DISTRIBUTION OF THE LONG-BILLED CORELLA IN SOUTH AUSTRALIA

W.B. EMISON AND C.M. BEARDSELL

SUMMARY

Between May 1982 and June 1983, five ground surveys were conducted to determine the distribution of most of the population of the Long-billed Corella in South Australia. This corella was usually found in River Red Gum woodlands between latitudes 36°15'S and 37°45'S and longitudes 140°20'E and 141°00'E. Sulphur-crested Cockatoos, Galahs and Little Corellas also occurred in this area, but their combined numbers were less than that of the Long-billed Corella.

Ninety-eight per cent of all Long-billed Corellas seen were in eight geographic regions within the survey area. The Naracoorte region contained large numbers of Long-billed Corellas during all seasons and was the centre of their distribution in South Australia. Four southern regions (Callendale, Killanoola, Penola and Kalangadoo) contained small but consistent numbers of Long-billed Corellas during all seasons. Numbers of Long-billed Corellas in three northern regions (Padthaway, Bordertown and Wolseley) varied from season to season with movements into or out of regions being associated with food availability.

The main foods of the Long-billed Corella in South Australia were Onion Grass corms, cereal grains and sunflower seeds. These foods came from pastures, germinating cereal crops, cereal stubbles, mature sunflower crops, sunflower stubbles, feed trails and ploughed paddocks.

INTRODUCTION

The Long-billed Corella *Cacatua tenuirostris* once had a continuous range from south-eastern South Australia through south-western and central Victoria extending as far east as Melbourne (Forshaw 1981). Today the highest densities (birds/ha) occur in the South-East of South Australia and south-western Victoria with lower densities occurring in central Victoria, along the Murray River between Victoria and New South Wales and in southern New South Wales. Recent taxonomic work by Schodde *et al.* (1979) and followed here has restricted the application of the name *C. tenuirostris* to the populations in south-eastern Australia, of which that population in the South-East of South Australia and south-western Victoria is the largest.

The Sulphur-crested Cockatoo *C. galerita,* Galah *C. roseicapilla* and Little Corella* *C. pastinator* are sympatric with the Long-billed Corella in the South-East of South Australia. These four species all feed on the ground and can cause damage to cereal and sunflower crops.

In 1982 funds were provided by the National Parks and Wildlife Service (South Australia) for a study of Long-billed Corellas in South Australia. Such a study was needed to assist formulation of management strategies for this corella because between 1980 and 1983 more than 100 destruction permits were issued for Long-billed Corellas which were damaging cereal and sunflower crops in the South-East of South Australia. The study was designed to include most of the known range of the Long-billed Corella in South Australia and was conducted over a 14 month period from May 1982 through June 1983. A primary aim of the study was to provide details on the seasonal distribution of the Long-billed Corella in South Australia. Also included in this paper are other relevant data collected on the Long-billed Corella, the Sulphur-crested Cockatoo, Galah and Little Corella.

SURVEY AREA

The area inhabited by the Long-billed Corella in the South-East of South Australia is rectangular and contains 144 five-minute latitude-longitude blocks. Its boundaries are the latitudes 36°15'S and 37°45'S and the longitudes 140°20'E and 141°00'E. The area so defined is 165 km from north to south and 60 km from east to west (approximately 10,000 km²) (Figure 1).

Landforms and soils

Information on the landforms and soils of the survey area is available from several sources (e.g. Boomsma and Lewis undated, Parkin 1969, Laut *et al.* 1977). The most important feature in much of the western and southern portions of the survey area is a series of long, narrow NNW/SSE oriented dune ridges (locally known as ranges), which originated mainly from sea-level fluctuations during the Pleistocene. Sandy soils occur on the dune ridges and clay soils occur on the poorly drained interdunal flats. In the Penola and Kalangadoo regions better drained clay soils are contiguous with similar regions in south-western Victoria.

* See Beardsell and Emison (1985) for details of Little Corella sightings and nomenclature.

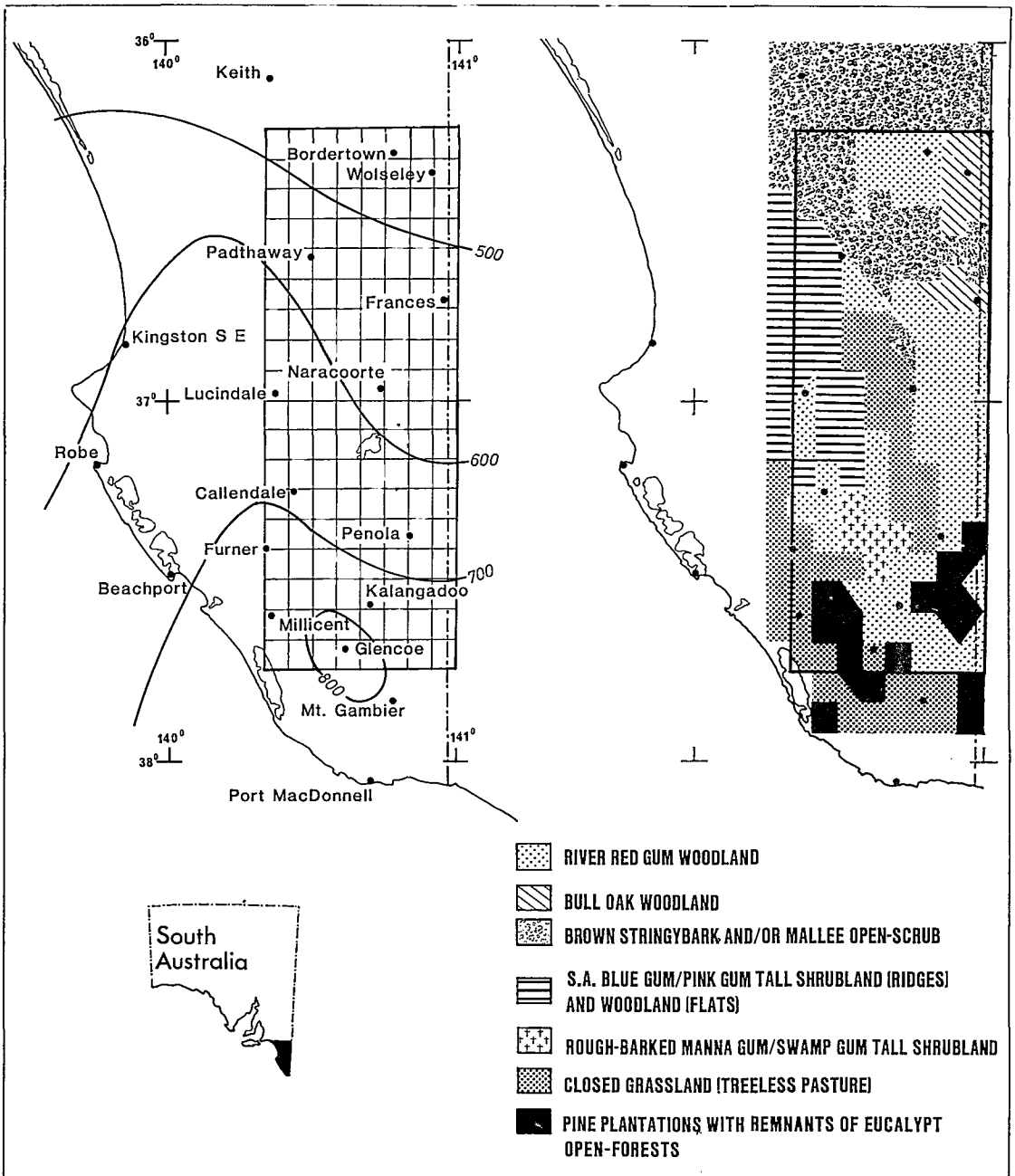

Figure 1. The South-East of South Australia. The map on the left shows place names, rainfall isohyets (mm) and the survey area with its 144 five-minute latitude-longitude blocks. The map on the right shows the outline of the survey area and the vegetation alliances in, and adjacent to, the survey area. On both maps, major localities are shown as black dots and the border between South Australia and Victoria is shown as a broken line.

In the north-east of the survey area two extensions of the West Wimmera Plains of Victoria occupy the Wolseley/Bordertown and Frances/Naracoorte areas. Between these two areas is a veneer of aeolian siliceous sands contiguous with the Little Desert Region of Victoria.

Weather

Temperatures in the survey area increase progressively from south to north. At Mt Gambier the highest mean monthly maximum is 25.6°C (January) and the lowest mean monthly minimum is 4.7°C (July). At Keith the highest mean monthly maximum is 29.9°C (January and February) and the lowest mean monthly minimum is 5.5°C (July); (Boomsma and Lewis undated).

Average annual rainfall decreases progressively from south to north (from 712 mm at Mt Gambier to 471 mm at Keith) (Figure 1). Seventy-five per cent of the annual rainfall at both Mt Gambier and Keith occurs from April through September. The highest annual rainfall in the survey area is 850 mm at Mt Burr (near Millicent); (Boomsma and Lewis undated).

Vegetation

The vegetation map in Figure 1 was drawn by using seven categories based on data showing which major plant alliance(s) occurred in each five-minute block. These seven categories are listed and discussed below. The classification of plant alliances follows Specht *et al.* (1974) but the nomenclature for all plants follows either that of Boomsma and Lewis (undated), Willis (1970) or, for *Allocasuarina,* Johnson (1982).

(1) River Red Gum woodlands (main alliances: (a) River Red Gum *Eucalyptus camaldulensis;* and (b) River Red Gum and South Australia (S.A.) Blue Gum *E. leucoxylon*) were the major alliances occurring in 38% of the 144 blocks in the survey area.

(2) Bull Oak woodland (main alliance: Bull Oak *Allocasuarina luehmannii*) was the main alliance in 7% of the blocks in the survey area.

(3) Brown Stringybark and/or Mallee open-scrub (main alliances: (a) Brown Stringybark *E. baxteri*; (b) Ridge-fruited Mallee *E. incrassata,* Slender-leaved Mallee *E. foecunda* and S.A. Blue Gum; and (c) Coastal White Mallee *E. diversifolia*). Fifteen percent of the blocks in the survey area contained mainly these alliances.

(4) S.A. Blue Gum/Pink Gum tall shrubland (ridges) and woodland (flats) (main alliance: S.A. Blue Gum and Pink Gum *E. fasciculosa*). About 13% of the blocks in the survey area contained mainly these alliances.

(5) Rough-barked Manna Gum/Swamp Gum tall shrubland (main alliance: Rough-barked Manna Gum *E. viminalis*/Swamp Gum *E. ovata* tall shrubland) was the dominant alliance in 3% of the blocks in the survey area.

(6) Closed-grassland. Treeless pasture was the main alliance in 16% of the blocks in the survey area.

(7) Pine plantations with remnants of eucalypt open-forest (main alliances: (a) Radiata Pine *Pinus radiata* plantations; (b) Messmate *E. obliqua* and Rough-barked Manna Gum open-forest; and (c) Brown Stringybark open-forest) occurred extensively in 9% of the blocks in the survey area.

METHODS

Between May 1982 and June 1983 five surveys of cockatoos were made by vehicle through each of the 144 five-minute latitude-longitude blocks in the survey area. One survey was conducted during each season of the year with the exception of winter 1982 when two were conducted (early June and late July-early August). The results of these two surveys were similar and have been averaged to allow comparisons with the results of the other surveys. The survey during spring was in October 1982; that during summer was in February 1983; and that during autumn was in April 1983. It is emphasized that, for discussion purposes, we refer to the surveys as seasonal surveys; however, each survey only spanned one or two weeks of a season so it may not have been completely representative of that season.

Surveys were conducted by driving along most roads in each five-minute block and recording all sightings of the Long-billed Corella, Sulphur-crested Cockatoo, Galah and Little Corella. We spent between one and two hours in each block and recorded the number and activities of cockatoos, the locality of sightings, date, time of day, weather conditions, names of observers and habitat details. We also stopped and walked to most sites where cockatoos were seen feeding where we searched for remains of food items (e.g. outer coverings of onion grass corms, uprooted cereal seedlings) or presence of probable food items (e.g. cereal grains in stubbles).

RESULTS AND DISCUSSION

Distributions and relative numbers

Long-billed Corellas were observed in 117 (81%) of the 144 five-minute blocks, Galahs in 119 (83%), Sulphur-crested Cockatoos in 106 (74%) and Little Corellas in 24 (17%) (Figure 2).

Counts of Long-billed Corellas, Galahs, Sulphur-crested Cockatoos and Little Corellas varied considerably between the four seasons (Table 1). The variations in counts were due mainly to: (1) seasonal movements associated with food availability (see section on seasonal movements); and (2) changes in the behaviour of the parrots that affected the ability of observers to locate them (e.g. large flocks are easier to locate than are small flocks). In the cool autumn and winter months large flocks of these cockatoos were found feeding in the open during most of the day (Table 2) and these large flocks were relatively easy to locate. However, during spring, flocks were much smaller thus more difficult to find than during the other

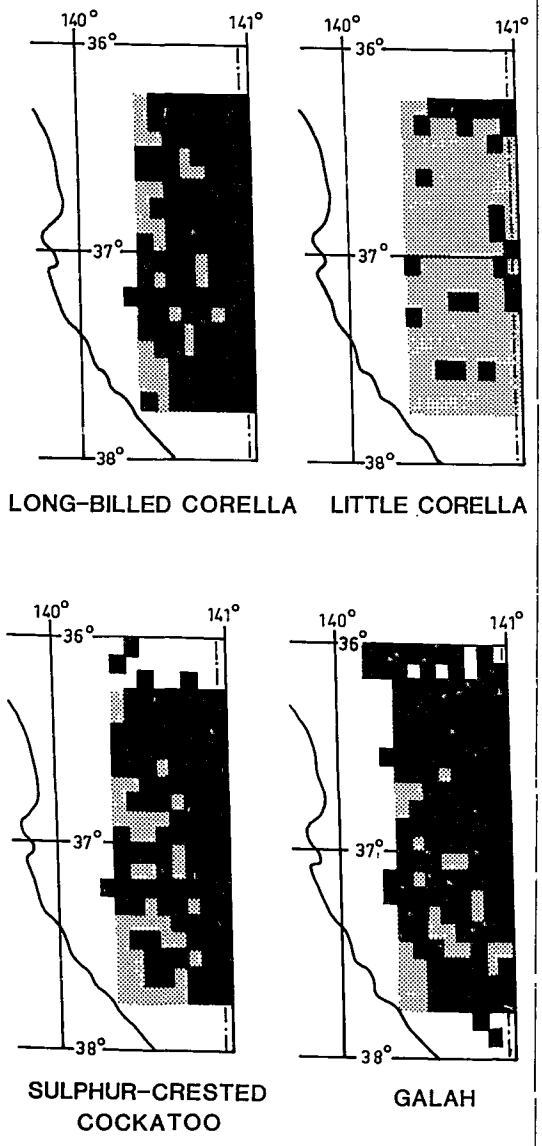

Figure 2. Distributions (black shading) of *Cacatua* spp in, and adjacent to, the survey area (grey shading), May 1982-June 1983.

seasons. In summer large flocks occurred at food sources, but during the hottest part of the day the birds roosted quitely in the canopies of trees and were difficult to find. Although many more birds were seen than in spring, consistently fewer were recorded than in autumn or winter (Table 2). Therefore, the actual figures for each seasonal count are not comparable. It is also emphasized that the total number of birds seen during any one season is only a sample of the total population in the survey area at that time.

Of the total numbers of individuals of all four species of *Cacatua* seen during the surveys the Long-billed Corella was consistently the most abundant (Table 1). The figures for the spring, summer and autumn surveys were similar in that 73 to 81% of all *Cacatua* seen were Long-billed Corellas, 10 to 13% were Galahs, 7 to 13% were Sulphur-crested Cockatoos and less than 1% were Little Corellas. However, during the winter survey the proportion of Long-billed Corellas seen dropped to 57% of the total number of *Cacatua* seen and the percentage of Galahs (28%) increased substantially; the percentages of Sulphur-crested Cockatoos and Little Corellas remained about the same as during the other three seasonal counts.

Habitat

Eighty-seven percent (85)* of all Long-billed Corellas seen during the seasonal surveys were in blocks (see Figure 1) covered mainly by River Red Gum woodland alliances (Red Gum blocks) or by the Bull Oak woodland alliance (Bull Oak blocks). Most of the sightings that included the other 13% (15%)* of birds were in blocks covered mainly by the S.A. Blue Gum/Pink Gum woodland alliance or by treeless pasture and most of these blocks were adjacent to Red Gum blocks. Few Long-billed Corellas were observed in the blocks covered mainly by the alliances of S.A. Blue Gum/Pink Gum tall shrubland, Manna Gum/Swamp Gum tall shrubland, Brown Stringybark/Mallee open-scrub or plantations of exotic pines.

The results of the surveys made during spring, summer and autumn were similar in that 81 to 86% (76 to 85%)* of all Long-billed Corellas seen were in Red Gum blocks. However, during the winter surveys only 66% (71%)* were observed in Red Gum blocks. Most of the sightings in winter which included the other 34% (29%)* of birds were in blocks covered mainly by the alliances of Bull Oak woodland, S.A. Blue Gum/Pink Gum woodland and treeless pasture. During this season there were extensive areas of cereal grains germinating in these blocks (particularly

* Percentages in parentheses are based on numbers of flocks seen, rather than on numbers of individual Long-billed Corellas seen.

Species	Season							
	Winter 1982 (*)	(% of total)	Spring 1982 (Oct.)	(% of total)	Summer 1983 (Feb.)	(% of total)	Autumn 1983 (April)	(% of total)
Long-billed Corella	19,850	(56.9)	6,950	(74.6)	13,600	(81.4)	18,900	(73.3)
Sulphur-crested Cockatoo	4,300	(12.3)	1,200	(12.9)	1,200	(7.2)	3,450	(13.4)
Galah	9,850	(28.2)	1,150	(12.4)	1,700	(10.2)	3,300	(12.8)
Little Corella	900	(2.6)	10	(0.1)	200	(1.2)	120	(0.5)
Total	34,900		9,310		16,700		25,770	

* Totals for winter are the averages of counts made in a survey in early June (1982) and of counts made in a second survey in late July/early August (1982).

Table 1. Numbers of Long-billed Corellas, Sulphur-crested Cockatoos, Galahs and Little Corellas counted during seasonal censuses of the survey area.

in Bull Oak blocks). The S.A. Blue Gum/Pink Gum woodland and treeless pasture blocks (along with some of the Red Gum blocks) were also the main areas where sunflowers occurred.

The correlation between the distribution of River Red Gums and the distribution of Long-billed Corellas is further demonstrated by results showing that 90% of the total number of Long-billed Corellas (n = 20,150) seen roosting in trees were in River Red Gums. More than 90% of the total number of Long-billed Corellas seen in trees during each of the seasons, spring, summer and autumn were in River Red Gums. The lowest percentage seen in River Red Gums (79%) was during winter and this was because 21% of the Long-billed Corellas seen roosting were either in S.A. Blue Gums scattered through the Red Gum blocks or in shelter belts of exotic trees in the otherwise treeless pastures in the southern half of the survey area. Slightly different results are obtained if only the number of flocks seen (disregarding numbers of birds in each flock) are used in the computations. These results show that 83% of the total number of flocks (n = 193) seen roosting in trees were in River Red Gums. Seasonally, these results were: spring—91%, summer—77%, autumn—85%, and winter—80%.

In summary, the distribution of Long-billed Corellas in our survey area coincided with the distribution of those grids which were covered mainly by River Red Gum woodland alliances. Although there may be several factors influencing the distribution of the Long-billed Corella, our data show that River Red Gum woodlands are particularly good indicators of where this corella is to be found in the South-East of South Australia.

Food sources

Studies on the food habits of the Long-billed Corella have previously been conducted in Victoria (Temby and Emison, MS). These studies showed that there the main foods were corms of the introduced Onion Grass *Romulea* spp, cereal grains (primarily oats, secondarily wheat and barley) and sunflower seeds. During all of the surveys in South Australia the presence of these foods was recorded for each block.

Our data show that cereals (either oats, wheat or barley) were grown throughout the survey area (Figure 3). Oats and barley were

	Average flock size	Sample size
Winter* (1982)	140.1	283 +
Spring (October 1982)	34.5	201
Summer (February 1983)	103.7	131
Autumn (April 1983)	135.1	140

* Two winter surveys were made: one in early June (1982) and one in late July/early August (1982).

\+ 139 flocks were seen in the early June (1982) survey and 144 flocks were seen in the late July/early August (1982) survey.

Table 2. Average sizes of flocks of Long-billed Corellas seen during seasonal censuses of the survey area.

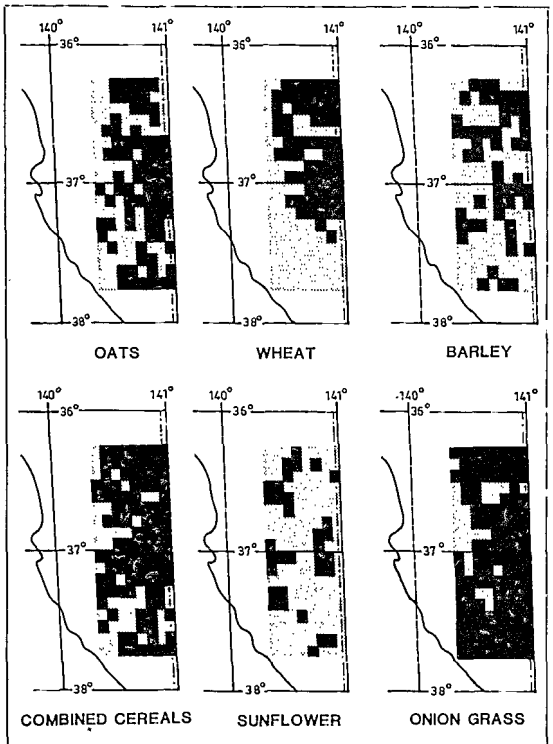

Figure 3. Distributions (black shading) of the main foods of the Long-billed Corella in the survey area (grey shading), May 1982-June 1983.

more widespread than wheat but were less abundant. Most wheat was grown in the northern half of the survey area (north of the 600 mm rainfall isohyet). Sunflowers were grown in three main areas (around Padthaway, Naracoorte and Callendale), although a few small crops were also recorded in the southern portion of the survey area. The two western sunflower areas (Padthaway and Callendale) were on loamy soils adjacent to areas of River Red Gums and S.A. Blue Gums. The Naracoorte sunflower area occurred on loamy soils adjacent to areas of River Red Gums and Rough-barked Manna Gums. Onion Grass was abundant throughout most of the Red Gum blocks. It was also present, but usually less abundant, on loamy soils under S.A. Blue Gums and on well-drained sites (e.g. roadsides) in treeless pasture. On sandy soils north and west of the survey area Onion Grass was absent from those limestone areas that once supported Dryland Tea Tree *Melaleuca lanceolata*.

Long-billed Corellas were not collected for analysis of foods present in their crops and stomachs; however, the food source was always recorded when they were seen feeding on the ground. The seven main sources of food we identified were pasture, germinating cereal, cereal stubble, sunflower stubble, mature sunflower, feed trail and ploughed paddock. Figure 4 shows the proportion of Long-billed Corellas seen on each of these food sources on a seasonal basis.

Long-billed Corellas were seen on pasture (usually feeding on Onion Grass corms) throughout the year with the highest percentage (81%) being seen during spring. Winter was the main season in which the birds fed in ger-

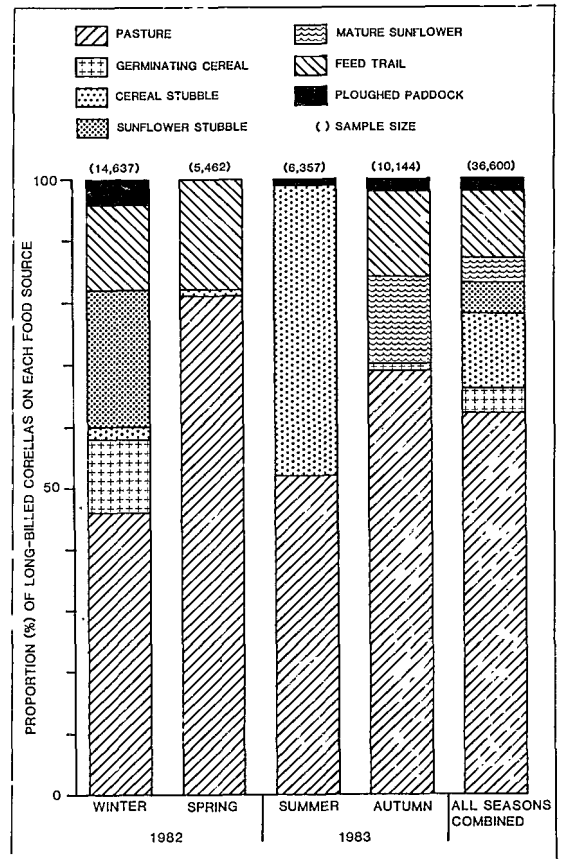

Figure 4. Seasonal use made by Long-billed Corellas of the various sources of foods in the survey area (sample sizes based only on feeding birds).

minating cereal crops (17% of all seen feeding during winter were on this food source), although this probably varies somewhat from year to year, depending on climatic conditions. Cereal stubbles were very important during summer (47% of all Long-billed Corellas seen feeding during summer were on this food source). Sunflower crops were of importance when the flower heads matured during autumn and when stubbles were present in winter. Feed trails were important to Long-billed Corellas during winter, spring and autumn (14-18% of those seen feeding were on this food source in these seasons); however, because of the severe drought conditions these figures may be atypical. The birds seen in ploughed areas were probably feeding on Onion Grass corms, although during winter some may have been seeking newly planted cereal grains.

In the survey area, the Long-billed Corella shared these food resources with a number of other animals, particularly the Sulphur-crested Cockatoo, Galah and Little Corella. Figure 5 shows the relative proportions of the four

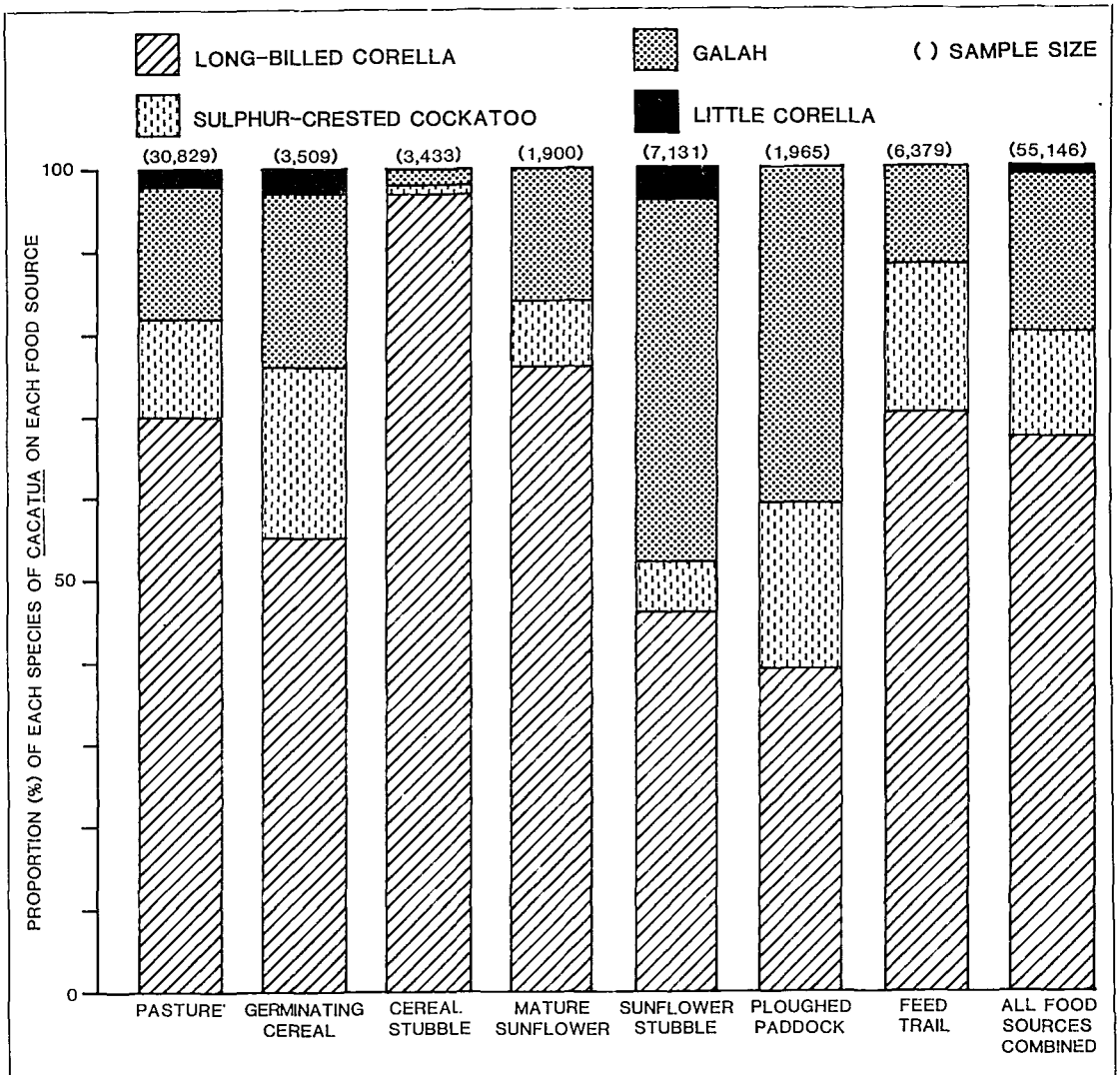

Figure 5. Relative proportions of four parrots of the genus *Cacatua* observed on each of the sources of food in the survey area (sample sizes based only on feeding birds).

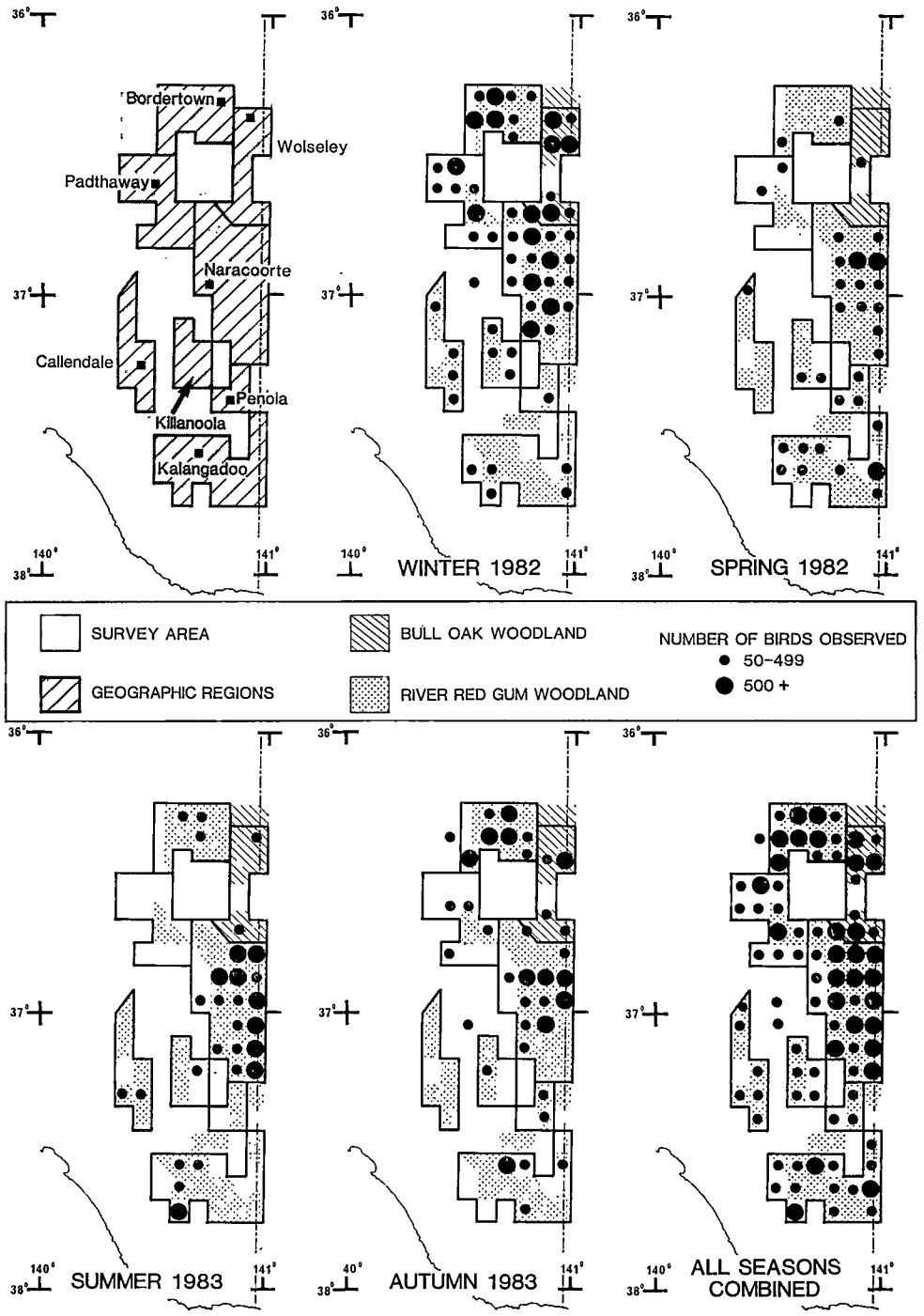

Figure 6. Seasonal distribution of the Long-billed Corella in relation to eight geographic regions within the survey area.

species of *Cacatua* seen on each of the seven major sources of food in the survey area. On four of these (pasture, germinating cereal, mature sunflower and feed trail) the proportions of the four parrot species seen were similar to those of the overall counts made throughout the year. However, of the parrots seen on cereal stubble more than 95% were Long-billed Corellas (Figure 5). This again emphasizes the importance of cereal grains to Long-billed Corellas during late summer. Over 40% of the parrots seen on sunflower stubble and in ploughed paddocks were Galahs (Figure 5). These latter figures reflect the large numbers of Galahs which apparently moved into the northern portions of the survey area during late autumn and winter.

Seasonal movements

For discussion purposes the survey area has been divided into eight geographic regions (Figure 6) on the basis of distribution of Long-billed Corellas as recorded during the four seasonal counts. These geographic regions included only 58% of the 144 five-minute blocks within the survey area. However, 98% of the total number of Long-billed Corellas seen during the four seasonal surveys were in these eight geographic regions.

The Naracoorte region contained large numbers of Long-billed Corellas during all four seasons and was obviously the centre of their distribution in South Australia (Figure 6). The four southern geographic regions (Callendale, Killanoola, Penola and Kalangadoo) usually contained small but consistent numbers of Long-billed Corellas during all four seasons. The only exceptions were in the Penola region in summer and the Callendale region in autumn when the censuses failed to locate 50 or more birds in at least one of the blocks in these areas.

The number of Long-billed Corellas in the three northern geographic regions (Padthaway, Bordertown and Wolseley) varied from season to season (Figure 6). Large numbers were present throughout these three regions during winter when many were feeding on germinating cereal grains and, in the Padthaway region, on sunflower stubbles. During spring, only small numbers were found at scattered localities within these three regions. During summer, small numbers persisted in the Bordertown and Wolseley regions, but no birds could be found in the Padthaway region. In autumn, large numbers of these corellas were again found, particularly in the Bordertown and Wolseley regions.

It is assumed that Long-billed Corellas departed from the sunflower areas near Padthaway during summer, although they only had to travel a few kilometres to be into the Naracoorte or Bordertown regions. The data also suggest that there was some seasonal movement of birds into and out of the other two northern geographic regions (Bordertown and Wolseley). However, because of the unusual seasonal conditions that prevailed during the course of this study, this suggestion should be tested by more extensive observations in these two regions.

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Fisheries and Wildlife Service, Arthur Rylah Institute for Environmental Research, 123 Brown Street, Heidelberg, Victoria, 3084

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