Population censuses of Yellow-tailed Black-Cockatoos in the Adelaide and Mount Lofty Ranges – autumn 2011 and 2012

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Introduction

The Yellow-tailed Black-Cockatoo (YTBC) *Calyptorhyncus funereus* occurs throughout south-eastern Australia west to Eyre Peninsula, with closely related taxa in south-west Western Australia (Saunders 1979). An endangered and isolated population containing fewer than 30 birds occurs on Eyre Peninsula has been the subject of study and recovery programs in recent years (Way & van Weenen 2008).

A breeding population of YTBC occurs in the forests of the Mount Lofty Ranges (MLR), with foraging groups dispersing to the Adelaide Plains. Early reports indicate that it was a regular non-breeding visitor to the Adelaide Plains. Early residents and visitors to Adelaide made frequent reference to black cockatoos or 'macaws' (e.g. Mantegani 1902). In a review of the parrots in the Adelaide region, Symonds Clark (1889) regarded it as an occasional visitor to the plains near Adelaide. White (1919) in a list of birds from the 'Reedbeds' (=Fulham) district, noted that it was recorded in the early days, presumably to visit the Banksia scrubs that existed then. Although fairly regularly reported from the foothills there were only very occasional records from the plains up until the mid-1990s (e.g. 1 at Salisbury in August 1944, 1 at Hazelwood Park on 11 November 1968, 4 at Kilburn on 18 November 1972 – SAOA records). Subsequently reports increased in the Adelaide Parklands (including Botanic Gardens) and eastern suburbs, mainly of small flocks (up to 10) in December and January. In late spring-summer 2009/10 and 2010/11 unprecedented numbers were recorded across the plains (e.g. 30 at Elder Park on 24 Jan 2010, 18 over Black Forest on 20 October 2010, one at Nailsworth on 1 Jan 2011, two 1 km S of Virginia on 18 Oct 2009 – SAOA records).

At the same time the distribution of YTBC has changed in the Mount Lofty Ranges. In the north there are early reports from the Mount Crawford district (e.g. Wilson 1852, Bellchambers 1917). Subsequently until recently there had been few reports north of the Torrens valley, with a report from Birdwood on 28 October 1994 considered unusual (Myers 1995). A comparison of the Adelaide region bird atlases conducted in 1975-5 and 1984-5 showed a wider distribution (Paton et al. 1994). In the last few years a sub-population has re-established in the north, particularly between Athelstone, Anstey Hill and Millbrook Reservoir, ranging as far north as Para Wirra NP (e.g. 50 in Sept 2009 – S. Taylor pers. comm.). In the east Eckert (2000) noted that YTBC formerly ranged west of the Finniss – Strathalbyn-Wistow Road but in recent years there had been several observations east to Bletchley and Langhorne Creek.

Lendon (1973) considered YTBC a summer visitor to the MLR although there have been records throughout the year. There is also some evidence that MLR population is linked to others in South Australia. Allen Lashmar in McInnes & Carne (1978) recorded 'on Kangaroo Island, in April 1975, a flight of at least 100 black cockatoos approaching the island from the sea, apparently having crossed Backstairs Passage from the South Australian mainland, a distance of about 14 km'. However, preliminary genetic research (Janette Norman, Museum Victoria, unpublished) indicates there is limited gene flow between mainland and KI populations (Way & van Weenen 2008). Dawson (1994) also suggests that some birds move east from the MLR to the Ngarkat district, however the use of the Ngarkat area by YTBC's from SE SA is more likely.

Dawson (1994) undertook a survey during the mid-1980s using over 1300 volunteers in the first attempt to determine nationwide YTBC population size, movements and ecology. The total population was estimated between 6000 and 13500.

No previous attempt has been made to determine the size of the population in the MLR region. The largest flock (800) was reported at Second Valley Forest, Honeysuckle Flat, on 28 September 1985 (G. Carpenter, R. Kernot and R. Allen pers. obs.). Other large flocks have been seen 5km SW Echunga (500) on 30 May 1979, Belair National Park (300) on 20 Sept 1983, McLaren Flat (300) on 15 August 1984, Black Hill (200) on 11 Sept 2010, Aldgate (200) on 21 July 1978 and Anstey Hill (150) on 1 Aug 2010 (Dawson 1994, SAOA records). This had led to an estimated population of 1000-2000 in the MLR region.

The population of Yellow-tailed black Cockatoos ranges over a large proportion of the AMLR region and immediate surrounds throughout the year (Figure 1). They are particularly widely distributed during breeding season (from late spring through to the start of autumn), when pairs of birds are spread over much of the forest landscape (although predominantly south of the River Torrens). When breeding, the activity of pairs is likely to be concentrated within 10 kms of nest locations as has been shown for similar species of Black-Cockatoo. The species aggregates in autumn after breeding to form large flocks, concentrating the majority of the region's population into a few localised areas within the region.

The May 2011 and May 2012 surveys were initiated by Natural Resources AMLR to provide information on the population size of YTBC in the Adelaide and Mount Lofty Ranges region. The timing of the surveys was planned to coincide with formation of non-breeding aggregations, taking advantage of the species' habitual seasonal flocking behaviour.

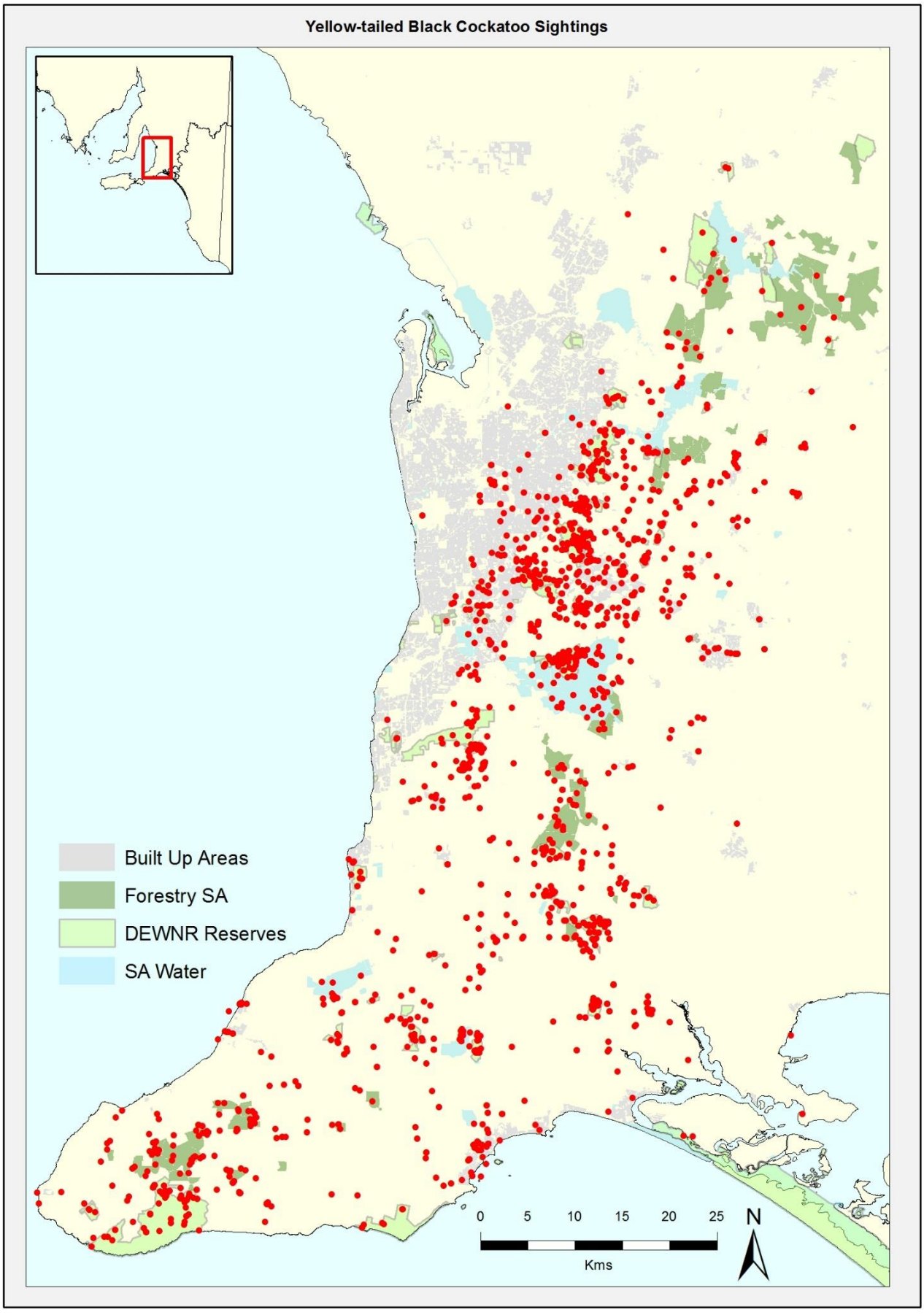

Figure 1. Yellow-tailed Black-Cockatoo sightings in the AMLR region and surrounds, from the Biological Databases of South Australia (BDBSA). Sightings are indicated by red circle.

Methods

2011

A media program was initiated to encourage the public to report sightings of YTBC over the weekend of 28-29 May 2011. Observers who registered interest in contributing to the survey were sent background information and data sheets. Participants were encouraged to not only count birds but provide information on numbers of males, females and juveniles, time and direction of movements and behaviour.

May was chosen for the timing of the survey because birds have finished breeding and they congregate into fewer and larger flocks, making the population census easier. The limited survey period (i.e. two days) aimed to reduce the likelihood of recounting the same flock at different localities, given that flocks are capable of moving many kilometres each day.

Several contracted and Natural Resources AMLR staff also searched areas where significant flocks had been recently observed to assist in the validation of flock size.

Weather during the survey was relatively fine with light winds and showers. All known recent sites of YTBC flocks were visited during the survey period.

2012

The 2012 census was undertaken on the weekend of the 26-27 May, and replicated the methodology of the 2011 census, aiming to provide an estimate of the population size of YTBC in the AMLR region. Minor modifications were made to the methodology and documentation provided to registered volunteers.

Results

A combined total of over 160 volunteer observers participated in the 2011 and 2012 censuses. All observations were added to the Biological Databases of South Australia (BDBSA) under project/survey number 620.

2011

44 records of YTBC were received for the survey period from 26 observers. A further 54 registered volunteer observers did not record YTBC during the survey. Reports were distributed from Millbrook Reservoir in the north, Goolwa in the east and Delamere in the south-west (Figure 2). The largest flock counted was 1250, located late on 28 May in the Second Valley Forest at Mount Hayfield. Fortunately a relatively accurate count of this flock was obtained, in contrast to an attempted count on 29 May when presumably the same flock was widely dispersed in pine forest on steep slopes.

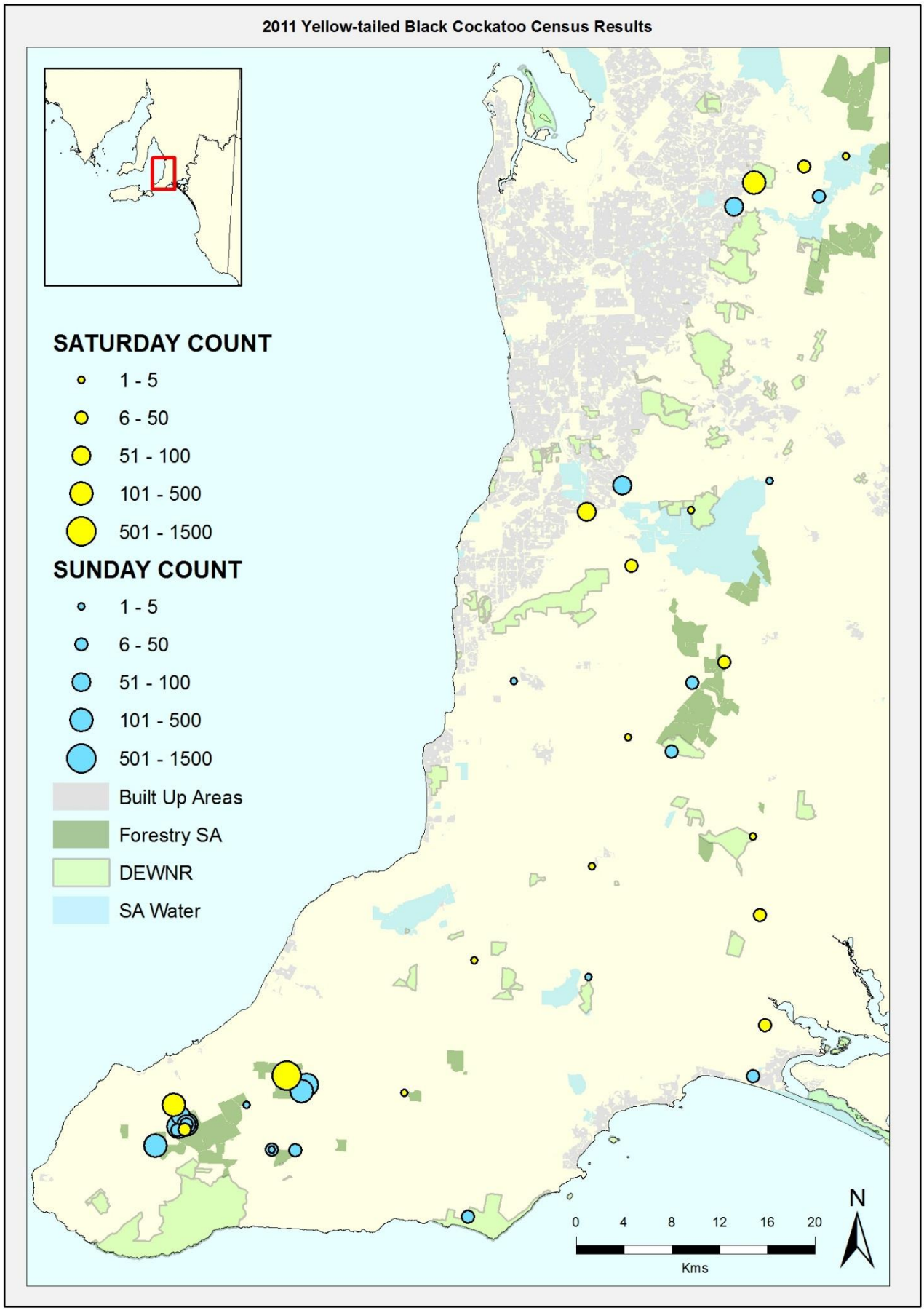

Figure 2. 2011 Yellow-tailed Black Cockatoo Census results.

In total 4688 birds were counted. Note however that this total includes recounts of the same flock at different localities on the same day, and probably the same flock at the same locality on different days. Taking this into account the total population in the Mount Lofty Ranges region during the survey is estimated at 2029. Large flocks were reported from four districts, namely Second Valley Forest, Mount Hayfield/Hay Flat (1250), Anstey Hill – Millbrook Reservoir (400), Second Valley Forest, Bedlam Flat (190) and McLaren Flat (100). Smaller flocks were reported from Kuitpo Forest (50),

Newland Head-Victor Harbor (25) and Goolwa district (42). No reports were received from the Belair NP – Cleland CP district where large flocks were present in the 1980s and 90s. Most flocks were reported in flight in or near Forestry SA pine forests. The large Anstey Hill flock was seen in flight only. Further information on the rationalisation of duplicate sightings is provided in Appendix 1.

Table 1. Location of YTBC flocks during the May 2011 survey.

Location	Total number
Second Valley, Mount Hayfield - Hay Flat	1250
Anstey Hill – Millbrook Reservoir	400
Second Valley, Bedlam Flat	167
McLaren Flat – Mount Bold	100
Kuitpo Forest	50
Goolwa	42
Newland Head – Victor Harbor	30
TOTAL	2029

2012

Over 80 volunteer observers participated in the census on Saturday the 26th and over 60 volunteer observers participated on Sunday the 27th. Reports were distributed from Anstey Hill in the North, Kuitpo in the east and Delamere in the south-west (Figure 3). The total count for Saturday was 3,255 individuals from 43 recorded sightings. The total count for Sunday was less with 2,174 individuals from 22 recorded sightings. In total 5429 birds were counted over the course of the weekend. Note however that this total includes recounts of the same flock at different localities on the same day, and probably the same groups at the same locality on different days. The information collected from volunteers included the time and location at which a flock was sighted, an estimate or actual count of flock size, and the direction of that flock's movement. This assisted with the identification of potential duplicate counts. Taking the duplicates into account, the total population count during the 2012 survey was estimated to be 1579.

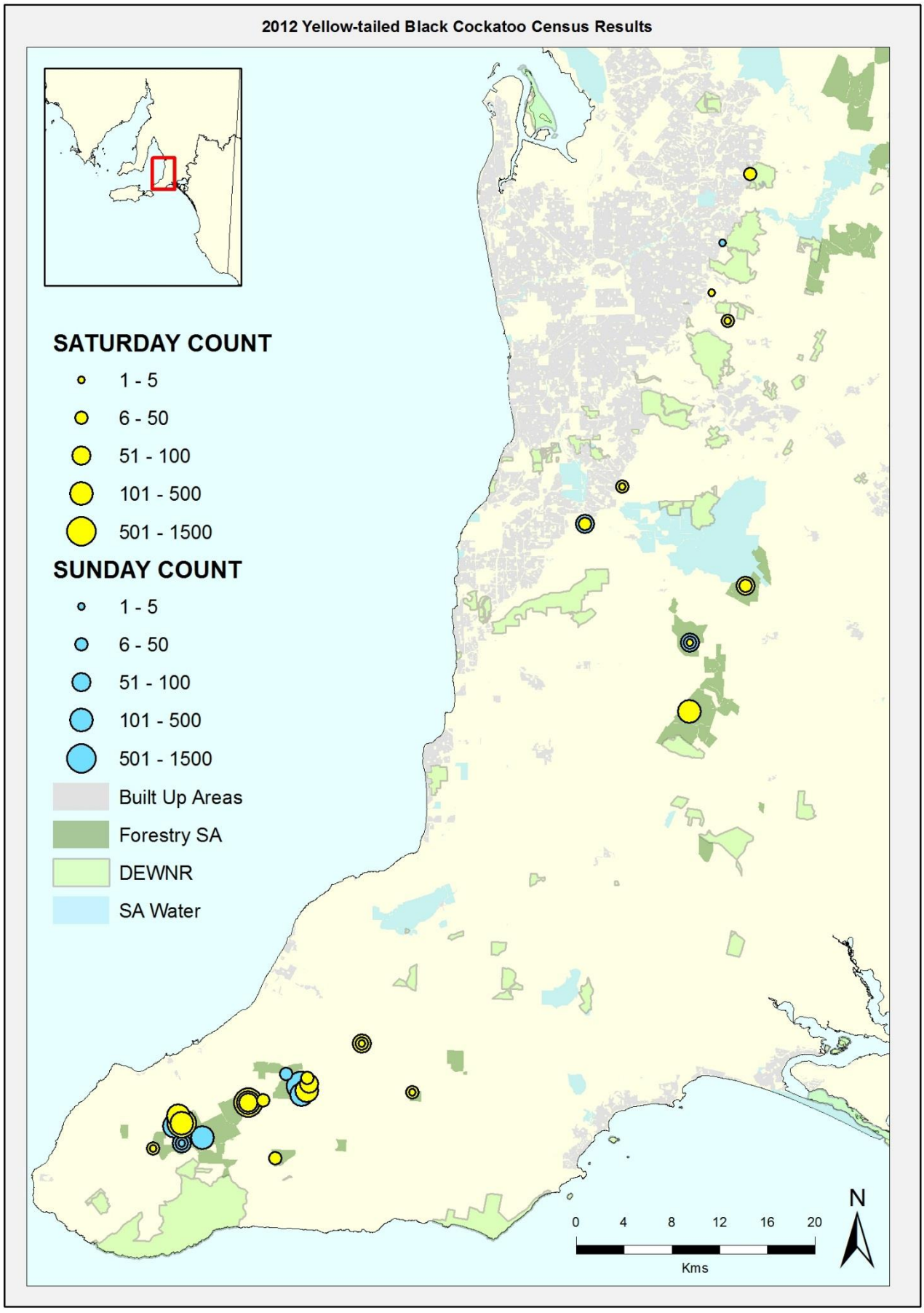

Figure 3. 2012 Yellow-tailed Black Cockatoo Census results.

The majority of assumed double counting occurred at Second Valley Forestry Reserve where the highest concentration of volunteers were situated. The highest number of sightings and largest flocks were counted in the Second Valley area on both Saturday 26 and Sunday 27 May. The counts made on Saturday afternoon of the 26 May yielded the most accurate counts of the greatest numbers of individuals recorded without potential duplicates. Therefore counts made on Sunday 26 May were used for final numbers for the Second Valley Forest area. Further information on the rationalisation of duplicate sightings is provided in Appendix 1.

Table 2. Location of YTBC flocks during the May 2012 survey.

Location	Total number
Second Valley Forest, Mount Hayfield/Hay Flat	546
Second Valley Forest, Bedlam Flat	537
Kuitpo Forest	200
Inman Valley	113
Back Valley	15
Happy Valley Reservoir	97
Anstey Hill	35
Horsnell Gully	28
Mount Crawford	8
TOTAL	1579

Sex Ratios

2011

Limited information was obtained on sex ratios and juveniles, largely because observers concentrated on obtaining total counts and many observations were of distant birds. Of about 225 birds sexed (mainly from two flocks at Second Valley), 60% were adult males. Several juveniles (identified by call) were in the Bedlam Flat flock

2012

Some information was obtained on sex ratios and juveniles in 2012. Of 288 birds sexed, 47% were adult males (135). Juveniles and females (153) have a similar appearance and are indistinguishable from each, and as such are grouped.

Discussion

The May 2011 and May 2012 census of YTBC in the Mount Lofty Ranges provided the first accurate assessment of the population size of the Yellow-tailed Black Cockatoo in the region. The results provide a benchmark to determine future population size and demographic changes. Although, just over 1500 individuals were recorded in 2012, it is assumed the difference of approximately 500 individuals between 2011 and 2012 is due to absence of observation rather than a population change between years. Due to the species feeding behaviour and the complexity of the terrain in which flocks were moving, large flocks can easily move undetected, particularly within the pine forests of Second Valley. The 2011 census was fortunate in that a relatively accurate count was obtained of the largest flock of 1250 individuals. The 2011 count of 2029 birds is therefore considered the upper estimate of the population size within the AMLR region.

The survey confirms that the Forestry SA forests and in particular Second Valley forests are very important as post-breeding areas, where 1430 (70%) birds were counted in 2011, and 1083 (68.5 %) birds were counted in 2012. The flock at Mount Hayfield in 2011 was the largest ever reported for the MLR region, although larger flocks have been reported in the South East and southern Murray Mallee (Ngarkat CP). Large groups were recorded in pines in the Second Valley forest, at Mount Hayfield, Bedlam Flat and Hay Flat. It is likely that these birds range throughout this area from autumn to spring, including in the adjoining forest at Honeysuckle Flat

where 800 birds were recorded in September 1985. Note also that it is possible that some of these birds may have dispersed from Kangaroo Island, given that birds are apparently capable of crossing Backstairs Passage (McInnes & Carne 1978).

Clearly the management of the Forestry SA reserves is critical to the YTBC in the region, particularly as they also support native forest areas with native foods and breeding sites. At the time of writing, Forestry SA plantations (primarily *P. radiata*) in the Mount Lofty Ranges continue to be replanted following harvest and overall a diversity of Radiata Pine plantation age classes occur in each of the three major plantation areas (Mount Crawford, Kuitpo and Second Valley) within the region. Consequently this autumn/winter food resource for large non-breeding flocks is likely to remain available into the foreseeable future, assuming forestry operations in the region remain economically viable.

The 2011 and 2012 censuses provided a preliminary insight into adult sex ratios, with results suggesting there are more males. A male-skewed sex ratio has important implications for the conservation of YTBC in the MLR, particularly with regards to monitoring and determining the effective population size. Adult sex ratios is a significant factor to consider as it can greatly influence population dynamics, population viability analyses and demographic population models (Donald, 2007). If not accounted for, skewed sex ratios can result in significant over or under estimation of effective population size. It is plausible, that higher female mortality, as opposed to skewed offspring sex ratio, may be a primary driver of male-skewed adult sex ratios in this species (Donald, 2007).

If we assume the population of 2000 individuals has a 1 male to 1 female sex ratio, and between 25% and 50% of the females/juveniles observed were juveniles and non-breeding adult females; it is possible there are between 500 and 750 breeding pairs of YTBC in the MLR region. If there is a male-skewed sex ratio of close to 60% within the broader population, the number of breeding pairs may be substantially lower, e.g. ~400 pairs or an effective population size of 800 individuals.

Future investigations should also aim to evaluate critical nesting and feeding areas within DEWNR, Forestry SA and SA Water reserves to assist with conservation management decisions, trail planning and prescribed burn planning. Additionally, studies should attempt to understand the importance of clustered breeding aggregation sites (e.g. sites identified in Cleland CP and Springmount CP) with regards to breeding success and disproportionate use of habitat in the landscape. Such sites are likely to support numerous suitable hollows and sufficient food resources within a 10km foraging radius of nesting sites. Likewise, studies could also investigate the condition of native food resources available to the species within the region, particularly during breeding season and the proportion of resources which is not currently exploited. Further discussion is provided in Appendix 2.

Acknowledgements

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References

Bellchambers, T.P. (1917) Notes from Humbug Scrub. *South Australian Ornithologist* 3:117

Dawson, J. (1994) *Report on the Yellow-tailed Black Cockatoo survey*. Bird Observers Club of Australia, Melbourne.

Donald, P.F. (2007) Adult sex ratios in wild bird populations. *Ibis* 149: 671–692

Eckert, J. (2000) *Birds*. IN *Natural History of Strathalbyn & Goolwa districts*. Strathalbyn Naturalists Club, Adelaide.

Forshaw, J.M. (1981) *Australian Parrots*. Landsdowne, Melbourne.

Gepp, B.C. (1986) *Birds in pine forests in South Australia*. IN Ford H.A., Paton, D.C. (eds) *The dynamic partnership: Birds and plants in southern Australia*. Government Printer, Adelaide.

Lendon, A.H. (1973) *Neville W. Cayley's Australian parrots in field and aviary*. Angus & Robertson, Sydney.

Mantegani, H. (1901-2) Recollections of the early days of South Australia from 1836. *Proceedings of the Royal Geographical Society of Australasia (SA Branch)* 5:70-76

McInnes, R.S. and Carne, P.B. (1978) Predation of Cossid Moth larvae by Yellow-tailed Black Cockatoos causing losses in plantations of *Eucalyptus grandis* in north coastal New South Wales. *Australian Wildlife Research* 5:101-121

Paton, D.C., Carpenter, G and Sinclair, R.G. (1994) A second bird atlas of the Adelaide region. Part 1: changes in the distribution of birds, 1974-5 vs 1984-5. *South Australian Ornithologist* 31:151-193

Saunders, D.A. (1979) Distribution and taxonomy of the White-tailed and Yellow-tailed Black-Cockatoos *Calyptorhynchus spp. Emu* 79:215-227

Symonds Clark, M. (1889) Our native parrots. *Proceedings of the Field Naturalists Section of the Royal Society of South Australia* 1888-1889:28-46

White, S.A. (1919) Birds recorded from the early days up to the present time for the Reedbeds district. *South Australian Ornithologist* 4:101-114

Wilson. T. (1852) Sketches of the present state of South Australia. No. XVII. Mount Crawford. *South Australian Chronicle and Colonial Record* 13:211-213

Appendix 1

Results

2011

Second Valley Forest, Mount Hayfield/Hay Flat

A single large flock was located at Mount Hayfield in the evening of 28 May. This observer obtained a relatively accurate count (1250 to within 50 birds) as the flock flew over and between a gap in the forest. The locality is in Forestry SA land containing a mixture of pine (mainly *Pinus radiata*) and native stringybark forest. The site was revisited on 29 May, particularly in an attempt to determine sex ratios. A large flock (388 counted) was located at the same location at 0900. By the afternoon presumably the same flock was located on the eastern side of the forest reserve adjacent Hay Flat Road. Here it was widely dispersed and feeding on *Pinus radiata* cones throughout the adjoining forest. Over the next hour it slowly travelled north past the headwaters of Ingalalla Falls. It was assumed that small numbers reported south of the Range Road on 29 May were part of the larger group.

Anstey Hill – Millbrook Reservoir

A large flock (up to 400) was seen in flight at Anstey Hill on both days during the survey. Presumably the same birds were seen at Highbury. A flock of 45 flying west at Millbrook Reservoir is also likely to be part of the same flock.

Second Valley Forest, Bedlam Flat

Two flocks (28 and 110) were seen in the morning of 28 May but it was unknown whether they were the same birds. On 29 May a large flock (117) was seen on Forest Rd. It is presumed that this was the same flock seen by a different observer soon after on Bedlam Flat Rd (estimated roughly at 150 at the time). This flock was followed by vehicle and on foot between 9:30 and 11:00 and was last seen near Delamere, a distance of about 3 km. During this time the flock was observed to feed in pines, roost in native stringybark forest and feed in an area of felled pines. At the latter birds were a few metres above the ground extracting seeds from the cones of felled trees. At 11:10 a further 30 birds were seen at Forest Rd, which must have been part of a separate flock. These are presumed to have been part of a flock of 50 seen soon after on Bedlam Flat Road. The total in this area was therefore estimated at 167.

A distinctive aberrant bird was also seen in the Bedlam Flat flock. Its head was yellow, upper breast yellow with black spots and wings black with yellow patches.

McLaren Flat - Woodcroft

A flock of 100 was reported flying over at Woodcroft in the evening of 28 May. This was assumed to be the same flock (also 100) reported by SAOA members at Manning Reserve earlier in the week. There is likely to be interchange between birds in this area with those at Mount Bold and Kuitpo.

Kuitpo

A flock of 40 was seen near Kuitpo on 29 May. It is assumed that 19 seen on Brookman Rd the previous day were part of this group.

Goolwa

42 were seen flying at Goolwa Beach on 29 May. It is assumed these were the same birds seen in two areas north of the town on 28 May.

Newland Head – Victor Harbor

A flock of 29 were recorded in pines at Newland Head CP on 29 May. It is assumed the same birds were seen in Victor Harbor (Hindmarsh River) the next day (M. Depledge – pers. comm.). A flock of about 60 seen at this locality on 3 June (G. Carpenter pers. obs.) presumably included the Goolwa flock.

2012

Second Valley Forest, Mount Hayfield/Hay Flat

A flock of 71 was observed at Springs Road flying in a south westerly direction on the afternoon of the 26 May. At the same time a flock of 282 was also observed flying in a south westerly direction at Hay Flat Road. Five minutes later a flock of 10 was observed at Mount Hayfield Road flying east. A fourth flock of 183 was observed at Hay Flat road flying in a south westerly direction. The four flocks totalled 546 individuals. A flock of 286 seen at Springs Road flying in a south westerly direction later that afternoon is assumed to be one of the flocks observed earlier in the afternoon at Hay Flat Road. A flock of 612 was observed at Springs Road on the morning of the 26 May flying in a north easterly direction. Based on the direction of flight, this flock is assumed to be an amalgamation of three smaller flocks observed south of this location at Forest Road, Bedlam Flat (144, 380) and Springs road (135) earlier that morning. Two flocks (100 and 40) observed later that morning at Hay Flat Road flying in a south westerly direction are assumed to belong to flocks observed flying north early that day.

On Sunday the 27 May a large flock of 868 was observed at Waterfall Track flying in a south westerly direction. At the same time a flock of 102 was also observed flying in a south westerly direction. It is assumed these individuals belong to groups observed the previous day. On the morning of the 27 May two flocks (280 and 4) were observed on Hay Flat Road and 10 were seen on Mount Hayfield Road. It is assumed these flocks comprise individuals observed in the flocks later that day. After taking into account possible duplicate counts, and the ability of flocks to easily move between the Bedlam Flat and Mount Hayfiled/Hay Flat areas; the total counts for Sunday in the Second Valley Forest area are less than the totals observed on the Saturday. The total count in this area was estimated at 546 based on counts made on the afternoon of the 26 May.

Second Valley Forest, Bedlam Flat

A large flock of 534 was observed flying in a westerly direction on Forest Road on the afternoon of the 26 May. The locality is adjacent to Forestry SA land containing a mixture of pine (mainly *Pinus radiata*). 3 individuals were also observed at Cole Road flying in a north easterly direction later in the afternoon. It is assumed the two flocks of 6 (12 in total), seen earlier on the morning of the 26 May at Cole Road are part of the same flock. 9 individuals observed in the early afternoon (26 May) at Tunkalilla Road flying in a north westerly direction are assumed to have joined up with flocks seen later that afternoon. It is also assumed six flocks observed on the morning of the 27 May of varying sizes (57, 5, 2, 350, 120, 80) are part of the same group. These flocks totalling 614 individuals, were observed moving in varying directions, between 7 am and 11 am, in the Bedlam Flat area. They are assumed to represent multiple observations of proportions of the same broader flock at different times. Therefore, based on counts made on the afternoon of the 26 May, the total in this area was estimated at 537.

Inman Valley

Several flocks (100, 8, 3, and 2), totalling 113, were observed in succession over a 1 hour and 20 minute period at Inman Valley Road, Bald Hills on 26 May. It is assumed that 80 seen at the same location the following day (27 May) were part of these flocks.

Back Valley

Small numbers of birds (11, 3, and 1), totalling 15, were observed on Back Valley Road, Back Valley adjacent to Hutchinson's ForestrySA plantation on 26 May. 2 birds observed at the same location the following day are assumed to be part of these flocks.

Happy Valley

Flocks of 85 and 12 were reported at the corner of Armata and Education roads, near Happy Valley Reservoir on the 27 May around midday. Whilst there is likely to be interchange between birds in this area with those at Kuitpo, it is assumed these are different flocks to those observed at Kuitpo. Because several smaller flocks were observed in this area (20 and 10), and nearby at Aberfoyle Park (8, 6, 3, 2, 6) on the 26 May at similar times when flocks were observed in Kuitpo on the same day. The total in this area was therefore estimated at 97.

Kuitpo

A flock of 110 was observed at Christmas Hill Road, Kuitpo on 26 May. Additional flocks of 12 and 70 were observed a Razorback Road, Kuitpo a few hours later. Given the distance and direction of flights these were likely to be different flocks from those observed at Christmas Hill. On the morning of 26 May small groups (2, 4, and 2) were observed in succession (over a 40 minute period) flying in a westerly direction at Knotts Hill road and were unlikely to be part of the other flocks observed. It is assumed a flock of 70 and several smaller groups (1, 6, and 3) observed on the afternoon of the 27 May at Knotts Hill Road are part of the same flocks observed the previous day. The total in this area was therefore estimated at 200.

Anstey Hill

A flock of 35 was seen in flight at Perseverance Road, Tea Tree Gully (Anstey Hill) in the afternoon on Saturday 26 May. Presumably 4 individuals observed at Black Hill Conservation Park on Sunday 27 May are part of the same flock.

Horsnell Gully

Small flocks (15, 8, and 3), seen flying west, in the morning at Horsnell Gully Conservation park are assumed to be different flocks than those observed at Anstey Hill in the afternoon. 2 observed in Skye on the morning of Saturday 26 May are also assumed to be different from other flocks observed on the same day.

Mount Crawford

Two small flocks comprised of 3 and 5 individuals were observed flying from Starky Road, Mount Crawford on Saturday 26 May. Despite being observed several hours apart, it is assumed these are different flocks based on directions of flight.

Appendix 2

Further Discussion

The increase in distribution of birds in recent years suggests that the population in the region is increasing. However care must be taken in reaching such a conclusion as it may also mean that birds are simply searching further afield for food resources. Because YTBC are long-lived, any reduction in numbers resulting from habitat change may take many years to become evident.

Another potentially important, district is around McLaren Flat, particularly areas of native vegetation such as Manning Reserve and Douglas Scrub where seed of banksias (both *B. marginata* and *B. ornata*) are eaten (G. Carpenter *pers. comm.).* Flocks frequenting these areas possibly range into native and pine forest at Mount Bold and Kuitpo, likewise flocks have previously been reported to feed on green almonds at Willunga.

The Anstey Hill area appears to have only been occupied in recent years. This flock may be the same as that previously in the Belair district in the 1980s and 90s. Likewise, this flock may vary in size and composition through exchange with flocks from as far south as the southern Fleurieu. Important food sites in this area have not been documented.

As in many areas of YTBC distribution, plantations of pines, particularly *Pinus radiata* in the MLR but also *P. halepensis* on the Adelaide Plains, are now used extensively by breeding and post-breeding flocks (Forshaw 1981, J. van Weenen *pers. comm.*). It is assumed that the population of YTBC has increased in the MLR since the early 1900s because of the use of pines for food. It has been suggested (J. van Weenen *pers. comm.*) that the dispersal of YTBC across the Adelaide Plains in November – January in recent years may be in response to a food shortage (as an unseasonably cool summer meant that much of their traditional foods did not develop and ripen). Throughout the region, stocks of native foods such as seed from Banksia and Hakea species continue to decline through habitat degradation by weeds, senescence and spread of Phytophthora. Forshaw (1981) has suggested that the native food is a critical part of YTBC diet, especially when breeding (December to January). Thus there is potential for the MLR population of YTBC may suffer with declines in this resource.

The census results also suggest that a post-breeding population no longer aggregates in the Belair National Park area. This may be due to an intensive pine eradication program over the last 20 years (both *P. radiata* and *P. halepensis*) and possible competition for pine seed from increasing introduced populations of Sulphur-crested Cockatoos *Cacatua galerita*. A reduction in the availability of pines as a food source is likely to continue to outside of dedicated commercial plantations as older plants die out or are eradicated and no longer used widely in planted shelterbelts. It is not clear if a reduction of available resources will have a significant impact on the population's viability in the long term. However, it is anticipated such reductions may see further shifts in movements of non-breeding aggregations associated with broader changes in the availability of non-commercial pine food resources.

The censuses suggest that flocks have a daily routine within a defined area. A habitual feeding routine occurs in populations elsewhere (e.g. Eyre Peninsula – Way & van Weenen 2008) and is likely to be exhibited in most populations.

Observations made during the censuses, indicate at least some young were produced in the summers of 2010/11 and 2011/12. Additional targeted surveys on winter flocks are required to better determine sex ratios and broader population breeding success.