

A COMMENT ON THE RELATIONSHIPS BETWEEN MINERS *MANORINA* SPP IN SOUTH AUSTRALIA

The Black-eared, Yellow-throated and Noisy Miners *Manorina melanotis*, *M. flavigula* and *M. melanocephala* are generally regarded as three species (Schodde 1975). The first two (*melanotis* and *flavigula*) are very similar in appearance and hybridization has been recorded between *flavigula* and *melanocephala* (Dow 1972). They are probably a group of species that has only recently diverged and still retains, perhaps in equilibrium, a high degree of variation.

PROBABLE HYBRIDIZATION BETWEEN NOISY AND YELLOW-THROATED MINERS

On 25 October 1975 I saw a group of miners at Caringa Farm near Dublin about sixty kilometres north of Adelaide. One bird looked like a typical Yellow-throated Miner whereas the second was like a typical Noisy Miner. The third bird looked like a Noisy Miner when at rest except that it had a paler crown and forehead and obvious yellow at the side of the throat. When it flew, however, it had a pale rump like a Yellow-throated. There was a juvenile with these three adults, which looked like a Noisy and was being fed by the second bird. All four birds seemed to be together as a group and congregated close to each other when one of the adult birds called.

The most acceptable explanation is that the third bird was a hybrid between *flavigula* and *melanocephala*. Dow (1972) saw three hybrids near Meandarra, Qld, one of which he caught. The appearance of my third bird was very similar to Dow's description of his hybrids. Yellow-throated Miners occur in the Adelaide Plains from Salisbury northwards (although they are uncommon in the southern part) and extensively in the Murray Mallee. Noisy Miners occur mostly in the Mt Lofty Ranges and along the River Murray, with a few records from the Adelaide Plains. The Yellow-throated was recorded in eighty blocks, the Noisy in 136 and both in thirty-five in the Bird Atlas of the Adelaide Region (S. Aust. orn. Ass. 1977). There is thus scope for hybridization yet this would be the first recorded case in South Australia and only the second recorded in Australia. Hybridization between Yellow-throated and Noisy Miners appears to be the exception rather than the rule although the two species often occur together. This suggests they usually behave as 'good'

species. Possibly the tight social structure of miners (Dow 1977, 1978), which permits little interchange between neighbouring colonies, helps to keep the species apart. In addition, they may occupy different habitats in the areas of overlap. It is not known whether the hybrids are sterile; if they are, it would provide an explanation for the lack of a distinct hybrid zone. Short (1969) considers that occasional hybrids with no hybrid zone are not a good reason for lumping species.

YELLOW-THROATED AND BLACK-EARED MINERS

A miner was caught at Braendlers Scrub (near Monarto, 35° 10' C, 139° 10' E, 70 km ESE of Adelaide) on 17 June 1975 that was in all respects like a Yellow-throated (*flavigula*) except that it had a grey rump and consequently was considered to be a Black-eared Miner (*melanotis*). However, when it was released I saw that in the field the rump was noticeably paler than the back. Three similar birds were caught at the same place on 21 October 1975 and I took more notice of their plumage. All three had some yellow on the forehead and throat; two had grey rumps with white edges to the feathers, making the rump paler than the back; the third had grey rump of similar colour to the back. Two birds had the last two to three millimetres of the tail white; the third had a hint of a white tip but the tail was very worn. It is doubtful if the white tip would have been visible in the field in any of these birds.

Black-eared and Yellow-throated Miners are undoubtedly hard to distinguish in the field but most bird-watchers consider that the colour of the rump is diagnostic (see Dow 1972; Slater 1975). Glover (1975) criticizes Slater (1975) for giving the Black-eared Miner a white tip to its tail; so this character could perhaps also be used for separating the species. Also, as the name suggests, the Yellow-throated has more yellow on the throat and forehead. Black-eared has no yellow or only a trace.

The intermediate birds at Braendler's Scrub could either have been hybrids or possibly the distinction between Yellow-throated and Black-eared Miners is not as clear-cut as most ornithologists believe. I examined thirty-nine specimens of miners at the South Australian Museum and

scored the rump, throat, tail and back, according to Table 1. There was at least one bird with each score for each character, except that no miners had pure-white rumps.

TABLE 1

Characters and scores used to determine a hybrid index for Yellow-throated and Black-eared Miners in SAM.

Character	0	1	2	3	4	5
Rump	All white	increasingly grey				All grey
Forehead/throat	Much yellow	No yellow				
Back	Pale grey	dark grey				
White tip of tail (mm)	11+	6-10	1-5	None		

The number of individuals with each score for each character and with each total score is shown in Figure 1. Although there appears to be a bimodality for each character it is also apparent that each is continuously variable so that no character alone clearly separates Yellow-throated and Black-eared Miners. There is a gap, however, in the distribution of total score, because the characters are correlated (yellow throat with pale rump, etc.) so that the two forms could be separated on a series of characters.

Most of the birds scoring two or three were from inland or northern Australia though three were from Port Prime (34° 31' S, 138° 20' E), Blanchetown (Murray Mallee) and Pungonda (34° 28' S, 140° 52' E, upper S-E). Although none of these birds had pure-white rumps, they would all have been readily identified as Yellow-throated Miners. Those scoring four to six were from inland Australia south to Taplan (34° 40' S, 140° 50' E, near Vict. border) and Mildura (Victoria). Several of these birds had grey rumps, which were nevertheless paler than their backs. They would probably all have been identified as Yellow-throated in the field. Birds scoring eleven or twelve were all from the upper South-East of South Australia (mostly near Karoonda) or north-western Victoria. All had

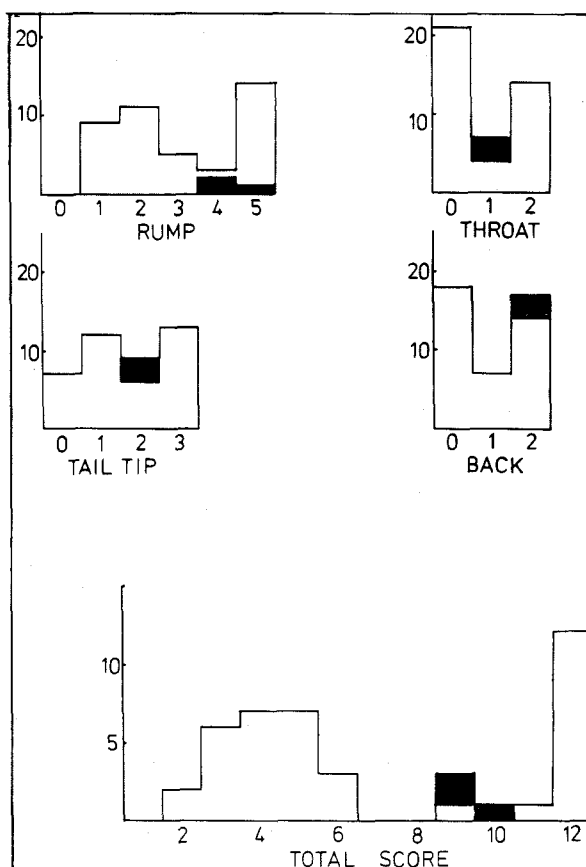


Figure 1. Number of individuals miners with each score for each character and for each total score. Birds from Braendler's Scrub in black, all others at SAM.

dark-grey rumps and backs and only a trace of yellow on the throat. One (from Panitya, Vict., 35° 10' S, 141° E) had a white tip to the tail (5 mm) but the rest had only faintly paler grey tips to the tail. The four birds scoring nine or ten were the three from Braendler's Scrub and one from Manya, Vict. (35° 10' S, 141° E), which looked very like the Braendler's birds, except that it had a large white tip to the tail (7 mm). Darker birds (score 9-12) had significantly longer beaks ($22.61 \text{ mm} \pm 0.84$, $n = 14$) than paler birds (score 2-6) ($21.86 \text{ mm} \pm 1.40$, $n = 25$) ($p < 0.05$). Darker birds also had shorter wings but this was not significant ($121.47 \text{ mm} \pm 5.15$, $n = 17$ and $123.76 \text{ mm} \pm 6.07$, $n = 25$; $p = 0.1-0.2$).

Thus when only a single character is considered at a time, there is no clear-cut separation

into two types. The usually suggested characters, colours of rump and tip of tail are insufficient alone. Only when four characters are considered and examined closely can two distinct groups of miners be discerned, each of which is highly variable. These characters are all difficult ones to assess in the field. The shade of the back and rump depend on the light, birds moving through sun and shade appear to have lighter, then darker rumps. The yellow throat and tip of the tail depend on good views being obtained.

I conclude that plumage provides poor cues to use in identifying Yellow-throated and Black-eared Miners. There may be consistent differences in calls or other aspects of behaviour that would separate the two forms.

The general pattern of loss of grey and increase of yellow in miners northwards in Australia is paralleled by clines shown in other honey-eaters such as Singing and White-plumed *Lichenostomus virescens*, *L. penicillatus* (Condon 1968). The cline in the miners (*flavigula* and *melanotis*) appears to be rather abrupt near the River Murray although light and dark forms occur together south and east of the Murray.

Information at present is insufficient to decide whether the complex consists of a single species or of two good species.

Taxonomic uncertainty over the status of these miners is not new. Ashby (1922) believed that the Dusky Miner *M. obscura* in south-western Australia was a separate species from the Yellow-throated and maybe conspecific with the Black-eared in the east. Condon (1951) reduced the Dusky to a subspecies of the Yellow-throated but retained the specific identity of the Black-eared. Serventy (1953) found that the Yellow-throated and Black-eared behaved as good species at Hattah Lakes, Victoria. However miner colonies could be inbred with little gene-flow between them so that variation of plumage within colonies would be less than that between colonies. This could give the appearance of dark-rumped forms breeding together and separately from pale-rumped forms. If Noisy (*melanocephala*) and Yellow-throated Miners can interbreed and produce viable hybrids, then the much more similar Yellow-throated and Black-eared could do the same. Any barrier to interbreeding that occurs is probably behavioural rather than physiological or genetic and so far no behavioural mechanism has been identified.

The classical explanation of a stepped cline of this type would be that it has arisen by hybridization and extensive gene flow after secondary contact (Short 1969; Ford 1974).

Serventy (1953) explained the divergence of the miners as resulting from isolation in the south-east and south-west during a period of extreme aridity. The former isolate became darker than the latter and became the Black-eared; the south-western form became the Yellow-throated. In wetter times their ranges could have expanded and met. Noisy Miners could have evolved in the south-east during a previous dry period.

However, an alternative explanation is equally plausible at our present state of knowledge. Ecological geneticists are increasingly interpreting variation in populations as the result of natural selection operating on genetic variation that has arisen *in situ* (eg. Clarke 1975). Intermediate specimens ought not necessarily to be seen as hybrids (Key and Kevan 1980), merely as one of a range of phenotypes displayed by a population. Where there is a continuous environmental gradient such as of temperature or rainfall and where selection favours different phenotypes at the opposite extremes, a cline may result. Such a cline could either be gradual or abrupt (stepped) depending on the severity of the selective gradient and the mobility of the organisms (extent of gene-flow). Endler (1977) produced computer simulations and a laboratory model using fruit-flies *Drosophila* of just such a situation. He found that stepped clines could not be distinguished from ones resulting from secondary contact of previously isolated populations.

Ford (1974) discusses the evolution and maintenance of clines by primary intergradation but suggests that secondary contact is much more likely when the cline is steep because gene-flow is hindered. However, gene-flow in miners could be less than in random mating because they are so sedentary and have closed breeding systems.

There are many examples of species-complexes in Australia that show morphological changes (usually of plumage) over a geographical range. The Australian Magpie *Gymnorhina tibicen* (Burton and Martin 1976), and the Varied Sittella *Daphoenositta chrysoptera* (Ford 1980) are two good examples. Such patterns have usually been explained as hybridization. However, I believe that another hypothesis, of a stepped cline without previous isolation, ought also to be considered.

Without more information, specially on behaviour, we cannot answer the question of whether *melanotis* or *flavigula* are distinct species. Quite likely the populations have arrived at an evolutionarily stable state of incomplete speciation.

I thank Shane Parker and Richard Schodde for their comments on an earlier draft of this paper. I am also grateful to my referees and especially to him who gave his opinion that the fact that the view expressed in the paper was heterodox was not an adequate reason for refusing it.

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2 October 1980.