Sex-related variation in morphology of helmeted guineafowl (*Numida meleagris*) from the Riemland of the north-eastern Free State, South Africa

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In the hope of developing a relatively simple, non-destructive way of sexing adult helmeted guineafowl (*Numida meleagris*), sexual differences in body mass and in the size of head adornments of adult helmeted guineafowl sampled during the winter months in the Riemland district of the northeastern Free State, South Africa, were investigated. Males have statistically significantly larger values for all attributes than do females. However, no single attribute, nor a combination of them, can be used to sex guineafowl unambiguously.

Key words: morphology, Riemland, helmeted guineafowl.

The helmeted guineafowl (*Numida meleagris*) is superficially sexually monomorphic, but male birds are said to have higher body masses (Siegfried 1966), larger helmets and longer and wider gape wattles (Fig. 1; Crowe 2000). Since knowledge of the sex ratio within gamebird populations is important for their effective management and it is difficult to sex non-breeding guineafowl, even by internal examination of gonads (Crowe 1978), this study attempts to determine the effectiveness of measurements of overall size (= body mass), helmet and wattle size and the development of cartilaginous structures on the cere (Fig. 1) as predictors of the sex of adult guineafowl.

The study area was in the Riemland district of the northeastern Free State, South Africa, situated between the towns of Heilbron (27°20′00″S, 27°57′00″E) to the north, Petrus Steyn (27°39′00″S; 28°08′00″E) to the south, Frankfort (27°16′30″S; 28°30′00″E) to the east and Hoogte (27°25′00″S; 28°03′00″E) to the west.

Data analysed were derived from 579 adult guineafowl (403 males, 176 females) shot during July/August 2002 and 2003. The sex of all birds was determined by examining their gonads.

Body mass was estimated to the nearest gram using a Salter spring balance. Helmet height and width and wattle length and width (Fig. 1) were measured to the nearest 0.1 mm with Vernier callipers. The development of wart-like cartilaginous structures on the cere (Fig. 1) was assigned one of three values: 0 = absent; 30 = moderate; 100 = well developed. Two-sample Student's *t*-tests assuming unequal variances were used to determine potentially significant differences in body mass and helmet/wattle measurements between males and females. Those attributes that exhibited significant differences were examined singly and in combination to determine their ability to predict the sex of helmeted guineafowl.

Statistics for body mass and helmet- and wattle measurements are summarized in Table 1. Although the ranges for all measurements overlap considerably, the means of all measurements are significantly ($P < 0.001$) greater for males. A histogram of the sum of the measurements (with body mass divided by 100 to bring it within the magnitude of measurements of helmets and wattles; Fig. 2) demonstrates their failure even when combined to predict sex effectively.

Even a stepwise discriminant analysis (Dixon 1985) employing all six measurements (order of discriminating ability: wattle length, mass, helmet

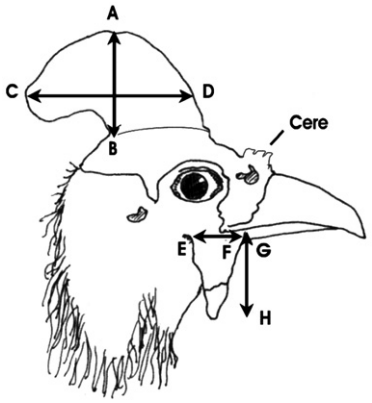

Fig. 1. Helmet and wattle measurements that were taken for individual guineafowl in the Riemland, South Africa, in 2002 and 2003: helmet height (A–B), helmet width (C–D), wattle length (E–F), wattle width (G–H). The cere structure depicted would be scored 100.

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Table 1. Means, standard deviations and ranges by sex for body mass and measurements of helmets and wattles of adult helmeted guineafowl from the Riemland.

	Cere	Body mass	Helmet length	Helmet width	Wattle length	Wattle width
Males	22.7 ± 34.3	1420 ± 99 1029–1686	25.7 ± 4.0 13.8–30.7	28.6 ± 8.7 8.9–52.7	24.9 ± 3.4 11.5–35.9	12.8 ± 1.7 8.5–26.3
Females	8.6 ± 34.3	1330 ± 110 1009–1686	22.5 ± 3.7 12.1–37.2	22.9 ± 8.7 8.9–52.7	21.6 ± 3.5 11.5–35.9	11.9 ± 1.7 7.0–26.3

width, helmet length, cere development), with the data normalized provided only a 74% correct prediction of sex.

Although none of the measurements individually (or in combination) employed here can predict the sex of adult helmeted guineafowl from the Riemland unambiguously, Fig. 2 does show bimodality. The smaller mode consisting of birds with a high combined score (>180) is comprised almost entirely of male birds (93%) and all 62 birds with scores >180 have well-developed cere structures. Furthermore, only seven (11%) of the 65 birds with well-developed cere structures were females. Thus, it is tempting to use this attribute as a predictor of male guineafowl. However, if this structure increases in size with age, the dominance of males amongst birds with well-developed cere structures may be due to the failure of females to live long enough for these structures to become well developed. Since the sex ratio of adult male to female guineafowl in the Riemland is 2:1 favouring males probably due to higher mortality amongst females (Prinsloo *et al.,* unpubl. data), it is likely that this is the case.

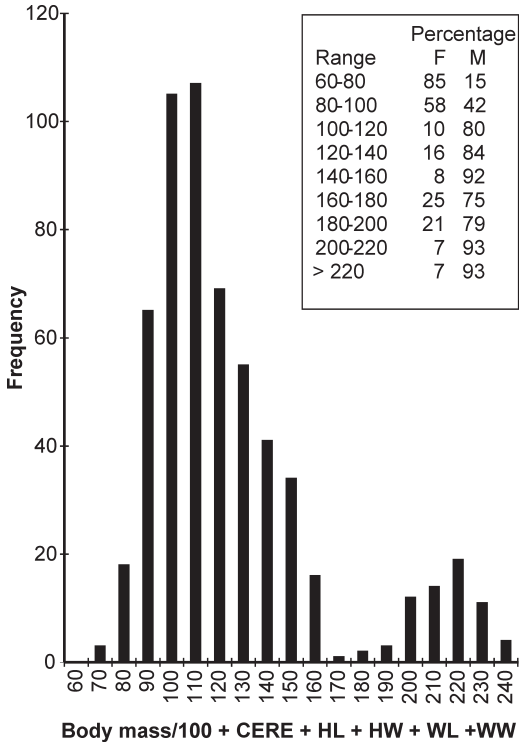

Fig. 2. A histogram of helmeted guineafowl specimens according to the sum of body mass divided by 100 and measures of cere development (CERE), helmet length (HL), helmet width (HW), wattle length (WL) and wattle width (WW).

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