

ROOSTING BEHAVIOR OF A SMALL GROUP OF STARLINGS

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During part of the winter of 1975-76, a group of four Starlings (*Sturnus vulgaris*) roosted nightly associated with six House Sparrows (*Passer domesticus*) in a martin house in the backyard of my home in Oxford, North Carolina. Observation of these birds provided information on the roosting behavior of Starlings exposed to a minimum of social interaction, useful for comparison with Starlings roosting in association with large congregations of blackbirds and Starlings. Resulting observations and comparisons are reported in this paper.

METHODS AND MATERIALS

In each of 35 mornings and evenings during the period 15 January to 22 February 1976, I watched from my study window the activities of the four Starlings for as long as they were present near their roosting place. Also, with use of a Gossen Panlux foot-candle meter, I made measurements of incident light near the martin house at various times during the period of observation. The light-sensitive probe of the foot-candle meter was aimed toward the zenith when making the measurements.

RESULTS AND DISCUSSION

Of particular interest in the roosting behavior of these Starlings was their protracted delay near their roosting place before proceeding to their foraging area in the morning or finally remaining in their roosting place in the evening. Thus, in the morning these Starlings remained near the martin house without starting their foraging 40-62 min (mean 51) after the first bird exited from the martin house; in the evening the last bird entered the martin house 71-101 min (mean 85) after the first bird entered it. The time between the roosting and foraging times in the morning and evening was spent in a rosebush beside the martin house, in the martin house, or moving back and forth between the martin house and rosebush.

The marked difference between the times of first and last entrance into the roosting place by these Starlings roosting near their foraging area may indicate that roosting behavior starts at the same time in the evening regardless of the distance from the roosting site at which the birds are foraging. Roosting behavior thus may be initiated at a time to enable birds foraging distant from the roosting site to make their roostward flights before darkness falls. The morning delay in starting foraging behavior likewise presents no apparent advantage to the birds roosting near their foraging areas, and the habit probably was developed in meeting the needs of birds flying to foraging areas distant from their roosting sites. Bray et al. (1975), working with radio-tracked Starlings, noted that birds arrived at the roosting sites sooner because they were foraging

nearer the roosting sites. Brown (1946) also made similar observations.

I suggested earlier (Stewart, 1973) that Starlings roosting in association with large congregations of blackbirds form their pre-roost gatherings in waiting for the selection by a leader species of the site to be used for roosting each night. As some House Sparrows, the leader species here, were present throughout the day near the martin house used by the small group of Starlings, the Starlings found the roosting site already indicated upon arrival from their foraging areas. Nevertheless, the Starlings came to the roosting site more than an hour ahead of the final roosting time. Thus, it now appears that an additional basis for pre-roost gatherings by Starlings may be the initiation of roosting behavior at the same time regardless of the distance from the roosting site at which the birds are foraging. The earlier observation explains why the Starlings roosting in association with blackbirds wait outside of the roosting site without entering it; the present observation explains why the Starlings come to the roosting site so much ahead of the final roosting time.

The first Starling exited daily from the martin house at light intensities of from 1.0 to 11.0 ft-c of incident light, and the birds continued moving into and out of the martin house through light intensities up to 2,400 ft-c. In the evenings the first Starling entered the martin house at light intensities from 98 to 2,200 ft-c, and the last bird entered at light intensities from 2.5 to 200 ft-c of incident light. In an earlier study (Stewart, 1974) I found Starlings going to their roosting places at a still wider range of light intensities or from 20 to 3,200 ft-c. Thus, with Starlings entering and leaving their roosting places at such a wide range of light intensities, I consider their roosting behavior to be related to light intensity only in a light-dark relationship, with the birds finally entering their roosting places just before and remaining there during darkness. D. E. Davis (1955) also found no correlation between roosting behavior and light intensity.

From observations on roosting behavior of blackbirds and Starlings, various authors (Nice, 1935; Bliese, 1955; Jumber, 1956; Meanley, 1965) concluded that these birds respond in their roosting behavior to light intensity. Also, G. J. Davis and Lussenhop (1970) reported correlation between light intensity and movement by Starlings toward their roosting site from their pre-roost assemblies, with the birds leaving their pre-roost assembly sites about 2.2 min earlier with each drop of 10 ft-c of light intensity. However, these various authors, finding correlation with light intensity and roosting behavior, worked with parameters of roosting behavior other than its first appearance and full progression through its various stages. To follow this course in use of the data from my small group of Starlings would appear to be equivalent to selection of a light intensity at which roosting behavior is always in progress.

With a group of four Starlings spending nearly an hour in the process of settling down to roosting after foraging near the roosting site and more than an hour in the morning alternating between

roosting and the start of foraging behavior, roosting behavior of Starlings clearly shows much variation. With this wide variation between first and final entrance into the roosting place among a group of four Starlings, variation can be expected also in the time of first entrance into the roosting place. It is this variation that continues to frustrate efforts of workers seeking to understand fully the roosting behavior of Starlings.

This variation is apparent also in what, in my observations of this small group of Starlings, seemed to indicate a seasonal trend in the time the first bird entered its roosting place. Thus, I found Starlings first entering their roosting place about 24 min earlier in late February than in mid-January or about 0.7 min earlier with each passing day. With sunrise an average of 0.8 min earlier with each passing day and with the first bird leaving the roosting place an average of 9 min before sunrise, it seems probable that the birds might return to their roosting place in the evening relative to the time they left it in the morning. However, because of variation in the time of overt roosting behavior, a statistical test showed the lack of a significant trend.

Other investigators have found birds other than Starlings going to their roosting places earlier when the days were longer: Meanley (1965) found Red-winged Blackbirds (*Agelaius phoeniceus*) going to their roost 1.5 hr earlier in July than in November. The possibility that birds go to their roost in the evening relative to the time they left it in the morning seems to be indicated. This possibility fits the concept that the birds in their roosting behavior may operate on a biological clock, as was reported by Aschoff (1963) for other types of animal behavior. The possibility that Starlings go to their roosts in the evening relative to the time they left them in the morning deserves further investigation.

SUMMARY

Observations were made on patterns followed in entrance into and departure from their roosting place by a small group of four Starlings. Although these Starlings foraged near their roosting place, they delayed their foraging nearly an hour after the first bird exited from the roosting place. Likewise, the first bird entered the roosting place in the evening more than an hour before the last bird entered it. This delay in starting of foraging in the morning and early starting of roosting behavior in the evening is seen as having developed in meeting the needs of birds flying to and from foraging areas distant from their roosting sites. The delay in entrance of the roosting place in the evening is also seen as a partial basis for pre-roost gatherings. No relationship was found between roosting behavior and light intensity, other than a light-dark relationship. These Starlings seemed to go to roost earlier as the days lengthened, suggesting that they returned to the roost in the evening relative to the time they left it in the morning, but a trend was not statistically supported because of variation in roosting behavior.

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