = introduced and naturalized.

Common name	Taxon	Threat Status	References
Southern giant petrel	*Macronectes giganteus*	M	70
Erect-crested penguin	*Eudyptes sclateri*	NU	68
Australian pelican	*Pelecanus conspicillatus conspicillatus*	V	32, 71, 76
Black shag	*Phalacrocorax carbo novaehollandiae*	NU	10, 21, 27, 50, 52, 56, 70
Little shag	*Phalacrocorax melanoleucos brevirostris*	NU	21, 24, 27, 70
Spotted shag	*Stictocarbo punctatus punctatus*	NT	24, 38, 70
White-faced heron	*Ardea novaehollandiae*	NT	21, 31, 70
White heron	*Egretta alba modesta*	NC	21, 24, 38, 50, 54, 70, 79
Cattle egret	*Bubulcus ibis*	M	33, 34
Australasian bittern	*Botaurus poiciloptilus*	NE	24, 49, 70, 72, 79
Glossy ibis	*Plegadis falcinellus*	V	53, 60
Royal spoonbill	*Platalea regia*	NU	21, 56, 57, 58
Mute swan	*Cygnus olor*	IN	24
Black swan	*Cygnus atratus*	NT	12, 17, 21, 27, 50, 52, 54, 62, 70
Canada goose	*Branta canadensis*	IN	12, 18, 21, 24, 27, 37, 38, 50, 52, 66, 70
Cape Barren goose	*Cereopsis novaehollandiae*	IN	3, 44
Feral/domestic goose	*Anser anser*	IN	21
Paradise shelduck	*Tadorna variegata*	NT	21, 24, 31, 37, 38, 46, 50, 52, 62, 70
Chestnut-breasted shelduck	*Tadorna tadornoides*	V	35, 73
Mallard	*Anas platyrhynchos*	IN	17, 50, 70
Grey duck	*Anas superciliosa superciliosa*	NC	70
Grey teal	*Anas gracilis*	NT	1, 10, 21, 38, 50, 51, 52, 54, 70, 81
New Zealand shoveler	*Anas rhynchotis variegata*	NT	12, 14, 21, 24, 50, 51, 52, 70, 81
Swamp harrier	*Circus approximans*	NT	21, 70
Pukeko	*Porphyrio melanotus*	NT	1, 70, 81
New Zealand pied oystercatcher	*Haematopus finschi*	D	1, 12, 21, 37, 47, 50, 56, 57, 62, 65, 66, 68, 70, 75, 81
Variable oystercatcher	*Haematopus unicolor*	R	1, 21, 47, 48, 52, 56, 57, 65, 68, 70, 75, 79
Pied stilt	*Himantopus himantopus leucocephalus*	D	10, 12, 21, 24, 29, 31, 37, 39, 42, 47, 48, 49, 51, 52, 54, 56, 57, 62, 63, 65, 67, 69, 70, 81, 82
Black stilt	*Himantopus novaezealandiae*	NC	21, 67, 68, 69, 72, 75, 79, 84
Banded dotterel	*Charadrius bicinctus bicinctus*	NV	11, 12, 19, 21, 24, 31, 37, 49, 50, 51, 52, 56, 62, 65, 68, 69, 75, 79, 81, 82
Black-fronted dotterel	*Charadrius melanops*	C	1, 2, 21, 23, 26, 49, 51, 55, 57, 68, 69, 70, 75, 78, 79, 81, 84

Appendix 1. Continued.

Wrybill	*Anarhynchus frontalis*	NV	18, 21, 31, 47, 48, 51, 54, 62, 63, 70, 75, 79, 84
Spur-winged plover	*Vanellus miles novaehollandiae*	NT	1, 4, 12, 21, 25, 37, 50, 56, 65, 70
Turnstone	*Arenaria interpres*	M	21, 46, 65, 70, 75, 79
Lesser knot	*Calidris canutus rogersi*	M	21, 48, 75
Sanderling	*Calidris alba*	V	21, 59
Sharp-tailed sandpiper	*Calidris acuminata*	M	1, 21, 51, 52, 53, 70, 75, 84
Pectoral sandpiper	*Calidris melanotos*	V	1, 25, 48, 52, 54, 70
Red-necked stint	*Calidris ruficollis*	M	48
Eastern bar-tailed godwit	*Limosa lapponica*	M	18, 21, 31, 48, 50, 51, 52, 57, 62, 70, 75, 78, 79
Siberian tattler	*Tringa brevipes*	V	57
Greenshank	*Tringa nebularia*	V	39, 70, 79
Lesser yellowlegs	*Tringa flavipes*	V	65
Red-necked phalarope	*Phalaropus lobatus*	V	13, 15, 16, 70, 79
Arctic skua	*Stercorarius parasiticus*	M	24, 25, 27, 51, 70
Long-tailed skua	*Stercorarius longicaudus*	M	38
Southern black-backed gull	*Larus dominicanus dominicanus*	NT	21, 70
Red-billed gull	*Larus novaehollandiae scopulinus*	NV	21, 39, 70
Black-billed gull	*Larus bulleri*	NE	17, 21, 31, 49, 52, 70, 81
White-winged black tern	*Chlidonias leucopterus*	M	64, 79
Black-fronted tern	*Chlidonias albostriatus*	NE	21, 36, 37, 38, 52, 63, 64, 70, 81
Caspian tern	*Hydroprogne caspia*	NV	1, 5, 6, 12, 21, 23, 25, 30, 37, 42, 47, 49, 52, 54, 61, 70, 79
White-fronted tern	*Sterna striata striata*	D	17, 21, 42, 52, 61, 70
Crested tern	*Thalasseus bergii cristatus*	V	43, 47, 64
Little tern	*Sterna albifrons sinensis*	M	56
Sacred kingfisher	*Todiramphus sanctus vagans*	NT	49, 70
Eurasian skylark	*Alauda arvensis*	IN	70
Welcome swallow	*Hirundo tahitica neoxena*	NT	1, 21, 24, 26, 70
Yellowhammer	*Emberiza citrinella*	IN	70
Chaffinch	*Fringilla coelebs*	IN	70
Greenfinch	*Carduelis chloris chloris*	IN	70
European goldfinch	*Carduelis carduelis*	IN	70
Common redpoll	*Carduelis flammea*	IN	70
Starling	*Sturnus vulgaris*	IN	21, 70
Rook	*Corvus frugilegus*	IN	24

[1]Adcock (1994); [2]Allen (2003a); [3]Allen (2003b); [4]Barlow (1972); [5]Barlow (1998); [6]Barlow & Dowding (2002); [7]Benn (1987); [8]Benn (2009); [9]Benn (2010); [10]Booth (1982); [11]Booth (1983); [12]Booth (1984); [13]Brown & Latham (1978); [14]Caithness *et al.* (2002); [15]Clarkson (2001); [16]Crockett (1961); [17]Cunningham (1947); [18]Cunningham (1952); [19]Cunningham (1953); [20]Daly (2004); [21]Department of Conservation (2009); [22]Dowding & Moore (2006); [23]Edgar (1972a); [24]Edgar (1972b); [25]Edgar (1973); [26]Edgar (1975); [27]Edgar (1976); [28]Gorby (1956); [29]Gorby (1959); [30]Guy (1948); [31]Heather (1957); [32]Heather (1978); [33]Heather (1980); [34]Heather (1982); [35]Heather (1987); [36]Heather & Sagar (1982); [37]Howell (1986); [38]Jowett (1993); [39]Keely & Sagar (1967); [40]Kirk

(1987); [41]Kirk & Lauder (2000); [42]McLintock (1948); [43]Medway (2000); [44]Medway (2003); [45]Miskelly *et al.* (2008); [46]O'Donnell (1995); [47]O'Donnell (2001a); [48]O'Donnell (2001b); [49]O'Donnell & West (1989); [50]O'Donnell & West (1990); [51]O'Donnell & West (1991); [52]O'Donnell & West (1992); [53]O'Donnell & West (1994); [54]O'Donnell & West (1995); [55]O'Donnell & West (1996); [56]O'Donnell & West (1998); [57]O'Donnell & West (2001); [58]Onley (1990); [59]Onley (1991); [60]Onley (1992); [61]Pennycook (1949); [62]Pennycook (1951); [63]Pennycook (1959); [64]Petch (1996); [65]Pierce (1971); [66]Pierce (1980); [67]Pierce (1984); [68]Pollock (2003); [69]Pollock (2006); [70]Sagar (1976); [71]Sagar (1978); [72]Sagar (1979); [73]Sagar (1983); [74]Sagar (2009); [75]Sagar *et al.* (1999); [76]Sibson (1978); [77]Sibson (1979); [78]Smith (1994); [79]Steven & Meurk (1996); [80]Stidolph & Cunningham (1953); [81]Taylor & Champion (1996); [82]Tily (1950); [83]Todd (1988); [84]Walls (2006).