



Birdlife at Belmont Lagoon Wetlands 2015-2020

Grahame Feletti

Hunter Bird Observers Club Special Report No. 10

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Cover Photo: Avian species of coastal wetlands feeding on Belmont Lagoon. (Photographer: Grahame Feletti)

Ideal conditions on a summer morning (31 December 2015) to observe groups of wetland birds feeding on the Lagoon. Species in the foreground include Little Egret, Intermediate Egret and Great Egret, Royal Spoonbill, Silver Gull and Australian Pelican. Behind this group a separate flock of Australian Pelican is engaged in cooperative feeding on small fish, along with Little Black Cormorant and Silver Gull. Further north in the distance a flock of Black Swan is feeding on lake-grass. This photo illustrates not only the abundance and diversity of avian species using the Lagoon, but also the wide range in dietary needs provided by this relatively shallow, saltwater habitat. Two other features worth noting are the man-made peninsula on the right, a legacy of BHP's John Darling coal mines built under the Lagoon last century, and the tall rim of Broad-leaf Paperbark trees – part of a remnant forest swamp, on the Lagoon's northern side.

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Table of Contents

	Page No.
Summary	1
Introduction	1
Methods	1
Results	2
Most Common species	2
Common species	4
Least common species	5
Update on waterbird species	7
Discussion and Conclusion	9
Acknowledgements	10
Appendix: Native birds listed by species taxonomical order	11

Summary

This Special Report presents updated results from bird surveys conducted around Belmont Lagoon and Wetlands from 2015-2020. Avian species included 83 coastal woodland and 37 coastal wetland species. Sizeable numbers of *Most-common* and *Common* species appear for both these groups. *Least common* species represent 50 per cent of all observed species, indicating the attraction of the Lagoon and Wetlands to many birds despite the salinity. The predominance of woodland species may be linked to replanting and maturation of adjacent coastal woodlands. The number and diversity of wetland species compare favourably with previous bird studies in the area, despite some significant hydrological changes to several freshwater sites in the past 75 years.

Introduction

Two recent studies, *Birdlife at Belmont Lagoon*¹ and *Birdlife at Belmont Wetlands State Park*² reported on coastal wetland, woodland and raptor species observed on 37 surveys from April 2015 to May 2016 at Belmont Lagoon and 73 surveys from April 2015 to December 2017 at Belmont Wetlands. The first study also compared its findings with a list of birds observed at Belmont Lagoon³ 50 years earlier.

The aims of this report are:

- to update the findings of recent surveys
- to compare the updated recent findings with those from 50 years ago
- to guide observations by bird-watchers and conservation by recreation planners that assists the enjoyment of this natural asset of Lake Macquarie.

Methods

Surveys started on 6th April 2015 and continued 2-3 weeks apart until 30th March 2020 using the same route, observer (GF), and time of day (see Methods of previous study¹). This report analyses data for the 5-year study period. Data from 128 bird surveys were entered on Excel spreadsheets and results calculated using its statistical software programs.

To help understand each species' use of this coastal wetland and surrounding woodland, data analyses include **Maximum** birds recorded each survey, **Mean** (from surveys it was recorded), **Count** (number of surveys it was recorded) and **Reporting Rate** (RR%: percentage of 128 surveys it was recorded in the 5-year period). Species were listed in decreasing order of Reporting Rate, and then RR% was used to define three species groups: *Most Common*: 80-100%; *Common*: 20-79%; and *Least Common*: 1-19%. *Woodland (wo)* and *Wetlands (we)* species were indicated separately in each of these sub-groups to assist in assessing their use of this coastal habitat. Species are also listed in standard taxonomical order in the Appendix.

¹ Feletti, G. (2016) Birdlife at Belmont Lagoon. *The Whistler*, 10, 28-32. Hunter Bird Observers Club, Inc.

² Feletti, G. (2018) Birdlife at Belmont Wetlands State Park. *The Whistler* 12, 43-49.

³ Holmes, G. (1973) Birds of Belmont Lagoon. *Hunter Natural History*, May, 125-26.

Belmont Lagoon (33°02'39"S, 151°39'48"E) lies between the Pacific Ocean and Lake Macquarie in the community of Belmont, NSW. Survey maps⁴ first described it as a freshwater site, part of an extensive coastal wetlands connected with north-eastern Lake Macquarie. More recently⁵, ecologists described it as *estuarine/palustrine* with several local saline/brackish wetlands contributing to it after heavy rainfall. In 1942 the Lagoon was engineered into two segments⁶, split by a dirt path and ditch (Cold Tea canal). Pipes then enabled tidal water interchange between it and the Lake. The Lagoon is now saltwater.



The landscape is dominated by Swamp She-oak *Casuarina glauca*, Broad-leaf Paperbark *Melaleuca quinquenervia* and Coast Banksia *Banksia integrifolia* plus wet heath species Crimson Bottlebrush *Callistemon citrinus* and Swamp Paperbark *Melaleuca ericifolia*. Since WW2 Grey Mangrove (*Avicenna marina*) has steadily emerged along the muddy canal banks and around the Lagoon's intertidal zones.

Results

120 native bird species, comprising 37 coastal wetland and 83 coastal woodland species, were recorded within a 500m radius of the Lagoon's centre. This area includes tracks and light woodland.

OVERVIEW TABLE Wetland and woodland species grouped by reporting rate

<i>Species Group</i> (defined by <i>Reporting Rate</i>)	<i>Coastal Wetlands</i>	<i>Coastal Woodlands</i>	<i>Combined Total</i>	Refer to
<i>Most Common</i> (80-100)	6 (5%)	10 (8.3%)	16 (13.3%)	Table 1
<i>Common</i> (20-79)	14 (12%)	30 (25%)	44 (37%)	Table 2
<i>Least Common</i> (1-19)	17 (14%)	43 (36%)	60 (50%)	Table 3
Total species	37 (31%)	83 (69%)	120 (100%)	Appendix

The Overview Table gives the observed number (and %) of wetland and woodland species over the five-year study. Note, the total number (83) of coastal woodland species observed around the Lagoon is at least double the total number of wetland species seen (37). This ratio for woodland to wetland species is similar within each sub-group of species (*Most Common*, *Common*, and *Least Common*).

Most Common Species

There are 16 species in this *Most Common* group, 10 woodland and 6 wetland species. Their high Reporting Rates (80-98%) effectively confirm their 'local resident' status but daily observations also noted these are 'locally nomadic' in feeding, breeding, roosting and sheltering in the surrounding area.

⁴ Crown Plan N174-2111 Surveyor William Biden's map transmitted to the NSW Surveyor-General on 30 Dec 1874

⁵ Winning, G and K. Markwell (1989) *Lake Macquarie wetlands inventory*. Report prepared for Lake Macquarie City Council by Shortland Wetlands Centre. Unpublished.

⁶ https://en.wikipedia.org/wiki/Belmont_Anti-Tank_Ditch

This includes Belmont Lagoon, Cold Tea Canal and Lake Macquarie, and in brackish lagoons and coastal vegetation on the hind dunes at Belmont Wetlands State Park⁷.

Table 1 below shows the diversity of this group of woodland (*wo*) and wetland (*we*) species in avian taxonomy. The abundance of each species is reflected by the larger numbers observed in Max and Mean columns.

Maximum numbers for Black Swan, Little Black Cormorant and Silver Gull species indicate that sizeable flocks were observed feeding on the Lagoon. But for Lewin's Honeyeater and Eastern Whipbird, a large Max is the sum of many single birds, pairs or small groups seen or heard calling on the 3 km survey trail.

The annual abundance and diversity of its woodland species indicate that Belmont Lagoon and environs cater daily to their dietary needs via the flora and small inhabitants of its remnant forests. A similar kind of provision (small molluscs, crustaceans, fish, insects) occurs in the preferred diets of wetlands species.

'Feeding frenzies' (defined here as a number of birds foraging actively and close together) were commonly observed in season for some woodland species. Rainbow Lorikeets, Little Wattlebirds and White-cheeked Honeyeaters congregated noisily in flowering Melaleuca, Banksia and Eucalypt species particularly those at the Highway end of the Cold Tea Canal track.

A similar form of 'feeding frenzy' was observed for some of these wetland species. This was a more time-limited, active pursuit of prey, usually started by birds of one species in one part of the lagoon. Other species soon joined in. Little Black Cormorants were noted chasing schools of fish-fry in these open waters. Early morning surveys in summer noted inter-species groups of Herons, Egrets, Cormorants, Pelicans and Gulls engaged in this activity.

TABLE 1 Most Common Species observed at Belmont Lagoon 2015-2020: woodland (*wo*) and wetland (*we*) species are indicated, their Maximum and Mean abundance, the Count of surveys they were sighted on and their Reporting Rate (%) for the entire survey.

Common Name	Scientific Name	Max	Mean	Count	RR(%)
Little Wattlebird <i>wo</i>	<i>Anthochaera chrysoptera</i>	32	7.3	126	98
Eastern Whipbird <i>wo</i>	<i>Psophodes olivaceus</i>	16	5.5	124	97
Australian Magpie <i>wo</i>	<i>Cracticus tibicen</i>	27	8.2	124	97
Little Black Cormorant <i>we</i>	<i>Phalacrocorax sulcirostris</i>	400	20.1	122	95
Chestnut Teal <i>we</i>	<i>Anas castanea</i>	64	25.0	120	94
Silver Gull <i>we</i>	<i>Chroicocephalus novaehollandiae</i>	204	20.1	120	94
Little Pied Cormorant <i>we</i>	<i>Microcarbo melanoleuco</i>	28	5.5	117	91
Australian Raven <i>wo</i>	<i>Corvus coronoides</i>	16	3.8	116	91
Lewin's Honeyeater <i>wo</i>	<i>Meliphaga lewinii</i>	9	3.1	114	89
Black Swan <i>we</i>	<i>Cygnus atratus</i>	256	43.3	113	88
White-cheeked Honeyeater <i>wo</i>	<i>Phylidonyris niger</i>	77	8.1	113	88
Grey Butcherbird <i>wo</i>	<i>Cracticus torquatus</i>	8	2.6	109	85
Crested Pigeon <i>wo</i>	<i>Ocyphaps lophotes</i>	12	4.1	108	84
Rainbow Lorikeet <i>wo</i>	<i>Trichoglossus moluccanus</i>	49	8.6	105	82
Welcome Swallow <i>we</i>	<i>Hirundo neoxena</i>	62	6.3	105	82
Red-browed Finch <i>wo</i>	<i>Aegintha temporalis</i>	60	12.1	103	80

⁷ BWSP Trust (2010) Belmont Wetlands State Park Trust Final Plan of Management. Section 6.0. Condition of Land. https://www.industry.nsw.gov.au/data/assets/pdf_file/0019/175051/Belmont-wetlands-state-park-pom-january-2010.pdf. Accessed 12/8/2016

Common Species

The *Common Species* group was defined (post hoc) by Reporting Rates of 20-79%, which represent 37% of all observed species. Listed by decreasing RR% in Table 2 are 30 coastal woodland and 14 coastal wetland species. These 44 species also accentuate the taxonomic diversity of birds observed at this coastal habitat.

This group includes breeding migrant species (Dollarbird, Eastern Koel, Olive-backed Oriole, White-breasted Woodswallow), local nomadic species (Australian Wood Duck, Pacific Black Duck, Intermediate Egret), and seasonal migrants (Yellow Thornbill, Pied Currawong, Silvereve). Other species (Little Corella) now appear to ‘winter-over’ around the Lagoon and Lake Macquarie, due to suburban factors and resources.

Sizeable numbers (Maximum) recorded on a survey more likely indicate a species’ abundance around the Lagoon than a feeding frenzy. Their higher Mean, lower Count and Reporting Rate may indicate a species’ annual migration through this area (Silvereve, honeyeater ssp.), or breeding migrants returning to the area (White-breasted Woodswallow, Eastern Koel, Black-faced Cuckoo-shrike). For some species (Australian Pelican, Grey Teal, Bar-shouldered Dove) the large numbers observed reflect the importance of the Lagoon for different needs.

Manually tracing these survey data in each year and checking species information in Hunter Region Annual Bird Reports⁸ revealed most of these species were ‘resident’ in the wider Hunter region. Many are nomadic with erratic migration patterns dependent on climatic conditions. Other species appear to move seasonally to this area (spring-summer or winter-spring) or annually to breed (Black-faced Cuckoo-shrike), to winter-over (Pied Currawong), or to avoid drought conditions elsewhere (Grey Teal).

Diet preferences of the 44 species in this group further illustrate the diversity and abundance of food sources available around the Lagoon (eg. diets of ducks in this group illustrate diet diversity⁹).

TABLE 2 Common Species observed at Belmont Lagoon 2015-2020: woodland (*wo*) and wetland (*we*) species are indicated, their Maximum and Mean abundance, the Count of surveys they were sighted on and their Reporting Rate (%) for the entire study period.

Common Name	Scientific Name	Max	Mean	Count	RR(%)
Grey Fantail <i>wo</i>	<i>Rhipidura albiscapa</i>	14	3.2	101	79
Spotted Dove <i>wo</i>	<i>Streptopelia chinensis</i>	11	2.6	99	77
Australian Wood Duck <i>we</i>	<i>Chenonetta jubata</i>	40	7.0	98	77
Australian Pelican <i>we</i>	<i>Pelecanus conspicillatus</i>	71	10.4	97	76
Bar-shouldered Dove <i>wo</i>	<i>Geopelia humeralis</i>	28	5.0	95	74
Striped Honeyeater <i>wo</i>	<i>Plectorhyncha lanceolata</i>	15	3.6	93	73
Magpie-lark <i>wo</i>	<i>Grallina cyanoleuca</i>	9	2.8	91	71
Willie Wagtail <i>wo</i>	<i>Rhipidura leucophrys</i>	8	2.6	87	68
Brown Thornbill <i>wo</i>	<i>Acanthiza pusilla</i>	19	3.8	86	67
Great Egret <i>we</i>	<i>Ardea modesta</i>	16	3.4	84	66
Little Corella <i>wo</i>	<i>Cacatua sanguinea</i>	100	15.3	84	66
Pacific Black Duck <i>we</i>	<i>Anas superciliosa</i>	18	3.5	81	63
White-browed Scrubwren <i>wo</i>	<i>Sericornis frontalis</i>	12	3.4	79	62
Brown Honeyeater <i>wo</i>	<i>Lichmera indistincta</i>	11	2.8	76	59

⁸ Williams, D. (Ed.) (2019). *Hunter Region Annual Bird Report Number 26 (2018)*, Hunter Bird Observers Club Inc., New Lambton, Australia.

⁹ Schodde, R. and Tidemann, S.C. (eds.) *The Reader’s Digest Complete Book of Australian Birds (2nd Ed.)*. Reader’s Digest Services Pty Ltd. Surry Hills, Australia. 1986. pp.150-52.

White-faced Heron <i>we</i>	<i>Egretta novaehollandiae</i>	11	2.0	70	55
White-breasted Woodswallow <i>wo</i>	<i>Artamus leucorhynchus</i>	48	10.9	70	55
Superb Fairy-wren <i>wo</i>	<i>Malurus cyaneus</i>	24	4.8	69	54
Laughing Kookaburra <i>wo</i>	<i>Dacelo novaeguineae</i>	9	2.7	65	51
Common Myna <i>wo</i>	<i>Sturnis tristis</i>	37	5.0	63	49
Pied Currawong <i>wo</i>	<i>Strepera graculina</i>	7	1.6	61	48
Intermediate Egret <i>we</i>	<i>Ardea intermedia</i>	17	4.0	60	47
Silvereye <i>wo</i>	<i>Zosterops lateralis</i>	100	12.2	60	47
Little Egret <i>we</i>	<i>Egretta garzetta</i>	20	3.9	59	46
Black-faced Cuckoo-shrike <i>wo</i>	<i>Coracina novaehollandiae</i>	10	2.1	58	45
Australian White Ibis <i>we</i>	<i>Threskiornis Molucca</i>	15	3.0	56	44
Olive backed Oriole <i>wo</i>	<i>Oriolus sagittatus</i>	9	2.4	55	43
Noisy Miner <i>wo</i>	<i>Manorina melanocephala</i>	10	2.9	54	42
Yellow Thornbill <i>wo</i>	<i>Acanthiza nana</i>	13	3.6	49	38
Great Cormorant <i>we</i>	<i>Phalacrocorax carbo</i>	4	1.8	48	38
Grey Teal <i>we</i>	<i>Anas gracilis</i>	32	6.8	45	35
Masked Lapwing <i>we</i>	<i>Valenellus miles</i>	12	2.8	45	35
Rufous Whistler <i>wo</i>	<i>Pachycephala rufiventris</i>	8	2.3	45	35
Australasian Figbird <i>wo</i>	<i>Sphecotheres vielloti</i>	20	3.2	43	34
Galah <i>wo</i>	<i>Eolophus roseicapillus</i>	32	7.0	42	33
Eastern Koel <i>wo</i>	<i>Eudnamys orientalis</i>	3	1.7	38	30
Striated Heron <i>we</i>	<i>Butorides striata</i>	3	1.2	37	29
Black-winged Stilt <i>we</i>	<i>Himantopus himantopus</i>	15	4.6	36	28
Brush Bronzewing <i>wo</i>	<i>Phaps elegans</i>	7	2.4	34	27
Pheasant Coucal <i>wo</i>	<i>Centropus phasianinus</i>	4	1.5	30	23
Royal Spoonbill <i>we</i>	<i>Platalea regia</i>	12	2.8	30	23
Yellow-faced Honeyeater <i>wo</i>	<i>Lichenostomus chrysops</i>	52	8.9	29	23
Eastern Spinebill <i>wo</i>	<i>Acanthorhynchus tenuirostris</i>	6	2.2	26	20
Fan-tailed Cuckoo <i>wo</i>	<i>Cacomantis flabelliformis</i>	2	1.2	25	20
Dollarbird <i>wo</i>	<i>Eurystomus orientalis</i>	7	2.1	25	20

Least Common species

In the Overview Table Least-Common species (RR<20%) accounted for half (60) the total number of species observed. Table 3 identifies these species. The RH column also shows that 24 species were noted on only one or two surveys over the five-year study (RR=1-2%).

There are 8 raptor species in this group. Osprey and White-bellied Sea Eagle have been recorded (by GF) or photographed by Rangers at other times and days hawking and fishing around the lagoon and beach.

Freshwater species (Purple Swamphen, Black-fronted Dotterel, Australasian Grebe and Straw-necked Ibis) were observed after rain, foraging on exposed mudflats in different parts of the Lagoon.

White-throated Needletail and Fork-tailed Swift are annual aerial migrants, coded as woodland species. They were reported in good numbers using or flying over the Lagoon on several surveys in 2016-18, but few have been noted more recently.

This group of 60 species is also taxonomically and behaviourally diverse. It includes breeding migrants (woodswallows), locally nomadic birds with large territories (raptors), and seasonal migrants (Dollarbird, Olive-backed Oriole). The significant maximum number given for some species from several consecutive surveys indicates migrating flocks (honeyeaters) passing through this habitat, using it like an oasis. An

unusual and brief observation was a pair of Glossy Black-Cockatoo feeding on *Casuarina glauca* on the air-vent peninsula of the Lagoon one morning (11/3/20).

Diet preferences of these 60 species also illustrate the diversity and abundance of food sources available to both woodland and wetland species at this Lagoon and its environs⁹.

TABLE 3 Least Common Species observed at Belmont Lagoon 2015-2020: woodland (*wo*) and wetland (*we*) species are indicated, their Maximum and Mean abundance, the Count of surveys they were sighted on and their Reporting Rate (%) for the entire study.

Common Name	Scientific Name	Max	Mean	Count	RR(%)
Eastern Rosella <i>wo</i>	<i>Platycercus eximius</i>	6	2.1	23	18
Golden Whistler <i>wo</i>	<i>Pachycephala pectoralis</i>	4	1.5	23	18
Black-shouldered Kite <i>wo</i>	<i>Elanus axillaris</i>	2	1.1	22	17
Brown Quail <i>wo</i>	<i>Coternix ypsilophora</i>	8	3.3	20	16
Osprey <i>we</i>	<i>Pandion cristatus</i>	2	1.2	19	15
Grey Shrike-thrush <i>wo</i>	<i>Colluricincla harmonica</i>	4	1.3	19	15
White-bellied Sea-Eagle <i>we</i>	<i>Haliaeetus leucogaster</i>	2	1.2	17	13
Sacred Kingfisher <i>we</i>	<i>Todiramphus sanctus</i>	4	1.5	17	13
Red Wattlebird <i>wo</i>	<i>Anthochaera carunculata</i>	5	1.8	17	13
Pied Butcherbird <i>wo</i>	<i>Cracticus nigrogularis</i>	10	2.3	16	13
Channel-billed Cuckoo <i>wo</i>	<i>Scythrops novaehollandiae</i>	5	1.8	15	12
Crested Tern <i>we</i>	<i>Thalasseus bergii</i>	3	1.6	15	12
Australasian Darter <i>we</i>	<i>Anhinga novaehollandiae</i>	2	1.1	14	11
Grey Goshawk <i>wo</i>	<i>Accipiter novaehollandiae</i>	1	1.0	14	11
Sulphur-crested Cockatoo <i>wo</i>	<i>Cacatua galerita</i>	3	1.5	14	11
Eastern Yellow Robin <i>wo</i>	<i>Eopsaltria australis</i>	2	1.5	13	10
Caspian Tern <i>we</i>	<i>Hydroprogne caspia</i>	3	1.3	12	9
Yellow-tailed Black-Cockatoo <i>wo</i>	<i>Calyptorhynchus funereus</i>	6	2.3	12	9
Scarlet Honeyeater <i>wo</i>	<i>Myzomela sanguinolenta</i>	18	5.4	12	9
Blue-faced Honeyeater <i>wo</i>	<i>Entomyzon cyanotis</i>	3	2.2	10	8
Tawny Grassbird <i>wo</i>	<i>Megalurus timoriensis</i>	2	1.1	10	8
Common Starling <i>wo</i>	<i>Sturnus vulgaris</i>	13	4.1	10	8
Pied Cormorant <i>we</i>	<i>Phalacrocorax varius</i>	6	1.9	9	7
Variegated Fairy-wren <i>wo</i>	<i>Malarus lamberti</i>	8	3.4	8	6
Striated Thornbill <i>wo</i>	<i>Acanthiza lineata</i>	8	4.1	7	5
White-throated Needle-tail <i>wo</i>	<i>Hirundapus caudacutus</i>	120	41.2	6	5
Brown Goshawk <i>wo</i>	<i>Accipiter fasciatus</i>	2	1.2	6	5
Purple Swamphen <i>we</i>	<i>Porphyrio porphyrio</i>	3	1.8	5	4
Red-necked Avocet <i>we</i>	<i>Recurvirostra novaehollandiae</i>	30	15.0	5	4
Swamp Harrier <i>we</i>	<i>Circus approximans</i>	1	1.0	5	4
Australian Reed-Warbler <i>we</i>	<i>Acrocephalus australis</i>	4	1.6	5	4
Australasian Grebe <i>we</i>	<i>Tachybaptus novaehollandiae</i>	2	1.5	4	3
Shining Bronze-Cuckoo <i>wo</i>	<i>Chalcites lucidus</i>	2	1.5	4	3
White-throated Treecreeper <i>wo</i>	<i>Cormobates leucophaea</i>	1	1.0	4	3
White-naped Honeyeater <i>wo</i>	<i>Melithreptus lunatus</i>	40	18.5	4	3
Mangrove Gerygone <i>we</i>	<i>Gerygone levigaster</i>	8	2.8	4	3
Fork-tailed Swift <i>wo</i>	<i>Apus pacificus</i>	31	23.7	3	2
Bar-tailed Godwit <i>we</i>	<i>Limosa lipponica</i>	11	7.3	3	2
Noisy Friarbird <i>wo</i>	<i>Philemon corniculatus</i>	22	8.3	3	2

Brown Cuckoo-Dove <i>wo</i>	<i>Macropygia amboinensis</i>	2	1.5	2	2
Horsfield's Bronze-Cuckoo <i>wo</i>	<i>Chalcites basalis</i>	3	2.0	2	2
Straw-necked Ibis <i>we</i>	<i>Threskiornis spinicollis</i>	10	5.5	2	2
Nankeen Kestrel <i>wo</i>	<i>Falco cenchroides</i>	1	1.0	2	2
Southern Emu-wren <i>wo</i>	<i>Stipiturus malachurus</i>	2	1.5	2	2
Buff-rumped Thornbill <i>wo</i>	<i>Acanthiza chrysorrhoa</i>	2	1.5	2	2
Tree Martin <i>wo</i>	<i>Petrochelidon nigricans</i>	2	1.5	2	2
Wonga Pigeon <i>wo</i>	<i>Leucosarcia picata</i>	1	1.0	1	1
Australian Pied Oystercatcher <i>we</i>	<i>Haematopus longirostris</i>	1	1.0	1	1
Black-fronted Dotterel <i>we</i>	<i>Elseyornis melanops</i>	1	1.0	1	1
Black Kite <i>wo</i>	<i>Milvus migrans</i>	1	1.0	1	1
Glossy Black-Cockatoo <i>wo</i>	<i>Caliptorhynchus lathamii</i>	2	2.0	1	1
Red-rumped Parrot <i>wo</i>	<i>Psephotus haematonotus</i>	1	1.0	1	1
Musk Lorikeet <i>wo</i>	<i>Glossopsitta concinna</i>	6	6.0	1	1
Scaly-breasted Lorikeet <i>wo</i>	<i>Trichoglossus chlorolepidotus</i>	2	2.0	1	1
Striated Pardalote <i>wo</i>	<i>Pardalotus striatus</i>	1	1.0	1	1
White-winged Triller <i>wo</i>	<i>Lalage sueurii</i>	1	1.0	1	1
White-browed Woodswallow <i>wo</i>	<i>Artamus superciliosus</i>	10	10.0	1	1
Rufous Fantail <i>wo</i>	<i>Rhipidura rufifrons</i>	1	1.0	1	1
Black-faced Monarch <i>wo</i>	<i>Monarcha melanopsis</i>	1	1.0	1	1
Rose Robin <i>wo</i>	<i>Petroica rosea</i>	1	1.0	1	1

Update on waterbird species

The list of bird species resulting from casual observations by Holmes around Belmont Lagoon in 1973³ included waterbird species not recorded (by GF) in 2016¹. Holmes also added his notes on maximum numbers and roughly where some of those birds were seen. His data are in the two left-hand columns of Table 4 below. The right-hand columns present additional more recent sightings from local bird-watchers.

This Table shows that some species recorded at the Lagoon by Holmes in 1973 still visit the Hunter region. Several have been sighted locally, in the wider wetlands area of north-east Lake Macquarie.

Two species recorded by Holmes but not recently observed at the Lagoon are on the list of *Threatened Species* for the Hunter region¹⁰: Great Knot and Curlew Sandpiper. Four listed by Holmes are species of *Special Interest* (Cat. 2) for the Hunter: Red Knot, Common Sandpiper, Little Tern and Whiskered Tern. References to recorded sightings of these species in other parts of the Hunter Region in 2018 are given below, citing more specific details in Williams⁸.

Table 4 Waterbird species reported in 1973 v. 2020

Seen in 1968-73	Comments/location	Seen in 2015-20	Comments/location
Nankeen Night-heron <i>Nycticorax caledonicus</i>	Holmes notes	2 (GF) 29Jan 20	Siloam Lagoon N-W corner of Belmont Wetlands State Park
Dusky Moorhen <i>Gallinula tenebrosa</i>	Holmes notes	2 (GF) 29/1/20	Siloam Lagoon N-W corner of Belmont Wetlands State Park
Purple Swamphen <i>Porphyrio porphyrio</i>	Holmes notes	5/5/17, 2/11/17 23,29/1/20 (KW)	Belmont Lagoon N-E mudflats (GF) Siloam Lagoon

¹⁰ <https://www.hbc.org.au/wp-content/uploads/Threatened-species-review-The-Whistler-Vol-10.pdf>
<https://www.environment.nsw.gov.au/threatenedspeciesapp/cmaSearchResults.aspx?SubCmaId=376>

Eurasian Coot <i>Fullica atra</i>	Holmes notes	4 (GF) 23/1/20	Siloam Lagoon N-W corner of Belmont Wetlands State Park
Buff-banded Rail <i>Hypotaenidia philippensis</i>	Infrequently seen on east side of Lagoon	2018 (KW)	Awabakul woodland
Black-fronted Dotterel <i>Euseyornis melanops</i>	Holmes notes	4/1/19 (GF)	Belmont Lagoon N-E mudflats
Whiskered Tern <i>Chlidonias hybrida</i>	Holmes notes		ABR 2018 p.85
Little Tern <i>Sternula albifrons</i>	Holmes notes	12/2018-1/2019 1/2020 (GC)	Sand island opposite Naru Lake Mac Belmont Lagoon (N-E) roosting
Bar-tailed Godwit <i>Limosa lapponica</i>	Holmes noted 39 9/11/69	23/9/19 2015-20 (KW) 8/8/2020	Belmont Lagoon N-E mudflats. Swansea Bridge sandbar Blacksmiths & Marks Point (GF)
Common Greenshank <i>Tringa nebularia</i>	Holmes notes		ABR 2018 p.79
Red Knot <i>Calidris canutus</i>	Holmes noted 8. 11/69		ABR 2018 p.75
Great Knot <i>Calidris tenuirostris</i>	Holmes: 3. 29/11/69 in S-E corner Lagoon		ABR 2018 p. 74
Sharp-tailed Sandpiper <i>Calidris acuminata</i>	Holmes noted		ABR 2018 p.76
Pectoral Sandpiper <i>Calidris melanotis</i>	Holmes: 1. 30/3/69 S-E corner Lagoon		ABR 2018 p.77
Curlew Sandpiper <i>Calidris ferruginea</i>	Holmes noted		ABR 2018 p.76
Australasian Pipit <i>Anthus novaeseelandiae</i>	Holmes noted	2018 (KW)	Woodland near Belmont Golf Course
White-fronted Chat <i>Epthianura albifrons</i>	Holmes noted		ABR 2018 p.118
Black Bittern <i>Ixobrychus flavicollis</i>	Holmes: 1. 16/2/69 S-W corner of Lagoon		ABR 2018 p.59

KW = K. Woodford; GC=G. Carter; GF = G. Feletti.

Besides the same 20 coastal wetlands species listed in both these reports (1973, 2020) the latter identified another 15 coastal wetland species *not* listed by Holmes in 1973: Chestnut Teal, Grey Teal, Australian Wood Duck, Intermediate Egret, Australian White Ibis, Straw-necked Ibis, Striated Heron, Pied Cormorant, Royal Spoonbill, Swamp Harrier, Osprey, Australasian Grebe, Red-necked Avocet, Australasian Darter, Australian Pied Oystercatcher (see Appendix). They are typically saltwater species. The three duck species probably prefer freshwater, but Chestnut Teal is known to regulate its salt intake¹¹.

¹¹ Baudinette, R.V., Norman, F.I. and J. Roberts (1982) Salt gland secretion in saline-acclimated Chestnut Teal, and its relevance to release programs. *Australian Journal of Zoology* 30(3), 407-415.

Discussion and Conclusion

Data collected over the five-year period (2015-2020) offer a contemporary profile of the coastal woodland and wetland species using Belmont Lagoon and its environs. The tally of 120 species observed is conservative (due to survey factors) but it compares favourably with 66 species in 1973 and 28 species in 2003¹².

It is feasible that species on Holmes' list currently not categorized as *Threatened Species* nor of *Special Interest* in the Hunter may return to Belmont Lagoon or its environs. They are: Common Greenshank, Sharp-tailed Sandpiper, and Pectoral Sandpiper.

Some evidence¹³ indicates these 'missing' migratory shorebird species (above) are returning to roost in former strongholds in the Hunter River estuary. This may be due to removal of mangroves blocking their flight-path along sand-spits. It might be feasible to study whether such species will do likewise at Belmont Lagoon if similar changes are made. Most observations of waterbird species feeding or roosting at this site have been in its north-eastern quadrant, furthest from human interference. The construction of new paths or bird-hides at the Lagoon along its western side, or some distance back from its eastern reed marshes, is recommended to reduce disturbance of waterbirds sensitive to human disturbance. Boardwalks¹⁴ would also protect these bird species and fragile saltmarsh plants at its edges.

Previous studies of coastal birdlife in the area can yield useful insights for bird-watching and conservation efforts. Commissioned avifauna reviews have typically provided a list of common species seen in the area plus threatened and endangered species. But these don't provide accurate species counts or population trends and movements. The following insights from a comparison of previous studies with this study may be more helpful.

Belmont Lagoon changed slowly from freshwater to saline from 1942 but its impact on waterbird species in this area is poorly known. Holmes' birdlist in 1973 indicates both freshwater and saltwater species co-habited there. Why there were fewer woodland species listed is not known, but twice as many woodland species were recorded at Belmont Lagoon in 2020. The larger total number of species reflects the ongoing ecological health of these wetlands for birdlife; this almost guarantees that new species will continue to surprise keen bird-watchers at the Lagoon.

Belmont Swamp (33°02'30", 151°40'10") is an adjacent freshwater lagoon that has also changed hydrologically, more recently. Located within Belmont Wetlands State Park it was a brackish/freshwater remnant of the extensive wetlands system from Bennetts Green to Swansea¹⁵. Compared with this study, a similar number of wetland species (113) was observed in Laverick's three-year birdlife study¹⁶. His photographs (1999) show parts of Belmont Swamp were open water. Now it is dry and overgrown with reeds and *Melaleuca* saplings, but temporarily marsh-like after sustained rainfall. A more recent study² identified a large decrease in wetland species and an increased number of woodland species at that habitat.

Birdlife at another secluded and shallow freshwater swamp/lagoon has been observed recently (GPS: 33°1'32"S, 151°40'11"E). It lies within Belmont Wetlands State Park, approx. 2km north of Belmont

¹² Brown, S. (2003) *Wetland Monitoring Program within the Lake Macquarie Catchment*. Banksia Environmental Consultancy (prepared for the Office of the Lake Macquarie and Catchment Coordinator).

¹³ Clarke, T. <https://www.hboc.org.au/conservation/rehabilitation-projects/>

¹⁴ <http://www.wabiz.org/gwelup/lake-gwelup-reserve>

¹⁵ Winning, G. and B. Gilligan (1991). *Wetlands of Lake Macquarie*. Pp.67-73. In J.H. Whitehead, R.W. Kidd, and H.A. Bridgman (Eds.) *Lake Macquarie: an environmental appraisal*. Review Seminar 31 July 1991 Belmont N.S.W.

¹⁶ LMCC (2001). Bird Life Study. Mr. Keith Laverick.3/53/218/001. GB310. (Minutes of the General Business Committee Meeting held on 2 July 2001. Lake Macquarie City Council Meeting 9 July 2001).

Lagoon. On 3 separate visits in heatwave conditions (23/1/20 to 4/2/2020) this wetland appeared one-third full (approx. 100m²). A total of 33 avian species has been listed, most seen on several occasions, and includes woodland and wetland birds not recently observed at Belmont Lagoon.

With more inland species likely to move to the coast during prolonged drought and higher summer maximum temperatures (due to climate change) it is important for coastal wetlands managers to ensure such (open) freshwater sources are sustained - for avifauna and other small native fauna.

Six *Threatened Species*¹⁷ listed as *Vulnerable*, and grouped as *least-common* in this study, were recorded at the Lagoon: Wompoo Fruit Dove, Glossy Black-Cockatoo, Australian Pied Oystercatcher, White-throated Needletail, Eastern Osprey and White-bellied Sea-Eagle. The two raptor species were sighted on other (non-survey) times and dates, searching for prey or feeding. Juveniles of these species were also observed soaring and feeding at other Belmont wetlands sites. An Australian Pied Oystercatcher was observed (31/12/15) with other shorebirds at the Lagoon. In 2019 and 2020 small groups of Pied Oystercatcher have been observed (GF, KW and BWSP Rangers) roosting in 4WD tracks on 9-mile Beach. Another *threatened species*, Dusky Woodswallow¹⁸, was observed breeding at Belmont Swamp, adjacent to the Lagoon, in 2016 and 2017. A pair produced 4 fledglings, which were observed the following spring.

Only three *Species of Interest* were observed at Belmont Lagoon in this period: Brush Bronzewing¹⁹ (reported elsewhere), Fork-tailed Swift, and Northern Mallard (which was observed but not counted).

In conclusion, the results of this study indicate that Belmont Lagoon and its environs continues to support many bird species. The predominance of woodland species may be linked to replanting and maturation in adjacent coastal woodlands, and adjacent freshwater sources. The number and diversity of wetland species compare favourably with previous bird studies in the area, despite some significant hydrological changes to several freshwater sites nearby in the past 75 years.

ACKNOWLEDGEMENTS

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¹⁷ <https://www.environment.nsw.gov.au/threatenedspeciesapp/cmaSearchResults.aspx?SubCmald=376>

¹⁸ Dusky Woodswallow observations at Belmont Wetlands. ABR 2016, p.94; ABR 2017 p.93. See Notable records.

¹⁹ Feletti, G. (2017) Brush Bronzewing at Belmont, NSW: recent field notes. *The Whistler* 11, 57-59.

²⁰ HBOC: L. Date-Huxtable, M. Roderick, A. Stuart, T. Clarke, R. McDonald, K. Wells, J. Cockerell, R. Kyte, S. Owen, B. Farley.

²¹ LMCC: M. McDonald, M. Smith, R. Economos, B. Saint, Lake Mac Printers.

²² BWSP Rangers: C. Smith, K. Radnidge, G. Johnson

APPENDIX NATIVE BIRDS AT BELMONT LAGOON 2015-2020 by species taxonomical order

Common Name	Scientific Name	Max	Mean	Count	RR(%)
Black Swan	<i>Cygnus atratus</i>	256	43.3	113	88
Pacific Black Duck	<i>Anas superciliosa</i>	18	3.5	81	63
Grey Teal	<i>Anas gracilis</i>	32	6.8	45	35
Chestnut Teal	<i>Anas castanea</i>	64	25.0	120	94
Australian Wood Duck	<i>Chenonetta jubata</i>	40	7.0	98	77
Brown Quail	<i>Coternix ypsilophora</i>	8	3.3	20	16
Australasian Grebe	<i>Tachybaptus novaehollandiae</i>	2	1.5	4	3
Spotted Dove	<i>Streptopelia chinensis</i>	11	2.6	99	77
Brown Cuckoo-Dove	<i>Macropygia amboinensis</i>	2	1.5	2	2
Wonga Pigeon	<i>Leucosarcia picata</i>	1	1.0	1	1
Brush Bronzewing	<i>Phaps elegans</i>	7	2.4	34	27
Crested Pigeon	<i>Ocyphaps lophotes</i>	12	4.1	108	84
Bar-shouldered Dove	<i>Geopelia humeralis</i>	28	5.0	95	74
Pheasant Coucal	<i>Centropus phasianinus</i>	4	1.5	30	23
Eastern Koel	<i>Eudnamys orientalis</i>	3	1.7	38	30
Channel-billed Cuckoo	<i>Scythrops novaehollandiae</i>	5	1.8	15	12
Horsfield's Bronze-Cuckoo	<i>Chalcites basalis</i>	3	2.0	2	2
Shining Bronze-Cuckoo	<i>Chalcites lucidus</i>	2	1.5	4	3
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>	2	1.2	25	20
White-throated Needletail	<i>Hirundapus caudacutus</i>	120	41.2	6	5
Fork-tailed Swift	<i>Apus pacificus</i>	31	23.7	3	2
Purple Swamphen	<i>Porphyrio porphyrio</i>	3	1.8	5	4
A. Pied Oystercatcher	<i>Haemotopus longirostris</i>	1	1.0	1	1
Red-necked Avocet	<i>Recurvirostra novaehollandiae</i>	30	15.0	5	4
Black-winged Stilt	<i>Himantopus himantopus</i>	15	4.6	36	28
Black-fronted Dotterel	<i>Eelseyornis melanops</i>	1	1.0	1	1
Masked Lapwing	<i>Valenellus miles</i>	12	2.8	45	35
Bar-tailed Godwit	<i>Limosa lipponica</i>	11	7.3	3	2
Silver Gull	<i>Chroicocephalus novaehollandiae</i>	204	20.1	120	94
Caspian Tern	<i>Hydroprogne caspia</i>	3	1.3	12	9
Crested Tern	<i>Thalasseus bergii</i>	3	1.6	15	12
Australian Pelican	<i>Pelecanus conspicillatus</i>	71	10.4	97	76
Striated Heron	<i>Butorides striata</i>	3	1.2	37	29
Great Egret	<i>Ardea modesta</i>	16	3.4	84	66
Intermediate Egret	<i>Ardea intermedia</i>	17	4.0	60	47
White-faced Heron	<i>Egretta novaehollandiae</i>	11	2.0	70	55
Little Egret	<i>Egretta garzetta</i>	20	3.9	59	46
Australian White Ibis	<i>Threskiornis molucca</i>	15	3.0	56	44
Straw-necked Ibis	<i>Threskiornis spinicollis</i>	10	5.5	2	2
Royal Spoonbill	<i>Platalea regia</i>	12	2.8	30	23
Little Pied Cormorant	<i>Microcarbo melanoleuco</i>	28	5.5	117	91
Great Cormorant	<i>Phalacrocorax carbo</i>	4	1.8	48	38
Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>	400	20.1	122	95
Pied Cormorant	<i>Phalacrocorax varius</i>	6	1.9	9	7
Australasian Darter	<i>Anhinga novaehollandiae</i>	2	1.1	14	11
Eastern Osprey	<i>Pandion cristatus</i>	2	1.2	19	15
Black-shouldered Kite	<i>Elanus axillaris</i>	2	1.1	22	17
Swamp Harrier	<i>Circus approximans</i>	1	1.0	5	4
Grey Goshawk	<i>Accipter novaehollandiae</i>	1	1.0	14	11

Brown Goshawk	<i>Accipiter fasciatus</i>	2	1.2	6	5
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	2	1.2	17	13
Black Kite	<i>Milvus migrans</i>	1	1.0	1	1
Dollarbird	<i>Eurystomus orientalis</i>	7	2.1	25	20
Sacred Kingfisher	<i>Todiramphus sanctus</i>	4	1.5	17	13
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	9	2.7	65	51
Nankeen Kestrel	<i>Falco cenchroides</i>	1	1.0	2	2
Glossy Black-Cockatoo	<i>Caliptorhynchus lathamii</i>	2	2.0	1	1
Yellow-tailed Black Cockatoo	<i>Calyptorhynchus funereus</i>	6	2.3	12	9
Galah	<i>Eolophus roseicapillus</i>	32	7.0	42	33
Little Corella	<i>Cacatua sanguinea</i>	100	15.3	84	66
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	3	1.5	14	11
Red-rumped Parrot	<i>Psephotus haematonotus</i>	1	1.0	1	1
Eastern Rosella	<i>Platycercus eximius</i>	6	2.1	23	18
Musk Lorikeet	<i>Glossopsita concinna</i>	6	6.0	1	1
Rainbow Lorikeet	<i>Trichoglossus haemotodus</i>	49	8.6	105	82
Scaly-breasted Lorikeet	<i>Trichoglossus chlorolepidotus</i>	2	2.0	1	1
White-throated Treecreeper	<i>Cormobates leucophaea</i>	1	1.0	4	3
Variegated Fairy-wren	<i>Malarus lamberti</i>	8	3.4	8	6
Superb Fairy-wren	<i>Malurus cyaneus</i>	24	4.8	69	54
Southern Emu-wren	<i>Stipiturus malachurus</i>	2	1.5	2	2
Scarlet Honeyeater	<i>Myzomela sanguinolenta</i>	18	5.4	12	9
Striped Honeyeater	<i>Plectorhyncha lanceolata</i>	15	3.6	93	73
Noisy Friarbird	<i>Philemon corniculatus</i>	22	8.3	3	2
Brown Honeyeater	<i>Lichmera indistincta</i>	11	2.8	76	59
White-cheeked Honeyeater	<i>Phylidonyris niger</i>	77	8.1	113	88
Blue-faced Honeyeater	<i>Entomyzon cyanotis</i>	3	2.2	10	8
White-naped Honeyeater	<i>Melithreptus lunatus</i>	40	18.5	4	3
Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>	6	2.2	26	20
Lewin's Honeyeater	<i>Meliphaga lewinii</i>	9	3.1	114	89
Little Wattlebird	<i>Anthochaera chrysoptera</i>	32	7.3	126	98
Red Wattlebird	<i>Anthochaera carunculata</i>	5	1.8	17	13
Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>	52	8.9	29	23
Noisy Miner	<i>Manorina melanocephala</i>	10	2.9	54	42
Striated Pardalote	<i>Pardalotus striatus</i>	1	1.0	1	1
Mangrove Gerygone	<i>Gerygone levigaster</i>	8	2.8	4	3
White-browed Scrubwren	<i>Sericornis frontalis</i>	12	3.4	79	62
Yellow Thornbill	<i>Acanthiza nana</i>	13	3.6	49	38
Striated Thornbill	<i>Acanthiza lineata</i>	8	4.1	7	5
Brown Thornbill	<i>Acanthiza pusilla</i>	19	3.8	86	67
Buff-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	2	1.5	2	2
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	10	2.1	58	45
White-winged Triller	<i>Lalage sueurii</i>	1	1.0	1	1
Rufous Whistler	<i>Pachycephala rufiventris</i>	8	2.3	45	35
Golden Whistler	<i>Pachycephala pectoralis</i>	4	1.5	23	18
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	4	1.3	19	15
Eastern Whipbird	<i>Psophodes olivaceus</i>	16	5.5	124	97
Australasian Figbird	<i>Sphecotheres vielloti</i>	20	3.2	43	34
Olive-backed Oriole	<i>Oriolus sagittatus</i>	9	2.4	55	43
Pied Currawong	<i>Strepera graculina</i>	7	1.6	61	48
Australian Magpie	<i>Cracticus tibicen</i>	27	8.2	124	97

Pied Butcherbird	<i>Cracticus nigrogularis</i>	10	2.3	16	13
Grey Butcherbird	<i>Cracticus torquatus</i>	8	2.6	109	85
White-browed Woodswallow	<i>Artamus superciliosus</i>	10	10.0	1	1
White-breasted Woodswallow	<i>Artamus leucorhynchus</i>	48	10.9	70	55
Willie Wagtail	<i>Rhipidura leucophrys</i>	8	2.6	87	68
Rufous Fantail	<i>Rhipidura rufifrons</i>	1	1.0	1	1
Grey Fantail	<i>Rhipidura albiscapa</i>	14	3.2	101	79
Australian Raven	<i>Corvus coronoides</i>	16	3.8	116	91
Magpie-lark	<i>Grallina cyanoleuca</i>	9	2.8	91	71
Black-faced Monarch	<i>Monarcha melanopsis</i>	1	1.0	1	1
Rose Robin	<i>Petroica rosea</i>	1	1.0	1	1
Eastern Yellow Robin	<i>Eopsaltria australis</i>	2	1.5	13	10
Red-browed Finch	<i>Aegintha temporalis</i>	60	12.1	103	80
Tawny Grassbird	<i>Megalurus timoriensis</i>	2	1.1	10	8
Australian Reed-Warbler	<i>Acrocephalus australis</i>	4	1.6	5	4
Tree Martin	<i>Petrochelidon nigricans</i>	2	1.5	2	2
Welcome Swallow	<i>Hirundo neoxena</i>	62	6.3	105	82
Silvereye	<i>Zosterops lateralis</i>	100	12.2	60	47
Common Myna	<i>Sturnis tristis</i>	37	5.0	63	49
Common Starling	<i>Sturnus vulgaris</i>	13	4.1	10	8