

## SHORT COMMUNICATION

### A COMPARISON OF THE BEHAVIOUR OF SOLITARY AND GROUP-HOUSED BUDGERIGARS

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#### Abstract

*Animal Welfare* 1993, 2: 269-277

*A comparison was made of the behaviour of budgerigars housed singly in commercially available cages obtained from a pet supplier, and budgerigars housed in a group of six in a small aviary. Budgerigars housed in the aviary consumed significantly more food and were more active, performing more wing stretching and flying. Caged budgerigars performed significantly more vocalizations. When tested individually, aviary birds were more active in a novel test chamber and were significantly more likely to approach an unfamiliar bird. Cage birds were generally reluctant to approach an unfamiliar bird, but showed an increasing tendency to approach when allowed a longer period of familiarization. Pet budgerigars are commonly housed in isolation from conspecifics, with little consideration of potential effects on welfare. The aim of this study was to provide some initial information about the effects of social isolation on the behaviour of budgerigars.*

**Keywords:** *animal welfare, aviaries, budgerigars, cages, housing, social isolation*

#### Introduction

In its natural habitat in Australia the budgerigar is a gregarious bird that flocks throughout the year, during most diurnal activities, and at most stages of the life cycle (Wyndham 1979). During roosting and flying cohesive flocks of some 20 to 100 individuals are maintained, but these may merge at feeding and watering grounds, where gregarious congregations of several thousand individuals are common (Wyndham 1979). There is no obvious hierarchical organization in wild flocks, and overtly agonistic encounters are rare. Behavioural studies in laboratories, however, demonstrate the subtle and complex nature of social interactions in budgerigars. Operant learning experiments have shown that budgerigars individually recognize live conspecifics and can discriminate colour slides of different budgerigars (Trillmich 1976a). The pair-bond, maintained by individual recognition (Trillmich 1976b), is an important unit in maintaining flock cohesion, and is relatively stable over time. Pairs will reform even after 70 days' separation in unisexual groups (Trillmich 1976c).

In the wild parents rear their broods in separate nest holes within the large colony. Both males and females play a role in raising offspring. Females feed their offspring mainly on the basis of body size (Stamps *et al* 1985), whilst males attend more to the begging rate of the offspring and are more likely to feed broods with a female-biased sex ratio (Stamps *et al* 1987). During the first three weeks after fledging young budgerigars

begin the complex process of social integration into a large flock of unfamiliar adults and juveniles. The fledglings typically initiate interactions with the adult males that are the focus for flock activities, but during this early period of independence the young budgerigar also forms a close mutual affiliative partnership with one of its siblings (Stamps *et al* 1990). Sibling partnerships gradually fade when budgerigars begin to form pair-bonds with unrelated birds of the opposite sex.

In contrast to this complex natural social life, young budgerigars sold as pets may be kept in total isolation from conspecifics. Most animal welfare organizations advocate that budgerigars should be provided with some company of their own kind, but most pet birds are kept alone. In 1988 the UK budgerigar population was estimated at 1.8 million birds in 1.1 million homes (Council for Science and Society 1988). Some owners may decide to keep a bird alone if the bird is to be trained to mimic the human voice or other non-specific sounds. The care and attention individually housed budgerigars receive from human caretakers may be an adequate substitute for the loss of social contact with their own species, but this is hard to evaluate in the absence of information about the physical and behavioural consequences of social isolation in budgerigars.

Most studies of the effects of social separation have been conducted with non-human primates. A vast literature portrays the young primate's response to separation from its mother or its peers as comprising an initial 'protest' stage characterized by agitation and distress vocalization. This is followed by a stage of 'despair' characterized by inactivity and withdrawal (for reviews see Kraemer 1992). These responses have been used as models of human depression (for review see Willner 1991). Studies of the domestic fowl have concentrated on the effects of social separation on fear, and on subsequent interactions with conspecifics of the same or opposite sex (see review by Jones 1987). The separation of chicks from their peers results in a period of 'distress' calling which eventually stops when they are depressed; the calling can be prolonged by the use of anti-depressant drugs (Lehr 1989). Long-term isolation of chicks increases fear of novel stimuli and conspecifics (Kruijt 1964), although individually reared birds appear to adapt to a social environment after an initial phase of aggression and withdrawal (Wood-Gush 1971). Social motivation and preference in birds can be assessed by measuring time spent near conspecifics in choice tests and/or work done to approach conspecifics eg by running on a treadmill (Mills & Faure 1990).

The aims of this study were to examine differences in the general behaviour, fear responses and social motivation of group-reared budgerigars housed at two months of age, individually in cages or in a group in an aviary. We did not control for the separate effects of social isolation and the restricted spatial allowance of an individual cage as these factors are also likely to be confounded in the pet population.

## Methods

Twelve budgerigars were obtained at two months of age from a commercial supplier. Six birds were housed together in a small aviary (48cm x 48cm x 140cm high), and six were housed individually in standard pet cages (43cm x 28cm x 38cm high). Aviary birds

were provided with two perches, sandpaper, cuttlefish, *ad libitum* water and grit and two branches, and were identified by individual natural colour markings and by coloured leg rings. Cage birds were provided with two perches, sandpaper, cuttlefish, *ad libitum* water and grit and at least two 'toys' excluding mirrors (eg plastic ladder, plastic swing, wobbling objects, bells) in order to simulate as closely as possible a 'pet' environment. The cages were placed in offices where the budgerigars received considerable attention and handling from staff working nearby. The cage birds were not able to see any other bird but we could not eliminate the possibility that two birds housed within the same building could hear each other. The other four cage birds were housed in separate buildings. All birds were visited every day (including weekends) by the experimenters.

Birds were weighed on arrival at the start of the experiment and fed mixed bird seed twice a day to establish a routine for later behavioural tests. Food dishes were left in place for 1h between 1000h and 1100h, and between 1600h and 1700h. The amount of food consumed was recorded for two months, and the birds were then weighed again. One cage bird became ill within a few days of arrival. Attempts to treat its chronic diarrhoea were unsuccessful and this bird had to be euthanased for humane reasons before the start of behavioural observations. Data from this bird (amount of food consumed) were excluded from all the food consumption analyses. Analysis of total weekly food eaten during morning and afternoon feeds (factor 1) by cage and aviary birds (factor 2) was made by repeated measures analysis of variance (ANOVA), with week as the repeated measure.

During this two month period behaviour was recorded in the individual cages and in the aviary. The frequencies of behaviour performed by the six birds in the aviary cannot strictly be regarded as independent but it was considered worthwhile to obtain some preliminary data that could provide a basis for the development of hypotheses to be tested with more aviary groups. Thus, each day for five consecutive days an observer directly recorded the behaviour of a different cage bird for a 30min period between 1000h and 1100h. A second observer simultaneously recorded the behaviour of one aviary bird each day, using focal animal sampling, for the same period. Observers sat quietly 3m from the cage or aviary and a 10min settling period was allowed before observations began. Two further five day periods of behavioural recordings were taken in each of the next two weeks using the same procedure. Counts of flying, vocalizing (loud warble, Brockway 1964), wing stretching, wing flicking, self scratching, feeding, drinking, ingesting grit, pecking objects within the cage or aviary and preening were recorded. In addition, the time spent preening was noted, and observations taken of the total number of moves from one perch to another (or to the wire wall) within the cage or aviary. Analysis of behaviour by cage and aviary birds (factor 1) was made by repeated measures ANOVA, with observation period (1 to 3) as the repeated measure.

The birds' behaviour in a novel test environment was then examined as an indicator of general fearfulness. Birds were caught using a small net and placed individually in a two-chambered test box. Each chamber was 39cm x 48cm x 35cm high with a perch across the width of the first chamber, in which the birds were initially placed. A video

camera was placed directly above the apparatus to record behaviour. The birds had to fly through a 10cm wide gap into the second chamber to obtain their morning food ration from a familiar feeding dish. Cage and aviary birds were tested on alternate days between 1000h and 1100h and the procedure was repeated such that each bird received a total of three tests. The number and duration of visits made to the second compartment, and the amount of food eaten during the total 1h test were recorded. The data were analysed by factorial ANOVA to examine the effects of housing treatment and test order on feeding behaviour in the novel environment.

After the completion of the above tests, the willingness of budgerigars to approach other, unfamiliar, birds during a 30min period were assessed using the same two-chambered test box. For these tests the apparatus was fitted with an additional perch across the width of the second chamber that also ran through a wire compartment (22 x 22cm). Each budgerigar alternated between acting as a subject placed in the first chamber with the opportunity to fly through the 10cm gap to associate with an unfamiliar bird, and acting as a captive bird held in the wire compartment in the second chamber. Captive birds were placed in the apparatus 10min before subjects to allow time to settle. Scan samples were taken at 60s intervals and the position and behaviour of the subject bird noted. If the subject bird entered the second chamber its position was defined as 'above' (perching on top of wire compartment), 'adjacent' (sitting on perch 0-1cm from wire compartment), 'close' (on perch 1-5cm from wire compartment) or 'distant' (>5cm from wire compartment). Each cage bird, when acting as a subject, was tested once a day for five days, each time being paired with a different captive aviary bird. To avoid imbalance arising from the death of one of the cage birds one randomly chosen aviary bird was not used at all in these tests. The five remaining aviary birds, when acting as a subject was tested once a day for five days, each time being paired with a different captive cage bird. Latency to approach a captive bird was analysed using repeated measures ANOVA.

After completion of the above approach tests each cage bird was given two longer (2h) approach tests to a selected individual 'partner'. The aim was to discover whether the apparent reluctance of cage birds to approach conspecifics was a short-term fear response to unfamiliarity, or a more stable and lasting phenomenon.

## Results

There was no significant difference in the weight of cage and aviary birds on arrival. The mean weight (g) of the cage birds after two months was 33.7 SD 6.7; the mean for the aviary birds was 36.8 SD 2.8, and these did not differ significantly. However, the amount of food consumed by the aviary birds (6.4g/day) was significantly greater than the cage birds (4.4g/day) ( $F = 57.0$ ;  $P < 0.0001$ ). Both groups consumed more during the morning feed than the evening feed ( $F = 12.1$ ;  $P < 0.005$ ).

There were no significant differences in most of the behaviours of cage and aviary budgerigars. However, aviary birds performed significantly more wing stretching ( $F = 8.75$ ;  $P < 0.02$ ) and flying ( $F = 9.0$ ;  $P < 0.02$ ) than cage birds. Cage birds performed

significantly more vocalizations ( $F = 15.8$ ;  $P < 0.005$ ). They also appeared to make more pecks at the objects in their cages, but this just failed to reach significance ( $F = 4.4$ ;  $P = 0.06$ ). The frequencies of some selected behaviour patterns are presented in Table 1.

There were no significant differences in the amount of food eaten in the novel test chamber by cage and aviary birds. Neither did the test order (first, second or third experience in the chamber) have a significant effect on the amount of food eaten, number or duration of visits to the food chamber. However, the number of visits made to the food chamber during the 1h tests was significantly greater for aviary birds than for cage birds (7.7 vs 1.1) ( $F = 11.3$ ;  $P < 0.005$ ); and the duration of each visit (s) was significantly shorter for aviary birds (190s vs 519s).

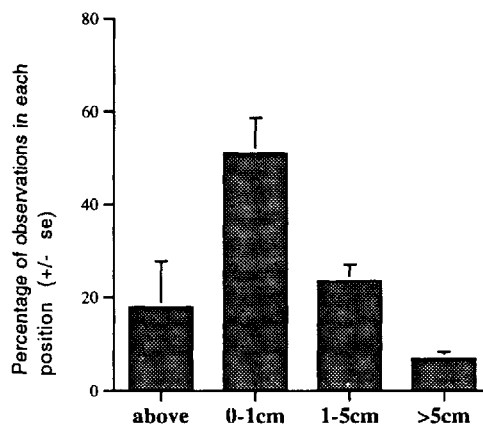
**Table 1** Mean frequencies (standard errors) of selected behaviour patterns performed by cage and aviary budgerigars during 30min observations.

Behaviour	Cage	Aviary	Significance
<i>Fly</i>	0.2 (0.1)	7.4 (2.6)	*
<i>Vocalize</i>	11.0 (2.2)	1.7 (0.4)	*
<i>Wing stretch</i>	1.5 (0.3)	5.2 (1.4)	*
<i>Wing flick</i>	0.6 (0.2)	0.3 (0.1)	
<i>Scratch self</i>	0.6 (0.3)	4.4 (1.7)	
<i>Peck objects</i>	5.5 (1.8)	0.6 (0.4)	
<i>Preen</i>	5.4 (1.0)	5.0 (1.2)	
<i>Position change</i>	8.7 (3.1)	13.0 (3.5)	

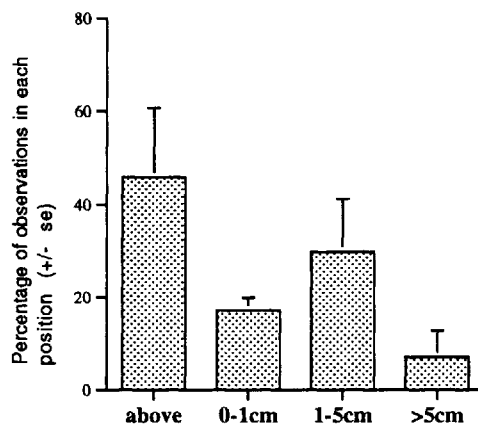
\*  $P < 0.05$

In the tests of association with an unfamiliar bird, four out of five cage birds did not pass through the gap within the 30min period allowed on any of the five trials. All aviary birds approached cage birds on all five trials. Thus, the mean latency (min) to approach was 27.0 SD 8.51 for cage birds and 6.0 SD 9.1 for aviary birds, a highly significant difference ( $P < 0.001$ ). After the first approach aviary birds spent a mean (min) of 15.5 SD 5.7 in the second chamber with the captive cage bird. They were most often noted in close proximity to the cage bird (Figure 1), and were observed placing their heads into the wire compartment to make physical contact with the captive at a rate of 11.6 occasions per hour. When the cage birds were given longer tests allowing greater familiarization with a captive aviary bird they all entered the second chamber. The mean latency (min) of the cage birds to approach an individual aviary bird was 34.8 SD 47.3.

In a second 2h test when cage bird subjects were paired for a second time with the same individual aviary birds their mean latency to approach was 14.0 SD 13.6. Combining the two tests we found that after their first approach cage birds spent a mean (min) of 93.8 SD 20.2 out of a possible 120 minutes in the second chamber with the captive aviary bird. However, they were less likely to position themselves in very close proximity to the captive bird than the aviary birds had been in the previous tests, and more likely to sit on top of the wire compartment (Figure 2). They only placed their heads into the wire compartment to make physical contact with the captive on 0.5 occasions per hour.



**Figure 1** Positions adopted by aviary birds after their initial contact with a captive cage bird during the first series of 30min tests of association.



**Figure 2** Positions adopted by cage birds after their initial contact with a captive aviary bird during the second series of 120min tests of association.



## Discussion

There were clear differences in the behaviour of budgerigars that were housed singly and those that were kept together in a group of six. The most obvious difference was in the greater flying, wing stretching and food consumption of the aviary birds. Increased space in the aviary or disturbance from other birds may have stimulated greater flight activity causing the aviary birds to eat more to compensate. Alternatively, if the aviary birds consumed more food due to social facilitation, they may have had more energy to fly. Cage budgerigars could fly between perches or to the cage wall but flew on fewer occasions than aviary birds. They also performed less wing stretching. Rebound experiments with domestic hens have shown that there is an internal basis to their wing stretching motivation, such that motivation appears to increase during a period of prevention by caging (Nicol 1987). If wing stretching or flying in budgerigars is similarly motivated then spatial restriction may be preventing the expression of the behaviour at the birds' preferred rate, thus compromising their welfare. A clear next step would be to transfer cage birds to an environment with a greater spatial allowance to discover whether there was any rebound in flying or wing stretching behaviour.

The increased vocalization behaviour of individually housed budgerigars was of interest. Even in aviaries housing six pairs it has been shown that budgerigars vocalize more frequently when sitting alone than when closely associating with other birds (Trillmich 1976c). Isolated birds in barren chambers vocalize more (in addition to showing increased mimicry) than birds in enriched chambers (Gramza 1970), leading Gramza to suggest that vocalization may be to some extent a self-stimulating activity.

Budgerigars are sexually stimulated by the song of conspecifics such that their gonads remain active throughout the year (Brockway 1969). In the absence of conspecifics vocalization may play a sexually self-stimulatory role, as has recently been found for ring doves (Cheng 1992). It is not known whether vocalization reduces any other effects of social deprivation.

All budgerigars fed in a novel test environment but the aviary birds moved between chambers more frequently than the cage birds. Fear generally inhibits movement in a novel test area (the open-field test) (Jones 1987) and we therefore conclude that the aviary birds were less fearful in this apparatus than the cage birds, despite the fact that aviary birds experienced social isolation for the first time during these tests. The aviary birds were also easier to catch at the end of the test, reinforcing our conclusion. These findings differ from those obtained with domestic chicks. Group-reared chicks often react more fearfully to individual testing in a novel environment than individually reared chicks, presumably because of the recent social separation (Jones 1987). The most marked differences in behaviour were seen when cage and aviary birds were given the opportunity to approach an unfamiliar bird. The aviary birds very quickly placed themselves in close proximity and appeared curious and interested in the captive. The cage birds in contrast were reluctant to approach the captive, despite the fact that they were familiar with the apparatus and had previously entered the second chamber to obtain food. The subsequent longer tests were designed to establish whether budgerigars that

had been kept in social isolation for two months had no remaining preference for association with conspecifics, or whether their reluctance was based on neophobia. The fact that all cage budgerigars did eventually approach a partner that had gradually become more familiar supports the latter hypothesis. Nonetheless, even towards the end of the 2h tests the cage budgerigars appeared reluctant to get too close to the captive and were much less likely to investigate the captive by placing their heads into the wire compartment. In conclusion, it is apparent that cage birds still showed some preference for association with a conspecific after a combination of three months' conspecific separation and increased human handling. Future experiments should determine whether the social motivation of cage birds to approach conspecifics is greater than their motivation to approach human handlers. Lastly, the welfare of the isolated pet budgerigar depends on whether it is motivated to seek social contact during the period of social deprivation, or only when it is placed once more in the company of other birds. Methods for assessing motivational state during the deprivation period itself need to be applied (Nicol & Guilford 1990).

#### **Animal welfare implications**

Pet budgerigars are commonly housed in isolation from conspecifics, with little consideration of potential effects on welfare. In studies of farm animal welfare a common first step has been to compare the behaviour of animals housed in different systems. The motivational basis of any behavioural differences observed can then be determined in further studies to assess whether the differences have any welfare implications. The aim of this study was to provide some initial information about the effects of social isolation on the behaviour of budgerigars.

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