Adult female apparent Black-eared Miner, Annuello Flora & Fauna Reserve, Victoria, 22 September 1986

Plate 28

Photos: C.E. Silveira

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The Black-eared Miner

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Summary

The historical (pre-1981) literature regarding all aspects of the ecology of the Black-eared Miner *Manorina melanotis* is shown to be unreliable. The Black-eared Miner is shown to have historically occurred in only a small portion of, and not throughout, the 'Murray Mallee'. A claim that the Black-eared and Yellow-throated Miners *M. flavigula* were reproductively isolated in the same locality through occupancy of different habitats, before widespread clearing, is unfounded. Other claims, that morphometric differences exist between the Black-eared and Yellow-throated Miners, that there are significant structural differences between the habitats of the Black-eared Miner and apparent intergrades, and that the Black-eared Miner requires mallee *Eucalyptus* spp. habitats of at least 55 to 60 years post-fire age, are all disputed. The Black-eared and Yellow-throated Miners are considered to be conspecific. The Black-eared Miner, as currently defined, could debatably be either a phenotypically stable taxon within the Yellow-throated Miner or one extreme of the phenotypic variation of a Murray Mallee population of the Yellow-throated Miner, depending on the interpretation of the extensive variation in plumage characters exhibited by apparent intergrades. Regardless of the true taxonomic status of the Black-eared Miner, all sight records of the Black-eared Miner are considered suspect and the last positively identified Black-eared Miner is considered to be a specimen collected west of Murrayville, Victoria, in 1949. Consequently, it is considered inappropriate that conservation efforts and resources be focused on the apparently already extinct Black-eared Miner, especially as phenotypically variable miners, including a range of dark phenotypes, continue to occupy denser mallee habitats and no decline of miners is evident within that niche.

Introduction

The taxonomic status of the Black-eared Miner *Manorina melanotis* has a long, confused history and is still unclear. Currently, the Black-eared Miner is being treated as a species by some authors (e.g. McLaughlin 1990, 1992, 1993; Fitzherbert et al. 1992; Garnett 1992a, b; Christidis & Boles 1994) in accordance with Schodde (1975). However, other authors have once again placed the Black-eared Miner, as had Mathews (1913), within the Yellow-throated Miner *M. flavigula* taxon (e.g. Sibley & Monroe 1990), as a subspecies or race *M. f. melanotis* (e.g. Schodde & Tidemann 1986, J. Ford 1987, Monroe & Sibley 1993).

Recent assessments of the taxonomy, distribution, habitat, ecology and conservation status of the Black-eared Miner have been complicated by the existence of apparent intergrades which exhibit plumage characters that may vary anywhere between those of the Black-eared Miner at one extreme to those of the Yellow-throated Miner at the other (H.A. Ford 1981, Joseph 1986, McLaughlin 1993). The existence of these phenotypically variable miners has resulted in suggestions that extensive interbreeding between the Black-eared Miner, the Yellow-throated Miner and subsequently 'hybrids' has occurred throughout the range of the Black-eared Miner (Schodde 1981, Joseph 1986, Starks 1987, McLaughlin 1990), to the extent that it is now considered unlikely that 'genetically pure' Black-eared Miners still exist (Garnett 1992a), especially as all so-called Black-eared Miner colonies contain apparent intergrades.

Recent opinion (e.g. Schodde 1981; Joseph 1986; Starks 1987; McLaughlin 1990, 1993) suggests that the Black-eared Miner, as a legitimate taxon, historically occupied dense mallee *Eucalyptus* spp. habitats in north-western Victoria, south-eastern South Australia and south-western New South Wales, an area collectively known as the 'Murray Mallee'. Widespread clearing of these dense mallee habitats not only resulted in a diminution of habitat, but caused a range expansion of the common and widespread Yellow-throated Miner, a species that favours open habitats, and precipitated the

'introgressive hybridisation' that has resulted in the demise of the Black-eared Miner (Schodde 1981; Joseph 1986; Starks 1987; McLaughlin 1990, 1993).

In this paper, I question the validity of some aspects of this opinion by listing anomalies found in the historical (pre-1981) literature, and by reassessing recent (post-1980) claims made regarding ecological separation between the Black-eared and Yellow-throated Miners. I review recent taxonomic treatments of the Black-eared Miner by a number of authors, and present some of my observations of miners in mallee habitats in Victoria. Also, in this paper, I use the term 'intergrade', introduced by J. Ford (1987, p. 160), in preference to the terms 'intermediate' and 'hybrid' used by other authors (e.g. Joseph 1986, Starks 1987, McLaughlin 1990).

Anomalies in the historical literature

An examination of the historical literature reveals a number of anomalies, some of which have resulted from the great confusion that has occurred in the identification of the Black-eared Miner from the time of collection of the type-specimens. The cause of most of this confusion is that, until the studies of H.A. Ford (1981) and Schodde (1981), there had been a widespread failure to appreciate that apparent intergrades between the Black-eared and Yellow-throated Miners existed. Consequently, as will be shown, the literature is littered with reports of Black-eared Miners which could have been intergrades as demonstrated by the specimens collected by the authors of those reports.

Before both the commencement of local clearing of mallee in 1912 (Starks 1987, p. 9) and the collection of the first Black-eared Miner (R4846, Museum of Victoria) by C.J. Cole, in 1910, the Yellow-throated Miner was already present at Carina, 20 miles (32 km) west of Kow Plains, Vic., in September 1908 (Howe 1909). Three years later, the Black-eared Miner was described by Wilson (1911) from specimens he had collected in the Kow Plains area. He described an adult male, but included neither a date nor a precise locality for the type-specimens, nor did he indicate how the Black-eared Miner differed from the Yellow-throated Miner of the Murray Mallee. The type-locality for his specimens was 'about 20 miles (32 km) north of Cowangie (Kow Plains)' (Jones 1952, p. 252). This is about 11.5 km west of Sunset Tank, Vic., and even today is deep into mallee that has never been cleared, at least 9 km north of an east-west band of cleared land. In a subsequent article, about the same trip to the Kow Plains area in 1911, Wilson (1912) stated that the Black-eared Miner was 'fairly common in the neighbourhood of the boring camp', that its 'notes and general habits are not unlike' those of the Noisy Miner *M. melanocephala*, and that one flock was often 'seen feeding just close to our tent doors'. This is most unusual behaviour for a supposedly shy bird (e.g. L.G. Chandler in Jones 1952, p. 252). Wilson (1912) failed to record the Yellow-throated Miner on the trip and 'the taxonomic identity of the female type' (R5040, Museum of Victoria) collected by him has since been questioned (McLaughlin 1990, p. 42). This specimen exhibited 'distinct deviation from other *M. melanotis* specimens in three plumage characters' (McLaughlin 1990, p. 26) and is now considered to be an **intergrade** (McLaughlin 1993, p. 123). There is, thus, clear evidence to suggest that Wilson did not discern the Black-eared Miner from intergrades.

In the following year, 1912, again in the Kow Plains area, Chandler (1913) on a collecting trip recorded 'a few pairs' of the Yellow-throated Miner in 'open timber' and recorded the Black-eared Miner as being 'very plentiful in the dense sapling mallee' to the south-east of Kow Plains. An examination of Chandler's six miner specimens, collected during the trip, surprisingly showed that only one was a Black-eared Miner, two were Yellow-throated Miners and three were **intergrades** (McLaughlin 1990).

Thus, Chandler also did not discern the Black-eared Miner from intergrades; in fact, neither did he discern the Yellow-throated Miner from intergrades (McLaughlin 1990, p. 45).

In October 1925, still in the Kow Plains area, the Dusky (Black-eared) Miner was 'seen and heard near the Kow Plains homestead', but no Yellow-throated Miners were reported (Ross 1926). The habitats near the homestead included 'a fine belt of pines [*Callitris preissii*]' and mallee that was not the 'small stunted stuff', but 'assumed the proportions of box [*Eucalyptus* spp.] or peppermint [*Eucalyptus* spp.]' (Howe 1909). Thus, the Black-eared Miner was apparently reported from open habitats more typical of the Yellow-throated Miner. Walters (1926, 1927), a resident of Cowangie (Kow Plains), updated the list of Ross (1926) with previously unlisted species, but he too failed to provide any records of the Yellow-throated Miner from this general area. Thus, even though Chandler (1913) had collected the Black-eared and Yellow-throated Miners from the Kow Plains area, in 1912, observers in the mid 1920s surprisingly did not report the Yellow-throated Miner.

In March 1914, a small flock of Black-eared Miners visited the Londrigan district, near Wangaratta in north-eastern Victoria; these were presumed to be visitors from north-western Victoria (Cheney 1915). Again, identification appeared to be a problem and Joseph (1986) consequently discounted this record because it lacked supporting evidence. In October 1915, in the Raak Plain area, near Nowingi, Vic., O'Donoghue (1916) reported the nest and eggs of the Black-eared Miner from 'open, park-like country' and found that Black-eared Miners also frequented timbered country of Needle Hakea *Hakea leucoptera*, Sandalwood [Sugarwood?] *Myoporum platycarpum*, Bignonia Emu-bush *Eremophila bignoniiflora* and Willow Acacia *Acacia salicina* — another open, apparently mallee-free habitat. O'Donoghue (1916) failed to mention the Yellow-throated Miner, but his companion on the trip, A.W. Milligan, collected a specimen (R7631, Museum of Victoria) from 16 km west of Nowingi (Starks 1987).

Ashby (1922) examined two specimens in the H.L. White Collection at the Museum of Victoria, a male and a female, both from Kow Plains, and stated that they were identical with a series of Black-eared Miner specimens that he had collected from Karoonda, South Australia. McLaughlin (1990) examined the H.L. White Collection and found that there was only one Black-eared Miner from Kow Plains, a female (HLW795); male miners from Kow Plains were either the Yellow-throated Miner (HLW832) or **intergrades** (HLW794, HLW833). Thus, it appears that Ashby too did not discern the Black-eared Miner from intergrades.

In September 1928, in the South Australian Murray Mallee, Sutton (1929) reported both Dusky (Black-eared) and Yellow-throated Miners in an almost entirely cleared area bounded by Halidon, Shell's Well, his 'Taplan Camp' (about 8 km east-north-east of Taplan), Loxton and Wunkar. He also reported three Dusky (Black-eared) Miners in the township of Halidon. Nine years later, in May 1937, in the Karoonda area, South Australian Murray Mallee, Rix (1937) failed to record any Yellow-throated Miners, yet observed Dusky (Black-eared) Miners in flocks of up to 20, at various parts, through an extensively cleared area from Chapman's Bore to Perponda.

Parsons & McGilp (1934) reported only the Black-eared Miner, in September 1933, on a trip to the mallee, north of Panitya, Vic. Miner specimens from this trip (B23168 and B23169, South Australian Museum) have since been identified as **intergrades** (Starks 1987). Nearby, in the Pinnaroo area, S.A., in 1936, McGilp & Parsons (1937) reported that the Black-eared Miner was 'fairly common along roadways where timber has been left', and later, in 1942, McGilp (1943) reported that roadside strips of scrub were in much demand as nesting quarters for the Black-eared Miner amongst other birds typical of open habitats including the Australian Magpie *Gymnorhina tibicen*

and the Nankeen Kestrel *Falco cenchroides*.

Condon (1951) considered that the Black-eared Miner was a full species, in contrast with the official checklist (RAOU 1926) which had treated the Black-eared Miner as a subspecies. He provided only a reference to Ashby (1922) and the following statement as justification, 'It would seem that this bird is quite distinct from *Myzantha (Manorina) flavigula*, with which it is sometimes associated by workers'. Apparently not realising their identity, Condon collected two **intergrades** (B17633 and B17634, South Australian Mûseum) from North Manya, Vic., in April 1934 (Starks 1987).

In October 1951, at Hattah, Vic., Jones (1952) reported that the Black-eared Miner 'was seen in a small colony' in mallee, and that the 'Yellow-throated Miner was mixed with the Black-eared, both kinds — obviously two species — nesting in the one area'. He also reported that there was 'much flurrying and fighting between the two species' at this site. Elsewhere, Mack (1961) in the Upper Murray region of South Australia, reported the Yellow-throated Miner as being 'fairly plentiful' and the Black-eared Miner as being 'very rare' in the same habitat, 'typical mallee scrub'.

Favaloro (1966) stated that the Yellow-throated Miner was 'very plentiful throughout the Sunset and is found wherever big timber, pine and belar [*Casuarina pauper*] still stand', and that the Dusky (Black-eared) Miner had 'always been a comparatively rare bird', but 'during the last 10 years, the numerical strength' of this miner had 'deteriorated alarmingly' with the destruction of its habitat. Referring to Dusky (Black-eared) Miners at a site in Hattah, Vic., he also stated that he had 'definitely identified 10 birds in company with the Yellow-throated Miner', in August 1951 (in Jones 1952, p. 252). Favaloro collected two miners at Hattah, in August 1951 (B5958 and B5959, Museum of Victoria); both were labelled *M. melanotis* and both have since been shown to be **intergrades** (Joseph 1986; Starks 1987; McLaughlin 1990, 1993). This has invalidated the view of Serventy (1953) who described miners at the same site at Hattah, observed in October 1951, as 'behaving as good species towards each other, there being no indication of interbreeding or intergradation of characters', and further, that *melanotis*, in the south-eastern Australian mallee, 'lives side by side with *flavigula* and shows no intergradation with it'.

Cox (1973) found that the Black-eared Miner was 'not common' in virgin mallee areas from Chapman's Bore to Glenburr Scrub, S.A., in the period 1969-1972; he observed compact parties of 10 to 25 which showed 'no variation in plumage' and never associated with the Yellow-throated Miner. He also stated that some of these Yellow-throated Miners showed 'darker rumps than normal'; that is, they were **intergrades**. Cheal et al. (1979) recorded the White-rumped (Yellow-throated) Miner in 1978, in both long-unburnt (>40 years post-fire) mallee and six-year post-fire regrowth mallee, at the Hattah Lakes National Park; no mention was made of either the Black-eared Miner or intergrades at these sites.

Recently, the historical literature has been relied upon to show the habitat preferences, foraging behaviour and previous status and distribution of the Black-eared Miner (e.g. Joseph 1986, Starks 1987, McLaughlin 1990). Yet clearly, the experienced observers Wilson, Chandler, Ashby, Parsons, McGilp, Condon and Favaloro did not distinguish the Black-eared Miner from apparent intergrades. This must cast doubt on the reliability of all historical information on the Black-eared Miner provided by these and less experienced observers as that historical information could have referred to either the Black-eared Miner, apparent intergrades or both.

Recent literature

H.A. Ford (1981), in discussing *Manorina* miners, made the point that

'intermediates' ought not necessarily be seen as hybrids but merely as a range of phenotypes displayed by a population. He examined 39 specimens of miners and showed that four characters, rump colour, forehead/throat colour, back colour and extent of the white tip of the tail, were **continuously variable** between the Black-eared Miner at one extreme and the Yellow-throated Miner at the other. He also stated that the characters were 'correlated (yellow throat with pale rump, etc.) so that the two forms could be separated on a series of characters'. He concluded that when the four characters were considered and examined closely, two distinct groups of miners could be discerned, 'each of which is highly variable', and further that, 'Information at present is insufficient to decide whether the complex consists of a single species or two good species'. He also concluded that 'plumage provides poor cues to use in identifying Yellow-throated and Black-eared Miners'.

Schodde (1981) stated that the Yellow-throated and Black-eared Miners 'have now been found to hybridize extensively throughout the area of overlap', and that the form *melanotis* was endemic to the Murray Mallee and 'formerly replaced *flavigula* in the more extensive tracts of primary mallee there'. No evidence was provided to support this latter contention, however likely it may be. More recently, Schodde & Tidemann (1986) stated that the Black-eared Miner, previously regarded as a separate species, was 'now hybridising and intergrading' with the white-rumped race of the Yellow-throated Miner and had 'been virtually hybridised out of existence by the opening-up of the Murray Mallee'.

Joseph (1986) proposed that, in the Murray Mallee, 'pre-*ca* 1945 *melanotis* and *flavigula* were reproductively isolated by a delicately balanced ecological barrier of their different habitat preferences, which acted as a pre-mating isolating mechanism', and that clearing of the mallee completely disrupted this ecological balance. His evidence for this was primarily based on the declining abundance of the Black-eared Miner and the increasing abundance of the Yellow-throated Miner over a period at one locality, the Karoonda area. Joseph (1986) stated that eight Black-eared Miner specimens were collected there between 1920 and 1937, and flocks of up to 20 were reported by Rix (1937). Most of the South Australian Murray Mallee was then cleared after about 1945 and intergrades first appeared in the Murray Mallee in 1951 (Joseph 1986). Intergrades were not reported in the Karoonda area until 1977 when five were collected, most of which tended to resemble *flavigula* but one of which very closely resembled *melanotis* (Joseph 1986). Then in 1983 four more intergrades were collected in the Karoonda area, all of which were almost pure *flavigula* (Joseph 1986).

This evidence from the Karoonda area does not support the hypothesis that the Black-eared and Yellow-throated Miners were reproductively isolated by their different habitat preferences before widespread clearing as, unlike most of the South Australian Murray Mallee, the Karoonda area had been extensively cleared well before 1945. Sutton (1929) reported that in September 1928 there was 'very little scrub, and most of the land was under crop' from about 22 miles (35.4 km) west of Karoonda, all the way up to Karoonda; and that 'the country was similar on the way to Enan Bore', 12 miles (19.3 km) south-east of Karoonda; and, further, that from Karoonda, north to Taplan, the country 'had been almost entirely cleared of the mallee flora'. The Yellow-throated Miner was not reported from the Karoonda area before, during, or up to several decades after the extensive clearing that had occurred by September 1928 (e.g. Ashby 1918, 1922; Sutton 1929; Rix 1937). The first records of the Yellow-throated Miner and intergrades are from the period 1969-1972 (Cox 1973). There is, thus, little justification for drawing conclusions about reproductive isolation based on the respective habitat preferences of the Black-eared or Yellow-throated Miners before, or after, clearing in the Karoonda area or for extrapolating for the rest of

the Murray Mallee as has been done by Joseph (1986). Reproductive isolation in this instance was attributable to geographic separation. Interestingly, the Black-eared Miner was able to survive for several decades, in the absence of the Yellow-throated Miner, in the extensively cleared and opened-up Karoonda area; that is, it survived in habitats more traditionally associated with the Yellow-throated Miner.

Joseph (1986) also provided a 13-character identification guide for the Black-eared Miner and reported that there were 20 Black-eared Miner specimens in Australian collections. He failed to find the Black-eared Miner in either South Australia or Victoria, in 1983 and 1984, but surprisingly presented some personal observations of its habitat preferences and behaviour. He concluded that it was 'very nearly if not already extinct in South Australia', and discounted all records of the Black-eared Miner in Blakers et al. (1984) with the possible exception of one. He also identified a **continuum of intermediates** between the Black-eared Miner at one extreme and the Yellow-throated Miner at the other (Joseph 1986, p. 6).

J. Ford (1987) considered the Black-eared Miner to be a dark subspecies *M. f. melanotis* of the Yellow-throated Miner and referred to a 'complex zone of intergradation' between *M. f. melanotis* and *M. f. flavigula*. He suggested that the remarks of Jones (1952) may be reinterpreted to indicate that 'these forms and therefore intermediates have co-occurred in the same nesting colonies at Hattah Lakes, north-western Victoria, for a considerable period'. He also noted that 'though *melanotis* is currently treated as a species in RAOU official lists (Schodde 1975), it appears to have species recognition signals not unlike those of *flavigula* as demonstrated by the extensive interbreeding between them'.

Starks (1987) provided a 13-character identification guide for the Black-eared Miner that differed slightly from that of Joseph (1986), and reported a total of eight Black-eared Miners in Victoria, in 1986, from three colonies, each of which contained intergrades. He concluded that there were 17 Black-eared Miner specimens in Australian collections. Four of these Black-eared Miner specimens (794, 796, R5040 and B10266, Museum of Victoria), all collected in Victoria, are now considered to be **intergrades** (McLaughlin 1990, 1993). This has cast doubt on the field identifications of the Black-eared Miner made by Starks (1987) and consequently on all associated ecological information provided by Starks (1987).

Sibley & Monroe (1990) stated that '*M. flavigula* includes *M. melanotis*'; and citing evidence from Joseph (1986) and R. Schodde suggested that 'the extent of hybridization between *flavigula* and *melanotis* in recent years has virtually eliminated *melanotis* as a distinct entity'. Sibley & Monroe (1990, p. xxi) followed the 'biological species concept', basing species limits on potential or actual reproductive isolation. In cases of secondary contact, disruption of gene flow and significant reduction in introgression were regarded as evidence of the full species level. According to Sibley & Monroe (1990) the Black-eared Miner did not fit this species definition. R. Schodde (pers. comm.) accepted the interpretation presented by Joseph (1986) and, from a zoogeographical perspective, treated the Black-eared and Yellow-throated Miners as allospecies (Schodde 1990). He stated that the Yellow-throated Miner had replaced the Black-eared Miner over most of the latter's range, and that it was also interbreeding with the latter and consigning it to genetic oblivion (Schodde 1990).

McLaughlin (1990, p. 42) suggested that 'given that intermediate-plumaged birds were present prior to extensive land clearing, perhaps all museum specimens of *M. melanotis* should be considered ''doubtful'' '. McLaughlin (1990, p. 42) also had 'doubts concerning the validity of all field identifications of *M. melanotis*', yet reported that 11 *M. melanotis* were recorded during searches in 1990. Garnett (1992b) treated these 11 individuals as 'probable non-hybrids' and suggested (Garnett 1992a) that

Table 1: Black-eared Miner *Manorina melanotis* and Yellow-throated Miner *M. flavigula* ranges for morphometric characters (from Tables 4 and 8, in McLaughlin 1990).

Character	*Victorian* M. melanotis *(mm)*	*n*	*Victorian* M. flavigula *(mm)*	*n*	*Combined South Australian and Victorian* M. melanotis *(mm)*	*n*
Male wing-length	114-121	3	**122-132**	7	**114-129**	9
Male tarsus-length	24.60-27.25	3	27.00-28.70	7	23.78-27.30	9
Tail-length	101-102	7	**106-118**	14	**101-114**	16
Head-width	18.00-21.50	7	19.41-23.15	14	18.00-21.50	16

it was unlikely that 'genetically pure' Black-eared Miners still existed.

McLaughlin (1993) concluded that there were 13 Black-eared Miner specimens in Australian collections. He stated that 'at least 17 different plumage characters separate' the Black-eared and Yellow-throated Miners, and that 'hybrids' displayed at least one plumage character intermediate between those described for the Black-eared and Yellow-throated Miners. He also found that plumage characters displayed by 'hybrid birds' were 'not consistently similar, and appeared to vary anywhere between the two pure extremes'. Such comments reinforce both the finding by H.A. Ford (1981) of **continuously variable** plumage characters between the Black-eared and Yellow-throated Miners, and the statement of Joseph (1986) that a **continuum of intermediates** exists between the Black-eared and Yellow-throated Miners. McLaughlin (1993) also found that the guides to the identification of the Black-eared Miner provided by both Joseph (1986) and Starks (1987) could result in inaccurate identifications. This has subsequently cast doubt on any identifications made by observers using those guides.

Christidis & Boles (1994) concluded that the 'taxonomic status of *Manorina melanotis* is unresolved'. They stated that Schodde & Tidemann (1986) and Sibley & Monroe (1990) had 'merged *melanotis* with *flavigula*' based on reports of extensive hybridisation between the two. They also stated that the 'significant ecological, behavioural and morphological differences recorded between *flavigula* and *melanotis*' by McLaughlin (1990, 1993) suggested that a 'fuller understanding of the relationships between these two' was 'dependent on further study'. Subsequently, in contrast with Schodde & Tidemann (1986), J. Ford (1987) and Sibley & Monroe (1990), Christidis & Boles (1994) followed Schodde (1975) and recognised '*M. melanotis* and *M. flavigula* as separate species'.

Morphometrics

McLaughlin (1990) found that **Victorian** Murray Mallee *M. flavigula* were statistically significantly larger in four of eight morphometric characters [male wing-length, male tarsus-length, tail-length (both sexes) and head-width (both sexes)] than **Victorian** *M. melanotis*. The ranges of all of these characters except head-width showed little or no overlap (see Table 1). However, if Victorian Murray Mallee *M. flavigula* are compared with combined South Australian and Victorian *M. melanotis*, considerable overlap occurs in the ranges of both male wing-length, and tail-length (shown in bold in Table 1), suggesting that the differences are not so clear-cut. The means and standard deviations that would clarify this issue cannot be determined from the presentation of the data in McLaughlin (1990). For one character (tail-length), however, the medians for South Australian male (n=6) and female (n=3) *M. melanotis* were 110 mm and 108 mm respectively, very similar to the 110 mm median for both sexes (n=14) of Victorian *M. flavigula* (Tables 4 and 8, McLaughlin 1990).

The assertion by Fitzherbert et al. (1992) that the 'Black-eared Miner has significantly shorter wings, tail and legs than its close relative the Yellow-throated Miner' is inaccurate. What has been found is that male Black-eared Miners from Victoria have significantly shorter wings and legs than male Yellow-throated Miners from Victoria; and, Black-eared Miners (both sexes) from Victoria have shorter tails and narrower heads than Yellow-throated Miners (both sexes) from Victoria (McLaughlin 1990). However, these findings were based on a very small sample size of Black-eared Miners (n=7, 3 males and 4 females) which surprisingly **included three intergrades** (HLW794, HLW796 and MVR5040, Museum of Victoria) (McLaughlin 1990, 1993).

There is no justification for specimens from a formerly continuous habitat to be separated on a political border (Victoria/South Australia). The most appropriate method of assessing morphometric differences would be to compare all *M. melanotis* (Victoria and South Australia), all Murray Mallee *M. flavigula* (Victoria, South Australia and New South Wales), all Murray Mallee intergrades (Victoria, South Australia and New South Wales) and all Australian *M. flavigula*. Until such time as such an assessment is made, no conclusive statement can be made regarding morphometric relationships.

Structural habitat

McLaughlin (1992) concluded that Black-eared Miners occupy 'dense vegetation', 'hybrid-only' colonies occupy 'structurally intermediate vegetation', and Yellow-throated Miner colonies occupy 'open vegetation'. Fitzherbert et al. (1992) interpreted this as 'hybrids occupy a separate niche to Black-eared and Yellow-throated Miners'. This is not supported by field observations by McLaughlin (1990, p. 46), who found that not only did 'hybrid birds' occur at all Black-eared Miner sites, but that at all but one of these sites Black-eared Miners were 'greatly outnumbered' by 'hybrids'. Furthermore, Starks (1987, p. 14) recorded a colony with both 'hybrids' and Yellow-throated Miners in post-fire regrowth mallee in the Sunset Country, and intergrades of varying plumage have also been recorded in colonies with Yellow-throated Miners in open mallee vegetation at numerous Victorian localities including near Sunset Tank, near Trinita, near Bronzewing, near Lake Wallawalla and at Lendrook Plain (Silveira pers. obs.).

Significant structural habitat variables

McLaughlin (1992) assessed 107 quadrats in core and non-core habitats of the Black-eared Miner. He proposed that, in core habitats (63 quadrats), five structural parameters (viz. amount of bark, tree density, trunk density, canopy cover and litter cover), were significantly positively correlated with increasing 'genetic purity' of Black-eared Miner colonies, and one structural parameter (diameter of trunks at breast height, dbh), was significantly negatively correlated. This suggests that relative to Yellow-throated Miner habitat, typical Black-eared Miner habitat would be one where there was a high amount of bark (bark score: 159 vs 12.4), high tree density (54.2 vs 5.7 trees/400 m^2), high trunk density (150.3 vs 10.6 trunks/400 m^2), high canopy cover (31.3% vs 13.1%), high litter cover (54.8% vs 36.5%) and small-diameter trunks (4.7 cm vs 24.6 cm dbh) (McLaughlin 1992, p. 13).

In the analysis by McLaughlin (1992), Black-eared Miner core habitats were selected on the basis that they were either known nest sites, mist-net capture sites or regularly used feeding areas. The 'genetic purity' of a Black-eared Miner colony was assessed by scoring individual miners within a colony, on plumage characters, on a scale of zero (Yellow-throated Miner) to six (Black-eared Miner), then deriving a mean for each colony. A Black-eared Miner colony was taken to be any colony that had had at least one Black-eared Miner recorded within it in the previous five

years, irrespective of the number of intergrades recorded within it. The Black-eared Miner colonies and their 'hybridisation' scores were: Wymlet (4.5), Pheeny's Track (4.1), Berrook 1 (4.3), Berrook 2 (5.5), Annuello (4.2) and Wyperfeld (4.6). No colony composed entirely of Black-eared Miners (score: 6.0) was assessed, **as none is known to exist**; consequently, no colony can strictly be called a Black-eared Miner colony.

The Pheeny's Track site contained 11 miners, two of which 'exhibited plumages consistent with *M. melanotis*' (McLaughlin 1990, p. 31). Six of these 11 miners were captured and examined in the hand; they were all intergrades, but two closely resembled the Black-eared Miner (McLaughlin 1990, p. 40). When one of these Black-eared Miner-like intergrades was released and viewed through binoculars at distances of eight to 20 m, two characters used for identification (post-auricular spot and tail band), at times appeared absent, as is the case in the Black-eared Miner, and two other characters (colour of dorsum and colour of uppertail), were impossible to separate from those of the Black-eared Miner. Previously, however, when this miner had been examined in the hand, all four of these characters were assessed and shown clearly not to be those of the Black-eared Miner. Thus, it is crucial that putative Black-eared Miners be examined in the hand for positive identification. In fact, McLaughlin (1990, p. 42) stated that 'the capture and description of miners in the hand is necessary for accurate determination of plumage states'. It is, thus, questionable to claim that two Black-eared Miners were recorded at the Pheeny's Track site, as **none** was captured and positively identified in the hand. It is similarly not possible to claim Black-eared Miners at any of the other sites, Wymlet, Berrook 1, Berrook 2, Annuello and Wyperfeld, for the same reason.

Despite the questionable identifications of Black-eared Miners, examination of the significant structural parameters of mallee vegetation (see Figs. 3.2 to 3.7, McLaughlin 1992) shows that Yellow-throated Miner colonies (score: 0) clearly differed from 'hybrid' colonies (here defined as those with a score >0 and <6.0). Yellow-throated Miner colonies preferred habitat where there was low tree density, low trunk density, low amount of bark and large-diameter trunks. However, if 'hybrid' colonies are examined in isolation from Yellow-throated Miner colonies, it is unlikely that there would be any correlation with increasing 'genetic purity' for three structural parameters: diameter of trunks at breast height, amount of bark, and canopy cover (see Figs 3.7, 3.4 and 3.5, McLaughlin 1992).

It also appears that no core habitat quadrats were selected from post-fire regrowth, despite post-fire regrowth occurring near, or at, all but one Black-eared Miner colony site (McLaughlin 1992). Post-fire regrowth has been extensively and regularly utilised as foraging habitat at the Annuello site (Starks 1987, Silveira pers. obs.) and thus satisfies one of the criteria that defines core habitat. Post-fire regrowth mallee has a very low litter cover and a very low amount of bark (McLaughlin 1992), hence inclusion of core habitat quadrats from post-fire regrowth in the analysis would have certainly confounded the correlations for both amount of bark and litter cover.

Post-fire age-classes

McLaughlin (1992) proposed that mallee of at least 55 to 60 years post-fire age was required by the Black-eared Miner, and that younger post-fire age-classes of up to 15 to 20 years possessed 'few of the structural features' that characterised typical Black-eared Miner habitat. However, the utilisation of post-fire regrowth mallee has been observed at the Annuello site (Starks 1987, Silveira pers. obs.) where a colony of miners, which once included an apparent Black-eared Miner, has been observed, on many occasions from 1985 to 1995, foraging repeatedly during the day (for

periods of over an hour), and widely (over a total of hundreds of hectares), in mallee of three to most recently 11 years post-fire age. This colony nested in long-unburnt mallee on the margin of four-year post-fire regrowth mallee in September 1986, and adults were seen feeding fledglings in nine-year post-fire regrowth mallee in March 1992 (Silveira pers. obs.).

Discussion

Identification of the Black-eared Miner has been shown to be a problem historically and continues to be a problem. Even when in the hand, there has been disagreement by successive investigators over the number of Black-eared Miner specimens in the same Australian collections: 20 (Joseph 1986), 17 (Starks 1987) and 13 (McLaughlin 1993). Field guides continue to provide differing views and biologists propose increasingly complex combinations of 'typical' characters (e.g. H.A. Ford 1981, Joseph 1986, Starks 1987, McLaughlin 1993). Consequently, positive identification of the Black-eared Miner in the field is impossible unless birds are captured and examined very carefully in the hand. Thus far, in recent years, no putative Black-eared Miner has proven to be a Black-eared Miner after capture or collection and examination in the hand (McLaughlin 1990, J. Eckert pers. comm.). There is, thus, no evidence to suggest that any 'pure' Black-eared Miner still exists, whatever its taxonomic status. Indeed, the last positively identified Black-eared Miner was one collected in 1949 (MVB3248, Museum of Victoria).

Given that the historical literature is unreliable, the only reliable locality information is that provided with the 13 known specimens of the Black-eared Miner. These specimens from known localities show that it is an exaggeration to suggest that the Black-eared Miner occurred throughout the Murray Mallee immediately before, when or since it was first collected in 1910. There are no specimens from New South Wales or north of the Murray River in South Australia, or east or north of Underbool, Vic. Eight (62%) of the 13 specimens were collected from one locality, the Karoonda area, a small south-western pocket of the Murray Mallee. One specimen was collected in 1920 apparently from Loxton, S.A. (about 95 km north-east of Karoonda), but more probably from 20 miles (32 km) south of Loxton (see Ashby 1922). The remaining four specimens (31%) were from scattered localities in Victoria, between about 115 and 135 km east of Karoonda (1 specimen, 1910, Underbool; 2 specimens, 1911-1912, Kow Plains area; 1 specimen, 1949, west of Murrayville). Based on specimens still available, Yellow-throated Miners and/or intergrades were definitely present at or near all of these Victorian localities except Underbool at the times of collection. Thus, the historical distribution of the Black-eared Miner comprised a small south-western zone of the Murray Mallee, entirely in South Australia and centred on the Karoonda area, containing exclusively Black-eared Miners; and to the east and north-east, an adjacent and much larger southern zone containing Black-eared Miners, apparent intergrades and Yellow-throated Miners. Overall, the Black-eared Miner historically can confidently be stated to have occurred only in a small portion of the Murray Mallee.

Despite problems with the identification of the Black-eared Miner, it appears that there is still a tendency toward darker miner phenotypes occurring in the more isolated (from Yellow-throated Miners) stands of mallee, and it appears that this was more pronounced earlier this century, certainly in the Karoonda area (Joseph 1986). Thus, a population of miners at one extreme of the pan-Australian distribution of the Yellow-throated Miner had differentiated to some extent from the parental Yellow-throated Miner. This population may have been progressing toward speciation (e.g. H.A. Ford 1981, p. 250), but diminution and fragmentation of the Murray Mallee has brought **increasing** and extensive secondary contact with the Yellow-throated Miner (e.g.

Schodde 1981, McLaughlin 1990), before the development of any pre- or post-mating isolating mechanisms. Cade (1983) considered that two avian populations which establish secondary contact after a period of genetic differentiation and show complete reproductive and genetic compatibility, with rapid exchange of genes between the two, are conspecific regardless of how phenotypically and genetically different they may be. The Black-eared and Yellow-throated Miners are, therefore, best considered conspecific, as stated by Sibley & Monroe (1990).

Within the Murray Mallee, apparent intergrades exhibit plumage characters that may vary anywhere between those of the Black-eared Miner at one extreme and those of the Yellow-throated Miner at the other (Joseph 1986, McLaughlin 1993). The nature of this variation in plumage characters is debatable. It could be either variation resulting from introgression between a phenotypically stable taxon (the Black-eared Miner *M. f. melanotis*) which has secondarily come into contact with the Yellow-throated Miner *M. f. flavigula*, or the variation of a phenotypically variable population which had differentiated to some extent from the parental Yellow-throated Miner but which has secondarily come into contact with the Yellow-throated Miner. As an alternative to recent opinion (see Introduction), it is suggested that the latter may be the case, and that the Black-eared Miner is one extreme of this phenotypically variable population. This Black-eared Miner phenotype historically occurred in two adjacent zones at the southern extreme of the distribution of the Yellow-throated Miner within the Murray Mallee. In one zone, the south-western, centred on the Karoonda area, the Black-eared Miner phenotype appeared to have become locally fixed, perhaps through genetic drift, whereas in the other zone a range of phenotypes from the Black-eared Miner through to the Yellow-throated Miner was present, but the Yellow-throated Miner resided only in open habitats. Clearing of mallee habitats within the south-western zone did not lead to the immediate extirpation of the Black-eared Miner phenotype; rather, it continued to survive for several decades, in the absence of the Yellow-throated Miner, in predominantly open habitats more traditionally associated with the Yellow-throated Miner. Only after the delayed arrival of the Yellow-throated Miner and/or apparent intergrades and subsequent presumed interbreeding did the Black-eared Miner phenotype eventually disappear (Cox 1973, Joseph 1986). In the adjacent and larger southern zone, clearing of mallee habitats did not precipitate, but caused increasing and extensive presumed interbreeding between the Black-eared Miner phenotype, apparent intergrades and the Yellow-throated Miner.

Overall, the Black-eared Miner phenotype has declined in abundance to apparent extinction, but there is no evidence, at present, to suggest that the apparent intergrades, including a range of dark phenotypes which still occur in denser mallee, are at a disadvantage or that these individuals are infertile. Thus, at present, even though there has been an apparent loss in phenotypic diversity, there has not necessarily been a consequent loss in genetic diversity. The possibility nevertheless exists that gene frequencies for so-called Black-eared Miner traits may in future reduce to zero with generation turnover; if this occurs there will then be a loss of genetic diversity. Clearly, at this point, if presumed interbreeding between the Yellow-throated Miner, apparent intergrades and the Black-eared Miner phenotype had produced less fertile offspring and led to a real decline in numbers of miners within denser mallee, and, consequently, a real decline in genetic diversity, then there would have been a real conservation crisis.

Conclusion

The historical literature on the Black-eared Miner is unreliable because of uncertainties in identification caused by the existence of apparent intergrades. These intergrades have existed at least since the Black-eared Miner type-specimens were collected in 1911, but were not recognised as such until 1981. One of the three Black-

eared Miner specimens collected from the type-locality, the female, is not a Black-eared Miner, but the first known intergrade; another, a male type-specimen, lodged at the American Museum of Natural History (McLaughlin 1993), still awaits accurate identification. The type-locality, about 32 km north of Cowangie, from which this first known intergrade was collected, even today lies at least 9 km into mallee that has never been cleared. Black-eared Miner specimens from known localities suggest that the historical distribution of the Black-eared Miner included only a small portion of the Murray Mallee and consequently, contrary to Joseph (1986), apparent intergrades are now known from well beyond the historical range of the Black-eared Miner. All recent records of the Black-eared Miner are suspect because none of the putative Black-eared Miners has been examined in the hand. Reproductive isolation based on ecological separation claimed by Joseph (1986) for the Karoonda area is unfounded, and correlations between structural parameters and increasing 'genetic purity' shown by McLaughlin (1992) are inconclusive. So-called 'hybrids' do not occupy a separate niche to Black-eared and Yellow-throated Miners as proposed by Fitzherbert et al. (1992) and the requirement by the Black-eared Miner for long-unburnt mallee is unproven. Morphometric differences between the Black-eared and Yellow-throated Miners shown by McLaughlin (1990) are suspect because of very small sample sizes, questionable selection of specimens and restricted analysis.

Given the definitions of Cade (1983) and Sibley & Monroe (1990) on species limits after secondary contact between two populations, the Black-eared and Yellow-throated Miners are considered to be conspecific. The Black-eared Miner, as currently defined (McLaughlin 1993), could debatably be either a phenotypically stable taxon within the Yellow-throated Miner or one extreme of a phenotypically variable population of the Yellow-throated Miner. The Black-eared Miner, taxon or phenotype, has declined through habitat clearance and apparent extensive interbreeding. The genes formerly concentrated in Black-eared Miner phenotypes are now likely to be spread amongst apparent intergrades, which are becoming increasingly rare in extensively cleared areas such as Karoonda, but continue to occur, and appear to be secure, in denser mallee habitats within existing nature reserves (Silveira pers. obs.), and unless there is a demonstrated threat to them (e.g. egg-collectors) **there is no cause for concern**. Management can never restore the Murray Mallee to its former self and, given that putative Black-eared Miners, apparent intergrades and Yellow-throated Miners will continue to interbreed freely in areas of contact throughout the former range of the Black-eared Miner, there is little that can be done to bring back and maintain the Black-eared Miner phenotype in its former numbers.

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Editor's note: Detailed biochemical studies, the results of which are in preparation, should settle the taxonomic question in the near future.