Morphological sexing of babblers: comments on Lambert and Blackmore (*Corella* 39, 2015)

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I found the discriminant function presented in Lambert and Blackmore's (2015) paper on morphological sexing of Grey-crowned Babblers *Pomatostomus temporalis* unusable and the results were incomplete.

In birds and other higher vertebrates, the male is larger than the female in most species (i.e. 'normal' sexual size dimorphism; Amadon 1959; Andersson 1994). Male Grey-crowned Babblers in central western New South Wales averaged longer in head-bill length than females. The pooled means (calculated from Table 2 in Lambert and Blackmore 2015) are: females 54.9 mm (n = 81) and males 57.8 mm (n = 109). Lambert and Blackmore proposed a univariate discriminant function to sex individual babblers in the field:

D = 0.776 × head-bill length (mm) – 43.920

Discriminant scores (D) and head-bill length are inter-convertible using the discriminant function. For males, the proposed cut-off of D > 1.017 gives:

Head-bill length > (1.017 + 43.920) ÷ 0.776 = 57.9 mm

which is slightly larger than the male pooled mean. For females, the cut-off of D < 1.610 gives:

Head-bill length < (1.610 + 43.920) ÷ 0.776 = 58.7 mm

However, for normal sexual size dimorphism, the female cut-off cannot be larger than the male cut-off. Birds measuring between 57.9 and 58.7 mm are not hermaphrodites! I suspect that a minus sign was omitted and the correct female cut-off could be D < –1.610, which is equivalent to:

Head-bill length < (–1.610 + 43.920) ÷ 0.776 = 54.5 mm

and slightly smaller than the female pooled mean.

The two cut-offs contain a range where sex is indeterminate: D = –1.610 to 1.017 or head-bill length = 54.5 to 57.9 mm. However, Lambert and Blackmore (2015) simply reported 87.1% accuracy for their discriminant function without detailing the numbers of birds sexed correctly, indeterminate and incorrect.

Next, Lambert and Blackmore (2015) compared discriminant function sexing to using head-bill length alone. They reported 64.7% accuracy (123 of 190 birds sexed correctly) for head-bill length alone, 33.7% in the 'overlap range'(64 birds) and 1.6% errors (3 birds). However, the head-bill length cut-offs (the overlap range) used were not specified.

Lambert and Blackmore (2015) could assist Corella readers and correct and more fully explain their results. They could explain the probability cut-offs behind the discriminant score cut-offs and interpret them using head-bill length. They could also discuss the advantages and disadvantages of using two cut-offs versus one cut-off and the problem of overlapping measurements and indeterminate results. Lambert and Blackmore (2015) stated repeatedly that their morphological sexing error rates may be acceptable 'for some studies'. They could give some examples where low rates of indeterminate or erroneous sexing results might be acceptable.

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Morphological sexing of babblers: a response to Totterman

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The primary aim of our study (Lambert and Blackmore 2015) was to demonstrate that Grey-crowned Babblers *Pomatostomus temporalis* cannot be reliably sexed by the size of morphological characters, as has been previously reported (Counsilman and King 1977). The authors are grateful to Totterman for noting the typographical omission of the minus sign in our cut-off for female Grey-crowned Babblers. The correct cut-off for females should indeed have been reported as D< -1.610. From our test dataset of 31 birds, 87.1% (27/31) were sexed correctly, with four falling into the overlap range. We used a classification DFA (without the stepwise process) to sex the birds using head-bill length alone. We report the proportion of birds sexed correctly to demonstrate the superior reliability of the stepwise DFA model, and consider publication of the cut-offs generated by the inferior classification model to be irrelevant; head-bill ranges and overlaps are already presented in Fig. 3.

We do not consider that a more detailed evaluation of the method of discriminant function analysis was warranted in our original paper, which is only concerned with the question of whether the method can be applied to sex Grey-crowned Babblers with certainty. However, we do note that the DFA was a stepwise function that selected the head-bill length as the best sexing measurement with two cut-off points due to the overlap in morphology. Whilst we reiterate that molecular techniques should be used to resolve sex in this species, estimates of gender with a high error rate may be tolerable in ecological studies of abundance and presence or studies where the breeding unit, as opposed to group composition, is the focus.

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