GENERAL NOTES

Sexual Differences in Measurements of Cassin's Auklet.—The sexes in most species of seabirds are very similar in plumage and size. Several workers have reported using small size differences to advantage in sexing, for example, *Fulmarus glacialis* (Dunnet and Anderson 1961), *Larus delawarensis* (Ryder 1978), and *Fratercula arctica* (Corkhill 1972, Harris 1979). However Threlfall and Mahoney (1980) were unable to sex Common Murres (*Uria aalge*) using measurements. Knudsen (1976) was only able to sex about ⅔ of the Cassin's Auklets (*Ptychoramphus aleuticus*) in his sample with certainty. In this note I report a method for determining the sex of breeding adult Cassin's Auklets using bill measurements.

I salvaged 71 fresh auklet carcasses that Western Gulls (*Larus occidentalis*) had preyed upon on Southeast Farallon Island, California, between January and April 1979 (4 specimens), and March and June 1980 (67 specimens). On the basis of plumage (Manuwal 1978), 64 of the specimens were judged to be adults, and 7 subadults (1- or 2-year-olds). The 7 subadults were salvaged between 28 April and 11 June 1980 and were easily recognizable by the heavily worn remiges and fresh contour plumage. Adult breeders exhibit uniform heavy wear on contour and flight feathers between May and the postnuptial molt in summer and early autumn. It is unlikely that I confused subadults and adults between January and late April because the recapture dates in Manuwal (1972: 190) of banded 1- and 2-year-old auklets suggest that they do not visit land until late in the breeding season, May or June, as is typical of other auks (*Cepphus columba,* Drent 1965, pers. observ; *Uria aalge,* Birkhead and Hudson 1977; *Fratercula arctica,* Ashcroft 1979). The other aging criteria discussed by Manuwal are not very reliable; in particular, an extensive banding and recapture program currently being carried out by the Point Reyes Bird Observatory on Southeast Farallon has not been able to corroborate the utility of using gular pouch length to discriminate experienced breeders from birds lacking breeding experience (R. P. Henderson, pers. comm.).

Birds were sexed by dissection. Most specimens were partially gutted by the gulls so that weight could not be measured. Exposed culmen and bill depth at the anterior edge of the nares were measured to the nearest 0.1 mm using a vernier caliper. Straightened wing length was measured to the nearest 1 mm using a wing ruler, and tarsus length, as the distance between the dorsal midpoint of the tibiotarsal joint to the anterior midpoint of the tarsometatarsal joint, was measured to 0.5 mm using dividers and rule. Statistical analyses were carried out using the MIDAS program developed by the Statistical Research Laboratory at the University of Michigan. The samples of adult males and adult females were each divided into 2 randomly-chosen subsamples of equal size. One sub-sample of each sex was examined for significant differences between the sexes, and the remaining sub-samples were used to test the predictive ability of the classification criterion derived.

The measurements of adult and subadult males and adult females are presented in Table 1. The 1 female subadult that was collected was within the range of subadult males for all measurements. Adult males have significantly longer culmens than subadult males (95% confidence interval for the difference between means derived by the Student-Newman-Keuls procedure, Sokal and Rohlf 1969: 0.57 ± 0.47). Adult males have deeper bills and longer tarsi than both females (95% confidence interval for bill depth: 1.55 ± 0.46, tarsus: 1.1 ± 0.56) and subadults (bill depth: 1.37 ± 0.38, tarsus: 0.80 ± 0.47). Mean wing length differs between adult males and subadults (4.0 ± 1.89) and between adult males and females (3.9 ± 1.57). Subadult males resemble adult females in all dimensions except wing length. Culmen depth exhibits the greatest difference between adult males and females. By taking 10.3 mm as the mid-point of the difference between means of adult male and female bill depth, and classifying individuals with a bill depth greater than 10.3 mm as males, and those less as females, 29/31 (94%) of the birds in the validation sample were correctly sexed. A discriminant function using all 4 variables did no better in sexing birds in the validation sample.

Knudsen (1976) demonstrated mensural differences between the sexes in Cassin's Auklet. However, he measured bill depth as the sum of the individual depth measure-

TABLE 1. Measurements (mm) of adult male and female and subadult male Cassin's Auklets.

	Adult males		Adult females		Subadult males	
Measurement	n	Mean ± SD (range)	n	Mean ± SD (range)	n	Mean ± SD (range)
Culmen	14	19.76 ± 1.07 (17.9–21.6)	19	19.51 ± 0.59 (18.4–20.5)	6	20.08 ± 1.02 (18.9–21.6)
Bill depth	14	10.89 ± 0.44 (10.4–11.7)	19	9.51 ± 0.41 (8.9–10.3)	6	9.33 ± 0.73 (8.4–10.4)
Wing	14	125.8 ± 2.54 (120–129)	19	125.7 ± 3.68 (119–130)	6	121.8 ± 2.93 (119–126)
Tarsus	14	30.9 ± 1.01 (29.0–32.0)	18	30.1 ± 0.93 (29.0–33.0)	6	29.8 ± 0.82 (28.5–31.0)

ments of the upper and lower mandibles. These measurements would be difficult and time consuming for a person to make on a living, struggling bird. The method presented here should permit rapid, relatively accurate sexing of Cassin's Auklets. Furthermore, when the members of a mated pair are captured together in their nesting burrow, the difference in bill depth between the sexes is often apparent to the naked eye.

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