CORELLA
Journal of the Australian Bird Study Association

Volume 34 Number 1 March 2010

Corella, 2010, 34(1): 1-6

LONG-TERM INDICES OF DENSITY OF TEN WOODLAND PASSERINES AT EYRE BIRD OBSERVATORY

S. J. J. F. DAVIES

Department of Environment and Agriculture, Curtin University of Technology, G.P.O. Box U1987, Perth, 6845, Western Australia

Received: 7 July 2009

Between 1980 and 2008 surveys of the birds in the vicinity of Eyre Bird Observatory (32º15'S; 126º18'E), in Western Australia have been made almost annually, using a point count method and a mapping method. The results have provided indices of the populations of seven resident, territorial species and three nomadic honeyeaters. Five of the resident species appear to have stable populations, varying over a narrow range, one species, the Blue-breasted Fairy-wren *Malurus pulcherrimus* appears to have declined, and one, the Weebill *Smicrornis brevirostris*, appears to have increased. The honeyeaters fluctuate in numbers greatly, presumably in association with the abundance of flowering mallee, both at Eyre and elsewhere. The results provide some baseline information about the range of fluctuation in numbers that can be expected for common species in mallee woodland at Eyre.

INTRODUCTION

In recent times, declines in the abundance and distribution of woodland passerines have been widely reported (e.g. Ford *et al.* 2001; Olsen *et al.* 2005). These declines have been observed throughout southern Australia, in woodlands both in the east and west of the continent. Several factors are thought to have contributed to these declines, especially clearing for agriculture, predation by exotic predators and the small size of surviving remnants.

The Nuytsland Nature Reserve (650 000 ha) on the southern coast of Western Australia contains part of one of the largest areas of undisturbed mallee woodland on the continent, stretching along the southern coast of Western Australia in a narrowing belt from Albany to the Western Australian border. The Eyre Bird Observatory (EBO) (32º15'S; 126º18'E), receiving an annual rainfall of 300 millimetres, is situated near the coast in the centre of the Reserve, and lies in mallee woodland that has not been grazed or burnt, since the Eyre Telegraph Station closed in 1927 – over 80 years. Since 1980, surveys have been conducted around the observatory as part of a week-long course entitled *Field Techniques in Bird Studies*. This course uses several different methods to calculate indices of the density of birds. Summaries of the data collected in the early years were included in Blakers *et al*. (1984). The surveys were not annual in the early years, because the course did not run in 1984, 1988, 1993 and 1995, but such records, as are available, make useful comparisons with recent years, because the methods are unchanged. The methods used have been developed from those described by Robbins (1978), and some of the preliminary results, as well as details of the development of the methods, have been described by Martindale (1980), Davies (1982) and Davies *et al*. (1985). The indices will not be accurate measures of abundance. In order to obtain accurate figures of abundance lengthy observations of colour-banded populations would be required. On the other hand, because the indices have been calculated by the same method over 29 years, they are likely to show up any long-term trends in abundance. Similar surveys have been extensively used to do so overseas (e.g. Freeman *et al.* 2007).

The mallee woodland around the EBO is dominated by *Eucalyptus diversifolia*, *E. angulosa*, *E. gracilis* and *E. oleosa* (Martindale 1980). A narrow fringe of *Acacia* woodland lies between the mallee and the sea, while to the north the mallee extends about 20 kilometres until it merges into the Nullarbor Plain. Over 240 species of birds have been recorded within a kilometre of the observatory, including nomadic honeyeaters, resident territorial species, trans-equatorial migrants, raptors, seabirds, pigeons and parrots (Watkins and Watkins 2003). A 50-metre grid has been laid out over 17.5 hectare of mallee around the observatory and fixed counting stations established for two kilometres along tracks to the east and west. The course on which the observations used to calculate the indices are made is held in early summer at the end of university semesters, and attracts between two and 12 participants.

METHODS

The data presented here were collected by university students who had various skills and experience in the observation of birds. In order to achieve some standardisation in their skill, the first day of the course was devoted to mistnetting and banding the local birds, so that the students had first hand experience of the birds they were to observe during the rest of the week. The justification for presenting the data lies in:

- its consistency over twenty-nine years of collection.
- the fact that the methods of collection remained unchanged.
- the birds on which data are presented are conspicuous or at least have distinctive calls, and are therefore easily recognisable.

- its ability to demonstrate long-term trends in numbers of birds seen.

It is not possible to repeat the observations and they are presented for their intrinsic value and in the hope that they provide interesting comparisons with other, systematically collected data.

Point Counts

The first method used at the EBO is the 'Individual Point Count' method. Ten points were set out in 1978, each 200 metres apart, along two kilometres of track. An observer moved along the track, stopped at each point, waited one minute and then recorded each bird seen or heard during the following five minutes. The distance of each bird observed from the point was also recorded. During the course students walked individually along the track early in the morning, setting out at ten-minute intervals, and doing a five-minute count at each peg, so that the number of observations available each year was ten times the number on the course. The leader(s) always did a count and when there were few students, the wardens also participated, enabling at least fifty counts to be incorporated in the calculation each year. Ramsay and Scott (1981) described a method of calculating densities from this method by determining the 'Effective Area Surveyed' that took into account the increasing difficulty of observing birds in thick vegetation as the distance from the point increased. They recommended a graphing method. Davies *et al*. (1985) developed a simple calculation that removed the need to graph each set of observations. The object of the graph was to determine the section of the graph where its slope was greatest, and that was used to determine the Effective Area Surveyed. The calculation of Davies *et al*. (1985) determined where the slope of the graph would be greatest and the Effective Area Surveyed. To do this, the distances from the point at which birds were detected were grouped into one of five circles with distances from the point of 0–10 metres, 10–20 metres, 20–30 metres, 30–40 metres and 40–50 metres. The number of detections within each circle was determined (n). The increment in area between each circle was also determined (R) (see Figure 1). The area surveyed was given by

$$\frac{R_i}{n_i} \times n_t$$

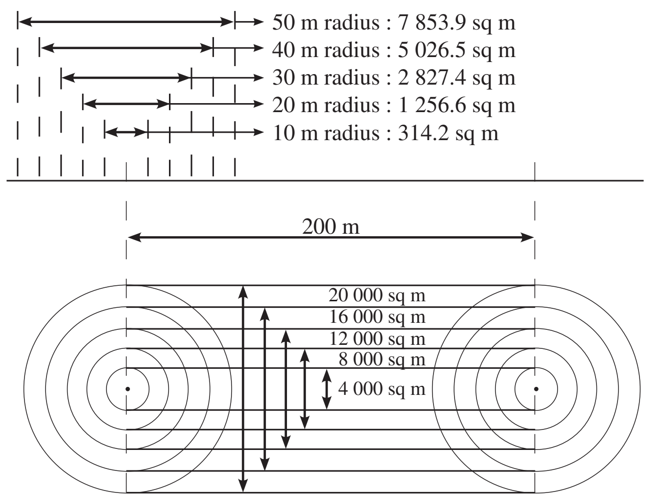

Figure 1. *Layout of Point Count method at Eyre Bird Observatory.*

where n_t is the total number of birds of that species detected at a point and n_i is the total number of birds of the same species detected within a circle of a particular width (i) (e.g. 20–30 m). The slope of the curve is greatest for the least area surveyed calculated by this formula, and this may be taken as the Effective Area Surveyed (Davies *et al*. 1985).

Mapping

This technique is called by Robbins (1978) 'Spot-mapping census'. In it the observer searches a plot of known size that forms part of a previously mapped grid. On each search the position of each bird seen or heard is recorded on a map of the plots. An important feature of the technique is designating those individuals of the same species heard singing (or seen) at the same time. These simultaneous records make it possible to define the minimum number of birds occupying the same territory, and to define approximately the territorial limits of each group (or pair). In this respect the technique differs from the international standard (International Bird Census Committee 1970) because so many Australian birds are cooperative breeders. A map of the layout of the grid used in the mapping is shown in Figure 2. Examples of the maps developed during a course are given in Martindale (1980). At the EBO two (after 1987 three) searches could be made within the constraints of the course structure. Each search was made in a different direction, west to east, east to west or north to south. Depending on the number of participants, each person covered one or two grid rows (see Figure 2). There was no constraint on time and when two grid rows had to be covered, a search would take appreciably longer than when each participant had only one row to cover. The aim was to contact all the birds, not to cover the ground in a specified time; searches took between one and four hours. The searches were all made in early summer (November – December); the weather was always fine during the searches, but often cloudy. Unlike the international standard, the plots at the EBO are 50 metres x 50 metres, whereas the recommended size is 100 metres x 100 metres, so that searching at Eyre was very intense. In another respect the mapping at Eyre did not meet international standards, because no allowance was made for territories that extended beyond the plot limits. The advantages of the technique are that it gives an opportunity to record all species that are in the area, its results closely approximate the absolute number of breeding groups, there is a minimum of error in estimating whether the birds recorded are within or outside the plot boundaries and observer bias is minimised because so many observers are involved. The main virtues of the mapping at the EBO are its long duration and consistent method that enable trends in numbers to be demonstrated over long time periods.

RESULTS

The results of the Mapping Method are presented for resident, territorial birds and these are illustrated in Figures 3 to 8. The results of the Point Counts are given for nomadic, non-territorial birds, and these are illustrated in Figures 9 to 12.

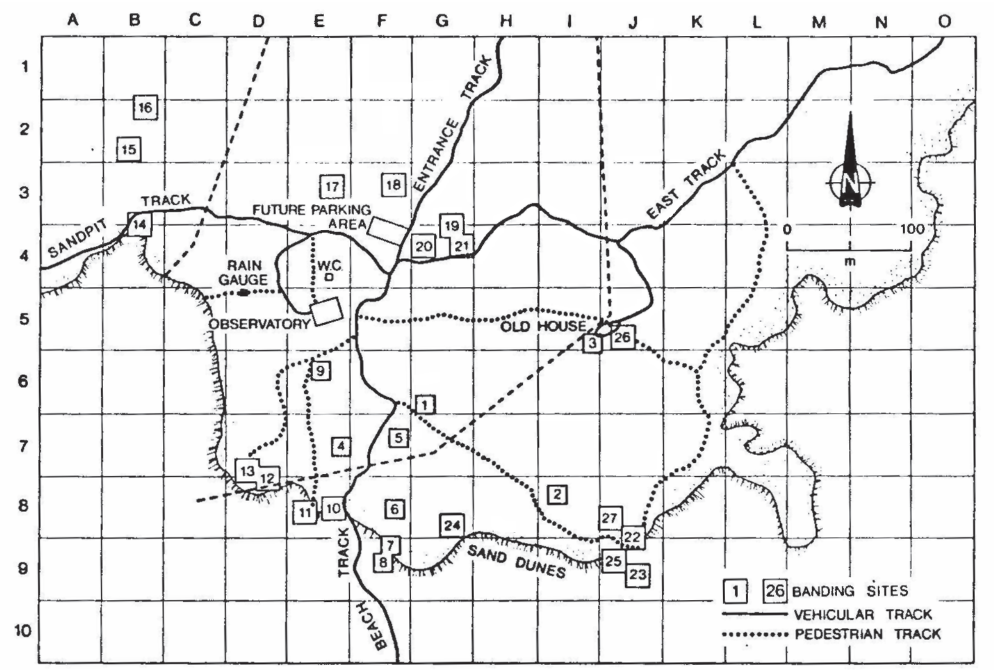

Figure 2. *A sketch map of the surroundings of Eyre Bird Observatory showing pathways, banding sites and census grid.*

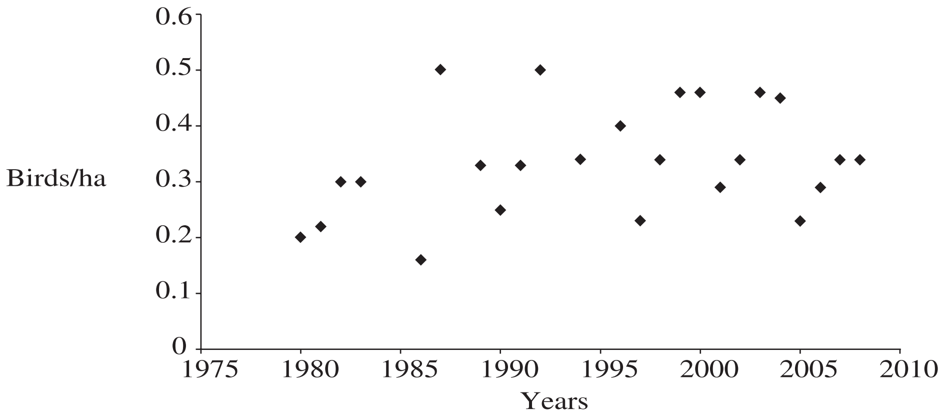

Figure 3. *Estimates of the density (◆) of the Grey Shrike-thrush at Eyre Bird Observatory from 1980 to 2008 based on mapping censuses.*

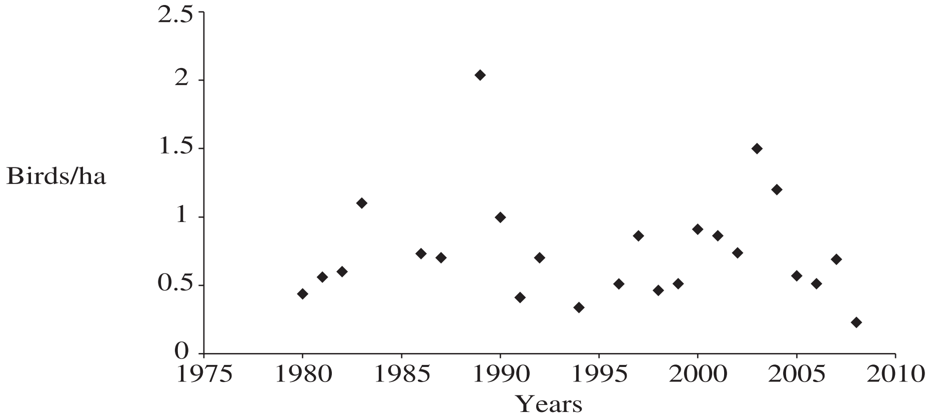

Figure 4. *Estimates of the density (◆) of White-browed Babbler at Eyre Bird Observatory from 1980 to 2008 based on mapping censuses.*

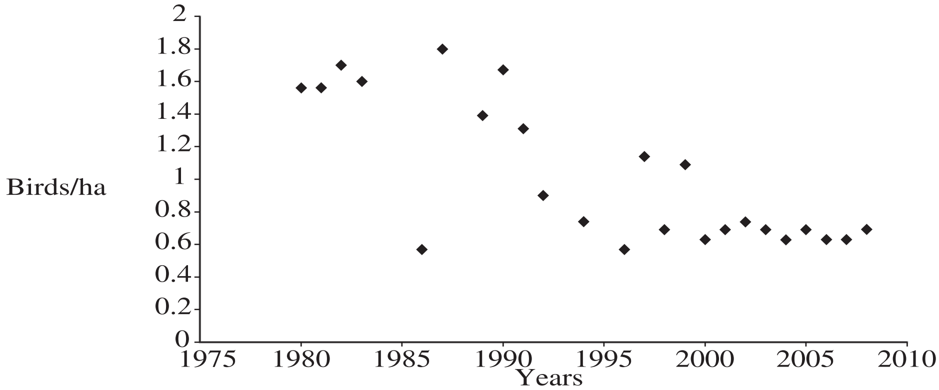

Figure 5. *Estimates of the density (◆) of Blue-breasted Fairy-wren at Eyre Bird Observatory from 1980 to 2008 based on mapping censuses.*

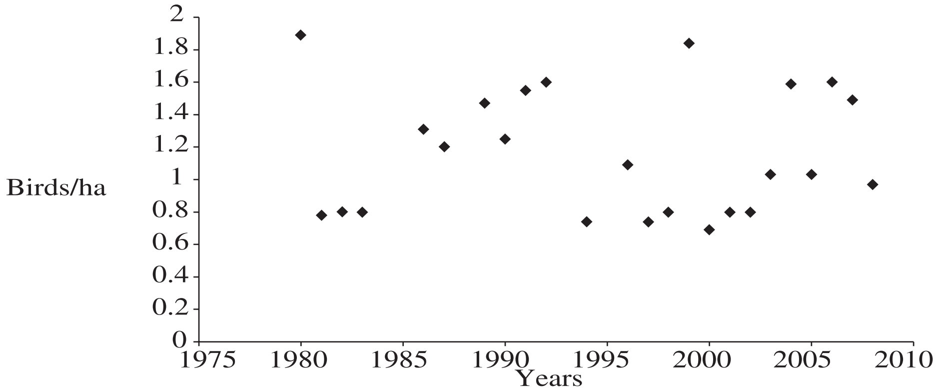

Figure 6. *Estimates of the density (◆) of White-browed Scrubwren at Eyre Bird Observatory from 1980 to 2008 based on mapping censuses.*

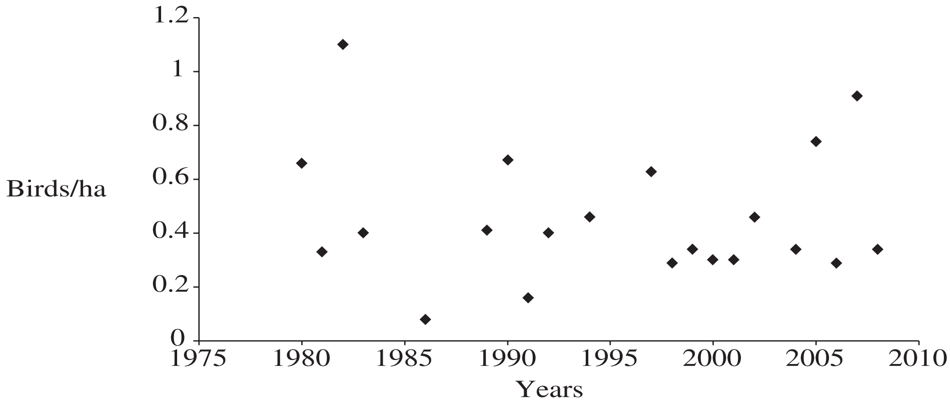

Figure 7. *Estimates of the density (◆) of the Inland Thornbill at Eyre Bird Observatory from 1980 to 2008 based on mapping censuses.*

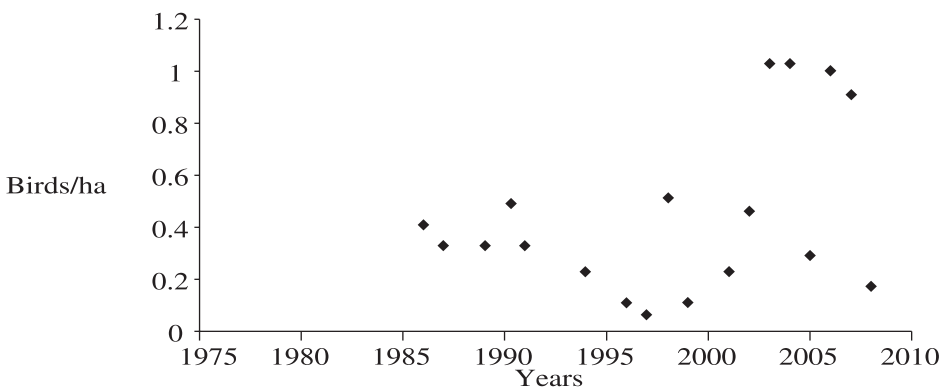

Figure 8. *Estimates of the density (◆) of the Weebill at Eyre Bird Observatory from 1985 to 2008 based on mapping censuses.*

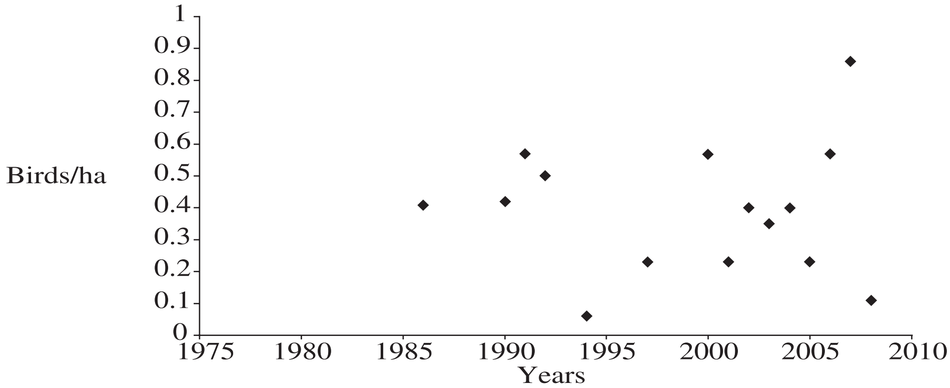

Figure 9. *Estimates of the density (◆) of the Spotted (Yellow-rumped) Pardalote at Eyre Bird Observatory from 1985 to 2008 based on mapping censuses*

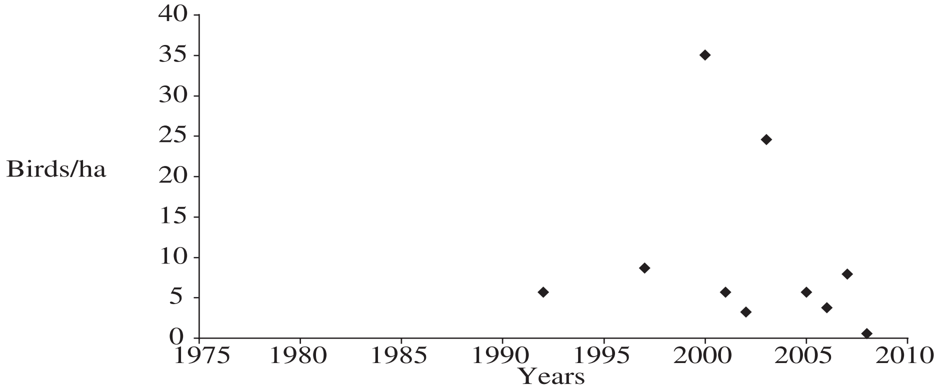

Figure 10. *Estimates of the density (◆) of New Holland Honeyeaters at Eyre Bird Observatory from 1991 to 2008 based on point count censuses.*

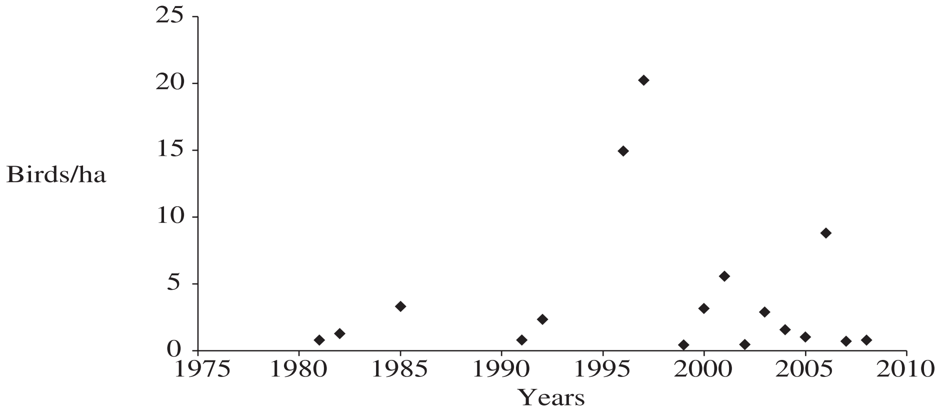

Figure 11. *Figure 11. Estimates of the density (◆) of the Singing Honeyeater at Eyre Bird Observatory from 1980 to 2008 based on point count censuses.*

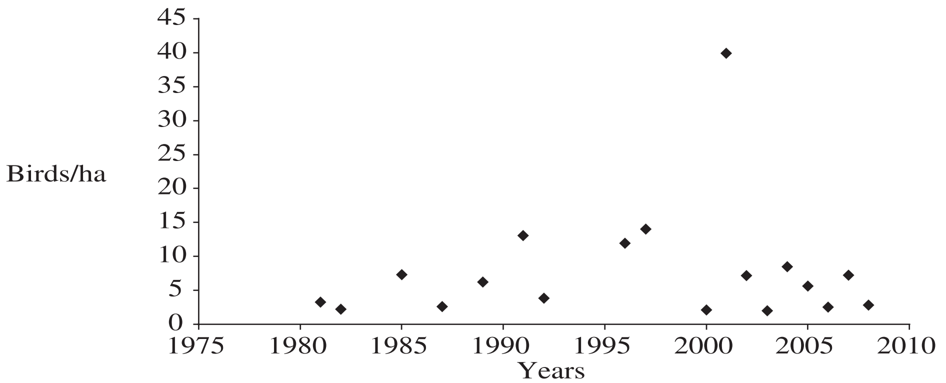

Figure 12. *Estimates of the density (◆) of the Silvereye at Eyre Bird Observatory from 1980 to 2008 based on point count censuses.*

DISCUSSION

The results for four of the resident, territorial birds show oscillations within a band of densities. Some years are good for the species and others are bad, but there are no indications of trends either up or down for the Grey Shrike-thrush *Colluricincla harmonica*, White-browed Babbler *Pomatostomus superciliosus*, White-browed Scrubwren *Sericornis frontalis* or Inland Thornbill *Acanthiza apicalis*. The Weebill *Smicrornis brevirostris* was recorded rarely in the grid area until 1985. Prior to 1985 numbers were so low that it was unreasonable to calculate its density. Thereafter it was found in low numbers, below 0.5 birds per hectare, until 2002 and subsequent years, when its numbers have been high in some years and very low in others. It will be interesting to see if the apparent increasing trend continues. The Inland Thornbill shows a wider range of oscillations than the other three species, for all but three of the years, remains within the range of 0.2 to 0.7 birds per hectare. The Spotted Pardalote *Pardalotus punctatus*, a territorial species in the breeding season, may have been overlooked before 1985, because since then it has always been present, although its numbers fluctuate more than the other resident, territorial birds. Nevertheless, like the Inland Thornbill, its density is rarely outside the range of 0.2 to 0.6 birds per hectare and shows no trend of increase or decrease.

The Blue-breasted Fairy-wren *Malurus pulcherrimus* appears to have declined steadily since 1988 and to have remained at half its previous density since then. There may be several reasons for this. The species may have declined in real terms. Alternatively, the regrowth around the observatory may have made it less conspicuous and easy to overlook. It is recognised as one of the most secretive of the fairy-wrens. It has, along with the other territorial species, invaded the newly established rehabilitated sand dunes at the EBO, and may find these more attractive than the area within the grid. It is significant that, along with the decline in estimates of density, there has also been a decline, not systematically recorded, in the size of family groups. Groups of 12 birds were seen in the 1980s, but most recently the sizes of groups have been below six birds.

The three mainly nomadic species, New Holland Honeyeater *Phylidonyris novaehollandiae*, Silvereye *Zosterops lateralis* and Singing Honeyeater *Lichenostomus virescens*, show predictable peaks and troughs in abundance. The New Holland Honeyeater was not seen at the EBO between 1977 and 1991, but since then has sometimes been abundant, especially when the eucalypts are flowering well. Two birds banded at Twilight Cove (20 km west of the EBO) were re-trapped at Esperance, a distance of 420 kilometres, showing that this species does move along the south coast. They were particularly abundant at the EBO in 2000 and 2004. There are always Singing Honeyeaters at the EBO, particularly favouring the rehabilitated sand dunes, but at times they are very abundant, either as a result of good breeding conditions or as a result of the arrival of immigrants, 1996 and 2006 were such years. Usually their density is below five birds per hectare. Silvereyes, likewise, are always at the EBO, but sometimes appear plentiful and occasionally, extremely abundant, as in 2001.

The interest in these figures lies in the long-term, consistent methods employed to gather them and their consequent ability to demonstrate trends in numbers. Compared with measures from south-eastern Australia the densities appear low (Blakers *et al.* 1984), but they are from a very natural and long undisturbed area of mallee, illustrating levels of fluctuations in stable populations.

ACKNOWLEDGEMENTS

I am grateful to the many Wardens and Caretakers of Eyre Bird Observatory who have maintained the facility and contributed to the collection of data on which this paper is based. I am especially grateful to the many students who have attended the course, collected, and analysed the data over the years. Michael Bamford and Silver Naumoska were kind enough to read and comment on a draft of the paper.

REFERENCES

Blakers, M., Davies, S. J. J. F. and Reilly, P. N. (1984). 'The Atlas of Australian Birds'. (Melbourne University Press: Melbourne).

Davies, S. (1982). Counting bush birds at Eyre. Eyre Bird Observatory Report, 1979–1981. *RAOU Report No***. 2**: 43–49.

Davies, S., Congreve, D.P. and Congreve, P. (1985). More counts of birds at Eyre. Eyre Bird Observatory Report, 1981–1983. *RAOU Report No*. **9**: 93–108.

Ford, H. A., Barrett, G. B., Saunders, D. A. and Recher, H. F. (2001). Why have birds in the woodlands of southern Australia declined? *Biological Conservation* **97**: 71–88.

Freeman, S. N., Noble, D. G., Newson, S. E. and Baillie, S. R. (2007). Modelling population changes using data from different surveys: the Common Bird Census and Breeding Bird Survey. *Bird Study* **54**: 61–72.

International Bird Census Committee. (1970). Recommendations for an international standard for a mapping method in bird census work. *Bird Study* **16**: 248–255.

Martindale, J. (1980). Warden's report: 1977–1979. Eyre Bird Observatory Report 1977–1979. *RAOU Report No.* **1**: 4–40.

Olsen, P, Weston, M, Tzaros, C. and Silcocks, A. (2005). The state of Australia's birds 2005 – Woodlands and birds. Supplement to *Wingspan* **15**: 2–32.

Ramsay, F. L. and Scott, J. M. (1981). Analysis of bird survey data using a modification of Emlen's method. *Studies in Avian Biology* **6**: 483–487.

Robbins, C. S. (1978). Census techniques for forest birds. In 'Proceedings of the workshop on management of southern forests for non-game birds'. R. M. De Graaf (Ed.). *U.S. Department of Agriculture Forest Service. General Technical Reports S.E.* **14**: 142–163.

Watkins, R. and Watkins, G. (2003). Birds of Eyre Bird Observatory. Eyre Bird Observatory Report 7, 1993–1995. *Birds Australia Report* No. **19**: 15–45.