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THE SUNBIRD

Volume 39 No. 2 December 2009

JUST FEEDING THE DUCKS: QUANTIFYING A COMMON WILDLIFE-HUMAN INTERACTION

RENEE CHAPMAN & DARRYL N. JONES

ABSTRACT

Wildlife feeding is very popular and widespread throughout the Western world. In Australia, the public is actively engaged in both private and public settings. Duck feeding in urban lakes, in particular, is a popular public activity. This preliminary study investigated the practice of duck feeding at 10 locations within south-east Queensland. The diversity of waterbird species fed was consistent with previous studies within the region. An unexpected finding was the abundance of domesticated ducks present. Dabbling duck species were seen to take advantage of feeding whereas grazing duck species did not. It was found that duck feeding was a common practice of humans and that on average people were involved for 4.5 minutes and fed an average of 4.9 slices of bread per feeding session. This suggests a need for further study into the potential impacts of bread deposited into the water system and the general health of duck species.

INTRODUCTION

Feeding of wildlife is a popular and common practice throughout the Western world (Jones & Reynolds 2008). It is undertaken as either private feeding in house yards or as public feeding in parks and reserves (Rollinson *et al.* 2003). Internationally, private feeding is performed by about one in five households in the USA and Britain (Cannon 1999; Isigame & Baxter 2007); and data from Australia has shown participation rates to be remarkably similar (Howard & Jones 2004).

Howard & Jones (2004) explored the reasons and motivations for feeding within south-east Queensland and found that feeding occurred for reasons including: the pleasure associated with close contact with wildlife; a way of counteracting the negative human impacts such as habitat destruction; an educative activity; a way of attracting wildlife to ones' house; and as a perceived benefit and assistance to the wildlife (Howard & Jones 2004). Oost (2008) found similar motivations to be associated with public feeding (Oost 2008).

Although public feeding is a popular activity (Obrams 2002), there has been limited research into this past-time. Furthermore, despite its popularity, in Australia there is a clear though unofficial opposition to the practice especially within reserves, ostensibly because of perceived or potential negative impacts (Ishigame & Baxter 2007). The possible negative impacts associated with feeding include: the risk of dependency; alteration of behaviour, particularly aggression; changes in population numbers; risks of disease; and health risks such as malnutrition (Obrams 2002). It has also been found that wildlife that are fed in locations with high human populations or visitation rates may become tame around humans and more susceptible to harm, for example, through vehicle-related incidents (Skira & Smith 1991). These areas can also increase the amount of harm towards humans as there is potential for confronting pest-like behaviour from the wildlife aggressively seeking food (Ballantyne & Hughes 2006).

As elsewhere, the feeding of ducks within urban lakes in Australia appears to be a very popular activity with bread being the most favoured form of food provided. Inevitably, this frequently leads to the depositing of large amounts of bread directly into suburban lakes. Despite the almost universal nature of this practice, very little research has been conducted on this activity or its ecological impacts. In an important exception, Turner & Ruhl (2007) quantified levels of phosphorus associated with bread being feed to ducks in a reservoir in the US. However, we found no other published information on the practice of this potentially important phenomenon. Here we report on a preliminary study of the practice of duck feeding within suburban lakes in south-east Queensland. This was undertaken as part of a larger study of the biodiversity of suburban lakes and aimed to quantify the numbers of people engaged in feeding, the amount of feeding, and the species being fed.

METHODS

Ten locations were selected across the Brisbane suburbs as suitable study sites (Table 1). These were urban lakes situated in parks that supported waterbirds and provided potential feeding opportunities for the public. At each site, two observation sessions (10.00 to 12.00 and 15.00 to 17.00 hours) were undertaken. At the start of each session all water birds on and near the lake were identified and counted. Throughout the two-hour observation period each separate group of people coming to the site to feed waterbirds were classed as a feeding event and the duration, the type of food used, and the amount of food used was recorded. In addition, at each feeding event the identification of species and number of individuals feeding were recorded and the approximate proportion of food consumed at each event was estimated. This was done by comparing the amount of bread remaining uneaten to the total amount distributed. Non-native domesticated duck taxa were identified according to the forms recognised in Murtagh (2000).

The data collected on water bird numbers, the people feeding them, feeding events, rates of feeding and species involved in each event were collated and analysed. An ANOVA was applied to gain an understanding of the average time spent feeding at sites and the amount of bread used for feeding. The strength of possible relationships between the number of people feeding at a site and the number of feeding events, the time spent feeding and the numbers of ducks present were assessed by Pearson's correlations. Bird names used follow Christidis & Boles (2008).

RESULTS

A total of 788 waterbirds of nine native species were detected at the ten sites, as well as numerous forms of domesticated ducks (Table 2). Of these, 600 (76.1%) were ducks. In addition, three individual specimens of likely Pacific Black Duck/Northern Mallard hybrids were detected at three sites (Table 2). The two most abundant native species were the Pacific Black Duck and the Australian Wood Duck which made up 45.3% and 21.1% respectively of all ducks counted (Table 2). The Pacific Black Duck was also the only species found at all 10 sites (Table 2).

Domesticated waterbirds, including Muscovies, Pekins, Rouens and various forms of geese were encountered at all but two of the sites. The introduced Northern Mallard was found at five sites while suspected Pacific Black Duck/Northern Mallard hybrids were found at three sites (Table 2).

The highest abundance of ducks was at Lakewood Estate with 145 individuals, which comprised 90 Australian Wood Ducks, 54 Pacific Black Ducks and a single domestic duck. For all sites, three native species Pacific Black Duck, Australian Wood Duck and Hardhead as well as numerous domestic forms were observed being fed. However, Pacific Black Duck dominated all feeding, making up 74.3% of all ducks observed being fed with all other species comprising the remainder. Significantly, although Australian Wood Ducks were relatively abundant, and made up about 25% of waterbirds recorded, this species accounted for only 5.8% of ducks observed being fed. Moreover, the Pacific Black Duck was the only species observed being fed at all sites.

Generally, only a minority of ducks present at each site were observed to respond to human feeding (Figure 1), with the percentage of ducks feeding ranging from none (Nudgee Waterhole) to 50% at Fred Francis Park; the overall mean of the total duck population was 60±105.92 and the overall mean of ducks feeding was 14 ±7.17.

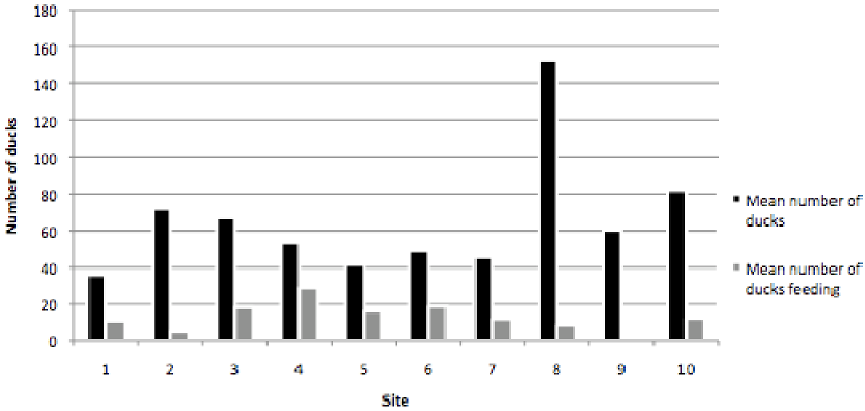

Figure 1. Mean numbers of all ducks present compared to the numbers fed.

The practice of feeding

The number of visitors engaged in feeding ducks varied considerably between sites (Table 3). The highest number of feeding events undertaken was at Underwood Park (22 feeding events per 4 hour observation period) and Riverdale Parklands (17 feeding events per 4 hour observation period) (Table 3). Although moderate numbers of ducks were present at Nudgee Waterhole Reserve, no feeding was detected. Excluding the Nudgee site, there were strong positive correlations between the number of people present and the number of events (R^2 = 0.997). There was also a clear postive relationship between the number of people and the time spent feeding (R^2 = 0.951) (Figure 2) but no correlation between the number of ducks and the number of people engaged in feeding (R^2 = 0.007).

Although items such as potato crisps and hot chips were occasionally fed to the ducks, sliced bread was overwhelmingly the most common type of food provided. However, not all the bread distributed for feeding was consumed (Table 3): Underwood Park had the lowest percentage of consumption at 44.4% while Riverdale Park had 88.6% consumed.

Figure 3 presents the number of people feeding, the time spent feeding per group and the amount of bread used per group for each site averaged over the two observation periods. Separate ANOVAs comparing these three parameters found no significant difference between sites, with the mean time spent feeding being 4.50+30.6 minutes and the mean number of slices of bread per group being 4.98+38.8. This equates to 1.11 slices per minute or 66.4 per hour per group.

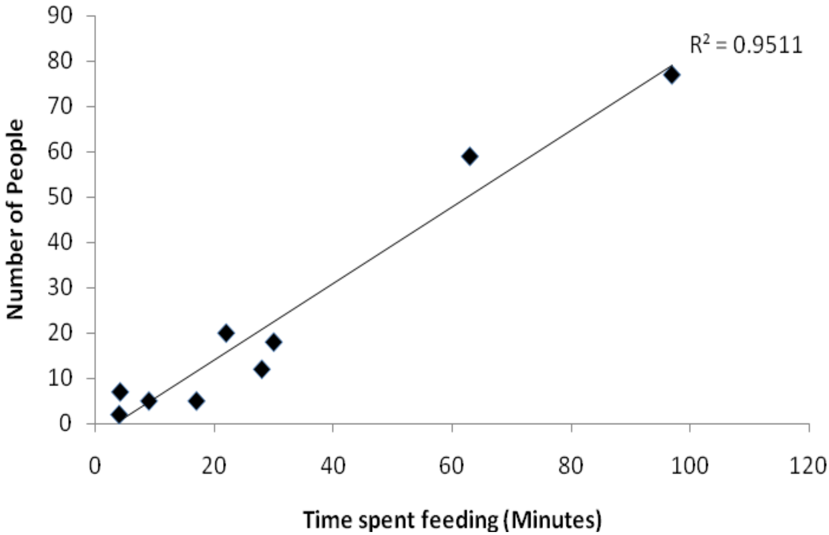

Figure 2. Correlation between the total numbers of people at locations and duration feeding birds.

DISCUSSION

To the best of knowledge, this is the first published study of the practice of duck feeding in urban lakes to be undertaken in Australia. As such, it is difficult to provide a comparison of these findings with other work. Instead, much of the discussion that follows is best understood as exploratory in nature.

The diversity of duck species detected in the urban lakes surveyed included three native duck species as well as several common waterbirds. In earlier work (Sinden *et al.* 2003) seven species of duck were identified at 52 water bodies within Brisbane with the same three species being the most abundant. Also similar to the earlier study was the widespread presence of a range of domesticated duck forms, almost certainly having being released by land-holders unable or unwilling to support these birds on their properties. This apparently ongoing practice raises numerous issues of animal welfare and ecological impacts which may require attention in the future. To our knowledge, there are no local or state government policies relating to these issues.

Potentially more alarming was the detection in the present study of at least three Pacific Black Duck/Northern Mallard hybrids. The aim of an earlier survey (Sinden *et al.* 2003) of water bodies in the Brisbane area was to provide a baseline for the presence of Northern Mallards or hybrids. The 2003 work detected no Northern Mallards and one possible hybrid; the presence of both taxa in the present study may suggest an increase, a finding which demands a more detailed assessment.

Species feeding

The largest number of ducks detected was at Lakewood Estate Park, yet this site had the smallest proportion of ducks feeding. This may be explained by the observation that most of the ducks present were grazing rather than dabbling ducks, which are more likely to take advantage of bread as a food source. The Australian Wood Duck is a grazing species which feeds almost entirely on vegetation (Frith 1959, Marchant & Higgins 1990). In contrast, the diet of Pacific Black Ducks and Hardheads is made up of both plant and animal food obtained within the shallows (Marchant & Higgins 1990). Both species locate food by dredging and dabbling through mud and eating vegetation on the edge of water bodies (Marchant & Higgins 1990) although in deeper waters hardheads also frequently dive to obtain food. This foraging behaviour predisposes these species taking advantage of the bread provided by humans, and may expose such species to higher risks of impact.

The feeding of ducks was found to be especially popular at both Underwood Park and Riverdale Parklands with both locations having a much greater number of feeding events than all other eight locations, probably because the surveys were conducted on public holidays. It was also apparent that visiting a recreational area to feed wildlife is a social activity; all but one feeding event involved a group of people. Interestingly, although there were clear linear relationships between the number of people feeding and the amount of time spent engaged in feeding, there was no such relationship between the number of ducks in an area and the number of people feeding. Although this issue requires much further investigation, preferably involving the marking of individuals, it may suggest that the ducks present are residents rather than visiting because of the feeding opportunities.

Rate of feeding

The average feeding time was 4.5 minutes in duration and on average a person distributed approximately five slices of bread during the event. For Underwood Park, this equates to approximately six and a half loaves of bread being distributed daily into the lake although only 44.4% was consumed by the waterbirds. This example demonstrates clearly that not all the bread used for feeding is consumed, allowing for the organic phosphorus within bread to be added to the nutrients in the system. Similarly, Sherwood Forest Park is believed to have 500 - 1200 visitors on a weekend day (Anonymous 1996 cited in de Lathouder 2007). Taking the upper level, if 1/3 of visitors undertook feeding the rate of feeding suggests that approximately 438 slices of bread are used or 30 loaves of bread are distributed daily. This rate suggests the need for further study to assess the impact of this activity on a range of important issues including the possibility of dependency, behaviour, population level changes, malnutrition and the water quality of the lake. In addition to this there is also a requirement to evaluate the importance of the interaction for well-being associated with humans and the importance for future conservation and human perception of nature.

In conclusion, this study highlights the popularity and amount of duck feeding which takes place in suburban areas. It is believed that species of dabbling duck are at more risk of direct impacts as these species access the artificial food more than grazing duck species. The number of domestic duck and mallard individuals found suggests a need for further management and monitoring to investigate and control aspects of competition and hybridization.

The amount and rate of feeding detected in this study strongly suggests a need for further study to investigate the possible negative impacts associated with wildlife feeding. The amount of bread input into these urban lakes could also have potential negative impacts upon water quality. The fact that feeding is clearly a social activity often undertaken in family groups requires more investigation to recognise this social aspect and also assess its significance for future conservation.

ACKNOWLEDGEMENT

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REFERENCES

BALLANTYNE, R. & HUGHES, K. (2006) Using front-end and formative evaluation to design and test persuasive bird feeding warning signs. *Tourism Management 27*: 235-246

CANNON, A. (1999) The significance of private gardens for bird conservation. *Bird Conservation International 9*: 287-297

CHRISTIDIS, L. & BOLES, W.E. (2008) *Systematics and Taxonomy of Australian Birds*. CSIRO Publishing, Melbourne.

DE LATHOUDER, R.M. (2007) *Assessing the abundance of freshwater turtles in an urban landscape: A comparison of trapping and observation techniques*. Honours thesis, Griffith School of Environment, Griffith University, Brisbane, Australia.

HOWARD, P. & JONES, D.N. (2004) A qualitative study of wildlife feeding in south-east Queensland. In: *Urban Wildlife: More than Meets the Eye*. (Eds. LUNNEY, D. & BURGIN, S.) Royal Zoological Society of New South Wales, Mosman, Pp. 55-62

FRITH, H.J. (1959) The ecology of wild ducks in inland New South Wales III Food Habits. *CSIRO Wildlife Research 4*: 131-155.

ISHIGAME, G. & BAXTER, G.S. (2007) Practice and attitudes of suburban and rural dwellers to feeding wild birds in Southeast Queensland, Australia. *Ornithological Science 6*: 11-19

JONES, D.N. & REYNOLDS, S.J. (2008). Feeding birds in our towns and cities: a global research opportunity. *Journal of Avian Biology* 39: 265-271.

MARCHANT, S. & HIGGINS, P.J. (1990). *Handbook of Australian, New Zealand and Antarctic Birds. Vol 1*. Oxford University Press, Melbourne.

MURTAGH, N. (2000) *For the Love of Ducks: An Australian Guide to Duck Husbandry*. Bolwarrah Press, Bolwarrah.

OBRAMS, M.B. (2002) Feeding wildlife as a tourism attraction: a review of issues and impacts. *Tourism Management 23*: 281-293.

OOST, M. (2008) *Impacts of picnic areas and human activities on bird communities in Australian National Parks*. PhD thesis, Griffith University. Brisbane, Australia.

ROLLINSON, D.J., O'LEARY, R. & JONES, D.N. (2003) The practice of wildlife feeding in suburban Brisbane. *Corella 27(2)*: 52-58.

SINDEN, K., O'LEARY, R. & JONES, D. (2003) *Domestic and Native Ducks within Brisbane City: Interbreeding and other Implications*. Report for Environment and Parks Brisbane City Council, March 2003.

SKIRA, I. & SMITH, S. (1991) Feeding wildlife in National Parks. *5th Australasian Regional Seminar in National Parks and Wildlife Management,* Tasmania.

TURNER, A.M. & RUHL, N. (2007) Phosphorus loadings associated with a park tourist attraction: limnological consequences of feeding the fish. *Environmental Management 39*: 526-533.

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TABLE 1. Descriptions of duck feeding locations, the lakes and their facilities.

Location Name	Suburb	Lat.S / Long.E	Area (ha)	Play Area	Picnic Area	Viewing Area	Signs
1. North Lakes	Mango Hill	27°13'19.25" 153° 1'16.34"	1.66	√	√	√	
2. Underwood Park	Priestdale	27°36'8.94" 153° 8'55.28"	0.76	√	√	√	
3. Centenary Lakes	Caboolture	27° 5'14.86" 152°57'1.04"	1.82	√	√		
4. Fred Francis Park	Bracken Ridge	27°18'39.15" 153° 1'17.02"	1.28	√	√		
5. Sherwood Forest Park	Sherwood	27°31'55.27" 152°58'29.18"	1.43		√	√	√
6. Minnippi Parklands	Tingalpa	27°29'0.24" 153° 6'52.03"	0.81	√	√		
7. Riverdale Parklands	Meadowbank	27°40'28.35" 153° 9'12.67"	0.76	√	√	√	
8. Lakewood Estate Park	Parkinson	27°38'2.97" 153° 2'21.64"	1.17	√	√	√	
9. Nudgee Waterhole	Nudgee	27°22'30.64" 153° 5'42.89"	2.25	√		√	√
10. Lockrose St Park	Mitchelton	27°24'52.40" 152°57'58.24"	0.09	√	√		

TABLE 2. Numbers of waterbirds observed at locations. (Location names: see Table 1)

	Location										
Waterbirds	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
Black Swan *C. atratus*	3	0	0	0	0	0	0	0	2	0	5
Pacific Black Duck *A. superciliosa*	14	44	45	39	20	33	40	54	14	54	357
Hardhead *A. australis*	2	0	5	0	0	0	0	0	6	0	13
Australian Wood Duck *C. jubata*	0	10	22	6	1	1	6	90	0	54	190
Domestic Duck various taxa	0	3	1	5	0	2	1	1	4	3	20
Northern Mallard *A. platyrhynchos*	0	7	3	5	0	2	0	0	2	0	19
Pacific Black Duck/ Northern Mallard, hybrid	0	1	1	1	0	0	0	0	0	0	3
Australasian Grebe *T. novaehollandiae*	1	4	0	0	0	2	0	0	0	0	7
Australian Pelican *P. conspicillatus*	0	0	0	1	0	0	0	0	0	0	1
Australian White Ibis *T. molucca*	3	1	0	21	12	0	0	0	0	2	39
Dusky Moorhen *G. tenebrosa*	10	6	17	0	4	4	6	4	22	1	74
Purple Swamphen *P. porphyrio*	4	0	35	3	5	0	0	13	0	0	60
Total	**37**	**76**	**129**	**81**	**42**	**44**	**53**	**162**	**50**	**114**	**788**

TABLE 3. Characteristics of bird feeding events at the ten locations

Location	People feeding	Feeding events	Duration (mins)	Bread (slices)	Eaten (%)
North Lakes	5	2	9	5	100
Underwood Park	77	22	9	104	44.4
Centenary Lakes	12	4	28	22	100
Fred Francis Park	7	2	4	6	100
Sherwood Forest Park	20	5	22	33	100
Minnippi Parklands	18	6	30	24.5	100
Riverdale Parklands	59	17	63	98	88.5
Lakewood Estate Park	2	1	4	2	100
Nudgee Waterhole	0	0	0	0	0
Lockrose St Park	5	2	17	9	100

FURTHER DISCOVERIES EXTEND THE RANGE OF CAPRICORN YELLOW CHAT IN COASTAL CENTRAL QUEENSLAND

WAYNE HOUSTON, ROGER JAENSCH, ROBERT BLACK,
ROD ELDER & LEIF BLACK

ABSTRACT

Extensive surveys of marine plain wetlands of western Broad Sound and the Fitzroy River Delta, Central Queensland between 2005 and 2008 identified several new sites and extended the documented range of the recently re-discovered Capricorn subspecies of Yellow Chat, *Epthianura crocea macgregori*. All newly discovered sites comprise only small portions (less than 300 ha) of much more extensive marine plains. They included: two breeding sub-populations and an incidental occurrence of the Capricorn Yellow Chat in western Broad Sound immediately west of its known range; two sites (one confirmed breeding sub-population) in the southern Delta near to previously documented sites; and the re-discovery of the chat in the far north of the Fitzroy Delta, where it was collected over 120 years ago in 1882 but not reported since. Each of these six sites supported between one and 28 chats, mainly in *Schoenoplectus litoralis* tall sedgeland and samphire (predominantly *Halosarcia pergranulata*) but also rank grasses on constructed banks of saltfield pond margins, and sometimes in barer habitat. In most cases these wetland habitats had been hydrologically modified by banks or walls designed to prevent tidal incursion and increase freshwater retention and persistence for cattle pasture enhancement. Despite the increase in known sites of occurrence, the population of this critically endangered subspecies is estimated at less than 400, the majority within one main area, Torilla Plain, with only small numbers (5 to 30) in the remaining sites.

INTRODUCTION

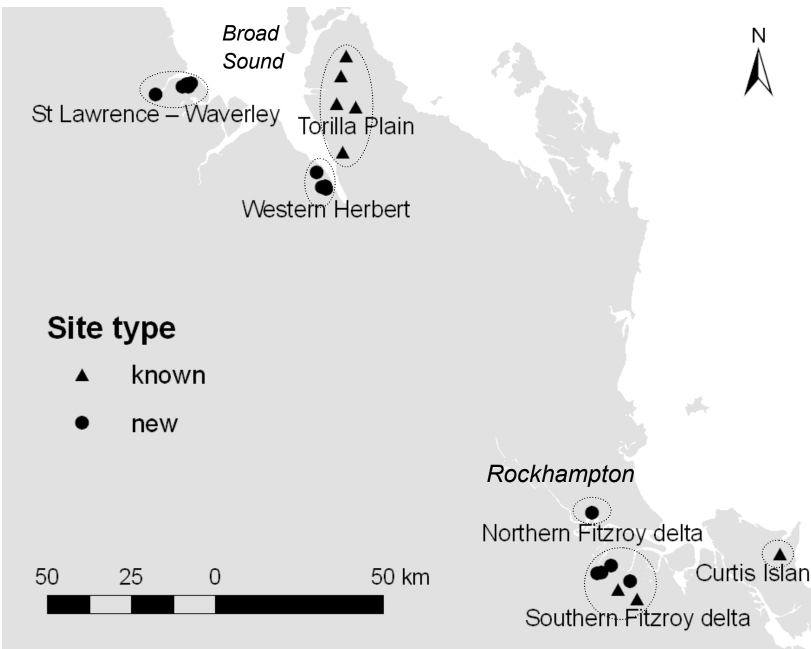
Previous articles in this journal and in unpublished reports have documented the re-discovery of the Capricorn subspecies of Yellow Chat *Epthianura crocea macgregori* at Curtis Island in 1992 (Arnold *et al.* 1993, Houston *et al.* 2004a) and several sites within the coastal mainland region of central Queensland known as Capricornia (Jaensch *et al.* 2004, Houston *et al.* 2004b). These discoveries re-established its known historical range: the Fitzroy River delta and Torilla Plain where they had been collected in 1859 (Mack 1930) and 1917 (Campbell 1917) respectively, but not recorded since. This research also documented numbers and broad habitat requirements of this diminutive and often inconspicuous bird: saline to freshwater wetlands of the tree-less marine plains of central Queensland. Lack of knowledge of the subspecies such as current distribution, population size and detailed habitat requirements has hampered recovery efforts for this endangered bird (Houston & Melzer 2008). The purpose of the present article is to expand this knowledge base by providing a fuller understanding of its current distribution, numbers and additional habitats, and thus contribute to the recovery of the subspecies. Detailed reporting of the collective contemporary knowledge of the population size, ecological requirements and management needs of this bird will be published separately.

METHODS

Chats were sighted during deliberate searching or incidentally during general bird surveys. The Centre for Environmental Management, Central Queensland University (WH, RB, RE & LB) commenced surveys of potential habitat for the Capricorn Yellow Chat in 2003 to inform and implement a recovery plan (Houston & Melzer 2008) for this subspecies. In 2006 and 2007 Wetlands International (RJ and CQU staff) assessed the biodiversity (mainly birds) and condition of coastal wetlands in western Broad Sound for the Fitzroy Basin Association (Melzer *et al.* 2008) and conducted surveys of birds in the lower Fitzroy River and Fitzroy Delta and in western Broad Sound during 2008 and 2009.

All observers were familiar with the bird and its habitats: tall sedgeland, grassland and saltmarsh on marine plains. When most conspicuous, chats were commonly first detected by recognition of short piping calls typically made by birds perched atop the vegetation. At other times, the observer first became aware of chats at a site when one or more were seen in or near the exposed lower edges of tall sedge clumps. A core set of details of each record including GPS geo-coordinates, plumage, habitat and behavioural observations were recorded. Equipment used for making sightings was 10x42 binoculars and 20x spotting scopes unless otherwise stated. The important hydrological conditions in habitats are described.

Figure 1. Capricorn Yellow Chat range in six named areas includes all recently recorded sites and 'new' sites discovered from 2005 to 2008.



A table of Yellow Chat sightings details recorded during the surveys may be requested from the senior author

RESULTS

Birds are now found in three northern areas adjacent to Broad Sound and three southern areas around the Fitzroy River Delta as shown in Figure 1. Details of site locations and habitats are summarised in Table 1.

BROAD SOUND

St Lawrence – Waverley Marine Plain (Sites A-F)

Site A can be viewed from a platform at the end of a gravelled pathway. It is located in a reserve immediately west of the St Lawrence camping ground administered by the Isaac Regional Council. Chats appear to only occasionally use this site. However, further sightings are likely because of the ready access for bird-watchers.

On 5 September 2006 RJ heard and then saw a single chat low in clumps of tall green sedge *Schoenoplectus litoralis* in water next to an islet in the St Lawrence Wetlands. Over a ten minute period the chat, a pale grey-brown bird with yellow rump and vent, fed and preened and moved spasmodically within the clumps, then flew to nearby sparse tall plants of *Cyperus alopecuroides* on the wetland edge. A similar bird, probably the same individual, was seen from 50-120 metres at the islet by RJ and Shane Westley approximately an hour later. Thirteen surveys of the area containing this site were conducted from 2005 to 2009 in eight months of the year, in both wet and dry seasons, without any further sightings being made by the authors.

Habitat is patchy, sparse and isolated from main areas (see below). The wetland formerly was tidally inundated but for many decades has been maintained by a road causeway as a semi-permanent freshwater body, receiving tidal water only on king tides.

Site B is in tall *S. litoralis* sedgeland in a broad swamp on the marine plain 8.3 km ENE of St Lawrence town. The marine plain complex lying between the St Lawrence Creek and Waverley Creek outer estuaries is almost continuous and may support a small (<10 birds) resident population of chats.

On 7 September 2006 RJ heard several calls at this location. Then soon after, through binoculars, a pale grey-brown chat was seen perching on a nearby fence. Over an hour later more calls were heard in sedge about 200 m to the NE. The dry swamp contained only damp substrate. Subsequently (see Sites B-F), one or more chats were seen on several other occasions, within 2.0 km (mostly within 700 m) of this location. Up to eight Yellow Chats were recorded from 2006 to 2009 and breeding has been inferred on four occasions. Records are from 10 dates over six different months (2 dry season, 4 wet season) and records of breeding are from both wet and dry seasons. There were only two chat-focussed surveys (18 July 2007, 8 October 2008) when none were reported.

For several decades tides have been excluded from this wetland by an enclosing system of low artificial sea walls (levee banks). Previously, when connected to the estuary, very high and king tides inundated part of it. Though water salinity may at times be relatively low (demonstrated by presence of freshwater plants such as nardoo *Marsilea* sp.), notably in mid wet season, the small catchment and lack of flushing ensure continued high salinity (evident by dominance of salt-tolerant plants) in the dry season. The area of tall *S. litoralis* sedgeland and samphire on this plain is approximately 200 hectares.

Western Herbert Marine Plain (Sites G-J)

The habitat in this area appears to support a small resident chat population of at least 20 birds.

Site G is a small swampy channel on the western side of Herbert Creek estuary. It is a small element of similar widespread habitat within the complex network of channels, ponds and basins on this marine plain. All accessible habitats in this area were surveyed for chats. In 2007 the nearest known chat populations were at the southern end of Torilla Plain (Figure 1), 10-12 km to the NNE across the estuary (Jaensch *et al.* 2004).

On 10 May 2007 two of us (RJ, RB) heard and observed a pair of Yellow Chats in breeding plumage in sparse to mid-dense *S. litoralis* sedgeland occupying most of the channel. On the channel margins were short grasses and forbs, but no exposed mud. One or more Yellow Chats were subsequently seen on this marine plain on five more occasions (Sites G-J) usually within 2.0 km (maximum distance 6.0 km) of Site G. In both 2007 and 2008, 28 Yellow Chats were recorded in this locality and breeding has been inferred on four occasions. Records of birds have occurred in the wet and dry seasons and of breeding in the wet and dry seasons. There were two chat surveys (25 November 2003, 29 March 2004: visiting sites G, I, and/or J) in which no chats were reported.

A 17 km long sturdy sea-wall, built to carry vehicles, excludes any tidal influence over the southern part of the Western Herbert Marine Plain. At least 100 ha of favoured habitats, tall *S. litoralis* sedgeland with directly associated samphire and stands of *C. alopecuroides,* occur on this plain.

FITZROY RIVER DELTA

Northern Fitzroy River Delta

The habitat here may support resident chats but the results of surveys are yet to demonstrate their presence year round. However, the discovery at this site has re-established its presence where it was collected over 120 years ago in 1882 by the naturalist Carl Lumholtz (Mary LeCroy, American Museum of Natural History, New York, pers. comm.).

Nankin Plain (Site K)

Site K is in sparse to mid-dense beds of *S. litoralis* in Nankin Plain. The sedgeland is in four connected, broad shallow channels up to 400 m wide, comprising oxbows, tributaries and other former components of the Fitzroy River. It is a small part of the 300 ha of tall *S. litoralis* sedgeland on this plain.

On 6 November 2008, two of us (RJ, RB) heard the calls of Yellow Chats here and then saw a fully coloured adult male, another bird and heard a third chat. The male was clearly seen also by

John McCabe, Allan Briggs and Shannon van Nunen through spotting scopes or binoculars. Further Yellow Chats were subsequently seen on this marine plain, within 0.7 km of Site K.

In the late dry season of 2008 up to 5 Yellow Chats were recorded at this locality, but breeding has not been confirmed. No chats were seen during two recent surveys (13 May and 15 October in 2008), nor during some earlier surveys (2003, 2004).

Some decades in the past, these wetlands were permanently separated from riverine and tidal influence by a major embankment, large enough to support a vehicular track. Accordingly, they provide low salinity wetland habitat for many months following good wet season inflow from the surrounding local catchment, but become saline in the dry season.

Southern Fitzroy River Delta

Yellow Chats have been recorded previously in the southern part of the delta (Sites L-O) which includes Twelve Mile Creek, a known breeding site, and Raglan Creek (Houston *et al.* 2004a). Recent records from new sites, in two clusters, are described below. The contribution of this additional habitat in supporting the resident sub-population of chats in the area is being further researched.

Inkerman Creek (Sites L-M)

Site L is a dense strip of samphire dominated by *H. pergranulata* and marine couch. It is < 30 m wide and lies between a 1 km section of road and the levee bank of a saltfield. Bordering the road are 2 freshwater pools (< 5 by 20 m) densely vegetated with the sedges *S. litoralis* and *Bolboschoenus caldwellii*. On the other side of the road is a 30 ha saltflat sparsely vegetated with small patches of dense samphire, predominantly *H. pergranulata* but also *H. indica* and beetle grass (*Leptochloa fusca*). King tides and rainwater from intense wet season storms occasionally inundate the saltflat. When inundated, the patches of samphire form 'islands' of habitat for chats.

Fourteen chats, most in breeding plumage, were observed in January 2005 (WH, RB). Pairs foraged on muddy edges bordering a shallow pool, both amongst dead sea purslane *Sesuvium portulacastrum* and at the base of a dense *S. litoralis* sedgeland. One pair flew 100 m across the road to a small (5 m x 30 m) patch of samphire, *H. pergranulata,* within the sparsely vegetated saltflat.

Site M is a broad shallow swale 200 m long formed by a road embankment that is bordered by small patches of tall *S. litoralis* and dense saltmarsh dominated by marine couch and *H. pergranulata*. It is approximately 1 km west of site L, across an almost bare saltflat and occasionally influenced by king tides.

At site M in January 2005, a pair seemed to be site faithful and disappeared into a patch of *S. litoralis* when disturbed. Pairs were foraging both along the muddy swale edges among dead sea purslane *S. portulacastrum* and under samphire vegetation.

Up to 23 chats were observed at Sites L-M over several years on 14 occasions with evidence of breeding in both wet and dry seasons. No chats were recorded in July 2004, April and July 2006, April and May 2007, June, September or November 2008. Evidence of breeding (agonistic behavior between males, display flights and presence of immature birds) was observed on several occasions. The longest period of continuous occupancy recorded was 10 months, between July 2007 and April 2008.

Saltfields (Sites N-O)

Site N consists of 7 km^2 of saltfields approximately 3 km ENE of site L. Levee banks (approx. 5 m wide x 0.5 to 1.5 m high) surround shallow rectangular ponds 10 to 100 ha used for salt production. Five birds, including an adult pair and three immature birds, were seen on 12 June 2008 (WH, RE and Richard Segal). The birds flew from a narrow band of low vegetation (1 m wide x 70 cm tall) on the levee bank around a salt pond. Plants present included exotic grasses *Chloris* spp., Guinea grass *Megathyrsus maximus*, salt-tolerant herbs sea purslane *Atriplex muelleri*, *Enchylaena tomentosa* with occasional tall *Avicennia marina* shrubs (up to 2 m).

After flushing from low vegetation the birds alighted on a taller *A. marina* shrub and then flew to the pond and foraged near the water's edge in a 30cm wide strip of exposed mud and rocks. Another male chat was seen approximately 1 km farther west. This bird flushed from a 50cm wide strip of exposed mud and rocks around the pond edge and flew into an *A. marina* mangrove shrub nearby.

Pond salinities ranged from seawater (approximately 35 ppt) to hypersaline. Most sightings of Yellow Chats were made on levees that surrounded the least saline ponds and supported more forbs, grasses and mangrove shrubs. Chats were also sighted once in a 10 ha patch of disturbed saltmarsh dominated by *H. pergranulata* and marine couch approximately 2 km to the west of Site N.

Site O is 20 ha of disturbed vegetation bordering a large salt production pond approximately 7 km south-east of site N. It contains saltmarsh dominated by marine couch, samphire (*H. pergranulata, H. indica*) and Harrisia cactus *Harrisia martini*, a swale containing dense stands of *S. litoralis* and an alluvial terrace thickly grassed with marine couch, Guinea grass, kangaroo grass *Themeda australis*, Harrisia cactus and *Cyperus scariosus*. Yellow Chats were recorded five times on these saltfields in 2008 (Table 1).

Up to 28 Yellow Chats were recorded at Sites N-O over a 6 month period in 2008 and on two occasions birds in breeding condition were present but breeding was not confirmed. Records of birds and of possible breeding have occurred in both the wet and dry seasons.

Potential chat sites

Chats were not found at several surveyed sites that seemingly had suitable habitat for chats (extensive channels and ponds bordered by tall *S. litoralis* and saltmarsh). These were:

1. Plains to the south of sites A to F in western Broad Sound including at least 400 hectares on north-eastern and central parts of the Waverley Creek – Amity Creek marine plain; 200 hectares in a far south-eastern part of the same plain; and 50 hectares on the northern Styx River marine plain. Each had extensive areas of tall *S. litoralis* sedgeland with associated samphire (dominantly *H. pergranulata*), beetle grass *L. fusca* tussock grassland, spike-rush *Eleocharis spiralis* sedgeland, marine couch *Sporobolus virginicus* grass sward and/or freshwater couch *Paspalum distichum* meadow. Low banks reduced or prevented tidal connectivity and increased persistence of fresh water and proliferation of *S. litoralis* sedgeland and, in some cases, freshwater plant

communities. Dedicated searching for Yellow Chats and general observations of waterbirds were conducted (RJ and others) in each of these three localities during 2006 and 2007 (3-5 surveys in each locality; months of surveys were January, March, May, June, July, September and November). No chats were found in this apparently prime habitat despite the surveys being conducted in mostly still weather suitable for hearing chats.

2. Some potentially suitable habitat also occurs in the Fitzroy River Delta, notably on the northern side of the delta associated with Barramundi Creek. Extensive *S. litoralis* lined channels lie upstream of a levee bank across the marine plain. Structurally the sedges range from a dense continuous band to sparser vegetation in clumps typical of suitable Yellow Chat habitat elsewhere. Although limited in extent, small patches of adjacent samphire vegetation are also present (*Halosarcia* spp. and marine couch). Some freshwater couch *P. distichum* occurs where freshwater influence is greater. Further upstream there is a large lake bordered by some large patches of tall *S. litoralis* and *Eleocharis* sedgelands plus occasional tussocks of *C. alopecuroides*. Suitable chat habitat is estimated at less than 50 ha. Despite favourable conditions such as healthy tall sedges and muddy edges, intensive surveys (RB and others) in June 2005 and October 2008 did not detect any chats. Based on aerial observations, several other sites with potential habitat also occur in the Delta system, notably associated with Gluepot Creek and Casuarina Island in the southern Fitzroy River Delta. However these are difficult to access and remain to be fully investigated.

CONCLUSIONS

The several new localities reported here, where Capricorn Yellow Chats were found, together with historical and other recent surveys have extended the local distribution of the subspecies beyond its historically recorded range. Small groups are now recorded in the northern Delta and Torilla Plain (historical localities), Curtis Island (Arnold *et al.* 1993, Houston *et al.* 2004b), more widely in the Torilla Plain and Fitzroy Delta wetlands than historically known (Jaensch *et al.* 2004; Houston *et al.* 2004a; present reports), and across western Broad Sound wetlands (present reports). Confirmed breeding localities now number five.

Given the secretive habits of the bird and the relative inaccessibility of its known habitat, small populations may have been overlooked. Though sometimes relatively conspicuous (males and females frequently perch and call atop vegetation), the bird is small and normally stays low in the vegetation where it feeds. Also it usually stays close to the ground when making short flights. When not breeding it may call only infrequently and often becomes secretive, mostly staying in cover. It is likely that a small number of further records will occur following more searches targeting this species in potentially suitable habitat.

Assessments of the conservation status of this subspecies have steadily improved over the past decade. The chat does not depend on the existence of just one or two wetlands with suitable habitat; instead its vulnerability is lessened by being spread across a suite of near-contiguous core wetlands on Torilla Plain where numbers tend to be highest and habitat is most diverse, and collectively across at least six regularly-used separate localities, up to 220 km apart (Fig. 1). At times the population comprises several hundreds of birds (Houston *et al.* 2004a, p. 40) whereas none were reported from 1917 to 1993. This positive outlook does not diminish the importance of protecting each wetland where the chat occurs, particularly as many patches of occupied habitat in the same area are discrete rather than continuous and numbers remain low. Despite great improvements in understanding of the range and ecology of the Capricorn Yellow Chat, it remains Critically Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The remaining actions in the recovery plan (Houston & Melzer 2008) requiring further implementation are: monitoring occupied habitat; persistence with searches in apparently optimal habitat that has not yet proved to support chats; further definition of the ecological requirements of this bird and threats to it and its habitat. Discussions to increase landholder awareness of chat habitat requirements at several localities are needed as is obtaining the cooperation of landholders in establishing voluntary conservation agreements over key areas of chat habitat for improved long term management.

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REFERENCES

ARNOLD, D., BELL, I. & PORTER, G. 1993. The incidence of the Yellow Chat *Epthianura crocea* (Castelnau and Ramsay) on Curtis Island. Report to Queensland Department of Environment & Heritage.

CAMPBELL, A. J. 1917. The Yellow-breasted Bush Chat (*Epthianura crocea*). *Emu* 17: 61-62.

HOUSTON, W. & MELZER, A. 2008. *Yellow Chat (Capricorn subspecies) Epthianura crocea macgregori* Recovery Plan. Report to Department of the Environment, Water, Heritage and the Arts, Canberra. Queensland Environmental Protection Agency, Brisbane.

HOUSTON, W., PORTER, G., ELDER, R., BLACK, R., & SHEAVES, M. 2004. Rediscovery of Yellow Chats (Capricorn subspecies) on the Fitzroy River delta, central Queensland. *Sunbird 34: 36-42*

HOUSTON, W., PORTER, G., O'NEILL, P. & ELDER, R. 2004. The ecology of the critically endangered yellow chat *Epthianura crocea macgregori* on Curtis Island. *Sunbird* **34**, 10-23.

JAENSCH, R., HOUSTON, W., BLACK, R., CAMPBELL, L., ELDER, R., McCABE, J. and PORTER, G. 2004. Rediscovery of the Capricorn subspecies of the Yellow Chat *Epthianura crocea macgregori* at Torilla Plain, on the mainland coast of central Queensland. *Sunbird 34: 24-35*

MELZER, A., JAENSCH, R. & COOK, D. 2008. Landscape condition in the Broadsound Basin. A preliminary assessment (2006 – 2007) to guide investment in natural resource management. Report to Fitzroy Basin Association.

MACK, G. 1930. The Yellow Chat. *Emu* 30: 87.

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Table 1. Site Descriptions and Habitats

Locality	Site	Site description	Latitude (⁰S)	Longitude (⁰E)	Habitat Types
St Lawrence – Waverley	A	West of St Lawrence	22.3461	149.5170	SG, GF, WS.
	B	Central swamp, near fence	22.3216	149.6064	SD, SG, HA, WS, DR.
	C	Central swamp, innermost	22.3176	149.6120	SG, HA, WS, BA.
	D	Small freshwater pond nearby	22.3252	149.6062	SD, SG, GF, WS.
	E	Eastern edge of broad salt flat	22.3199	149.6006	SD, HA, WS, BA, DR.
	F	South-western corner of broad salt flat	22.3268	149.5894	SG, HA, WS.
Western Herbert	G	Southern satellite swamp	22.6000	149.9741	SG, HA, GF, WS.
	H	Swamp and small lake associated with I	22.5941	149.9624	SG, HA, GF, WS, DR.
	I	Principal channel system	22.5933	149.9708	SG, HA, GF, WS, DR.
	J	North-eastern satellite swamp	22.5560	149.9487	SG, GF, WS, DR.
Nankin Plain	K	Northern part of second channel from the west	23.4655	150.6857	SG, WS, DR.
Southern Fitzroy R. Delta	L	Swamp and saltmarsh, Inkerman Creek east	23.6242	150.7104	SD, SG, HA, GF, WS, BA, DR.
	M	Swamp and saltmarsh, Inkerman Creek west	23.6262	150.6992	SD, SG, HA, GF, WS, BA, DR.
	N	Inkerman Creek saltfield and saltmarsh	23.6063	150.7361	BA, GF, HA*
	O	Western swamp and saltmarsh of Pelican Creek saltfields	23.6490	150.7861	BA, GF, HA*

GPS Datum: WGS84.
Habitat Types: Habitat conditions vary from year-to-year and with seasons. SD = tall clumps of dry *Schoenoplectus litoralis* plants;
SG = tall clumps of green *Schoenoplectus litoralis* plants;
HA = low samphire *Halosarcia* sp. shrubs;
GF = grass-forb meadow;
WS = shallow water within vegetation;
BA = ground, mostly bare;
DR = dry ground, dry wetland.
*indicates levee bank and damp pond margins (a mixture of rocks and mud).

ANALYSIS OF BIOMETRIC VARIATION IN BROWN HONEYEATER *LICHMERA INDISTINCTA* IN SOUTH EAST QUEENSLAND

J.T. COLEMAN, S.H. MACDONALD & H.J. SMITH

ABSTRACT

Standard morphometric measurements from 145 Brown Honeyeaters, mist-netted for banding over a three year period in South East Queensland, were pooled and analysed. Data is presented on the morphometric variation in the birds caught and, as the species is sexually dimorphic across its range, the results are compared with similar studies.

This study found males were generally larger than females, which aligns well with other studies conducted in South East Queensland and supports the finding that sexing criteria based on wing length are useful. Other measurements exhibited a higher degree of overlap between the sexes and were less reliable than wing length in determining the sex of a bird.

Body condition index changed little seasonally over the 3 year period of the study. The value of baseline data over much longer time periods is highlighted as a means of monitoring trends.

INTRODUCTION

Since 1964 over 30,000 Brown Honeyeaters, *Lichmera indistincta,* have been banded in Australia. Ageing and sexing criteria have been described for this species in Western Australia (de Rebeira 2006, Rogers et al 1986) and South East Queensland (Liddy 1989) with all authors highlighting sexual dimorphism. Only limited literature is available for other parts of Australia. Marchant & Higgins (2001) notes clinal variation and subspecific variation in biometric measurements in different parts of Australia making it important that size variation in this species is well understood throughout its range if these parameters are to be used for sex determination.

While plumage provides an accurate means of sexing this species (Marchant & Higgins 2001) there are times, during moult, or for juvenile birds, when this method may be unreliable and morphometric characters would be more accurate. This paper seeks to provide additional, current morphometric data for the species in South East Queensland with ranges, mean averages and overlap ranges for a number of measurements taken from males and females. In addition this paper will examine which measurements provide the most accurate sex determination and compare the ranges identified for this study with other local and national datasets. Body condition data is also presented.

MATERIALS AND METHODS

Since 2006 Brown Honeyeaters have been caught using mist-nets in a variety of habitats in South East Queensland as part of a long term monitoring program looking at a range of species. Each location was visited at least once per month between 06:00 EST and 12:00 EST with the number and type of mist-nets set being the same on every visit, to ensure the sampling effort remained constant and therefore comparable both between and within years. The study is ongoing and the methodology described here ensures continuity into the future for existing monitoring sites while also ensuring that new sites follow the same consistent methodology so that long term trends in productivity, abundance and survival can be developed from the dataset over time.

Every bird caught was aged according to plumage and where possible sexed on plumage or, if appropriate, on the presence or absence of cloacal protuberances and/or brood patches. Ageing and sexing criteria were based on those described in de Rebeira (2006), with the absence of the spot behind the eye and/or the presence of buff tips on un-moulted covert feathers being used to identify juveniles. Males were differentiated from females by having grey heads contrasting with the back feathers whereas females have a greenish head which does not contrast with the back (de Rebeira 2006).

A range of measurements were taken from all birds caught irrespective of whether they were caught for the first time or were a recapture. The biometric measurements taken from each bird were: flattened wing chord length, tail length, total head length, bill to feather length, minimum tarsus length and body mass. Wing chord length and tail length were recorded to the nearest mm with all other size measurements being recorded to the nearest 0.1mm. Body mass was recorded to the nearest 0.1g. The method of recording these measurements is well described in other sources (Lowe 1989, Redfern & Clark 2001).

Statistical analysis was done using StatsDirect v2.6.6. Samples were compared using one -tailed analysis of variance (ANOVA) for normally distributed samples and Kruskall-Wallis tests were used to compare samples with non normal data, with statistical significance being accepted for results with $P<0.001$. Non normality in data was tested for using a Shapiro-Wilk W test.

Body condition index was calculated by dividing tarsus measurement into body mass to give a weight per unit of size and to reduce the influence of body size on body mass measurements. Tarsus was selected as a size variable, as this bone measurement has been demonstrated as a reliable predictor of body size in birds (Senar & Pascual 1997)

RESULTS

Between the 1st October 2006 and 30th April 2009 a total of 145 Brown Honeyeaters were caught and banded at four sites in South East Queensland. The numbers of males, females and juveniles caught at each location are shown in Table 1. Only adult birds were used in the analysis of variation in size, to remove bias as a result of juvenile plumage causing any incorrect sexing.

An analysis of variance for wing length shows a statistically significant sexual dimorphism (ANOVA F=221.3, DF=84, P<0.0001) with males having larger wing lengths than females (Males: Mean 70.0mm, SE +/- 0.4mm, n=45, Females: Mean 63.0mm, SE +/- 0.3mm, n=40). The degree of overlap in wing length between genders is low. Wing length ranged from 59-76mm with females and males only overlapping in the 65-67mm range (Figure 1). Unsexed juvenile wing length also shows a degree of dimorphism (Figure 2) but the distinction is far less clear than in adult birds. Despite moult and the potential for wear in flight feathers to influence wing length, no significant differences in wing length in adults were noted throughout the year (ANOVA F=0.65, DF=50, P=0.4, F=0.38, DF=18, P=0.82 for males and females respectively).

For total head length, an analysis of variance also demonstrated that males are statistically larger than females (Kruskal-Wallis T= 46.5, DF=1, P<0.0001). Total head

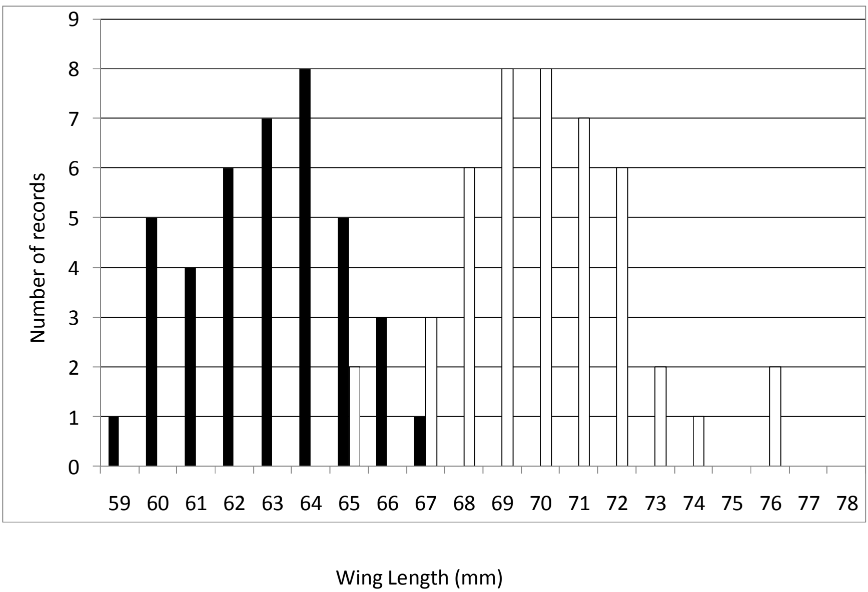

Figure 1: Distribution of wing chord lengths (Females = black columns, Males = white columns)

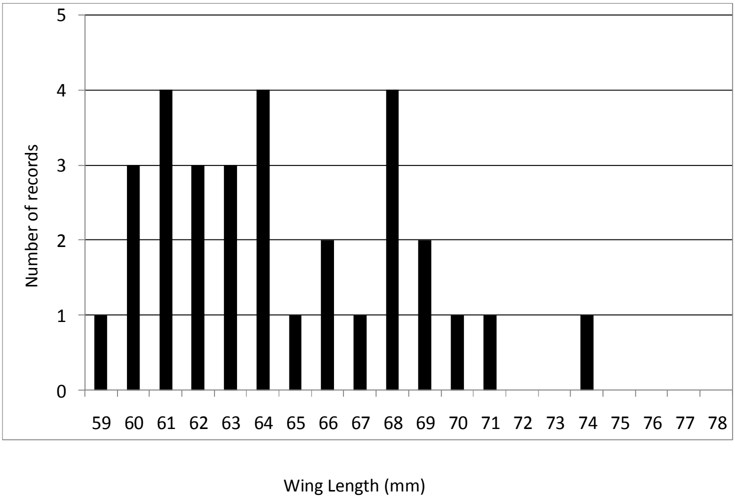

Figure 2: Distribution of wing chord lengths of juveniles (Unsexed).

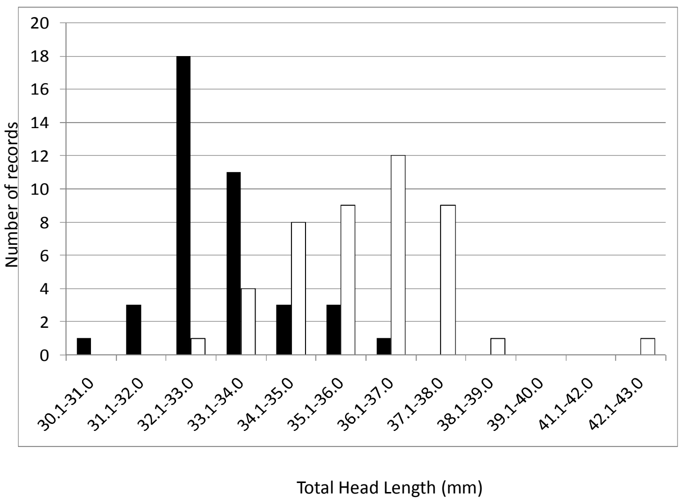

Figure 3: Distribution of total head lengths (Females = black columns, Males = white columns).

length ranged in size from 30.7- 42.9mm with males and females overlapping in the range 32.5-36.1mm (Figure 3) a much larger overlap than that recorded for wing length. Despite the overlap in range, males were on average 2.9mm larger than females (Males: Mean 36.1mm, SE+/- 0.3mm, n=45, Females: Mean 33.1mm, SE +/- 0.2mm, n=40)

The same trend in dimorphism was shown for bill to feather length with a statistically significant difference between the sexes (Kruskal-Wallis T= 24.6, DF=1, P<0.0001). Measurements ranged from 12.8-19.2mm with the sexes overlapping in the range 13.3-18.4mm (Figure 4). Despite males being generally larger than females (Males: Mean 16.1mm, SE +/- 0.2mm, n=45, Females: Mean 14.7mm, SE +/-0.3mm, n=39) the smallest bill length was recorded from a male while the largest bill length was recorded from a female, indicating a large overlap in this measurement between genders.

Tail length also showed a statistically significant difference between males and females (Kruskal-Wallis T=33.4, DF=1, P<0.0001. Males had longer tails than females (Males: Mean=56.2mm, SE+/- 0.6mm, n=45, Females: Mean=50.9, SE +/- 0.5mm, n=40). However, as with total head length and bill to feather length, there was a large overlap in the ranges for each sex with tail length ranging from 44-63mm and overlapping in the range 47-59mm (Figure 5)

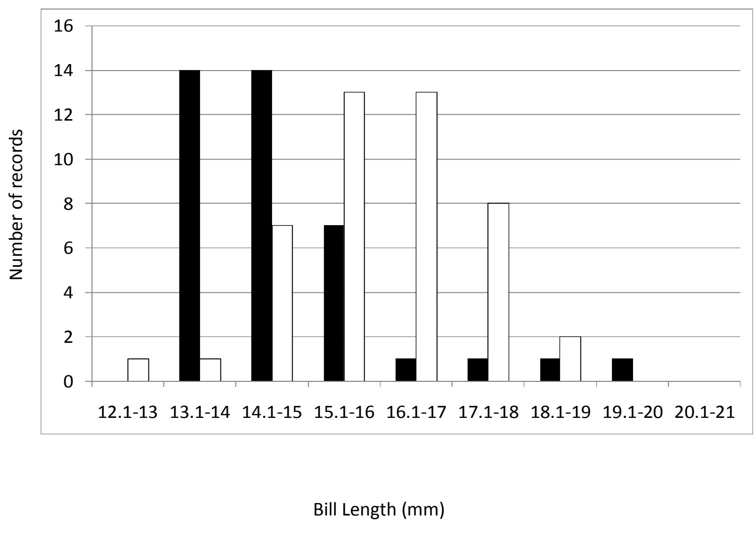

Figure 4: Distribution of bill lengths (Females = black columns, Males = white columns).

Figure 6 shows similar dimorphism for tarsus, which ranged from 10.8 to 20mm, with males being larger than females (ANOVA F=11.7, DF=83, P=0.001). Average male tarsus was 17.6mm (SE +/- 0.1, n=44) compared to average female tarsus length of 16.8mm (SE +/-0.2, n=40).

An analysis of body condition index suggested some differences in body condition index between sampling periods (Figure 7). However, an ANOVA indicated that these differences were not significant (ANOVA F=0.6, DF=183, P=0.82).

DISCUSSION

Sexual dimorphism has been described for the Brown Honeyeater by a number of authors in different parts of Australia (de Rebeira 2006, Liddy 1989, Marchant & Higgins 2001). However, clinal and subspecific variations (Marchant & Higgins 2001) make establishing criteria for sexing individuals difficult without local study of the morphometric variation.

In this study sexual dimorphism was evident in all morphometric measurements taken, but it is wing length which shows the largest separation between the sexes and is the most reliable method for sexing adults. Existing data sets show variation in the wing length ranges used for sexing. De Rebeira (2006) proposed for the Kimberley region that birds with wing lengths of less than 62mm could be reliably sexed as females and males being reliably identified as birds with wing lengths greater than 66mm.

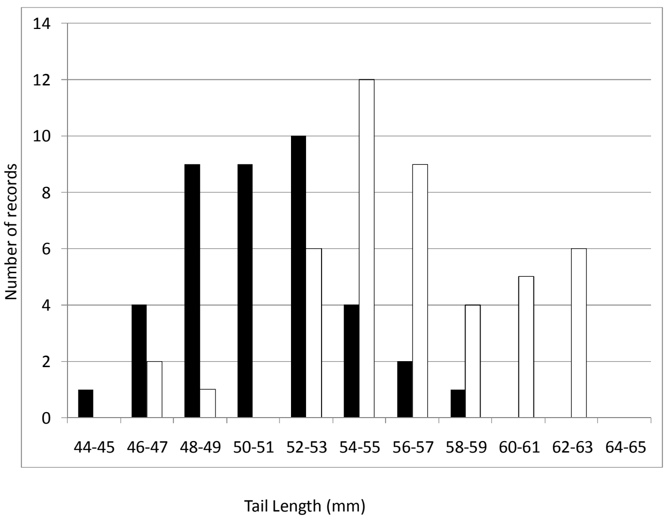

Figure 5: Distribution of tail lengths (Females = black columns, Males = white columns).

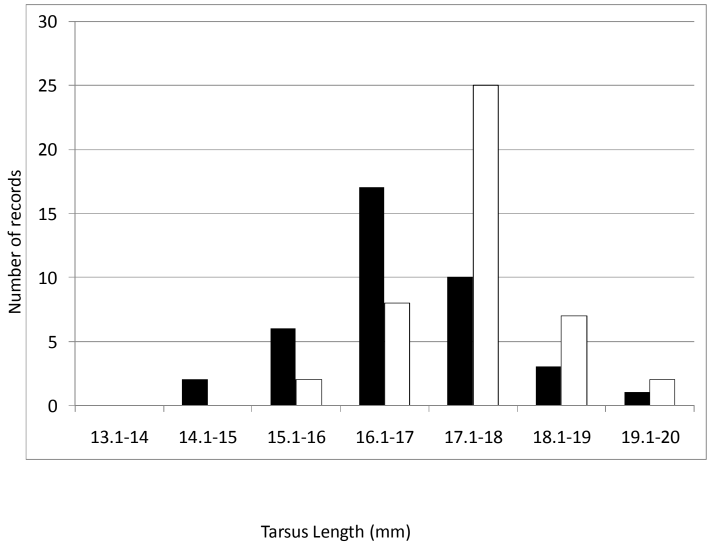

Figure 6: Distribution of tarsus lengths (Females = black columns, Males = white columns).

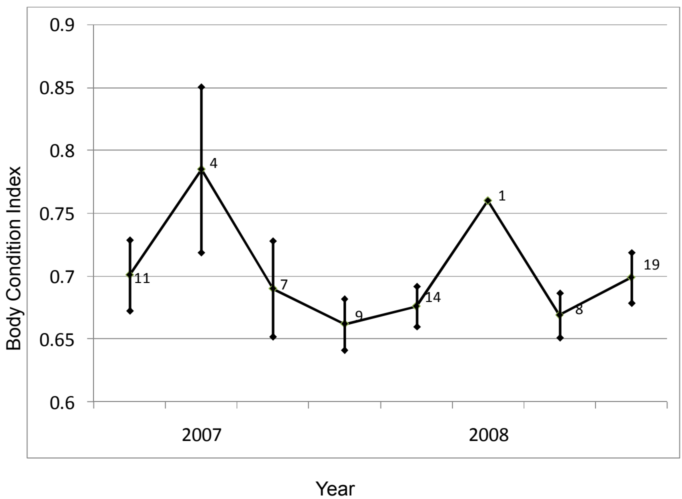

Figure 7: Annual changes (quarterly from 2006-2009) in body condition index of Females and Males (combined, n = birds / quarter).

Birds from Broome Bird Observatory showed ranges of 60-72mm for males and 56-67mm for females, compared to Eyre Bird Observatory in Southern Western Australia with ranges of 61-69mm and 53-63mm respectively. Rogers et al (1986) suggested males in South East Queensland could be safely identified as those birds with wing lengths of 71-72mm with females being safely identified on wing length if their wings were 64-65mm highlighting the significant size variation in this species geographically (Marchant & Higgins 2001). This study confirms the dimorphism identified in SE Queensland and indicates that birds with wing lengths of 68mm or greater will be male and birds with wing lengths of less than 66mm will be females supporting the findings of Liddy (1989). These delineation points will vary regionally and will need to be established for other regions within Queensland.

De Rebeira (2006) and Rogers et al (1986) indicated ranges of measurements for total head length for males and females and indicated that these ranges could be used for identifying the sex of individuals. However, the data presented here suggests, that at least for South East Queensland, total head length has limited value for this purpose as a result of the degree of overlap recorded between males and females.

Body condition index indicates little change in body condition over time or between seasons. This mirrored results shown for the Mangrove Honeyeater, *Lichenostomus fasciogularis*, in Queensland, in which mean body mass showed little variation throughout the year (Robertson & Woodall 1982). However, other studies have shown significant seasonal variation in honeyeater body condition, linking the observed results to food availability (McFarland 1986), demonstrating that there may be both species level and regional factors influencing this measure.

Nonetheless, body condition data is likely to be useful when presented over long time periods as it may show long term trends important for understanding changes in population indices or productivity over time. A similar technique has been used in waterfowl to monitor changes in body condition over time (Coleman et al 2002) and also between birds of differing status (Coleman & Coleman 2002) indicating that this method may demonstrate value.

Unsexed juveniles demonstrate dimorphism with two distinct size ranges for wing length. Using wing length is therefore likely to be a diagnostic sexing criterion for juvenile birds but will require further evaluation to determine accurate ranges.

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REFERENCES

COLEMAN, J.T. & COLEMAN, A.E. (2002). A preliminary analysis of Mute Swan biometrics in relation to sex, region and breeding status. Pages 340-345. In: E.C. Rees, S.L. Earnst and J. Coulson (Eds). *Proceedings of the fourth international swan symposium, 2001. Waterbirds 25*, Special Publication 1

COLEMAN, J., SPRAY C.J., PERCIVAL, S., RICKEARD, A.T. & YEOMAN, P. (2002). The dynamics of a flock of Mute Swans at Berwick upon Tweed with particular reference to the effects of age, sex, social status and body condition on moult. Pages 346-351. In: E.C. Rees, S.L. Earnst and J. Coulson (Eds). *Proceedings of the fourth international swan symposium, 2001. Waterbirds 25*, Special Publication 1

DE REBIERA, C.P. (2006). *Banders Guide to the Birds of Western Australia.*

MARCHANT, S. & HIGGINS, P. J. (Eds) (2001). 'Handbook of Australian, New Zealand and Antarctic Birds. Vol. 5. Tyrant flycatchers to Chats.' (Oxford University Press: Melbourne.)

LIDDY, J. (1989). Brown Honeyeaters *Lichmera indistincta* at a banding station in south-eastern Queensland. *Corella*13:65-72

LOWE, K.M. (1989). *The Australian Bird Banders Manual.* Australian Bird and Bat Banding Scheme Publication, Canberra.

McFARLAND, D.C. (1986). Seasonal changes in the abundance and body condition of honeyeaters (Meliphagidae) in response to inflorescence and nectar availability in the New England National Park, New South Wales. *Austral Ecology* 11:331-340

REDFERN, C.P.F. & CLARK, J.A. (2001). *The Ringers Manual.* British Trust for Ornithology, Thetford, Norfolk, United Kingdom

ROBERTSON, J.S. & WOODALL, P.F. (1982). Measurements, weight and seasonal variation of the Mangrove Honeyeater in south-east Queensland. *Corella* 6:1-5

ROGERS, K., ROGERS, A. & ROGERS, D. (1986). *Banders Aid: A Guide to ageing and sexing bush birds.*

SENAR, J.E. & PASCUAL, J. (1997). Keel and tarsus length may provide a good predictor of avian body size. *Ardea* 85:269-274

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Table 1: Brown Honeyeaters mist-netted at 4 localities in South East Queensland

Locality	Coordinates	Male	Female	Un-sexed	Male	Female	Un-sexed
		Adults			Juveniles		
Eagleby Wetlands	27 42 26.3 S, 153 13 47.2 E	37	37	14	7	15	20
Nudgee Beach Road	27 21 34.9 S, 153 06 00.9 E	4	2	1	0	1	1
Nudgee Beach	27 20 32.4 S, 153 05 46.0 E	3	0	0	0	0	0
Wynnum	27 25 23.0 S, 153 10 04.8 E	2	0	0	0	0	0
Totals		**46**	**39**	**15**	**7**	**16**	**22**

BEHAVIOUR OF SOUTHERN CASSOWARY *CASUARIUS CASUARIUS* TOWARDS INTRUDERS

MARIANNE D. KELLER

ABSTRACT

Southern Cassowary (Casuarius casuarius) attacks on humans have been described, however very little information can be found about territorial defense behaviour, agonistic behaviours and displays of this species. Southern Cassowaries were observed in north Queensland, in captivity and in audiovisuals on the internet. A range of behaviours, including low intensity agonistic displays are described. This information may help people who encounter a cassowary, to properly interpret the intent of a bird stressed by their presence, and therefore avoid confrontation. Further research into the behaviour of this interesting but endangered species is much needed.

INTRODUCTION

The Southern Cassowary, *Casuarius casuarius*, a ratite, inhabits coastal rainforest in tropical north Queensland and Papua New Guinea. Female cassowaries (76kg) are heavier than males (55kg), and both grow approximately 2m tall (Latch 2007). Kofron (1999) described a cassowary as being responsible for the death of a 16 year old boy, who fell after attacking the bird with a baseball bat. This is the only recorded fatality, caused by a cassowary. Kofron noted that 85 humans were chased, 45 charged, 28 kicked, nine were pushed, two were head-butted, two robbed of food and four were jumped on. The latter being the attacks which resulted in the greatest injuries.

While all animals give warning signals prior to attacking, little published information can be found about inter-specific agonistic behaviours and displays of Southern Cassowary towards people (Marchant & Higgins 1990). This knowledge could be important to people sharing the species habitat particularly as agonistic behaviours may vary depending on the intensity of the threat perceived by a bird. Low intensity agonistic behaviours or displacement behaviours might be easily confused with e.g. preening. The occurrence and intensity of displacement behaviours correlate with the bird's anxiety levels (Kortmulder 1998) and knowledge of these behaviours could also help in assessing stress levels of cassowary in captivity.

MATERIALS AND METHODS

I observed Southern Cassowaries in natural settings, in captivity and audio-visuals on the internet. Their behaviour was described and supplemented with further descriptions of cassowary behaviour found in scientific literature. The cassowary behaviours described were then compared with agonistic behaviours and displays of other avian species. The internet was a valuable source yielding many individual video clips of cassowaries' reactions to human provocation.

Wild cassowaries were observed on the Atherton Tableland and at Cape Tribulation on separate occasions (in January 2000 and July 2005). Altogether, three males with chicks (1 x three, 2 x two) and 7 solitary birds were observed. Of these, one bird at Mt. Hypipamee Crater (July 2005), was known to be very territorial and, while staying close to humans, showed a range of agonistic behaviour. No bird in the wild was approached purposely, and most of the observed behaviour was directed against other tourists.

Cassowaries also have an unfortunate reputation in zoos. In captivity, they are often confined to small enclosures without sufficient vegetation to retreat to, when provoked by keepers or the public. As captive birds can lose their natural fear of humans, these birds will display territorial defense behaviour and agonistic behaviour more frequently. This can be seen in video clips of distressed birds in zoos reacting to a perceived stress as visitors film them, or because they are agitated by a keeper for visitor amusement.

Previous experience of similar behaviour in cranes led to my choice of Ellis's sociogram (1998) to describe cassowary behaviours. Low intensity agonistic behaviour is first described and followed sequentially by increasingly agitated behaviours. Attacks were observed only on video clips and in photographs.

RESULTS

Low intensity agonistic behaviour is displacement behaviour that is always followed by a fixating stare. These behaviours include: pecking, strutting, and ritualised preening.

Pecking: Ritualised pecking at the ground, interrupted by lifting up of the head and fixating or glaring at intruders. This behaviour might be shown, if intruders are at some distance.

Ritualized preen: The bird normally faces the intruder at an angle of 75° or stands in lateral view (90°). The further away from the neck and chest the bird preens, or effectively, the longer it takes to bring the head back to fixate on the intruder, the more relaxed the bird appears. The bird will fixate on the intruder at regular intervals. A more agitated bird preens closer to the chest. In this case, no more than three seconds may elapse between gazes. This either causes the bird to bow and present the casque, or more commonly, it will preen the side of the chest, enabling it to look at the intruder constantly whilst doing so. With further provoking, ritualized preening can become a mere head flick.

Strut: The bird presents its lateral aspect and walks slowly and, quite pointedly, lifts its legs higher than is necessary. Foot movement might be exaggerated. The neck is extended upward and the head is horizontal.

Frantic movement: Depending on stress level, this walk can become faster, even frantic and a bird may turn to the right and left while walking in short straight lines past the intruder. The bird will always turn towards the intruder and then move past the intruder again. When turning, while facing the intruder, the bird will stretch itself upward, perhaps to appear larger. It seems that as the degree of agitation of the bird increases the area it struts reduces, its pace quickens and leg movements become less exaggerated. This was observed in captive birds and in a bird coping with multiple intruders in its personal space (video clip from Mission Beach).

Stretch: The bird stretches the neck vertically, the feathers from the rump forward are ruffled, and the bird exhibits a rumbling call or a hiss when directed towards humans (White 1913, Crome 1976). In addition to the behaviour described by Crome, the head can be extended upward, if the intruder is overhead, on a bridge or balcony.

Ruffle-bow: The cassowary bows and calls. It is not known if the ruffle-bow is actually part of the agonistic behaviour repertoire. *C. benetti* vocalizes at very low frequencies in a ruffle bow posture (Mack & Jones 2003). The same paper postulates that, since low frequency calls penetrate even dense rainforest, cassowaries are able to communicate although they are far apart. While the paper does not describe the posture in which *C. casuarius* vocalizes, it recorded calls at 32Hz versus 23Hz for *C. benetti*.

Ruffle shake: The bird extends its neck, ruffles the feathers and then shakes. A ruffle shake was observed in one video, after an attack.

Charging/ running/ chasing: Cassowaries will run after intruders and this is the most common form of attack (Kofron 1999). There is no obvious difference in the locomotion pattern of a bird defending its territory and one that is being chased. According to Mack and Jones (2003) birds face onward while running, not with the casque facing forward.

Pushing: Cassowaries will use their chest to push intruders, in short bursts, with or without kicking. The bird might be looking downwards, if the intruder is backing up (video clip). However, fighting cassowaries keep their heads back (Mack & Jones 2003).

Kicking: Most cassowaries kick fast using one foot at a time. The foot is not raised over the hock joint. Kicks may be accompanied by hisses, made as the foot is lifted.

Jump or Jump-rake: Leaping in the air, while slashing down with an inner toe. Only 1.8% of attacks on humans in Kofron's paper were jumps. This is not surprising with the number of agonistic behaviours that are shown prior to this "last resort". The weight of this flightless bird and the energy needed to propel itself from the ground would also make this a high risk and high energy demand behaviour. I could find only one picture of one jump-raking cassowary. In this case both feet were lifted to the same height and the bird was, at the most, a metre from the ground.

Crouching, which in cranes is regarded as the most intense agonistic display, was not observed in cassowaries. Nor was the extension of the wings forward and upward, or extension and laying flat of the wings observed, as seen in agonistic displays of rheas and other ratites that live in open habitat. Ostriches display this wing behaviour to strangers approaching the flock (Schulz 2004).

Males with chicks avoided confrontation and showed avoidance behaviours. Moving away at a slow pace with back to intruders is characteristic avoidance behaviour. Kofron (1999) described 221 attacks but males defending chicks or eggs were involved in only ten of these.

DISCUSSION

Wilson and Tisdell (2005) demonstrated that members of the public will value wild bird species more, and be more willing to protect them, when provided with quantities of useful knowledge about them. The cassowary has been described as being aggressive and unpredictable. It has been postulated that feeding by the public increases confrontational behaviour in cassowaries. Kofron (1999) reported that 75% of all attacks reviewed involved birds that had been fed previously. Cassowaries have a short enterogastric tract and their food is high in indigestible fibre, which means that daily food intake can equal up to 10% of their bodyweight (http://www.cassowary.com/workshop.html) and therefore they are dependent on large territories. The greatest threat to survival of cassowaries is habitat loss, fragmentation and degradation (Latch 2007). Most illegally hand-fed birds live near human habitation, roads or fragmented habitat. These birds become accustomed to the presence of humans and lose their natural fear. They also might become dependent on being fed and become more assertive in their attempts to receive food from humans. When they are successful, this negative behaviour is positively reinforced and will be more likely to be repeated (Reid 1996). Education about cassowaries is crucial to improving the understanding and appreciation of this much maligned bird in communities. Agonistic behaviours are a warning sign to prevent confrontation. People, who know how to interpret agonistic behaviour, can help avoid physical attacks. While not comprehensive or definitive this paper describes some agonistic behaviours of cassowaries that the public might recognise. Further research into cassowary ethology would certainly help in the understanding and management of this interesting and endangered species.

The Environment Protection Authority advises people to stay away from cassowaries. Signs are erected in habitats warning of the presence of known "problem" birds. It is important also to provide useful information about behaviours that cassowaries commonly use in the presence of intruders to dispel myths that they are unpredictable or overly aggressive.

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REFERENCES

ELLIS D.H., KEPLER C.B., SWENGEL S.R. & ARCHIBALD G.W. 1998. A sociogram for the cranes of the world. *Behavioural Processes*. 43: 125-151.

KOFRON C. 1999. Attacks to humans and domestic animals by the southern cassowary (Causarius causarius johnsonii) in Queensland, Australia. *The Zoological Society of London*. 249: 375-381.

KORTMULDER K. 1998. Displacement Behaviour Solving a Silent Contradiction. *Acta Biotheoretica*. 46: 53-63.

LATCH P. 2007. *Recovery plan for the southern Cassowary Causarius causarius johnsonii*, Brisbane: Environmental Protection Agency.

MACK A.L. & JONES J. 2003. Low-frequency vocalizations by cassowaries (casuarius spp.). *The Auk*. 4: 1062-1068.

MARCHANT S. & HIGGINS P.J. 1990. *Handbook of Australian New Zealand & Antarctic Birds Vol.1, Part A: Ratites to Petrels* Oxford University Press Melbourne.

REID P. 1996. *Excel-Erated Learning*, pp 29-34. Berkeley: James and Kenneth Publishers.

SCHULZ A. 2004. *Untersuchungen zum Verhalten und der Haltung von Afrikanischen Straußen (Struthio camelus) unter deutschen Klimabedingungen*. Munich, thesis, pp 73-74.

WHITE H.L. 1913. Notes on the cassowary (*Casuarius australis* Wall). Emu 12:172-178.

WILSON C. & TISDELL C. 2005. Knowledge of birds and willingness to support their conservation: an Australian case study. *Bird Conservation International*. 15: 225-235.

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OBITUARY
Richard Alexis Zann
27 November 1944 - 7 February 2009

It came as a great shock to Australian ornithologists to learn of the death of Richard Zann, who with his wife Eileen and daughter Eva perished together at their home in Kinglake, Victoria, when the community was ravaged by bushfire on 7 February 2009.

Richard was born in Casino, NSW, in 1944. I did not know Richard's family particularly well, but Richard I knew over the years as a student, colleague, and friend. But most present members of Birds Queensland, though they may have known his name, were probably unaware of his connection with the Society or the role he played in it in the earlier part of his career in Brisbane.

I first met Richard Zann in September 1968 on taking up my appointment as Lecturer at the University of Queensland. At that time, Richard was researching the behaviour of grass finches for his Ph.D. in Zoology under the supervision of Dr Jiro Kikkawa.

These were exciting days for the study of animal behaviour and ecology. Combining the enthusiasm of Professor Glen McBride, a notable ethologist, Dr Peter Dwyer, a critically thinking mammalian ecologist, our post-graduate students, and frequent visitors from CSIRO and other teaching and research centres, we organised weekly discussions and seminars that members of that group still tell me were a highlight of their university days - an unforgettable source of stimulation. Many students from that cohort, having contributed widely in Australian science, are now approaching their own retirement age. Richard Zann was a member of that group.

In such gatherings, many personalities surfaced: some quite dominant and opinionated. Richard tended to listen quietly to occasional bouts of overheated discussion. When the argument waned, he spoke quietly and measuredly, offering sensible logical advice or opinion tinged with a maturity perhaps unexpected among students at this level.

It was a delight to have Richard and some other key members of that group back in Brisbane in September 1996 contributing to a Festschrift in honour of recently retired Professor Jiro Kikkawa. Visitors from Austria, Canada, Finland, Israel, Japan, The Netherlands, New Zealand, Norway, Sweden, United Kingdom, and United States attended that meeting, but not a single member of our original group remained in residence at the University of Queensland. Richard, having continued interests developed while studying in Queensland, presented a paper on his recent work: "Long-term studies of reproduction and its timing in Australian Zebra Finches".

While completing his Ph.D., Richard and I frequently discussed a variety of issues ranging from editorial matters, word usage and presentation in scientific journals, to the physical design of aviaries, the problems of dialects in bird song and the analysis of time-series in behavioural data. As a newcomer to Australia I thought to minimise my ignorance of research in my new home. I solicited information from any researcher known to be working on Australian birds and catalogued their entries in an "Index to current Australian ornithological research". In that 1971 publication, Richard described his work: "A comparative ethological investigation of captive specimens of the *Poephila* genus of Australian grass finches has been carried out in order to elucidate some problems in behavioural evolution. The races described include *Poephila personata personata, P. personata leucotis, P. acuticauda acuticauda, P. acuticauda becki, P. cincta cincta, P. cincta atropygialis*. The breeding behaviour of all but one of these has been studied in detail. An extensive catalogue of their action patterns has been assembled with special emphasis on vocalizations. Results are being prepared for publication."

But Richard's interests were already turning to the Zebra Finch. We had weeks of discussions in which he weighed the pros and cons of travelling to Bielefeld, Germany, to take up a post-doctoral position with Professor Klaus Immelmann, well known for his work in Australia: honeyeaters, finches, and Mallee Fowl, but with strong interest at the time on the physiology and behaviour of the Zebra Finch – mainly in captive birds.

However, in 1972, Richard took up residence in Victoria with a position at La Trobe University. There he began what was to become the most detailed field study of the Zebra Finch, culminating in his 1996 monograph of the species.

Although highly focussed on descriptive behaviour in a few species, he showed his ability to organise and analyse more general ornithological matters. The best example of this was his splendid study of the biogeography of the island of Krakatau.

There are a few members of Birds Queensland (and others) who still claim to be foundation members of the Queensland Ornithological Society from its first year, some from attendance at the first meeting on 15 October 1969 when it was voted into existence. Most current members are unaware that there was a prior meeting held by staff and students in the Department of Zoology at the University of Queensland. This handful of enthusiasts in the Department were passionate about the study and enjoyment of birds. The meeting was chaired by Phil Straw, who still studies birds in New South Wales. Richard Zann attended that meeting and clearly added his opinion supporting the motion that another meeting should be called. A meeting advertised to all known enthusiasts in the wider Brisbane area for the purpose of deciding whether to launch a society for those interested in birds. It was at that meeting that the name was given to the Queensland Ornithological Society, later to become known as Birds Queensland. And that was the reason that the University served so long as the venue for our regular meetings. Richard Zann was a vital player in that early history.

Fittingly, it was to the QOS that Richard presented his first research results, one of the first presentations that the Society was to hear.

My later encounters with Richard were during my years as a Council Member, Research Committee Member, and President of the Royal Australasian Ornithologists Union (Birds Australia) between 1969 and 1985. As a Councillor, Richard showed early interest in the role of the Union in conservation (or perhaps its lack thereof) and served as its first "Conservation Officer" in attempting to draft policy. This was a time of uncertainty. The RAOU Atlas was about to be launched and animated debate on the direction of the Union was being pulled between the proposed structure of a Handbook of Australasian birds and issues concerning conservation, which was largely seen as problems local rather than national in scope. Richard was placed in a complicated position and we had frequent telephone discussions leading up to preparations for the next impending meeting of Council. Richard always displayed the same level -headed approach that I had noticed in him as a student many years earlier. His research presentations, which I attended at many conferences, always displayed confidence while retaining humility. I think this characteristic was one that served him well in both his science and his teaching.

It was with great sadness to learn that Richard was among the victims of the Victorian bushfires. He had much more to contribute to Australian ornithology. His wife, Eileen, and daughter Eva were also talented in their own fields. Richard is survived by his son, Christopher.

Douglas D. Dow

OBITUARY
James Allen Keast
15 November 1922 - 8 March 2009

Professor James Allen Keast passed away on 8 March, 2009, in Kingston, Canada, in his 87th year. Allen was born on 15 November, 1922, in Sydney, and became an avid ornithologist ever since his Scottish grandfather pushed his head into shrubbery to see little wrens when he was about 10 days old. Allen became a member of the Royal Zoological Society of New South Wales at the age of 16, being introduced by the distinguished bird artist Neville W. Cayley. After serving in the Army in New Britain, watching lories and swiftlets among the zero fighters, Allen went to the University of Sydney to study zoology (B.Sc. with First Class Honours in 1950 and M.Sc. in 1952) and joined many expeditions throughout the continent. He discovered that dark-flanked Silvereyes seen in winter around Sydney migrated to Tasmania in spring. Allen was awarded the Peter Brooks Saltonstall Scholarship at Harvard University to study under Professor Ernst Mayr for his PhD. His thesis, demonstrating the role of geographical isolation in the speciation of Australian birds, was published by Harvard University's Museum of Comparative Zoology in 1961 ("Bird speciation on the Australian continent"). He advanced the concept of refugia in the distribution of rain forest birds. He was also influenced by Professor A. Sherwood Romer and developed an interest in functional morphology. His postdoctoral positions took him to Oxford and Pretoria while holding the position of the Curator of Birds, Reptiles and Amphibians at the Australian Museum in Sydney. In 1962 he visited the Museum of Comparative Zoology at Harvard, where he was invited to apply for a position at Queen's University in Canada. He had broken his leg in a skiing accident in the Rockies on the way there, and was still on crutches when he went to the interview for the job. He demonstrated the motion of kangaroos hopping to and from his crutches during the seminar and got the job, which he held until his retirement in 1989. He developed a field programme at the Queen's University Biological Station at Lake Opinicon and studied birds and fishes over 30 years, supervising 27 graduate students and writing 7 books and more than 120 research papers and book chapters. He often returned to Australia during this period and after retirement. He was a Visiting Professor at Griffith University (School of Australian Environmental Studies) for one semester. He loved fieldwork and spent many weekends watching Queensland birds. His contribution to Australian ornithology was rewarded by his election to the Fellowship of the Royal Australasian Ornithologists' Union in 1960 and the award of D. L. Serventy Medal in 1995. Noteworthy among his ornithological and biogeographical contributions are "Continental drift and the evolution of the biota on southern continents" in the *Quarterly Review of Biology* (46: 335-378, 1971) and edited books of "Ecological Biogeography of Australia" (3 volumes, W. Junk, 1981), "Birds of Eucalypt Forests and Woodlands: Ecology, Conservation, Management" (Surrey Beatty, 1985) and "Biogeography and Ecology of Forest Bird Communities" (Academic Publishing, 1990). To celebrate the life of Allen, Queen's University organised "Keast Fest" at its Biological Station for 13 June 2009. QOS members may be interested in his article "The Sydney ornithological fraternity, 1930s-1950; anecdotes of an admirer" published in *Australian Zoology* (Vol.30, No.1, 1995), in which Allen talks about his early years in Australia with his delectable sense of humour (available at http//rzsnsw.org.au/publications/AZ30-1_Keast_26-32.pdf).

Jiro Kikkawa

Errata: *Harris, Peter L and Stewart, David. Grasswren Amytornis dorotheae Surveys near Mt ISA (1990 - 1995). Sunbird: Volume 39, Issue 1; June 2009; 3-13.*
See Table 1 *Locations of Carpentarian Grasswren Amytornis dorotheae NW of Mt Isa.* to substitute the columns below for accurate locations.

Date	Latitude / Longitude
	ºS ºE
23-06-90	19º 56 , 139º 09
07-07-90	"
14-07-90	"
04-08-90	19º 54 , 139º 09
29-09-90	"
15-12-90	19º 56 , 139º 09
02-02-91	"
22-05-91	18º 23 , 138º 13
23-05-91	18º 24 , 138º 14
01-06-91	19º 53 , 139º 09
27-07-91	19 º56 , 139º 09
21-08-91	19º 56 , 139º 12
23-08-91	19º 58 , 139º 11
14-09-91	19º 51 , 139º 10
21-09-91	19º 49 , 139º 11
22-02-92	20º 17 , 139º 09
05-04-92	"
04-05-92	20º 03.5 , 139º 09
10-05-92	20º 03 , 139º 10. 5
10-05-92	20º04 , 139º05
15-05-02	20º16 , 139º11
23-05-92	20º18 , 139º15.5
30-05-92	20º20 , 139º17
31-05-92	20º23 , 139º19.5
14-06-92	19º21 , 139º03.5
12-07-92	20º16 , 139º06.5
30-08-92	20º22.8 , 139º19.6
13-09-92	20º23.48 , 139º12.22
03-10-92	20º25.4 , 139º09.64
06-10-92	20º31.85 , 139º26.9
31-10-92	20º25.4 , 139º21.3
07-11-92	20º38.7 , 139º09.9
07-11-92	20º35.9 , 139º09.2
07-11-92	20º29.8 , 139º07.3
08-11-92	20º40.7 , 139º08.25
08-11-92	20º36.3 , 139º17.05
22-11-92	20º32.55 , 138º40.37
28-11-92	20º24.42 , 138º42.5
28-11-92	20º20.91 , 138º36.17
28-11-92	20º18.37 , 138º42.68
05-12-92	20º11.32 , 138º55.76
12-12-92	20º08.99 , 138º34.31
12-12-92	20º25.79 , 138º51.65
10-01-93	20º23 , 139º19.5
23-01-93	20º23 , 139º19.5

03-04-93	20º02.58 , 138º37.09
03-04-93	19º58.87 , 138º32.18
04-04-93	20º04.25 , 138º42.23
18-04-93	19º58.13 , 138º59.82
19-04-93	20º08.74 , 138º56.75
01-05-93	19º42.56 , 138º25.82
02-05-93	19º46.88 , 138º31.03
02-05-93	19º44.78 , 138º47.42
08-05-93	19º52.2 , 138º28.57
22-05-93	19º50.28 , 138º59.16
23-05-93	19º45.85 , 139º02 66
29-05-93	19º38.35 , 138º59.64
05-06-93	19º48.87 , 139º31.83
05-06-93	19º50.7 , 139º37.85
04-07-93	20º31.89 , 139º26.85
15-07-93	19º37.8 , 138º59.87
19-07-93	19º36.23 , 139º31.18
22-07-93	19º27.76 , 139º23.27
24-07-93	19º38.78 , 139º23.53
01-08-93	20º31.89 , 139º26.85
14-08-93	19º22.1 , 139º32.1
15-08-93	19º18.54 , 139º33.17
22-08-93	19º32.45 , 139º49.5
22-08-93	19º33.3 , 139º49.8
11-09-93	20º39.08 , 139º02.82
12-09-93	20º36.05 , 139º18.3
18-09-93	19º05.36 , 139º13.62
25-09-93	19º18.16 , 139º29
11-10-93	19º13.3 , 139º08.1
11-10-93	19º14.38 , 139º11.25
13-11-93	20º36.25 , 139º17.15
13-11-93	20º36.58 , 139º17.02
13-11-93	20º35.03 , 139º17.93
20-11-93	20º35.23 , 139º18.14
27-02-94	20º22.75 , 139º19.53
05-03-94	20º22.75 , 139º19.53
07-05-94	20º35.23 , 139º18.14
31-07-94	20º17 , 139º09
20-08-94	20º35.23 , 139º18.14
17-12-94	20º35.23 , 139º18.14
24-12-94	20º29.1 , 139º24.17
04-02-95	20º35.23 , 139º18.14
18-02-95	20º35.23 , 139º18.14
25-03-95	20º35.23 , 13918.14
01-04-95	20º35.23 , 139º18.14
30-04-95	19º52.2 , 139º38.2
06-05-95	20º35.23 , 139º18.14

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