

Comparison of bird species recorded in surveys of Booti Booti National Park undertaken 27 years apart

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Two sets of 3-year duration bird surveys were undertaken in Booti Booti National Park with an interval of 27 years. A total of 206 species were recorded, of which 22 species are listed as either vulnerable or endangered under the *Biodiversity Conservation Act 2016* (NSW; BC Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth; EPBC Act).

The northern boundary of Booti Booti National Park is situated approximately 7 km south of Forster on the Mid North Coast of New South Wales. It contains a wide variety of habitats including wetlands, heath, forest and rainforest within its 1586 ha and has an equally diverse bird population.

A total of 188 species were recorded during the first survey period (1985-1988) and 167 species during the second (2012-2015). This represented an 11.2% decline in the number of species between the two surveys. No obvious reasons can be attributed to these changes. Changes could be a combination of environmental factors such as weather changes, feral animals and fire management or surrounding residential developments.

Over the two sets of surveys, 55 species were recorded breeding. Whilst the first set of surveys found 48 breeding species, there were only 20 species found breeding during the second set of surveys. This is a reduction of 58.3%. Interesting breeding records included Topknot Pigeon *Lopholaimus antarcticus* during the first set of surveys and Osprey *Pandion haliaetus*, classed as vulnerable under the BC Act, during the second. Australian Pied Oystercatcher *Haematopus longirostris*, considered endangered under the BC Act, and the Australian Pelican *Pelecanus conspicillatus* were found to be breeding during both sets of surveys.

INTRODUCTION

Booti Booti National Park (BBNP) was originally set aside as Booti Booti State Recreation Area (BBSRA) on 30 September 1977 and consisted of ~800 ha. In 1992, it was re-dedicated as National Park, with the inclusion of additional estate to a total of 1586 ha. Situated between Forster to the north, Pacific Palms to the south, the Pacific Ocean to the east and Wallis Lake to the west, the park also includes eight islands within Wallis Lake: Shepherd, Little Snake, Snake, Pelican, Coomba, Black Rocks, Earps and Booti (**Figures 1 and 2**).

BBNP is dominated by three elevated headlands, Cape Hawke (224 m), Booti Hill (169 m) and Charlotte Head (96 m) (**Figure 2**). Cape Hawke, in the north, is joined to Booti Hill and Charlotte Head, to the south, by a low-lying isthmus. Ramsay (1987) stated: “*The isthmus forms a barrier between Wallis Lake and the Pacific Ocean. The clays and cemented sands underlying*

the isthmus contain a perched aquifer which results in large swampy areas between the drier well-drained dune ridges. The headlands comprise sandstone and siltstone conglomerate which have resulted in unstable coarse soils which are very susceptible to erosion if disturbed” (Ramsay 1987, p.5).

Griffith *et al.* (1999) gave a general description of BBNP and Yahoo Nature Reserve (Yahoo Nature Reserve covers the whole of Yahoo Island and is not part of Booti Booti National Park) as a “... *complex mosaic of sedgeland, heathlands, swamp forests, dry forests, wet forests and rainforest*”, also noting that “*A total of 46 different vegetation communities occur within the reserves...*” (p.27). Moreover, in this complex mosaic, “*Four communities contain threatened plant species. Six of the 46 communities are not known to be reserved elsewhere in northern NSW... An additional nine communities are considered to*

have high conservation significance as coastal wetland vegetation.” (p. 27).

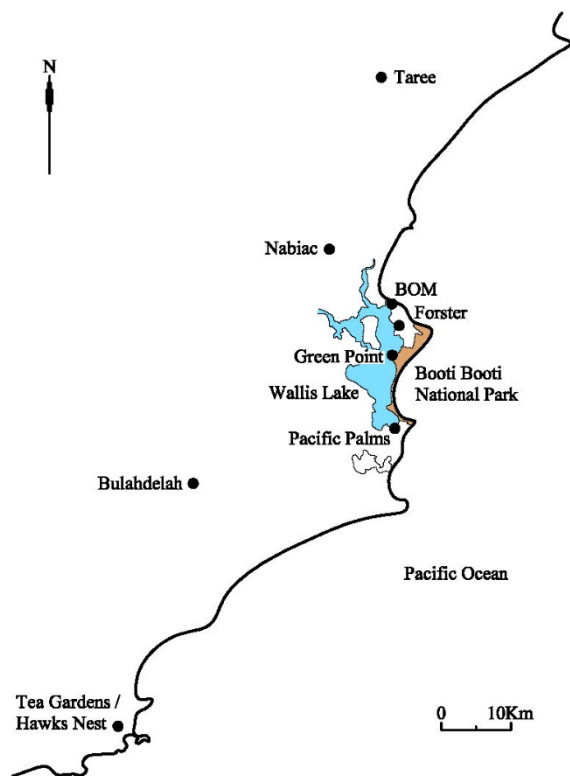


Figure 1. Locality sketch

As BBSRA, the reserve was managed for recreational activities (fishing, swimming, camping), but with regard for intrinsic conservation values (Griffith *et al.* 2000). Between 1969 and 1975, the area behind Seven Mile Beach was mined for heavy minerals and the area behind Elizabeth Beach was also mined between 1969 and 1970 (Griffith *et al.* 2000). Following mining, disturbed areas were rehabilitated with introduced plant species such as Bitou Bush *Chrysanthemoides monolifera* ssp. *rotundata* and non-endemic species such as Horse-tailed Sheoak *Casuarina equisetifolia* ssp. *incana* (Griffith *et al.* 2000). Numerous small cabins were available for hire in the Santa Barbara picnic area from approximately the mid-1950s through to the late 1970s (D. Hartmann pers. comm.). Early on during this tenure, numerous Norfolk Island Pines *Araucaria heterophylla* were planted and remain today.

Prior to the area being set aside as park, very little is known of the fire history of the area. Cape Hawke was last known to have burnt in a wildfire around 1955 (R. Underwood pers. comm.). Photos showed that all vegetation on top of Cape Hawke

was completely destroyed. Today, stumps of trees over 2 m in diameter can still be seen near the summit. Apart from Cape Hawke, most of the park would have been burnt, by either hazard reduction or wildfire, at least twice during the period 1985 to 2015 (pers. obs.).

The nearest Bureau of Meteorology (BOM 2016) recording station (No. 60013) is located adjacent to Forster breakwall, ~7 km north of the northern park boundary on The Lakes Way. Average rainfall for the area is 1226 mm (years 1896 to 2015) from an average of 89 rain days per year. The highest day-time temperature recorded is 43° (December 2004) with a December mean of 28.2° (1999 to 2016). Conversely, the lowest temperature recorded was 2° (August 2012) with a July mean of 6.9° (1999 to 2016).

Objectives

The main objective for this paper is to document the birdlife of a sizable area within the Hunter Region for which little information has been reported previously, the Booti Booti National Park. The availability of results from a set of surveys carried out in the 1980s as well as from a more recent set of surveys also allowed the opportunity for comparisons of the two data sets and to consider what changes in the National Park’s birdlife have occurred across an interval of approximately three decades. Although the survey methodologies were not exactly the same in the two sets of surveys, they were similar enough for indicative conclusions about changes to be made and for reasons to be considered when there appeared to have been significant changes.

METHODS

The initial set of surveys of BBSRA was undertaken between June 1985 and May 1988 with surveys conducted in all 36 months (**Table 1**). The surveys were carried out opportunistically while carrying out functions as the onsite National Parks and Wildlife Service ranger within the reserve. Identifications were made either audibly or visually with use of binoculars and occasionally a telescope.

Between September 2012 and August 2015, a second set of surveys was undertaken across the expanded BBNP footprint, with surveys made in 35 of the possible 36 months (**Table 1**). These surveys were mostly carried out in the morning, commencing within one hour after sunrise and lasted for ~three hours. Occasional surveys were also undertaken at other times of the day and evening during the second survey period.



Figure 2. Booti Booti National Park

The various habitat areas were visited in a random fashion, with some areas visited many times while others only once during the year. The entire length of Seven Mile Beach was walked following storm events to search for seabird beach wrecks.

Birds were recorded either within the park, flying over the park or observed from within the park (e.g. out to sea from the beach). Additionally, birds were also recorded within the village of Green Point, the tourist facilities of Camp Elim and Tiona and The Lakes Way road reserve, which are all bordered by the park (**Figure 2**). Several access tracks / fire trails were closed between surveys and hence were no longer accessible during the second survey. Access to the islands within BBNP (Wallis Lake) was not practical on a regular basis but waterbirds on the islands were able to be recorded from viewing points on the mainland using binoculars.

For seasonal migration comparisons, the following months have been combined: winter (June, July and August) and summer (December, January and February). For inclusion as a summer migrant, a species needed to be recorded a minimum of four times during summer and at least five times more frequently than any winter records (Newman 2007). For a winter migrant, this is reversed.

Breeding records were based on the following criteria: active visible nest, feeding of a dependent juvenile, observing a recently fledged juvenile or repeated visits to a nest (e.g. termitarium by a kingfisher or bank hole by pardalote) or small patch of vegetation (e.g. clump of grass by a fairy-wren) with food.

The observation frequency of each species was statistically tested between each survey set using the Yates-corrected Chi-squared test (Fowler & Cohen 1994). Where the expected frequency of any species was less than 5 in either survey set, species were omitted from further testing, due to insufficient observations. For one degree of freedom, Chi-squared

results between 3.84 and 6.62 are considered to be 'Significant', while over 6.63 the result is 'Highly Significant'.

During the period between June 1988 and October 2006, I continued to document bird observations whilst working in BBSRA / BBNP. Supplementary records were also sourced from observations reported by visiting birdwatchers, in forums such as bird club newsletters and Hunterbirding.

RESULTS

From the surveys, 206 species of birds were recorded, with 21 more species recorded during the first survey ($n = 188$; 1985 to 1988) than the second ($n = 167$; 2012 to 2015). The observation of a further eight supplementary species, increased this total to 214, of which 22 are listed as vulnerable or endangered under the *Biodiversity Conservation Act 2016* (NSW; BC Act) or vulnerable, endangered or critically endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth; EPBC Act) (**Table 2**). Full details of the species recorded and their seasonal Reporting Rates are presented in the **Appendix**; some highlights are presented below.

The average number of species recorded monthly during the first survey was slightly less than those recorded during the second, being 71 (range 18-110) and 75 (range 43-99) respectively (**Table 1**).

Table 1. Summary of monthly totals of birds recorded during two sets of *c.* 3 year-duration surveys in Booti Booti NP.

Month	Survey 1					Survey 2						
	1985	1986	1987	1988	Average	2012	2013	2014	2015	Average		
January		85	75	80	80		87	81	76	81		
February		62	67	58	62		63	87	79	76		
March		110	69	53	77		49	79	82	70		
April		75	69	62	69		80	43	79	67		
May		65	51	59	58		69	79	63	70		
June	74	70	65		70		63	59	68	63		
July	83	80	18		60		83	79	75	79		
August	74	67	43		61		50	74	83	69		
September	105	67	72		81	63		94		79		
October	87	83	64		78	99	96	56		84		
November	95	84	54		78	65	94	84		81		
December	69	71	82		74	68	87	98		84		
Total		$n = 36$				71		$n = 35$				75

Table 2. Species recorded in Booti Booti NP listed as threatened under the *Biodiversity Conservation Act 2016* (NSW; BC Act) or the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). E = endangered, V = vulnerable, CE = critically endangered, E1 = endangered and V1 = vulnerable.

Species	BC Act		EPBC Act		
	E	V	CE	E1	V1
Wompoo Fruit-dove <i>Ptilinopus magnificus</i>		Yes			
Rose-crowned Fruit-Dove <i>Ptilinopus regina</i>		Yes			
White-throated Needletail <i>Hirundapus caudacutus</i>					Yes
Australian Pied Oystercatcher <i>Haematopus longirostris</i>	Yes				
Sooty Oystercatcher <i>Haematopus fuliginosus</i>		Yes			
Eastern Curlew <i>Numenius madagascariensis</i>	Yes		Yes		
Bar-tailed Godwit <i>Limosa lapponica</i>					Yes
Red Knot <i>Calidris canutus</i>				Yes	
Curlew Sandpiper <i>Calidris ruficollis</i>	Yes		Yes		
Sooty Tern <i>Onychoprion fuscatus</i>		Yes			
Little Tern <i>Sternula albifrons</i>	Yes				
Black-browed Albatross <i>Thalassarche melanophris</i>		Yes			Yes
Gould's Petrel <i>Pterodroma leucoptera</i>		Yes		Yes	
Black-necked Stork <i>Ephippiorhynchus asiaticus</i>	Yes				
Osprey <i>Pandion haliaetus</i>		Yes			
Little Eagle <i>Hieraaetus morphnoides</i>		Yes			
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i>		Yes			
Masked Owl <i>Tyto novaehollandiae</i>		Yes			
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>		Yes			
Little Lorikeet <i>Glossopsitta pusilla</i>		Yes			
White-fronted Chat <i>Ephianura albifrons</i>		Yes			
Varied Sittella <i>Daphoenositta chrysoptera</i>		Yes			
Dusky Woodswallow <i>Artamus cyanopterus</i>		Yes			
Totals	5	15	2	2	2

Species recorded in 80% or more of each of the surveys have been considered as resident within the dataset (refer **Appendix:** available at www.hboc.org.au/the-whistler-volume-14/). Of the resident 34 species during survey one, seven were recorded in all surveys ($n = 36$) with an additional seven species only absent from one survey ($n = 35$). Similarly, during survey two, 43 species are

considered resident with nine recorded in 100% of survey months ($n = 35$) and a further six absent from one survey only ($n = 34$). From these two data sets, 27 species were classed as resident across both surveys. A total of 55 species were recorded breeding within or immediately adjacent to the park (**Table 3**).

Table 3. Species recorded breeding within or immediately adjacent to Booti Booti NP. S1 = Survey one; S2 = Survey two.

Species	S1	S2	Species	S1	S2
Black Swan	Yes		Striped Honeyeater		
Pacific Black Duck	Yes		Brown Honeyeater		Yes
Australian Wood Duck	Yes		White-cheeked Honeyeater	Yes	Yes
Brown Quail			Little Wattlebird	Yes	
Topknot Pigeon	Yes		Red Wattlebird	Yes	
Eastern Koel	Yes		Yellow-faced Honeyeater	Yes	
Channel-billed Cuckoo	Yes		Noisy Miner	Yes	
Tawny Frogmouth	Yes	Yes	Striated Pardalote	Yes	
Purple Swamphen	Yes	Yes	Brown Gerygone		Yes
Australian Pied Oystercatcher ^E	Yes	Yes	Yellow Thornbill	Yes	
Masked Lapwing	Yes	Yes	Varied Sittella ^V	Yes	
Australian Pelican	Yes	Yes	Black-faced Cuckoo-shrike	Yes	
White-faced Heron	Yes		Golden Whistler	Yes	
Eastern Osprey ^V		Yes	Australasian Figbird	Yes	Yes
White-bellied Sea-Eagle ^V	Yes		Olive-backed Oriole	Yes	Yes
Whistling Kite	Yes	Yes	Pied Currawong	Yes	

Table 3. Species recorded breeding within or immediately adjacent to Booti Booti NP (cont.).
S1 = Survey one; S2 = Survey two.

Species	S1	S2	Species	S1	S2
Rainbow Bee-eater	Yes	Yes	Australian Magpie	Yes	
Dollarbird	Yes		Grey Butcherbird	Yes	
Azure Kingfisher	Yes		Dusky Woodswallow ^v	Yes	
Sacred Kingfisher	Yes		White-breasted Woodswallow	Yes	Yes
Laughing Kookaburra	Yes	Yes	Willie Wagtail	Yes	
Yellow-tailed Black-Cockatoo	Yes		Grey Fantail	Yes	
Little Corella		Yes	Leaden Flycatcher	Yes	Yes
Scaly-breasted Lorikeet	Yes		Eastern Yellow Robin		Yes
Green Catbird	Yes		Golden-headed Cisticola	Yes	
Satin Bowerbird	Yes		Welcome Swallow	Yes	
Variegated Fairy-wren	Yes	Yes	Silvereve	Yes	
Superb Fairy-wren	Yes	Yes			

Although 39 species recorded during the first survey period were absent from the second, 31 of these could be classed as vagrant or occasional visitors with recording rates less than 12% and a further five species were recorded less than 40% of the time. Of the remaining three species Brown Quail *Synoicus ypsilophorus* and Golden-headed Cisticola *Cisticola exilis* were recorded moderately often, 50% and 44% respectively, while Dusky Woodswallow *Artamus cyanopterus* was a breeding resident with a 92% recording rate. Conversely, 18 species recorded during the second survey period were absent during the first. Occasional visitors comprised 11 species, with four species in less than 40% of survey months while the remaining three, namely Little Corella *Cacatua sanguinea*, Brown Honeyeater *Lichmera indistincta* and Pied Butcherbird *Cracticus*

nigrogularis were recorded greater than 60% of survey months. Moreover, the Pied Butcherbird is now classed as a resident species with a recording rate of 80%.

During survey one, 21 species were classed as either winter ($n = 7$) or summer ($n = 14$) migrants to BBSRA / BBNP. During survey two, the number of species considered to be seasonal migrants dropped to 14, being two and 12 respectively. Combining both survey periods, six species, Eastern Koel *Eudynamys orientalis*, White-throated Needletail *Hirundapus caudacutus*, Dollarbird *Eurystomus orientalis*, Rufous Whistler *Pachycephala rufiventris*, White-breasted Woodswallow *Artamus leucorhynchus* and Rufous Fantail *Rhipidura rufifrons* were summer migrants (Table 4).

Table 4. Species recorded as either summer or winter migrants to Booti Booti NP with a comparison to the 2017 Hunter Region Annual Bird Report (ABR) (Stuart 2018). Altitudinal migrant (AM), bird of passage (BOP), resident (R), summer migrant (SM) and winter migrant (WM).

Species	Survey 1		Survey 2		Status ABR
	Summer	Winter	Summer	Winter	
Topknot Pigeon <i>Lopholaimus antarcticus</i>				Yes	R
Eastern Koel <i>Eudynamys orientalis</i>	Yes		Yes		SM
Channel-billed Cuckoo <i>Scythrops novaehollandiae</i>	Yes				SM
Fan-tailed Cuckoo <i>Cacomantis flabelliformis</i>				Yes	R
White-throated Needletail <i>Hirundapus caudacutus</i>	Yes		Yes		SM
Pacific Golden Plover <i>Pluvialis fulva</i>			Yes		SM
Bar-tailed Godwit <i>Limosa lapponica</i>	Yes				SM
Sharp-tailed Sandpiper <i>Calidris acuminata</i>			Yes		SM
Great Egret <i>Ardea alba</i>		Yes			R
Little Egret <i>Egretta garzetta</i>		Yes			R
Rainbow Bee-eater <i>Merops ornatus</i>	Yes				SM
Dollarbird <i>Eurystomus orientalis</i>	Yes		Yes		SM
Sacred Kingfisher <i>Todiramphus sanctus</i>	Yes				SM
Nankeen Kestrel <i>Falco cenchroides</i>		Yes			R
Green Catbird <i>Ailuroedus crassirostris</i>			Yes		R
Striped Honeyeater <i>Plectorhyncha lanceolata</i>			Yes		R

Table 4. Species recorded as either summer or winter migrants to Booti Booti NP with a comparison to the 2017 Hunter Region Annual Bird Report (ABR) (Stuart 2018). Altitudinal migrant (AM), bird of passage (BOP), resident (R), summer migrant (SM) and winter migrant (WM) (cont.).

Species	Survey 1		Survey 2		Status ABR
	Summer	Winter	Summer	Winter	
Striated Pardalote <i>Pardalotus striatus</i>		Yes			R
Brown Gerygone <i>Gerygone mouki</i>		Yes			R
Cicadabird <i>Edolisoma tenuirostris</i>	Yes				SM
Rufous Whistler <i>Pachycephala rufiventris</i>	Yes		Yes		SM
Olive-backed Oriole <i>Oriolus sagittatus</i>	Yes				R
White-breasted Woodswallow <i>Artamus leucorhynchus</i>	Yes		Yes		SM
Spangled Drongo <i>Dicrurus bracteatus</i>		Yes			WM / BOP
Rufous Fantail <i>Rhipidura rufifrons</i>	Yes		Yes		SM
Leaden Flycatcher <i>Myiagra rubecula</i>	Yes				SM
Black-faced Monarch <i>Monarcha melanopsis</i>			Yes		SM
Rose Robin <i>Petroica rosea</i>		Yes			AM
Golden-headed Cisticola <i>Cisticola exilis</i>	Yes				R
Tawny Grassbird <i>Cincloramphus timoriensis</i>			Yes		R
Total	14	7	12	2	

The Chi-squared test produced 14 significant and 19 highly significant changes (Table 5) to the status of species over both sets of surveys. Some of these changes are easily accounted for as I lived in the park during the first set of surveys. Several species were resident around the house or called at dusk and dawn and consequently were recorded regularly. Conversely, as a park ranger carrying out duties, appropriate time was not spent identifying birds with unfamiliar calls and were more likely under recorded. Additionally, not all areas of the park were visited on a regular basis whilst undertaking these duties and, as such, birds requiring more specialised habitat requirements will have also been under recorded.

Over such a long time span, range extensions or contractions may have occurred or are occurring with some species. Park management techniques can impact species both positively and negatively, as do changes to land use adjacent to the park. My ability at identifying calls during the preceding interval also matured, resulting in an increased recording rate of some vocally and anatomically similar species.

Further commentary on these changes is made in the individual order / family accounts within the discussion section of the paper.

Table 5. Results of Chi-squared test between two sets of c.3-year duration bird surveys in Booti Booti NP. Survey 1 (S1) is from June 1985 to May 1988 and Survey 2 (S2) is between September 2012 and August 2015.

Species	Number of Records		χ^2	Statistical Significance
	S1	S2		
Pacific Black Duck <i>Anas superciliosa</i>	27	13	3.87	Significant
Australian Brush-turkey <i>Alectura lathami</i>		11	9.38	Highly Significant
Brown Quail <i>Synoicus ypsilophorus</i>	18		15.58	Highly Significant
Brown Cuckoo-Dove <i>Macropygia phasianella</i>	5	16	5.05	Significant
Pheasant Coucal <i>Centropus phasianinus</i>	22	2	14.51	Highly Significant
Pied Stilt <i>Himantopus leucocephalus</i>	1	18	13.93	Highly Significant
Pied Cormorant <i>Phalacrocorax varius</i>	17	31	3.90	Significant
Osprey ^V <i>Pandion haliaetus</i>	4	27	16.24	Highly Significant
Black-shouldered Kite <i>Elanus axillaris</i>	25	8	7.31	Highly Significant
Brahminy Kite <i>Haliastur indus</i>	2	23	16.57	Highly Significant
Nankeen Kestrel <i>Falco cenchroides</i>	14		11.71	Highly Significant
Little Corella <i>Cacatua sanguinea</i>		22	20.65	Highly Significant
Australian King-Parrot <i>Alisterus scapularis</i>	26	10	5.84	Significant
Eastern Rosella <i>Platycercus eximius</i>	36	19	4.22	Significant
Rainbow Lorikeet <i>Trichoglossus moluccanus</i>	5	33	19.96	Highly Significant

Table 5. Results of Chi-squared test between two sets of c.3-year duration bird surveys in Booti Booti NP. Survey 1 (S1) is from June 1985 to May 1988 and Survey 2 (S2) is between September 2012 and August 2015 (cont.).

Species	Number of Records		χ^2	Statistical Significance
	S1	S2		
Green Catbird <i>Ailuroedus crassirostris</i>	35	18	4.39	Significant
Satin Bowerbird <i>Ptilonorhynchus violaceus</i>	33	9	11.96	Highly Significant
White-throated Treecreeper <i>Cormobates leucophaea</i>	12	27	5.43	Significant
Superb Fairy-wren <i>Malurus cyaneus</i>	17	35	6.05	Significant
Brown Honeyeater <i>Lichmera indistincta</i>		24	22.70	Highly Significant
New Holland Honeyeater <i>Phylidonyris novaehollandiae</i>	18	33	4.25	Significant
Striated Pardalote <i>Pardalotus striatus</i>	13	1	8.34	Highly Significant
Brown Gerygone <i>Gerygone mouki</i>	14	29	4.96	Significant
Brown Thornbill <i>Acanthiza pusilla</i>	16	33	5.69	Significant
Pied Butcherbird <i>Cracticus nigrogularis</i>		28	26.81	Highly Significant
Dusky Woodswallow <i>Artamus cyanopterus</i>	33		30.14	Highly Significant
Forest Raven <i>Corvus tasmanicus</i>	2	12	6.04	Significant
Magpie-lark <i>Grallina cyanoleuca</i>	6	32	17.16	Highly Significant
Black-faced Monarch <i>Monarcha melanopsis</i>	2	14	7.88	Highly Significant
Australasian Pipit <i>Anthus novaeseelandiae</i>	14	4	4.25	Significant
Golden-headed Cisticola <i>Cisticola exilis</i>	16		13.65	Highly Significant
Tree Martin <i>Petrochelidon nigricans</i>	10	1	5.60	Significant
Common Myna <i>Acridotheres tristis</i>		13	11.42	Highly Significant

DISCUSSION

The original survey (1985-1988) was initiated to record a baseline avifauna list for BBSRA. Living and working within the reserve during the first survey period potentially influenced results in favour of more cryptic and locally isolated populations.

The following paragraphs provide some commentary on the observations of the various orders / family groups of birds recorded during both survey periods and generally within BBSRA / BBNP between 1985 and 2015. Details about the records for every species are presented in the **Appendix**.

Ducks (Anseriformes): Moderately represented by six species with three recorded breeding. Two species, Chestnut Teal *Anas castanea* and Australian Wood Duck *Chenonetta jubata*, recorded slight decreases in recording rates between surveys. This was in contrast to Grey Teal *Anas gracilis*, which although recorded a substantial increase, was not actually statistically significant. Australian Wood Duck was a common breeding resident, in the vicinity of The Ruins campground, prior to the second survey, but is now predominately confined to the Cape Hawke valley and adjacent residential areas. The increase in records of Grey Teal between the first and second survey period is partly due to an area of the park

being visited more regularly during the second period. The decline in observation rates of the Pacific Black Duck *Anas superciliosa* between surveys was however statistically significant but cannot be explained, except for a lower rainfall during S2 resulting in less patches of water being available for the species. Pacific Black Duck was also recorded breeding during the first survey period.

Brush-turkey & Quails (Galliformes): Two species of quail, Stubble *Coturnix pectoralis* (only recorded once) and Brown were recorded during the first survey only. Brown Quail was a moderately common species along The Lakes Way, north of Green Point Drive in the first set of surveys, but changes to mowing patterns of the road verges by the local Council may have influenced its recording rate in the second set of surveys. Additionally, the increased presence of wild dogs *Canis sp.* and Red Fox *Vulpes vulpes* may have impacted the bird's abundance within the park. The lack of sightings during the second survey period resulted in a highly significant statistical change. During June 2016, subsequent to the second set of surveys, three coveys of Brown Quail were observed, including one covey with dependent chicks.

Grebes (Podicipiformes): Recorded in the first survey only and only on three occasions, the

Australasian Grebe *Tachybaptus novaehollandiae* was a vagrant within the park.

Pigeon & Doves (Columbiformes): This order was well represented with 12 species recorded during the surveys and one, Rose-crowned Fruit-Dove *Ptilinopus regina*, outside them (D. Ongley 10/2016 via Hunterbirding). Four species, White-headed Pigeon *Columba leucomela*, Brown Cuckoo-Dove *Macropygia phasianella*, Wonga Pigeon *Leucosarcia melanoleuca* and Brown-capped Emerald-Dove *Chalcophaps longirostris*, showed substantial increases in recording rates between the first and second surveys. There are no obvious reasons for these increases except better awareness of them. Both being cryptic, the Wompoo Fruit-Dove *Ptilinopus magnificus*, only recorded once during the first set of surveys, and Rose-crowned Fruit-Dove may have been under recorded. Although recorded breeding on one occasion during November 1986, by the presence of a dependent juvenile, the Topknot Pigeon *Lopholaimus antarcticus* was observed as a winter migrant during S2. This winter status could be more accurately redefined as a food migrant, with birds feeding on the fruits of Cabbage Palms *Livistona australis*, which predominately ripen during autumn and winter months. A breeding record of Topknot Pigeon is considered unusual in the Hunter Region (Turner 2020); the only other known record is from Gogerly (1925).

Cuckoos (Cuculiformes): Another well-represented order with nine species recorded. Recording and change rates within this group varied substantially. Both Horsfield's Bronze-Cuckoo *Chalcites basalis* and Black-eared Cuckoo *C. osculans* are considered vagrants with very low recording rates and Pallid Cuckoo *Heterosceus pallidus* was recorded in the first survey only, again at low rates. Pheasant Coucal *Centropus phasianinus* was moderately common (61% RR) during the first survey, with only a couple of sightings during the second. This decrease is statistically highly significant. Similar to Brown Quail above, the Pheasant Coucal is predominately a ground-dwelling bird and potentially has been impacted by increased predation. In contrast, recording rates for Brush Cuckoo *Cacomantis variolosus* increased from the first to the second survey. Although recorded consistently between surveys, Fan-tailed Cuckoo *Cacomantis flabelliformis* was classed as a winter migrant during the second survey. My residing within the park during the first survey may account for the more consistent recording rate during that period. Additionally, Higgins (1999) states that reduced

records in the Australian Capital Territory during November to February may be the result of movement or a reduction in calling. Moreover, within Forster, to the north of the park, there was a strong preference for autumn, winter and spring records (A. Carlson unpub. data January 2001 to April 2006). Regarded as a 'common resident' in the Hunter Region by Stuart (2018, p. 21), the Fan-tailed Cuckoo may show some nomadic movements locally.

Frogmouths & Swifts (Caprimulgiformes): Tawny Frogmouth *Podargus strigoides* was recorded in low numbers during both sets of surveys; however, within the village area of Green Point, a resident pair has been breeding consistently over many years (A. Carlson pers. comm.). Although classed as a summer migrant during both surveys, the White-throated Needletail recorded a moderate decrease between surveys 1 and 2. Tarburton (2014) summarised these decreases on a state-by-state and national scale prompting a revision of the conservation status to Vulnerable under the EPBC Act in 2019.

Rails (Gruiformes): Buff-banded Rail *Hypotaenidia philippensis* and Dusky Moorhen *Gallinula tenebrosa* were both recorded in single surveys only being survey 1 and 2 respectively. With reasonable expanses of suitable habitat within the park, which are not easily accessible, and their cryptic nature, Buff-banded Rails may easily be under-recorded. Although recording rates increased moderately between the first and second surveys, the Purple Swamphen *Porphyrio porphyrio* is also probably under-recorded within the park. Observations of adults with small dependent chicks on several occasions confirmed breeding by this species.

Waders, Gulls & Terns (Charadriiformes): Although well represented by 30 species, including one, being the Painted Button-quail *Turnix variegatus* which was recorded between surveys, many ($n = 19$) were recorded as vagrants only in either or both of the two surveys. This order does however contain both Australian Pied *Haematopus longirostris* and Sooty Oystercatcher *H. fuliginosus*, listed as endangered and vulnerable respectively, and Curlew Sandpiper *Calidris ferruginea* and Little Tern *Sternula albifrons* both listed as endangered under the BC Act 2016 and the EPBC Act 1999. Both Australian Pied Oystercatcher and Masked Lapwing *Vanellus miles* were recorded as breeding. Masked Lapwing was observed in all months during both survey periods and along with Silver Gull *Chroicocephalus*

novaehollandiae and Crested Tern *Thalasseus bergii* are considered resident species. Caspian Tern *Hydroprogne caspia* is known to utilise Pelican Island periodically, and as this island was not accessed routinely, the true status of this species within the park was not determined. Higgins & Davies (1996) suggests that, in some Australian sites seasonal patterns appear consistent with passage, which concurs with Stuart (2018, p. 42) who lists them as ‘common bird of passage’ within the Hunter Region. Pied Stilt *Himantopus leucocephalus* was recorded statistically highly significantly more during the second survey period than the first. Again, this is mostly due to an area of the park being visited more regularly during the second survey.

Penguins (Sphenisciformes): Little Penguin *Eudyptula minor*. One bird was found on the southern boundary of the park on 22 January 1987. The bird had a broken leg and died a short time after being rescued. This bird was considered to be north of its usual distribution (Marchant & Higgins 1990). The nearest breeding colony was on Statis Rock, Seal Rocks approximately 12 km to the south (Holmes 1977), however no recent breeding records are known from that location.

Albatross, Petrels & Shearwaters (Procellariiformes): Predominately this group of birds dominate the mid to open ocean and require additional knowledge to separate species when viewing from the coast. Seven Mile Beach was walked following storm events to search for beach-wrecked birds for identification. While recording rates of the six species observed within this order were all low, counts, especially beach wrecks, could number in the hundreds.

Hérons, Egrets, Ibis & Cormorants (Pelecaniformes): 18 species were recorded within this diverse group of water-dependent birds which includes the endangered Black-necked Stork *Ephippiorhynchus asiaticus* (BC Act 2016). A colony of Australian Pelican *Pelecanus conspicillatus* bred on Pelican Island, within Wallis Lake (Turner 1993), for many years prior to relocating to adjacent, but less suitable, Snake Island (Stuart *et al.* 2012). Pelican Island is an exposed sand island which is now subject to inundation during higher tides. Observations and estimates of the breeding events could be made from the village of Green Point. A second species, White-faced Heron *Egretta novaehollandiae*, was also recorded breeding within the park. Of the 18 species observed within this order, only the two recorded breeding are regarded as resident during

both surveys, while Pied Cormorant *Phalacrocorax varius* is considered resident during the second survey period. The statistically significant increase in Pied Cormorant records could be related to a breeding colony that exists at Forster (pers. obs.). All four cormorant species are resident within Wallis Lake, adjacent to the park. Two species, Great Egret *Ardea alba* and Little Egret *Egretta garzetta* were considered winter migrants during the first survey period, even though the recording rates were similar between each survey period ($n = 50$, S1 and $n = 63$, S2; $n = 33$, S1 and $n = 43$, S2, respectively).

Kites, Eagles & Goshawks (Accipitriformes): Of the nine species recorded during the surveys, three were observed breeding. This includes Osprey *Pandion haliaetus* and White-bellied Sea-Eagle *Haliaeetus leucogaster* which are listed as vulnerable under the BC Act 2016. The third species, Whistling Kite *Haliastur sphenurus*, regularly nested in the Norfolk Island Pines within the Santa Barbara Picnic area. Two species, Osprey and Brahminy Kite *Haliastur indus* showed statistically highly significant increases in observation rates. In particular, the increase in observations of Brahminy Kite correlates with the southern expansion of its range as noted by Stuart (2018). Conversely, observations of Black-shouldered Kite *Elanus axillaris* recorded a statistically highly significant decrease between the surveys, as land use adjacent to the park slowly changed from cleared farmland to residential dwellings. Pacific Baza *Aviceda subcristata* and Grey Goshawk *Accipiter novaehollandiae* were recorded outside of the two survey periods.

Owls (Strigiformes): Barn Owl *Tyto alba* and Southern Boobook *Ninox boobook* were recorded during either one or both surveys. The substantial reduction in recording rates of the Boobook most likely is related to my residing within the park during the first survey. Boobooks are resident in the Cape Hawke valley, adjacent to the northern end of the park, and would most likely utilise the park for foraging at times. Masked Owl *Tyto novaehollandiae* was reported in 1985 (T. Rose pers. comm.) and has been recorded recently in the Cape Hawke valley using both the NP and the rural residential properties adjacent to it (pers. obs.).

Bee-eater, Dollarbird & Kingfishers (Coraciiformes): All five species observed within this order were recorded breeding. Only the Laughing Kookaburra *Dacelo novaeguineae* is classed as resident and hence a non-migrant. Rainbow Bee-eater *Merops ornatus*, Dollarbird

Eurystomus orientalis and Sacred Kingfisher *Todiramphus sanctus* were either summer migrants during one or both survey periods. Although not explained, the substantial reduction in observations of Azure Kingfisher *Ceyx azureus* between surveys is also reflected by reduced observations of the species within Forster, to the north of the park (pers. obs.).

Falcons (Falconidae): Although well represented by four species, they were all recorded at relatively low rates. Similar to the Black-shouldered Kite, Nankeen Kestrel *Falco cenchroides* also recorded a statistically highly significant decrease between the surveys, again with land use adjacent to the park slowly changing being the most plausible reason. Two Brown Falcon *Falco berigora* were present at commencement of the first set of surveys, however both became road-kill victims, one in July 1985, one month into the first survey period, and the second, in the middle of 1987. This species has only been sighted sporadically since then.

Cockatoos, Parrots & Lorikeets (Psittaciformes): Of the 13 species recorded during the two surveys, the single sighting of Budgerigar *Melopsittacus undulatus*, is classed as an aviary escapee. Yellow-tailed Black-Cockatoo *Zanda funereus* and Scaly-breasted Lorikeet *Trichoglossus chlorolepidotus* were recorded as breeding residents during both surveys. Although Eastern Rosella *Platycercus eximius* was considered resident during the first survey, a 54% observation rate during the second set of surveys resulted in a statistically significant decrease. Similarly, Australian King-Parrot *Alisterus scapularis* also recorded a statistically significant decrease in observations, with both species common residents within nearby residential areas. Conversely, Rainbow Lorikeet *Trichoglossus moluccanus* and Little Corella both recorded statistically highly significant increases in observations, which correlates to increases for Rainbow Lorikeet generally along the east coast through the provision of long-flowering flora species in residential gardens (Forshaw & Cooper 2016).

Passeriformes

Bowerbirds (Ptilonorhynchidae): Satin Bowerbird *Ptilonorhynchus violaceus* and Green Catbird *Ailuroedus crassirostris* were observed breeding in the park and both were recorded in more than 90% of months during the first set of surveys. However, during the second set of surveys, both species were observed substantially less, with statistical highly significant and significant decreases calculated

respectively. Living in the park during the first survey period certainly influenced observations of Satin Bowerbird in particular, with a resident male attending a bower within 20 m of the garden. Reduced Catbird records during the second set of surveys resulted in the species being recorded as a summer migrant. A cryptic species, Catbirds are often recorded by call and in Brisbane, Woodall (1997) recorded increased call rates during the spring / early summer period, which correlates with the summer migrant status for the species during the second set of surveys. Observations of Regent Bowerbird *Sericulus chrysocephalus* remained consistent across both surveys.

Treecreepers (Climacteridae): White-throated Treecreeper *Cormobates leucophaea* was the only species observed within this family with recordings increasing statistically significantly between the first and second set of surveys. This change correlates with my improved audible identification of the species.

Fairy-wrens (Maluridae): Two of the four wren species recorded were also observed breeding, being Variegated *Malurus lamberti* and Superb Fairy-wren *M. cyaneus*. Both species also went from moderate observations to resident status between surveys. The increase of Superb Fairy-wren records, which was statistically significant, is related to my increased ability to identify females without seeing an accompanying male. The increase in records of Southern Emu-wren *Stipiturus malachurus* from the first to the second survey periods was helped by the presence of a second person during some of the surveys with hearing able to detect the higher-pitched calls of this species.

Honeyeaters (Meliphagidae): Another well represented family with 18 species recorded during surveys and White-eared Honeyeater *Nesoptilotis leucotis* observed between surveys. Seven species were recorded breeding and one species, White-fronted Chat *Epthianura albifrons*, is listed as vulnerable (BC Act 2016). However, White-fronted Chat was not observed during the second survey period and the decline of this species within the park between surveys also correlated with the decline in observations of the species in the Forster Keys area north-west of the park (pers. obs.). Two species recorded statistical increases in recording rates, being Brown Honeyeater highly significantly, which was also recorded breeding, and New Holland Honeyeater *Phylidonyris novaehollandiae* significantly. Although Striped Honeyeater *Plectorhyncha lanceolata* observations

increased between surveys from vagrant to low/moderate status, the change was not statistically significant. Immediately north-west of BBNP in the Pipers Bay area, Striped Honeyeater is considered a breeding resident (A. Carlson unpub. data June 2012 to date). Although White-cheeked *Phylidonyris niger*, Tawny-crowned *Glyciphila melanops* and Yellow-faced Honeyeater *Caligavis chrysops* were observed consistently across both sets of surveys, total numbers of each species were noticeably less during the second survey period. For White-cheeked and Tawny-crowned Honeyeater, inappropriate fire regimes may be contributing to changes in floral diversity required for each species. Known for their large migrating flocks heading north during autumn (Stuart 2018), Yellow-faced Honeyeater does not appear to use BBNP as a conduit in the same numbers as previously. Another species recorded consistently during both surveys and breeding, Noisy Miners *Manorina melanocephala* are now confined to the park edges abutting residential development. Sightings of Little Friarbirds *Philemon citreogularis* in Green Point in September and October 1985 were and still are unusual for a coastal area of the Hunter Region (Stuart 2018).

Pardalotes (Pardalotidae): Both Spotted Pardalote *Pardalotus punctatus* and Striated Pardalote *P. striatus* were observed during the surveys. Although Striated Pardalote was recorded breeding during the first survey period, it was also classed as a winter migrant during the same period. It also recorded a statistically highly significant decrease from the first to the second set of surveys, although it was regularly observed in Forster to the north. Spotted Pardalote was recorded consistently across both surveys.

Gerygones, Scrubwrens & Thornbills (Acanthizidae): A reasonably well-represented family with nine species recorded including two species breeding. Four species, Brown Gerygone *Gerygone mouki*, White-browed Scrubwren *Sericornis frontalis* and Yellow *Acanthiza nana* and Brown Thornbill *A. pusilla*, were classed as resident during the second survey period. Two species, Brown Gerygone and Brown Thornbill, also showed statistically significant increases in recording rates between the two surveys. This is most likely due to observations of both species during S1 being made during working hours and time did not permit following the birds to positively identify them. Brown Gerygone was classed as a winter migrant during the first survey period.

Sittella (Neosittidae): A single species family, Varied Sittella *Daphoenositta chrysoptera*, which is listed as vulnerable under the BC Act 2016, was recorded at low levels during both survey periods and breeding during the first set of surveys.

Cuckoo-shrikes & Trillers (Campephagidae): Three of the five species observed within this family are considered vagrants. Black-faced Cuckoo-shrike *Coracina novaehollandiae* was observed breeding and classed as resident during both surveys. Cicadabird *Edolisoma tenuirostris* was considered a summer migrant during the first set of surveys.

Whistlers and Shrike-thrushes (Pachycephalidae): Both Golden Whistler *Pachycephala pectoralis* and Grey Shrike-thrush *Colluricincla harmonica* were classed as resident during both surveys with Golden Whistler also observed breeding. Similar to its status within the Hunter Region (Stuart 2018), Rufous Whistler *Pachycephala rufiventris* was recorded consistently across both surveys as a summer migrant.

Shrike-tit (Falcunculidae): Another single species family with Crested Shrike-tit *Falcunculus frontatus* recorded in low numbers during both survey periods.

Whipbird (Psophodidae): The only locally endemic species within the family, Eastern Whipbird *Psophodes olivaceus* was classed as a resident during both sets of surveys.

Figbird & Orioles (Oriolidae): Both Australasian Figbird *Sphecotheres vieillotii* (Turner 1995) and Olive-backed Oriole *Oriolus sagittatus* were recorded breeding within the park. The Figbird was recorded consistently between the two surveys at a level just below resident status. The Oriole was classed as a summer migrant during the first survey period. Classed a 'usual resident' within the Hunter Region (Stuart 2018, p. 91) orioles are considered to be 'partially migratory and partially resident' (Higgins *et al.* 2006, p. 368) or 'locally nomadic in response to food-supply fluctuations' (Walther & Jones 2008). Similar to the Topknot Pigeon, Olive-backed Orioles could more accurately be considered food-source nomads rather than summer migrants.

Currawongs, Butcherbirds & Woodswallows (Artamidae): Half of the six species observed within this family are considered breeding residents. A comparison of records between the

first (1977-1981) and second (1998-2007) national Birds Australia atlases indicates that some species are extending their range southward at a rate of roughly 150-200 km per decade possibly due to climate change (Silcocks & Sanderson 2007). Pied Butcherbird is one such species, which was not recorded during the first survey period but was found to be resident during the second, a highly significant statistical increase. Conversely, the vulnerable (BC Act 2016) Dusky Woodswallow, was a breeding resident during the first survey and not recorded during the second resulting in a statistically highly significant decline. Observations of the summer breeding migrant White-breasted Woodswallow reduced moderately between the first and second survey periods.

Drongo (Dicuridae): Another single species family, Spangled Drongo *Dicurus bracteatus* was recorded consistently during both sets of surveys and as a winter migrant during S1.

Fantails (Rhipiduridae): Two of the three species observed, Willie Wagtail *Rhipidura leucophrys* and Grey Fantail *R. albiscapa*, were resident and had breeding records. The third species, Rufous Fantail, was a summer migrant with a single breeding record (A. Carlson pers. comm.).

Crows & Ravens (Corvidae): Torresian Crow *Corvus orru* was classed as a resident species across both surveys. Both Forest Raven *C. tasmanicus* and Australian Raven *C. coronoides* were recorded in low numbers during both sets of surveys, however records of these two species within the park may be under-estimated due to my ability to differentiate their calls. A small increase between survey sets was statistically significant for Forest Raven, a result of better call recognition. Torresian Crows are possibly ‘expanding their range’ (Stuart 2017, p. 96) and may be progressively pushing Australian Ravens out of the area.

Flycatchers & Monarchs (Monarchidae): Increasing its recording rate between surveys, highly significantly statistically, Magpie-lark *Grallina cyanoleuca* was considered a resident species during the second survey. Although not recorded breeding during either survey, they have been observed breeding regularly within the village of Green Point (A. Carlson pers. comm.) adjacent to the park. Leaden Flycatcher *Myiagra rubecula* was observed moderately as a summer migrant and recorded breeding during both survey periods. Black-faced Monarch *Monarcha melanopsis* recorded a statistically highly significant increase

in recording rates and Restless Flycatcher *Myiagra inquieta* was observed within the park outside of the two survey periods.

Robins (Petroicidae): Three robin-type species were observed during both surveys with Eastern Yellow Robin *Eopsaltria australis* considered as a breeding resident. Rose Robin *Petroica rosea* was recorded as a winter migrant during the first survey period but only at low rates during the second. The winter migrant status along the coast correlates with Stuart’s (2018, p. 97) classification as a ‘usual resident’ but an ‘altitudinal migrant’ within the Hunter Region.

Mistletoebird (Dicaeidae): Mistletoebird *Dicaeum hirundinaceum* was recorded at low rates during both survey periods.

Finches (Estrildidae): Only two finch species were observed with one, Zebra Finch *Taeniopygia guttata*, a White-winged variant, probably an aviary escapee. The second, Red-browed Finch *Neochmia temporalis* was classed as a resident species during both surveys.

Pipits (Motacillidae): Australasian Pipit *Anthus novaeseelandiae* was observed at medium and low levels respectively, during the first and second surveys, resulting in a statistically significant decrease. Generally observed along road verges and within the Pipers Bay wetland area during the first survey, altered slashing regimes along the road verge has been detrimental for this species.

Cisticolas (Cisticolidae): Mostly recorded in spring and summer, when the bird is most vocal (Higgins *et al.* 2006), the Golden-headed Cisticola was not recorded during the second survey. This resulted in a highly significant decline statistically. Located in semi-grazed grassland inside the park on the park’s northern boundary, between surveys, cattle were removed from the area allowing regeneration of remnant rainforest vegetation in some sections. The Cisticola is still present in semi-grazed grassland just north and west of the park, in southern Forster / Pipers Bay, but this land is earmarked for development in the future, which will severely impact its long-term outlook.

Songlarks and Grassbirds (Locustellidae): Occupying similar habitat to the Cisticola, the Tawny Grassbird *Cincloramphus timoriensis* was recorded consistently at low to medium levels during both surveys. The second species observed within this family, Brown Songlark *C. cruralis*,

was sighted only once during the first survey period.

Reed-Warblers (Acrocephalidae): The only species observed within this family, Australian Reed-Warbler *Acrocephalus australis* was recorded as an incidental observation only during the first survey period.

Martins and Swallows (Hirundinidae): Represented by two species only, Welcome Swallow *Hirundo neoxena* was recorded as a breeding resident during both surveys. The decline in Tree Martins is statistically significant and consistent with Higgins *et al.* (2006, p. 1556) ‘Comparison of data in Aust. Atlas (1997-81) and Aust. Atlas (1998-2002) ... declines were recorded ... on and E of the Great Divide in se. QLD and NSW’.

White-eyes (Zosteropidae): The Silvereye *Zosterops lateralis* was recorded at resident status during both sets of surveys. The migratory patterns of Silvereye sub-species are not well understood (Higgins *et al.* 2006). However, Griffioen & Clarke (2002) suggest that the southern population, subspecies *lateralis*, migrates in a ‘south Y’ pattern. Such a pattern could result in a consistent transition of sub-species through the park, rather than a year-round permanent population. Close inspections of the individual birds present during surveys was not undertaken to determine which subspecies occupied the park at various times of the year.

Starlings and Myna (Sturnidae): The two Sturnidae species had a recording reversal between the two survey periods. Common Starling *Sturnus vulgaris* was recorded during the first survey only while Common Myna *Acridotheres tristis* was recorded during the second survey only, both at low/medium rates. The increase in Common Myna observations was statistically highly significant and coincides with the general northward movement of the species as indicated in Higgins *et al.* (2006, p. 1941) ‘Expanded into Mid-north coast in the 1990’s ... though not recorded at Forster ... till Dec. 2001’.

Thrushes (Turdidae): Observed predominately during winter, thrushes *Zoothera sp.* were recorded at low rates during both surveys. As the two thrush species, Bassian *Z. lunulata* and Russet-tailed *Z. heinei*, are difficult to tell apart by plumage in the field (Higgins *et al.* 2006), the most reliable identification is by call. Records of birds were generally only by brief observation and in dappled

light beneath the canopy. A cryptic species, recording rates of thrushes are most likely underestimated within the park.

CONCLUSIONS

The avifauna of Booti Booti National Park and its proximal areas has not before been fully documented. In two sets of *c.* 3-year surveys conducted approximately three decades apart, in 1985-1988 and 2012-2015, 214 species were recorded (including some species seen opportunistically by other observers, outside of the formal surveys). The relatively high species diversity demonstrates the general importance of the area for birds.

There were marked changes in the status of many species between the 1985-1988 and 2012-2015 survey periods. However, the 27-year interval between survey periods has also leap-frogged some of the incremental changes suspected to have occurred. Changes to species in the area will always occur due to environmental reasons, fire and feral animal management and development adjacent to the park.

The assignment of “migrant” status to some species requires additional work, in order to verify if Booti Booti National Park birds do vary from the generally accepted status applied to birds of the Hunter Region. Also, additional survey effort is required, to investigate the apparent changes to breeding status of some species.

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