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BREEDING BIOLOGY OF THE FOX SPARROW IN NEWFOUNDLAND

By William Threlfall and J. Richard Blacquiere

The Fox Sparrow (*Passerella iliaca*) is a widely distributed species (Austin 1968), common in a wide variety of habitats in Newfoundland (Peters and Burleigh 1951, Terrill 1968). Because of its secretive nature and difficulties involved in finding nests, little has been written about the breeding biology of this ground-feeder. Herein we present data on breeding activities and nestling growth of Fox Sparrows in Newfoundland.

MATERIALS AND METHODS

A detailed study of the breeding biology of Fox Sparrows was undertaken in the spring and summer of 1977 and 1978 at the Oxen Pond Botanic Park (OPBP), St. John's, Newfoundland (47°34′N, 52°45′W). Spring arrival time, territory establishment and size, nest parameters, egg laying, incubation, chick growth, and nestling period were investigated at the OPBP. Eight active nests were found during the study and additional data were extracted from Newfoundland Nest Record Scheme cards (NNRS, courtesy of the late L. M. Tuck). Degree of territorial fidelity was not determined at the OPBP, but banding data obtained in 1970 and 1971 on Gull Island, Witless Bay (47°15′N, 52°46′W) which lies approximately 30 km south-southwest of the OPBP were used. The sample site on Gull Island was in a climax balsam fir/black spruce/white spruce (*Abies balsamea/Picea mariana/Picea glauca*) forest, with mountain maple (*Acer spicatum*), silver birch (*Betula papyrifera*), dogberry (*Pyrus americana*) and mountain alder (*Alnus crispa*) in open places, where a dense understory of wood fern (*Dryopteris spinulosa*) and skunk currant (*Ribes glandulosum*) also grew. In the closed forest, mosses (*Mnium* spp. and *Polytrichum* spp.) and small flowering plants (cracker-berry (*Cornus canadensis*) and starflower (*Trientalis borealis*)) flourished.

RESULTS AND DISCUSSION

The Fox Sparrow is one of the earliest spring migrants to arrive in Newfoundland. The mean date of arrival at the OPBP, from 1973 to 1978 was 9 April (range 4–19 April; B. S. Jackson pers. comm.). Bare ground where the birds forage appears to be a prerequisite in territory establishment. In 1977, when snow melt was early, we recorded birds on 4 April at the OPBP, and territories were established the following day (as determined by singing). In 1978 snow remained until the last week in April and the birds arrived on 19 April. Males and females returned to the breeding grounds at the same time and established pair-bonds within a week of arrival and after territories had been established by the males.

It was possible to determine individual territory size in three instances at the OPBP by mapping singing posts and activity ranges. All were in regenerating balsam fir/black spruce forest. Each territory covered an area of approximately one hectare (Type A; Nice 1941). Those on Gull Island were considerably smaller, being approximately 0.25 ha each. In the latter area territorial fidelity was quite marked with 12 (23%) of 51 birds banded in 1970 being recaptured on the island in 1971; 9 (75%) of these were taken in nets set in the exact same place each year and the remaining 3 (25%) within 50 m of their banding location.

Eight active nests were found in 1977 and 1978 (5 in conifer trees, 2 underneath and protected by such trees, and 1 on the ground beneath an alder (*Alnus* sp.)). Tree nests were bulky (mean wt., 5 air-dried nests taken after use, 49.6 g, range 39.0–59.7 g), in comparison to ground nests (2 nests, 9.8 g and 15.2 g). The former had an outer wall of black spruce twigs, rotting wood, lichens (*Alectoria* sp. and *Usnea* sp.) and moss (*Polytrichum* spp.), with an inner cup of dead grasses, while the latter were built of dead grasses set in a depression that supported the sides. Both types of nest were lined with fine grass, and contained an assortment of other materials (e.g., hair, *Alectoria* sp., feathers, green monofilament fishing line).

Philipp (1925) noted a tendency for nests built early in the season to be placed higher than nests built later. Forty NNRS cards containing data on nest height indicate that 45 nests were no more than 2.7 m above the ground, and one was higher than 6 m. A significant negative correlation ($r = -0.60$) was shown between height of nests above ground (6 m nest excluded) and advance of the breeding season (based on date of laying of first egg). As nest construction time is unknown, the date of laying of the first egg was calculated using a variety of criteria listed in Blacquiere (1979). Egg-laying occurred from 27 April until 3 July (68 days). We divided this interval into four 17-day periods and nests built in each were classified as ground (G) or tree (T) nests, as follows: (a) 27 April–13 May, 4 G, 12 T; (b) 14 May–30 May, 4G, 7 T; (c) 31 May–16 June, 10 G, 5 T; (d) 17 June–3 July, 3 G, 0 T.

A G-test for homogeneity in replicates, considering the four time periods as replicates, showed a significant difference in frequencies of nest height over time ($G = 10.673$, $df = 3$). A major factor influencing nest height may be snow cover, as noted by Morton (1978) for White-crowned Sparrows (*Zonotrichia leucophrys*) in California. Temperature and wetness of the ground may also be important. Our observations also suggest that some Fox Sparrows may build more than one nest before the first clutch is laid. At OPBP a nest under construction on 24–25 April was full of snow on the 25th. The birds were not seen to visit this nest again, but on 3 May the presumed same birds were found incubating 3 eggs in a bulky tree nest 5 m from the abandoned nest. In another case where 3 eggs disappeared after incubation had begun, a new nest was built and 4 young raised. The replacement clutch was started 2–4 days after the first clutch was lost. We found no evidence of double broodedness.

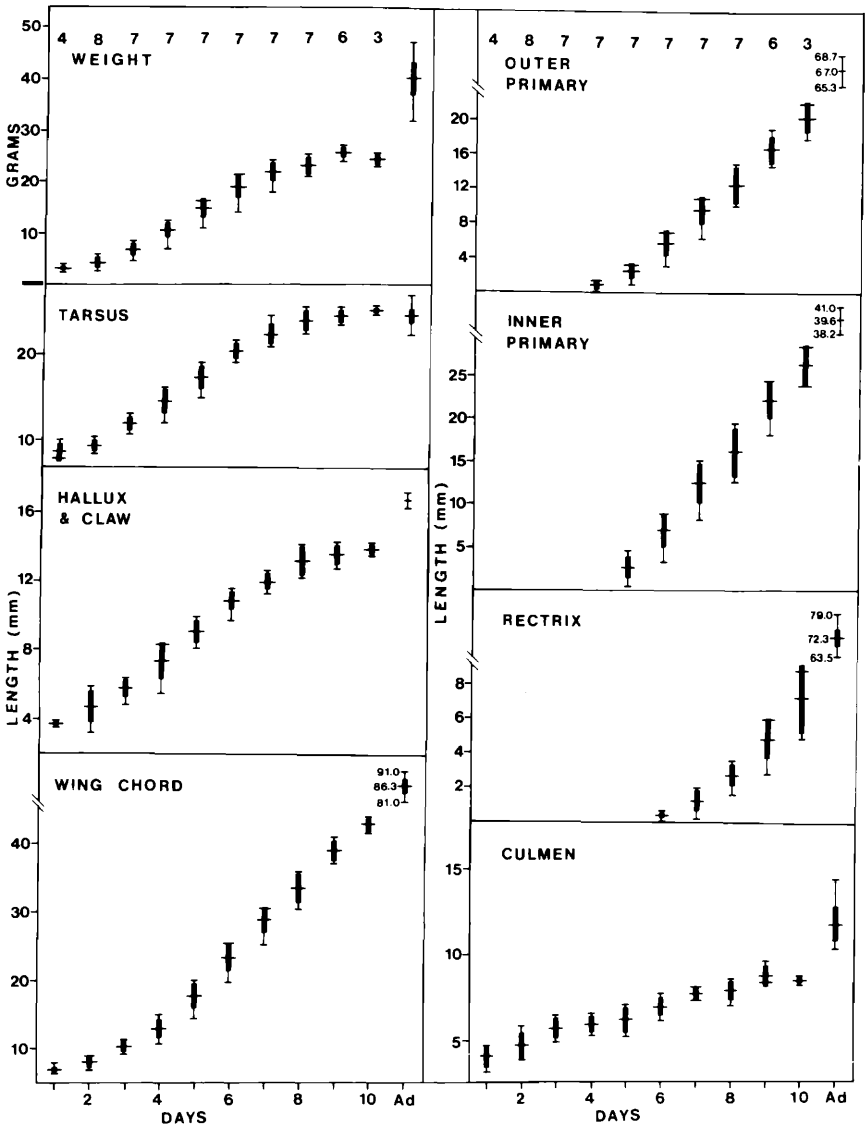

FIGURE 1. Growth parameters of nestling Fox Sparrows, showing mean, standard deviation, and range of measurements. Sample sizes for nestlings are given, across the top of the figure. Measurements of 33 adults (Ad) are also given for comparison. In the latter figures, where no standard deviation is indicated (black bar), only 2 birds were measured.

Egg-laying began immediately after nest construction was complete. The frequency distribution (weekly) of onset of laying is relatively constant from late April to mid-June, then drops off with no starts after 5 July (i.e., the number of nests in which laying started for 10 weeks, starting 27 April was as follows: 6, 8, 3, 4, 7, 6, 7, 2, 1, 1). Mean clutch size (37 NNRS cards) was 3.24 (SD 0.60; range 2–4). Twenty eggs were measured (length 23.5 ± 0.84 mm, width 17.1 ± 0.50 mm), and 21 weighed (3.5 ± 0.20 g). The foregoing figures closely approximate those given by Terrill (1968).

Incubation and brooding was performed by the female, as noted by Philipp (1925) and Mailliard (1921). Ryan (1974) gave an incubation time of 14 days for a clutch of three eggs he studied. He did not observe incubation before the final egg was laid, and he noted that hatching was relatively synchronous (within a 12–18 h period). The incubation period for one clutch was determined in the present study to be 12 days 4 h, with the female starting incubation before the clutch was complete. Hatching was spread over a period of at least 35 h, with the last hatched chick disappearing some 48 h after emergence. The nestling period (i.e., "the interval between the hatching of the young bird and its departure from the nest" (Skutch 1945)) for chicks from two nests watched in this study was approximately 9–10 days, which is a little shorter time than the 10.5 days noted by Ryan (1974). The growth of chicks was followed from hatching to fledging and was compared to similar adult parameters (Fig. 1). The growth constant (k) for this species was calculated (k = 0.544), using the method of Ricklefs (1967), and an asymptotic weight of 27.3 g. The point of inflection was 3.7 days. As with many other ground-nesting or ground-foraging birds, the tarsus and feet grew most rapidly (Fig. 1), thus allowing early nest-leaving, which may serve as a possible anti-predator strategy (*see* Austin and Ricklefs 1977, O'Connor 1978). Both adults were seen feeding nestlings and fledglings. One adult male was seen feeding a young bird 21 days after it had fledged.

SUMMARY

The breeding biology of Fox Sparrows was investigated in eastern Newfoundland in 1977 and 1978. Supplementary data were obtained from a 1970–71 study and Newfoundland Nest Record Scheme cards. Birds returned to the Province in April and established territories, which varied in size from 1.00 ha to 0.25 ha depending on locale. Territorial fidelity was significant. Early nests were usually built in trees at heights significantly greater than late nests. Tree nests were bulkier than ground nests. Egg-laying occurred from late April until early July, with a mean clutch size of 3.24 eggs. Egg sizes are given. Incubation time for 1 clutch was 12 days 4 h, with hatching being spread over 35 h. Chick growth was followed from hatching to fledging and was compared with adult parameters.

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Department of Biology, Memorial University, St. John's, Newfoundland, Canada, A1B 3X9. Received 16 Dec. 1981; accepted 18 Mar. 1982.