A METHOD OF AGEING THE TUI (Prosthemadera novaeseelandiae) AND ITS USE IN ASSESSING BODY MEASUREMENTS

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Ageing and moult

Adult Tuis have a narrow eighth primary*, with a notch out of the inner web, an adaptation which probably causes their loud whirring flight. While examining Tuis in the National Museum of New Zealand, I noticed that juvenile birds, with brown body plumage, do not have this notch on the eighth primary and that the feather is also wider. Figure 1 shows these differences and also illustrates the variation in the size and shape of the adult notch. Despite this variation, the differences between a juvenile and an adult primary were always easy to see. When I looked at all adult plumaged Tuis in the Auckland, Canterbury, Otago and National Museums, I found that 26 of the 132 birds lacked a notch on the eighth primary.

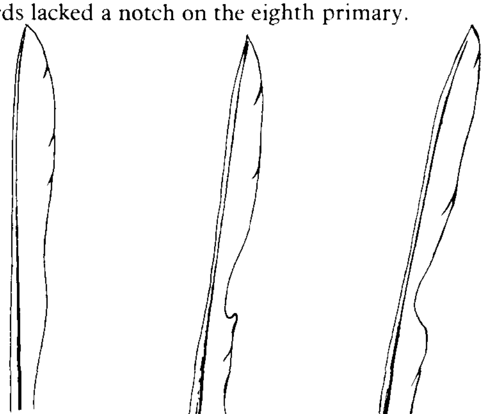

FIGURE 1 — Examples of the shape of the eighth primaries of Tuis

Most temperate passerine species undergo only a partial moult in their first autumn, replacing their juvenile body feathers and wing coverts but retaining their main flight and tail feathers (Ginn & Melville 1983). For example, in the male Blackbird (*Turdus merula*), the retained browner juvenile primaries stand out well against the glossy black adult body feathers. The two moulting juvenile Tuis in the museum collections were moulting their body feathers

*Primaries are numbered descendantly, that is, starting from the innermost.

only, suggesting that Tuis, like many other temperate passerines, retain their juvenile primaries until their second autumn, when they undergo a complete moult. The retention of these unnotched primaries allows us to recognise first-year Tuis throughout their first winter and summer, even though they are otherwise in adult plumage. I therefore concluded that the 26 adult-plumaged birds without wing-feather notches were first-year birds.

Enough moulting Tuis with dates are in the museum collections to show that birds moult mainly in February and March. Based on this information, supplemented by the occurrence of worn specimens in summer, fresh specimens in early winter and my own observations of live juvenile birds, Figure 2 summarises the Tui moult sequence and timing.

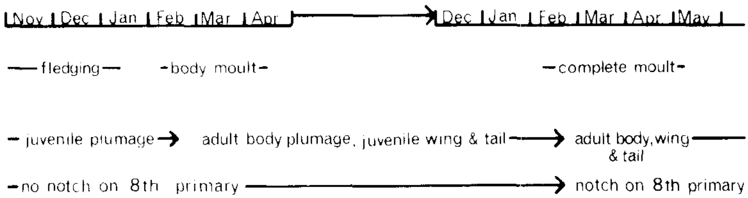

FIGURE 2 — Moult sequence of Tuis

Measurements

Measurements of Tuis are distributed bimodally, females being smaller than males, but some overlap occurs (Craig *et al.* 1981, Robertson *et al.* 1983). Distinguishing males from females has required retrospective analysis of data using a combination of several measurements (Robertson *et al.* 1983). Craig *et al.* (1981) put forward three measurements that could be used to distinguish the sex of Tuis, but Robertson *et al.* (1983) pointed out that the limits were not applicable to the birds in the Orongorongo Valley. This situation was clarified when I measured the wings, tails, tarsi and bills of the museum specimens from the mainland and assigned them to the age categories by means of the wing notch criterion.

Table 1 gives these results. Wing length emerged as a suitable discriminator of the sex of Tuis, as long as the bird is aged first. Overlaps in Craig *et al.*'s and Robertson *et al.*'s data were caused by the inclusion of first-year birds in their samples. Figure 3 illustrates this point.

Craig *et al.* (1981) said that head and bill length, weight and tarsus (tarsometatarsus) seem to be good discriminators of the sex of Tuis. Head and bill length is difficult to measure accurately on museum specimens because of the differing treatments of the skulls and the variety of poses and extreme contortions of some skins and mounts. Many of the museum specimens had not been weighed. I was unable therefore to check these results, but tarsus length, which I did measure, overlapped between sexes in 64% of cases for adults but not at all for juveniles or first-year birds, possibly because the sample was small.

The measurements of wing, tail and tarsus of Craig *et al.*'s birds on Tiritiri Matangi Island and the adjacent mainland are shorter on average than

TABLE 1 — Measurements of museum specimens of Tuis

	Wing	Tail	Tarsus	Bill
Adult Male				
Mean	154.3	123.2	40.3	24.5
Range	149-163	115-133	37.0-42.8	22.9-27.7
s.d.	3.1	3.5	1.4	2.6
n	79	76	79	79
1st-year Male				
Mean	147.7	117.9	39.7	24.8
Range	145-151	112-122	39.0-40.7	22.4-26.6
s.d.	2.0	3.6	0.5	1.2
n	12	11	12	12
Juvenile Male				
Mean	145.0	114.6	40.6	23.0
Range	141-150	114-115	39.1-42.5	21.2-25.8
s.d.	4.1	0.5	1.6	1.8
n	5	5	5	5
Adult Female				
Mean	138.4	112.8	36.5	22.4
Range	130-146	105-125	34.1-41.2	20.4-26.0
s.d.	3.8	4.1	1.7	1.3
n	27	27	27	27
1st-year Female				
Mean	130.6	107.1	35.8	22.0
Range	127-134	102-113	34.0-38.3	20.7-23.2
s.d.	1.9	3.6	1.2	0.9
n	14	14	14	11
Juvenile Female				
Mean	132	105	36.2	23.1
Range	131-133	104-106	36.0-36.4	23.0-23.2
s.d.	-	-	-	-
n	2	2	2	2

mine. Shorter wing and tail measurements would be expected due to the inclusion of first-year and juvenile birds in their sample, but this does not account for all the variation because the averages and ranges for their birds are similar to those of first-year and juvenile birds that I measured. It would appear, therefore, that the birds measured by Craig *et al.* (1981) are in fact smaller than those I measured. Robertson *et al.* (1983) found that Orongorongo Valley Tuis were larger than those on Tiritiri Matangi. The consequence of this is that the discriminatory boundaries for determining the sex of Tuis given by Craig *et al.* (1981) cannot be used throughout New Zealand and apply

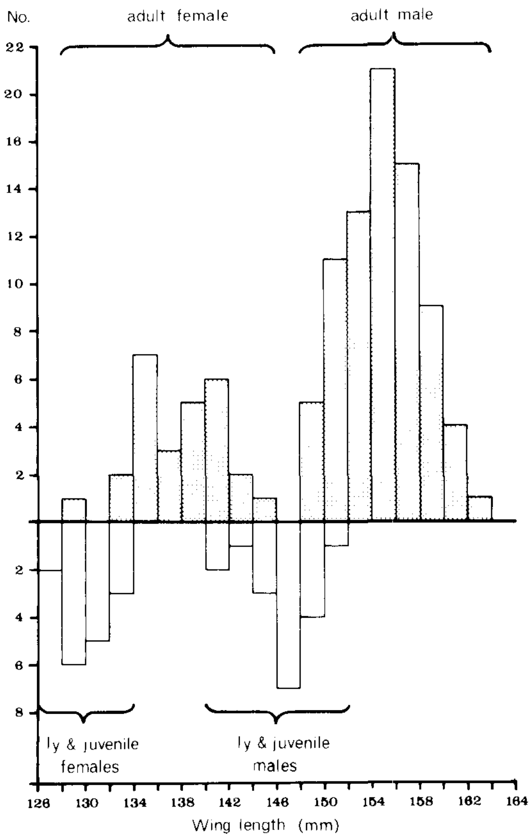

FIGURE 3 — Distribution of wing lengths of Tuis. 1y = first year

only to the populations they measured on Tiritiri Matangi Island and the adjacent mainland. That these northern birds are smaller is not surprising for there is a north-south increase in size (Bergmann's Rule) for Bellbirds *Anthornis melanura* (J. A. Bartle and P. M. Sagar pers. comm.) and Tomtits *Petroica macrocephala* (Fleming 1950), and Tuis from the Kermadec Islands, their most northerly locality, are smaller than those from the mainland (pers. obs. of museum specimens).

In contrast, my measurements are very similar to those from the Orongorongo Valley. Again, the differences in means of wing and tail can be attributed to the inclusion of first-year and juvenile birds in the Orongorongo sample. The ranges of the Orongorongo samples are similar to those of my measurements for first-year and adults combined. Slightly larger bill and tarsus measurements for the Orongorongo birds are probably due to the drying out of museum specimens and consequent shrinkage (e.g. Kinsky & Harper 1968). I am preparing a paper on the size differences of Tuis throughout New Zealand, which should clarify the comparisons above.

I compared the sizes of Tuis of differing age and sex classes using the museum measurements. First-year and adult male Tuis were, on average, larger than females of the same age by 9-13% for wing, tail, tarsus and bill measurements. On Tiritiri Matangi and the adjacent mainland the difference between the sexes (summed difference between the means) was 16%, which is slightly greater, but as Craig *et al.* (1981) pointed out this may be a consequence of the small sample.

Adult birds had longer wings and tails than first-year birds of the same sex by 4-6%, but tarsus and bill measurements were similar. The small sample of juveniles had similar measurements to first-year birds.

Conclusion

Adult Tuis have a notch on the inner web of the eighth primary and first-year birds can be recognised by the absence of a notch. The sex of a bird, aged in this way, can be determined by its wing length.

I hope that this illustration of the usefulness of ageing Tuis will encourage the investigation of ageing techniques for other New Zealand native birds.

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