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TARSUS LENGTH AS A SEX DETERMINANT IN THE SUPERB LYREBIRD *Menura novaehollandiae*

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In 1971 I noted some confusion in the recorded sex of plain-tailed Superb Lyrebirds *Menura novaehollandiae*. For two birds held in captivity, one was believed to be an adult male (correct by tail type) and the other a sub-adult male. Having recorded tarsus measurements of road-killed birds which were sexed by dissection, I believed the sub-adult male was in fact a female because of its shorter tarsus length. A measurement that would enable the accurate sexing of lyrebirds in juvenile plumage is necessary since Burton 1969 states that male lyrebirds do not attain their distinctive tail until three years of age. Other research however, has found that tail plumage gradually changes from the age of two years (Moroney 1972) with each bird following its own course through a series of annual moults, extending over 6–8 years before producing a mature tail (Smith 1982).

During August 1968 to January 1983, 16 road-killed lyrebirds and one live bird (tarsus only measured) were sexed by dissection and tarsus lengths were measured as per Disney (1974). With respect to tarsus length, the length of the tarso-metatarsal bone was determined with vernier calipers, from the notch at the back of the intertarsal joint to the lowest edge of the first complete scale immediately proximal to the point where the toes separate. Five specimens were severely mangled and full compliment of measurements could not be taken. Thirteen Australian Museum Data Sheets were completed. The stomach contents were also noted (Rose 1973). These data clearly indicated that females have shorter tarsi than males, irrespective of age. In order to confirm this initial finding other lyrebird skins were sort for further analysis.

In 1976, the tarsi were measured on birds held in the Australian Museum collection. Plain-tailed birds without the sex recorded on the specimen label were not included. One specimen with a typical adult male tail had a tarsus measurement that fell within the range assigned to females (see Table 1). This specimen was unusual in that it did not have the plumage typical of an adult male. It was as if a male tail had been sewn on to the skin of a sub-adult female. On close inspection this in fact proved to be the case; the tail had been sewn on to the specimen. As the specimen was collected 80 years ago my only option was to exclude it from the data analysis. In 1998 Walter Boles kindly sent to me copies of Data Sheets of lyrebird skins held at the Australian Museum and copies of recent papers on the development of the adult male lyrebird tail.

In 1977 I visited the British Museum (Tring, Hertfordshire, England), and on examining their collection of lyrebird skins, I found they were mainly 19th Century specimens that had been sexed by the tail-type. On nine mature-tailed male birds, the tarsi were measured and included in this paper. Two of the plain-tailed skins labelled as females had on close inspection, commenced to grow male tail feathers, for the observed filamentous feathers were not worn adult female tail feathers. The tarsi measurements for these birds were within the range reported here for males. Thus, these data were included in the data set for males, whereas other plain-tailed skins held by the British Museum were excluded from the current analysis if the bird's sex had not been confirmed by dissection.

The Ipswich Museum (Ipswich, Suffolk, England), held two male specimens with complete tails, which are included in the data set. The Cambridge University Natural History Museum (Cambridge, England) held seven lyrebird skins correctly sexed. One was a juvenile bird still possessing down and was collected by Van Heugel in 1974 from the Dandenong Ranges, Victoria, Australia. The Curator of Birds at the Cambridge University Natural History Museum (C. W. Benson) assured me that it had

TABLE 1

Means and standard deviations for morphometric data collected from varying numbers of female and male lyrebirds. Two-tailed t-tests indicate there are significant differences between the sexes for all the morphometric data included in Table 1. Males were larger than females in all cases. The probability for the comparison of tarsus measurements between the sexes was much lower than for the other morphometric data, which could be due to a greater difference or a larger sample size.

	Female Lyrebirds							Male Lyrebirds						
	WT (g)	LE (mm)	WS (mm)	WL (mm)	TA (mm)	BL (mm)	TZ (mm)	WT (g)	LE (mm)	WS (mm)	WL (mm)	TA (mm)	BL (mm)	TZ (mm)
(n)	16	12	14	17	13	12	24	8	7	8	9	6	8	31
$\bar{x}$	654.7	768.8	709.6	245.7	451.6	39.7	95.5	932.0	921.1	807.3	276.6	574.5	41.8	111.4
SD	157.4	36.7	83.4	34.0	36.3	1.9	3.6	187.6	123.0	31.0	11.8	134.9	2.0	3.4

Wt = weight; LE = total length; WS = wing span; WL = wing length; TA = tail length; BL = bill length; TZ = tarsus length.
(Weight: $t_{22} = 3.82$, $p = 0.0009$; Total length: $t_{17} = 4.06$, $p = 0.0008$; Wingspan: $t_{20} = 3.16$, $p = 0.0049$; Wing Length: $t_{24} = 2.62$, $p = 0.015$; Tail Length $t_{17} = 3.14$, $p = 0.006$; Bill length: $t_{17} = 2.35$, $p = 0.031$; Tarsus Length: $t_{53} = 16.99$, $p < 0.000001$).

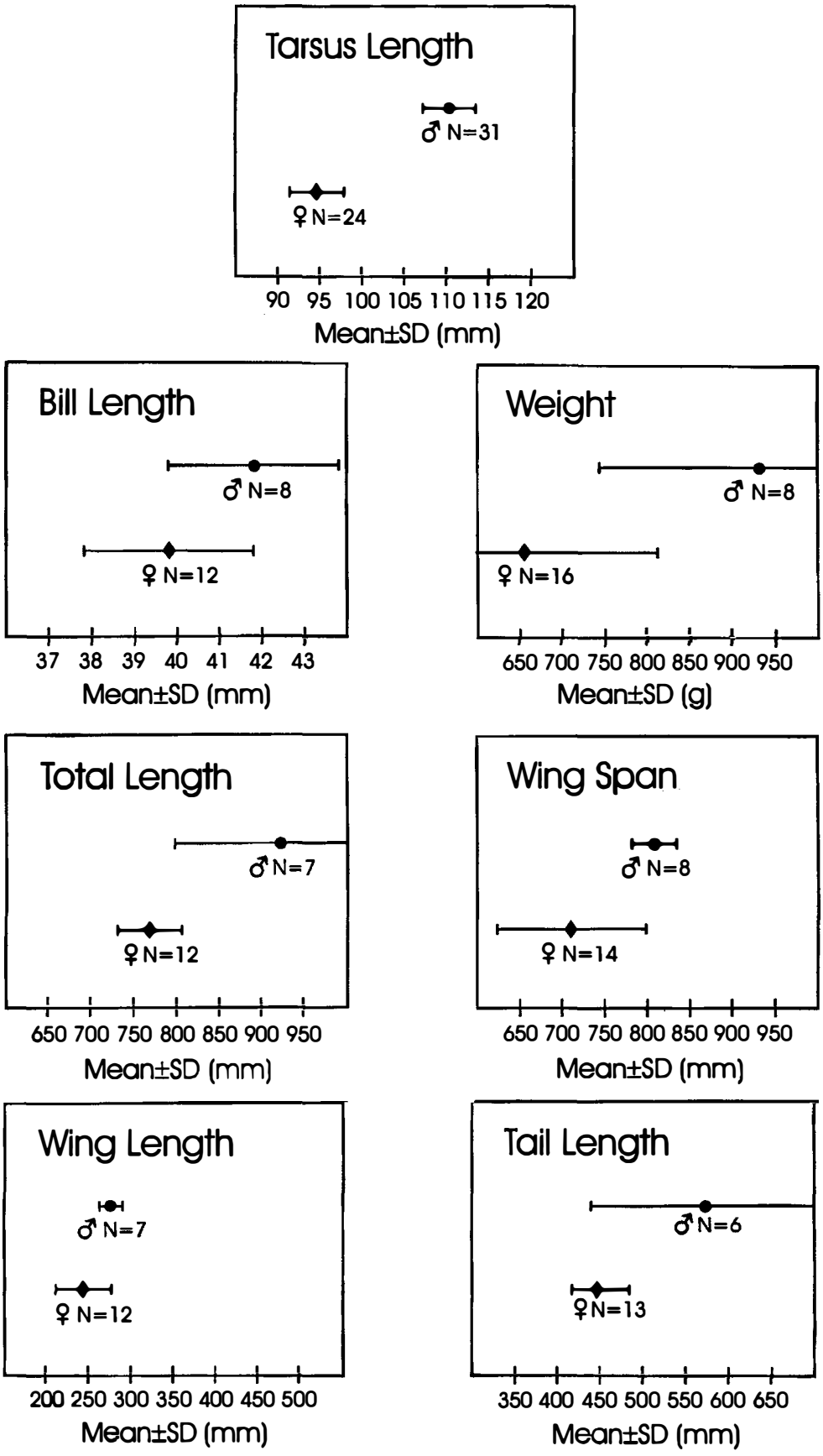

Figure 1. *Means and standard deviations for morphometric data collected from varying numbers of female and male lyrebirds. Wt = weight; LE = total length; WS = wing span; WL = wing length; TA = tail length; BL = bill length; TZ = tarsus length.*

been sexed by dissection and correctly recorded as a male by Van Heugal. With a tarsus measurement of 112 mm, this value lies well outside the range reported here for females.

Unfortunately not all of the collected specimens had complete sets of morphometric data. Nevertheless, Table 1 presents the mean weight, total length, wingspan, wing, tail, bill and tarsus length for male and female Lyrebirds. An analysis of the data clearly indicates that male lyrebirds with a mean tarsus length of 111.4 ± 3.4 mm can be distinguished from females with a mean tarsus length of 95.5 ± 3.8 mm. (see Fig. 1).

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FLEDGING DATE AND POST-FLEDGING PERIOD OF THE SOOTY OWL *Tyto tenebricosa*: A COMMENT ON PAGE (2000)

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Page (2000) reported two dependent juvenile Sooty Owls *Tyto tenebricosa* in northern New South Wales in April 1997, and speculated on the basis of their dark plumage that they were 10 months old. Reference to Higgins (1999) and recent studies cited therein reveals that there is no basis for such a conclusion. Sooty Owls can lay in almost any month of the year; Sooty and other large forest *Tyto* hatch after 5–6 weeks' incubation, fledge at 2–3 months, and have lost visible traces (in the field) of pale natal down, to reveal full (dark) juvenile plumage, within a month of fledging (Higgins 1999). Therefore, all one can say is that dependent juvenile Sooty Owls, past the downy stage and therefore fledged at least a month, were seen in early April, with no conclusions possible on hatching/fledging dates or length of post-fledging dependence period. I also have two records (from different territories) of dependent juvenile Sooty Owls in April and May in northern New South Wales, in the Border Ranges in 1990. The post-fledging period has been estimated at 3–5 months for the Sooty Owl (Higgins 1999), although further study is needed on this and other aspects of the breeding cycle of large *Tyto*.

Some other statements by Page (2000) also require updating in the light of recent studies cited in Higgins (1999). The Sooty Owl's northern limit is Eungella National Park near Mackay; with appropriate survey techniques in suitable habitat it is frequently detected, and in some parts of northern New South Wales is the most frequently encountered large forest owl; there have been several comprehensive dietary studies in the 1990s.

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REPLY

I wish to thank Steve Debus for his comments. I agree since the article was first written in early 1999 there has been more relevant references published (Higgins, P. J. (Ed.), 1999. *Handbook of Australian, New Zealand and Antarctic Birds*: Vol. 4. Oxford University Press, Melbourne). The aim of the article was to publish an interesting breeding record and stimulate debate on the species as well as increasing our broader knowledge of threatened avifauna. One of *Corella's* aims is to publish these types of interesting observations with the goal of exchanging data and I encourage others to use this Journal for this function. Active debate and sharing of ideas is important.

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