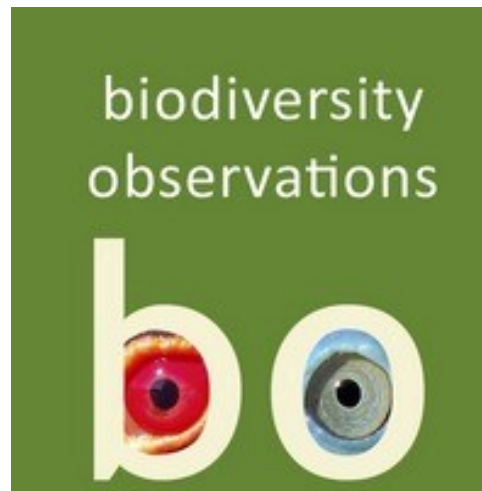


The use of eye-colour and other features to determine the age of Arrow-marked Babblers *Turdoides jardineii*

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Ornithology

The use of eye-colour and other features to determine the age of Arrow-marked Babblers *Turdoides jardineii*

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Abstract

As in most passerines, the appearance of an adult Arrow-marked Babbler *Turdoides jardineii* develops during the first year of life. Here we describe, based on photographic evidence, the development of the eye colour, and the colours of the bill and inner mouth.

Introduction

We have been ringing birds in southern Africa, and especially Namibia, for more than 20 years and are now evaluating our findings and our data on biometrics, moult and other features to determine age and sex of poorly-researched species and subspecies (Bryson 2023,

Bryson et al. 2023, Bryson & Pajjmans 2021, 2022, 2023, Pajjmans & Bryson 2023). Here we follow Arrow-marked Babblers *Turdoides jardineii* through the ageing process of the first year and describe and depict the changes of the colour of the eye, bill and inner mouth into adulthood (Figure 1). This paper is based on records from localities in southern Africa.

Methods

The subspecies were defined following the distribution maps and description in Dean (2005) and Collar & Robson (2020). Photographs were taken by the authors, unless specified otherwise.

Taxonomy

Arrow-marked Babblers occur from Uganda to South Africa and seven subspecies are recognized by Collar & Robson (2020). The status of the further subspecies *T. j. convergens* (Dean 2005) is under discussion, and it is sometimes subsumed under *T. j. jardineii* (Collar & Robson 2020).

First-year Arrow-Marked Babblers

The eye-colour of the Arrow-marked Babbler *Turdoides jardineii* undergoes changes during the first year of life and thus can be used for the determination of age, together with features on the plumage, the colour of the gape flange and the colouration of the inner mouth.

We found that newly-fledged individuals displayed a yellow gape flange and horn-coloured areas on the bill, mainly on the proximal lower mandible (Figure 2). At this stage, the eye is olive-brown, the skin of the eye-ring is still greenish-yellow and the inner mouth is dark yolk-yellow. The plumage shows a uniformly pale grey-brown (Dean 2005, Collar & Robson 2020) and only minute signs of arrow-like feather-tips are visible. The top of the head is still plain, while above the eye the typical pointed feathers start to show (Figure 2).



Figure 1: Adult Arrow-marked Babbler *Turdoides jardineii tamalakanei* with well-defined, arrow-like, white feather tips, black bill and inner mouth and eye with orange colour contained by a red outer ring. Katima Mulilo, Namibia, 2 October 2006.



Figure 2: A juvenile Arrow-marked Babbler *T. j. tamalakanei*, within a few weeks of fledging, and starting its partial post-juvenile moult, which is visible on head on neck, especially in (A). The young age is indicated by the greenish-brown eye-colour, the yellow skin around the eye, the yellow gape flange and the yellow inner mouth. Maun, Botswana, 25 February 2006.

Slightly later in their development, with progressing post-juvenile moult, white pointed feather tips grow on the throat and around the neck, while the gape flange fades into pale yellow, and the skin around the eyes darken (Figure 3).

With progressing age the eye starts to show an orange colour, still with a greenish tinge. The gape flange recedes and white, pointed tips appear on throat, chest and around the head (Figure 4).

The occurrence of first-year birds at a similar stage of development at different times five months apart probably points towards a complex scenario, such as opportunistic breeding after rainfall or an extended breeding season as in neighbouring Zimbabwe and elsewhere in southern Africa, where egg-laying has been recorded in all months of the year by Fry et al. (2000) and from October to February by Monadjem et al. (1994, p. 341; 1995, p. 517).

Skinner (1995) recorded that egg-laying dates in Botswana are from November to January. Despite this restricted timing, we found some individuals showed the white arrow-tips considerably earlier than others when compared to the changing gape and the eye-colour. The timing of the change of eye-colour and the decrease of the gape flange were also variable (Figure 5).

While the individual (A) still shows a muddy-orange eye and a swollen, light yellow gape flange in mid-October, the white feather-tips on the throat are distinct and already formed on the side of the neck (Figure 5). In contrast, at the end of February, the gape flange of (B) has shrunk and the eye is a richer shade of orange, and the feathers on the throat and chest are still in development (Figure 5).

After the post-juvenile moult which brings forward dark head-arrows and white tips on the chest and around the neck, the inner mouth and tongue still show a blackening yellow colouration. In fully grown adults the inner mouth, the edges of the bill, and the gape are entirely black (Figure 6).



Figure 3: First year Arrow-marked Babbler *T. j. convergens* in post-juvenile moult. (A) still with yellow skin ring around the eye, which is darkened in (B). Both in Mozambique, 9 February 2007.



Figure 4: Two first-year *T. j. jardineii* at the same stage of development with matching eye-colour and gape, but recorded in different seasons, about half a year apart. (A) is in head moult, shown by the white scale on the cheek. Both in Gaborone, Botswana: 11 October 2006 (A), and 10 March 2011 (B).

Figure 5: Two first-year Arrow-marked Babblers *T. j. jardineii*. Gaborone, Botswana, 11 October 2006 and Maun, Botswana, 25 February 2006 respectively.

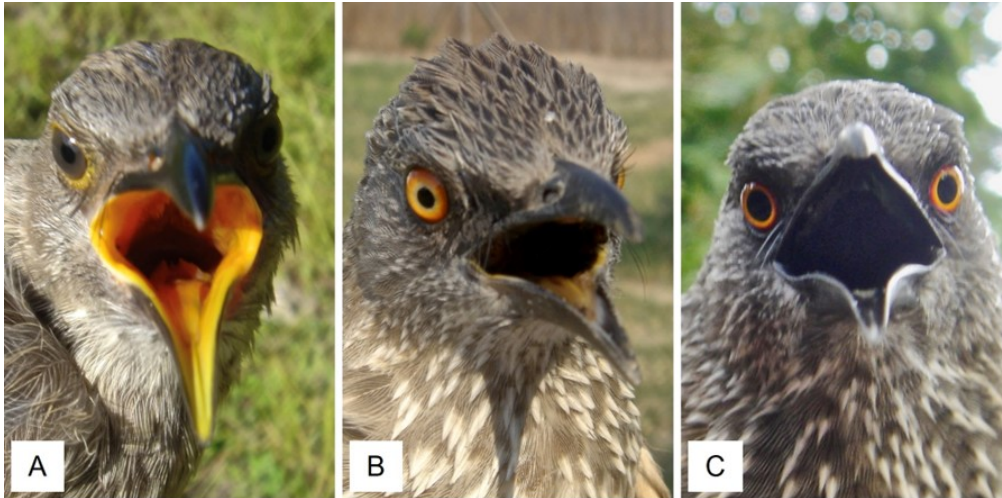


Figure 6: Mouth colouration developing from yolk-yellow in juveniles (A), to blackish yellow after the post-juvenile moult (B) and finally to fully black in adults (C). (A) Maun, Botswana, 25 February 2006. (B) and (C) Katima Mulilo, Namibia, 2 October 2006 and 24 January 2005 respectively.

Adult Arrow-marked Babblers

Fully grown adults of the subspecies *T. j. tamalakanei* display rich white feather-tips on the throat and chest, while the subspecies *T. j. convergens* has the "white streaks narrower and sharper" (Dean 2005, p. 813) (Figure 7A and B). The bright eye is usually of a light orange colour with a cherry-red outer ring.

Red Eyes

Some adults show plain red eyes where the inner ring is only faintly lighter. We hypothesize that this colouration is related to hormonal changes due to mating and preparation for breeding. Examples can be found in the [Macaulay Library](#).

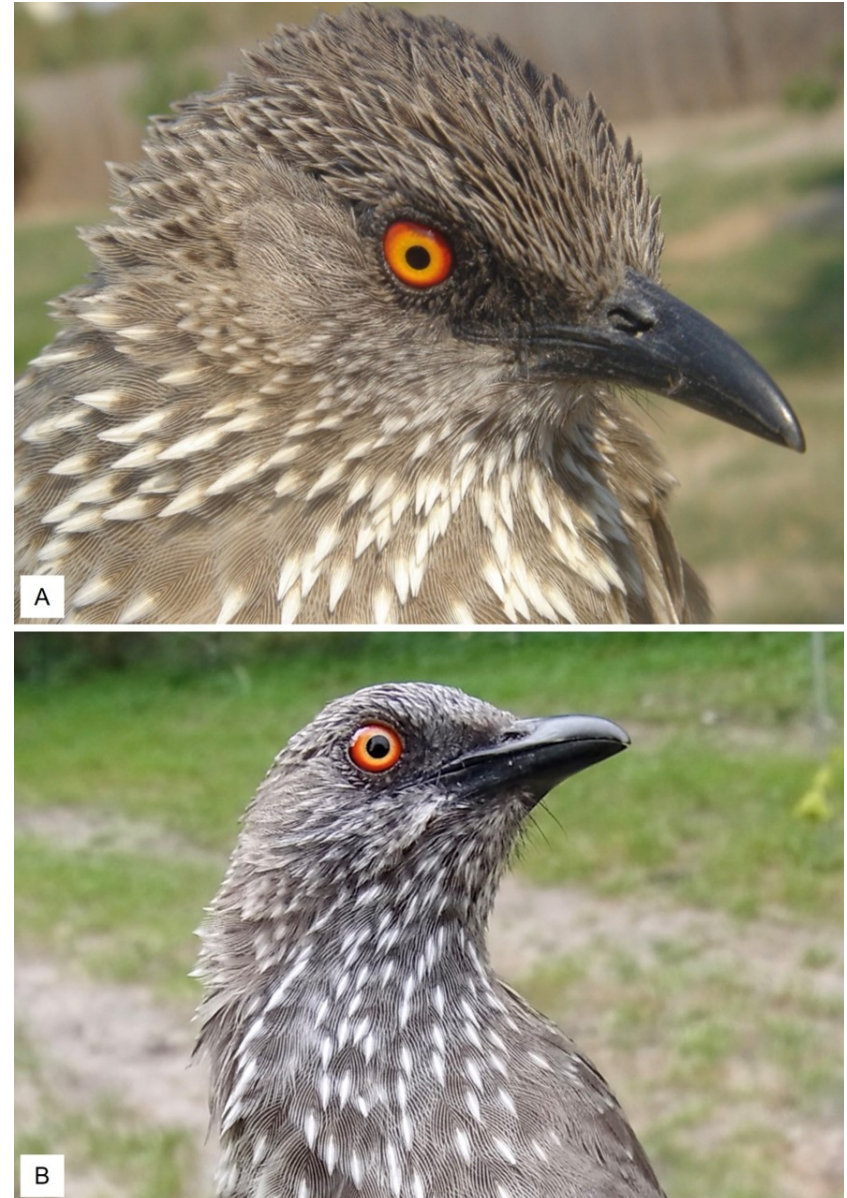


Figure 7: Adults of the subspecies *T. j. tamalakanei* (A) with broad and of the subspecies *T. j. convergens* (B) with narrow white feather-tips on throat and upper chest. Both southern species show an orange-coloured eye with a red outer ring. (A) Katima Mulilo, Namibia, 2 October 2006. (B) Maun, Botswana, 25 February 2016.

Figure 8 shows a probable male calling during courtship in October, Figure 9 shows an adult carrying nesting material in March. It is undetermined if this feature is restricted to the time before breeding or if it occurs in males only: A female on the nest with yellow-and-red eye (photo by Ken Oake, Botswana) is depicted in Tarboton (2004, p. 274).

Eye colour in northern subspecies

Looking through photos of northern subspecies we hardly found the orange and red eye colour, but predominantly plain yellow eyes or only slight orange rings around the inner yellow of the eye. Figures 10 and 11 show adults from Tanzania, Kenya and Uganda, Figure 12 shows a bird from Kenya with a yellow eye and a hue of an orange outer ring.



Figure 8: Arrow-marked Babbler with plain reddish eye, described as vocalizing during courtship. Kruger National Park, South Africa, 9 October 2022. Photo courtesy of Dylan Vasapolli/Birding Ecotours. [Macaulay Library ML582753151](#).



Figure 9: Arrow-marked Babbler with plain reddish eye carrying nesting material. Chobe NP, Botswana, 1 March 2018. Photo courtesy of Michael Woodruff. [Macaulay Library ML89597911](#).

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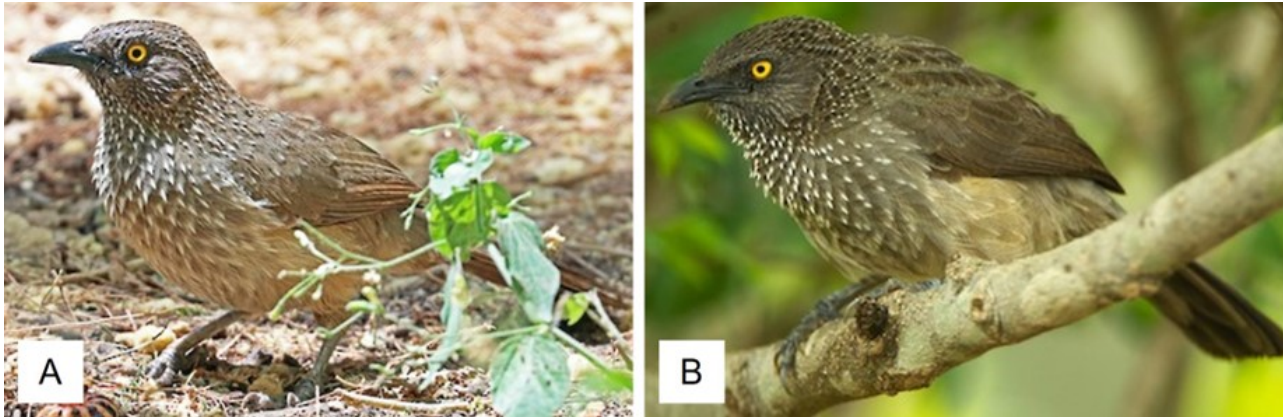


Figure 10: Adult Arrow-marked Babblers with bright uniform yellow eyes. (A) Arusha, Tanzania, 13 September 2018. Photo copyright by Greg Griffith. Source: [Macaulay Library ML204329891](#), and (B) Maasai Mara NR, Rift Valley, Kenya, 6 October 2010. Photo copyright by Francesco Veronesi. Source: [Macaulay Library ML465637531](#).



Figure 11: Adult Arrow-marked Babblers with bright uniform yellow eye. Western Uganda, 29 November 2019. Photo copyright by Corey Finger. Source: [Macaulay Library ML311945951](#).



Figure 12: Young adult Arrow-marked Babbler with bright uniform yellow eye. Massai Mara NR, Kenya, 3 June 2013, Photo copyright by Tommy Pedderson. Source: [Macaulay Library ML100523431](#).

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