NOTES

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DISTINGUISHING GENDER OF FLORIDA GRASSHOPPER SPARROWS USING BODY MEASUREMENTS

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The Florida Grasshopper Sparrow (*Ammodramus savannarum floridanus*) was federally classified as endangered in 1986 because of its restricted distribution, loss of habitat, and population decline (Fed. Reg. 1986). The recovery plan for the sparrow (USFWS 1988) provides for a captive breeding program if the population continues to decline. Identification of sex of individual Florida Grasshopper Sparrows would be important should that recovery effort become necessary. However, for this sexually monochromatic species (Smith 1968) the identification of sex is difficult outside the March-June breeding season in Florida. The sex of monomorphic passerines can be determined by laparotomy and laparoscopy, but the risk of injury or death by these procedures (*op. cit.* Richner 1989) may be unacceptably high with endangered birds. We examined wing-length and weight measurements of Florida Grasshopper Sparrows as a non-invasive method of distinguishing sex classes.

Wing-length and weight data are from a banding study conducted during March 1989 to June 1992 on the U.S. Air Force, Avon Park Air Force Range, in Highlands and Polk counties, Florida. The study area and banding methods are described by Delany et al. (1992). Sex was determined during the breeding season by the presence or absence of a cloacal protuberance. Age (juvenile, <1 year old; or adult, ≥1 year old) was determined by plumage (Smith 1968). Wing chord was measured to the nearest 0.5 mm with a ruler and end stop according to the North Am. Bird Banding Manual (1977). Weight was obtained with a 50-g Pesola spring balance calibrated in 0.5-g intervals, and estimated to the nearest 0.1 g. Measurements were made within 15 minutes following capture and the application of one USFWS aluminum band and two plastic bands.

Measurements of both wing chord and body weight were available for 25 adult males and eight adult females. Bartlett's test was used to test whether variances of individual measurements (Steel and Torrie 1980:471) or covariance matrices of measurement pairs (Morrison 1976) were heterogeneous with respect to sex. Gender means of wing chord and body weight were compared with a *t*-test. A linear discriminant function (Johnson and Wichern 1982:466) was estimated assuming equal prior assignment probabilities and misclassification costs. For this small sample, we followed Lachenbruch's (1975) jackknifing procedure for unbiased estimation of misclassification rate.

Normal probability plots and bivariate scatterplots of sparrow body measurements (Fig. 1) indicated no obvious departure from univariate and bivariate normal distributions. Tests of variance heterogeneity were not rejected for variables individually ($P \geq 0.237$) or for the variable pairs ($P = 0.702$). Thus, (co)variance estimates were pooled over sexes. Both wing chord and weight were highly distinguished by sex (Table 1, Fig. 1). The estimated discriminant function incorrectly classified 12% of the males (3 of 25) and 12.5% of the females (1 of 8) (Fig. 1), producing an average misclassification rate of 12.3%.

Measurement of both wing length and body weight appears to be a reliable indicator of sex for Florida Grasshopper Sparrows. A difference in wing length by sex also was reported for three individuals collected by Mearns (1902) during April 1901. The usefulness of these criteria, however, depends on their validity outside the breeding season when other identifying characters and behavior are absent. Grasshopper Sparrows undergo a postnuptial molt (Sutton 1935, Smith 1968) that may affect measurements of wing chord.

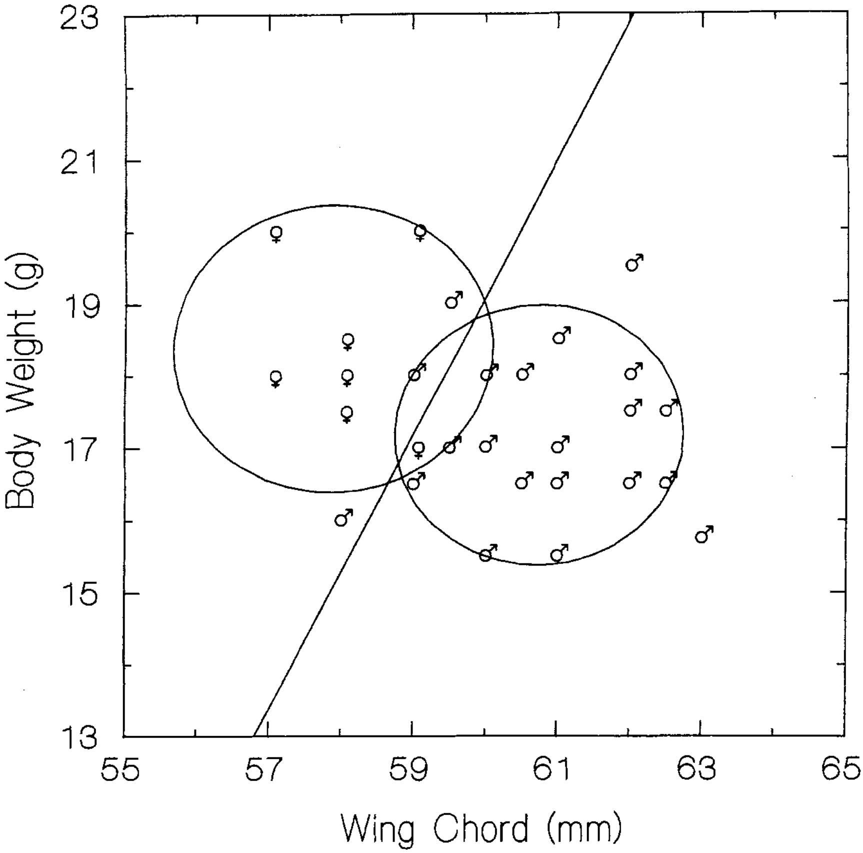

Fig. 1. Body weight (g) relative to wing chord (mm), by sex, with 50% prediction ellipse for adult Florida Grasshopper Sparrows. The estimated discriminant function was y = 106.169 - 2.12403 chord + 1.11419 weight. If sample means represent population means for gender, an individual would be classified as female for values of $y \geq 0$ and as males otherwise. Line represents weight and wing chord values yielding equal male/female classification probabilities.

Table 1. Comparison of body measurements of adult Florida Grasshopper Sparrows by sex, during the breeding season (March-June), 1989-1992, on the Avon Park Air Force Range, Highlands County, Florida.

	Female (N=8)		Male (N=25)			
Variables	$\bar{x}$	SE	$\bar{x}$	SE	t	P
Wing chord (mm)	57.88	0.30	60.74	0.25	6.06	<0.001
Weight (g)	18.38	0.39	17.17	0.21	2.83	0.008

Egg formation may cause variation in the weights of females (Clark 1979). Other caveats concerning measurements of wing chord (Yunick 1986) and weight (Collins and Atwood 1981) and their interpretation relative to sexual dimorphism (Clark 1979, Rising and Somers 1989) also apply to our data. Measurements from individuals of known sex outside the breeding season are needed to evaluate the efficacy of using wing chord and weight measurements to determine the sex of adult Florida Grasshopper Sparrows.

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BANDING CONFIRMATION THAT SOME MIDDLE ATLANTIC COAST BOAT-TAILED GRACKLES VISIT FLORIDA IN THE WINTER

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The Boat-tailed Grackle (*Quiscalus major*) is thought to be composed of four breeding populations, separable on the basis of iris color and body measurements of adults (Stevenson 1978). The middle Atlantic coast population (*Q. m. torreyi*), which breeds from Long Island (Suffolk County), New York, to Duval County, Florida, has straw-colored irides. Adults in the breeding population of the Florida peninsula (*Q. m. westoni*) have dark (gray-black) irides, higher tail/wing-length ratios, and longer, narrower bills than *Q. m. torreyi*. These two breeding groups once were separated by a coastal gap of about 75 km, from Jacksonville (Duval County), Florida, to St. Augustine (St. John's County), Florida (S. A. Grimes *in litt.*, Tomkins 1963; Stevenson 1978). Data collected during the Florida breeding bird atlas project indicate that this gap may have been narrowed; by which race, however, is unknown (B. H. Anderson, pers. comm.).

The subspecific validity of *Q. m. westoni* has been questioned. Although the subspecies was described in 1934 (Sprunt 1934), it was not recognized by the American Ornithologists' Union (1957), perhaps because several conflicting reports have been published about the origin of light-eyed Boat-tailed Grackles in the Florida peninsula (Sprunt 1932, 1933). Stevenson (1978) believed that the confusion about the iris color of grackles breeding in Florida may be partially based on lack of information about the post-breeding movements of northern, light-eyed grackles. Pennock (1931) and Sprunt (1932, 1933) reported seeing light-eyed individuals in Florida as far south as Punta Gorda (Charlotte County), but none of these birds were collected, and Stevenson (1978) doubted the validity of the sight reports. An individual identified as *torreyi* was collected by William Brewster at Mellonville (Seminole County), 16 March 1877 (Museum of Comparative Zoology No. 201169; Stevenson and Anderson in press). More recently, pale-eyed males have been seen around St. Augustine, about 55 km south of the known breeding range of *torreyi* (Stevenson 1978). Finally, on 4 March 1972, H. M. Stevenson and G. Carleton collected a male *Q. m. torreyi* at St. Augustine (Tall Timbers Research Station specimen No. 3282; Stevenson 1978).