

# Survival and Longevity of Adult Male Florida Grasshopper Sparrows

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*Abstract:* Survival and longevity were estimated for the endangered Florida grasshopper sparrow (*Ammodramus savannarum floridanus*) from resightings of 48 color-banded adult males during 1989–1992. Annual survival rate was 0.598 and mean life expectancy was 2.95 years (1.95 years for sparrows  $\geq 1$  year old). The high survival rate and longevity of the subspecies may facilitate the recovery of populations remaining in good breeding habitat. Annual recruitment of 5.4 young per pair is needed to maintain a stable population of grasshopper sparrows on the study area. Information on population dynamics may help evaluate recovery efforts. Additional information is needed on the fecundity of the Florida subspecies.

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The Florida grasshopper sparrow (*Ammodramus savannarum floridanus*) is a little-known, nonmigratory sparrow endemic to the southcentral prairie region of Florida. During the breeding season (March–June), the subspecies is isolated from the eastern race (*A. s. pratensis*) by  $>500$  km (Am. Ornithol. Union 1957). Because of its restricted distribution, loss of habitat, and population decline, *A. s. floridanus* was classified as endangered in 1986 (Fed. Reg. 1986). Most of the known population occurs in 3 breeding aggregations of  $<50$  pairs each (Delany and Cox 1986). Basic life-history information is needed before management strategies for the sparrow can be fully assessed (U.S. Fish and Wildl. Serv. 1988). This paper provides information on the survival and longevity of adult male Florida grasshopper sparrows derived from a banding study.

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## Methods

The study area was a 700-ha dry prairie on the Avon Park Air Force Range in Highlands and Polk counties, Florida. The grass, saw palmetto (*Serenoa repens*), and shrub community was described by Delany et al. (1985). Webb (1990) reviews geologic and climatic influences that may have produced this relict ecosystem and subsequent subspeciation of *A. s. floridanus*. The study area was managed for cattle grazing and a breeding aggregation of grasshopper sparrows by prescribed burning every 2–3 years.

Grasshopper sparrows were marked with numbered aluminum U.S. Fish and Wildlife Service bands and a unique pair of colored plastic leg bands during March 1989–June 1992. Capture and banding methods are described by Delany et al. (1992). Birds were released at the site of capture. The study area was systematically searched (according to Delany et al. 1985) each year to locate grasshopper sparrows. Female grasshopper sparrows were secretive, and we recorded few observations. As a consequence, their captures were omitted from this analysis.

We examined banding and resighting data on 48 male sparrows initially captured as adults ( $\geq 1$  year old). We used program JOLLY (Pollock et al. 1990) to estimate the survival and capture (resighting) probabilities of the Cormack-Jolly-Seber (CJS) mark-recapture model (Cormack 1964, Jolly 1965, Seber 1965). Adult mean life expectancy was calculated as  $-1/\log(\phi)$ , where  $\phi$  represents annual survival probability (Seber 1982).

## Results and Discussion

The CJS model provided a good fit to the data ( $X^2 = 1.96$ , 2df,  $P = 0.375$ ). Since survival and capture rates did not vary over the course of the study ( $X^2 = 3.76$ , 2df,  $P = 0.153$ ), data from all years could be pooled to obtain greater precision in the estimates. The adult survival rate for male Florida grasshopper sparrows (Table 1) was at the upper range reported for adult passerines (Lack 1954, Ricklefs 1973). Because migration can contribute to mortality (Breitwisch 1989), we expected a higher annual survival rate in this resident population. Sources of mortality for Florida grasshopper sparrows were not determined. The mean life expectancy was 2.95 years (1.95 years for sparrows  $\geq 1$  year old) (Table 1) and approached the 3.08 year longevity record reported for the species (Klimkiewicz and Futcher 1987). One individual banded (920-63010) as an adult on 18 April 1989 and re-

**Table 1.** Estimates of annual survival probability, life expectancy, and capture (resighting) probability of color-marked adult male Florida grasshopper sparrows, Avon Park Air Force Range, Highlands County, Florida, 1989–1992. Estimates are based on unmarked (*U*) birds caught and marked (*M*) birds resighted per year.

Year	<i>U</i>	<i>M</i>	Survival rate		Adult mean life expectancy	Capture probability	
			$\phi$	se ( $\phi$ )		<i>P</i>	se ( <i>P</i> )
1989	29		0.437	0.100	1.21		
1990	8	11	0.668	0.146	2.48	0.868	0.121
1991	11	9				0.650	0.157
1992		15					
mean			0.552	0.085	1.68	0.759	0.199
pooled			0.598	0.066	1.95	0.770	0.093

sighted on 28 June 1992 exceeded the longevity record by  $\geq 1$  year. We believe our estimates are accurate because male Florida grasshopper sparrows were sedentary and easy to locate during the breeding season.

Assuming juvenile survival rate is 25% of adult survival (Wray et al. 1982), annual recruitment of 5.4 young per pair is needed to maintain a stable population (see Ricklefs 1973:399) of grasshopper sparrows at our study area. The species is double-brooded (Smith 1968) and annual productivity can reach 10.9 young per pair (Wray et al. 1982). Mean clutch size estimated from oology slips for 51 Florida grasshopper sparrow egg sets was 3.71 (McNair 1986). The relative longevity of adult Florida grasshopper sparrows and high reproductive potential may facilitate the recovery of populations remaining in good breeding habitat (see Delany et al. 1985). However, continued habitat loss due to prairie improvements for cattle (Davis 1980) and agriculture (Callahan et al. 1990) will further isolate sedentary populations and jeopardize those that depend on immigration for stability.

Florida grasshopper sparrow response to range management that improves nesting habitat (U.S. Fish and Wildl. Serv. 1988) may be slow and difficult to predict (see Wiens et al. 1986). Survival is an important component of the population characteristics often used to monitor endangered species (Dobson 1990:115). Our preliminary information on the population dynamics of Florida grasshopper sparrows may be helpful in evaluating recovery efforts. Further demographic information is needed on the fecundity of the Florida subspecies.

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