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Measurements, Weights and Seasonal Variation of the Mangrove Honeyeater in south-east Queensland

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Analysis of the measurements of museum specimens of Mangrove Honeyeaters *Lichenostomus fasciogularis* indicated that there were significant differences between the sexes. Males had larger wing, tail and culmen lengths and weights than females. Most of these parameters were not normally distributed but Critical Values were calculated to allow sexing of individuals with approximate levels of probability (generally 70-80%). Specimens collected from Mount Dryander (BM(NH) were larger than specimens from other areas of Queensland.

Frequency histograms of measurements from Mangrove Honeyeaters banded at Wellington Point near Brisbane showed a clear bimodal distribution only in the case of weights. There was a marked influx of birds in May-June followed by a sharp decline from July-December. The mean weights of males and females were remarkably constant throughout the year.

The Mangrove Honeyeater *Lichenostomus* (= *Meliphaga*) *fasciogularis* is restricted to the coastal fringe of eastern Australia, extending from Smoky Cape in northern New South Wales to Townsville in Queensland (Ford 1978, Officer 1964). Recently Ford (1978) described intermediate forms between the Mangrove Honeyeater and the Varied Honeyeater *L. versicolor* from near Townsville and suggested that the two taxa may be conspecific.

Both sexes of the Mangrove Honeyeater have similar plumage and although Mathews (1924) noted that females were smaller than males, there have been no critical analyses of this size difference nor of the possibility of using it to distinguish the sexes.

Mangrove Honeyeaters are largely confined to coastal mangroves but will also enter neighbouring gardens and this study is partly based upon birds handled at a garden banding station.

Methods

Banding operations* took place in J. S. Robertson's garden at Wellington Point near Brisbane from 1964 to 1975. Most of the birds were trapped while feeding from a sugar and water solution (Robertson 1964, 1966) but some were also netted. Banding activities continued throughout each year with no emphasis on a particular season.

The birds were measured using the techniques described by Disney (1974) and were weighed to the nearest gram on a letter balance (Robertson 1966).

Museum specimens were examined and measured in the British Museum (Natural History) and the Queensland Museum and were borrowed from the American Museum of Natural History and The Australian Museum.

* Bands used were provided by the Australian Bird-banding Scheme, Division of Wildlife Research, CSIRO.

The analysis of measurements was restricted to those specimens collected post-1940 since it seemed likely that some of the earlier specimens had been incorrectly sexed.

Statistical analyses were performed using the techniques described by Sokal and Rohlf (1969).

Results

Museum Specimens

Initially the data from museum specimens were examined to determine whether they conformed to the normal distribution. There was no evidence of significant skewness for any of the parameters listed in Table 1 except female culmen length. However, with only two exceptions (male wing length, female weight) there was significant leptokurtosis (data more concentrated about the mean than the corresponding normal distribution) in all parameters measured. This means that although means and standard errors of means are presented in Table 1, they must be interpreted and used with caution.

The significance of the differences between the sexes was tested using the non-parametric Mann-Whitney U-Test. This indicated (Table 1) that there were significant differences between male and female measurements for all parameters except tarsus length.

In order to use these differences in a diagnostic manner, the Critical Value, Significance and Power of the measurements were calculated (Day 1977, Sokal and Rohlf 1969). A bird with dimensions greater than the C.V. should be a male; one with smaller dimensions should be a female.

The Significance of the test = probability that the bird has dimensions greater than the C.V. when it is actually a female;

The Power of the test = 1 – (probability that the bird has smaller dimensions that the C.V. when it is actually a male).

TABLE 1

Measurements and weights of the Mangrove Honeyeater.

Measurement		This study		Museum Specimens		Significance of sex diffs. in museum data	Critical Value	Significance/ Power
		?M	?F	M	F			
Wing length	Mean	92.8	87.7	94.2	88.7	**	91	0.19 /0.80
	S.E.M.	0.2	0.3	1.0	1.2			
	n	117	99	13	9			
Tarsus	Mean	26.2	25.6	26.4	25.7	N.S.		
	S.E.M.	0.6	0.6	0.3	0.4			
	n	9	9	13	9			
Culmen	Mean	17.7	15.8	18.4	17.1	**		
	S.E.M.	0.2	0.2	0.2	0.5			
	n	9	9	13	9			
Tail	Mean	84.2	79.4	84.9	78.6	*	82.5	0.29 /0.73
	S.E.M.	1.3	2.6	1.1	2.2			
	n	9	9	13	9			
Weight	Mean	31.1	25.6	29.2	25.8	*	27.5	0.20 /0.78
	S.E.M.			0.8	0.8			
	n	169	145	7	5			

(N.S. = P>0.05; * = P<0.05; ** = P<0.01)
S.E.M. = Standard Error of Mean.
n = Sample Number.
N.S. = Not Significant.

The C.V. is chosen so as to minimise the Significance and maximise the Power thus increasing the probability of correctly sexing a bird.

Critical values, significance and power are presented in Table 1 for wing and tail lengths and weight. They are omitted for tarsus and culmen lengths because the sex differences are are either non-significant or of very small magnitude. Since the calculation of Critical Values requires a normal distribution, these values may not be very accurate but they should be of practical use and indicate that 70-80% of birds will be correctly sexed using the Critical Value.

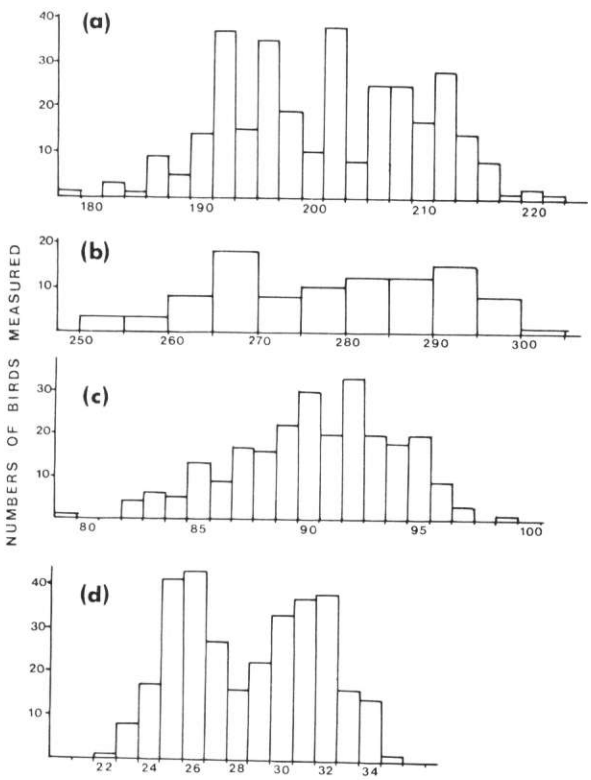
While analysing the data from museum specimens it was noticed that the British Museum (Natural History) specimens collected from Mount Dryander seemed larger than the other specimens from Queensland, both to north and south. Significant differences (Mann-Whitney U-test, $P<0.05$) were observed between the Mount Dryander and all other specimens for male wing and tail lengths. Other parameters tended to show similar trends but they were not statistically significant.

Due to the paucity of sexed specimens available, the BM(NH) and all other specimens were lumped together for the calculations in Table 1 but this will have introduced greater variability and may well account for non-normal distributions observed.

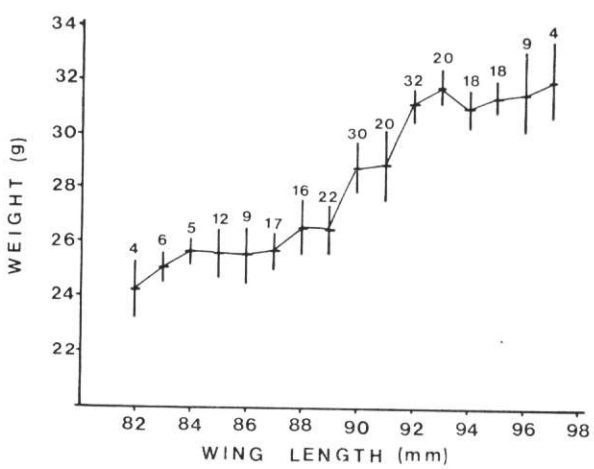
Banding operations at Wellington Point

The measurements collected by J. S. Robertson at Wellington Point were first examined by frequency histograms (Fig. 1). For most parameters (e.g. length, wing span and wing length, etc.) there was no clear indication of bimodal distribution but in the case of weights there was a definite bimodal distribution with the lowest point between the bimodal peaks at 28 g.

This was investigated further by examining the relation between weight and wing length (Fig. 2). This indicated that mean weight was remarkably constant for a range of wing lengths



• Figure 1. *Frequency histograms of measurements taken from Mangrove Honeyeaters banded at Wellington Point, Brisbane: (a) Length; (b) wing span; (c) wing; (d) weight. Lengths were measured in mm, weight in g.*



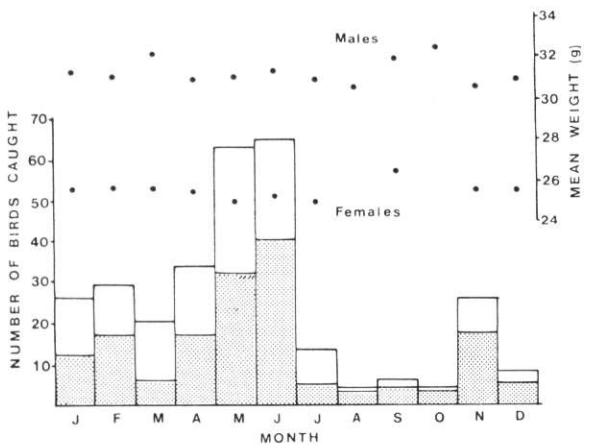
• Figure 2. *The relation between weight and wing length of Mangrove Honeyeaters banded at Wellington Point, Brisbane. The short horizontal bar indicates the mean weight; the vertical line indicates ± 2 S.E.M.; and the numbers show sample sizes.*

from 82-89 mm, then there was a sharp rise to another region of uniform mean weights for wing lengths of 92-97 mm. This supported the indication that weights were arranged in two fairly discrete groups.

Unfortunately it does not seem possible to separate immature from adult Mangrove Honeyeaters on features of plumage and the combination of all age classes may account for the "flat" histograms (e.g. wingspan) in Figure 1. There were also insufficient recaptures of banded Mangrove Honeyeaters at Wellington Point to demonstrate changes of body size, wing or wing span with age.

The museum data on weights, although very limited, supported this with a critical value of 27.5 g. For reasons discussed below, 28 g was used as a Critical Value for sexing the banded birds and, on this basis, their mean measurements are presented in Table 1.

Using the same sexing criteria (C.V. $>$ 28 g), seasonal variation in the numbers of birds banded and their mean weights are presented in Figure 3.



• Figure 3. *Seasonal variation in Mangrove Honeyeaters banded at Wellington Point, Brisbane. The histogram represents the number of birds caught in each month of the year, with the shaded areas indicating males and the clear areas females. The mean weights of males and females in each month are illustrated above.*

Discussion

Analysis of measurements from museum specimens of Mangrove Honeyeaters show that there are significant differences between the sexes and that it is possible to sex individual birds on the basis of measurements although not with a high level of reliability.

Before using the data presented here to sex a field population of birds, it is important to determine the distribution of measurements within that population as was done at Wellington Point. This is particularly important since data from specimens collected at Mount Dryander indicate that there may be significant differences between local populations. The reasons for these differences would require more investigation.

Measurements of the Mangrove Honeyeaters banded at Wellington Point (sexed according to a C.V. of 28 g) are very similar, or slightly smaller than the museum specimens (Table 1), but the weights of males are larger. This justifies using 28 g as a C.V., rather than 27.5 g indicated by the museum weight, and may reflect that these were birds caught at a feeding station providing an almost inexhaustable supply of high quality food.

The numbers of Mangrove Honeyeaters caught at the feeding station shows considerable seasonal variation (Fig. 3). There appears to be a marked influx of birds in May and June followed by a decline to much lower levels in July to October-December. Reports in the literature indicate the breeding season to be from August to December (extending to April/May in northern Queensland) (Reader's Digest 1976) and one could speculate that the decline in numbers observed at Wellington Point is the result of birds leaving the feeding station to breed in the mangroves. The influx of birds in May-June could be the result of young birds entering the population but one would expect to see this earlier in the year and it is more likely to be the result of local movements although there is no evidence to support this at present.

The sex ratio shows no significant difference from a 1:1 ratio (Chi-squared test) although in spring there appears to be a predominance of males.

The mean weights of males and females appear to be remarkably constant. Since the birds were sexed using a criterion of weight, the frequency distribution of the weights ends at above 28 g for females and below 28 g for males and thus it would be inappropriate to calculate the variance of these means. The means change by little more than ± 1 g throughout the course of the year (Fig. 3). This may be a response to the abundant supply of food provided.

This study has indicated the importance of recording the weights of birds handled during banding operations. In the Mangrove Honeyeater, weight seems to be one of the most useful parameters to distinguish the sexes. However, in order to use these data, it is first necessary to examine a series of accurately sexed specimens. Unfortunately most early museum specimens do not record weights and, in some cases, the reliability of the sexing is in doubt.

Even with more recent specimens there is a danger that, when specimens have been stored in a deep freeze for some time in an unsealed container, there may be a considerable loss of weight due to dehydration. This leads to spurious weights being recorded at the time of skinning.

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