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THE NESTING BIOLOGY OF HOUSE SPARROWS IN KANSAS

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House Sparrows (*Passer domesticus*) first made their appearance in Kansas when 5 birds were introduced in Topeka from New York City in 1874 (Barrows 1889). Sparrows were introduced also at Lawrence about 3 years later. They have since spread. In the early years of their existence in North America, House Sparrows were more abundant in towns and cities than in farm lands. Currently House Sparrows are most abundant in the grain producing regions of central North America (Cink 1975:611; Robbins 1973:8). Their close association with human settlement and agriculture permitted the successful colonization of North America. The abundance and accessability of House Sparrows have made them a convenient species to study. North American studies include those of Anderson (1978), North (1968), Sappington (1977) and Will (1969).

This study, begun by Edward C. Murphy and myself in 1975, was intended to provide basic information on the breeding biology of House Sparrows and an understanding of factors influencing reproductive success in this species. A general overview of House Sparrow breeding biology will be presented here; additional information of our work can be found in Murphy (1978a, 1978b) and Lowther (1979).

Methods and Materials

In the fall and winter of 1974-1975, 150 nestboxes were placed on several farms in southwestern Leavenworth County, Kansas. Observations at these nestboxes continued through 4 breeding seasons (1975-1978). Much of the agricultural lands around the study farms was used as pasture or for hay and the major crops grown included sorghum, soybeans and wheat. Livestock were present at all study farms; cattle were present in varying numbers at all farms and pigs were raised at 3 farms.

Beginning in early spring, visits were made to nestboxes until the first eggs were discovered. Visits after this continued through the summer at 3 or 4 day intervals. This pattern of visitation generally permitted accurate determination of the important dates of a nesting attempt: egg laying, hatching, and when young left the nest. Nest contents were recorded at each visit: eggs were numbered and weighed (to the nearest 0.1 g), and young were weighed (to the nearest 0.25 g) and banded when reaching 10-15 g. Older young were generally not handled in order to prevent them from leaving the nest prematurely.

For each nesting attempt, dates of nesting activities were determined as were the number of eggs laid, eggs hatching, and young surviving nestbox life. Weights of young birds 7 days old were determined, either actual weights or estimated weights based on measurements taken at ages bracketing 7 days.

Seasonal variation in House Sparrows nesting activities was examined by partitioning nest records into 10-day intervals beginning with the date of initiation of the first clutch of each season. Within these 10-day intervals means were calculated for several variables measuring aspects of House Sparrow nesting activities.

For 1977 and 1978, numbers of livestock present at each farmstead were used as an index of food abundance at each farm. These numbers are estimates of the average number of animals present during April-May. Sweepnet samples of insects, taken in 1978, supported the use of this index as a measure of food abundance.

Results and Discussion

House Sparrows begin egg laying in March or early April. The precise date depends on overall environmental conditions, the most likely including warm temperatures and sufficient food for egg production. First eggs appeared on 31 March 1975, 7 March 1976, 11 March 1977, and 22 March 1978. Egg laying continued through the summers and last clutches were initiated on 7 August 1975, 3 August 1976, 25 August 1977, and 18 August 1978. Successful birds could rear up to 4 broods during the summer. Peaks of egg laying activity can be partitioned to 4 broods on a monthly basis: first clutches were usually laid in April, second clutches in May, third clutches in June, and fourth clutches in July. Figure 1 shows the seasonal nesting efforts for each year of the study.

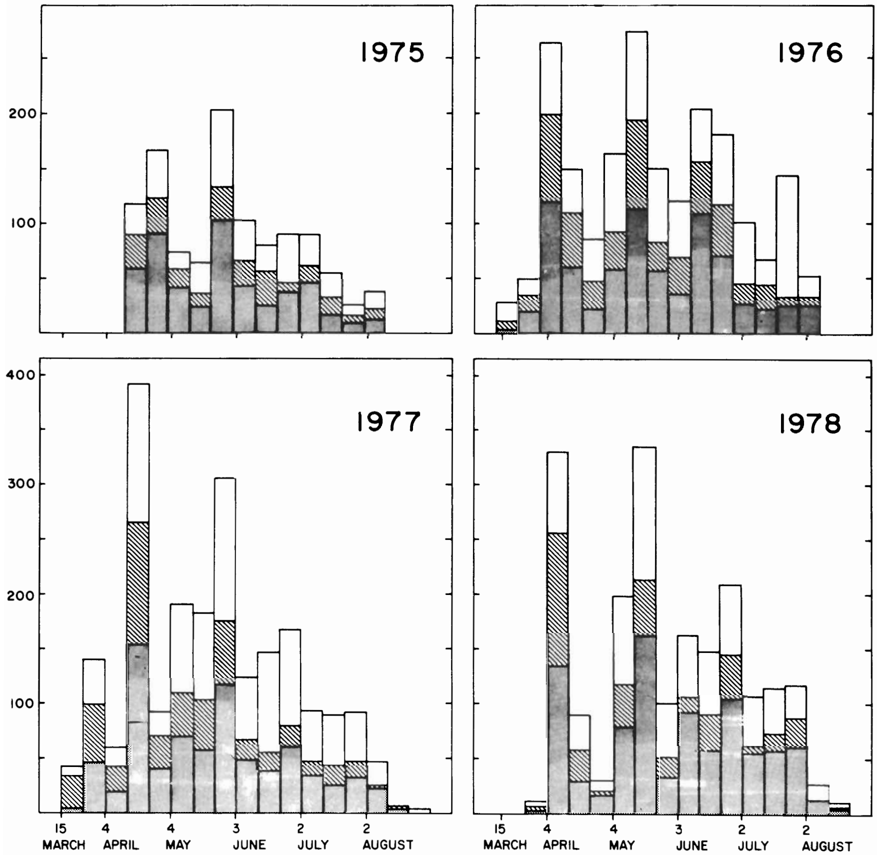

Fig. 1. Seasonal distribution by date of clutch completion to total eggs laid (open bar), number of young known to have hatched (diagonal lines), and number of young that survived nest life (stipple) for 10 day intervals.

Clutch size varied from 1 to 8 eggs: 5 eggs was the most common clutch size (46% of all clutches) and 6 eggs the next most frequent (29%; see Fig. 2). An egg weighs about 2.8 g ($\bar{x}$ = 2.82 g, SD = 0.2455, n = 7816), so normal clutches weigh half as much as the female laying them. This is a considerable energetic expenditure and females feed largely on insects to build up protein reserves for laying eggs (Pinowska 1975). Mean clutch size increases to a maximum in June (to over 5.5 eggs/nest) and then decreases (Fig. 3).

Incubation lasts about 12 days (for 5 egg clutches, $\bar{x}$ = 11.76 days, SD = 1.14, n = 510); however, by 10-day intervals there is a seasonal decrease from an average of about 13 days early in the season to about 11 days at the end. This

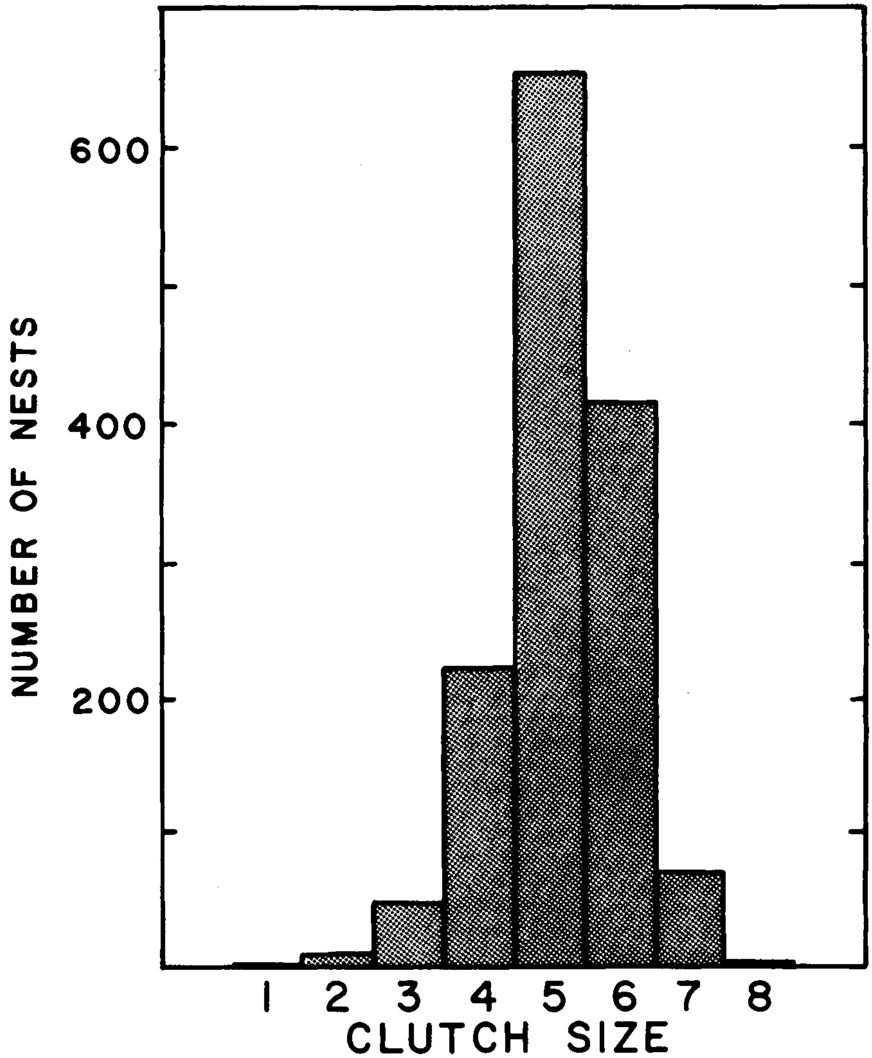

Fig. 2. Clutch size distribution of House Sparrows. Data is based on 1423 clutches observed during four breeding seasons.

gradual decline is significantly correlated with the seasonal increase in temperature (in 1977: $r = -0.84$, $P < 0.01$, $df = 14$; 1978: $r = -0.91$, $P < 0.01$, $df = 11$). Increasing temperatures may be the causative factor for shortening the incubation period, since absences from the nest by adults in warm temperatures would not slow embryonic development as much as in cooler temperatures. Kluijver (1950) found that incubation sessions decreased in length and recesses increased in response to increasing air temperatures in box nesting Great Tits (*Parus major*). If House Sparrows are also more attentive at lower ambient temperatures, high summer temperatures are important in providing incubation heat. The length of the nestling period also showed a statistically significant decrease as temperature increased (1977: $r = -0.68$, $P < 0.01$, $df = 13$; 1978: $r = -0.83$, $P < 0.01$, $df = 11$). For the 4 year study, the nesting period lasted about 14 days ($\bar{x} = 13.91$ days, $SD = 2.06$, $n = 826$).

Hatching success for all completed clutches was 62.5% (4570 young hatching from 7316 eggs of 1423 clutches). Of these young, 2951 (or 64.6%) survived nestbox life. Only 161 clutches (11.3%) were successful in rearing all eggs laid and in 291 clutches (20.4%) only 1 egg or young was lost in rearing the clutch. For 595 clutches (41.8%) no young were raised. Incubation usually began with the next to last egg so the last egg laid may hatch 1 or sometimes 2 days later than the other eggs. This last hatched young is often the runt of the brood and very frequently dies. At age 7

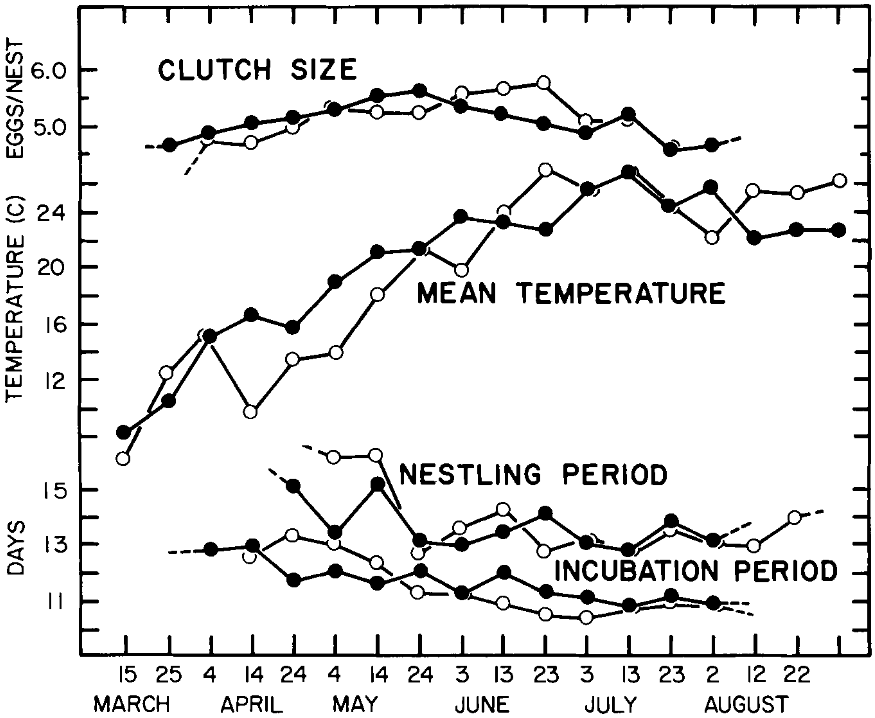

Fig. 3. Seasonal variation by 10-day intervals in mean clutch size, mean temperature, mean length of nestling period, and mean length of incubation period for 1977 (closed circles) and 1978 (open circles). Clutch completion date, hatching date, and date young leave the nest determined the abcissa values for clutch size, incubation period, and nestling period, respectively.

days, there is evidence of slight sexual dimorphism, but there is much overlap in weight distributions: males averaged 20.5 g (SD=2.69, n=70) and females averaged 19.8 g (SD=3.11, n=48) at 7 days of age.

Bird populations are limited to some extent by habitat quality and habitat quality is determined, in part, by food abundance. The degree that populations are dependent on food supplies may be evidenced in patterns of variation in breeding activity and nesting success. The study farms showed differences in food abundance which were partly associated with differences in size of House Sparrow populations maintained and the overall nesting activity and success at each farm. Presence of livestock at farmsteads provide a partial explanation for understanding House Sparrow nesting success. Numbers of livestock present showed a strong association with total seasonal production of young (r_S=0.35, P≈0.10, n=14); without the North study farm (see below), the rank correlation becomes highly significant (r_S=0.75, P<0.005, n=12; see Fig. 4).

Food abundance at the study farms was indexed by sweepnet samples of insects and by counts of livestock present at the farmstead. Cattle and pigs, especially when penned in feedlot conditions, create an atmosphere favorable for certain

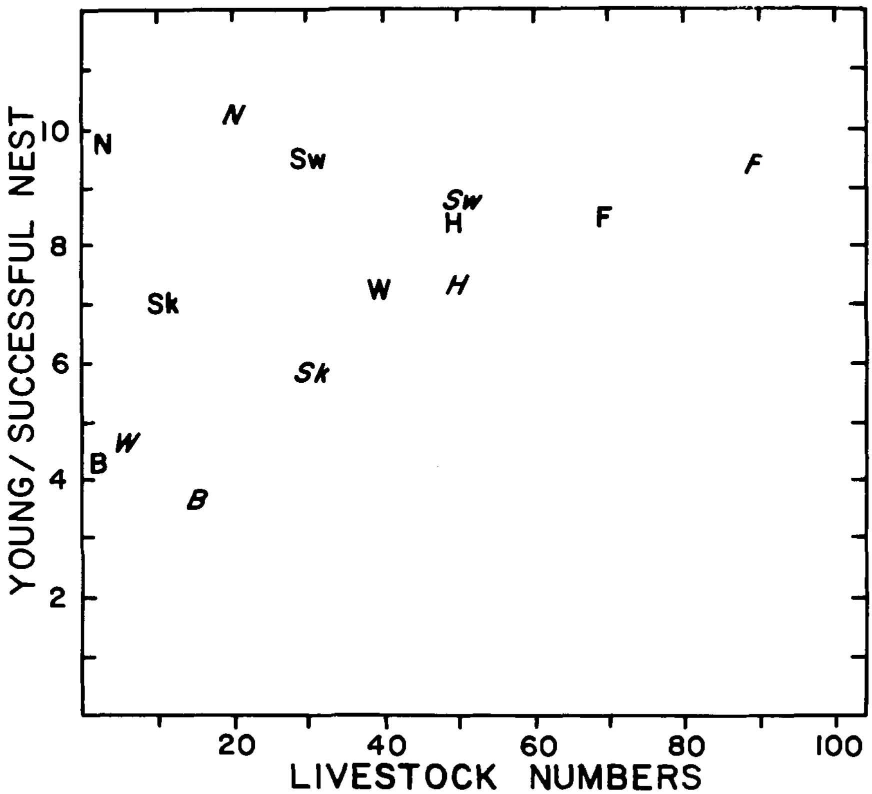

Fig. 4. Relationship between seasonal production of young from nests successfully rearing young at least once and numbers of livestock present at study farms in early spring 1977 (italic) and 1978. Initials identify the study farms.

insect populations (e.g., dung fauna). Insects are important protein sources both for females laying eggs and for nestlings. Large insect populations at farms result in increased nesting success as well as greater persistence in nesting efforts by sparrows (Fig. 4). One farm (the North farm, coded N in Fig. 4) seems out of place in this general relationship. This is explained partly because the livestock counts—as an index to food abundance at the farms—were made early in the season when no cattle were at the North farm. Cattle were not fed overwinter at the North farm but brought in to be pastured during summer (June and later). At this farm, House Sparrow nesting activities began later and continued later in the season than at other farms, still suggestive of an association with the presence of livestock.

All places where House Sparrows are found are not equally productive. Nesting efforts at different times of the year and at different farms will show differences in success depending on many factors. Trying to understand this variation has made the House Sparrow an interesting subject for study.

Acknowledgments.—The initial organization of the breeding biology study was done by Edward C. Murphy. Richard F. Johnston and Calvin L. Cink gave freely of their knowledge of bird biology. Special gratitude must be given to the landowners at whose farms this study was undertaken: Daniel Farmer, Francis Wiley, Othal Wiley, Harry Skeet, Arthur C. Hemphill, Frank Brune, Thomas H. Swearingen, Lena North and Cleve B. Vaughn. Funding for this project was initially provided by NSF grants DEB 72-02374 and BMS 76-02225 and continued by General Research Fund grants from the University of Kansas.

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A LATE MAY RECORD OF PINE GROSBEAKS IN SOUTHWEST KANSAS

Steven C. Kingswood

On 26 May at approximately 0700 hours Eddie Stegall and I noticed an unusual fringillid that we could not immediately identify. This bird was active in a low-lying area of shortgrass prairie dominated by several deciduous trees, roughly four miles north of Elkhart, Kansas along highway K-27 and adjacent to a U.S. Forest Service tree farm. The size of this bird was similar to that of the Western Kingbird (*Tyrannus verticalis*) and Northern Oriole (*Icterus galbula bullockii*) seen in the area at that time, but this bird was "chunkier" and had a shorter tail than either the oriole or kingbird. This bird and the next one seen over a 30 minute period were largely a drab gray except for a darker tail and wings and a mustard color around the head and a touch on the breast. At closer range I could see that the heavy finch-like bill was definitely not crossed. After referring to Robbins et al. (1966), we tentatively concluded that these birds were female Pine Grosbeak (*Pinicola enucleator*). The two birds were often observed feeding on the ground in company with a few House Sparrows (*Passer domesticus*), and for about ten minutes the birds were watched at distances closer than 50 feet as they fed on the shoulder of the highway. During this time two distinct light-colored wingbars and all field marks noted above were seen with great clarity. I had a glimpse during this half-hour of a similar bird, but which was rosy red around the head, back, and breast. This was undoubtedly a male Pine Grosbeak. Upon returning to Wichita a few days later, I contacted Max Thompson of Winfield, Kansas concerning our observations. At his invitation I examined study specimens of Pine Grosbeaks from the Southwestern College collection. This further reinforced my belief that our identification of the grosbeaks was correct.

The occurrence of Pine Grosbeaks in Kansas on 26 May is a late date for the entire southern Great Plains. Sightings in Topeka as late as 30 April (Johnston, 1956) and near Wakita, Oklahoma, 11 May (Sutton, 1966) suggest, however, that this date is not totally unexpected. The continuance of "winter" weather late in the spring this year may appear to be the most likely explanation for these lingering

Pine Grosbeaks. According to Bent (1968), however, the irregular and erratic southern movements of these birds, especially "winter invasions", occur as the result of local food supplies. Bent also reports that ground feeding, even on "bare, gravelly soil", occurs when tree buds are scarce. Specimens of the Pine Grosbeak collected in Hays, Kansas are of the northern race, *P. e. leucura* (Ely, 1961). Although breeding populations of the Rocky Mountain race, *P. e. montana*, are closer to our observation site (less than 190 miles from the Elkhart area) than those of the northern races, records of *P. e. montana* from the southern Great Plains are few (Bailey and Niedrach, 1965; Ligon, 1961). However, a bird captured near Pampa, Texas in December, 1933 was of the *montana* race (Wolfe, 1956). The origin of the three Pine Grosbeaks seen in Morton County, Kansas on 26 May 1979, however, will have to remain a mystery.

I would like to thank Max Thompson for encouraging me to publish our observation records and allowing me to examine study skins of the Southwestern College collection.

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BOOK REVIEW

Wild Flowers and Weeds of Kansas. Janet E. Bare. The Regents Press of Kansas, Lawrence, Kansas. 509 pages with 132 color photographs and 689 black and white photographs, maps, and line drawings. Hard cover. $35.00

While admittedly written for the beginning botanist or biologist, this substantial book will be helpful to anyone who would like to identify the herbaceous plants that can be found throughout the state. Woody plants and grasses are excluded, but for the former H. A. Stephen's handbook, *Trees, Shrubs and Woody Vines in Kansas*, also published by The Regents Press, is suggested. This is not a "coffee table" wildflower book, nor a picture key. Its size (22.5 x 29 cm.) and weight (a little over 2 kilos) clearly suggests that it is also not a field guide. But in your car or home you will find the real value of this book in the dichotomous keys that permit the user to identify the plant in hand.

As you are aware, it is one thing to describe in words and in pictures the differences between a semipalmated sandpiper and a western sandpiper and quite something else to actually identify these species in the field with certainty all of the time. But with practice, you can get better at it. So with a little patience and a little practice you will be able to use this book effectively as you come to understand the differences between an inferior or superior ovary and a palmately or pinnately compounded leaf as well as the characteristics of an irregular flower or a glabrous stem. Actually there is a mimimum of technical terminology and Dr. Bare has described and often pictured most of these descriptors that might be foreign to you in the introductory section or defined them in the glossary. The special terminology that is needed for particular groups of plants like the composites is defined at the beginning of the appropriate keys.

The introductory section includes a discussion of the physiography of Kansas which I believe will help the user appreciate the distributional patterns of various plants species in the state. There is also a section with helpful suggestions on the collection and identification of plants. The index includes both scientific and common names.

The species accounts not only give additional descriptive information on vegetative structure, flowers and fruits, to substantiate the initial identification of the specimen through the use of the keys, but also indicate the time of flowering, the characteristic habitat, its distribution in the state, and the derivation of its names. Furthermore there is a wealth of other kinds of information on the importance of the species as food for birds and mammals, as food for native American Indians and the early pioneers, as dyes, cosmetics, medicines, and even love potions. I think you ought to get a copy of this book because I am convinced that it will make your hours in the field more enjoyable.

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