

FEATURE ARTICLES

**INDIVIDUAL, TEMPORAL, AND SEASONAL VARIATION IN SPERM  
CONCENTRATION IN TREE SWALLOWS**

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*Abstract.* We determined sperm concentrations in Tree Swallows (*Tachycineta bicolor*) by manually expressing semen samples from males during prelaying, egg-laying, incubation, and nestling periods. Sperm concentrations varied by orders of magnitude ( $0-10^9$  sperm mL<sup>-1</sup>) among males. Sperm concentrations were highest during the incubation period and lowest during the prelaying period. None of the samples collected during the prelaying, egg-laying, and incubation periods were devoid of sperm. In contrast, 45% of samples collected during the nestling period lacked sperm. Sperm concentrations (1) did not vary over the course of the morning during prelaying, egg-laying, and incubation periods but significantly increased during the nestling period; (2) did not vary with the date that samples were collected during prelaying, egg laying, and incubation but significantly decreased with date during the nestling period; and (3) did not vary with the number of fertile females at the study site during any part of the breeding season. We hypothesize that the variations in sperm concentration arose from a combination of factors including intrinsic differences among males, daily patterns of sperm depletion associated with copulation, and an end-of-season decline in sperm production. If males vary in sperm availability then female Tree Swallows may benefit from pursuing extra-pair copulations as fertility insurance.

*Key words:* Tree Swallows, *Tachycineta bicolor*, sperm concentration, sperm competition.