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The Migration of the Tasmanian Race of the Silvereye

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In a recent contribution to this journal, Lane (1972a) reviewed results hitherto achieved through the Co-operative Silvereye Project, and posed a number of questions for future study. The purpose of this paper is to add a few more questions, and to modify some of those listed by Lane.

This paper is little more than a summary of a more extensive discussion of migration and the factors related to it published some years ago (Mees 1969). As this earlier paper is unlikely to be available to many banders in Australia, it may therefore be useful to present here a concise review of it.

It is now generally known that *Zosterops lateralis lateralis* (Latham), the Tasmanian subspecies of the Silvereye, is a partial migrant. Large numbers cross Bass Strait each autumn to spend the winter in south-east Australia where its winter range is known to extend from Adelaide in South Australia, in a half-moon pattern along the coastal regions to as far north as Brisbane and Moreton Bay in Queensland. Near Sydney, Tasmanian birds may constitute 60 per cent or more of the total winter population of the species (Lane 1972b); this dwindles to about five per cent in the extreme north-east of New South Wales (Liddy 1966) and in south-eastern Queensland (Robertson 1971). On the other hand, a large proportion of the population remains in Tasmania throughout the year.

The phenomenon of partial migration is by no means unique to *Z. l. lateralis* but is known to occur in a variety of species in different continents; indeed, it cannot be separated clearly from irregular migration, leading to "invasions", such as are known particularly well from species living in the colder parts of the Old World. In order not to expand this note too greatly, I shall confine myself to a discussion of the annual partial migration as shown by *Z. l. lateralis* although it will be necessary to mention a few matters of a more general nature.

There is no reason to assume that the factors which cause a partial migrant to migrate, differ essentially from the factors which limit "ordinary" migration of the whole population of a certain area. The main question that arises in the study of partial migrants as opposed to sedentary or wholly migratory populations is obviously: why do certain individuals of what appears to be a single population, react differently to presumably identical external (environmental) conditions? Theoretically, a number of different answers can be given. I shall list these and then discuss the arguments for and against each one: (1) young birds migrate, old birds remain sedentary; (2) one sex is migratory, the other sedentary; (3) there are genetical differences (other than sexual) between the birds so that some are disposed to migrate, others not. Reasoning on, one could even divide this possibility as follows: either the instinct (whatever that is) to migrate is present in a variable amount in all birds, causing, under a given set of circumstances, certain birds to migrate a great distance, others a small distance, and still others not at all, or there are two different populations genetically distinct, one migratory, the other sedentary, and (4) there are no genetical differences but whether a bird migrates or not depends on a number of external

for age and sex a series of resident individuals (say 100 birds) in mid-winter in Tasmania, and a similar series of Tasmanian migrants in their Australian winter-quarters, preferably near the northern end of the winter-range where numerical differences between age and sex-groups would be most pronounced.

- Is there any indication that in some years a larger proportion of the Tasmanian population winters in Tasmania than in others, and can this be correlated with population density (= breeding success in the preceding season), weather, and food conditions?

- Are there Tasmanian birds that are sedentary throughout their lives, in other words that can be proved never to migrate?

- Are birds ready to migrate heavier (do they have more fat) than birds that stay behind? Personally I would expect all birds to come in *Zugdisposition* (prepare for the journey), and that finally the external stimuli decide how many actually migrate.

On the other hand, one of the questions posed by Lane, and here discussed under point 3, can be dismissed as it has already been answered. Lane (1972a: 4) has developed a hypothesis that: "there appeared to be two breeding populations of silvereyes in at least some areas of eastern Australia, one of which was sedentary and one which migrated", and expressed this in the following question for future research: "Is there any plumage variation distinguishing sedentary and migratory birds which breed in the same area?" Although Lane does not say so explicitly, the inference is inevitably that he assumes the co-existence of two different species of the *Zosterops lateralis* group in parts of south-eastern Australia, distingushed by migratory behaviour and possibly (to be investigated) by morphological characters as well. As mentioned previously, the available banding results disprove Lane's hypothesis (for the Tasmanian race).

Several banders appear to be a bit vague about the geographical variation known to exist in eastern Australian races of *Z. lateralis* and the nomenclature to be applied to them. They prefer, for example, to call Tasmanian birds which are distinguished by a pale throat and deep tawny flanks "Tasmanian type". Nevertheless, in this case trinomials may be used to advantage. The main geographical variation was described by Keast (1958); subsequently a few corrections mainly in nomenclature to be applied, were made by me. In this connection the Tasmanian race, which Lane (1972b) still referred to as *Zosterops lateralis tasmanica,* is actually the nominate race and should therefore be known as *Zosterops lateralis lateralis* (cf. Mees 1969: 30).

On purpose I have limited this discussion to the Tasmanian race. Birds inhabiting the Australian mainland present similar problems. There is much evidence that there also, populations are partly migratory. Recently Kikkawa (1970) provided proof that mainland birds overwinter on the Capricorn Islands, Queensland. However, when a bird is either banded or recovered in Tasmania, its provenance is certain, it can only be a Tasmanian breeding-bird. But when a bird is banded and recovered anywhere on the Australian mainland, it might still be a passage migrant from Tasmania, unless it was found breeding. Hitherto very few nestlings and birds attending nests have been banded, a deficiency to which Gwynn (1962) and Lane (1972a) have rightly drawn attention. This makes mainland data much more difficult to analyse.

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TABLE 1

Recoveries of Tasmanian birds

Band Number	Circumstances	Date	Locality	Distance and Direction
010-06887	banded	20. 6.59	Lane Cove, Sydney NSW	
	retrapped	7. 7.59	Lane Cove, Sydney NSW	
	retrapped	30. 7.59	Lane Cove, Sydney NSW	
	retrapped	5. 8.59	Lane Cove, Sydney NSW	
	retrapped	21. 8.59	Lane Cove, Sydney NSW	
	killed by cat	19. 1.60	Rosevears, Tas.	920 km SW
010-34267	banded	9. 7.61	Cartwright Point, Hobart, Tas.	
	retrapped	9. 8.62	Eastwood, Sydney, NSW	1080 km NNE
010-09570	banded	17. 8.61	Launceston, Tas.	
	retrapped	18. 8.62	Eastwood, Sydney, NSW	920 km NNE
010-10425	banded	2. 8.59	North Ryde, Sydney, NSW	
	retrapped	26. 5.62	North Ryde, Sydney, NSW	
	found dead	12.11.62	Rosebery, Tas.	1030 km SSW
010-67681	banded	31. 3.63	Riverside, Tas.	
	retrapped	10. 8.63	Turramurra, Sydney, NSW	920 km NNE
010-43261	banded	16. 6.63	Sutherland, Sydney, NSW	
	retrapped	17. 6.64	Exeter, Tas.	900 km SSW
010-78709	banded	20. 5.64	Pendle Hill, Sydney, NSW	
	retrapped	22. 5.64	Pendle Hill, Sydney, NSW	
	retrapped	4. 6.64	Pendle Hill, Sydney, NSW	
	found dead	c.25.11.64	St Marys, Tas.	900 km SSW
010-12230	banded	8. 7.63	Launceston, Tas.	
	recovered	10. 9.65	Uralla, NSW	1290 km NNE
011-13608	banded	3. 7.65	Hastings Point, NSW	
	recovered	14. 5.66	Don near Davenport, Tas.	1600 km SSW

We may assume that for the partial migrant *Z. l. lateralis* to migrate, the following conditions must be fulfilled: it must be in the right physiological condition, and there must be certain external stimuli. Here again, one could think of genetical factors to explain individual differences, but it is also possible that the necessary physiological condition (*Zugdisposition* of German literature) may be influenced by non-genetical factors which vary from year to year, such as availability of food, and whether or not the bird has successfully bred or has been feeding young late in the season. Thus, there may be both genetical and non-genetical variation. On this presumed great physiological variation, external factors which are also variable, work and cause a part of the population to migrate. A conspicuous and measurable physiological change taking place in birds ready to migrate, is the accumulation of fat (fuel for the journey).

External factors which may be assumed to influence migration are meteorological factors (day-length, temperature, etc.), quantity of available food, and population density (a discussion of these factors, with references to relevant literature may be found in my previous paper, Mees 1969: 354).

On the basis of the preceding considerations, the following questions can be added to Lane's list:

- Is there a difference in proportions between adult and juvenile birds wintering in Tasmania and those wintering on the Australian mainland?
- Is there a difference in proportions between the sexes of birds wintering in Tasmania and those wintering on the Australian mainland?

Although it has already been shown that they cannot account for the whole answer, it would stil be interesting to know whether there is any difference in migratory behaviour between age and sex-groups. To answer these questions, all that is necessary would be to catch and examine

and internal factors which may vary from year to year.

The remarkable amount of new data accumulated over the past years as a result of the massive banding program makes it possible to eliminate some of these points and to support others. It should be realized that none of the assumed factors would necessarily exclude any or all of the others, and that very likely a combination of them has its influence.

• 1. It is generally known that in many birds, especially strongly territorial species, the old birds are sedentary whereas the young of the year which have not yet established a territory, migrate. It is very possible that in *Z. l. lateralis* also, juveniles are more inclined to migrate, as was suggested by Keast (1958), but this is certainly not the whole answer to the problem, as banding results show that birds migrate when several years of age (e.g. nos. 010-34267, 010-09570, 010-10425, 010-12230). Lane (1962) found some Tasmanian birds in four consecutive years at North Ryde (Sydney). Also of a total of nine recoveries of Tasmanian birds (Table 1), four were certainly older than one year; nothing can be said of the age of the other five. This proves convincingly that old birds constitute a large proportion of the migrants, and hence age can play but a minor role (if any) as a factor deciding whether a bird migrates or not.

• 2. In several Northern Hemisphere species, females are known to be more strongly migratory than males; this results in partly segregated winter quarters for the sexes or, more often, in shifts in their proportional numbers, females predominating near the southern limits of the winter quarters, males near the northern. As the sexes of *Z. l. lateralis* cannot be separated on plumage characters (cf. McKean 1965 and Mees 1969: 335; contra Kikkawa 1963), sexing in the field, is impractical and has not been done on any reasonably large scale. Of museum specimens of definite migrants (specimens of *Z. l. lateralis* collected on the Australian mainland) examined by me, 18 were sexed as males, 5 as females. From sad experience I know that sexing of museum material is often unreliable, nevertheless it looks as if both sexes migrate, and there is certainly no predominance of females over males in the figures above.

• 3. This point would imply that, whereas there could be a great difference in migratory behaviour between individuals, each individual would have a more or less constant migratory behaviour. Banding results prove that the hypothesis of genetical differences alone is not sufficient, although of course they may an influence. No. 010-34267 was banded in southern Tasmania in mid-winter, yet the next winter it was in Sydney; no. 010-09570 was banded in winter in Tasmania, and was retrapped a year later on almost the same date in Sydney; the same is true for no. 010-12230, although there is not such a striking closeness in the dates; finally no. 010-43261 was banded in winter in Sutherland (Sydney) and recovered in Tasmania on almost the same date a year later. These recoveries demonstrate convincingly that one and the same individual may spend one winter in Tasmania, yet the next winter it may migrate as far as Sydney, or the other way around.

An interesting facet of partial migration already observed by Lack (1943-1944: 146), is that in certain species of European songbirds, individuals do either migrate a long distance, or not at all. There is evidence that the same holds true for *Z. l. lateralis*: a bird will either migrate to its previous winter quarter, or stay in Tasmania; it will not, under varying outside stimuli, migrate one year to Sydney, the next to Brisbane, and the third year only as far as Gippsland (Victoria).

• 4. Now that the three other factors have been shown to be at the most of subsidiary importance, those mentioned under the fourth point remain as the major ones. They are also the most diverse, the most complicated, and hence the most difficult to analyse.

In a very simplified manner they may be put as follows. It is now generally accepted that the finer physiological processes taking place in birds, in particular periodic processes like moult, reproduction and migration, are ruled by hormones. It is also known that of the glands of internal secretion, producing hormones, the pituitary gland or hypophysis takes a special position in that its hormones have the function of stimulating and co-ordinating the hormone-production of the other glands.

As these periodic processes can, to a certain extent, be influenced by manipulating external factors like temperature and day-length, it is evident that these factors must in some way be registered and the information passed on to the hypophysis.