Birdlife at Belmont Wetlands State Park

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Belmont Wetlands is the 10th State Park of NSW, set on 514ha of coastal woodland and hind dunes at Belmont, Lake Macquarie. Despite historic degradation of this area, studies of its native birds continue to reflect and support ongoing rehabilitation of these coastal woodlands. This paper describes 105 species observed in a recent study (2015 to 2017). It also refers to an earlier study by Keith Laverick (LMCC 2001) in the same area and identifies significant differences in observed numbers of the same species. Differences are discussed in terms of known changes in habitat and Hunter Region trends.

INTRODUCTION

Belmont Wetlands State Park (BWSP) is located at 33°02'S, 151°40'E between the Pacific Ocean and Lake Macquarie. It is part of the largest remaining coastal wetlands system in the Lake Macquarie Local Government Area. This system has three separate vegetation communities, all connected by groundwater interactions (Brown 2003). BWSP includes Belmont Lagoon (see **Figure 1**), a spiritually and culturally important site for traditional owners and custodians, the Awabakal people. For over 100 years this landscape has been degraded due to prolonged mineral-sand mining, coal industry construction, erosion of natural sand dune barriers, changes in natural water flows, weed infestations, elevated nutrient levels and other urban factors.

Before the former owners, Broken Hill Propriety Holdings Company (BHP), returned this coastland to the NSW Government in 2002, several site condition assessments of the wetlands were made which included fauna and flora surveys. In 2006 the NSW Government proclaimed this land Crown Reserve and a State Park Trust was formed to rehabilitate and manage its natural resources as a recreational reserve (BWSP Trust 2010). Section 6.6 of that report cites several earlier avian studies of interest. This study aimed to document the current avian population, both resident and migratory, and to document changes since the last published studies.

Previous Studies

BWSP Trust noted 81 species were identified by Peddle Thorp in a study for BHP in 1994. Ongoing records in Lake Macquarie City Council's (LMCC) fauna database for this area include three vulnerable avian species (Black Bittern *Ixobrychus flavicollis*, Great Knot *Calidris tenuirostris*, Powerful Owl *Ninox strenua*) and two endangered species (Little Tern *Sterna albifrons* and Swift Parrot *Lathamus discolor*). M.K. Laverick presented a three-year Bird Life Study report to LMCC (2001) which included detailed information on 113 species observed over 104 surveys in a three-year period. It also provided site photographs and a scale drawing of the study area showing four adjacent open freshwater areas (North and South Railway Swamps, Swan Lake, Big Swamp). In **Figure 1** these lie within the red and yellow sail-shaped area bordered by George Fire Trail and Merleview Fire Trail. Laverick's report helped shape the current study's survey route and enabled comparison of observations of the same species 20 years apart.

Study Area Vegetation

Section 6.5 of BWSP Trust (2010) identifies three dominant vegetation communities in these wetlands. Coastal Sand Scrub is relatively dense and low, with Coast Tea Tree *Leptospermum laevigatum*, Coast Banksia *Banksia integrifolia* and Coast Wattle *Acacia sophorae.* Swamp Mahogany-Paperbark Forest features Broad-leaved Paperbark *Melaleuca quinquenervia*, Swamp Mahogany *Eucalyptus robusta* and Swamp Oak *Casuarina glauca.* The third is fragmented areas of Coastal Sand Apple-Blackbutt Forest, with Smooth-barked Apple *Angophora costata*, Blackbutt *E. pilularis* and Old Man Banksia *Banksia serrata.* Red Bloodwood *Corymbia gummifera* also appears along the Fernleigh Track – Kalaroo Fire Trail border. Besides natural regrowth, considerable new planting has occurred. Golden Wreath Wattle *Acacia saligna* and Bitou Bush *Chrysanthemoides*

monilifera were planted extensively from c. 1960, rapidly colonizing and dominating the hind dunes. Introduced grasses (Coolatai grass *Hyparrhenia hirta* and Natal grass *Melinis repens*) are also prevalent along fire trails. Together these sources yield abundant seed and blossom.

Figure 1 Aerial Map of Belmont Wetlands and Belmont Lagoon (State Park boundaries in red; original Belmont Swamp area is sail-shaped between George Fire Trail and Merleview Fire Trail). Adapted with permission from Belmont Wetlands State Park Trust, Final Plan of Management 2010, Fig. 12, p.43.

METHODS

Between 9/4/2015 and 29/12/2017 this author completed 73 regular bird surveys at Belmont Wetlands about every 10 days – except from 1/6/2016 to 28/9/2016 due to closure of George Fire Trail (GFT). The 6.7km route included the triangular route used by Laverick (4.4km). It started where Fernleigh Track (FT) and GFT meet at Belmont rail siding, but continued past Merleview Fire Trail (MFT) to Jewells siding. Then it crossed to the adjacent, dirt Kalaroo Fire Trail (KFT), went south along the eastern side of Laverick's "Big Swamp" until it met the south end of GFT. The final leg went north on GFT back to FT. A survey took approx. 2 hours and was completed between 6.00 and 10.30am. All observations were audiotaped; these data were later transcribed and analysed using MS Excel.

Survey results are presented in two sections. The first identifies species observed in 2015-17, each with maximum number and average count (median) per survey, number of surveys a species was recorded (Obs) and its Belmont Wetlands Reporting Rate (BW RR%). The latter measures a species' detection, given as the percentage of all surveys it was recorded.

The second section compares species observations in the current study with Laverick's report. The Chi-squared Test (1df, with Yates correction factor) was used to identify very significant differences between pairs of observations for each species (Fowler & Cohen 1999). A very high level of significance ($p<.01$) was set for detecting differences in observed numbers of each species in 2001 from 2018 in order to minimize spurious effects from additional flora on the current survey route. This approach seems valid; the survey effort was similar in number of surveys and each study was conducted in a 3-year period.

RESULTS

Section 1: The Present Study

A total of 105 species were recorded at Belmont Wetlands (BW) over 73 surveys between April 2015 and December 2017 (see Appendix on website: http://hboc.org.au/publications/the-whistler). This list includes generalist and specialist (coastal woodlands) species, plus several waterbird species. Criteria specified in Stuart (2016) identify most of these as resident or visitor, breeding in the Hunter Region. Species in the Appendix are listed in decreasing order of Reporting Rate. Fifteen species were most commonly observed (BW RR%>80). No obvious feature (e.g. dietary preference) or taxonomic grouping is evident.

Principal dietary influences

To further examine birds' use of BW habitats, **Table 1** shows the 40 most common species recorded (BW RR%>28). Nectar, seed or insects are the main diet for many of these, as indicated by seasonal spikes in median species counts at times of abundance. Nectar feeders commonly seen along FT are: Little Wattlebird *Anthochaera chrysoptera*, Lewin's Honeyeater *Meliphaga lewinii*, White-cheeked Honeyeater *Phylidonyris niger*, Striped Honeyeater *Plectorhyncha lanceolata*, Rainbow Lorikeet *Trichoglossus moluccanus*, Eastern Spinebill *Acanthorhynchus tenuirostris* and Yellow-faced Honeyeater *Caligavis chrysops*. Fairley & Moore (2010) support current BW survey records by offering the following times of year for floral abundance: Smooth-barked Apple (Nov.-Dec.), Coast Banksia and Old Man Banksia (Jan.-Jun.), Red Bloodwood (Feb.-Mar.), Broad-leaved Paperbark (Feb.-May), Swamp Mahogany (Apr.-Sep.), Swamp She-oak (Jun.-Sep.), Coast Tea Tree and Coast Wattle (Jul.-Oct.), and Golden Wreath Wattle (Aug.-Nov.). Small passerines (Silvereye *Zosterops lateralis*, Superb Fairy-wren *Malurus cyaneus*, White-browed Scrub-wren *Sericornis frontalis*) feed on flowering weeds (Bitou Bush *Chrysanthemoides monilifera* and Lantana *Lantana camara*) in spring and autumn.

Table 1. Comparison of survey data for the 40 most common species at Belmont Wetlands (BW) 2015-2017 and Belmont Swamp (BS) 1997-1999 (Laverick in LMCC 2001).

Common Name	**Scientific Name**	**Max**	**Median**	**Obs**	**BW RR%**	**BS RR%**	$\mathbf{X^2}$
Little Wattlebird	*Anthochaera chrysoptera*	57	20.0	73	100	97	0.0
Eastern Whipbird	*Psophodes olivaceus*	43	14.0	73	100	96	0.1
Lewin's Honeyeater	*Meliphaga lewinii*	21	9.0	72	99	54	**11.7***
Grey Butcherbird	*Cracticus torquatus*	18	5.0	72	99	73	3.2
Australian Raven	*Corvus coronoides*	22	6.0	70	96	100	0.0
Grey Fantail	*Rhipidura fuliginosa*	32	5.0	68	93	91	5.3
Laughing Kookaburra	*Dacelo novaeguineae*	13	4.0	68	93	70	2.7
Bar-shouldered Dove	*Geopelia humeralis*	30	6.0	65	89	70	1.9
Superb Fairy-wren	*Malurus cyaneus*	21	5.0	63	86	47	**10.0***
Spotted Dove	*Streptopelia chinensis*	9	2.0	63	86	89	0.0
Australian Magpie	*Gymnorhina tibicen*	12	3.0	62	85	92	0.1
White-cheeked Honeyeater	*Phylidonyris niger*	33	10.5	60	82	85	0.0
Pied Currawong	*Strepera graculina*	8	2.0	61	84	28	**25.3***
Striped Honeyeater	*Plectorhyncha lanceolata*	12	3.0	59	81	1	**79.2***
Red-browed Finch	*Neochmia temporalis*	53	8.0	59	81	66	1.2
Rainbow Lorikeet	*Trichoglossus moluccanus*	188	5.0	54	74	11	**44.0***
Grey Shrike-thrush	*Colluricincla harmonica*	7	2.0	51	70	35	**10.4***
Welcome Swallow	*Hirundo neoxena*	37	3.0	49	67	60	0.3
Olive-backed Oriole	*Oriolus sagittatus*	13	4.0	49	67	32	**10.5***
Eastern Yellow Robin	*Eopsaltria australis*	6	1.0	49	67	31	**12.3***
Silvereye	*Zosterops lateralis*	90	5.0	46	63	95	4.9
Brush Bronzewing	*Phaps elegans*	12	5.0	40	55	21	**11.4***
White-browed Scrubwren	*Sericornis frontalis*	46	3.0	41	56	71	0.2
Eastern Spinebill	*Acanthorhynchus tenuirostris*	15	2.0	41	56	19	**16.3**
Golden Whistler	*Pachycephala pectoralis*	8	3.0	41	58	9	**34.6**
Rufous Whistler	*Pachycephala rufiventris*	15	2.0	39	53	52	0.1
Brown Thornbill	*Acanthiza pusilla*	17	3.0	36	49	44	0.2
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	7	2.0	36	49	68	2.1
Pacific Black Duck	*Anas superciliosa*	5	2.0	33	45	81	**7.4***
Yellow-faced Honeyeater	*Lichenostomus chrysops*	28	3.0	33	45	29	3.0
Grey Goshawk	*Accipter novaehollandiae*	2	1.0	26	36	2	**28.9***
White-breasted Woodswallow	*Artamus leucorhynchus*	33	6.0	29	40	75	**8.1**
Willie Wagtail	*Rhipidura leucophrys*	3	1.0	28	38	76	**9.3**
Dollarbird	*Eurystomus orientalis*	13	2.0	25	34	20	2.8
Brown Quail	*Synoicus ypsilophora*	21	3.0	23	32	7	**14.3***
Eastern Rosella	*Platycercus eximius*	11	2.0	22	30	63	**8.3**
Noisy Miner	*Manorina melanocephala*	8	2.0	22	30	7	**13.1***
Galah	*Eolophus roseicapilla*	10	2.0	21	29	47	3.1
Eastern Koel	*Eudynamys orientalis*	3	1.0	23	32	1	**27.8***
Crested Pigeon	*Ocyphaps lophotes*	6	1.0	21	29	56	6.2

Note: Obs is the number of surveys a species was recorded. Chi-square values (X^2>6.63) in bold indicate a very significant difference ($p<.01$) in observed frequencies of the same species between the current study and Laverick's study (LMCC 2001). An asterisk (*) indicates 15 species that are reported far more often in 2018 than in 2001.

Table 1 also suggests that BW habitats provide abundant insects, attracting obligate aerial summer visitors (Dusky Woodswallow *Artamus cyanopterus*, White-breasted Woodswallow *Artamus superciliosus*, Welcome Swallow *Hirundo neoxena* and Dollarbird *Eurystomus orientalis*) and generalist woodland species (Grey Butcherbird *Cracticus torquatus*, Australian Magpie *Gymnorhina tibicen*, Pied Currawong *Strepera graculina*, Black-faced Cuckoo-shrike *Coracina novaehollandiae* and Grey Fantail *Rhipidura fuliginosa*). Pied Butcherbird *Cracticus nigrogularis* was observed rarely at BW (RR=8%).

BW's flora attract a wide range of granivorous species in season. Bar-shouldered Dove *Geopelia humeralis*, Spotted Dove *Streptopelia chinensis*, Red-browed Finch *Neochmia temporalis*, Brush Bronzewing *Phaps elegans*, Brown Quail *Coturnix ypsilophora*, Galah *Eolophus roseicapilla* and Crested Pigeon *Ocyphaps lophotes* are seen feeding on acacia, melaleuca, leptospermum and grass seeds on tracks. Seed-fruits attract: Eastern Rosella *Platycercus eximius*, Pied Currawong, and Yellow-tailed Black-Cockatoo *Zanda funereus* in autumn, while Little Corella *Cacatua sanguinea*, Australian King-Parrot *Alisterus scapularis* and Scaly-breasted Lorikeet *Trichoglossus chlorolepidotus* are uncommon spring-summer foragers. Sulphur-crested Cockatoo *Cacatua galerita* visit in any month, but typically in spring-summer. Small flocks of Plum-headed Finch *Neochmia modesta* and Double-barred Finch *Taeniopygia bichenovii* have also been reported foraging on BW fire trails (Stuart 2016).

Small rodents, reptiles, birds, frogs, crustaceans and native fish in BW's marshes contribute to the diet of various carnivorous and omnivorous species listed as common residents in **Table 1**. Open woodland generalists include: Australian Raven *Corvus coronoides*, Laughing Kookaburra *Dacelo novaeguineae*, Pied Currawong and Grey Shrike-thrush *Colluricincla harmonica*. Eight raptor species were recorded hawking over BW in 2015-17, including Osprey *Pandion haliaetus* and Swamp Harrier *Circus approximans*. In autumn 2016 and 2017 a pair of White-bellied Sea-Eagle *Haliaeetus leucogaster* was observed, and separately, a single juvenile each season. All but Grey Goshawk *Accipiter novaehollandiae* are uncommon residents of this coastal area.

Use by vagrants and migrants

Monthly records of juvenile birds along the survey route suggest that BW provides a range of habitats that support breeding by most resident and visitor species listed in **Table 1**, although nest sites are not usually obvious nor is confirmation easy within the current survey schedule. However, Dusky Woodswallow was observed at BW in 2015, and one pair bred successfully in summer 2016/17 - at the eastern-most part of its range in the Hunter (Stuart 2016). White-breasted Woodswallow are summer visitors which nest in small knot-holes of tall, dead Broad-leaved Paperbark stumps in the middle of BW's open marshes. Few of these stumps remain now, but alternative nest sites have not been detected.

A species of interest which nests in dense acacia, melaleuca, or leptospermum scrub on coastal hind dunes is Brush Bronzewing (Higgins & Davies 1996). This secretive ground pigeon was recorded in good numbers per survey during its breeding period from September to March in 2015/16 and 2016/17 (Feletti 2017). However this pattern did not repeat in spring-summer 2017/18. The species was occasionally seen or heard in winter (16 observed; 8 surveys) but rarely in spring or summer. No breeding behavior was observed in summer 2017/18.

Other summer-breeding or autumn visitors include: Olive-backed Oriole *Oriolus sagittatus*, Sacred Kingfisher *Todiramphus sanctus*, Dollarbird, Black-faced Cuckoo-shrike and two cuckoo species - Eastern Koel *Eudynamys orientalis* and Channel-billed Cuckoo *Scythrops novaehollandiae*.

Apart from the 40 common species, Belmont Wetlands has had over 60 occasional visitors, listed in the Appendix (RR<15%). Most of these visitors are nomadic, but resident in the Hunter Region (Stuart 2016), including: Brown Honeyeater *Lichmera indistincta*, Scarlet Honeyeater *Myzomela sanguinolenta*, Mistletoebird *Dicaeum hirundinaceum*, Spangled Drongo *Dicrurus bracteatus*, Crested Shrike-tit *Falcunculus frontatus*, Red-whiskered Bulbul *Picnonotus jocosus*, Black-faced Monarch *Monarcha melanopsis*, Leaden Flycatcher *Myiagra rubecula*, Rufous Fantail *Rhipidura rufifrons*, Yellow-tailed Black-Cockatoo, Sulphur-crested Cockatoo *Cacatua galleria*, and Little Corella.

Section 2: Comparison of Current Study Results with Laverick's 2001 Report

Laverick's detailed Bird Life Study (LMCC 2001) allows us to compare ecological and avian data at the same site. Climate-wise, the two 3-year periods were quite similar. In 1997, his first year of surveys

at Belmont Swamp (BS), an intense El Nino and drought conditions occurred. Above-average rainfall (La Nina) was recorded in 1998, stopping surveys for several months until a more normal weather pattern followed in 1999. In 2015-16 Belmont Wetlands experienced a similar weather pattern; then in 2017 intense, prolonged and record heatwaves began in early spring and continued into mid-autumn 2018. Marshes (occasional wetlands) remained dry and overgrown with cumbungi and weeds.

This reflects a major ecological change in 20 years because Laverick's photographs and sketch map of BS (the 'sail-area' in **Figure 1**) in his report show open-water swamps. He also recorded medium to large waterbird species and their breeding attempts (e.g. Dusky Moorhen *Gallinula tenebrosa*, Black Swan *Cygnus atratus*, Great Cormorant *Phalacrocorax carbo*, Australian White Ibis *Threskiornis moluccus*, Grey Teal *Anas gracilis*, Royal Spoonbill *Platalea regia*, Australasian Grebe *Tachybaptus novaehollandiae*, Nankeen Night-Heron *Nycticorax caledonicus*, Straw-necked Ibis *Threskiornis spinicollis*, Latham's Snipe *Gallinago hardwickii*, Intermediate Egret *Ardea intermedia*, Little Egret *Egretta garzetta*, Caspian Tern *Hydroprogne caspia*.) None of these was observed at BW in the current study. Occasionally a pair of Pacific Black Duck *Anas superciliosa*, Chestnut Teal *Anas castanea* and Purple Swamphen *Porphyrio porphyrio* have been recorded for short periods on a brackish marsh beside FT.

Table 1 enables us to compare detection of each species in the two studies (BS in 2001, BW in 2018). For example, Striped Honeyeater (BW RR% 81) and Rainbow Lorikeet (BW RR% 74) were commonly observed species in 2015-17 but recorded rarely by Laverick (1%, 11% respectively in 1997-99). Of the 15 most common species in this study (BW RR%>80) 7 were also most commonly recorded by Laverick (BS RR%>80). These are: Little Wattlebird, Eastern Whipbird *Psophodes olivaceus*, Australian Raven, Grey Fantail, Spotted Dove, Australian Magpie, White-cheeked Honeyeater. Further comparisons (BW RR%, BS RR%) show another 8 species are most common in 2018 (BW RR%>80) but were not in 2001 (BS RR%<80). These are: Lewin's Honeyeater, Grey Butcherbird, Laughing Kookaburra, Bar-shouldered Dove, Superb Fairy-wren, Pied Currawong, Striped Honeyeater, Red-browed Finch. This Appendix (2018) and Laverick's study (LMCC 2001) each lists over 60 uncommon species (RR%<28). Many were detected in both studies, sometimes only once (Crested Shrike-tit *Falcunculus frontatus*, Cicadabird *Edolisoma tenuirostris*, Leaden Flycatcher *Myiagra rubecula*, Black-faced Monarch *Monarcha melanopsis*).

It is useful to determine which species have responded to woodland habitat changes (e.g. flora rehabilitation efforts, natural maturation) since 2001. This is done statistically, by comparing observation tallies (BW Obs, BS Obs) for each of 40 common species in this study. Using the chi-squared test on these data (frequencies, not RR%) yields χ^2 values in **Table 1**. Nineteen of these species have very significant differences ($p<.01$ $\chi^2>6.63$) in observed frequencies. An asterisk (*) indicates 15 species are reported far more often in 2018 than in 2001. These include: Lewin's Honeyeater, Superb Fairy-wren, Pied Currawong, Striped Honeyeater, Rainbow Lorikeet, Grey Shrike-thrush, Olive-backed Oriole, Eastern Yellow Robin, Brush Bronzewing, Eastern Spinebill, Golden Whistler, Grey Goshawk, Brown Quail, Noisy Miner and Eastern Koel. The other four species in bold were reported far more often in 2001 (Pacific Black Duck, White-breasted Woodswallow, Eastern Rosella and Willie Wagtail). χ^2 values for the other 21 species (40%) in **Table 1** indicate no measurable difference in detection (at this confidence level) between 2018 and 2001.

DISCUSSION

Results from the current study (2018) indicate that avian fauna continue to thrive in the surveyed area (BW) of Belmont Wetlands State Park. The observed total of 105 species at Belmont Wetlands in 2018 compares favourably with Laverick's 2001 list of 113 species. Similar weather patterns in 1997-99 and 2015-17 enable comparison of this coastal habitat and its birdlife in those two study periods (BOM 2017). Two main ecological changes have occurred there in the past 20 years. First, open wetlands reported in 2001 are now marshes overgrown with reeds and weeds. This probably explains nomadic movement of at least 13 common waterbird species to adjacent sites; they are occasionally seen flying over the area. The marshes now support significantly more observations of woodlands insectivores (Olive-backed Oriole, Superb Fairy-wren, Eastern Yellow Robin, Golden Whistler, Eastern Koel), and insects supplement the diet of many other species.

Second, along with hydrological changes at BW has been ongoing maturation of woodlands flora on these coastal hind dunes, and an increased floral abundance from substantial replanting of native

flora since the 1960s. Together these influences have resulted in greater diversity in nectar-eaters, granivorous and other carnivorous/omnivorous species which regularly use this coastal woodlands habitat. Similar, high reporting rates for these broad dietary groups in 2001 and 2018 studies indicate most of their respective species were common originally but survey maxima data indicate they are thriving in 2018. Two notable species predictably very common within the next decade are Striped Honeyeater and Rainbow Lorikeet, due to their breeding and dietary behaviour (Moffat *et al*. 1983).

The change from open water swamps to occasional marshes has likely affected reporting rates of some coastal raptors (Osprey 2001 19%; 2018 4%), White-bellied Sea-Eagle (2001 13%; 2018 22%), Grey Goshawk (2001 2%; 2018 36%) but most of the woodlands raptors reported by Laverick are still seen hawking infrequently, here and over Belmont Lagoon (Feletti 2016).

Apart from the (13) waterbird species not observed at BW in 2015-17, four species showed significant decline in observations from 1997-99. Of no concern is Pacific Black Duck, now observed at Cold Tea Creek. Eastern Rosella and White-breasted Woodswallow each nest in mature tree-hollows – generally in short supply at BW due to urbanisation and industry. These nest sites are under increased competition from bird and possum species. Open nests of Willie Wagtail are also now at greater risk of predation from woodlands carnivores or cuckoo species. However these data may be cyclical, since 2018 records show increased sightings of each species and 20-year records in the Hunter Region indicate their status is 'of no concern' (Stuart 2016).

Both Belmont Lagoon and Belmont Wetlands contain a considerable amount of reed bed habitat potentially suitable for the Australasian Bittern *Botaurus poiciloptilus* which has recently been reported from several adjacent suburbs. It was not recorded in this study as it would have low probability of detection with the survey method used. For the same reason Powerful Owl was not detected in the current study, despite recent confirmed reports (B. Ciezak pers. comm. 2/5/2018) at BWSP.

CONCLUSION

Both 2001 and 2018 studies reported a mix of generalist and specialist (coastal) woodlands birds. Many common species in 2001 have increased in observed numbers per survey, and in detectability (RR%). This reaffirms BWSP as a sustainable coastal woodlands. There is also strong overlap between species listed as uncommon (e.g. RR%<15), which supports BWSP's ongoing legacy as a short-term refuge and food source for numerous woodlands visitors and birds of passage. Laverick provided LMCC with key information on the adverse consequences of further residential development or neglect of this natural asset. In summary, the 2001 and 2018 reports are encouraging; despite ecological changes to this habitat over the last 20 years, birdlife is flourishing at Belmont Wetlands State Park.

Several other species, listed in the *Threatened Species Conservation Act 1995* (NSW) and more recently in the *Biodiversity Conservation Act 2016* (NSW), have a regular presence in this area: White-bellied Sea-Eagle, Osprey, and Dusky Woodswallow (Roderick & Stuart 2016).

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REFERENCES

BOM (2017). Australian Government Bureau of Meteorology. Special Climate Statement 62–exceptional September heat in eastern Australia. 5 October 2017. http://www.bom.gov.au/climate/current/statements/scs62.pdf. Accessed 1/2/2018.

Biodiversity Conservation Act (2016). No. 63. Current version 1 December 2017. https://www.legislation.nsw.gov.au/~/view/act/2016/63. Accessed 16/2/2018.

Brown, S. (2003). Wetland Monitoring Program within the Lake Macquarie Catchment. (Banksia Environmental Consultancy, June.)

BWSP Trust 2010 (Belmont Wetlands State Park Trust) Final Plan of Management. http://www.belmontwetlands.com.au/uploads/2/5/4/3/25431561/adopted_plan_of_management_-_belmont_wetlands_state_park.pdf Accessed 12/8/2016

Fairley, A. and Moore, P. (2010). 'Native Plants of the Sydney Region (3rd Ed)'. (Allen & Unwin, Jacana Books: Crows Nest, NSW)

Feletti, G. (2016). Birdlife at Belmont Lagoon: past and present. *The Whistler* **10**: 28-32.

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

Fowler, J. and Cohen, L. (1999). 'Statistics for Ornithologists. (2nd ed.)' (British Trust for Ornithology. Guide 22.)

Higgins, P.J. and Davies, S.J. (Eds) (1996). 'Handbook of Australian, New Zealand and Antarctic Birds Volume 3: Snipe to Pigeons'. (Oxford University Press: Melbourne.)

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). Also accessible at http://hboc.org.au/wp-content/uploads/Laverick-Belmont-Swamp.pdf

Moffatt, J.D., Whitmore, M.J. and Date, E.M. (1983). Communal breeding by Striped Honeyeaters. *Emu* **83** (3): 202–203.

Roderick, M. and Stuart, A. (2016). Threatened bird species in the Hunter Region: 2016 status review. *The Whistler* **10**: 33-49.

Stuart, A. (Ed.) (2016). Hunter Region of New South Wales Annual Bird Report Number **24**. (Hunter Bird Observers Club Inc.: New Lambton, NSW.)