NOTES ON THE FEEDING PATTERNS OF THE LONG-BILLED CORELLA, SULPHUR-CRESTED COCKATOO AND GALAH IN SOUTHEASTERN AUSTRALIA.

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SUMMARY

High temperatures may influence diurnal patterns of feeding in cockatoos. Long-billed Corellas, Sulphur-crested Cockatoos and Galahs all fed less during the middle of the day in summer. At other times of the year feeding patterns were similar throughout the day. Food shortages during autumn and winter, and physiological demands of breeding during late winter and spring may influence these seasonal patterns of feeding. Long-billed Corellas usually spent more time feeding than the other cockatoos. Flock sizes of all three species varied depending on the activities of the birds. They were largest when feeding, smallest when flying and intermediate when roosting.

INTRODUCTION

At least 30 of the 50+ species of Australian parrots are reported to feed mainly during morning and late afternoon and to roost in tree canopies or in the shelter or rocks or small shrubs during the middle of the day (Frith 1969; Schodde 1976; Saunders 1977; Wyndham 1980; Forshaw 1981; Emison and Beardsell 1985; Rowley 1990). Many of the references to the cessation of feeding by parrots during midday also contain statements about the high temperatures which occur during these hours. Indeed, some of the authors indicate that some species can and do feed throughout daylight hours when temperatures are not high (Saunders 1977; Wyndham 1980; Rowley 1990). Thus, there is some indication that high midday temperatures play an important role in determining why many species roost in the middle of the day. It is also likely that flock size is influenced by the feeding activities of parrots. In this paper we examine these relationships by analysing the feeding patterns and activities of the Long-billed Corella *Cacatua tenuirostris*, Sulphur-crested Cockatoo *C. galerita* and Galah *Eolophus roseicapillus* in relation to temperature and flock size.

METHODS

During a study (1979-1984) of the feeding of the Long-billed Corella (Temby and Emison 1986; Emison and Beardsell 1985, 1989) we periodically drove along roads within the range of the Long-billed Corella (Figure 1) and recorded the activities (i.e. feeding, roosting, flying) of all flocks of Long-billed Corellas, Sulphur-crested Cockatoos and Galahs seen. At the same time, the numbers of birds in each flock were either counted or estimated. Other data

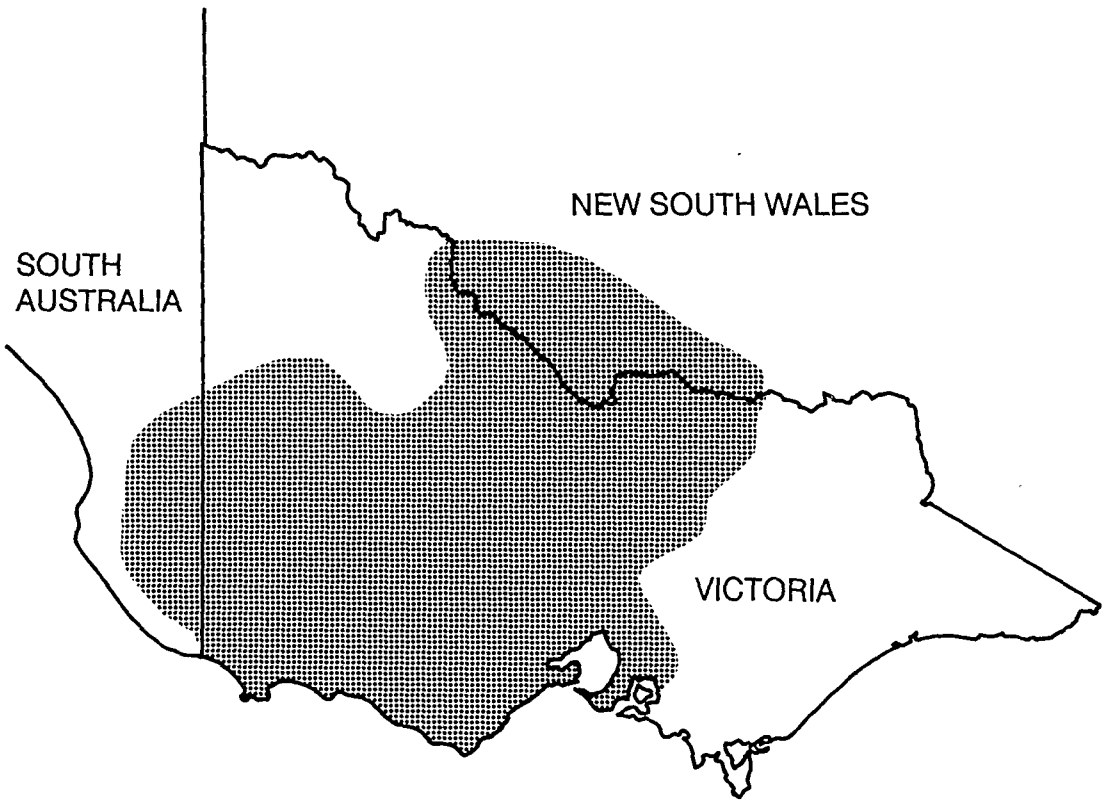

Figure 1. Distribution (shaded area) of the Long-billed Corella.

recorded for each flock included: the locality of the sighting; date; time of day; weather conditions; names of observers; habitat details; and, when possible, the ambient temperature. For the purposes of this study, we have defined the seasons as: summer = December - February, autumn = March - May, winter = June - August and spring = September - November.

RESULTS

We recorded the activities of 620,000 Long-billed Corellas, 125,000 Sulphur-crested Cockatoos and 100,000 Galahs. Some individuals were undoubtedly seen and counted more than once because observations were made over a number of years and were sometimes made in the same localities. Thus, the above totals do not indicate population sizes. However, the differences in the numbers of each species seen do give an indication of relative abundances within the range of the Long-billed Corella (i.e. Long-billed Corellas were five to six times more numerous than were the other two species).

Daily feeding patterns

During summer, the percentages (calculated separately for each species by dividing the number seen feeding by the total number seen of that species) of Long-billed Corellas, Sulphur-crested Cockatoos and Galahs seen feeding during the daylight hours indicated that the birds fed substantially less during the midday (1100 - 1600) hours (Figure 2). The percentages of Long-billed Corellas seen feeding during summer were consistently higher (although only slightly so during the midday hours) than were those of either the Sulphur-crested Cockatoo or the Galah. The differences in the percentages of birds feeding in each of the three daily time-intervals were highly significant (X^2, $P < 0.0001$) for each of the three species of cockatoo.

During the rest of the year (March - November), the percentages of Long-billed Corellas, Sulphur-crested Cockatoos and Galahs seen feeding during daylight hours indicated that the birds fed slightly more during the midday (1100 - 1600) hours (Figure 3). However, the percentages of Galahs seen feeding during these months were consistently lower than were those for either the Long-billed Corella or the

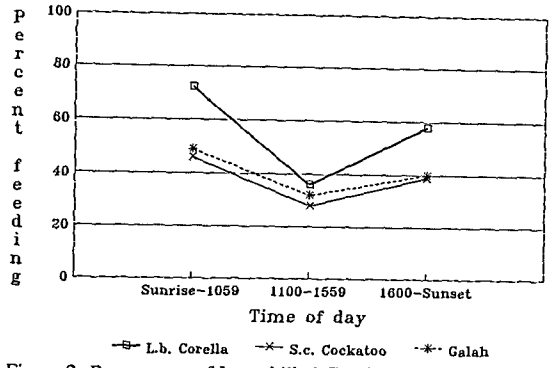

Figure 2. Percentages of Long-billed Corellas, Sulphur-crested Cockatoos and Galahs seen feeding during summer (December - February).

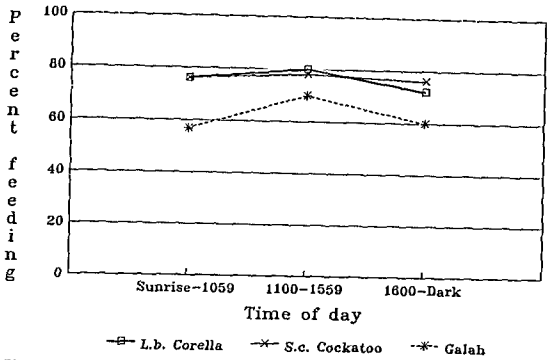

Figure 3. Percentages of Long-billed Corellas, Sulphur-crested Cockatoos and Galahs seen feeding during the March - November period.

Sulphur-crested Cockatoo (Figure 3). The differences in the percentages of birds feeding in each of the three time-intervals for each species were all found to be highly significant (X^2, $P < 0.0001$).

Temperature

The percentages of birds of each species seen feeding when the temperatures were within each of the four ranges (0-9 °C, 10-19 °C, 20-29 °C and higher than 30 °C) showed similar trends for all three species (Figure 4). Percentages were highest when temperatures were 0-19 °C and lowest when temperatures were above 30 °C. The percentage of Long-billed Corellas feeding when temperatures were above 30 °C was more than twice the percentages of either the Sulphur-crested Cockatoo or the Galah.

Flock size

Seasonally, the mean sizes of flocks of Long-billed Corellas were consistently larger than those of either the Sulphur-crested Cockatoo or the Galah. However, the pattern of variation between seasons was similar for all three species with mean size highest in autumn, then followed in order by winter, summer and lastly spring (Figure 5). Also, for all three species, the mean flock sizes were largest when the birds were feeding, smallest when they were flying and intermediate when they were roosting; again, the mean sizes of flocks of Long-billed Corellas for these activities were larger than those of the other two species (Figure 6).

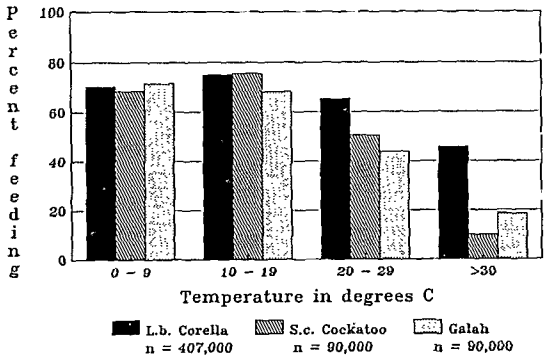

Figure 4. Percentages of Long-billed Corellas, Sulphur-crested Cockatoos and Galahs seen feeding at various temperature ranges.

DISCUSSION

Our results are consistent with observations (Frith 1969; Forshaw 1981; Emison and Beardsell 1985) that Long-billed Corellas, Sulphur-crested

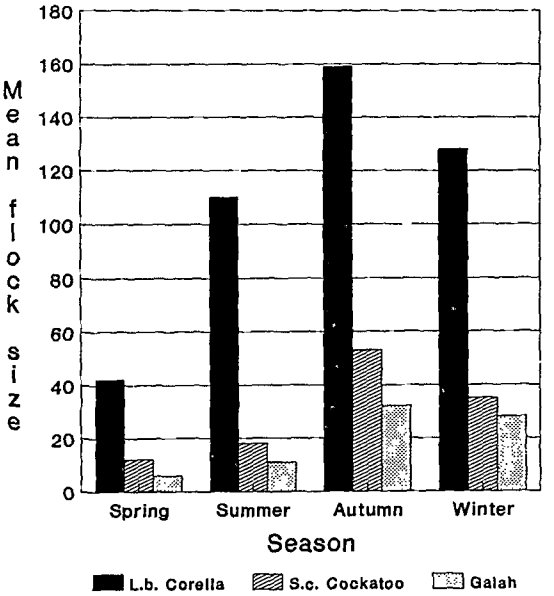

Figure 5. Mean flock sizes, on a seasonal basis, of Long-billed Corellas, Sulphur-crested Cockatoos and Galahs.

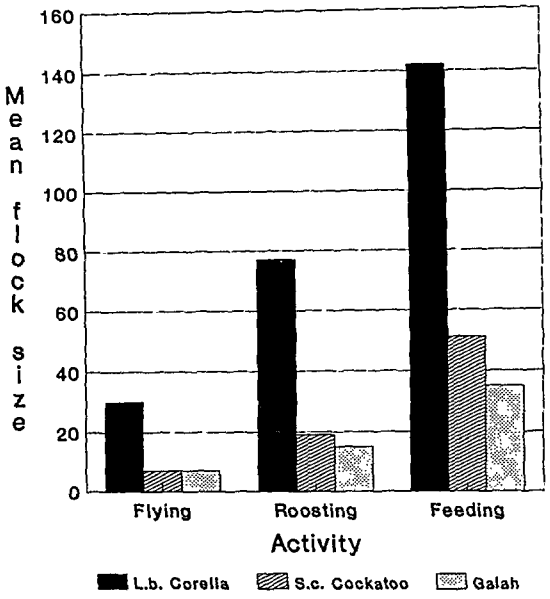

Figure 6. Mean flock sizes of Long-billed Corellas, Sulphur-crested Cockatoos and Galahs which were seen flying, roosting and feeding.

Cockatoos and Galahs feed less when temperatures are high. In our results, this behaviour was also reflected in a low percentage of birds of each species feeding during the midday hours of summer. During the rest of the year, the percentages of birds feeding during the midday hours were slightly higher than the percentages of birds feeding at other times.

Although the daily feeding patterns of the Long-billed Corella and the Sulphur-crested Cockatoo were similar during the March - November period, the reasons for the lower percentages of Galahs feeding during this period cannot be adequately explained by this study. However, the results of a study in the wheatbelt of Western Australia suggested that Galahs feed throughout the day only when food is scarce or when breeding birds have young to feed or eggs to incubate (Rowley 1990). The diurnal foraging pattern of Galahs in the Canberra area also has been shown to vary with season (autumn, winter and spring), perhaps because of changes to food resources and the physiological demands of winter (Westcott and Cockburn 1988).

Despite the similarity in feeding patterns of the three species during summer, the percentages of corellas seen feeding were consistently larger, and at the higher temperatures more than double, the percentages of the other two species. Again, the reasons for these differences between the species are unclear but may be related to the specialist diet of the Long-billed Corella. On a yearly basis, about 85% of the food eaten by this corella is either Onion Grass (*Romulea* spp) corms or cereal grains (Temby and Emison 1986). During late summer, these two foods may be in short supply because Onion Grass corms are difficult to dig up from the hard dry soils and cereal grains, which are available only as wastage in stubbles, are also taken by other birds and sheep. Thus, the Long-billed Corella may be forced to spend more time searching for food during this period (and during hotter hours) than do either of the other two species. However, this hypothesis can not be confirmed because detailed feeding studies have not been undertaken in this region on either the Sulphur-crested Cockatoo or Galah. Certainly, both of these species feed extensively on Onion Grass corms and cereal grains but their diets may also include foods which are not eaten by Long-billed Corellas. The high percentages of birds seen feeding at all times of the day during the March - November period suggest that food may be in short supply during this period for all three species or perhaps because of the physiological demands of cooler weather.

Highest mean flock sizes for all three species were recorded in autumn and winter and this coincided with months when most cereal crops were germinating and most sunflower crops were mature or in stubble. Moderately high mean flock sizes were recorded during summer and this coincided with the months of January and February when cereal crops were in stubble but still had spilled grain on the ground. At times, extremely large flocks of Long-billed Corellas, Sulphur-crested Cockatoos and Galahs congregated on the very concentrated but transitory food sources provided by germinating cereals, mature sunflowers and stubbles of cereal and sunflower. Mean flock sizes during spring were the lowest of the four seasons. This time of the year coincided with the period when these three species were breeding and when they were seen feeding mainly on Onion Grass corms, which are widely distributed and less transitory than are the cereals and sunflowers.

The phenomenon of small flocks and individual birds flying to join others seen feeding on a suitable food source (e.g. corellas in a field of germinating cereal) is well known and allows avian species to efficiently exploit localised temporary food sources (Cannon 1984). This behaviour was observed during this study (i.e. the mean flock sizes of birds seen

feeding were larger than the mean flock sizes of birds seen flying). The mean sizes of roosting flocks were also larger than the mean sizes of flying flocks (although still much smaller than those of feeding flocks) which reflects the communal roosting behaviour of the three species.

It is not known if the consistent differences between the large mean flock sizes of Long-billed Corellas and the smaller mean flock sizes of Sulphur-crested Cockatoos and Galahs are attributable to behavioural differences between the three species or are simply a reflection of the total population sizes of each of the species in the study area. Further work on this aspect is required. Perhaps a comparison of the flock sizes of a population of Galahs, which is located more within its main range and is much larger than those on the periphery of its range (e.g. in southeastern Australia), with the flock sizes found during the present study would help to explain these differences.

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