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VARIATION IN THE CALLS OF MIGRATORY AND SEDENTARY SUBSPECIES OF SILVEREYE

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Variation in the three contact calls of the Silvereyes in the Brisbane region were compared to those of a sedentary subspecies in the Capricorn-Bunker group of islands in the Great Barrier Reef. Brisbane males within a flock or holding territories in the same area used the same variable call, whereas the Capricorn subspecies call showed no individual consistency. This difference between the subspecies was discussed in relation to their ranging behaviour.

INTRODUCTION

Bruce and Kikkawa (1988) described three types of contact calls used by the Silvereyes found on the islands of the Capricorn-Bunker group, *Zosterops lateralis chlorocephala* (which will be called Capricorn Silvereyes in this paper) and Silvereyes in the Brisbane region *Z. l. familiaris*. These were two loud contact calls, the variable call (VC) and the linear call (LC), and one softer call, the short call (SC). The VC was used exclusively by the males, whilst the other two calls were used by both sexes. Each of these call types exhibited a large amount of variation in frequency structure.

Pizzey (1980) stated that parties and flocks of Silvereyes 'show remarkable cohesion; banded members of the same party have been retrapped together several years apart'. The precise migratory patterns of the eastern mainland population of Silvereyes remains uncertain, although there seem to be two discrete breeding populations, one migratory and the other sedentary (Mees 1974; Rooke 1984). The Capricorn Silvereyes are restricted to the islands of the Capricorn-Bunker group. The various contact calls may play an important role in flock cohesion or mate recognition in both these subspecies.

Robertson (1990) investigated the three contact call types for both Capricorn Silvereyes and Silvereyes trapped around Brisbane and found more variation between individuals than within individuals. This was particularly noticeable for the VC. In a Canonical Discriminant Analysis, all individuals had quite distinctive VC's, but the Capricorn Silvereyes' VC clumped together. The number of peaks in frequency, or modulations, was the major factor separating the individuals, followed by the time to the last peak and the starting frequency. There was some individual distinctiveness for the LC based on the frequency at one-half and one-quarter through the call and the ending frequency, but Capricorn and Brisbane Silvereyes were not separated. There was only a little individual distinctiveness in the SC, based on frequency through the call. Playback experiments appeared to support the hypothesis of mate recognition via each of the three calls.

This paper investigates the variation in the call types further, comparing the sedentary Capricorn Silvereye calls with those potentially migratory Silvereyes in the Brisbane region. More calls used by Silvereyes in courtship, alarm and agonistic behaviour are described.

METHODS

Calls were recorded from Silvereyes on Heron Island (23°26′S, 151°57′E) during June 1985, July 1987 and October 1987. The identity, sex and age of most Silvereyes were known from the records of the long-term study undertaken at Heron Island (Kikkawa 1980, 1987). Birds were trapped or mist netted and, after holding them in cages for around 30 minutes, they were released into the same area they were captured. Calls were recorded from birds held temporarily in cages (C), released from the hand (R), in the field with no capture involved (F), at feeding stations where fruit had been placed (S) and in aviaries (A).

Recordings were taken from Silvereyes from four localities within Brisbane. Twelve Silvereyes (eight females and four males) were trapped in Everton Hills (27°23′S, 152°58′E) in April 1985 and kept for six months in an aviary, and 12 Kangaroo Point (27°28′S, 153°2′E) Silvereyes (seven females and five males) were collected in June 1986 and kept in cages for 12 days (Bruce and Kikkawa 1988). Calls from all these birds were recorded throughout their captivity. Silvereyes were recorded in the field at Annerley (27°31′S, 153°1′E) in April 1989 and five male birds were trapped in May and October 1989 and placed in separate cages within an aviary. Similarly, birds were recorded in the field at Indooroopilly (27°30′S, 152°58′E) in July and August 1989, and January 1990, and seven birds (four females and three males) were trapped during July and August 1989 and placed in the same aviary. Calls of the birds in this aviary were recorded throughout August to November 1989.

At least three VC's were recorded from each Brisbane individual in the field and captivity. Most of the birds from Everton Hills had over 20 calls recorded during their six months captivity. One bird was recorded 37 times. Kangaroo Point birds were recorded between four to ten times during their 12 days in captivity.

Recordings were made with a Dan Gibson Electronic Parabolic Microphone and a Sony TC-D5 Pro cassette recorder. Sonagrams were produced with a Kay Elemetric Sonograph 6061B using FL-1 and narrow band selectors.

RESULTS

The details of age, sex and date recorded of each Capricorn Silvereye mentioned in the figures are given in Table 1. Notice that calls of juveniles, most here being around six months old, did not differ in general structure from those of adults.

Variable call

Figure 1 shows several samples of the VC of Capricorn Silvereyes, each new number referring to a different individual, and each letter, to a different context as outlined previously. Although the birds had a tendency to repeat a structurally similar call within a bout of calling, on different occasions the calls appeared quite dissimilar. The call structure was not related to the broad context categories listed.

TABLE 1

Details of the birds recorded for Figures 1, 2, 5 and 6. Bird = colour band coded number, date = date call recorded month/year, age = bird's age in years when recorded (J = juvenile), sex = m (male) and f (female).

Fig.	No.	Bird	Date	Age	Sex
1 VC	1	570	7/87	6	m
	2	660	6/85	4	m
			7/87	6	m
	3	850	6/85	3	m
	4	3524	6/85	1	m
			6/85	1	m
			7/87	3	m
	5	4340	5/85	J	m
	6	4438	5/85	J	m
			7/87	2	m
	7	4458	6/85	J	m
	8	4933	7/87	1	m
	9	5105	7/87	J	m
2 VC	1	4387	6/85	J	m
	2	4388	6/85	J	m
	3	5179	7/87	J	m
	4	5180	7/87	J	m
	5	5193	7/87	J	m
	6	5194	7/87	J	m
	7	1510	7/87	8	m
	8	5105	7/87	J	m
	9	570	7/87	6	m
	10	5275	7/87	J	m
	11	3637	7/87	3	m
	12	5249	7/87	J	m
5 LC	1	850	6/85	3	m
	2	660	6/85	4	m
	3	3510	6/85	1	f
	4	5104	7/87	J	?
	5	5304	7/87	J	f
	6	5194	7/87	J	m
	7	5193	10/87	J	m
	8	3788	6/85	1	f
6 SC	1	822	10/87	5	m
	2	3663	7/87	3	m
	3	5412	7/87	J	m
	4	660	7/87	6	m
	5	3514	6/85	1	m
	6	4427	6/85	J	m
	7	4397	6/85	J	f
	8	3474	6/85	1	m
	9	4256	6/85	J	m
	10	4469	6/85	J	f

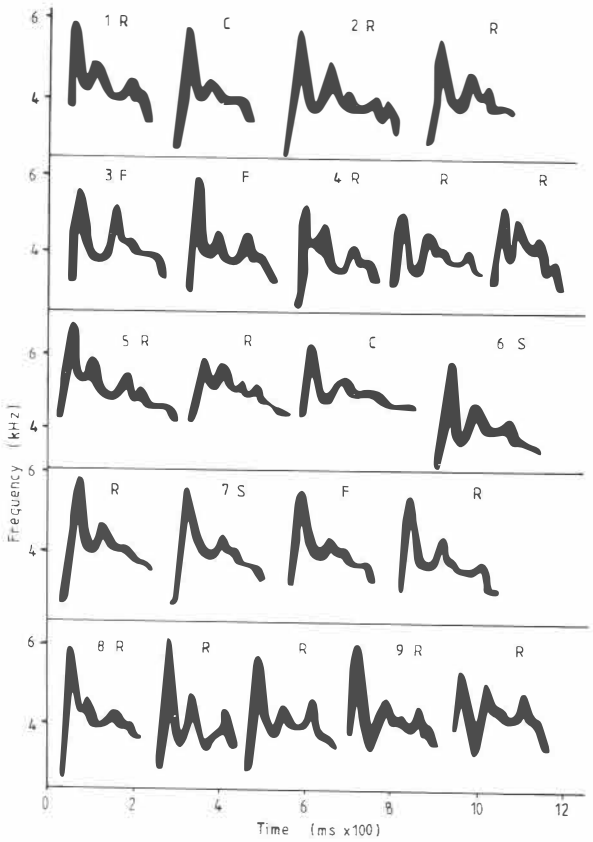

Figure 1. *Variable calls (VC) of nine Capricorn Silvereyes. A new number indicates a new individual, and the letters indicate recording context (R = on release, C = in cage, F = in field, A = in aviary and S = feeding station). Table 1 gives more details.*

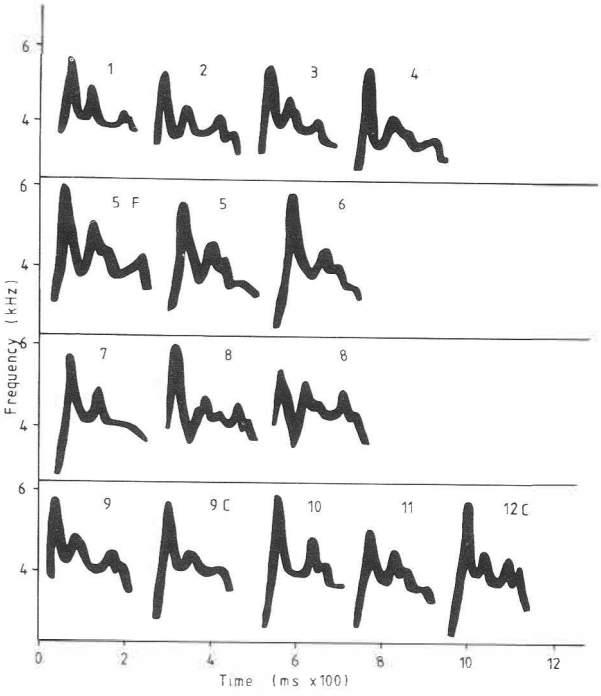

Figure 2. *Variable calls of Capricorn Silvereye siblings and father and son pairs. Details are given in the text and Table 1. All are from birds released from capture except as indicated (F = in field, C = in cage). VC number 12 was identical in two contexts — on release and in the cage (shown).*

Figure 2 compares the structure of the VC between pairs of first-year siblings, and between first year birds and their fathers. The sibling pairs (1 and 2, 3 and 4, 5 and 6) produced a very similar VC. However, number 8 is also a first year bird, who appears to have acquired a repertoire of at least two VC's already and it is not known if siblings share all their VC's. The father-son pairs (7 and 8, 9 and 10, 11 and 12), all recorded in the sons' first year of life, did not produce similar VC's.

For the Brisbane Silvereyes, birds of the same flock tended to share a very similar variable call. The nine males from Everton Hills used structurally the same VC throughout their six months in captivity (Fig. 3). It consisted of a major frequency modulation with one or two small deflections after it, and a smaller second and third modulation, also with deflections. Often a fourth frequency modulation was added.

The birds from Kangaroo Point (Table 2 and Fig. 3) were caught as a flock and two pairs. Note that the two males which were captured within the same flock had a very similar VC, consisting of three frequency modulations of similar height. The VC's of the other two birds caught in separate pairs were individually distinctive.

TABLE 2

Circumstances of capture of Silvereyes from Kangaroo Point on June 14, 1985. The individuals W, U1, U2 and M came from a flock of 10 Silvereyes caught in the net at one time. VC's from the four males are shown in Figure 1. Sex was determined by gonadal examination.

Bird	Time	Sex	Calls recorded
R	0630	m	VC,LC
Y	"	f	LC
B	0842	m	VC
G	"	f	LC,SC
W	0830	m	VC,LC
U1	"	f	LC,SC
U2	"	m	VC,LC
M	"	f	—

The group of calls in Figure 3 from Indooroopilly had a characteristic large first frequency modulation, followed by a second smaller modulation with a deflection, a short flattened segment and then another small modulation. This third modulation was sometimes omitted. The last VC in the Indooroopilly section in Figure 3 was a bird captured at Indooroopilly which displayed migratory restlessness (Ken Chan, pers. comm.), and whose VC varied dramatically from those in the local population.

Annerley calls (Fig. 3) possessed a large first frequency modulation, a second smaller modulation and a third modulation with a deflection. Often a fourth modulation also occurred. Figure 4 shows all the different VC's recorded from the individuals at Annerley in winter and summer. The winter variety of VC's reflects the large number of flocks entering the area, but also shows two typical Annerley VC's, one of which was recorded from a bird singing in the area in April.

Linear call

Figure 5 shows the LC's of eight individuals, both male and female (see Table 1) from Heron Island and eight individuals from the Brisbane region. There was no consistency within individuals (1 and 3), between siblings (6 and 7), or between parents and offspring (2 and 4, 5 and 8) in structure or frequency for the Capricorn Silvereyes. The Brisbane birds, although showing no individual consistency in structure, did show some consistency in the frequency range of the linear part of the call (Table 3).

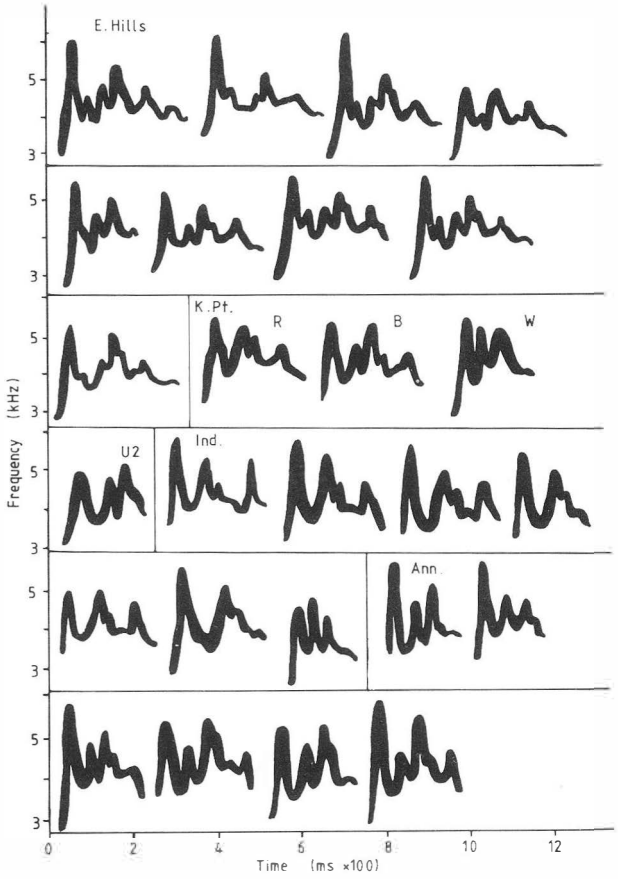

Figure 3. *Sonagrams of VC's from different individuals recorded in captivity and in the field at different localities around Brisbane. E. Hills = Everton Hills, K. Pt. = Kangaroo Point, Ind. = Indooroopilly and Ann. = Annerley.*

Short call

The Capricorn Silvereyes' SC's in Figure 6A had a large amount of variation in structure, although falling into two categories of the M-shape and the broader upside-down U-shape. It did not show any sexual distinctiveness (Table 1) or individual (see number 6) or contextual consistency (compare R, F and C). Brisbane Silvereyes produced SC's similar to the Capricorn Silvereye (Fig. 6B). The SC was used repeatedly between members of a flock or a pair foraging or flying in close proximity. The M structure was used in the flight of the individuals 850, 4343, and 3818, all recorded in 1985, and 822 recorded in 1987.

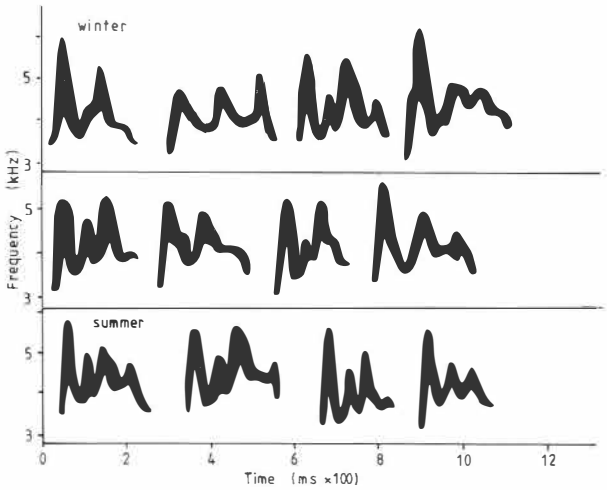

Figure 4. *Sonagrams of VC's of different individuals recorded at Annerley in summer and winter 1989.*

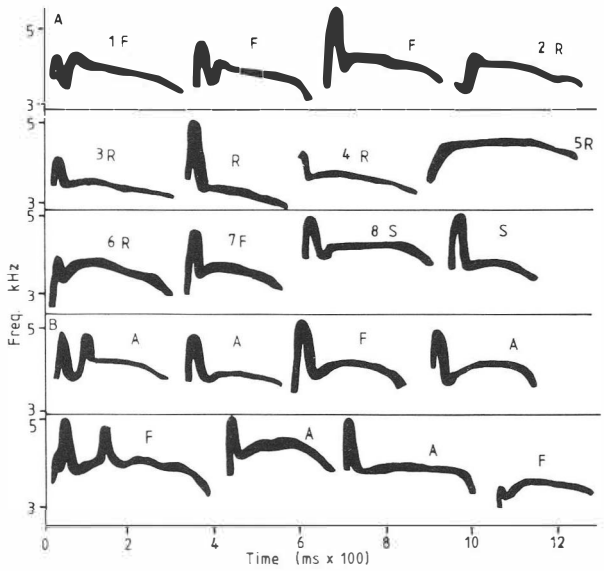

Figure 5. *Linear calls (LC) of different individual Capricorn Silvereyes (A) and Brisbane Silvereyes (B). Different numbers refer to different individuals and contexts are included (see Fig. 1). Further details on Capricorn Silvereyes are given in Table 1.*

TABLE 3

Characteristics of linear calls of Brisbane Silvereyes, listing number of calls recorded, the number of different structures used (one or two frequency peaks before the linear section of the call) and the frequency range of the maximum point of the linear section of the call.

Suburb	Indiv.	Calls	Structure	Freq. range kHz
Annerley	KW	4	1	3.9–4.0
	KY	3	1	3.9–4.1
Kang. Pt	G	4	1	4.2–4.4
	U2	8	1	4.1–4.5
	MG	4	2	4.0–4.0
E. Park	Y	20	1	3.9–4.1
	BY	7	2	4.2–4.3
	DG	12	1	4.1–4.2
	LB	9	2	3.6–3.8

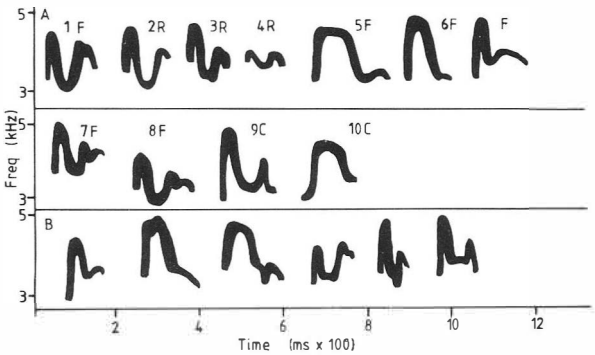

Figure 6. *Short calls (SC) of Capricorn Silvereyes (A) and Brisbane Silvereyes (B). Different numbers refer to different individuals and contexts are included for Capricorn Silvereyes (see Fig. 1). Brisbane calls are all from different individuals recorded in an aviary.*

Other Calls

Courtship (Fig. 7A): Commonly heard near the beginning of the breeding season, this soft call was uttered by the male 1041 on Heron Island when following a female and wing quivering. This was combined with occasional allopreening and picking up nest material.

Alarm call (Fig. 7B and C): This call was commonly heard from Silvereyes in response to a human intruder in their territory. Two formats of this call were recorded. One was the more common three-syllable call shown in Figure 7C, and the other, a call that consisted of the first syllable of the latter call with a sharp increase in frequency at the end (Fig. 7B). The highest amplitude of the call was between 2 and 3 kHz. Both these examples were recorded from the Capricorn subspecies, but was also heard on the mainland.

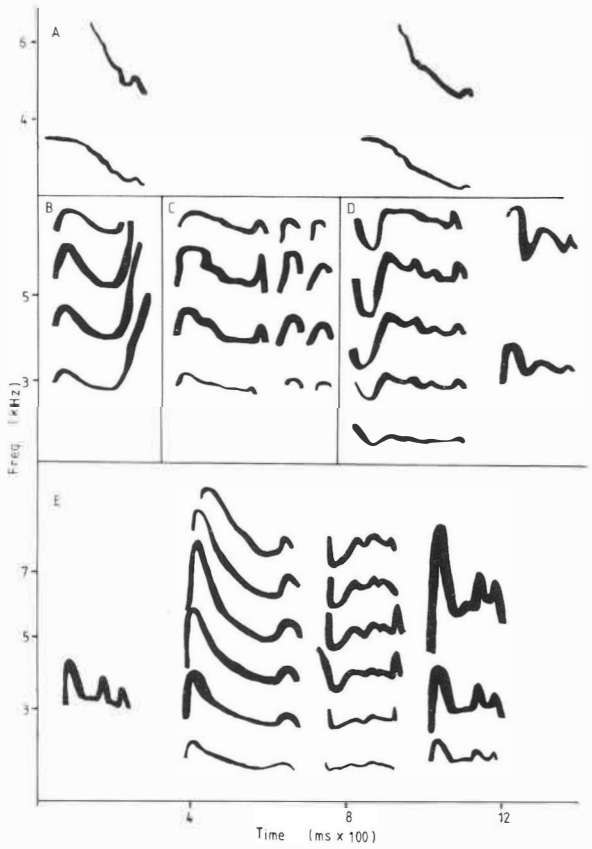

Figure 7. *Four other calls recorded from Capricorn Silvereyes. A = courtship call, B and C = alarm call and D and E = agonistic call.*

Agonistic calls (Fig. 7D and E): This harsh call was often used at feeding stations on Heron Island whilst conspecifics were fighting over food. It was used in association with a loud, single or rapidly repeated SC. Frequency structure of the harsh component differed slightly between calls, but the highest amplitude frequency occurred between 5 and 7 kHz. Usually the repeated SC syllables of the call were of exactly the same structure.

DISCUSSION

The winter ranges of adult Capricorn Silvereyes are centred around their summer breeding territories, where they sometimes form small flocks with one or two neighbouring pairs, and sometimes join large flocks as they forage near their territories. However, even when chasing other birds in site defence, the pairs do not venture more than a mean distance of 23 m from the position of the previous year's nest (Catterall *et al.* 1989). Juveniles have significantly larger ranges than adults (Catterall *et al.* 1989). Jansen (1987) found these flocks to be variable in composition and size over time, and lacking in any age structure or dominance hierarchy.

Capricorn Silvereyes do not migrate but occasionally birds move between islands in the Capricorn group. The need for a contact call for flock cohesion is somewhat reduced, and therefore these calls may only be used in mate recognition (Robertson 1990). The large amount of variation in the structure of all three call types may facilitate individual recognition in the Capricorn Silvereye, and the function of this variation in different contexts needs to be studied further.

On the mainland, Silvereyes are well known migrants, Tasmanian birds ranging as far as south-east Queensland (Mees 1974). The flocks of Silvereyes captured in Brisbane each used a distinctive VC and Silvereyes which held territories in the same area in Brisbane, during summer and winter, also used a distinctive VC. No individual produced more than one structure for their VC. The birds captured in Everton Hills did not structurally alter their VC over a six month period in an aviary. One Silvereye from Annerley was taken in a cage to Indooroopilly and its calls recorded during one morning. Its calls did not vary in structure from the typical Annerley calls. Birds from Annerley and Indooroopilly were caged in the same enclosure but individual males were only recorded using the VC typical of their area.

If the VC of males within a flock are the same, then mate recognition could be mistaken for flock recognition in playback experiments. This would need to be investigated further with playback experiments using VC's of different members of a flock, and members of different flocks. In migratory Silvereyes, the VC may be used for flock cohesion and other calls used for mate recognition. For example, the frequency range of the linear calls is a likely candidate in such recognition. Zann (1984) found such a situation in the distance call of the male Zebra Finch *Poephila guttata*, it possessing large inter-individual differences which facilitated the location of the male by its mate in the large flocks that form in the non-breeding season.

Further investigations of the pattern of VC use in migratory Silvereyes may be useful in providing a means of studying the patterns of migration of the male Silvereye in Australia by the recording and analysis of their VC.

ACKNOWLEDGMENTS

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BOOK REVIEW

Australian Grass Parakeets
S. Sindel and J. Gill. Singil Press, Austral, Australia. 192 pp. $A45.00

This is the third in the planned series of six aviculture specialist books covering the Australian Psittaciformes. This volume covers the genus *Neophema*. The previous two dealt with lorikeets and cockatoos and were reviewed in *Corella* **11**: 132 and **14**: 78 respectively.

Stan Sindel and Jim Gill have drawn from their extraordinary 80-odd years combined avicultural experience to produce another magnificent volume. It follows the successful format of its predecessors with chapters which discuss the housing, diets and management of birds. The chapter on diseases was written by Jim, who not only obviously possesses vast knowledge of aviculture but is also widely acclaimed as one of the most knowledgeable avian vets in the country. A chapter is also devoted to each of the seven species. These species profiles provide information on such subjects as classification, earliest reports, range, habitat and field notes, breeding in the wild, avicultural history, sexing, display, nesting requirements, incubation and development of the young and a lot of information on all known aviary mutations. The species accounts also include distribution maps and numerous colour photographs which illustrate mature birds, developing nestlings and various mutations.

In drawing from their immense personal experience and those of many other eminent aviculturists, the authors have produced another fine reference book which should be a 'must' for anyone who keeps or intends to keep and breed the species involved. Both of the earlier books in this series have become standard avicultural reference works and no doubt the new book will achieve the same high status. I am also sure, however, that the book will prove to be of considerable interest to those who simply seek to improve their knowledge, but do not keep aviary birds.

This is a limited edition book which is not available in bookshops. It can be purchased through aviculture societies or direct from the publisher Singil Press, P.O. Box 9, Austral, NSW 2171.

J. W. Hardy
Ermington, NSW