

## COLOURS AND MARKINGS OF THE MOUTHS OF NESTLING AUSTRALIAN SONGBIRDS

WALTER E. BOLES AND N.W. LONGMORE

### INTRODUCTION

The colours and markings of the mouths of nestling songbirds (Passeriformes) have been reported by several authors: Ingram (1907), Ticehurst (1910), Bates (1911), Swynnerton (1916), Wetherbee (1961), Ficken (1965), Harrison (1975) and Maclean & Vernon (1976). Ingram (1907) thought it possible that these characters may be of some taxonomic use, a suggestion echoed by subsequent authors. The families they considered were primarily European, North American and African. In this paper, we report on the mouth-colours and markings of the nestlings of over 120 species of Australian songbirds, representing more than 30 families, and discuss some of their taxonomic implications.

Ingram (1907) was concerned only with tongue-markings whereas Ficken (1965) dealt only with the colours of the mouth linings. In this paper we discuss both aspects of the nestlings' mouths, as did Maclean & Vernon (1976) who divided colours and markings of the mouths into three categories:

"1. Yellow or orange with black markings on the tongue and sometimes on the tips of the mandibles; markings also occur rarely on the palate.

2. Yellow, orange, pink, red or purplish without markings.

3. The estrildid condition with elaborate papillae and markings on the gape, tongue and mandibles." (p.95).

The specialized markings of nestling grassfinches (Estrildidae) of category 3 have been illustrated and discussed by Immelmann (1982) and others and will not be considered further here.

### METHODS

Mouth-colours were obtained using photographs in books and in the National Photographic Index of Australian Wildlife (NPI), Australian Museum, Sydney. Much bird photography takes place at nests. Nestling birds readily gape, thereby exposing the linings of the inside of their mouths; photographs provide a readily obtainable source of information for

many species. These data are less easy to obtain for species which nest in hollows or which construct domed or covered nests because young are usually fed inside the nest where they are out of view.

Some photographs permit a complete view of the tongue and inside mouth. Others are less comprehensive and for some species our record of the inside mouth is based on a composite of several photographs. This makes the assumption that there is no significant variation between individuals of the same age, and indeed, past authors have remarked on the consistency of these characters within a particular species. A comparison of our results for these same species supports this. The same assumption is necessary for those species in which only a single individual has been examined. Though the concordance between our observations and those of previous authors supports this assumption for most species, we did find examples and suggestions of individual variation within some. The data are still insufficient to determine the cause of this variation.

We have complete (single individual or composite) information from at least one representative of all but the following Australian passerine families: *Atrichornithidae* (scrub-birds), *Climacteridae* (tree-creepers) and *Paradisaeidae* (birds-of-paradise). Our search of the literature and of available photographs has not been exhaustive and we encourage observers to supplement our report as more information is acquired.

Selected sources of information are given in Figure 1 for those species in which we have recorded some variety of markings. These have been cited because they illustrate the markings for the species in question; in the case of composite views, photographs verifying the *lack* of markings for part of the mouth lining are omitted. Throughout, the major sources are abbreviated thus: *RD* — *Reader's Digest Complete Book of Australian Birds*, *NPI* — *National Photographic Index of Australian Wildlife* and *WW* — *The Wrens and Warblers of Australia*. Where the same picture appears both in an NPI photograph and in a book, the

citation of the latter is given because of its greater accessibility. The page number, in the case of books, or acquisition number in the case of the *National Photographic Index*, is given after the source.

### RESULTS

The unmarked condition (category 2 of Maclean & Vernon 1976) is by far the most frequent among Australian passerines. "The mouth colours of almost all nestling [North American] passerines are either red or yellow" (Ficken 1965: 71). In Australian species, yellow-orange is the most common colour but orange-red or red are characteristics of several families (Table I). From her data on North American species, Ficken (p.73) considered that "nestling mouth-lining colour is usually a good family character". This appears true for Australian passerines as well, with the exception of the Cracticidae in which *Cracticus* and *Strepera* have yellow-orange linings and *Gym-*

*norhina* red ones. Because of the limited range of possible mouth-colours, families in which they are the same are not necessarily closely related, e.g. Dicaeidae and Corvidae. It is highly probable that the unmarked condition is ancestral to those in which markings are present. Of Australian species we examined, those lacking mouth-markings are listed with their mouth-colours in Table I; species for which we have insufficient views are not listed.

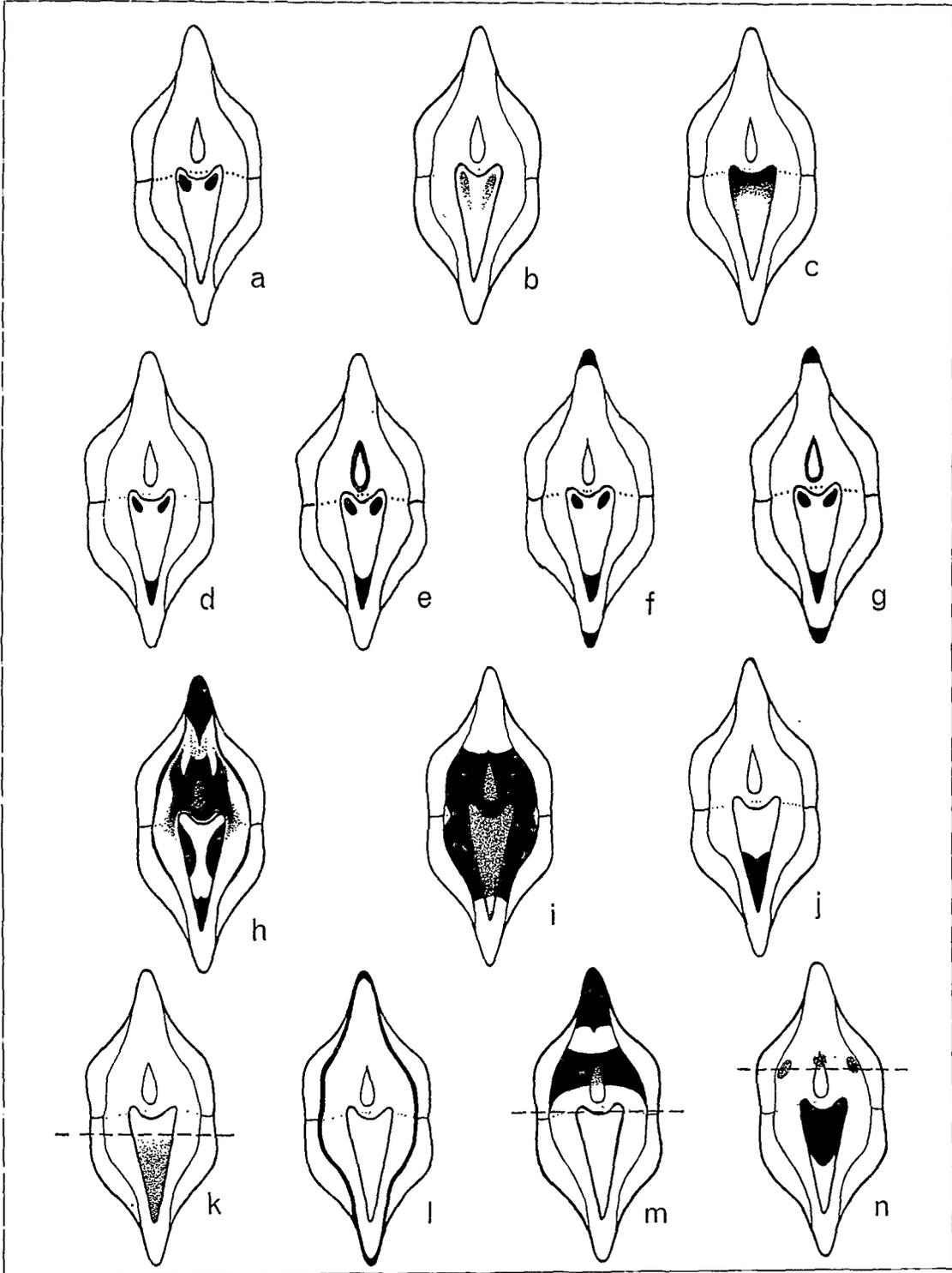
Maclean & Vernon (1976) divided their third category, comprising species with tongue and/or palate markings, into eight groups ranging from species with only two tongue-spots to those with spots plus elaborate palate markings. These authors included a few Australian genera in this category to which we have added others with several previously unreported patterns. All Australian species for which we have recorded markings have yellow-orange mouth-linings.

Figure 1. Mouth- markings recorded in nestling Australian passerines. Unless another author is cited, all markings have been confirmed by us; the photographic references for each are given as described under Methods. Patterns for which we have incomplete views have a dashed line indicating the limit of our observation.

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>a) Clamorous Reed Warbler <i>Acrocephalus stentoreus</i> (NPI XTC 435)<br/>Golden-headed Cisticola <i>Cisticola exilis</i> (NPI 3110)<br/>Zitting Cisticola <i>C. juncidis</i> (NPI T2107)<br/>White-fronted Chat <i>Ephthianura albifrons</i> (RD 512)<br/>Orange Chat <i>E. aurifrons</i> (WW 316)<br/>Crimson Chat <i>E. tricolor</i> (RD 510)<br/>Yellow-throated Honeyeater <i>Meliphaga flavicollis</i> (RD 484 faint, absent in NPI XT1814)<br/>Grey-fronted Honeyeater <i>M. plumula</i> (RD 486)<br/>Yellow-tufted Honeyeater <i>M. melanops melanops</i> (NPI 428)<br/>white-eyes <i>Zosterops</i> (Swynnerton 1916)</p> <p>b) cuckoo-shrikes <i>Coracina</i> (Maclean &amp; Vernon 1976)<br/>Fuscous Honeyeater <i>M. fusca</i> (NPI 3129)<br/>Mangrove Honeyeater <i>M. fasciocularis</i> (NPI 3128)</p> <p>c) Eastern Silveryeye <i>Zosterops lateralis</i> (NPI 383, NPI 2841)<br/>Yellow-tufted (Helmeted) Honeyeater <i>M. melanops cassidix</i> (NPI 4283)</p> | <p>d) Little Grassbird <i>Megalurus gramineus</i> (NPI 300)<br/>European Skylark <i>Alauda arvensis</i> (Ingram 1907)</p> <p>e) Tawny Grassbird <i>Megalurus timoriensis</i> (WW 290, WW 291)</p> <p>f) Singing Bushlark <i>Mirafra javanica</i> (RD 336)<br/>European Skylark <i>Alauda arvensis</i> (Harrison 1975; RD 337 – incomplete)</p> <p>g) Rufous Songlark <i>Cincloramphus mathewsi</i> (NPI 1813)</p> <p>h) Brown Songlark <i>Cincloramphus crucialis</i> (NPI 45]3; Maclean &amp; Vernon 1976)</p> <p>i) New Holland Honeyeater <i>Phylidonris novaehollandiae</i> (NPI 2286)<br/>White-cheeked Honeyeater <i>P. nigra</i> (RD 498, NPI 1287)<br/>Crescent Honeyeater <i>P. pyrrhoptera</i> (RD 496)<br/>(Basal section of tongue and internal nares are also black but are indicated by stippling for contrast.)</p> <p>j) Brown Honeyeater <i>Lichmera indistincta</i> (NPI 1901)</p> <p>k) Lesser Lewin's Honeyeater <i>Meliphaga notata</i> (NPI 3662)</p> <p>l) Chiming Wedgebill <i>Psophodes cristatus</i> (RD 397)<br/>Chirruping Wedgebill <i>P. occidentalis</i> (RD 397)</p> <p>m) Orange-winged Sittella <i>Daphoenositta</i></p> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

*chrysoptera chrysoptera* (NPI 345 — in- n) complete view)

Black-capped *Sittella D.c. pileata* (RD — incomplete view)



The simplest pattern is a pair of spots on the tongue (Fig. 1a) which in some species are diffuse and appear as blurred streaks (Fig. 1b). Spots are characteristic of the Old World warblers (Sylviidae), accentors (Prunellidae), several species of true shrikes (Laniidae) and Australian chats (Ephthianuridae) (Ingram 1907; Swynnerton 1916; Maclean & Vernon 1976). We have recorded tongue-spots in the following sylviid warblers and ephthianurine chats: Clamorous Reed Warbler *Acrocephalus stentoreus*, Golden-headed Cisticola *Cisticola exilis*, Zitting Cisticola *C. juncidis*, White-fronted Chat *Ephthianura albifrons*, Crimson chat *E. tricolor* and Orange Chat *E. aurifrons*. Several species of honeyeater exhibit this pattern. Because of the diversity of markings in this family these are discussed together below.

Maclean & Vernon (1976) listed cuckoo-shrikes *Coracina* as having blurred streaks (Fig. 1b) but did not indicate for which species these markings had been recorded. We did not observe it in a photograph of the Black-faced Cuckoo-shrike *C. novaehollandiae* (NPI 1761) but as this view was incomplete, the possibility must be investigated further. Maclean & Vernon (1976) questioned Swynnerton's report of tongue-spots in white-eyes *Zosterops*. In two individuals of the Eastern Silvereye *Z. lateralis* (NPI 383, NPI 2841), we found suggestions of diffuse round marks at the base of the tongue (Fig. 1c) but in a third (NPI 2273) no marks appeared to be present. More nestlings of this genus need to be examined to clarify this apparent variation.

The two-spot pattern is augmented in some species by additional markings on the tongue and/or palate:

Little Grassbird *Megalurus gramineus* (tip of tongue; Fig. 1d).

Tawny Grassbird *M. timoriensis* (tip of tongue, edges of internal nares; Fig. 1e).

Singing Bushlark *Mirafra javanica* (tip of tongue, tips of upper and lower mandibles; Fig. 1f).

European Skylark *Alauda arvensis* (Ingram 1907 gives this as Fig 1f, Harrison 1975 as Fig. 1d; an incomplete view (RD 337) suggests that the mandible tips are not dark (Fig. 1d) — compare with *Mirafra javanica* (RD 336)).

Rufous Songlark *Cincloramphus mathewsi* (tip of tongue, tips of upper and lower mandibles, edges of internal nares; Fig. 1g). This

differs markedly from the elaborate tongue, palate and mandible markings of the Brown Songlark *C. cruralis* (Fig. 1h) as reported by Maclean & Vernon (1976).

The greatest diversity of mouth-markings we have found within a family is in the honeyeaters (Meliphagidae). An unmarked condition appears to be the most frequent (16 species of ten genera: Table I) but five patterns of markings have been identified in the following species:

Grey-fronted Honeyeater *Meliphaga plumula* (Fig. 1a).

Yellow-tufted Honeyeater *M. melanops* (subspecies *melanops* as in Fig. 1a (NPI 428); subspecies *cassidix* (Helmeted Honeyeater) as in Fig. 1c — very dark [NPI 4283]).

Yellow-throated Honeyeater *M. flavicollis* (one individual as in Fig. 1a — very faint (RD 484); in another all markings absent (NPI XT1814).

Fuscous Honeyeater *M. fusca*; Mangrove Honeyeater *M. fasciogularis* (Fig. 1b).

New Holland Honeyeater *P. novaehollandiae*, White-cheeked Honeyeater *M. nigra*, Crescent Honeyeater *P. pyrroptera* (black buccal cavity and pharynx, surrounded by a yellow-orange edge; Fig. 1i). The two other Australian species currently placed in *Phylidonyris*, the White-fronted Honeyeater *P. albifrons* and Tawny-crowned Honeyeater *P. melanops*, lack this pattern, having unmarked yellow-orange mouth-linings (NPI XT1467 and NPI 1895, respectively; see Boles & Longmore (1986).

The next two honeyeater patterns have not been previously reported:

Brown Honeyeater *Lichmera indistincta* (yellow-orange mouth with an extensive black tongue tip; Fig. 1j). This pattern has not been previously reported for any species.

Lesser Lewin's Honeyeater *M. notata* (light grey tongue contrasting with a yellow-orange mouth-lining; Fig. 1k). This was also found in a nestling specimen of an unidentified *Meliphaga* (s.s.) from Papua New Guinea.

Another mouth-marking not previously recorded is that of the wedgebills *Psophodes cristatus* and *P. occidentalis*: inside edges of both mandibles black, surrounding an otherwise yellow-orange mouth-lining (Fig 1e). This pattern is not found in the congeneric whipbirds *P. olivaceus* (NPI 1752) and *P. nigrogularis* (RD 395).

## A. Yellow-orange.

- PITTIDAE: *Pipita versicolor*, *p. iris*  
 MENURIDAE: *Menura novaehollandiae*  
 HIRUNDINIDAE: *Hirundo neoxena*, *H. ariel*  
 MOTACILLIDAE: *Anthus novaeseelandiae*  
 CAMPEPHAGIDAE: *Lalage sueurii*, *L. leucomela*, *Coracina novaehollandiae* (the last requires further confirmation of absence of markings.)  
 TURDIDAE: *Zoothera dauma*, *Turdus merula*, *T. philomelos*  
 PACHYCEPHALIDAE: *Petroica phoenicea*, *P. multicolour*, *P. goodenovii*, *Eopsaltria australis*, *E. griseogularis*, *E. georgiana*, *Microeca leucophaea*, *Tregellasia capito*, *Poecilodryas superciliosus*, *Heteromyias cinereifrons*, *Falcunculus frontatus*, *Pachycephala inornata*, *P. pectoralis*, *P. rufiventris*, *Colluricincla megarhyncha*, *Oreoica gutturalis*, *Monarcha melanopsis*, *Myiagra rubecula*, *Rhipidura rufifrons*, *R. fuliginosa*, *R. leucophrys*  
 TIMALIIDAE (POMATOSTOMATINAE): *Pomatostomus superciliosus*  
 ORTHONYCHIDAE: *Orthonyx temminckii*, *Psophodes olivaceus*, *P. nigrogularis*, *Cinclosoma castanotum*  
 MALURIDAE: *Malurus leucoptos*, *M. cyaneus*, *Amytornis goyderi*  
 ACANTHIZIDAE: *Dasyornis broadbenti*, *Sericornis citreogularis*, *S. beccarii*, *S. magnus*, *Chthonicola sagittata*, *Smicrornis brevirostris*, *Gerygone olivacea*, *Acanthiza inornata*, *A. nana*, *A. robustirostris*  
 ZOSTERPODIDAE: *Zosterops lateralis* (requires confirmation of presence of markings)

- PARDALOTIDAE: *Pardalotus punctatus*  
 NECTARINIIDAE: *Nectarinia jugularis*  
 MELIPHAGIDAE: *Anthochaera chrysoptera*, *A. carunculata*, *Philemon argenticeps*, *P. corniculatus*, *P. citreogularis*, *Plectorhyncha lanceolata*, *Manorina melanophrys*, *M. melanocephala*, *Meliphaga virescens*, *M. ornata*, *Melithreptus gularis*, *Cissomela nigra*, *Acanthorhynchus tenuirostris*, *Phylidonyris melanops*, *P. albifrons*, *Myzomela sanguinolenta*  
 EPHTHIANURIDAE: *Ashbyia lovensis*  
 PASSERIDAE: *Passer montanus*  
 STURNIDAE: *Sturnus vulgaris*  
 DICRURIDAE: *Dicrurus hottentottus*  
 PTILONORHYNCHIDAE: *Ailuroedus melanotis*, *Sericulus chrysocephalus*, *Ptilonorhynchus violaceus*, *Prionodura newtoniana*  
 GRALLINIDAE: *Grallina cyanoleuca*  
 ARTAMIDAE: *Artamus cinereus*, *A. cyanopterus*, *A. minor*  
 CRACTICIDAE: *Cracticus nigrogularis*, *C. torquatus*, *Strepera graculina*, *S. versicolor*

## B. Orange-red; red

- PYCNONOTIDAE: *Pycnonotus jocosus*  
 DICAELIDAE: *Dicaeum hirundinaceum*  
 FRINGILLIDAE (CARDUELINAE): *Carduelis carduelis*, *C. chloris*  
 ORIOLIDAE: *Oriolus sagittatus*, *O. flavocinctus*, *Sphecotheres viridis*  
 CORCORACIDAE: *Corcorax melanorhamphos*  
 CRACTICIDAE: *Gymnorhina tibicen*  
 CORVIDAE: *Corvus coronoides*, *C. mellori*

TABLE I. Mouth colours of nestling Australian passerine birds which lack tongue or palate markings.

We were unable to obtain a complete view of the inside mouth of any nestling Varied Sittella *Daphoenositta chrysoptera*; however partial views of two subspecies demonstrated some in-traspecific variation. Heavy markings on the palate and upper mandible (Fig. 1m) of one Orange-winged Sittella *D.c. chrysoptera* (NPI

345) were absent in an individual of the Black-capped Sittella *D.c. pileata* (NPI 1862). A dark tongue spot (Fig. 1n) was recorded for *D.c. pileata* (RD 450) and appeared to be present in inadequate views of some other individuals of both species.

## DISCUSSION

The suggestion by Ingram (1907) and others that mouth-markings and colours may be of taxonomic use seems valid for families such as the Sylviidae and Alaudidae, in which there appear to be characteristic patterns which remain uniform through most species. We have observed these characteristic patterns in all Australian species of larks and Old World warblers we have been able to examine. Similarities between taxa, however, do not necessarily indicate a relationship. *Motacilla*, *Zosterops*, several genera of laniid shrike and purportedly *Coracina* (Maclean & Vernon 1976) exhibit the pattern in Figure 1b. Recent evidence from DNA-DNA hybridization studies indicates that the cuckoo-shrikes and true shrikes belong to a quite different section of the passerines than *Motacilla*, which is allied to the finch-like families and relatives (Sibley & Ahlquist 1982a).

Maclean & Vernon (1976) considered that the presence of tongue-spots in *Ephthianura* (Fig. 1a) confirmed the inclusion of that genus in the Sylviidae but were unaware of this pattern in any of the honeyeaters. We have since discovered similar tongue-spots in several species of *Meliphaga* (sensu lato) honeyeaters. DNA-DNA hybridization studies indicate a close, probably confamilial relationship between the honeyeaters and Australian chats and a distant one between these groups and the Old World warblers (Sibley & Ahlquist 1982b). In contrast to the species of *Ephthianura*, nestling Gibber Chats *Ashbyia lovensis* lack markings on the tongue (Queensland Museum slide MC 763). Interestingly *Ashbyia* also differs in the palate of the adults which is black (S.A. Parker, pers. comm.), not yellow-orange as in other ephthianurine chats.

There has been debate whether the lark-like *Cincloramphus* is a member of the Sylviidae or of one of the endemic Australo-Papuan families. With the larks, the only other family in which this combination has been recorded, it shares the black tongue-spots and tips to the tongue and mandibles, but has an elaborate pattern not observed in any other genus thus far. Although lark-like in some aspects of their ecology and behaviour, songlarks have been considered by most authors to be most closely related to one of the groups of warblers. Some Old World warblers have tongue-spots and tipped tongues whereas none of the Australian

warblers (Acanthizidae) is known to have any mouth-markings. Sibley & Ahlquist (in press), using DNA-DNA hybridization, concluded that it belonged to the Sylviidae. It is also of interest that the palate colour of adult *C. mathewsi* differs between sexes, being pink in females and black in males (Mayr 1963). The sequence of palate change with maturity needs to be documented.

The taxonomic value of mouth-colours and markings differs from family to family. Conservative and uniform in some families, the markings are quite variable in the honeyeaters with five observed patterns in addition to the unmarked condition. Unlike previous authors, we have found considerable variation within other families, genera, and even species; most of these are endemic or near endemic Australasian families. The differences between congeneric species in *Cincloramphus*, *Psophodes* and *Phylidonyris* and between subspecies of *Daphoenositta chrysoptera* and *Meliphaga melanops* do not necessarily mean that these taxa are unnatural groupings as currently constituted. The morphological and ecological diversity of the honeyeaters might be expected to be reflected in these characters, more so than in a comparatively uniform group, such as the larks. Divergent mouth-patterns in members of a taxon may be only stages of a relatively continuous sequence and thus the differences may appear more pronounced than they actually are. Because mouth-markings are lost as the bird matures, age differences may account for some of the observed variation within a taxon. Care must be taken to ensure that comparisons are made between individuals of the same age. To resolve these types of problems, additional individuals of each taxon in question must be observed. For example, it would be of considerable interest to obtain views of other subspecies of *D. chrysoptera*.

The presence of mouth-markings in post-juvenile birds and changes in palate colour may be valuable as an aid to determining the age of the birds. Kuschert (1980) found that tongue-spots in the European Reed Warbler *Acrocephalus scirpaceus* were retained in first-year birds and subsequently lost before the second year.

In many species the colour of the inside mouth changes as the bird matures; Brown Thornbills *Acanthiza pusilla*, Yellow-tufted Honeyeaters *Meliphaga melanops* and Pied Currawongs *Strepera graculina*, for example,

have mouth-linings yellow-orange in the nestlings and black in the adults (pers. obs.). In Pied Currawongs, the mouth-colour goes from yellow-orange to black; the extent of the black on the palate is correlated with the degree of skull pneumatization (unpub. data). Similar relationships can be worked out for other species by comparing nestling data presented here with adult palate colours, many of which are given by Cleland (1913).

Mouth-markings of some taxa are sufficiently distinct to allow identification of nestlings to species. This could be helpful for unidentified birds, both alive and preserved.

#### ACKNOWLEDGEMENTS

We wish to thank the staff of the National Photographic Index of Australian Wildlife for access to the collection. Messrs S.A. Parker, T.R. Lindsey and L. Joseph made valuable criticisms of earlier drafts. Mr. N. Chaffer provided us with information from photographs in his possession. Ms D.S. Kent drew the figures. Dr R. Schodde drew out attention to the mouth-markings of certain honeyeaters which subsequently led to this study.

#### REFERENCES

- Bates, G.L. 1911. Further notes on the birds of southern Cameroon. *Ibis* (Ser.9) 5: 479-545 (Part I), 581-632 (Part II).
- Boles, W.E. and N.W. Longmore, 1986. Generic allocation of the Tawny-crowned Honeyeater S. *Aust. Orn.*
- Cleland, J.B. 1913. The colouration of the palate and pharynx of Australian birds. *Austral Avian Rec.* 2: 1-5.
- Ficken, M.S. 1965. Mouth colour of nestling passerines and its use in taxonomy. *Wilson Bull.* 77: 71-75.
- Harrison, C.J. 1975. *A Field Guide to the Nests, Eggs and Nestlings of British and European Birds*. New York: Quadrangle.
- Hindwood, K.A. 1966. *Australian Birds in Colour*. Sydney: Reed.
- Immelmann, K. 1982. *Australian Finches in Bush and Aviary*. Revised third edition. Sydney: Angus and Robertson.
- Ingram, C. 1907. On tongue-marks in young birds. *Ibis* (Ser.9) 1: 574-578.
- Kuschert, V.H. 1980. Zungenflekung und irisfarbe als alterskennzeichen beim Teichrohrzsanger (*Acrocephalus scirpaceus*). *Vogelwarte* 30: 214-218.
- Macleay, G.L. and C.J. Vernon. 1976. Mouthspots of passerine nestlings. *Ostrich* 47: 95-98.
- Mayr, E. 1963. Comments on the taxonomic position of some Australian genera of songbirds. *Emu* 63: 1-7.
- National Photographic Index of Australian Wildlife. 1982. *The Wrens and Warblers of Australia*. Sydney: Angus and Robertson.
- Reader's Digest. 1976. *Complete Book of Australian Birds*. Sydney: Reader's Digest Services Pty. Ltd.
- Sibley, C.G. and J.E. Ahlquist, 1982a. The relationships of the wagtails and pipits (Motacillidae) as indicated by DNA-DNA hybridization. *L'Oiseau et R.F.O.* 51: 189-199.
- , 1982b. The relationships of the Australo-papuan sittellas *Daphoenositta* as indicated by DNA-DNA hybridization. *Emu* 82: 173-176.
- , In press. The phylogeny and classification of the Australo-Papuan passerine birds. *Emu*.
- Swynnerton, C.F.M. 1916. On the colouration of the mouths and eggs of birds. — I. The mouths of birds. *Ibis* (Ser.10) 4: 264-294.
- Ticehurst, C.B. 1910. On the down-plumage and mouth-colorations of nestling birds. *Brit. Birds* 4: 70-73.
- Wetherbee, D.K. 1961. Observations of the developmental condition of neonatal birds. *Amer. Midl. Nat.* 65: 413-435.
- Walter E. Boles: Department of Ornithology, Australian Museum, 6-8 College Street, Sydney. N.S.W. 2000.*
- N.W. Longmore: Associate, Department of Ornithology, Australian Museum, 6-8 College Street, Sydney. N.S.W. 2000.*

Received 22 July 1983; accepted 23 January 1985