Birds of Tomago Wetlands, Hunter Wetlands National Park 2007 – 2012

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As a result of a project to reinstate tidal inundation to the Tomago Wetlands in the Hunter Wetlands National Park, the Hunter Bird Observers Club commenced monthly surveys before and after tidal gates were opened to provide baseline data for waterbirds, in particular shorebirds, and to monitor changes in diversity and numbers. Tidal inundation had been cut off in 1976 which resulted in drying of the largely Coastal Saltmarsh habitat. The effectiveness of the project has been difficult to ascertain as, after initial opening of tidal gates, tidal inundation was interrupted on a number of occasions and consistent heavy rain fell during the study period. The gradual increase in diversity and numbers of waterbirds resulted from the constant presence of water whether saline or fresh. Small numbers of three shorebird species visited the two sites chosen for intensive surveying. The restoration of habitat requires a maturation period and ongoing monitoring will be required before its effectiveness can be quantified.

INTRODUCTION

For the purposes of this article, the story of the Tomago Wetlands begins in the 1970s when, according to Clarke & van Gessel (1983: 117-144), migratory shorebirds used the Tomago Wetlands for diurnal and nocturnal roosting and as a secondary feeding area, but abandoned it sometime after 1976 when saline water was prevented from entering the Wetlands by the installation of tidal gates at the mouth of the North/South Drain (**Figure 1**). The tidal gates were part of a flood mitigation scheme which saw a ring drain, levee and floodgates built around Fullerton Cove. This action excluded tides and minor Hunter River floods and resulted in converting wetlands to grazing land and drying out the saltmarsh. (Brereton *et al.* 2010: 98). In 1983 a recommendation was made to restore saltmarsh behind Fullerton Cove at Tomago by permitting full tidal flushing which would potentially reverse this loss of important shorebird habitat (Moss 1983: 55). In 1985, 716.6ha of land at Tomago was donated by BHP to be added to Kooragang Nature Reserve (KNR) gazetted in 1983 and listed as a Ramsar site in 1984. In 2011, KNR (which includes parts of the bed of the Hunter River and Fullerton Cove), Hexham Swamp Nature Reserve and Ash Island were combined to form the Hunter Wetlands National Park (HWNP). In 1993, the Kooragang Wetland Rehabilitation Project (KWRP), a collaborative project of the Hunter-Central Rivers Catchment Management Authority with several organizations, including NSW Fisheries and NSW National Parks and Wildlife Service (NPWS), was formed and the Tomago site was incorporated into the KWRP. From 1984 until 1993 the Tomago Wetlands received little attention. Implementation of the recommendation to open the tidal gates to restore saltmarsh did not occur until 2008 following a long and arduous approval process. In October of that year a SmartGate system (SG system) to automatically control the amount of water within a flood mitigation network based on real-time environmental parameters was commissioned by the University of New South Wales Water Research Laboratory (WRL) and the plan to restore migratory shorebird and fish habitat finally made progress. The SG system allowed tidal flushing of approximately 100 ha of the Wetlands (WRL website accessed May 2012). However, due to a breach in a levee protecting private land, the SG system was closed in February 2009 and not reopened until June 2010. Since then the SG system has been periodically closed by the managers, NPWS, due to various, unavoidable circumstances.

In response to the plan to reinstate tidal flushing to part of the Tomago Wetlands, the Hunter Bird Observers Club Inc. (HBOC) decided in 2007 to undertake ongoing monthly surveys to document

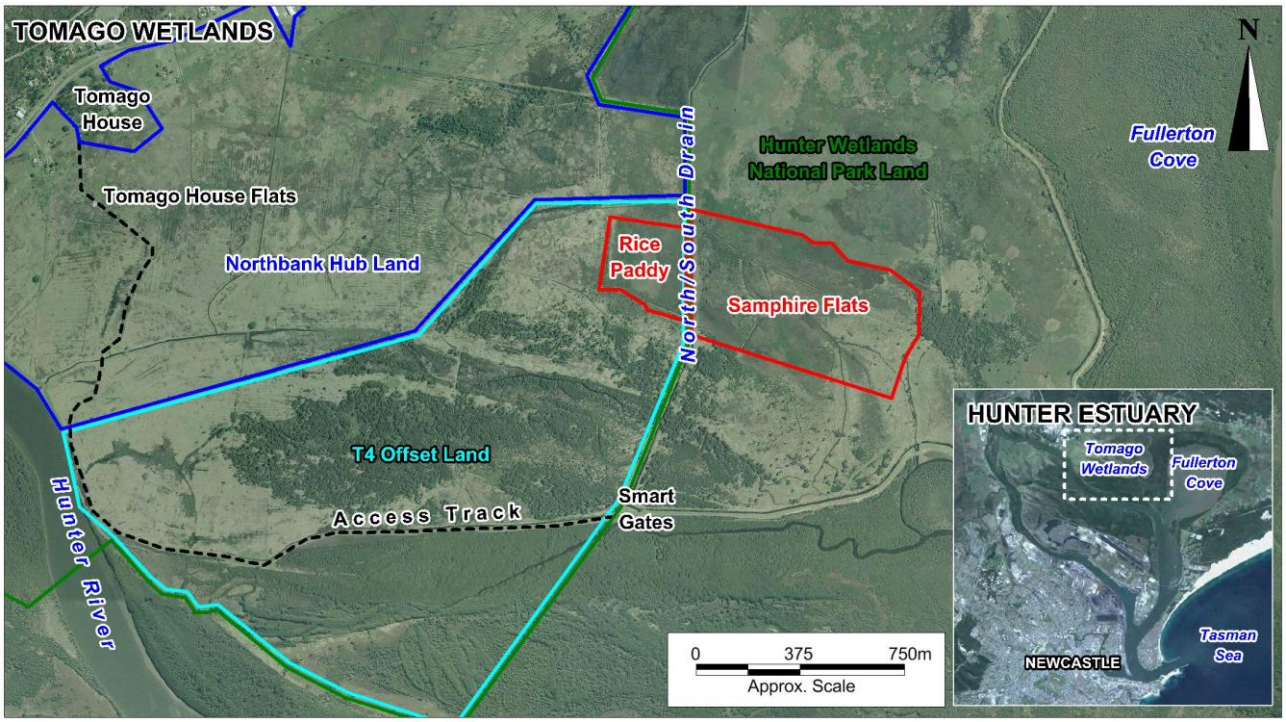

Figure 1. Tomago Wetlands location and sites

Figure 2. Samphire Flats in dry conditions - photo Neville McNaughton

Figure 3. Samphire Flats in flooded conditions - photo Neville McNaughton

changes in avian diversity and abundance, particularly in relation to shorebirds and other waterbirds resulting from the installation of the SG system. It was thought that one measure of success would be to demonstrate the return of waterbirds, and in particular shorebirds, to the Wetlands. The initial HBOC surveys before the SG system was implemented provided baseline data showing that very few waterbirds and no shorebirds, other than the Masked Lapwing *Vanellus miles* were using the Wetlands. It is hoped that the results of these surveys will contribute to overall knowledge about the processes of wetland restoration and aid in ongoing management.

THE SITES

Tomago Wetlands 32° 50' 08" S 151° 42' 32" E (**Figure 1**) lie to the west of Fullerton Cove on the North Arm of the Hunter River approximately 9 km north of Newcastle, NSW. They are encompassed by the North/South Drain on the western side, Fullerton Cove on the eastern side, the Hunter River on the southern side and private land and Tomago Road on the northern side.

A preliminary evaluation in early March 2007 resulted in two sites, Rice Paddy and Samphire Flats, being chosen for concentrated survey effort because of their potential importance as wetland habitat for shorebirds. Although Rice Paddy lies outside HWNP, HBOC chose to monitor this site as a result of discussions with NPWS in 2006 which indicated that Rice Paddy would be added to the national park estate and managed for the restoration of shorebird habitat as a replacement of the mudflats lost at Big Pond on Cormorant Road, Kooragang Island. However, the Rice Paddy was recently purchased by Port Waratah Coal Services as part of an offset for the proposed Terminal 4 coal loader and remains outside HWNP. It must be noted that the two sites constitute a relatively small area of the Tomago Wetlands. Two additional sites, adjacent to Rice Paddy and Samphire Flats, named Smart Gates and Tomago House Flats, were also selected for less rigorous monitoring. All sites contain a degree of residual salinity in the soil as they were historically parts of an estuarine and fully tidal system prior to the construction of levees and tidal gates. A detailed description of these four sites follows.

Tomago House Flats site lies outside HWNP. It is an area of degraded floodplain in private ownership and recently rezoned from agricultural to industrial use. Access to the HWNP is gained through the Tomago House Flats site which is not open to the public.

The Smart Gates site includes the access road and a tidal creek which flows into the Hunter River and the mouth of the North/South Drain where the SG system is installed. Mature mangroves line the creek and a stand of Swamp Oak *Casuarina glauca* borders the northern side. Introduced weeds and grass are abundant along the track.

The Rice Paddy, which is on the western side of the North/South Drain, is about 8.4ha and surrounded by a low levee. Approximately 50% is covered in the Common Reed *Phragmites australis* on its eastern side. The western side is more open and the vegetation is a mixture of shorter sedges, grasses and some remnant Samphire *Sarcocornia quinqueflora*. This site is often dry, but becomes wet after heavy rainfall and, at very high tides, when a culvert allows saline water from the North/South drain to enter the area.

Samphire Flats is bordered on the western side by the North/South Drain. At the eastern and southern edges are stands of Swamp Oak and on the northern side there is a band of Common Reed. The site is approximately 35ha. It is open and flat with remnant saltmarsh vegetation, Samphire and Salt Couch *Sporobolus virginicus*, as well as assorted weeds including small patches of the exotic Spiny Rush *Juncus acutus*. Before the SG system was opened, the site was largely dry becoming wet only through rainfall. Since tidal flushing was reinstated the saltmarsh has rejuvenated and seems to be healthy. The band of Common Reed remains unaffected.

SURVEYS

From March 2007 to March 2012, 59 counts were made at monthly intervals with the exception of June and August 2007 when inclement weather prevented access. The surveys took place on the third Tuesday of the month commencing at 7.30 am at Tomago House Flats. Two to four regular and experienced observers were always present, but as many as ten people have taken part in some surveys. Care was taken to not double count the species through discussion during and after the survey. Sightings of species seen outside the regular survey dates have been included only where they contribute to the overall understanding of the avian population.

The survey of Tomago House Flats had two parts and lasted about 45 minutes; firstly the area around Tomago House was surveyed on foot and secondly both sides of the track leading to Smart Gates were surveyed from vehicles. On reaching the Smart Gates site observers surveyed for approximately 30 to 45 minutes. Observers then drove to the Rice Paddy where they both walked around the levee and through the middle of the site in an attempt to flush birds from the vegetation. This took between 60 and 90 minutes. Samphire Flats was monitored on foot with observers spreading out to cover as much ground as possible. The actual coverage depended on the number of people present and typically took 90 to 120 minutes. Species were located by both call and visual observation.

RESULTS

The baseline period was from March 2007 to October 2008; during this time the wetlands were generally dry due to both low rainfall and lack of tidal flushing. In December 2009 the inland drought broke and there was increased heavy rainfall on the east coast of Australia. From October 2008 to June 2010 the SG system was closed. However, during that period rainfall increased so that water levels in the wetlands were lower due to the tidal gates being closed but remained wet due to the increased rainfall. In summary, Samphire Flats and the Rice Paddy were mainly dry until October 2008. Since that time they have been progressively flooded primarily with fresh water intermittently mixed with some saline water. The water level on Samphire Flats has remained largely constant at approximately 0.5m, apart from some drying out during the time the SG system was closed, whereas the Rice Paddy has remained wet but not always flooded.

Figures 2 and **3** show Samphire Flats under dry and flooded conditions.

The constant presence of water, whether from rainfall or tidal flow, resulted in increased numbers and diversity of bird species at Tomago Wetlands as discussed below. The benefit of the SG system will be to allow the Wetlands to be independent of rainfall and provide greater consistency by letting tidal water into the Wetlands even during periods of inconsistent rainfall and when drought conditions return. The surveys after the SG system resumed in June 2010 may not represent the anticipated long-term condition of the Samphire Flat habitat because inundation primarily involved fresh as opposed to estuarine water as a consequence of the exceptionally high rainfall during this period. These factors influencing the ongoing changes in habitat are important to understanding the changes in the bird populations which occurred during the surveys.

The Appendix contains a list of the 131 species seen during the surveys and an indication of the areas where they occurred. A summary of records follows with emphasis on the two wetland sites, Rice Paddy and Samphire Flats. For each species the reporting rate is shown in parentheses as a percentage immediately following the species name (i.e. a species seen on five of the 59 surveys has a reporting rate of 8.5%). The reporting rates apply only to the species observed on Rice Paddy and Samphire Flats.

Waterbirds

Three locally common, breeding species of waterfowl, Black Swan *Cygnus atratus*, Chestnut Teal *Anas castanea* and Pacific Black Duck *Anas superciliosa* were present in small numbers, mostly on Samphire Flats. The maximum count of six Black Swans (23.7%) occurred in May and June 2011 with two birds building a nest in May. Cygnets were seen near the nest in August. The numbers of both Chestnut Teal (8.5%) and Pacific Black Duck (16.9%) built up to 35 in March 2012. In January 2012 a pair of Pacific Black Duck was seen with six ducklings.

The fish-eating species arrived in small numbers from November 2010: Little Pied Cormorant *Microcarbo melanoleucos* (8.5%), Little Black Cormorant *Phalacrocorax sulcirostris* (11.9%), Australasian Darter *Anhinga novaehollandiae* (6.8%) in February 2011, and in February 2012 Australian Pelican *Pelecanus conspicillatus* (3.4%).

Three species of bitterns were seen, Australasian Bittern *Botaurus poiciloptilus*, Australian Little Bittern *Ixobrychus dubius* and Black Bittern *Ixobrychus flavicollis*. The Australasian Bittern (22%) was seen over seven months from April to October 2009 on the Rice Paddy with a maximum of four birds in August and September. Birds were flushed from the stand of Common Reed and, although breeding was not definitely established, its continued presence over this period in the same general area may be indicative of a breeding event. This species was also seen by the authors on a number of occasions outside the survey dates and external to the four survey sites. The Australian Little Bittern was heard on Samphire Flats in

December 2010 outside the survey period and in March 2011 one was seen at exactly the same spot. There was only one sighting of the rare Black Bittern, seen in mature mangroves near the Smart Gates site in April 2011.

Of the four species of egrets observed, only the Eastern Great Egret *Ardea modesta* (39%) was consistently present with a maximum of 10 birds in November 2011. The other three species were seen only once; two Intermediate Egrets *Ardea intermedia* and one Little Egret *Egretta garzetta* in January 2012 and six Cattle Egrets *Ardea ibis* in December 2011.

Both local species of heron were observed with maximum counts of 48 White-faced Herons *Egretta novaehollandiae* (57.6%) in July 2011 and 26 White-necked Herons *Ardea pacifica* (11.9%) in November 2008.

Two species of ibis and one spoonbill occurred during the survey period. Australian White Ibis *Threskiornis molucca* (25.4%), a breeding resident in the Hunter Region (Stuart 2011), increased to a maximum of 130 in November 2011. Small numbers of the inland-breeding Straw-necked Ibis *Threskiornis spinicollis* (10.2%) occurred intermittently with a maximum of 74 in September 2009. After heavy rain broke the drought conditions inland none was seen again until five birds reappeared in November 2011. The Royal Spoonbill *Platalea flavipes* (16.9%) was also an intermittent visitor, with numbers increasing gradually from October 2011 to a maximum of 54 in March 2012.

The first Purple Swamphen *Porphyrio porphyrio* (30.5%) appeared in January 2010 on Samphire Flats with a maximum of 39 in June 2011.

Shorebirds

Two migratory species, Latham's Snipe *Gallinago hardwickii* (11.9%) and Sharp-tailed Sandpiper *Calidris acuminata* (5.1%) were seen in small numbers. Latham's Snipe, maximum of two birds, occurred on both the Rice Paddy and Samphire Flats. Three were seen on a non-survey visit.

Sharp-tailed Sandpiper was seen only on Samphire Flats with a maximum of 26 in December 2009, one juvenile bird in October 2010 and one adult in September 2011. However, outside the survey dates 7, 4, 23 and 35 birds were seen in October 2007, December 2009, January 2010 and October 2011 respectively (A. Lindsey, P. Svoboda and N. McNaughton pers.comm.).

Three species of resident shorebird occurred, but only on Samphire Flats, These included 27 Black-winged Stilts *Himantopus himantopus* (3.4%), the majority of which were in juvenile plumage, in May 2011, and a single record of three Banded Lapwings *Vanellus tricolor,* an uncommon species in the Hunter Region, in October 2007. The Masked Lapwing was more commonly recorded (35.6%) with a maximum of 44 in February 2011.

Other Species

The Stubble Quail *Coturnix pectoralis* (6.8%) and Brown Quail *Coturnix ypsilophora* (10.2%) were seen in small numbers. A sighting of King Quail *Excalfactoria chinensis* was made outside the regular surveys when two birds, male and female, were flushed on Samphire Flats in February 2010 (Stuart 2011). This species is rare in the Hunter Region and previous records in 1994 (Stuart 1995) and in 2000 (Stuart 2001) were from west of the Hunter Estuary.

Eight species of raptor were recorded, the most common being Swamp Harrier *Circus approximans* (71.2%) and Nankeen Kestrel *Falco cenchroides* (42.4%). The increasingly rare Little Eagle *Hieraaetus morphnoides* was seen only once in April 2011. In November 2006 the authors observed a single Spotted Harrier *Circus assimilis* before systematic surveys commenced.

Several species of passerines were recorded over the five years. The maximum of 12 White-fronted Chats *Epthianura albifrons* (18.6%) occurred in June 2008. The Southern Emu-wren *Stipiturus malachurus* (76.3%) was found mostly on the drier edges where, despite some saline influence, Swamp Oak saplings continue to grow, particularly around the Rice Paddy. Parties of up to 12 birds were recorded. The most common passerine was the Golden-headed Cisticola *Cisticola exilis* (100%) followed by Australasian Pipit *Anthus novaeseelandiae* (95%). In 2007, the Brown Songlark *Cincloramphus cruralis* (16.9%) was present for five successive months with a maximum of 7 in October. In that year there was an influx of this species into the Hunter Region including areas as far east as the Hunter Estuary from which it is normally absent (Stuart 2008).

DISCUSSION

The surveys document a gradual increase in the diversity and abundance of waterbirds over the duration of the study. During the baseline period, when the Rice Paddy and Samphire Flats were mainly dry, between two and five species were present. However, mainly as a result of consistent rainfall from December 2009 until March 2012 water was usually present on these sites, particularly in the case of Samphire Flats. The bird populations responded to this change and the number of species increased to a maximum of 10 in January and February 2012. Numbers of birds also increased, but remained modest compared with other wetlands of comparable size (e.g. Ash Island and Morpeth Waste Water Treatment Works (see tables in Stuart 2011) where numbers are regularly ten times higher than those in this study.

The Australasian Bittern, although a rare resident of the Hunter Region (Stuart 2011), is consistently seen over several areas in the Hunter Estuary. Our surveys established that both the Rice Paddy and Samphire Flats are important habitat for this species and there were indications that the Rice Paddy may be a breeding site. It remains to be seen whether future increased presence of salt water resulting from ongoing SG system operation will impact negatively on this species which prefers a freshwater environment. However, as the Rice Paddy will receive salt water intermittently the Australasian Bittern may not be affected at this site.

According to Clarke & van Gessel (1983: 117-144) the open Samphire meadows on the western shore of Fullerton Cove supported a diverse and numerous population of shorebirds including Sharp-tailed Sandpiper, Pacific Golden Plover *Pluvialis fulva*, Latham's Snipe, Common Greenshank *Tringa nebularia*, Marsh Sandpiper *Tringa stagnatilis* and Wood Sandpiper *Tringa glareola*. During the five years of this study, only two species of migratory shorebirds occurred, both only occasionally and in small numbers. Since the process of habitat restoration is ongoing and given the propensity of many shorebird species to return to the same sites despite long absences, albeit for a variety of reasons (Van de Kam *et al*. 2004: 301), it is likely that more species will return in the future. The Sharp-tailed Sandpiper and the Black-winged Stilt are examples of shorebirds which have already indicated their ability to exploit the area opportunistically.

The regular presence of raptors, three of the eight species recorded occurring regularly, is indicative of the value of the Tomago Wetlands. The mix of species and their abundance showed little variation between the periods of wet and dry conditions during our surveys.

The increase in water levels has resulted in a loss of dry habitat supporting passerine species, but edge habitat will remain and this should be sufficient to prevent a loss of species diversity. Water levels in wetlands fluctuate naturally and wetland-dependent passerines seem capable of adapting to prevailing conditions. The White-fronted Chat may benefit from the spread of saltmarsh which is its preferred habitat (NSW Scientific Committee website accessed June 2012).

Four species listed under the *NSW Threatened Species Conservation Act 1995* occurred during the surveys. Australasian Bittern is listed as Endangered and three species, Black Bittern, Little Eagle and White-fronted Chat are listed as Vulnerable. The Australasian Bittern is also listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as Endangered. All migratory shorebirds including the Latham's Snipe and Sharp-tailed Sandpiper are listed under the EPBC Act.

CONCLUSION

When habitat is modified or an attempt is made to restore it to a former condition there is a maturation period associated with the change (Maron *et al*. 2012). In the case of the Samphire Flats area the restoration process has been compromised by two factors. Firstly, the closure of the SG system between February 2009 and June 2010 following the breach of the levee wall, after a mere four months of salt water inundation and secondly, by the abnormally high rainfall throughout the entire period from December 2009 and after June 2010 when the SG system was again operational. Consequently, further changes in the Samphire Flat habitat are anticipated. The assessment of the effectiveness of the Samphire Flat restoration is further complicated by the fact that abnormally wet conditions in inland Australia attracted many species of waterbirds and shorebirds away from the Hunter Region. Rice Paddy is unlikely to return to optimal shorebird habitat unless it is specifically managed with this objective in mind. It will be possible to assess fully

the effectiveness of the Tomago Wetlands Project in the future only when there has been an uninterrupted period of tidal flow to the Wetlands and there is a return to drier climatic conditions, particularly drought, when bird species are forced from the inland and use the Hunter Estuary as a refuge. Our surveys provide promising indications of future success exemplified by 26 White-necked Herons present in November 2008. This species is described as being moderately often recorded as 1-2 birds throughout the Region (Stuart 2009) although larger than usual numbers were recorded in 2008 due to the dry conditions.

Although the restoration project relates to shorebird and fish habitat, it has benefited many other aquatic species. The continuation of regular bird monitoring will contribute to the future management of Tomago Wetlands and increase knowledge about the outcomes of wetland restoration. In the longer term nocturnal surveys could be undertaken to establish whether migratory shorebirds are returning at night to roost as they have done in the past. In view of the loss of wetland habitat in the Hunter Region over the last two hundred years, the restoration of the Tomago Wetlands is an important and positive initiative for the future of wetland avifauna.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge WEPL Investments Pty Limited who gave permission to access the Hunter Wetlands National Park, the Kooragang Wetland Rehabilitation Project who encouraged our endeavours and provided the background information on the history of Tomago Wetlands, and the National Parks and Wildlife Service for permission to survey the area. We thank Peggy Svoboda for reading and commenting on the draft and Dan Williams for creating the map. We particularly thank the many members of the Hunter Bird Observers Club who took part in the surveys. The surveys were led by one of the authors, Neville McNaughton, who was present on all surveys. Other regular observers were P. Svoboda, R. McLean, J. and T. Iverson, A. Gooden and A. Lindsey.

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APPENDIX - Summary of bird species recorded during surveys at Tomago Wetlands

Species	Scientific Name	Survey Days Present	Max. No.	Number of surveys present at sub-sites			
				Rice Paddy	Samphire Flats	Smart Gates	House Flats
Stubble Quail	*Coturnix pectoralis*	6	8	1	4	2	0
Brown Quail	*Coturnix ypsilophora*	7	3	0	6	1	0
King Quail *(1)	*Excalfactoria chinensis*	0	0	0	0	0	0
Black Swan	*Cygnus atratus*	14	9	0	14	0	0
Grey Teal	*Anas gracilis*	2	3	0	0	2	0
Chestnut Teal	*Anas castanea*	38	36	2	3	22	12
Pacific Black Duck	*Anas superciliosa*	42	35	1	14	25	8
Hardhead	*Aythya australis*	1	2	0	0	0	1
Australasian Grebe	*Tachybaptus novaehollandiae*	1	1	0	0	1	0
Rock Dove	*Columba livia*	1	3	0	1	0	0
Crested Pigeon	*Ocyphaps lophotes*	19	3	0	1	3	15
Bar-shouldered	*Geopelia humeralis*	19	2	0	0	11	8
Topknot Pigeon	*Lopholaimus antarcticus*	2	12	0	0	0	2
White-throated Needletail	*Hirundapus caudacutus*	1	2	0	0	0	1
Australasian Darter	*Anhinga novaehollandiae*	19	2	2	2	16	1
Little Pied Cormorant	*Microcarbo melanoleucos*	21	3	1	4	15	4
Great Cormorant	*Phalacrocorax carbo*	4	2	0	0	3	1
Little Black Cormorant	*Phalacrocorax sulcirostris*	22	27	1	7	15	3
Pied Cormorant	*Phalacrocorax varius*	11	5	0	0	8	3
Australian Pelican	*Pelecanus conspicillatus*	5	3	1	1	0	3
Australasian Bittern	*Botaurus poiciloptilus*	14	4	9	3	4	0
Australian Little Bittern (3)	*Ixobrychus dubius*	1	1	0	1	0	0
Black Bittern	*Ixobrychus flavicollis*	1	1	0	0	1	0
White-necked Heron	*Ardea pacifica*	8	26	5	4	1	0
Eastern Great Egret	*Ardea modesta*	32	21	3	22	10	9
Intermediate Egret	*Ardea intermedia*	2	6	0	1	0	1
Cattle Egret	*Ardea ibis*	4	10	0	1	0	3
Striated Heron	*Butorides striata*	2	1	0	0	1	1
White-faced Heron	*Egretta novaehollandiae*	51	48	8	31	14	37
Little Egret	*Egretta garzetta*	1	1	0	1	0	0
Australian White Ibis	*Threskiornis molucca*	32	130	7	12	11	12
Straw-necked Ibis	*Threskiornis spinicollis*	9	74	4	3	3	2
Royal Spoonbill	*Platalea regia*	17	54	5	9	2	6
Eastern Osprey	*Pandion cristatus*	1	1	0	0	0	1
Black-shouldered Kite	*Elanus axillaris*	26	3	5	7	4	13
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	38	2	2	11	13	19
Whistling Kite	*Haliastur sphenurus*	22	4	4	11	8	3
Brahminy Kite	*Haliastur indus*	1	1	0	0	0	1
Brown Goshawk	*Accipter fasciatus*	1	1	0	0	1	0
Spotted Harrier *(4)	*Circus assimilis*	0	0	0	0	0	0
Swamp Harrier	*Circus approximans*	57	5	25	32	22	30
Wedge-tailed Eagle	*Aquila audax*	1	1	0	0	1	0
Little Eagle	*Hieraaetus morphnoides*	1	1	1	0	0	0
Nankeen Kestrel	*Falco cenchroides*	32	2	3	24	5	7
Brown Falcon	*Falco berigora*	5	2	0	3	3	2

Note: * No records for survey dates.
Footnotes (1) to (8) refer to sightings of these birds during visits additional to the surveys.
(1) Two seen at Smart Gates on 13/02/2010.
(2) Single birds at Samphire Flats, Rice Paddy and Smart Gates on five, one and one non-survey occasions respectively.
(3) One seen at Samphire Flats on 29/12/2010.
(4) One seen at Samphire Flats on 18/11/2006.

Summary of bird species recorded during surveys at Tomago Wetlands cont.

Species	Scientific Name	Survey Days Present	Max. No.	Number of surveys present at sub-sites			
				Rice Paddy	Samphire Flats	Smart Gates	House Flats
Australian Hobby	*Falco longipennis*	15	2	4	5	0	7
Peregrine Falcon	*Falco peregrinus*	1	1	0	0	1	0
Purple Swamphen	*Porphyrio porphyrio*	18	39	0	18	0	0
Black-winged Stilt	*Himantopus himantopus*	2	27	0	2	0	0
Banded Lapwing	*Vanellus tricolor*	1	3	0	1	0	0
Masked Lapwing	*Vanellus miles*	35	44	2	20	1	23
Latham's Snipe (5)	*Gallinago hardwickii*	7	2	2	5	1	0
Sharp-tailed Sandpiper (6)	*Calidris acuminata*	3	26	0	3	0	0
Caspian Tern	*Hydroprogne caspia*	3	3	0	0	0	3
Crested Tern	*Thalasseus bergii*	1	1	0	0	0	1
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	3	25	0	1	0	2
Galah	*Eolophus roseicapillus*	23	12	2	0	11	13
Rainbow Lorikeet	*Trichoglossus haematodus*	8	18	0	0	3	6
Scaly-breasted Lorikeet	*Trichoglossus chlorolepidotus*	1	6	0	0	1	0
Eastern Rosella	*Platycercus eximius*	51	14	1	4	22	40
Red-rumped Parrot	*Psephotus haematonotus*	2	2	0	0	1	1
Pheasant Coucal	*Centropus phasianinus*	14	1	2	0	7	10
Eastern Koel	*Eudynamys orientalis*	7	2	0	0	0	7
Channel-billed Cuckoo	*Scythrops novaehollandiae*	13	3	0	0	1	12
Horsfield's Bronze-Cuckoo	*Chalcites basalis*	4	1	1	0	2	1
Shining Bronze-Cuckoo	*Chalcites lucidus*	12	4	0	0	11	1
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	25	3	0	0	22	5
Brush Cuckoo	*Cacomantis variolosus*	3	1	0	0	3	0
Southern Boobook *(7)	*Ninox novaeseelandiae*	0	0	0	0	0	0
Eastern Grass Owl *(8)	*Tyto longimembris*	0	0	0	0	0	0
Azure Kingfisher	*Ceyx azureus*	22	2	0	0	21	2
Laughing Kookaburra	*Dacelo novaeguineae*	14	6	0	1	4	10
Sacred Kingfisher	*Todiramphus sanctus*	23	2	0	1	15	10
Dollarbird	*Eurystomus orientalis*	6	2	0	0	1	5
White-throated Treecreeper	*Cormobates leucophaea*	10	1	0	0	10	0
Superb Fairy-wren	*Malurus cyaneus*	51	21	32	21	40	26
Variegated Fairy-wren	*Malurus lamberti*	4	4	1	1	2	0
Southern Emu-wren	*Stipiturus malachurus*	44	18	38	24	24	9
Brown Gerygone	*Gerygone mouki*	2	5	0	0	0	2
Mangrove Gerygone	*Gerygone levigaster*	6	2	0	0	5	1
Yellow Thornbill	*Acanthiza nana*	19	6	0	3	17	0
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	2	6	0	0	2	0
Brown Thornbill	*Acanthiza pusilla*	9	5	1	3	6	0
Eastern Spinebill	*Acanthorhynchus tenuirostris*	3	1	0	0	3	0
Lewin's Honeyeater	*Meliphaga lewinii*	2	2	0	0	1	1
Yellow-faced Honeyeater	*Lichenostomus chrysops*	12	31	0	2	9	2
White-plumed Honeyeater	*Lichenostomus penicillatus*	2	1	0	0	0	2
Noisy Miner	*Manorina melanocephala*	18	5	0	0	1	17
Red Wattlebird	*Anthochaera carunculata*	4	2	0	0	0	4

Note: * Not seen on survey days.
Footnotes (1) to (8) refer to sightings of these birds during visits additional to the surveys.
(5) Two and three seen at Samphire Flats on 28/12/2009 and 1/10/2011 respectively.
(6) Seven, four, 23 and 35 seen at Samphire Flats on 19/10/2007, 28/12/2009, 2/1/2010 and 1/10/2011 respectively.
(7) One and two recorded at House Flats and Smart Gates on 8/1/2011 and 5/9/2011 respectively.
(8) One seen at Samphire Flats on 14/11/2011.

Summary of bird species recorded during surveys at Tomago Wetlands cont.

Species	Scientific Name	Survey Days Present	Max. No.	Number of surveys present at sub-sites			
				Rice Paddy	Samphire Flats	Smart Gates	House Flats
White-fronted Chat	*Epthianura albifrons*	12	12	0	11	1	0
Scarlet Honeyeater	*Myzomela sanguinolenta*	2	2	0	0	2	0
Brown Honeyeater	*Lichmera indistincta*	30	5	0	0	29	1
Noisy Friarbird	*Philemon corniculatus*	9	100	0	0	9	0
Striped Honeyeater	*Plectorhyncha lanceolata*	40	3	0	10	36	3
Eastern Whipbird	*Psophodes olivaceus*	3	1	0	0	1	2
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	35	6	5	9	20	10
White-winged Triller	*Lalage sueurii*	1	1	0	0	0	1
Golden Whistler	*Pachycephala pectoralis*	24	2	0	0	21	3
Rufous Whistler	*Pachycephala rufiventris*	18	2	0	2	12	4
Grey Shrike-thrush	*Colluricincla harmonica*	30	6	0	7	26	3
Australasian Figbird	*Sphecotheres vieilloti*	5	3	0	0	0	5
Olive-backed Oriole	*Oriolus sagittatus*	18	5	0	7	11	2
White-breasted Woodswallow	*Artamus leucorynchus*	6	5	1	0	2	3
Grey Butcherbird	*Cracticus torquatus*	39	5	0	6	31	10
Pied Butcherbird	*Cracticus nigrogularis*	33	5	1	10	8	23
Australian Magpie	*Cracticus tibicen*	48	30	13	30	17	41
Pied Currawong	*Strepera graculina*	10	8	0	0	2	9
Spangled Drongo	*Dicrurus bracteatus*	5	2	0	0	6	1
Rufous Fantail	*Rhipidura rufifrons*	1	1	0	0	1	0
Grey Fantail	*Rhipidura albiscapa*	37	6	2	4	37	7
Willie Wagtail	*Rhipidura leucophrys*	16	4	4	6	5	5
Australian Raven	*Corvus coronoides*	43	9	7	9	21	22
Torresian Crow	*Corvus orru*	5	2	0	2	2	1
Leaden Flycatcher	*Myiagra rubecula*	2	2	0	0	1	1
Magpie-lark	*Grallina cyanoleuca*	25	10	4	14	6	8
Eastern Yellow Robin	*Eopsaltria australis*	13	3	0	0	12	2
Golden-headed Cisticola	*Cisticola exilis*	59	36	57	51	26	13
Australian Reed-Warbler	*Acrocephalus australis*	24	4	9	3	11	2
Tawny Grassbird	*Megalurus timoriensis*	55	7	30	20	26	15
Little Grassbird	*Megalurus gramineus*	47	12	37	14	18	14
Brown Songlark	*Cincloramphus cruralis*	10	7	1	9	0	0
Silvereye	*Zosterops lateralis*	37	33	1	1	31	9
Welcome Swallow	*Hirundo neoxena*	24	50	2	13	10	1
Fairy Martin	*Petrochelidon ariel*	10	40	2	6	5	0
Tree Martin	*Petrochelidon nigricans*	5	100	1	1	3	0
Common Starling	*Sturnus vulgaris*	2	2	0	0	0	2
Common Myna	*Sturnus tristis*	7	2	0	0	0	7
Mistletoebird	*Dicaeum hirundinaceum*	25	3	0	0	25	0
Red-browed Finch	*Neochmia temporalis*	23	25	0	0	16	6
Chestnut-breasted Mannikin	*Lonchura castaneothorax*	10	12	0	0	1	9
Australasian Pipit	*Anthus novaeseelandiae*	56	14	18	56	4	24
European Goldfinch	*Carduelis carduelis*	1	2	0	0	1	0