

OBSERVATIONS OF BEHAVIOUR OF SULPHUR-CRESTED COCKATOOS *Cacatua galerita* IN SUBURBAN SYDNEY

KAREN BAYLY

Department of Biological Sciences, Macquarie University, New South Wales, Australia 2109

Received: 21 August 1998

A population of Sulphur-crested Cockatoo *Cacatua galerita* at Ashfield, New South Wales, was observed over a four year period. The birds were intentionally habituated to human observers and contact with humans was positively reinforced. The habituation process allowed behaviour patterns to be observed at distances of 0.5–3 m which is closer than other studies on free-ranging Sulphur-crested Cockatoos. Five previously undescribed behaviour patterns were noted — *pair beak-clacking*, *posing*, *male/male beak-clacking*, *male/male allopreening* and *chousing*. The *courtship display* differed strikingly from previous descriptions. Other observed behaviour patterns were similar to previous descriptions for *Cacatua* species.

INTRODUCTION

Considering that the Sulphur-crested Cockatoo *Cacatua galerita* is a common bird, there have been surprisingly few published studies on its behaviour. To date, the major descriptive work on the social and vocal behaviour of wild populations of these birds was carried out by Noske (1982) as part of an investigation into the pest status of Sulphur-crested Cockatoos on agricultural crops.

There are considerable challenges in observing wild populations of animals. It is often difficult to identify and track individuals, and marking may affect the life history of the marked individual. For example, wing-tagging is known to increase the probability of predation on tagged cockatoos (Rowley and Saunders 1980). In addition, animals may be wary or shy of human observers, and it may take many years of habituation before some behaviour patterns can be observed (Martin and Bateson 1993).

Likewise, studies of captive animals may be confounded by the response of a particular species to captivity. Confinement can inhibit breeding or foraging behaviour (Martin and Bateson 1993), while forcing individuals to live together in a small group can create behavioural dynamics that might not occur in a free-ranging population (e.g. Lambert *et al.* 1994).

Certain species of birds living in suburban areas, such as Sulphur-crested Cockatoos, can easily be habituated to humans by the provision of even small amounts of food. This allows close observation of the birds while allowing them to interact freely with and within their normal environment. This method was used to study a population of Sulphur-crested Cockatoos (hereafter referred to simply as cockatoos; names will be given for other cockatoo species) that moved into a Sydney suburb in 1994 after extensive bushfires in and around the Sydney region.

OBSERVATION AREA AND METHODS

The observed population resided in the inner west suburb of Ashfield (northern section, latitude 33°53'30"S, longitude 151°08'00"E). This suburb consists of a mixture of medium and high density housing,

shops, major roads and quiet suburban streets. However, there is a considerable amount of 'green space' in the form of parks and churchyards where a number of native trees, predominantly *Eucalyptus haemostoma* and *Syncarpia glomulifera*, have been preserved.

In addition, numerous native plants, including *Melaleuca* spp., *Callistemon* spp. and *Grevillea* spp., have been planted as street trees, and many residents' gardens contain a variety of fruit and nut-bearing species such as plane trees *Platanus* spp., cypress *Cupressus* spp. and camphor laurel *Cinnamomum camphora*.

When I began observations, 13 cockatoos were roosting at night in a *E. haemostoma* located in a churchyard. This roost had been abandoned by the end of the observation period in 1997 but two birds — a paired male and female — maintained a nest hole in the churchyard.

The cockatoos were observed on the balcony of a third floor unit in a residential building located approximately 100 m from the churchyard. Initially, the birds were attracted to the balconies by pieces of bread that a number of residents regularly threw out on to the lawn, and later began foraging elsewhere within the grounds of the building.

The cockatoos were encouraged to visit the balcony on a regular basis by the provision of water and small amounts of sunflower seed. Initially, a handful of seed was placed either on the balcony railing or balcony floor, and eventually only offered in a hand-held dish. Close observation during these feeding periods allowed identification of individual birds by subtle morphological differences as well as by behavioural differences (Appendix 1), and enabled sexing of individuals by eye colour (Sindel and Lynn 1988) and pair maintenance behaviour (Appendix 1). Observation during feeding also habituated the cockatoos to the close presence (0.5–3 m) of human observers, and facilitated identification of individual birds during non-feeding periods.

I provided seed approximately once a day and at different times of day, but the cockatoos often used the balcony when no food was available for resting during the middle of the day and for interacting socially at other times. Over 20 cockatoos were observed during the four year period, and 13 of these were observed regularly (Appendix 1).

OBSERVATIONS

Five previously undescribed behaviour patterns were noted, and observations of the courtship display differed from previous descriptions (Table 1). Other behaviour patterns were similar to those previously described for *C. galerita* and/or other *Cacatua* species (Noske 1982; Rowley 1990; Rowley and Chapman 1991).

TABLE 1

Category, type, description and number of independent events of behaviour patterns previously undescribed for Sulphur-crested Cockatoos, based on observations of a population at Ashfield, New South Wales, 1994–1997.

Category	Type	Description	No. independent* events
Pair Maintenance and Mating	Courtship display	Commences with a protracted bout of allopreening. Allopreening may be interrupted by a bout of beak clacking and posing before allopreening is recommenced. Copulation follows after a variable number of bouts of allopreening, beak clacking and posing.	4**
	Pair beak-clacking	Both male and female make fast beak movements that create a clacking noise. Body posture is relaxed.	3**
	Posing	Head is held in a position in close contact (touching or almost touching) to the pair bond partner while beak clacking occurs. Head and body feathers are sleeked. Poses change abruptly but close contact is re-established with each new pose. Occurred frequently in one established pair, noted less frequently in birds establishing pair bonds.	2**
Social Behaviour	Male/male beak-clacking	Consists of fast beak movements which create a clacking noise, posture is upright and eyes are narrowed. Feathers slightly sleeked, body held more stiffly than during <i>pair beak-clacking</i> (above).	4**
	Male/male allopreening	Approaching male puts his head alongside other male and begins to allopreen this male's head and neck. Eyes of both are narrowed. Allopreening may be reciprocated after 10–15 seconds or birds may break apart. Movements are small and tentative — this allopreening appears far less relaxed than in male/female or parent/offspring allopreening. Any other male may join in by using his foot to push or grab the male performing the allopreening.	3
Vocal Communication	Chorusing	Performed by a group of cockatoos. Commenced with one cockatoo giving a medium volume and pitch 'rark' which was accompanied by a small outward movement of folded wings. This was immediately followed by the same sound and movement from every other cockatoo in the group in quick succession, and the whole routine was then repeated once or twice. The order in which birds vocalised appeared to remain the same for the repeats.	5

*'Independent' events involve non-overlapping pairs or sets of individuals.

**Multiple occurrences of the behaviour were observed for one or more of the independent pairs or sets of individuals.

Pair maintenance and mating

I defined a pair as any courting or established male and female combination. *Pair beak-clacking* was observed in three out of five pairs and *posing* in two out of five pairs. Neither of these behaviour patterns have been reported for wild cockatoo populations although a caged male has been observed beak-clacking at humans (pers. obs.).

There was a striking difference between the previously described courtship display and that noted in the observed population (Table 1). A number of researchers (Noske 1982; Sindel and Lynn 1988; Forshaw and Cooper 1989) describe the courtship display as consisting of the male strutting towards the female, with crest erect, and head bobbing and swishing in a figure-eight movement. If the male's advances are accepted, allopreening may follow. This 'figure-eight' display was never observed in the study population, either as a prelude to any of the observed copulations or in other contexts. Instead, copulations were invariably preceded by allopreening (Appendix 2), sometimes interspersed with *pair beak-clacking* and *posing* (Table 1). Copulations were recorded for four out of five pairs in the observed population and multiple copulations were observed for two of these pairs (Table 1).

UNUSUAL MATING BEHAVIOURS

On one occasion, F4 was seen to mate with M5 and M6 consecutively. M5 mounted F4 after a bout of *allopreening*, but with no *pair beak-clacking* or *posing*. M6 attempted to interfere with the copulation between F4 and M5 by gaping (Appendix 2) at M5 and grabbing on to F4's wing with his foot. M6 began to allopreen F4 as soon as M5 dismounted. M6 and F4 then began *pair beak-clacking* and subsequently copulated. F4 was observed copulating with M5 and M6 separately at other times. *Pair beak-clacking* was not observed between F4 and M5, but was observed between F4 and M6. *Posing* was not observed between either F4 and M5 or F4 and M6.

M3 was observed displaying to F3 by making small side-to-side rocking movements with his head curved downwards and tail held down. This was accompanied by a 'keening'¹ noise by M3 and was performed near food. F3 approached him and they began to feed together with beaks almost touching. M3's keening did not stop and at times he reached over and stroked F3's toes with his beak. This behaviour occurred between this pair on two occasions.

¹'Keening' is a thin, soft, high-pitched wailing sound.

Social behaviours

Male/male beak-clacking and *male/male allopreening* (Table 1) have not been reported previously but were recorded for five out of eight males in the observed population. The use of these behaviour patterns appeared to be complex. The first observed interaction occurred between M1 and M2. Both birds were within one bird's length (~40 cm) of each other. The beak-clacking continued for approximately six seconds until M1 moved his head toward M2. Both birds ceased beak-clacking at this point and M1 allopreened M2's cheek. M2 attempted to allopreen M1 but M1 gaped at M2. The arrival of another bird terminated the behaviour.

The second interaction was between M5 and M6. M6 was on the balcony and M5 was on the roof when *male/male beak-clacking* began. Both birds beak-clacked together, then one at a time, then together again. Beak-clacking was interrupted periodically by squeaky high-pitched 'ee-ah' vocalisations. *Male/male allopreening* did not occur on this occasion. Both birds jumped, head bobbed and head flicked (Appendix 2) repeatedly and at one point M6 lengthened his neck and extended his head upwards. This movement was accompanied by a choking noise. Small but definite outward movements of the wings on both males were also noted. The behaviour terminated when M6 flew away. Beak-clacking followed by allopreening also occurred sequentially in a single bout beginning with M5 and M6, followed by M5 and M7, then M6 and M7.

Vocal communication

Chorusing (Table 1) only occurred when 5–9 cockatoos were on the balcony together. A distant bird was often heard trumpeting during the *chorusing*, and although trumpeting was heard at other times, there was no observed occasion when the combination of a group of cockatoos and distant trumpeting was not associated with *chorusing*. When M1 and F1 were present in the group (twice), the *chorusing* was initiated by M1, then F1 called and the rest of the group followed. Each of the other three events was initiated by a different cockatoo.

DISCUSSION

The present study describes for the first time some aspects of social and sexual behaviour which complement earlier descriptions of behaviour observed in free-ranging populations of Sulphur-crested Cockatoos. Taken together, these findings suggest more complex behaviour patterns than previously recorded for this species.

Many of the new behaviour patterns may have been recorded for the first time simply because the cockatoos were observed at a distance of 0.5–3 m, which is significantly closer than distances reported in previous studies on free-ranging cockatoos (e.g. 50–100 m in Noske 1982). It is likely that many of the observed behaviour patterns would not have been seen without habituating the birds to the balcony and to the close presence of the observers. Although these are suburban birds, interacting with an environment which includes humans and buildings, cockatoos are usually wary (Sindel and Lynn 1988) and

fear can prevent the expression of normal avian behaviour patterns (Jones and Waddington 1992).

Studies comparing the behaviour of wild birds with tame birds released into the field have shown that the behaviour of human-habituated birds is often indistinguishable from that of normal wild individuals (Bland and Temple 1987). Given this, it is unlikely that the social or sexual behaviour seen in this study was an artefact either of the urban environment or the close proximity of the observers, especially considering that the behaviour patterns were observed more than once and with different individuals.

Pre-copulatory *pair beak-clacking* and *posing* displays were performed numerous times by established pairs as well as by an unpaired female and two male suitors, and suggest more complex reproductive behaviour than has been previously attributed to these birds.

The sequential copulation of an unpaired female with two unpaired males may be an extension of a behaviour occurring in another *Cacatua* species. Sexually immature galahs *Cacatua roseicapilla* appear to live a relatively asexual life initially, with the most common bonding during this period occurring between two males (Rowley 1990). Just prior to sexual maturity, a female may intrude on this bond, forming a trio (ibid). The trio copulation event involving F4, M5 and M6 may be an extension of similar behaviour, and may form part of a pair bond selection process for naive birds.

The *male/male beak-clacking* display appears to have elements of antagonism. It is interesting to note that the participants in two events appeared to be rivals: M1 was a dominant male that had only recently vacated the area where M2 still had a nest site, and M5 and M6 were both courting F4. *Male/male allopreening* may be a social device for diffusing antagonism between males in a social group.

The *chorusing* has not been noted in any other cockatoo populations. The observers were only alerted to this phenomenon when it began, and any preliminary cues to its context were missed. It is possible that this behaviour may be a response to trumpeting, perhaps given by an distant member of the flock.

ACKNOWLEDGMENTS

Many thanks to Phillip Bartlett for assisting with field observations, to Chris Evans, Sylvia Halkin, the editor and two anonymous referees for their comments on this manuscript, and to Ian Rowley for his encouragement. Thanks also to Lesley Hughes, Janet Lake and Angela Moles for their comments on an earlier version of the manuscript.

REFERENCES

- Bland, J. D. and Temple, S. A. (1987). Using hand-tamed birds in field studies. In 'Proceedings of the Second International Symposium on Breeding Birds in Captivity'. (Ed. C. V. Berquist.) Pp. 1973–1983. (International Foundation for the Conservation of Birds: Los Angeles.)
- Forshaw, J. M. and Cooper R. P. (1989). Parrots of the World. (Lansdowne: Sydney.)
- Jones, R. B. and Waddington, D. (1992). Modification of fear in domestic chicks, *Gallus gallus*, via regular handling and early environmental enrichment. *Animal Behaviour* 43: 1021–1033.
- Lambert, D. M., Millar, C. D., Jack, K., Anderson, J. S. and Craig, J. L. (1994). Single- and multilocus DNA fingerprinting of communally breeding pukeko: Do copulations or dominance ensure reproductive success? *Proc. Nat. Acad. Sci. USA* 91: 9641–9645.

Martin, P. and Bateson P. (1993). *Measuring Behaviour: An Introductory Guide*. (Cambridge University Press: Cambridge.) 2nd Edition.

Noske, S. (1982). *Behaviour, ecology and pest status of the White Cockatoo (Cacatua galerita) and the Galah (C. roseicapilla)*. (M.Sc. Thesis, University of New England, Armidale.)

Rowley, I. (1990). *The Galah — The Behavioural Ecology of Galahs*. (Surrey Beatty: Sydney.)

Rowley, I. and Chapman, G. (1991). The breeding biology, food, social organisation, demography and conservation of the Major Mitchell or Pink Cockatoo, *Cacatua leadbeateri*, on the margin of the Western Australian wheatbelt. *Aust. J. Zool.* 39: 211–261.

Rowley, I. and Saunders, G. (1980). Rigid wing-tags for cockatoos. *Corella* 4: 1–7.

Sindel, S. and Lynn, R. (1988). *Australian Cockatoos — Experiences in Field and Aviary*. (Singil Press Pty Ltd: Australia.)

APPENDIX 1

Descriptions of individual Sulphur-crested Cockatoos observed most frequently in behavioural study at Ashfield 1994–1997.

Code * Pairings	No. years observed	Distinguishing morphological and/or behavioural characteristics	Comment
M1 # F1	3.5 years	Claw and first phalange of inner right toe missing, largest of all the cockatoos	Effective at displacing other cockatoos most of the time
F1 # M1	3.5 years	Scar on right periophthalmic ring, for approx. 1 year of observation suffered from a swollen eye, tibia appeared short, usually arrived with M1 and joined him in chasing other cockatoos	As above
M2 # F2	3 years	Upper mandible 'roman', large cere, feathers on forehead gave pronounced dome-shape to forehead, usually uttered high pitched 'aaaah' on arrival at balcony	Formed pair bond during observation period and fledged two chicks; became more effective at displacing other cockatoos most of the time toward end of 3 year period
F2 # M2	3 years	Long groove running down the right side of upper mandible, very wary — hissed at observers throughout the 3 year period	As above
F3 # Seen in courtship with M3 and company of M4 but no permanent bond	3.5 years	Steel band on left leg, small size, small feet, gait less awkward than the other cockatoos	Often chased by other cockatoos; would move away from M1 and F1, and M2 and F2 with apparently little provocation on their part
M3 # Seen in courtship of F3 but no permanent bond	2 years	Medium-size but compact, bold — no hesitation in approaching even when food was not available, distinctive walk, gave a vocalisation that sounded like 'Cocky' on arrival at balcony	Disappeared after first two years of observation
M4 ^ Seen in company of F3 but no bonding behaviour observed	1 year	Tibia, 'pantaloons' and neck appeared long compared to the other cockatoos, had a distinctive walk, feathers rarely dirty	Appeared in final year of observation
M5 # Seen copulating with F4 but no permanent bond	2 years	Large but smaller than M1, often arrived with F4 and/or M6, wary — often hissed when approached quickly	Became a regular visitor to the balcony in final year of observation
M6 # Seen copulating with F4 but no permanent bond	2 years	Medium-size but tibia appeared long, not much yellow on tail near vent, wary, often arrived with F4 and/or M5	Became a regular visitor to the balcony in final year of observation
F4 # Seen copulating with both M5 and M6 but no permanent bond	2 years	Small bird — smaller than F3, plumage off-white and often 'dirty' in colour, large feet, arrived on balcony in first year of observation with a bleeding right foot — foot slightly enlarged afterwards	Appeared to be forming a bond with M6 towards end of observations
F5 ^ None	4 years (sporadically)	Had a deformed beak — the tip of the upper mandible curved outward for approx. 3 cm and to one side instead of toward the lower mandible	Chased away from food on balcony by all the cockatoos but tolerated when flock foraging on the lawn
M7 ^ None	1 year	Lower mandible slightly forward of normal position, beak did not close properly, bird often strutted and uttered a strange 'choking' vocalisation on arrival at balcony, tibia appeared long	Appeared in final year of observation
M8 ^ None	1 year	Initially, arrived with M2 and F2 uttering begging calls, large cere, very dark eyes, became very bold over the year	Offspring of M2 and F2

* M = male, F = female.

Sexing based on eye colour plus pair maintenance and/or copulatory behaviour.

^ Indicates sexing based on eye colour only.

APPENDIX 2

Descriptions of previously named behaviours of Sulphur-crested Cockatoos and/or other *Cacatua* species referred to in this paper.

Type	Description	Reference
Allopreening	Preening of another bird's feathers, usually of the opposite sex, or between parent and offspring. Approaching bird nibbles the neck, eyes, and crest of other bird. Reciprocated by other bird. May occur simultaneously between two birds. Breast and flanks may also be preened. In male/female interaction (pers. obs.), allopreening of vent initiated when male presents his vent to female for preening. When female commences preening male's vent, male reciprocates. Vent allopreening often precedes copulation in courting pairs.	Noske (1982) Rowley (1990) Rowley and Chapman (1991)
Copulation	Commences with courtship display. Female crouches, wings held slightly out, head up and back. Male then mounts female and places his feet between her shoulders, with his long body axis directly above hers. Male steadies himself on female's back and begins to sweep his tail from one side of the female's tail to the other, ending each sweep by pushing his tail under the female's tail, and working his tail further under hers with every sweep. Finally male stretches his neck so that his head is to the side of the female's head — his head is on the same side of the female as his tail — and stretches out the wing on the opposite side to his head and tail (probably for balance). He dips his tail under hers and makes brief cloacal contact and then dismounts.	Noske (1982) Rowley (1990)
Gaping	Silent, mildly threatening display. Bill is partly opened as if about to bite and pointed at other bird.	Rowley (1990) mentioned in Noske (1982)
Head bobbing	Commences with downward bob of the head. Movement is up and down in the vertical plane. Crest may be erect or down.	Noske (1982) Rowley (1990)
Head flicking	Backward flick of the head. Crest may be erect or down.	Mentioned in Noske (1982) as part of 'strut'
Jumping	Two footed jumps along perch or ground, usually toward another bird. Single or repeated. Head may be bobbed with crest erect.	Mentioned in Noske (1982) as 'hopping'
Trumpet	A short sharp 'eh' or clicking noise (pers. obs.) followed by a 'ah eh' sound with emphasis on the 'ehh'.	Possibly described in Noske (1982) as 'squawk 1a'

BOOK REVIEW

Birdwatch in Australia and New Zealand.

Ken Simpson and Zoe Wilson, 1998. Reed New Holland, Frenchs Forest, New South Wales. RRP £25.

This is an introduction to birdwatching: why it is fun and how to do it. Written for the beginner, it has been most attractively produced: a compact paperback of 200 pages, about half of which are adorned by well-selected photographs — mostly taken by Peter Rogers and of very high standard.

After an introduction about the diversity of birdwatchers and ease of backyard birding, the book falls into four main sections. 'Looking at Birds' has chapters on habitats, family likenesses, identification and light and shade. All sound enough, though there is little or nothing there which will be new to the experienced birdwatcher; the very basic identification section might have been greatly improved by topography illustrations and more detailed explanation of how the wing and tail feather slide over one another and what feather tracts can be seen on a perched bird. 'Bird Behaviour' has chapters on sound, daily routines, breeding behaviour and seasonal routines.

'Your Birdwatching Kit' offers sensible suggestions about what to take in the field, though more could have been said about some items; for example, the brief (and accurate) section on telescopes gives no conception of how these lovely devices can enhance birdwatching in open habitats. Nor is there any mention of the importance of knowing where you are when birdwatching; maps, compass and/or a GPS can be essential to birders who do not want to get lost, or want to document their records thoroughly. Another chapter in this section deals with keeping records, but offers little guidance on what to do with the records that are kept. The book ends with a section on support. The only

Australian bird society for which contact details are given is the Bird Observers Club of Australia. The section on Further Reading also has surprising omissions: the four World checklists mentioned do not include the extremely influential one by Sibley and Monroe; HANZAB is not listed as one of the standard references for Australia and New Zealand. A glaring gap is the absence of any information on birding resources available through the internet — to the many beginners who have internet access, this can be one of the cheapest and best ways to find out more about birds and birdwatching.

It is unlikely that this book will be particularly useful to the members of the ABSA, most of whom are not the complete beginners that the authors of this book had in mind. The book also makes no mention of bird-banding. Admittedly this is a book about birdwatching but in some cases the omission looks somewhat contrived, particularly in the caption to a photograph of conspicuously colour-banded Oystercatchers, and in a discussion about movements of Double-banded Plovers (which are well known as a result of birdwatchers reporting colour-banded birds). Some experienced birders may find this book worth adding to their library because of the fine photographs. As a gift to beginners it might be more useful, though a browse through the book would be recommended before purchase. The book is written in easily read prose, with a friendly and familiar style which some readers may find annoyingly patronizing in large doses: 'There is an obviously dangerous curvy and pointy thing up the front of the budgerigar, as with all birds. This is its beak or bill, which has upper and lower pieces that we call the upper and lower mandibles . . .'

D. Rogers, A. Rogers and K. Rogers
340 Nink's Road, St Andrews, Victoria 3761