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SPOTTING PATTERN OF THE LAST LAID EGG OF THE HOUSE SPARROW

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Abstract.—For more than 90% of completed clutches of House Sparrows (*Passer domesticus*), the last laid egg is more lightly colored with a more diffuse spotting pattern than eggs laid earlier.

PATRÓN DE MANCHAS EN EL ÚLTIMO HUEVO DE LA CAMADA DE *PASSER DOMESTICUS*

Resumen.—Varios estudios han indicado que el último huevo de la camada de *Passer domesticus* tiene una apariencia diferente a los demás. De 1975–1978 estudié 1423 camadas de estas aves en Kansas. Encontré que en más del 90% de las camadas completas, el último huevo es más pálido y el patrón de manchas más difuso que en el resto de los huevos de la camada.

Several studies of the breeding biology of House Sparrows (*Passer domesticus*) have mentioned that the last laid egg in a clutch often has a different appearance and can be readily identified (Dawson 1964, Lowther 1983, Murphy 1978, Seel 1968). When compared to other eggs in the clutch, these "last" eggs have larger spots and appear lighter in color, in part due to a more diffuse spotting pattern (Fig. 1). I present quantitative data to indicate the frequency of identifiable last laid eggs.

During a 4 yr study (1975–1978) of the breeding biology of House Sparrows at nine farms in northeastern Kansas, I obtained measurements on 1423 completed clutches. About 150 nestboxes were monitored each year at 3-d intervals throughout the breeding season. Eggs were numbered and measured. During 1975 recording of "last" eggs was not part of the regular field routine, but was added to observations for 1976–1978.

The precise laying sequence of most eggs was not known, but given that sparrows lay 1 egg/d, eggs could be assigned to segments of the laying sequence depending on how many eggs were present in the nest on the first visit after clutch initiation. For example, a five egg clutch may have one egg in the nest on the first visit after clutch initiation. On the next visit 3 d later, three new eggs would have been added. Only one new egg, the fifth, would be found in the nest on the next visit 3 d later. The fifth egg would be known to be the last laid egg and might have, also, a "last" egg spotting pattern. For 1976–1978 data, known last eggs (=the last and only new egg in a clutch) were also eggs with "last" spotting patterns in the following frequencies: for four egg clutches, 45 of 51 known last eggs (=88%) had a "last" egg spotting pattern; for five egg clutches, 164 of 175 last eggs (=94%) had the last pattern; for six egg clutches, 96 of 100 last eggs (=96%) had the last pattern; and for seven egg clutches 15 of 15 last eggs (=100%) had the last pattern. Other

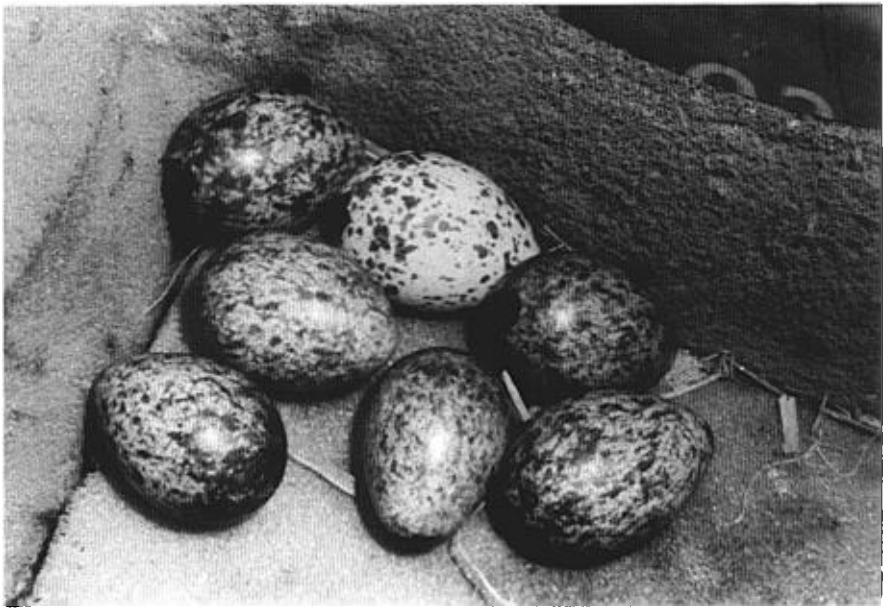

FIGURE 1. Clutch of seven House Sparrow eggs showing the contrast between the "last" egg spotting pattern (middle egg of top row) with the pattern of other eggs in the clutch.

known last eggs resembled the other eggs of their clutches. Table 1 gives the occurrence of eggs that were identified as "last" by their spotting pattern during the course of the entire 4 yr study. Included in these data are clutches which may have had two or three new eggs present, on the visit after clutch completion, of which one frequently showed a "last" spotting pattern. In all, about 90% of clutches have eggs with a "last" pattern.

Intraspecific parasitism can account for eggs of odd appearances in nests. For House Sparrows, Wetton et al. (1987) found 8% of nestlings to be genetically mismatched to their purported parents, and Manwell and Baker (1975) found two of 32 clutches with an electrophoretic mix of eggs. For my field routine, I noted no obvious evidence of intraspecific brood parasitism, i.e., all new eggs could be accounted for as 1 new egg/d. The high frequency in which known last eggs have a "last" pattern provides some argument against ascribing all eggs of an odd appearance to parasitic females. The 1976–1978 data include 104 clutches which had additional eggs with a "last" pattern. For 63 clutches, both "last" eggs were at the end of the laying sequence, often times a "last" egg followed by a "double last" egg (=eggs with an even lighter "last" appearance). For 12 clutches, one of the "last" eggs was first in the laying sequence. For the remaining 29 clutches the additional "last" eggs were in intermediate positions in the laying sequence.

House Sparrows begin incubation prior to clutch completion, often

TABLE 1. Yearly distribution of clutch sizes of House Sparrows and the occurrence of "last" eggs among these clutches; the designation of "last" eggs was not part of the regular routine in 1975 (with only 44% of all clutches including "last" eggs) but was in 1976–1978 (with 91% of all clutches including "last" eggs).

	1975		1976		1977		1978		% last 1976–1978
Clutch size	No.	Last	No.	Last	No.	Last	No.	Last	
1			1						0
2	4				5	1	3	2	38
3	12	5	9	6	16	9	12	9	65
4	36	11	69	55	58	49	58	52	84
5	113	55	160	141	204	194	181	176	94
6	52	23	134	123	114	110	114	113	96
7	7	4	20	17	23	21	19	19	92
8					1	1	1	1	100

with the penultimate egg. Physiological changes in the female as she completes egg laying and begins incubation may influence the function of pigment glands and result in the change in spotting pattern. Such a speculative physiological response may be a general occurrence among birds, especially noticeable for passerines that have spotted eggs and begin incubation prior to clutch completion, but I know of no study specifically addressing this question.

Stuart Baker (1934:76–84) noted four species of *Passer,* including House Sparrows, which "nearly always" include one odd egg in a clutch. For both Prairie Warblers (*Dendroica discolor,* Nolan 1978:177) and Song Sparrows (*Melospiza melodia,* Nice 1937:111–112) the last egg of a clutch has a different appearance, but the frequency of these "last" eggs was not as great as I recorded for House Sparrows. Nice's (1937) suggestion that depletion of pigment in the pigment gland is the cause of differences in appearance of "last" eggs receives some support from the increasing frequencies at which larger clutches include "last" eggs (see Table 1) and by the "last," "double last" sequence in some clutches. Careful inspection of egg pattern within a clutch may permit designation of "last" eggs in other species. This knowledge would be useful in determining laying sequence for some eggs and for knowing if egg laying is actually complete.

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