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Contents

Resident and migratory shorebirds of the Moulting Lagoon Game Reserve Ramsar site

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Executive summary

Internationally significant numbers of Australian Pied Oystercatcher are present within the Moulting Lagoon Game Reserve Ramsar site, in addition to Pacific Gull and Black Swan. A highly diverse bird community of resident and migratory shorebirds is present at the site year round, which complements the resident population of waterfowl and seabirds. Identified threats to these breeding species include the presence of unfenced livestock on foreshores and vehicles damaging roosting and breeding habitats. Relatively few historical data on the distribution and abundance of resident shorebirds are available for the survey area, so the present survey establishes important baseline data for future surveys and monitoring efforts. Control of vehicles and livestock on private property adjacent to Little Bay would contribute to an improvement in the conservation and management of important feeding and roosting habitats for resident and migratory shorebirds.

Introduction

Moulting Lagoon Game Reserve is an estuarine wetland of international significance (Box 1, page 25) with extensive waterbird populations that use the lagoon for some or all of the year. The site was nominated as a Ramsar Wetland of International Importance in 1982, and is approximately 4507 ha in size. The Moulting Lagoon Game Reserve was proclaimed in December 1988, with some minor boundary adjustments to the wetlands, and it includes some adjacent Crown foreshore. The Game Reserve is 4760 ha.

Management responsibility for the Lagoon is with the Tasmanian Parks and Wildlife Service (PWS) of DPIPWE (Parks and Wildlife Service 2007). Full details of the known values and of the management regime for the wetlands is in DSEWPC (2011). A map of the Moulting Lagoon Game Reserve (hereafter MLGR) Ramsar site is shown in figure 1 (page 25). Additional details, maps and materials of the MLGR Ramsar site can be obtained from http://ramsar.wetlands.org/Database/SearchforRamsarsites/tabid/765/Default.aspx. Management of Long Point is undertaken by the Tasmanian Land Conservancy, which has prepared a draft management plan for their Long Point Reserve (TLC 2007).

Three species of bird have been recorded as meeting the criterion of counts of or above 1% of their global populations, which is the threshold for a site of international significance. These species are Black Swan, *Cygnus atratus*, Pacific Gull, *Larus pacificus* and Australian Pied Oystercatcher, *Haematopus longirostris*.

Twenty-five species of resident and migratory shorebirds have been recorded in the MLGR (DSEWPC 2011, Appendix 1). Many of the waterbird and shorebird species present in the MLGR are listed under the EPBC Act (1999), as is the recently listed threatened community of *Subtropical and Temperate Coastal Saltmarsh* (http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=118).

Biannual waterbird counts have been undertaken in the MLGR since 1992, with coordinated summer and winter counts made of birds in defined count zones. The counts are coordinated by the PWS. While the focus of these counts has been waterfowl, other species such as resident and migratory shorebirds, gulls and terns have been included in count reports.

The reporting of non-waterfowl species has increased over time, varies inter-annually and provides an initial indication of the numbers of resident and migratory shorebirds, albeit with some limitations (see 'discussion', page 32). These counts do not identify breeding and non-breeding individuals of resident species observed.

Few shorebird-specific surveys have been undertaken in the MLGR (but see Wakefield 1984, Schokman 1991), and a dedicated and broad-scale survey of nesting sites of resident shorebirds has not been undertaken due to highly limited access because nesting sites have to be accessed either by boat or through private land. A low number of reports based on brief visits provide limited data.

The aims of the current project are to:

- address the major data gap on the presence of nesting sites of resident shorebirds in the Moulting Lagoon Game Reserve Ramsar site by the provision of fine-scale GPS data for nesting territories;
- assess and identify the significance of values associated with these breeding populations;
- identify observed threats to the resident shorebirds;
- provide baselines to monitor changes in conditions and values, and the efficacy of any management actions targeted at coastal habitats and bird values; and
- collate and review all available data on resident and migratory shorebirds found within the Moulting Lagoon Game Reserve Ramsar site, and assess their significance.

***Box 1:** Summary of the Moulting Lagoon Ramsar site*

Australia 5AU003
Site: Moulting Lagoon Game Reserve
Designation date: 16 November 1982
Coordinates: 42°02' 00S 148°11'00E
Elevation: 0–20 m
Area: 4,507 ha
Summary description: Moulting Lagoon Nature Reserve. 16/11/82; Tasmania;
42°02' 00S 148°11'00E. Crown Land, Game Reserve. A large estuary at the mouths of the Swan and Apsley rivers adjacent to, and contiguous with, the Apsley Marshes Ramsar site. The lagoon, plus several sections of coastal reserve surrounding it, and an additional area of dry land 1 km north, comprise the Moulting Lagoon Game Reserve. Moulting Lagoon is an excellent example of a large estuary formed behind a bayhead sand spit and is one of onlt two such areas in the Tasmanian Drainage Division; furthermore, the estuary is recognised as one of high conservation significance for Tasmania. The site provides an important resting and breeding ground and an important drought refuge for about 100 resident and migratory bird species such as Australian Shelduck (*Tadorna tadornoides*) and Black Swan (*Cygnus atratus*). The site is used for recreational shooting, fishing and boating, aquaculture and off-road driving. The surrounding area is used for grazing, residential development, mining, aquaculture and recreation. Both the site and the surrounding area have Aboriginal and European cultural significance. Ramsar site no. 251.
Source: https://rsis.ramsar.org/ris/251

The establishment of baseline data on resident shorebirds will increase the knowledge available on the values of the Moulting Lagoon Game Reserve Ramsar site and will provide critical information for future management actions.

Methods

All mapping data were collected using a Garmin *eTrex-30* 12-channel hand-held unit based on the WGS-84 datum and recorded as UTM coordinates. During the boat surveys, the locations of nesting birds and breeding territories were marked on a small-scale (approximately 1:20,000) map while in the field. The UTM coordinates of these locations were derived from *Google Earth*. The bird surveys report both the number of breeding pairs for each species, and the total number of individuals observed for each species. No assessment of vegetation was undertaken during surveys.

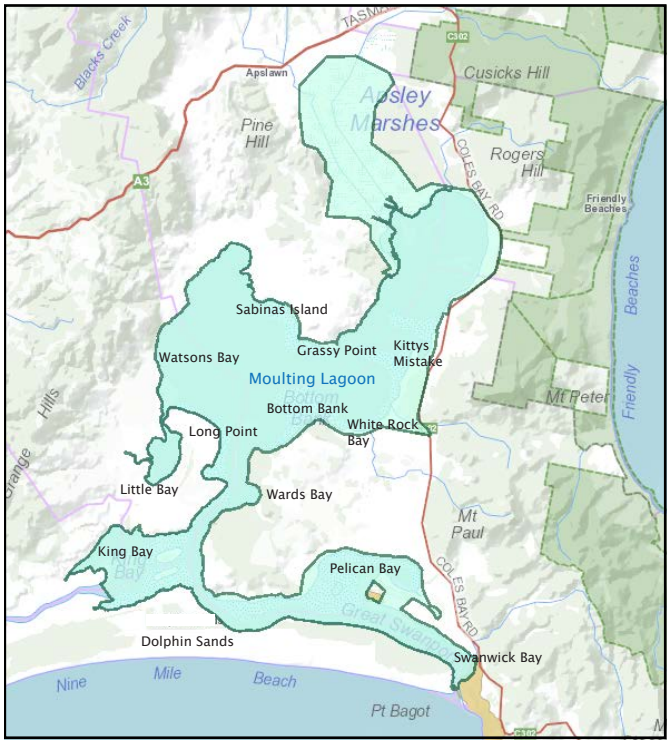

***Figure 1:** Map of the Moulting Lagoon Game Reserve Ramsar Site (from http://maps.thelist.tas.gov.au/listmap/app/list/map). The adjacent Apsley Marshes Ramsar site is also shown. The boundaries of the two Ramsar sites are enclosed by the dark green line. Selected place names are shown.*

(a) Resident shorebirds (boat and ground-based surveys)

Extensive areas of the MLGR foreshore are inaccessible on foot because of expansive areas of marshland: this ensured that almost the entire foreshore survey was water-based (figure 2, page 26). Foreshore areas were surveyed from a small dinghy using 10 X 40 binoculars to scan the foreshore and identify nesting shorebirds on their breeding territories. The shallow depths and the extensive areas of marine vegetation in the MLGR frequently ensured approaches were no closer than 50 m or so offshore. Resident shorebirds were typically observed as pairs, and the survey assumed that these pairs occupied a breeding territory.

Ground-based surveys were undertaken where access to the foreshore was possible and where the vegetation and substrate allowed foot travel. These surveys were

conducted in a manner identical to shorebird mapping surveys elsewhere in Tasmania (Woehler and Ruoppolo 2013a, 2013b) to provide comparable GPS and population data.

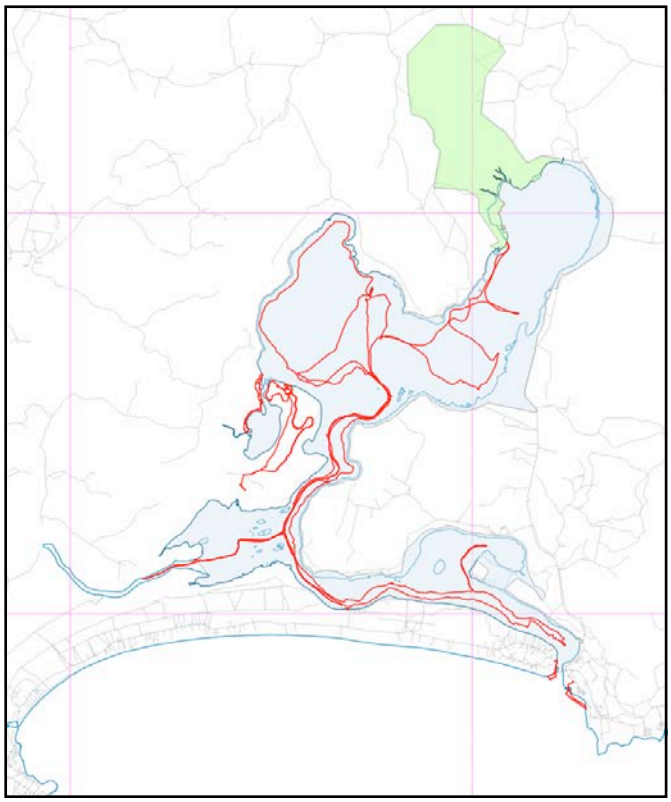

Figure 2: *Survey effort (red lines) in the Moulting Lagoon Game Reserve Ramsar site, 2013–14. The site's extent is shown in pale blue. The Apsley Marshes Ramsar site is shown in pale green; the 10 km UTM grid is shown in pink; roads are shown in grey. The surveys at Bagot Point and on Sandpiper Beach, outside the Ramsar site, were undertaken in January 2012 and are not included in the analyses reported here.*

(b) Resident and migratory shorebirds — historical data

Historical records of resident and migratory shorebirds were obtained from three sources. First were any published reports, narratives and accounts. In all, just six such publications were found (see 'results', next column). Second, the waterbird count dataset was provided by PWS, which includes data on all birds observed during the biannual waterbird counts. Third, the BirdLife Tasmania database was searched for all records in and around the MLGR.

There was some overlap between the PWS waterbird counts' shorebird data and that obtained from the BirdLife Tasmania database because some members of BirdLife Tasmania have been, and continue to be, involved in the biannual PWS counts. Records with matching dates and species' numbers were deemed to be identical records.

(c) Incidental breeding observations

Any observations of breeding, or evidence suggestive of breeding, were documented during the surveys as per resident shorebirds. Several instances of nesting or attempted nesting by Caspian Tern, *Sterna caspia*, and White-bellied Sea-Eagle, *Haliaeetus leucogaster*, were observed and mapped.

(d) Waterbirds and other observations

General observations of birds were made during all survey days. The list of bird species observed and, where appropriate, estimates of numbers are detailed. Observations and/or evidence of threats to shorebird and seabird values that were made during the surveys were collated and mapped where useful or relevant. This included, but was not limited to, observations of destructive vehicular activities and unfenced livestock on the foreshores.

(e) Estimations of populations' significance

There are presently no official guidelines for assessing the level of significance of resident (i.e. non-migratory) shorebird populations in Australia at a national level, beyond their inclusion for sites through the application of Ramsar criteria. These criteria use a mixture of percentages of populations and absolute numbers to identify sites that are of international significance and that hold populations that meet the criteria, including supporting 1% or more of the global population. Shorebird species whose estimated resident or migratory populations within the MLGR exceed 0.1% of their global populations are highlighted as being of national significance. All current global population estimates were obtained from Wetlands International (2014).

Results

Surveys were conducted on five days, with a sixth day washed out due to a sudden downpour (table 1). Surveys were predominantly undertaken by boat due to the vegetated foreshore. Approximately 98 km of surveys were conducted from the water, and 21.4 km on foot, a total survey effort of 119.4 km (figure 2).

Date	Area(s) surveyed	Survey (km)	Method
21 December 2013	Watsons Bay to Long Point, Swan Nook, King Bay & Great Swanport	49.1	Boat
8 January 2014	North of Long Point to Sherbourne Bay, Bulls Head to Bottom Bank	48.9	Boat
29 January 2014	Saltpans, western shore of Little Bay	4.1	On foot
7 February 2014	Little Bay	6.6	On foot
21 February 2014	Saltpans and wetlands, eastern shore of Little Bay (Long Point)	10.7	On foot

Table 1: *Survey effort, Moulting Lagoon Game Reserve, 2013–14.*

Common name	Scientific name	Breeding pairs	Birds	Comments	*EPBC Act 1999*
Australian Pied Oystercatcher	*Haematopus longirostris*	33	185	No nests north of White Rock Bay	—
Sooty Oystercatcher	*H. fuliginosis*	1	1	Swanwick Bay	—
Red-capped Plover	*Charadrius ruficapillus*	11	27	Dense population on saltpans and ponds, western shore of Little Bay, likely to be an underestimate for Ramsar site	Marine
Caspian Tern	*Sterna Caspia*	2	50	Likely to have more than 2 breeding pairs	Marine, migratory

Table 2: *Estimated total breeding populations, shorebirds and seabirds, MLGR 2013–14, with total numbers seen per species, additional comments and species'status under the* EPBC Act 1999.

Breeding species accounts

Australian Pied Oystercatcher

A total of 33 breeding territories of Australian Pied Oystercatcher was identified during the survey (figure 3). All were in the southern half of the Lagoon, and none were north of White Rock Bay. The highest concentration was on the foreshores between Barkstand Point and Swanwick Bay. In total, 185 Pied Oystercatcher were seen during the survey, and it is likely that an unknown proportion of these were nonbreeding birds.

There are no previous records of breeding numbers. Bryant (1933) did not mention oystercatcher in his brief account of a visit in 1932. Thomas (1965) makes no mention of oystercatcher in his account of a visit in 1964. Wall and Thomas (1965) observed 67 Pied Oystercatcher at the Swan River estuary in King Bay in March 1965. Wall (1971) recorded 'nests' of Australian Pied Oystercatcher at Moulting Lagoon in 1969, but gave no numbers.

Wakefield (1984) reviewed numbers of resident and migratory shorebirds at Moulting Lagoon for the period 1978 to 1983, and reported a maximum count of 97 individuals, and noted some seasonal differences in their presence in the lagoon. There is no indication as to what was the breeding status of the oystercatchers reported by Wakefield.

Schokman (1991) detailed observations from the Pelican Rocks to Pelican Bay area in the south-east of the lagoon close to Swanwick Bay. His data showed winter peaks, corresponding to winter roosting flocks, with a maximum of 109 in the winter of 1988.

The Ecological Character Description (ECD) for the MLGR Ramsar site (DSEWPC 2011) draws on the PWS biannual waterbird counts, and shows that the numbers of oystercatcher recorded during these counts have exceeded the 1% threshold in 14 of the 19 years between 1992 and 2010 (Appendix 2, page 37).

The 33 breeding territories located during the current survey corresponds with 66 breeding adults, which is 0.6% of the estimated global population of 11,000 birds (Wetlands International 2014), identifying the MLGR Ramsar site to be nationally significant for breeding Australian Pied Oystercatcher. The 185 oystercatcher observed during the survey represents 1.7% of the estimated global population of 11,000 birds (Wetlands International 2014), exceeding the 1% threshold and confirming the MLGR Ramsar site to be internationally significant for Australian Pied Oystercatcher.

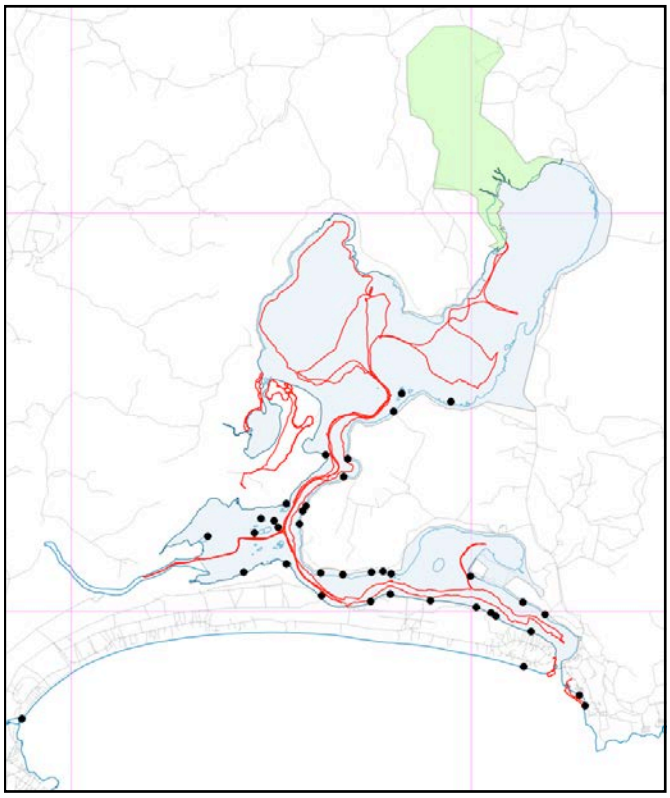

Figure 3: *Breeding territories of Australian Pied Oystercatcher, MLGR Ramsar site, 2013–14. The nests at the mouth of the Meredith River, at Bagot Point and on Sandpiper Beach, outside the Ramsar site, were surveyed in January 2012 and are not included in the population estimates reported here.*

Sooty Oystercatcher

Just one probable breeding territory of a Sooty Oystercatcher was observed during the survey, located at a small rocky outcrop and associated rock face at the

north-west end of Swanwick Bay (figure 4). The habitat inside the MLGR Ramsar site is generally unsuitable for Sooty Oystercatchers, but the habitat and location of the observed Sooty Oystercatcher is potentially suitable breeding habitat.

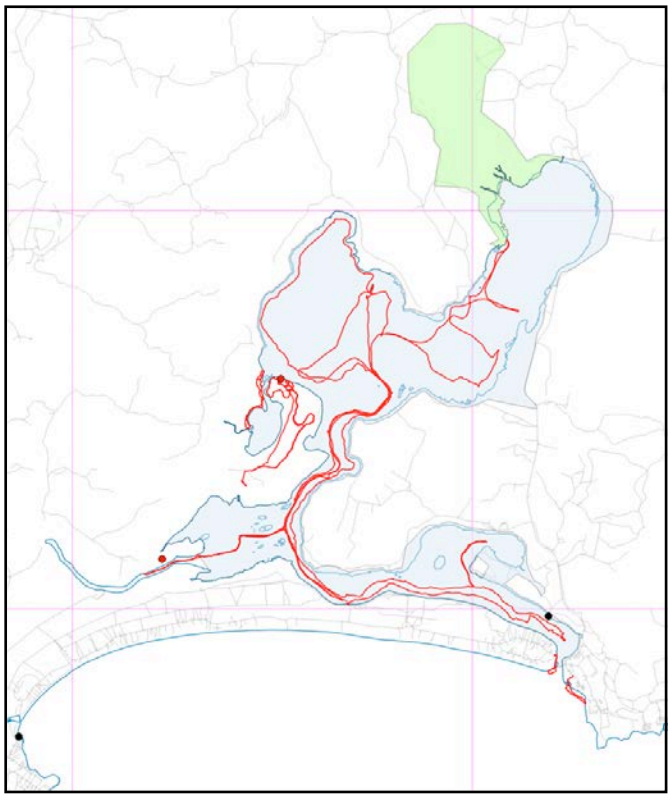

Figure 4: *Probable breeding territory (1) of Sooty Oystercatcher (black symbol) and two nests of Caspian Terns (red symbols), MLGR Ramsar site, 2013–14.*

As with Australian Pied Oystercatcher, there are no previous records of breeding numbers for Sooty Oystercatcher. Wakefield (1984) reported no birds at six areas around the lagoon. The ECD for the MLGR Ramsar site (DSEWPC 2011) lists Sooty Oystercatcher, and the PWS biannual waterbird counts have recorded them in 16 of 21 years, albeit in low numbers. Numbers of Sooty Oystercatcher are higher in winter months in the MLGR (Appendix 2).

Red-capped Plover

A total of 11 breeding territories of Red-capped Plover was located during the survey (figure 5). All were associated with saltpans on the western shores of Little Bay and a saltpan on Long Point. In total, 27 birds were seen, including fledged chicks that indicated breeding had occurred.

There are few previous records of breeding or non-breeding numbers. Bryant (1933) did not mention Red-capped Plover in his brief account of a visit in 1932. Thomas (1965) makes no mention of Red-capped Plover in his brief account of a visit in 1964. Wakefield (1984) reviewed numbers of resident and migratory shorebirds at Moulting Lagoon for the period 1978 to 1983, and reported a maximum count of 16 Red-capped Plover at Little Bay, but gave no indication as to the breeding status of the individuals.

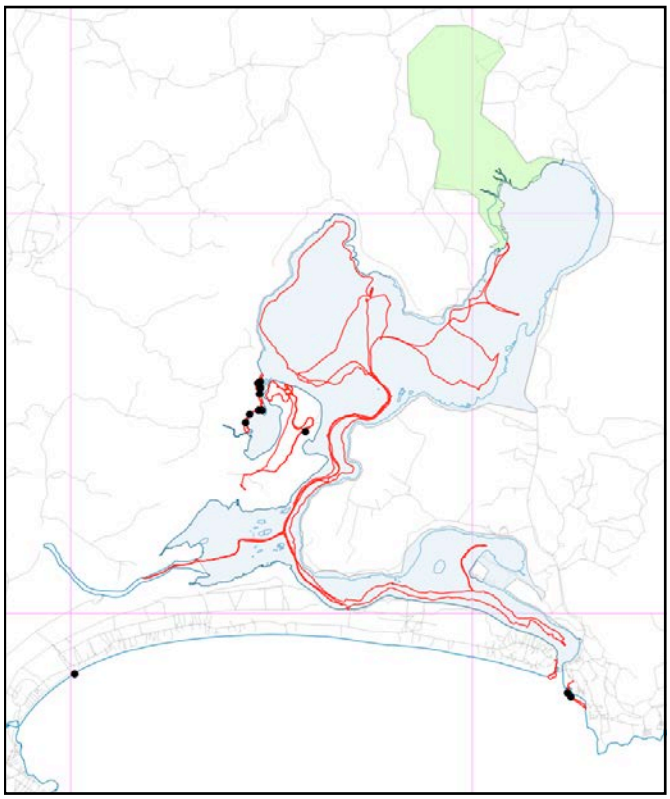

Figure 5: *Breeding territories of Red-capped Plover, MLGR Ramsar site, 2013–14. The nests on Nine Mile and Sandpiper Beaches, outside the Ramsar site, were surveyed in January 2012 and are not included in the population estimates reported here.*

Schokman (1991) recorded a maximum of 32 Red-capped Plover in the Pelican Rocks–Pelican Bay area in the south-east of the lagoon close to Swanwick Bay. His data showed a general decrease in the numbers present in the period 1987–90 inclusive, and noted one instance of breeding failure that he attributed to human disturbance. Lloyd (2008) noted Red-capped Plover at Little Bay.

It is likely that the local population of Red-capped Plover is larger than that reported here. The survey effort was confined to the MLGR Ramsar site, and located Red-capped Plover on foreshore saltpans around the lagoon. Extensive areas of saltpans are visible on private property around the lagoon in satellite imagery, and it is likely that these saltpans also support breeding populations of Red-capped Plover. Lagoons are located to the west and north-west of Flacks Road, around Serpentine Lagoon, Big and Little Punchbowl, and Cherry Tree lagoons, and consideration should be given to gaining access to survey these areas in the future.

The 11 breeding territories located during the current survey corresponds with 22 breeding adults, which is <0.1% of the estimated global population of 95,000 birds (Wetlands International 2014). The 27 Red-capped Plover observed during the survey represents 0.03% of the the estimated global population of 95,000 birds (Wetlands International 2014).

It is important to note that there are some likely errors in the PWS Waterbird Count dataset for Red-capped Plover at MLGR (Appendix 2). Counts of 150 (July 1997), 255 (July 1996) and 401 (February 1992) are either transcription or data entry errors or misidentification errors, as the numbers reported are excessive.

It is noteworthy that 255 Red-kneed Dotterel were also recorded in the PWS Waterbird Count for July 1996, reinforcing the suggestion of transcription or data entry errors. All records of anything other than single Red-kneed Dotterel from MLGR are highly suspect and also likely to be misidentification, data entry or transcription errors. Given the numbers involved, the likely candidate species might be Red-necked Stint, but in the absence of any evidence, these probably spurious records should be disregarded.

Other resident shorebird species

There were no breeding Hooded Plover, *Thinornis rubricollis*, within the MLGR Ramsar site during the 2013–14 survey. This is due to the absence of suitable nesting habitat (oceanic sandy beaches) inside the MLGR site.

One pair of Black-fronted Dotterel, *Elseyornis melanops*, was observed on the shores of a farm dam adjacent to a vehicular track to Little Bay on 29 January, and at the same site on 21 February. The extensive farm dams and creeks feeding into Moulting Lagoon are likely to support other breeding pairs of Black-fronted Dotterels. Few records of Black-fronted Dotterel are present in the PWS Waterbird Count dataset, but it is noteworthy that the July 2009 count (15) approached the threshold for national significance (16) for the species (Appendix 2). It is highly likely that MLGR is nationally-significant for Black-fronted Dotterel.

A flock of 8–12 Banded Lapwing, *Vanellus tricolor*, were observed on the hill slopes overlooking Little Bay on 7 February. The birds were disturbed by the vehicle, flushed and flew away before inspection of the flock could be undertaken for the presence of juveniles. Other flocks are likely to be present in the pastures and open grasslands surrounding Moulting Lagoon.

Caspian Tern

Two nest sites of Caspian Tern were located during the survey, and the potential remains of other nests were observed in the MLGR. One of the two nest sites was at the south-western end of King Bay near a series of small pools into which the adults were diving to feed, and the other was at the water's edge on the north-west foreshore of Long Point (figure 4). During ground surveys around Little Bay, a number of old nests were observed; these appeared to be Caspian Tern nests that had been used earlier in the season.

High numbers of Caspian Tern were observed throughout the MLGR during the current survey, with adults seen feeding and flying back to presumed nests with fish in their bills. The dense foreshore vegetation prevented potential nest sites from being identified from the water. A total of 50 Caspian Tern was recorded from all parts of the MLGR, well below the 1% criterion for this species (1000 birds). A flock of 11 was observed roosting on the saltpans beside Little Bay on 29 January. The counts from this survey are consistent with the numbers of Caspian Tern recorded during the PWS Waterbird Counts in summer months over the last decade. Thomas (1965) observed one pair at Moulting Lagoon attacking a Swamp Harrier, *Circus approximans*.

Nonbreeding (migratory) shorebird species accounts

A flock of 19 Pacific Golden Plover, *Pluvialis fulva*, was observed on the saltpans on the western shore of Little Bay on 29 January 2014. The birds were relatively nervous and were not approached. The highest count in the PWS Waterbird Count dataset is of 76 Pacific Golden Plover in February 2003, but lower numbers and many null counts have been recorded since then (Appendix 3, page 38).

There is a record of 34 Pacific Golden Plover from King Bay in February 1983 (BirdLife Tasmania, unpubl. data), 12 from Pelican Bay (Wakefield 1984), and of 35 at Pelican Rocks in February 1987 and in March 1991 (Schokman 1991). Lloyd (2008) observed 71 Pacific Golden Plover at Long Point. All available records from the MLGR fail to meet the 0.1% threshold for the species (100 birds), so the Ramsar Site is not nationally important for this species.

A flock of 14 Bar-tailed Godwit, *Limosa lapponica*, was observed on a sandbar in Swanwick Bay on 21 December 2013 (figure 6). The birds were actively feeding at the water's edge. The highest count in the PWS Waterbird Count data set is of 101 Bar-tailed Godwit in February 2006 (Appendix 3).

Figure 6: *Bar-tailed Godwit feeding on the water's edge of a sandbar, Swanwick Bay. © Eric J. Woehler*

The earliest record is of 20 Bar-tailed Godwit in September 1961 (Wall and Thomas 1965), while Wakefield reported 32 (1984) and Schokman 12 (1991). All available records from the MLGR fail to meet the 0.1% threshold for the species (279 birds), so the Ramsar site is not nationally important for this species.

A single Eastern Curlew, *Numenius madagascarensis*, was observed on 21 December 2013 close to Pelican Rocks. The highest count in the PWS Waterbird Count dataset is of 47 Eastern Curlew in February 1994, but the numbers reported since then have decreased, with many null counts reported in the last few years and only four counts exceeding ten birds in the last 10 years (see Appendix 3).

Eastern Curlew have been observed feeding on exposed mud flats at the Swan River estuary in King Bay, with 27–30 in November 1964 and March 1965, respectively (Thomas 1965, Wall and Thomas 1965). A count of 100 Eastern Curlew was made from Pelican Bay in September 1961 (reported as 'Swan River', which is now known as King Bay in Wall and Thomas (1965), and counts of 15 and 13 were reported from 1981 and 1983, respectively, from King Bay (BirdLife Tasmania unpubl. data). Wakefield (1984) reported 100 Eastern Curlew at King Bay between 1978 and 1983, and Schokman (1991) reported 18 in Pelican Bay in January and March 1988.

Eastern Curlew numbers throughout Tasmania have decreased by between 50 and 90%, depending on location, and the decrease in numbers reported from Moulting Lagoon are consistent with the trends around Tasmania (BirdLife Tasmania unpubl. data). The current threshold for national importance is 32 Eastern Curlew, so the February 1994 count (47) was the last time the threshold was met for this species in the MLGR Ramsar site.

Figure 7: *Common Greenshanks roosting on wooden poles associated with marine farm infrastructure. © Eric J. Woehler*

A flock of 16 Common Greenshank, *Tringa nebularia*, was observed on 21 December 2013. The birds were roosting on wooden poles used for marine farm racks (figure 7). The highest count in the PWS Waterbird Count dataset is of 164 Common Greenshank in February 1994, which is the highest number ever recorded for the species in the MLGR Ramsar site, but the numbers reported since then have decreased, with many null counts reported since 2007, and only six counts exceeding 10 birds in the last 10 years (Appendix 3). The ECD (DSEWPC 2011) noted that the MLGR supports the largest flock of Common Greenshank in Tasmania, citing Wakefield (1984).

Earlier counts of Common Greenshank in the MLGR were of 115 birds in King Bay in February 1981 (BirdLife Tasmania unpubl. data) and Schokman(1991) reported 13 at Pelican Rocks in September 1989. Wakefield (1984) describes the importance of a long line of stakes on the margin of The Cut in King Bay, on which the Common Greenshank roost at high tide. These stakes have largely disappeared since the late 1970s and early 1980s (figure 8) and the Common Greenshank now use poles associated with marine farm leases (figure 7). All records from the MLGR since 1995 are below the 0.1% threshold for the species (100 birds), so the Ramsar site is no longer nationally important for this species.

Figure 8: *Remains of the wooden stakes at The Cut, Swan River estuary, King Bay, 2013.© Eric J. Woehler*

Wall (1971) observed a 'large flock' of Curlew Sandpiper, *Calidris ferruginea*, 'fewer' Red-necked Stint and 'some' Sharp-tailed Sandpiper, *C. acuminata*, on the east side of Moulting Lagoon in October or November 1969. Approximately 40 Sharp-tailed Sandpiper were reported from King Bay in February 1981 (BirdLife Tasmania unpubl. data) and Wakefield (1984) reported 27 from King Bay between 1978 and 1983. Schokman (1991) did not observe any Sharp-tailed Sandpiper from Pelican Rocks. All available records from the MLGR fail to meet the 0.1% threshold for the species (160 birds), so the Ramsar Site is not nationally important for this species.

Two flocks of Red-necked Stint, *C. ruficollis*, were observed during the survey. The first was of 100 birds on the saltpans on the western foreshore of Little Bay, close to the flock of Pacific Golden Plover, on 29 January 2014 (figure 9a, page 31). A second flock of approximately 200 was observed actively feeding in a muddy pool on the north to north-east foreshore of Little Bay on 7 February 2014 (figure 9b, page 31). It is possible that the increased numbers reflect early northward movements of Red-necked Stint from farther south in south-east Tasmania where they spend the summer months. There is no way of determining if the

stints recorded on 29 January were part of the flock seen on the second occasion, so it has been conservatively assumed that the 200 stints observed included all of the birds seen earlier.

Red-necked Stint have been seen regularly in the PWS Waterbird Count dataset, with the highest count of 362 recorded in February 1994 (Appendix 3). A similar count of 355 in February 2005 was the last time more than 300 were recorded in the MLGR. The counts since 2008 have been very low compared to early counts of 250 in October 1969 and 224 in October 1981 (BirdLife Tasmania, unpubl. data).

Figure 9a: *Part of the roosting flock of Red-necked Stints on the saltpans on the western foreshore of Little Bay.*
© Eric J. Woehler

Figure 9b: *Feeding Red-necked Stint, February 2014.*
© Eric J. Woehler

Wakefield (1984) reported a minimum of 160 in the period 1978–83, and Schokman (1991) reported 126 in November 1987 and 104 in January 1988. Schokman's data show seasonal patterns in Red-necked Stint observed at Pelican Rocks consistent with the migratory behaviour of this species. All records from the MLGR since Winter 2005 are below the 0.1% threshold for the species (315 birds), so the Ramsar Site is no longer nationally important for it.

A solitary Sharp-tailed Sandpiper was observed at the northern entrance of Little Bay on 21 February 2014. The bird was roosting behind some vegetation and was not approached due to its nervous behaviour. Sharp-tailed Sandpipers have been reported infrequently in the PWS Waterbird Count dataset, with the highest count of 31 recorded in February 2005 (Appendix 3).

Selected waterfowl species accounts

Limited opportunities were available during the current survey to assess numbers of waterfowl on Moulting Lagoon. Approximately 2000 Black Swan were present in King Bay on 21 December 2013, while between 2400 and 2800 were present between Long Point and Watsons Bay on the same day. There were approximately 3000 Black Swan present between Watsons Bay and Sabinas Island, giving a total of between 7400 and 7800 swans on 21 December.

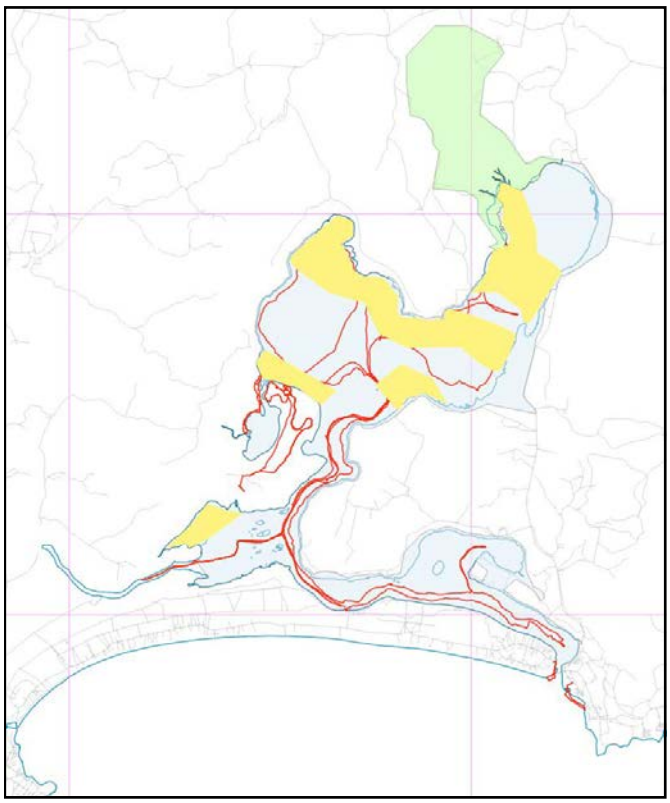

Figure 10: *Map of waterfowl concentrations observed during the 2013–14 survey (yellow areas). The survey effort in the Moulting Lagoon Game Reserve Ramsar site, 2013–14, is shown by the red lines; MLGR Ramsar site is shown in pale blue; Apsley Marshes Ramsar site is shown in pale green; the 10 km UTM grid is shown in pink; roads are shown in grey.*

Sabinas Island was briefly visited on 21 December 2013, and several hundred swan nests were present with between 1 and 8 eggs. There were approximately 1200–1500 Australian Shelduck, *Tadorna tadornoides*, sitting on the water west and north-west of the island. Many were moulting and unable to fly. A flock of approximately 250 Chestnut Teal, *Anas castanea*, were seen in Swanwick Bay later in the day.

There were approximately 300 Eurasian Coot, *Fulica atra*, close to Sabinas Island on 8 January 2014, and 500–600 Chestnut Teal east of Cockatoo Island on the same day. A further 120 Chestnut Teal were present off Kittys Mistake and 200 off Bottom Bank Island later that day. Figure 10 shows the approximate areas of the large flocks of waterfowl observed on Moulting Lagoon during the survey.

Other significant sightings

One active White-bellied Sea-Eagle, *Haliaeetus leucogaster*, nest was observed during the survey on the northern shore of Wards Bay on 21 December 2013. A second

nest, previously observed north-east of Grassy Point (N. Castle personal communication), was not located because it was believed the tree had fallen over. A third nest is reported to be present close to Serpentine Lagoon (N. Castle personal communication). Several White-bellied Sea-Eagles were seen during the survey, either flying overhead or perched in trees on the foreshores of the lagoon (figure 11).

Figure 11: *White-bellied Sea-eagle, Moulting Lagoon. © Eric J. Woehler*

Observed threats to shorebirds in Moulting Lagoon

A large flock of sheep was observed on the foreshore in Watsons Bay on 8 January. Extensive vehicle tracks could be found in the saltpans and in the vegetation on the western foreshore of Little Bay on all visits to the area. The vehicle tracks were well established, and deep wheel ruts were observed in some areas. The areas where vehicle tracks were seen were on private property.

Discussion

Limitations to the survey

The vegetated foreshore and extensive areas of shallows restricted access to some foreshore areas of the Moulting Lagoon Game Reserve during the survey. It is possible that potential foreshore breeding sites may have been missed from the boat surveys; however, all the previously identified significant sites for shorebirds in MLGR (e.g. Wakefield 1984, Schokman 1991) were visited and surveyed.

The estimates reported here are absolute minima for the breeding species. The species most likely to have been underestimated are Red-capped Plover, Black-fronted Dotterel and Caspian Tern. However, it is highly unlikely that breeding or total population estimates for these species would meet national or international thresholds, even if unsurveyed birds that may have been missed were included.

The estimate for the breeding population of Australian Pied Oystercatcher in the MLGR (33 pairs) is considered accurate for 2013–14. The survey is the first GPS mapping of resident shorebirds in the MLGR, and establishes a baseline for future surveys of nesting shorebirds, and a useful basis for comparison with the ongoing PWS Waterbird Counts.

Comparison with previous counts of shorebirds

The survey has confirmed the international significance of the MLGR to Australian Pied Oystercatcher, exceeding the 1% threshold (see 'results', page 26). The survey also confirmed that other nesting species failed to meet their respective thresholds for international or national significance.

The migratory shorebirds observed in the current survey are broadly consistent with the PWS Waterbird Counts, with the caveats regarding the possible mis-identification or data entry errors noted previously (see Results). A record of 35 Great Knot, *Calidris tenuirostris*, from the February 2007 PWS count is almost certainly incorrect, and likely to have been Red Knot, *C. canutus*, or another species of shorebird altogether.

The survey has broadly confirmed the significant sites for migratory shorebirds around the MLGR as identified by Wakefield (1984) and Schokman (1991). The survey results are consistent with observed broad-scale and long-term decreases in the numbers of migratory shorebirds in the MLGR (PWS Waterbird Counts) and elsewhere in Tasmania, most notably Eastern Curlew but also other species such as Red-necked Stint and Bar-tailed Godwit (BirdLife Tasmania, unpubl. data).

Increased levels of human disturbance from recreational boating and changes in the feeding and roosting habitats in MLGR, such as the loss of some of the stakes in The Cut in King Bay, will have contributed to the long-term decreases in migratory shorebird numbers in MLGR. There is also the potential disturbance to feeding and breeding shorebirds from aquaculture operators working their leases (figure 12, page 33), and this should be investigated in terms of the frequency and intensity of activities, and their potential to disturb shorebirds.

Two species of migratory shorebirds not encountered in the current survey and previously recorded from the MLGR are Curlew Sandpiper, *Calidris ferruginea*, and Double-banded Plover, *Charadrius bicinctus*. Curlew Sandpiper are Palaearctic migrants, breeding at high northern latitudes before spending the summer months in Australia. Their numbers in Tasmania have decreased by more than 90% since the mid-1980s (BirdLife Tasmania unpubl. data) and there are very few records from south-east Tasmania in recent years. Curlew Sandpiper have been reported during PWS Waterbird Counts (Appendix 3) but the count of 100 Curlew Sandpiper in the July 2013 PWS count is believed to be another error in the PWS Waterbird Count dataset.

Double-banded Plover migrate to south-east Australia from New Zealand, spending the winter months in south-east Australia and Tasmania. The timing of the

current survey is outside the period of peak numbers for the species in Tasmania. Surveys in late winter and early spring will obtain contemporary data for the species in the MLGR.

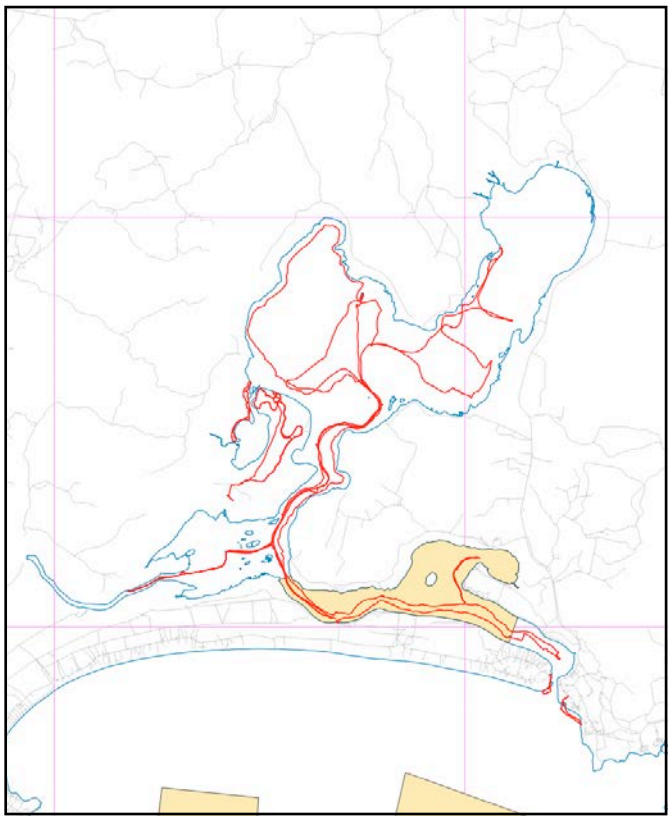

Figure 12: *Marine farming leases (pale orange) in the Moulting Lagoon Game Reserve Ramsar site and in Great Oyster Bay.*

Management of threats to shorebirds in the MLGR

Few direct threats to shorebirds and their habitats were observed during the survey; this was due largely to most of the survey being conducted from the water looking onshore. The ground-based surveys around Little Bay provided evidence of the two serious threats to shorebirds and their breeding and roosting habitats in MLGR.

The extensive network of saltpans and low coastal vegetation is used for roosting by resident and migratory shorebirds, and this network was damaged by numerous vehicle tracks, in many cases resulting in deep ruts in the substrate. The area also supported a significant breeding population of Red-capped Plovers, with the numbers and spacing involved suggesting that there is a loose colonial population resident in this area (figures 5 and 13).

From the extensive network of tracks it is clear that there is considerable vehicle usage in this area. If vehicles are present in the breeding season (September to March), the potential exists for them to disturb breeding efforts, and to crush nests, eggs and chicks of Red-capped Plover breeding in the area. It is assumed that the area is accessed by shooters to provide ready access to their hides. All of the damage observed to saltpans from vehicles around Little Bay were on private property.

As well as vehicular tracks, there was evidence of stock present in this area, with sheep tracks on many saltpans. Flocks of sheep moving through these areas during the summer would also potentially disturb breeding effort, and crush nests, eggs and chicks of Red-capped Plover. A flock of sheep was also seen on the foreshore of Watsons Bay, but there was no evidence of shorebirds breeding in this area.

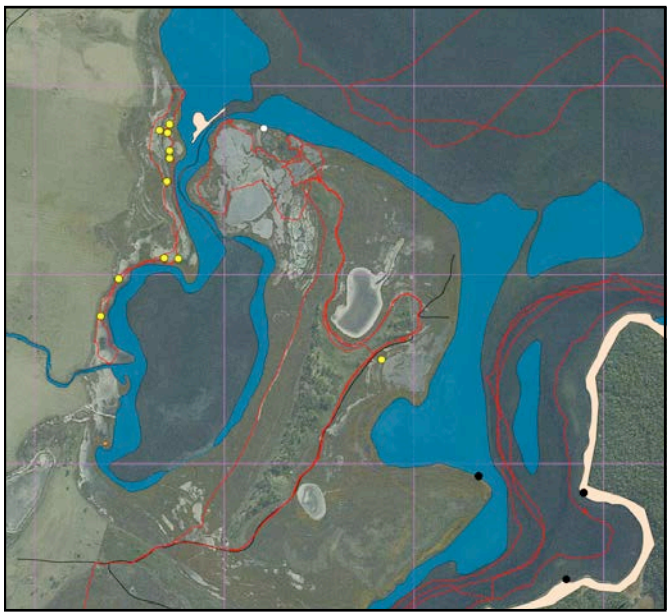

Figure 13: *Map of Little Bay and Long Point showing areas of Crown Land (pale yellow) and Tidal Crown Land (blue). Roads and tracks are shown in black and the survey routes in red. A 1 km grid is shown (pink). Breeding territories of Pied Oystercatchers are shown in black symbols, Caspian Tern (white) and Red-capped Plover (bright yellow).*

Prevention of vehicles and livestock on the saltpans on private property on the western foreshore of Little Bay would provide immediate protection to nesting and roosting Red-capped Plover and to migratory shorebirds such as Red-necked Stint, Pacific Golden Plover and Sharp-tailed Sandpiper that roost in this area. Fencing these areas of private property would prevent vehicle and livestock access to the saltpans and foreshores between Watsons Bay and the Tasmanian Land Conservancy's property around eastern Little Bay: this could be achieved with support from Glamorgan Spring Bay Council, NRM South and PWS. PWS manage vehicles and livestock on their property.

Management and conservation considerations

It is important to recognise the connectivity of the MLGR Ramsar site with surrounding shorebird habitats such as Bagot Point at the mouth of Moulting Lagoon, Belmont Lagoon and the mouth of the Meredith River. Each of these sites is known to support migratory shorebirds (Wakefield 1984), and it is likely that they are used if shorebirds are disturbed in MLGR, or if adverse weather conditions or high tides prevail at roost sites,

thus preventing the birds from using these sites.

Bagot Point and Sandpiper Beach are used for roosting and breeding by small terns (E.J. Woehler and V. Ruoppolo unpubl. data) and for breeding by Hooded and Red-capped Plover. Breeding populations of Australian Pied Oystercatcher on Nine Mile Beach, Sandpiper Beach at Swanwick, Bagot Point and the Friendly Beaches should also be considered as regional populations for the species.

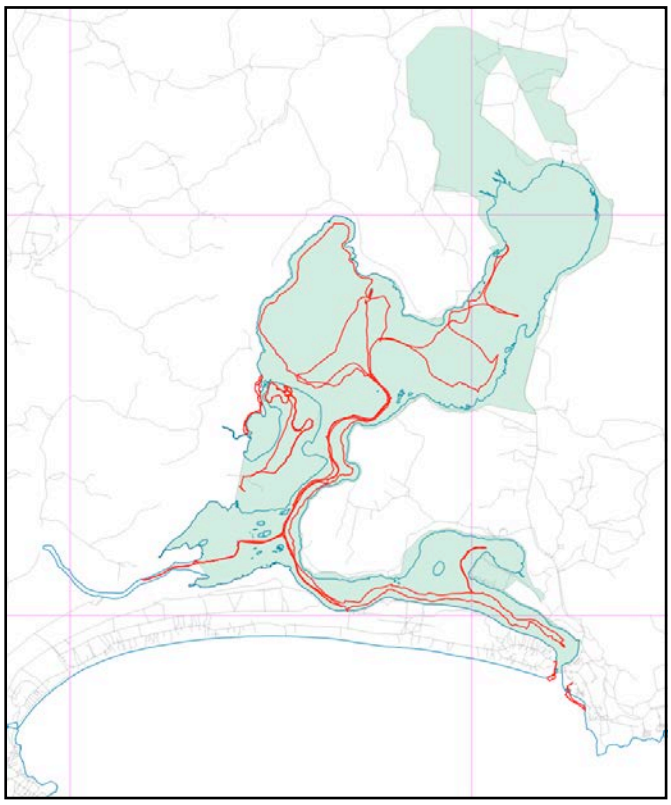

Figure 14: *The Moulting Lagoon Game Reserve Ramsar site and the Apsley Marshes Ramsar site are within the Moulting Lagoon Important Bird Area (IBA).*

It is appropriate to consider future management of the MLGR Ramsar site and these associated sites as a single management unit, connected as they are by the resident and migratory shorebirds that move amongst them. Such integrated management would incorporate recognition of the potential for threats to adversely affect Ramsar shorebird values outside the MLGR Ramsar site boundary.

One approach that addresses the need for conservation at broader, regional scales (and which contributes to national and international conservation needs) is the Important Bird Areas (IBAs) program of BirdLife International. IBA criteria are internationally agreed, standardised, quantitative and scientifically defensible; an IBA is an internationally agreed upon priority for conservation action. Further details of the program and IBA criteria are available at http://www.birdlife.org/action/science/sites/index.html

The Moulting Lagoon Game Reserve Ramsar site and the Apsley Marshes Ramsar site are part of the Moulting Lagoon IBA (details of extent and significant species present are at www.birdata.com.au/iba.vm, figure 14). Explicit recognition of the existence of the IBA and creation of a regional management framework for the IBA and its associated bird values will serve as a much-needed model for similar site networks elsewhere in Tasmania (e.g. the Robbins Passage–Boullanger Bay wetlands in the north-west and the Derwent–Pitt Water network in south-east Tasmania).

Concluding comments

The Moulting Lagoon Game Reserve Ramsar site is a wetland of national and international significance for waterfowl, shorebirds and seabirds. The wetlands provide critical feeding and roosting habitat for migratory shorebirds. The shorebird and seabird communities present managers with the responsibility of conserving nationally and internationally significant bird values. Appropriate management frameworks that recognise the regional-scale network of sites and enforce conservation measures are fundamental to the survival of these values. Long-term population trends are needed to provide managers and the community with critical feedback on the efficacy of conservation and management efforts.

Recommendations

1. **Prevention of vehicles and livestock on the saltpans of the western foreshore of Little Bay.** This would protect nesting and roosting Red-capped Plover and migratory shorebirds that roost in this area, such as Red-necked Stint, Pacific Golden Plover and Sharp-tailed Sandpiper. Fencing to prevent vehicle and livestock access to the saltpans and foreshores between Watsons Bay and the Tasmanian Land Conservancy's property around eastern Little Bay could be achieved with support from Glamorgan Spring Bay Council, NRM South and PWS.

   All of the fencing required is on private property. Control of vehicles and livestock on private property beside Little Bay would help improve the conservation and management of important feeding and roosting habitats for resident and migratory shorebirds.
2. **Repeat surveys of resident shorebirds in Moulting Lagoon Game Reserve Ramsar site.** Repeated surveys at approximately 4–6 year intervals will provide a time series of population data useful for PWS as managers responsible for the site. BirdLife Tasmania should continue to undertake these surveys for continuity in the research and data analyses. Such counts would complement the biannual PWS Waterbird Counts by providing a regional context for the counts inside the MLGR.
3. **Collaboration with PWS staff and volunteers involved in Waterbird Counts.** Collaboration

such as provision of shorebird identification materials would help reduce the likelihood of errors in shorebird identification during the biannual Waterbird Counts. BirdLife Tasmania should approach PWS staff who coordinate volunteer counters to discuss appropriate approach(es).

Acknowledgments

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We wish to convey our thanks to the following individuals who have contributed to the project. Robbie Gaffney provided the PWS Waterbird Count data. Stewart Blackhall, DPIPWE (retired), for his discussion and advice about all aspects of Moulting Lagoon, and for his valuable comments on an earlier draft. Comments from Sue Drake, Alan Fletcher and Priscilla Park OAM improved the draft.

The survey could not have been undertaken without the remarkable contribution of Norm Castle, who willingly provided his boat and extensive local knowledge of the lagoon for the surveys. Terry Higgs (Glamorgan Spring Bay Council) accompanied us during the surveys, and Mel Kelly (Glamorgan Spring Bay Council), Lyndel Wilson and Donald Coventry (NRM South) provided financial, logistical and enthusiastic support for the survey. Lyndel and Donald spent a brief period surveying shorebirds on Long Point before a sudden downpour ended all survey efforts.

Mick Graham provided access to Moulting Lagoon through The Grange. Denna Kingdom (Tasmanian Land Conservancy) provided a bird list for Long Point and permission to access the property for this survey. James Fitzsimons provided Wall and Thomas (1965).

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Appendix 1

Updated list of resident and migratory shorebirds recorded from the Moulting Lagoon Game Reserve Ramsar Site, based on DSEWPC (2011), with updated and revised scientific names, and additional species based on BirdLife Tasmania records.

Resident shorebird species

- Pied Oystercatcher, *Haematopus longirostris*
- Sooty Oystercatcher, *Haematopus fuliginosus*
- Black-fronted Dotterel, *Elseyornis melanops*
- Red-capped Plover, *Charadrius ruficapillus*
- Hooded Plover, *Thinornis rubricollis*
- Red-kneed Dotterel, *Erythrogonis cinctus*
- Banded Lapwing, *Vanellus tricolor*
- Masked Lapwing, *Vanellus miles*

Migratory shorebird species

- Banded Stilt, *Cladorhynchus leucocephalus*
- Pacific Golden Plover, *Pluvialis fulva*
- Double-banded Plover, *Charadrius bicinctus*
- Lesser Sand Plover, *Charadrius mongolus*
- Bar-tailed Godwit, *Limosa lapponica*
- Whimbrel, *Numenius phaeopus*
- Eastern Curlew, *Numenius madagascariensis*
- Grey-tailed Tattler, *Tringa brevipes*
- Common Greenshank, *Tringa nebularia*
- Marsh Sandpiper, *Tringa stagnatilis*
- Ruddy Turnstone, *Arenaria interpres*
- Great Knot, *Calidris tenuirostris* *
- Red Knot, *Calidris canutus*
- Little Stint *Calidris minuta*
- Red-necked Stint, *Calidris ruficollis*
- Long-toed Stint, *Calidris subminuta*
- Sharp-tailed Sandpiper, *Calidris acuminata*
- Curlew Sandpiper, *Calidris ferruginea*

* unconfirmed record, PWS Waterbird Counts

Appendix 2

PWS Waterbird Count data for resident shorebirds, MLGR 1992–2013, with species thresholds for National and International Significance. Figures in ***bold italic type*** are considered errors (see Results). Numbers observed during the current survey are shown at the bottom of the table.

Species significance thresholds and survey dates	Pied Oystercatcher	Sooty Oystercatcher	Hooded Plover	Red-capped Plover	Black-fronted Dotterel	Masked Lapwing
International (1%)	110	115	375	950	100	1000
National (0.1%)	11	12	38	95	10	100
February 1992	108			***401***		35
July 1992	74			26		38
February 1993	103			18		38
July 1993	101			12		27
February 1994	142			19	9	68
July 1994	74	4		27	2	24
February 1995	44			4		20
July 1995	56			13	9	30
February 1996	75			0		28
July 1996	119	3		***255***		48
February 1997	84			6		43
July 1997	232	9		***150***	1	91
February 1998	78			4		60
July 1998	183	6		22	1	33
February 1999	147			14		59
July 1999	118				4	19
February 2000	107	1		5		36
July 2000	No count undertaken					
February 2001	193			6		30
July 2001	131			72	10	35
February 2002	107			8		70
July 2002	67	10		15		47
February 2003	113			15		15
July 2003	114					45
February 2004	138					28
July 2004	75	5		8	2	54
February 2005	202	1		6		56
July 2005	210	1		26	6	63
February 2006	123	4	2	20		86
July 2006	191	5		10		148
February 2007	173	6	1	18	0	128
July 2007	149	0	0	0	0	121
February 2008	188	2	0	27	0	69
July 2008	229	3	0	34	0	27
February 2009	206	1	0	29	0	84
July 2009	75	0	0	8	15	57
February 2010	327	0	0	13	0	52
July 2010	108	6	0	23		61
February 2011	173	0	0	8	0	47
July 2011	48	2	0	14	6	53
February 2012	249	2	4	8	0	43
July 2012	97	0	0	***94***	0	72
February 2013	214	6	0	1	0	65
July 2013	98	7	0	0	0	93
December 2013–January 2014	185	1	0	27	2	>100

Appendix 3

PWS Waterbird Count data for migratory shorebirds, MLGR 1992–2013, with species' thresholds for National and International Significance. Figures in ***bold italic type*** are considered errors (see Results). Numbers observed during the current survey are shown at the bottom of the table.

Codes used: Bar-tailed Godwit (BTGO), Whimbrel (WHIM), Eastern Curlew (EACU), Common Greenshank (COGR), Red-necked Stint (RNST), Sharp-tailed Sandpiper (STSA), Curlew Sandpiper (CUSA), Banded Stilt (BAST), Pacific Golden Plover (PGPL) and Double-banded Plover (DBPL).

Species significance thresholds and survey dates	BTGO	WHIM	EACU	COGR	GRKN	RNST	STSA	CUSA	BAST	PGPL	DBPL
International (1%)	2790	5500	320	1000	2900	3150	1600	1350		1000	500
National (0.1%)	279	55	32	100	290	315	160	135		100	50
February 1992			14								
July 1992		2	6			19					
February 1993			26	115							
July 1993											
February 1994	1	6	47	164		362					1
July 1994			2								81
February 1995			1								2
July 1995											
February 1996			24	30							
July 1996						100					34
February 1997			14	95							8
July 1997			1	12		28		10			152
February 1998				16		118		20			
July 1998			20	7							
February 1999	2		19	79							
July 1999											36
February 2000			16	10		24					
July 2000	No count undertaken										
February 2001			22	65		112					1
July 2001											
February 2002			17	52		165					106
July 2002				1		16					
February 2003		3	11	3		33	3			76	2
July 2003						***15?***					
February 2004				69		62	16				
July 2004						82		***14?***			
February 2005	19		16	86		355	31			25	
July 2005	58		1			9					47
February 2006	101		17	41		284	3			19	
July 2006	45			18		80				2?	61
February 2007	8	0	1	1	35	269	0	0		2	0
July 2007	0	0	0	0	0	10	0	0		0	0
February 2008	0	0	14	0	0	0	0	0		0	2
July 2008	24	0	3	0	0	1	0	0		0	0
February 2009	12	0	9	22	0	0	0	0		0	0
July 2009	13	0	1	1	0	0	0	0		0	12
February 2010	10	0	12	24	0	22	2	0		0	0
July 2010	15	0	0	0	0	22	0	0		0	54
February 2011	0	0	0	0	0	20	0	0		18	0
July 2011	0	0	0	0	0	0	0	0		0	8
February 2012	9	0	5	0	0	0	0			0	0
July 2012	5	0	0	0	0	0	0	0		0	20
February 2013	10	0	0	0	1	2	0	0	340	16	8
July 2013	4	0	0	0	0	0	0	***100***	250	5	15
December 2013–January 2014	14?	0	1	16	0	≥200	1	0		19	0