DIFFERENTIATING THE SEXES OF THE BROWN CREEPER

By JAMES B. CUNNINGHAM

ABSTRACT

The measurements of male and female Brown Creepers *(Finschia novaeseelandiae)* were compared to determine whether they are sexually dimorphic and, if so, which characters can be used to distinguish the sexes. In all the measured characters males were significantly larger than females. Possible selective advantages of the Brown Creeper's sexual dimorphism are discussed. Wing length was found to be the most reliable discriminator of sex.

The Brown Creeper *(Finschia novaeseelandiae)* is a small insectivorous passerine endemic to the South and Stewart Islands of New Zealand. The sexes are alike in plumage, and during an investigation of its breeding ecology and vocal behaviour, I needed a method for sexing captured birds in the field.

In many species of birds that are monomorphic in plumage, body measurements have been useful for distinguishing the sexes (see Craig *et al.* 1982). In this paper, measurements of adult Brown Creepers are analysed to determine the characters by which males and females differ most and which characters can be used to sex captured birds.

Methods

The birds measured were captured in mist nets in Kowhai Bush, a native forest near Kaikoura (see Hunt & Gill 1979) from August 1979 intermittently to October 1981. I excluded birds captured during the annual moult (February-March) and all fledglings and juveniles captured before they had acquired adult size and plumage in May. Before May I could easily distinguish fledgling and juvenile Brown Creepers from adults by their bright yellow bill flanges or buccal linings.

I sexed the birds later by observing breeding pairs, in which only males sing the loud complex song and only females build nests and incubate. I verified the sex of some birds by observing copulation and egg laying.

Immediately after capture, I weighed the birds with a 30 ± 0.5 g capacity spring balance and with vernier calipers I measured (± 0.1 mm) bill length (tip to base at skull), bill width (at base of exposed culmen), bill depth (at base of exposed culmen), tarsometa-

TABLE 1 — Measurements of adult Brown Creepers from Kowhai Bush

	Male				Female			
	n	Mean	SD	Range	n	Mean	SD	Range
Body weight (g)	51	13.4	0.69	12.0 - 15.0	24	11.0	0.43	10.5 - 12.0
Bill length (mm)	50	13.0	0.45	12.0 - 14.3	25	12.4	0.32	11.6 - 13.2
Bill width (mm)	50	3.6	0.25	3.0 - 4.0	25	3.4	0.19	3.1 - 3.8
Bill depth (mm)	50	4.0	0.14	3.8 - 4.3	25	3.6	0.17	3.3 - 3.8
Tarsus length (mm)	50	27.3	0.43	26.1 - 28.4	25	26.1	0.62	24.6 - 27.3
Wing length (mm)	26	61.2	1.17	59.5 - 63.6	18	56.9	1.00	54.7 - 58.5

tarsus length (ankle joint to articulation of toes), and wing length (minimum chord of unflattened and unstraightened wing).

Results

Male Brown Creepers were larger than females (one-tailed Wilcoxon two-sampled test; $p < 0.0005$). Males weighed on average 2.4 g (17.9%) more than females (Table 1), had bills of 0.6 mm (4.6%) longer, 0.2 mm (5.6%) wider, and 0.4 mm (10%) deeper than females, had tarsometatarsi 1.2 mm (4.4%) longer than females and wings 4.1 mm (6.7%) longer than females.

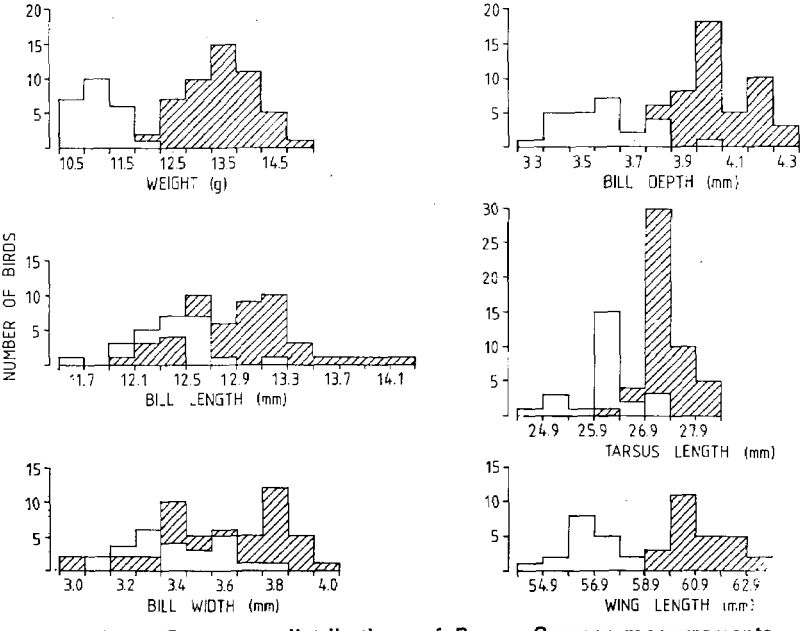

FIGURE 1 — Frequency distributions of Brown Creeper measurements. Cross-hatched columns, males; open columns, females

Figure 1 shows the overlap between the measurements of males and females. The weights of males and females overlapped only slightly, and all bill and tarsometatarsal measurements also overlapped. However, wing lengths did not overlap. The shortest wing length of males was 59.5 mm and the longest wing length of females was 58.5 mm.

Discussion

Brown Creepers in Kowhai Bush are sexually dimorphic, the males being larger in all characters examined. Robertson *et al.* (1983) found that male Whiteheads *(Mohoua albicilla)*, a species closely related to the Brown Creeper, are larger also.

To explain the evolution of sexual dimorphism in birds, two major hypotheses have been proposed (Selander 1966, 1972). The first predicts that sexual selection favours an increase in the size of the sex involved in territorial competition. The second hypothesis argues that, through sexual dimorphism, males and females avoid competition by partitioning the resources of their habitat. The selective forces implied in both of these hypotheses may have influenced the evolution of sexual dimorphism in the Brown Creeper.

In agreement with the first hypothesis, male Brown Creepers, the larger sex, are the principal territory defenders. According to the hypothesis, larger males have a selective advantage over smaller males for breeding sites, whereas larger females have no selective advantages in this respect because females seldom defend territories.

The exploitation of different subniches by dimorphic males and females has been demonstrated by Selander (1965, 1966), Newton (1967), Holyoak (1970), Wallace (1974), and others. In the Goldfinch *(Carduelis carduelis)*, for example, Newton (1967) showed that males, which have a 9% longer bill than females, could feed more efficiently on the seeds of the teasel *(Dipsacus fullonum)*. Therefore, the sexual differences of Brown Creepers, especially of bill dimensions, may be expected to reduce competition between the sexes. With their larger bills, males may take a wider size range of foods than females, thus reducing competition for food. However, I have no direct evidence for this hypothesis.

Body measurements in which the sexes do not overlap are the most reliable for sexing birds in the hand. In this study, the wing lengths of the sexes did not overlap, and so non-moulting adult Brown Creepers can be sexed by wing length. Those with a wing length 59.5 mm or more are males; those with a wing length 58.5 mm or less are females. Although the weights of males and females overlapped slightly, weights may help to confirm the sex of birds with intermediate or borderline wing length.

ACKNOWLEDGEMENTS

I am grateful to the Marlborough Catchment Board for permission to work in Kowhai Bush and to the Zoology Department, University of Canterbury, for institutional support. Field work was made possible by a grant from the Frank M. Chapman Memorial Fund of the American Museum of Natural History and by travel funds from the New Zealand Wildlife Service. I am also grateful to John Warham and Robert R. Jackson for comments on the manuscript.

LITERATURE CITED

CRAIG, J. L.; DOUGLAS, M. E.; STEWART, A. M.; VEITCH, C. R. 1981. Specific and sexual differences in body measurements of New Zealand honeyeaters. Notornis 28: 121-128.

HOLYOAK, D. T. 1970. Sex-differences in feeding behaviour and size in the Carrion Crow. Ibis 112: 397-400.

HUNT, D. M.; GILL, B. J. (eds.) 1979. Ecology of Kowhai Bush, Kaikoura. Mauri Ora Spec. Pub. 2. Christchurch: Univ. Cant. Biol. Soc.

NEWTON, I. 1967. The adaptive radiation and feeding ecology of some British finches. Ibis 109: 33-98.

ROBERTSON, H. A.; WHITAKER, A. H.; FITZGERALD, B. M. 1983. Morphometrics of forest birds in the Orongorongo Valley, Wellington, New Zealand. NZ J. Zool. 10: 87-97.

SELANDER, R. K. 1965. On mating systems and sexual selection. Amer. Nat. 99: 129-141.

SELANDER, R. K. 1966. Sexual dimorphism and differential niche utilization in birds. Condor 68: 113-151.

SELANDER, R. K. 1972. Sexual selection and dimorphism in birds. Pages 180-230 in B. G. Campbell (ed.), Sexual selection and the descent of Man. Chicago: Aldine.

WALLACE, R. A. 1974. Ecological and social implications of sexual dimorphism in five melanerpine woodpeckers. Condor 76: 238-248.

JAMES B. CUNNINGHAM, *Department of Zoology, University of Canterbury, Christchurch*