Philopatry, Natal Dispersal, and Inbreeding Avoidance in an Island

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# ISLAND POPULATION OF SAVANNAH SPARROWS

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*Abstract.* Over a 9-yr period, we studied dispersal of young banded Savannah Sparrows (*Passerculus sandwichensis*) from their natal nest to the site where they first bred 1 yr later

risk of philopatry (Charlesworth and Charlesworth 1987, Pusey 1987, Harvey and Read 1988, Ralls et al. 1988).

In some cases, philopatry may be unavoidable because of isolation or saturation of suitable breeding habitats. If breeding with relatives reduces reproductive success compared to breeding with nonrelatives, selection should favor the ability to recognize kin and avoid mating with them (Harvey and Ralls 1986, Hep-

their parents or siblings, young Savannah Sparrows appeared to avoid incest by dispersing more when their opposite-sex parents were still alive, and by pairing exclusively with nonrelatives.

## METHODS

### *Study area*

Our main study area was located on Kent Island, an

on the ground in fields, in vegetation along the shoreline, and in other open habitats within their mate's territory, and defend their own, smaller territories against other females. Population densities can be as high as

viduals mated with relatives produced by EPFs in other nests. Nonetheless, the absence of matings between brood-mates is consistent with inbreeding avoidance, even if brood-mates are not always genetically related.

15 nesting females/ha. On Kent Island ~30% of fe-

because nestlings probably use the same criteria for

young from the first brood. After they leave the nest

sumably they identify the birds that brood, feed, and

~10 d after hatching, fledglings remain with their siblings and parents within or near their natal territory for another 10–25 d. As they become independent of their parents, they join loose juvenile flocks that wander

protect them as their parents, and identify those nestlings occupying the same nest and sharing parental care through the fledgling stage as their siblings (see Hepper 1991). There is no published evidence that birds rely

model thus assumed that older birds were dominant and their nest sites were not available to 1-yr-olds

year. Further evidence of strong philopatry comes from the fact that none of the >7000 Savannah Sp

[redacted]

| | Minimum no. recruits | Minimum frequency of |
|---|---|---|
| [redacted] | | |

TABLE 2. Natal dispersal distance (distance between natal nest and first adult nest) for the study population of Savannah Sparrows. All birds were uniquely banded as nestlings on Kent Island and had returned to the island 1 yr later to breed.

| | Natal dispersal distance (m)† | | | | | |
|---|---|---|---|---|---|---|
| Sex | Median | Mean | 1 SD | Minimum | Maximum | *N* |
| Males | 202.8 | 261.8 | 215.6 | 6 | 1381 | 65 |
| Females | 248.4 | 309.0 | 290.8 | 7 | 1540 | 78 |
| Both sexes combined | 228.5 | 287.5 | 259.6 | 6 | 1540 | 143 |

† Differences in dispersal distances between sexes were not significant (Mann-Whitney *U*

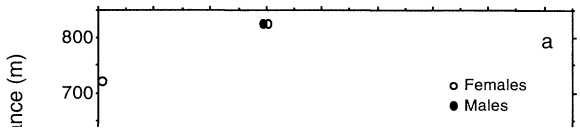


TABLE 4. Natal dispersal between fields for Savannah Sparrows on Kent Island, relative to movements of parent.

| | Status of opposite-sex parent | Status of same-sex parent |
|---|---|---|

TABLE 5. Natal dispersal distance for Savannah Sparrows on Kent Island as a function of whether or not their father or mother returned that year.

| Sex | Status of parents | Natal dispersal distance (m) | | | |
|---|---|---|---|---|---|
| | | Median | Mean | 1 SD | *N* |
| Males | Father returned | 214.8 | 232.9 | 147.3 | 34 |
| | Father did not return | 183.7 | 283.5 | 269.8 | 30 |
| | Mother returned | 199.1 | 252.0 | 189.6 | 31 |
| | Mother did not return | 202.8 | 264.5 | 242.0 | 31 |
| Females | Father returned | 275.7 | 340.0 | 322.6 | 36 |
| | Father did not return | 250.3 | 260.9 | 210.3 | 37 |
| | Mother returned | 238.3 | 354.6 | 348.9 | 40 |
| | Mother did not return | | | | |

ing avoidance, we simulated random pairing in each year using all nesting attempts observed through 1995 ($N = 917$ nests). Only 9 of 1000 simulations produced zero cases of close inbreeding ($\phi > 0.125$) as observed in this study ($P < 0.01$). Based on the simulations, the probability of observing fewer than two cases of close inbreeding if pairing were random was 0.05. As a more conservative test, we included only a single nesting attempt involving the same pair. Based on 1000 simulations, we found that the probability of observing zero cases of close inbreeding was 0.06. If Savannah Sparrows chose mates without regard to their relat-

have been 2.40 ± 1.24 cases [mean ± 1 SD, range = 0–8 cases].

Sparrows as a function of natal philopatry, determined by initial banding age.

| Lifetime reproduction | Sex | Age at banding | | | *P* |
|---|---|---|---|---|---|
| | | Nestling | Juvenile | Adult | |
| Total nests | Males | 3.5 (3.3) | 3.2 (1.9) | 2.9 (2.3) | 0.43 |
| | Females | 2.5 (1.8) | 2.9 (2.0) | 2.9 (2.2) | 0.39 |
| Total eggs | Males | 14.8 (14.5) | 13.6 (8.0) | 11.9 (10.2) | 0.34 |
| | Females | 10.4 (8.0) | 12.6 (8.8) | 11.1 (9.5) | 0.39 |
| Total fledglings | Males | 9.6 (8.5) | 9.2 (5.7) | 7.4 (6.6) | 0.20 |
| | Females | 6.7 (5.2) | 7.7 (5.5) | 6.8 (6.5) | 0.64 |

bination of ecological, neutral, and genetic models is

Fleischer, R. C., P. E. Lowther, and R. F. Johnston. 1984.

natal dispersal in mountain white-crowned sparrows. Con-

Morton, M. L., M. W. Wakamatsu, M. E. Pereyra, and G. A. Morton. 1991. Postfledging dispersal, habitat imprinting, and philopatry in a montane, migratory sparrow. Ornis Scandinavica **22**:98–106.

Nagata, H. 1993. The structure of a local population and dispersal pattern in the Styan's grasshopper warbler, *Lo-*

Russell, E. M., and I. Rowley. 1993. Philopatry or dispersal:

wren, *Malurus splendens*. Animal Behaviour **45**:519–539.

Shields, W. M. 1982. Philopatry, inbreeding, and the evolution of sex. State University of New York, Albany, New York, USA.

———. 1987. Dispersal and mating systems: investigating their causal connections. Pages 3–24 *in* B. D. Chepko-Sade