

MISCELLANEOUS PUBLICATIONS NO. 41
MUSEUM OF ZOOLOGY, UNIVERSITY OF MICHIGAN

THE LIFE HISTORY OF HENSLOW'S
SPARROW, *PASSERHERBULUS*
HENSLOWI (AUDUBON)

BY
A. SIDNEY HYDE

ANN ARBOR
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FREDERICK M. GAIGE
Director of the Museum of Zoology

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THE LIFE HISTORY OF HENSLOW'S SPARROW, *PASSERHERBULUS HENSLOWI* (AUDUBON)*

INTRODUCTION

HENSLOW'S Sparrow presented itself as a suitable subject for investigation because of its obscure habits and the comparative dearth of knowledge concerning it. Observers in southern Michigan were agreed that a marked increase in abundance had taken place within a few years preceding the inception of the study. Although the actual causes of such changes in the population of a wild species are frequently too well hidden or too complex for conclusive analysis, it seems worth while to record some of the environmental factors as a first step.

Field work was carried on at the Edwin S. George Reserve in southern Livingston County, Michigan. The periods of field investigations are as follows: June to September of 1933 and 1934; the fall of 1935 and spring of 1936. A field assignment from the Roosevelt Wild Life Station allowed me to make a few incidental observations across northern and western New York in the summers of 1935 and 1936.

I wish to express my thanks to Dr. J. Van Tyne, Museum of Zoology, University of Michigan, for suggesting the problem and for guidance throughout the course of the investigation; to Mr. F. M. Gaige, Director of the Museum, who made it possible to establish headquarters in the field; to Messrs. P. F. Hickie, Adolph Murie, Lawrence Camburn, and to my father, Arthur M. Hyde, for assistance in the solution of various difficulties encountered in the field. To the several score of ornithologists who answered inquiries regarding the bird in their respective regions, thanks are hereby expressed. I am indebted to my wife, Nancy H. Hyde, for valuable help in the preparation of the manuscript.

I also wish to thank the United States Bureau of the Biological Survey for the identification of items in seventeen stomachs, and Messrs. Milton B. Trautman and Louis W. Campbell for permission to examine their valuable notes on Henslow's Sparrow.

This publication was made possible by a grant from the Edwin S. George Foundation.

The bibliography does not pretend to be complete, but it contains those titles which seem most pertinent and which contributed something definite for the purposes of this paper.

The problem of the subspecific status of eastern and western representa-

* A contribution from the Edwin S. George Reserve.

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, in the University of Michigan.

tives of Henslow's Sparrow has been given considerable study, but conclusions are withheld until the evidence becomes more complete.

THE BIRD AND ITS GENERAL HABITS

Henslow's Sparrow is so much a part of its environment that some conception of the interaction of the bird with its habitat is desirable as a basis for discussion. Observations upon the habits of the bird began with Audubon (1831, 1: 360), when he collected the type specimen in 1820 "amongst tall grass," a comment that marks the specimen as truly an ecological type for the species as it was a taxonomic type. Giraud in 1844 (p. 104) wrote a characterization of the bird and its habitat that could scarcely be improved upon:

In general it frequents the low, wet meadows, and passes most of its time on the ground among the tall grass and is exceedingly difficult to flush, even when pursued with dogs; it will not fly until nearly within their reach; when it starts from the ground, moves on only a few yards, and again drops among the grass—and unless the gunner is expert is apt to escape. From the eagerness with which it is pursued by dogs, we may assume that it possesses considerable game effluvia.

This rail-like inclination to hide rather than to fly is remarked upon by others and is so ingrained into the nature of the bird as to make heavy grass a prime requisite of its habitat. In southern Michigan I have watched birds at very close range sneaking through the clumps of *Spartina*, where they could be glimpsed but momentarily; an attempt to flush them usually resulted in their complete disappearance. At other times I have seen birds remain motionless at the base of a clump almost at my feet, apparently feeling that they were completely hidden. This "instinct" was first noticed as a positive thigmotaxis in a nestling, which, when removed from the nest always moved away from an open space until it felt the contact of a few blades of grass, after which it remained quiet. Wounded birds were several times found in hollows in the soil beneath tussocks.

The general coloration of Henslow's Sparrow is a pattern of streakings of browns, buffs, black, and white that makes the bird inconspicuous at best, and practically invisible when it is in the grass.

The song has been called the "nadir of bird songs." It is an insignificant two-syllabled "tze-sick," more fully described later on.

With its strong "instinct" for concealment and its inconspicuous plumage and song it is small wonder that Henslow's Sparrow is easily overlooked and frequently misidentified, even by ornithologists. The tardiness of its discovery in some localities where it is fairly common is probably partly because of these factors. There are authentic records that the bird has bred in a locality certain years and has been definitely absent from it in other seasons. Its susceptibility to alterations in the environment, its apparently

innate tendency toward irregularity in occurrence, and its great seclusiveness combine to make impossible the full interpretation of the historical record. The examination of this record, however, is even more important than it would be for a conspicuous species, because one positive record is apt to be an indication of more individuals that are not observed. On the other hand the danger of misidentification must be constantly guarded against.

HISTORICAL SKETCH

In tracing the development of our knowledge of the distribution of Henslow's Sparrow it is necessary to keep in mind certain changes in the environment created by man. The primeval forests which extended almost unbroken from western Indiana to the salt marshes of the Atlantic coast must have originally offered little to induce colonization by this bird. Only as the forests were cleared would there be any considerable amount of habitat available to the bird within this region, and a careful examination of the record tends to support this hypothesis.

Audubon (1831, 1: 360) gave the following account of his discovery of "Henslow's Bunting":

I obtained the bird represented in this plate opposite Cincinnati in the state of Kentucky, in the year 1820. . . . It was on the ground, amongst tall grass, and exhibited the usual habits of its tribe. Perceiving it to be different from any which I had seen, I immediately shot it, and the same day made an accurate drawing of it.

. . . Its history and habits are unknown. In appearance it differs so little from the Buntings, that, for the present I shall refer it to that genus.

The specific name *henslowi* was given in honor of John Stevens Henslow, Professor of Botany in the University of Cambridge, for the "many kind attentions" which he had shown Audubon (Herrick, 1917, 2: 354, footnote; Audubon, 1841, 3: 75-76).

Nuttall (1832-34, 2: 571-72) remarked that the bird bred in New Jersey and was abundant in winter in South Carolina and Florida, "threading its way through the grass with the nimbleness of a mouse." In 1839 Audubon (p. 104) recorded the bird as an abundant breeder from Maryland to New York, accidental in Ohio, and the winter range as from Carolina to Louisiana.

The discoverer gave us his most lengthy published account of the bird in the second edition of his *Birds of America* (1841, 3: 75-76):

This species is abundant in the State of New Jersey and breeds there; but of this I was not aware until after . . . the spring of 1838, when my friend Dr. James Trudeau sent me a specimen procured by himself. . . . This specimen is the finest I have seen, although Dr. Bachman and myself have procured a great number in South Carolina, where this species abounds in the latter part of autumn, and where some remain during winter. I have found it in great numbers in all the pine barrens of the Floridas, in

winter, but mostly in sandy or light soil, in woods thinly overgrown by tall trees, but on the ground, where it spends its time; it runs with rapidity, passing through the grass with the swiftness of a mouse. In the State of New Jersey it is found in ploughed fields, and I have no doubt was previously overlooked or supposed to be the Yellow-winged Bunting, to which it bears some resemblance. It has not been observed farther to the eastward than the state just mentioned. Its plumage in spring is more richly coloured than in autumn or winter.

In the west Audubon was again the first to note the species. For his Nebraska records of 1843, see the section on "Occurrence." A possible record for south central North Dakota is his journal entry for June 4, 1843: "Bell shot a Bunting which resembles Henslow's, but we have no means of comparing it at present" (M. R. Audubon, 1898, 2: 3-4). For over twenty years the northwestern corner of the known range was the Loup Fork of the Platte, where Hayden took a specimen June 10, 1857 (Baird, Cassin, and Lawrence, 1860: 452).

Farther east neither Kennicott nor Pratten in their Illinois lists of 1855 mentioned either Henslow's or the Yellow-winged Bunting (Grasshopper Sparrow). However, Baird, Brewer, and Ridgway (1874, 1: 550-52) wrote that Kennicott submitted some unidentified eggs "several years since," and that they were probably those of Henslow's Sparrow. Ridgway (1889, 1: 254) was the first to recognize the bird in Illinois, in 1871.

The first New England record we find is that of Wheeler (1859: 137), who found a nest at Berlin, Massachusetts. As late as 1862 Coues and Prentiss (1862: 412) recorded only one specimen from the District of Columbia, and a careful scrutiny of Baird, Cassin, and Lawrence's editions of 1858 and 1860 throws some doubt upon the locality of its collection. In Pennsylvania Turnbull (1869: 29) recorded the species as rare in the eastern part. A set of eggs with no locality, is listed by Heermann (1854) as being in the collection of the Academy of Natural Sciences of Philadelphia.

For one reason or another discovery of the bird in the following states came years later than in adjacent areas: Minnesota, 1880 (Roberts, 1932, 2: 394); Michigan, 1881 (Covert, 1894: 217); Ohio, 1894 (Jones, 1910: 38), except for Audubon's statement; Vermont, 1902 (Howe, 1902: 405); Delaware, 1903 (Rhoads and Pennock, 1905: 201); Rhode Island, 1910 (Hathaway, 1913: 555); North Carolina, 1932 (Odum and Taylor, 1934: 396-97); and West Virginia, 1935 (Hicks, 1938). In Minnesota, Michigan, and Ohio, at any rate, the avifauna had been studied for many years before the species was confirmed on the state lists.

Henslow's Sparrow was almost always discovered as a breeder later in the states which were originally heavily forested than in those states with considerable areas of prairie or marsh. The following list shows the dates of the first authenticated breeding records:

EASTERN STATES

<i>Almost entirely forested</i>	<i>With extensive coastal marshes</i>
Massachusetts, 1859	New Jersey, 1832-34
New Hampshire, 1874	Maryland, 1843
Connecticut, 1876	New York (L. I.), 1844
New York (inland), 1887	Virginia, 1879
Vermont, 1902	Delaware, 1903
Pennsylvania, 1913	Rhode Island, 1910
West Virginia, 1935	

MIDDLE WESTERN STATES AND PROVINCE

<i>Entirely forested</i>	<i>With prairies</i>
Wisconsin, 1870	Nebraska, 1843
Minnesota, 1880	Kansas, 1856
Michigan, 1881	Iowa, 1868
Ohio, 1894	Indiana, 1869
Ontario, 1898	Illinois, 1871
	Missouri, 1879
	South Dakota, 1882

Is it because of the fact that the bird was overlooked that it was not reported as a breeder in upstate New York, Vermont, Pennsylvania, and West Virginia until from five to fifty-four years after it was so reported from all of the prairie states? It seems unlikely, for the eastern states were the first to be settled and to have their avifauna studied. Widespread clearing of the forests has made more habitat available for the bird; the result has been an increase of the species, at first very slow, possibly because of a small breeding stock, but now more noticeable. Recent marked increases in abundance are reported from Ohio, southern Michigan, and Ontario. In particular, Ohio and southern Michigan have become within recent years centers of abundance from which may have emanated, by reason of pressure of population, those pioneers which are systematically occupying southern Ontario from west to east.

OCCURRENCE

NORTH DAKOTA.—No authenticated specimens have come to light. A record from Pembina, July, 1879 (Abbott, 1880: 984; Roberts, 1932, 2: 393-96), is regarded by Witmer Stone (letter) as a confusion of localities or identities. Stone writes that no specimens of *henslowi* from Dakota were in Abbott's collection of North American birds when it was presented to the Academy of Natural Sciences of Philadelphia in 1887 and that Abbott had not disposed of any specimens. A record of a bird taken by H. V. Williams (1926: 101) at Grafton, May 23, 1923, and sent to N. A. Wood at Ann Arbor must be rejected, for there is a specimen of Nelson's Sparrow (*Ammospiza caudacuta nelsoni*) in the University of Michigan Museum of Zoology taken by Williams on that date, and none of Henslow's. This forces us to reject

Williams's record of another specimen from Grafton. Larson (1928: 104) recorded the species as breeding in McKenzie County. Although the locality is hundreds of miles from any other known breeding place, his comments carry the conviction that the identity is correct. A North Dakota specimen is exceedingly desirable.

SOUTH DAKOTA.—Moody County is the type locality for *occidentalis*, of which specimens were collected June 6, 1883 (Brewster, 1891: 145); two are in the Museum of Comparative Zoology. An Audubon specimen (A.M.N.H. No. 41572)¹ labeled "Ft. Union, Upper Missouri. 1843" may have come from the Dakota side of the line (Zimmer, letter). There are sight records from Clay County (Visher, 1915: 331), Sanborn County, (Visher, 1913: 570), and Harding County, September 4 (Visher, 1911: 14). At Sioux Falls the average date of arrival is May 9, the earliest date is April 29 (Larson, 1925: 34).

MINNESOTA.—Summer resident as far north as Grant and Isanti counties; specimen taken in Kittson County, June 6, 1898; nest found near Heron Lake, where the bird breeds on native prairies; average date of arrival in state, May 6; earliest date, April 25, 1891 (Roberts, 1932, 2: 393-96). Bred near Minneapolis (Roberts, 1890: 213).

Specimens examined: Heron Lake, 2; Minneapolis, 2; Pipestone County, 1; Anoka County, 3; Mower County, 1.

NEBRASKA.—Authenticated specimens: Loup Fork of the Platte, June 10, 1857 (U.S.N.M. No. 8968, sent to P. L. Sclater in 1861—J. H. Riley, letter); specimen taken by Aughey at Kearney Junction, September, 1874, not preserved (Swenk, letter); specimens seen by Audubon, May 9 and 17, 1843, near present site of Omaha and in Dixon County (M. R. Audubon, 1898, 1: 477, 493-96). Trostler's record of a female taken with nest and eggs near Omaha (Bruner, Wolcott, and Swenk, 1904: 86) is rejected by Swenk (letter) who writes: "I believe Mr. Trostler was not always quite sure on his sparrow identifications . . .," and that the record was "inserted there on the insistence of the late Dr. R. H. Wolcott . . . who had confidence in the record." Inquiry has failed to reveal the present location of Trostler's specimens. Swenk regards the state as without an authentic breeding record, but the Loup Fork specimen was taken in the breeding season. Since there are nesting records from states on three sides of Nebraska the bird probably breeds there.

Migration dates: Lincoln, April 22 (Bruner, Wolcott, and Swenk, 1904: 86); several other records for eastern Nebraska, April 26 to May 9. Papillion, Sarpy County, October 9, 1882, U.S.N.M. No. 88732 (J. H. Riley, letter).

¹ A.M.N.H. = American Museum of Natural History; U.S.N.M. = United States National Museum; M.C.Z. = Museum of Comparative Zoology; U.M.M.Z. = University of Michigan Museum of Zoology.

KANSAS.—Specimens examined: Douglas County, Lawrence, 10. Other authenticated records: Fort Riley, June 13, 1856, female specimen in U.S.N.M. No. 5716 (Baird, Cassin, and Lawrence, 1860: 452); Marshall County, two nests (Peabody, 1920: 145); Wilsey, Morris County, originally reported as Baird's Sparrow (see Wetmore, 1920: 458). A small colony was seen by me near Topeka about June, 1920. There is a specimen in M.C.Z. from Leavenworth (G. M. Allen, letter).

WISCONSIN.—Delavan marshes, common; nest, May 29, 1898; Milton, Rock County, 6 specimens (Kumlien and Hollister, 1903: 95-96); reclamation destroying this habitat (Hollister, 1919: 107); Beaver Dam, "abundant summer resident" (Snyder, 1902: 111). Dane County, common summer resident; average date of arrival, April 25; earliest date, April 18; average date of departure, September 24; latest date, November 14; specimen, October 3; Sauk County, one taken April 7 (Schorger, 1931, 2: 46). Fond du Lac County, April 30, 1922; several records from southeast, from May 4 to 26, June 10, and August 24, furnished by C. S. Jung (letter), who considers the bird a migrant only, there. Waukesha County, "third and fourth weeks in May" (Cahn, 1913: 135).

Specimens examined: Walworth County, Delavan, 8 adults, 1 juvenile, May 29 to September 2; Turtle Lake, 1; Lake Koshkonong, 4, May 28 to September 16; Walworth, 1; Dodge County, Beaver Dam, 1.

IOWA.—Formerly a summer resident in Grundy County (nest and female taken in 1899) and in Lee, Linn, and Poweshiek counties; specimen taken at Tiffin, Johnson County (Dumont, 1933: 148). Dumont stated that the bird has apparently disappeared from the state in recent years, except as a "fairly rare migrant," but L. J. Bennett (letter) writes that he observed the birds throughout the breeding seasons of 1932-37 in northwestern Iowa and considers the scarcity of records to be owing to the paucity of observers.

At Grinnell the birds arrived from early to mid-April (Jones, 1892: 72) and left about October 15 (Jones, 1895a: 236).

Specimens examined: Dickinson County, July, 1881, 2; Clay County, August 29, 1907, 1 juvenile.

There are three specimens from Storm Lake, Buena Vista County in M.C.Z. (G. M. Allen, letter).

MISSOURI.—Breeding records: St. Louis and St. Charles counties; "probably of general distribution throughout the prairie and Ozark border regions" (Widmann, 1907: 178); Warrensburg, common (Scott, 1879: 139); Kansas City, "rather uncommon" (Harris, 1919: 296).

Specimens taken in Shannon County, March 19 and May 4, 1907 (Woodruff, 1908: 204); the March 19 specimen has been examined; 2 specimens, M.C.Z., from near Durham, Lewis County (G. M. Allen, letter).

ILLINOIS.—Breeding; northeastern part, many records; Chicago and vicinity (Eifrig, 1919); Fox Prairie, Richland County, "very abundant" in

1871 (Ridgway, 1889: 254-57); Adams County (Poling, 1890: 240); DuPage County, specimen taken by Gault, July 25, 1896.

Migration: DuPage County, 1 taken March 28, 1910 (Eifrig, 1911: 50); Chicago region, mid-April to last of September (Woodruff, 1907: 136); Urbana, April 13, 1927 (Hyde, notes); Richland County, October 28, 1882 (Ridgway, 1883: 58); Beach (near Chicago), November 12, specimen (Stevenson and Brodkorb, 1933: 373). According to W. W. Cooke (1888: 191), on the authority of Ridgway, it sometimes winters in southern Illinois.

Specimens examined: Hancock County, Hamilton, 1; Richland County, Noble, 1; Wood Lawn, 1; Cook County, Coulhour (Colehour), 1.

INDIANA.—Breeds in northern portion (Butler, 1898: 943-45). Wilders, common (Dunn, 1895: 391-92); Bloomington, rare, nest and young, June 3, 1902 (McAtee, 1904: 113); Lake County, several breeding records.

Migration: Tippecanoe County, seen April 7, 1929 (Test and Test, 1934: 232); Dune Park, April 26, 1925 (C. S. Jung, letter); Jackson County, December 25, 1933, specimen, verified by Wetmore (Fleetwood, 1934: 388; and letter).

Specimens examined: Lake County, Tolleston, 2.

MICHIGAN.—It is surprising that in southern Michigan, where the species is more abundant than in most other parts of its range, no record seems to have appeared before that of Covert (1894: 217) in his 1881 list of Michigan birds. The authenticity of this record was questioned for many years. The first undoubted evidence for the occurrence of the bird seems to be the finding of a nest near Plymouth by Purdy (1897: 220, 406) on July 27, 1893. A specimen taken by him at that time is now U.S.N.M. No. 151992, although he assigned another, incorrect number to this specimen. The species must have been rare at Plymouth, for Purdy (1897: 220) stated that he found no more birds, in spite of careful search. The earliest Michigan specimen in the University of Michigan collection was taken in 1894 (N. A. Wood, 1921: 592). "The existence of Henslow's Sparrow as a summer resident in . . . St. Clair County was reported by an eastern ornithologist in 1900 . . .," according to J. C. Wood (1905: 416), who also stated that a nest was found there on May 28, 1905. In 1905 Swales (p. 111) wrote that the bird seemed to be "well distributed in small colonies along both sides of Lake St. Clair, and also in a few suitable localities in Wayne County." In 1897 the Michigan Ornithological Club (1: 27) published the following, based upon observations by various people: "Henslow's Sparrow is by no means so rare a species as supposed, but is scattered over at least the three lower tiers of counties in Michigan." This description of its occurrence coincides with its present principal distribution in the state. The bird is abundant in suitable habitat in southern Livingston County, where the present study was made. Additional records for the breeding season are:

Saginaw Bay region, Clinton and Calhoun counties (Walkinshaw, letter); Eaton Rapids (Kalmbach, 1908: 230); Albion, where there was a colony of forty to sixty (Hennessey, 1916: 114); Ann Arbor (unusually abundant in 1930—Olsen, 1931: 481); Mackinaw City, June 13, 1931 (specimens—Wing, 1931: 618).

Specimens examined from Mackinaw City, Ann Arbor, Waterloo, and St. Clair, Jackson, and Wayne counties. Specimens were collected by me in Eaton and Livingston counties.

Migration: Battle Creek, average date of arrival April 22 (Walkinshaw, letter); Ypsilanti, specimen, April 18, 1909 (Wood and Tinker, 1910: 134); Livingston County, April 15, 1936. Fall: Birmingham, Oakland County, October 25, 1934, specimen caught in mousetrap (Van Tyne, letter). At Anderson, southern Livingston County, I found the species very common on September 21, 1935, when about two dozen birds were flushed, but on October 5 not more than one dozen were discovered in the same fields. On October 18 seven or eight birds were all that could be found by diligent search, and on October 24 only four or five birds were seen (one collected) during an all-day tramp over a few hundred acres of breeding habitat near Portage Lake, Jackson County. The species was not seen after that date.

ONTARIO.—In 1898, during the breeding season, W. E. Saunders (1899: 80) took four specimens and saw more east of Lake St. Clair and at Sarnia. Fleming (1902: 403) reported the species from east of Georgian Bay but has since written (letter) that this record should be eliminated pending substantiation. Saunders (1936, letter) writes that he reported it as rare in the London region prior to 1931 (Saunders, 1931) and that it has been increasing to the extent that in certain habitats near Rondeau it is "actually the commonest of all birds. . . ." Fleming (letter) writes that the bird is working eastward and increasing in numbers. H. Richardson (1933: 58) reported the finding of a nest with eggs at Toronto in 1932. The first specimen actually collected in the Toronto region was one found dead May 12, 1934 (L. L. Snyder, 1935: 123). In addition, Baillie and Harrington (1937: 271) stated that nests have been found in Peel, Norfolk, and Elgin counties, and that a specimen was taken July 11, 1937, at Bradford, Simcoe County. Macoun and Macoun (1909: 503-4) recorded a bird from Lansdowne, Leeds South County.

Migration: Fall dates, Point Pelee, 6, October 4, and 1, October 8, 1909 (N. A. Wood, 1910: 72); Middlesex County, October 12, 1930 (Saunders and Dale, 1933: 242).

Specimens examined: Long Point, Norfolk County, 6; Toronto, 1; Bradford, Simcoe County, 1 (juvenile); Copenhagen, 2 (1 juvenile); Jeannette's Creek (east of Lake St. Clair region), 1.

OHIO.—

Now known to breed in 46 counties, most of which are in northern and central Ohio. Present in summer in every county north of Paulding, Henry, Wood, Seneca, Wyandot, Marion, Delaware, Franklin, Fairfield, Hocking, Perry, Muskingum, Coshocton, Tuscarawas, Stark, and Columbiana. Also in Champaign, Greene, Madison, and Jackson. . . . This species . . . is generally believed to have greatly increased in the state during the last four decades Several distinct habitat types are utilized . . . as nesting areas. (Hicks, 1935: 177-78.)

Breeds sparingly in ten of the twenty-two unglaciated counties of south-eastern Ohio (Hicks, notes). Recorded in summer in Pickaway County and in the southern tier of counties by M. B. Trautman (notes). Mahoning County, arrived April 23 (Vickers, 1908: 150-52); Toledo region (L. W. Campbell, MS); near Columbus (Nice, letter). Especially common in 1936 (R. L. Baird, 1936: 388).

Migration: Licking County, April 21 (Field, 1903: 140); Oberlin, average date of arrival, April 29, the majority leave about mid-September (L. Jones, 1910: 38; 1895b: 241); Tiffin, September 25 (Henninger, 1906: 136).

Specimens examined: Muskingum County, Zanesville, 2; Duncan Falls, 3; Jackson County, Madison Township, 2; Lucas County, Holland, 1; Knox County, Mount Vernon, 1.

NEW YORK.—Breeding: Monroe, Albany, Rensselaer, and Rockland counties and New York City region (Eaton, 1914: 293-95); Syracuse, June 30, 1887, male taken (Green, 1887: 350); Ithaca (Wright, 1919: 574); Branchport (C. F. Stone, 1933: 228); Oneida Lake (Stoner, 1932: 715-16); Finger Lakes region (Spiker, 1935: 539-40); Long Island (Giraud, 1844: 104); Mastic, L. I. (Nichols, Murphy, and Griscom, 1917: 443); south of Albany (Bedell, 1925: 590); in the Sodus Bay, Oswego, Pulaski, and Watertown regions, where they were found by me, as well as in Hammond Township, northern St. Lawrence County, where four specimens were taken, including two juveniles. Two are in the collection of the Roosevelt Wild Life Station and two in the Museum of Zoology, University of Michigan.

Additional specimens examined: Sand Lake, Rensselaer County, 2.

Migration: Binghamton, April 10, 1905 (Eaton, 1914: 293-95); Branchport, May 6 (Stone, 1933: 228); Ossining, October 5, 1910 (Eaton, 1914: 293-95); Shelter Island, November 20, 1901, female taken (Worthington, 1902: 204); Mastic, April 14; Bronx region, April 4 (Griscom, 1923: 274).

VERMONT.—“Rare local summer resident in southern half” (Forbush, 1929: 60); Pownal (Howe, 1902: 404); Bennington (Ross, 1913: 437). Observed at Wells River during the breeding season of 1937 (Smith, 1938: 552).

NEW HAMPSHIRE.—“Rare local summer resident from White Mountain valleys southward” (Forbush, 1929: 60); common near Hancock and Bennington, rare in Alstead Hills, near Dublin (Thayer, 1904: 492); Salisbury (Deane, 1878: 39).

MASSACHUSETTS.—Many records from Middlesex and adjacent parts of Worcester and Norfolk counties; less common in central Worcester County, increasing again to the west; Barnstable County, 2 records. Normal date of arrival, May 6 (April 1, 8, 26); average date of departure, October 14 (Forbush, 1929: 59–61). Osterville, Cape Cod, November 6, 1874, sight record (Brewster, 1878: 118–19). Williamstown and Norwood (Howe, 1902: 404).

CONNECTICUT.—Windham County, 2 sets of eggs taken August 6, 1879 (Jones, 1881–82: 17–18); Northford (Linsley, 1891: 180); Norwich, July 3, 1882, eggs (“Hawk,” 1885: 154); Stamford, eggs (Howes, 1928: 84); Danbury, nest; locally common in Litchfield County, rare elsewhere; date of arrival, April 27, 1905 (Sage and Bishop, 1913: 125). Fairfield, nest and young (Saunders, 1922: 264).

RHODE ISLAND.—Breeds principally in the town of Charleston; seen May 10, 1903, and August 5, 1905; two nests, May 28, 1911 (Hathaway, 1913: 555).

NEW JERSEY.—In the northern part a “locally common summer resident, and much more widely distributed than formerly supposed” (Griscom, 1923: 274). Breeds near the Kittatinies (Urner, 1936: 336); “. . . locally present in the breeding season along the . . . neap tide meadows . . . from Hudson County . . . to Cape May and thence along Delaware Bay to Salem” (Rhoads, 1902: 6–14). I visited a small colony at Cape May and saw two birds at Cape May Court House, May 18–19, 1935. Repeated search in the Camden region failed to reveal the bird in the breeding season, although W. Stone (1903: 76) found it at Lindenwold, near Camden.

Migration: Carney’s Point, April 13, 1924 (*Cassinia*, No. 25[1922–24]: 48); Salem, April 12 (*Cassinia*, No. 23[1919]: 35); Pennsville, April 17 (*Cassinia*, No. 24[1920–21]: 46). Elizabeth, September 3 and October 12 (Urner, 1930: 81). Haddonfield, one with other migrating sparrows in shrubbery, October 7, 1933 (Hyde, notes).

Specimens examined: Cape May, 1 adult, 5 juveniles; Point Pleasant, 5 adults, 1 juvenile; Forked River, 1 adult.

DELAWARE.—Medford Mills, nesting pair taken; sight records at Delaware City, Odessa, Rehoboth; breeds in “lower Delaware” (records from C. J. Pennock, letter); nest completed, Smyrna (*Cassinia*, No. 24[1920–21]: 46).

Specimens examined: Rehoboth, 1; Choptank Mills, 2.

PENNSYLVANIA.—Unknown as a breeder in the Philadelphia region, and a rare migrant there. Has bred in Huntingdon County (Dickey, 1913: 299); Pymatuning Swamp, Crawford County (Sutton, 1928*a*: 179–82); Center County (Burleigh, 1931: 48); Pocono Mountains, occasional in summer (Carter, 1917: 16); one seen in Pike County, July 22 (Woodruff, 1905: 48).

Migration: Near Philadelphia, April 20, 1906 (*Cassinia*, 10[1906]: 53); April 28, 1932 (*Cassinia*, 29[1931-32]: 52); Chester County, April 25 (Hunt, 1904: 386); State College, April 28 (Burleigh, 1924: 72); Berwyn, Chester County, October 23 (Pennock, letter).

Specimens examined: Kennett Square, October 7, 1905; Swarthmore, October 20, 1929; Harrisburg, October 15, 1928; Crawford County, 9.

MARYLAND.—Nest, Cabin John (Friedmann and Clark, 1931: 610). Other breeding season records: Prince George's County, July 4, 1843, U.S.N.M. No. 1111; rather common at Kensington, found at Laurel (April 10–October 14), and found in Howard County (Kirkwood, 1895: 331); at Piney Point, St. Mary's County, C. Cottam, E. E. Court, and I found a small colony on May 18, 1930; 2 specimens were collected by Court.

Specimen examined: Montgomery County, near Great Falls, 1.

DISTRICT OF COLUMBIA.—Average spring arrival, April 18 (Cooke, 1918: 484). Specimens banded October 31, November 5, and 16 (Oberholser, letter).

Specimen examined: 1, taken June 2, 1895.

VIRGINIA.—Nest, Falls Church (Jouy, 1881: 57). Other breeding season records: Fairfax County, common (Ridgway, 1879: 238; H. B. Bailey, 1920: 97). Massanetta (near Harrisonburg), "very common" (Bailey, 1912: 82); Ashland, May 11, specimen taken (Embody, 1910: 173); Princess Anne County (H. B. Bailey, 1913: 224; Howell and Burleigh, 1934: 394). New Alexandria, April 1, 1917 (M. T. Cooke, 1918: 484).

Specimens examined: Wallop's Island, 1; Alexandria, 4; Mount Vernon, 1.

NORTH CAROLINA.—Recently found to be a summer resident in a small colony near Chapel Hill (Odum and Taylor, 1934: 396-97). Beaufort, a singing bird seen by E. E. Brown, July 31, 1929 (Brimley, letter).

Migration: Raleigh, earliest date, March 18, 1898 (Brimley, letter); latest spring date at Raleigh, May 3 (Brimley, 1917: 301); latest fall date, October 7 (Odum, *vide* Brimley letter). "Rare winter visitor" in sandhills (Skinner, 1928: 183).

Specimens examined: Raleigh, 2; Chapel Hill, 2, of which one taken June 9, 1934, had an egg with shell in the oviduct.

WEST VIRGINIA.—Recently recorded as a summer resident in Mineral County, where adults and young were seen (Brooks and Haller, 1936: 453); nesting pair taken about a mile south of Burlington, July 16, 1937, by Sutton (letter); and a small colony found by Hicks (1938: 291) in Mason County, July 7, 1935; Grant County, July 7, 1937 (Hicks, 1938: 291).

Migration: Twelve seen and one taken October 9, 1935, near Masontown, Preston County (Haller, Handlan, Margolin, and Brooks, 1936: 91).

TRENDS OF DISPERSAL

During the breeding season Henslow's Sparrow is found along the Atlantic coast from the vicinity of Cape Cod to extreme southern Virginia. The landward edge of the coastal marshes of New Jersey offers considerable stretches of favorable habitat, but the bird cannot be called common even there. West of the coastal plain many of the known breeding colonies are so situated as to lead to the belief that watercourses serve as important migration highways for the species. In the Appalachian highlands the valleys of the Merrimac, Connecticut, Hudson, Delaware, and Susquehanna rivers appear to have a more than casual relationship to the locations of colonies reported from northern New England, New York, and Pennsylvania.

The vicinity of the shore of Lake Ontario in western New York probably has a greater population of Henslow's Sparrows than does an equal area in the hinterland of the state. This may be simply because northbound migrants tend to "pile up" when their migration is stopped by such a large expanse of water. The probable flight of the species around, rather than across, Lake Erie has already been implied. It is not to be supposed that Henslow's Sparrow, any more than a bird of greater power of flight, has any way of knowing whether or not it can cross Lake Erie. It is true, however, that a greater proportion of a weak flying species attempting the flight would be lost, than of a strong flying species. The birds which had gone around the lake were those that survived to rear young. A group of migrants which had just arrived on their breeding stands in southern Michigan, on April 15, 1936, appeared to be exhausted, although they had presumably crossed no considerable stretch of water during their journey.

WINTER RANGE AND HABITAT

Great care must be taken in defining the "winter range" of a species which, like Henslow's Sparrow, gives evidence of regular southward movement in late November and even late December. If this term is taken to mean the minimum territory into which the species withdraws during the winter, reliance must be placed upon January and early February records in delimiting it. Thus, the record of Allison (1899: 266) regarding an influx of Henslow's Sparrows into Amite County, Mississippi, November 15, 1897, cannot be taken as proof that the birds wintered there, although that was his assumption. Similarly, Skinner's (1928: 183) statement that the bird is a "rare winter visitor" in the sandhills of North Carolina cannot bring that state into the regular winter range without more definite dates.

FLORIDA.—Since the pioneer writings of Nuttall (1832-34, 2: 571-72) and Audubon (1841, 3: 75-76) Florida appears to have been the principal winter home of Henslow's Sparrow. It is possible that this impression is created partly, at least, by the numbers of ornithologists that winter there,

in proportion to those in the other southern states. Audubon (1841, 3: 75-76) stated that it winters in Florida "in woods thinly overgrown by tall trees" in the pine barrens.

A photograph (Pl. I, Fig. 1) of just such a habitat near Pensacola, Florida, was taken and very kindly donated by Francis M. Weston, of Pensacola, who writes (letter):

The photograph shows the edge of a typical growth of longleaf yellow pine. From the center of the picture over toward the left is an area of about ten acres of wet ground in which only an occasional pine grows . . . most of the grass is a low wire grass. . . .

The area pictured is typical of the pine flats of this region, and is what is known as the "pine flat acid habitat."

Plants identified in the area shown in the photograph include: rose pogonia (*Pogonia ophioglossoides*), grass pink (*Calopogon* sp.), ladies' tresses (*Spiranthes* sp.), white-fringed orchis (*Habenaria conspicua*), orange-fringed orchis (*Habenaria ciliaris*), pipewort (*Eriocaulon* sp.), meadow beauty (*Rhexia* sp.), pitcher plants (*Sarracenia drummondii*, *flavia* and *purpurea*), elephant's foot (*Elephantopus tomentosus*), sundew (*Drosera*), *Lycopodium carolinianum* (?), sheep laurel (*Kalmia angustifolia*), white-top sedge (*Dichromena latifolia*), southern red lily (*Lilium Catesbeii*), bladderwort (*Utricularia subulata*), and white violet (*Viola primulifolia*).

The past winter was a wet one, and the sparrows were uniformly just within the edge of the pines. In dry winters, they spread over the whole of the open area. At the time the photograph was taken the boggy area immediately in front of and to the left of the camera was ankle deep in water.

Weston adds that a friend "took a specimen [of Henslow's Sparrow] directly in front of the camera while I was setting up my tripod."

In November, 1881, C. J. Maynard found Henslow's Sparrows to be more numerous than either Grasshopper Sparrows or Short-billed Marsh Wrens in Florida (Brewster, 1882: 121). Brewster wrote: "The occurrence of Henslow's Bunting is . . . of importance, as confirming Audubon's more or less discredited statement that it wintered numerously in Florida. . . ." W. W. Worthington and W. E. C. Todd (1926: 217) recorded it as a common winter resident in the Choctawhatchee Bay region of the Panhandle. Weston (letter) states that the birds are so difficult to flush in their winter home that it is very hard to judge accurately their abundance. G. C. Fisher (1910: 46) found the bird common up the Apalachicola River, in western Florida, and "John Williams" (C. J. Penneck, 1920: 50) recorded the bird as a "more or less regular winter visitor" in Wakulla County, farther east. Scott (1889: 322) regarded it as a rare migrant and winter resident near Tarpon Springs, Pinellas County. Two birds were seen in this region on February 1, by C. H. Pangburn (1919: 403). Scott (1881: 16) took a specimen at Clearwater, March 25. Winter specimens from Winfield, Columbia County, in northern

Florida, and from Rosewood, Levy County, and Okeechobee and Brevard counties were recorded by Howell (1932: 454).

Specimens examined: Whitfield, 8.

GEORGIA.—Henslow's Sparrow is recorded as a winter resident near Atlanta, Georgia, by E. R. Greene (1933: 39), who has records of its occurrence for December, January, and February. Two specimens in the United States National Museum were collected in Liberty County, eastern Georgia, in December, 1848 (J. H. Riley, letter). W. J. Hoxie listed the bird as a "rare winter visitor" in the Savannah region (W. G. Fargo, 1934: 191).

Specimens examined: Sapelo Island, McIntosh County, 2, of which No. x5650 in the J. and J. W. Mailliard collection is labeled "20 June 1888." This is undoubtedly an error for "Jan.," for the bird is in winter plumage, and would not be expected in any such latitude in June. The label of the collector, Worthington, is missing, and had he taken a bird there in June he would probably have noted it in an ornithological journal.

SOUTH CAROLINA.—Audubon (1841, 3: 75-76) noted that some Henslow's Sparrows wintered in South Carolina. In 1888 Wayne (p. 210) wrote that he found the bird "wintering in large numbers" at Yemassee, near the southern tip of the state. He shot thirty-six in January and February. A female was collected by Wayne (1905: 398) on January 28, 1905, near Charleston, where the bird winters in low, broom-grass fields (E. B. Chamberlain, letter). Loomis (1885: 190) listed the species as an early spring and late fall migrant in Chester County, in the north. According to Wayne (1910: 118) the bird varies greatly in abundance in different years; March 28 is given as a late date of departure for the north.

Specimens examined: Yemassee and vicinity, 16; Mount Pleasant, October 29 to March 13, 6; Charleston, 1.

ALABAMA.—An "uncommon winter resident in the southern half"; Greensborough, January 12, 1890 (Howell, 1924: 231); Coosada, February 18 to April 4, 10 specimens taken in old fields of rice and broom sedge (*ibid.*). A specimen was too badly shot to save, near Meyer's Bluff on the Warrior River, January 12, 1890 (Holt, 1921: 83); this was probably the same specimen from Greensborough referred to by Howell. The Museum of Comparative Zoology contains a specimen from Elmore County (G. M. Allen, letter).

MISSISSIPPI.—This state certainly lies within the winter range, since specimens have been taken in both Alabama and Louisiana. Allison's fall record has been noted above. Specimens were taken at Ariel, October 9 (Kopman, 1915: 25) and November 1 (Allison, 1899: 267-68).

LOUISIANA.—Seen at Covington, November 2 and January 23; at New Orleans, November 30 (Kopman, 1915: 25); winters in unbroken pine flats (Beyer, Allison, and Kopman, 1906: 15).

TEXAS.—Careful inquiry fails to reveal justification for the inclusion of “northern Texas” within the breeding range of the bird as given by the 1931 A. O. U. *Check-List* (p. 388). The only Texas records that come to light are: Lee County, winter (Nehrling, 1891: 344); Cooke County, Gainesville, sight record, February 27 (W. W. Cooke, 1888: 191); Navarro County, “autumn visitor” in “long grass, about the borders of wooded creeks on the prairie” (Ogilby, 1883: 201). While there is no definite midwinter record in the foregoing, it is probable that southeastern Texas, at any rate, may be safely placed within the minimum winter range. The Cooke County record of February 27 may have been of a northbound migrant.

DATA FROM OTHER STATES

The following states have yielded no record of the bird as either a winter or a summer resident. The meager available migration data for them are herewith summarized.

TENNESSEE.—Roane County, two specimens, April 16 and “March” (Fox, 1886: 315). One of these specimens, A.M.N.H. No. 401181, was examined and bore the date April 17—not 16, as published by Fox.

KENTUCKY.—Type specimen taken in 1820 near Newport (Audubon, 1831, 1: 360). Nelson County, specimen taken October 30, 1884 (Blincoe, 1925: 420).

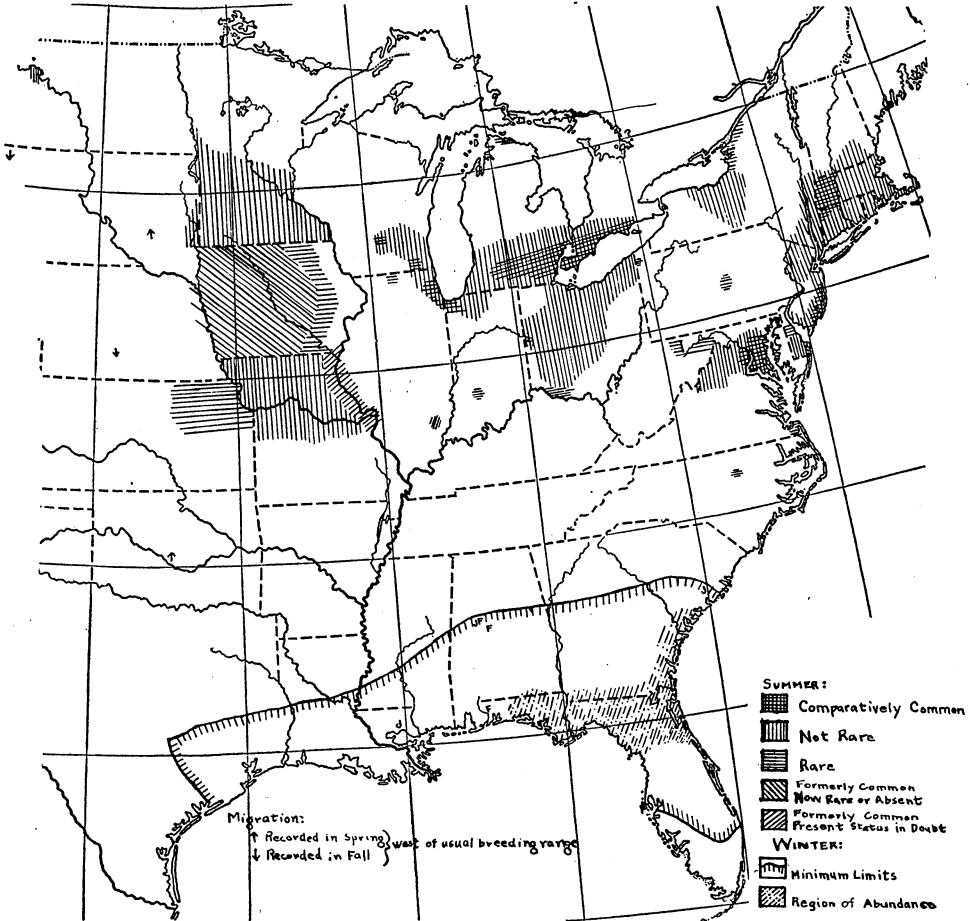
ARKANSAS.—Little Rock, sight record, March 7 (Hunt, 1931: 238).

OKLAHOMA.—Cleveland County, sight record, April 28 (Nice, 1931: 182).

SUMMARY OF DISTRIBUTION AND MIGRATION DATA

The winter home of the species apparently centers in northern Florida and extends to southeastern Texas and South Carolina, and from this area the northward movement becomes noticeable in early March. By the end of the second or third week in April, the species has reached Kansas, northern Illinois, southern Michigan, and New Jersey. The middle of May sees the species at its northern limit, which extends from northwestern North Dakota, through central Minnesota, the northern tip of lower Michigan, Ontario, perhaps as far north as Georgian Bay, and northern New York and New England as far north as Wells River, Vermont. The southern limit of the known breeding range extends from Chapel Hill, North Carolina, through West Virginia, southern Ohio, and southern Illinois, to northeastern Kansas. Evidence indicates a greater abundance from Washington, D. C., up the Atlantic coast to Massachusetts, in the southern part of the Great Lakes region, and, until recently at any rate, in the Mississippi Valley from St. Louis to northern Illinois, than throughout the rest of the range (see Map 1). Withdrawal into the winter quarters begins by the middle of September and is not completed until well into December.

It has been my experience as well as that of other observers that in certain localities Henslow's Sparrow is well established as a breeder, whereas in other ones it is irregular, and its presence in a given season cannot be certainly predicted. In Fairfax County, Virginia, Ridgway (1879: 238) reported it as a common breeder; forty years later Bailey (1920: 97) found



MAP 1. Range of Henslow's Sparrow. J.= January; F.= February.

it still common there. At Oberlin, Ohio, Jones (1910: 38) did not find the bird between 1896 and 1907. Comments upon the irregularity are scattered throughout the literature. Cartwright, Shortt, and Harris (1937: 162) remarked upon the same tendency in Baird's Sparrow (*Ammodramus bairdi*).

THE BREEDING HABITAT

In terms of plant ecology the breeding range of Henslow's Sparrow is confined within the limits of the eastern deciduous forest formation, with the

possible addition of a few localities within the related lake forest. The bird is in no sense a forest species, although it is found wintering in the southern pine woods. It is a species which has adapted itself to open grassy territory between the forested areas, and to certain types of prairie farther west. Such a choice of habitat readily accounts for some of the local shifts in distribution that have accompanied the clearing of the land and other changes effected by man.

Under primitive conditions the habitat of the type required for breeding by Henslow's Sparrow must have been of very limited extent east of the prairie subclimax. Such natural habitats as the coastal marshes, late stages in the succession of glacial lakes and ponds, and occasional breaks in the forest caused by fires, probably were the original main breeding places east of the prairie openings of Illinois. L. W. Campbell (MS) considers that the bird bred in the oak openings of northwestern Ohio before the coming of the white man.

Throughout its summer range Henslow's Sparrow is characteristic of weedy or grassy fields and meadows. In many instances the habitat is dotted with bushes, often small ones, and the situations are usually low-lying and damp.

Along the Atlantic coast the drier edge of the salt marshes is probably the most frequently chosen habitat. On the most southerly grassy area in New Jersey, at Cape May Point, a small colony was located on May 19, 1935. At least one pair seemed to be definitely attached to a "territory." The lower, more marshy portion of the habitat was occupied by cattails (*Typha*). The major portion of the area was covered with grass, some parts with low sod grasses, other parts with tall grasses which formed clumps. Nearly all of the birds were in the latter. Thickets of scrub oak and other scrubby trees bordered the area, and, on higher ground, dissected it in places.

On the previous day, May 18, two singing Henslow's Sparrows had been located in the wet bayberry (*Myrica*) zone between the woods and the salt meadows near Cape May Courthouse. The shrubs were from six to eight feet tall, and the aspect resembled a typical forest-edge habitat, except that one to three inches of water covered the area. One of the birds sang from the top of a ten-foot hickory sapling. Seaside Sparrows (*Amospiza caudacuta caudacuta*) were flushed from low shrubby growths of bayberry along the ditches and from shorter grass just to seaward of the higher shrub zone.

Rhoads's full account (1902) of Henslow's Sparrow in New Jersey described the habitat as "in the drier grounds bordering the salt marsh and bogs, and an old briary grass field. . . ." At Point Pleasant, Witmer Stone (1894: 139) found it "in a swamp bordering the Pine Barrens. . . ."

Judd (1897: 326) took one in a tussocky meadow north of Boonton, Morris County. Williams (1933: 230) found the birds in a high field north of Princeton. Several pairs were discovered by Stone "in a bog north of Lindenwold, on August 1, 1903" (*Cassinia*, No. 7[1903]: 76). Carter found a nest in a cranberry bog near Marlton (*Cassinia*, No. 10[1906]: 62). In view of the type of habitat preferred in Michigan it is surprising that the species is not more common in the cranberry bogs. Urner (1936: 336) stated: "Dry fields about the Kittatinies . . . are favored by Henslow's Sparrows in summer." In the southern part of New Jersey they breed, with the Short-billed Marsh Wren (*Cistothorus stellaris*), "along the drier edges of the salt marsh."

J. P. Giraud in *The Birds of Long Island* (1844: 104) commented: "In general it frequents the low, wet meadows, and passes most of its time on the ground among the tall grass. . . ." On Long Island nearly seventy-five years later Nichols, Murphy, and Griscom (1917) found it breeding in a "dry field with sparse grass . . . near the landward edge of the meadows where these are quite fresh."

At Piney Point, St. Mary's County, Maryland, a small colony, apparently breeding, was located on May 18, 1930. The birds were in a grassy field with occasional clumps of myrtle or bayberry.

Farther north, in New England, less dependence seems to be placed upon the salt-marsh habitat, perhaps because there is much less of it. Near Williamstown, Massachusetts, Howe (1902) found the breeding habitat to be "wet meadows grown up with the steeple-bush (*Spiraea tomentosa*). In Norwood, Massachusetts, a meadow they inhabit is grown with sedges (*Scirpus atrocinctus*, *Carex monile*, *C. bullata*, *C. flava*, *C. scoparia*), redtop (*Agrostis alba vulgaris*), fowl-meadow grass (*Poa serotina*), and rush (*Juncus effusus*)" (Howe, 1902). This author stated that G. M. Allen found white hellebore (*Veratrum viride*) to be the "principal growth in a meadow where he once found them in New Hampshire." As long ago as 1881 C. M. Jones gave a good account of the species in northern Connecticut and described the habitat as swampy meadow, but not so swampy as the "places where these birds usually make their homes." At Fairfield, in southern Connecticut, Saunders (1922) found the bird breeding in a field of young pines which had been planted a few years before in "the usual typical dry field, with sweet vernal grass (*Anthoxanthum odoratum*) and the common daisy (*Leucanthemum vulgare*). . . ." In the same state Sage and Bishop (1913: 125) mentioned that the species "frequents hillside meadows and swamps partially overgrown with shrubbery."

In Virginia, Howell and Burleigh (1934: 394) found a colony in July in a beach-grass area with Short-billed Marsh Wrens. Bailey (1913: 224) described a nesting ground in extreme southeastern Virginia as "low and

wet, covered with broom-straw and scattering scrub bushes, corresponding to the breeding-places of this species elsewhere."

Mr. J. M. Valentine (letter) writes that the newly discovered nesting colony at Chapel Hill, North Carolina, is established in a "low, swampy meadow."

In western and northern New York I have found the birds in summer in two types of situations, one of which might be designated as upland, weedy hayfields or pastures with or without shrubs (Pulaski, Oswego, Watertown regions); the other was a low wet meadow (northern St. Lawrence County). Near Ithaca, Wright (1919) found the birds breeding near pine seedlings ". . . on a sedgy hillside," possibly comparable to Saunders' Connecticut habitat. In the Branchport region C. F. Stone (1933) recorded them "in a hummocky swale surrounded by . . . coarse weeds and clumps of briars." Twenty miles south of Albany, at an elevation of 1000 feet, they were found in old fields, with rather damp soil, in July "hip-high with white and yellow Bush clover and carpeted with hop clover. Pine seedlings and goldenrod are also features of these fields." In a near-by locality the same author (Bedell, 1925) found them in fields covered mainly with cinquefoil and goldenrod.

Sutton (1928a: 179-82) found the birds in a single locality, out of many apparently suitable ones, in the Pymatuning Swamp, in northwestern Pennsylvania. There were about a dozen pairs in a ten-acre expanse of dense grass "traversed by a small over-grown stream. . . . In the same field there were also Grasshopper Sparrows, Meadowlarks, and Bobolinks, the latter particularly abundant."

In Ohio Vickers (1908: 150-52) located a colony in a "meadow of very heavy upland grass." Near Columbus Mrs. M. M. Nice (letter) has found the bird in summer in timothy.

In the Chicago and Indiana dunes region Eifrig (1919) stated that Henslow's Sparrow prefers "weedy pastures with water near by. . . ." He found it most common in a large swale where the Marsh Hawk abounded. Elsewhere in Illinois Ridgway found it in 1871 breeding abundantly on Fox Prairie in the southern part of the state, and it seems probable that this area and other original prairie areas of Illinois formed early strongholds for the species. During six seasons spent in the intensively farmed section of east central Illinois I failed to discover any except a very few migrants. Poling (1890: 240) found the birds breeding in Adams County in the swamp grass of the Mississippi bottoms and in a clover field through which a swampy brook flowed.

Hollister (1919) found the bird common in Wisconsin in "an immense weed, grass and fern-grown marsh or low-land prairie" in the Delavan region, although he stated (p. 107) that reclamation was destroying the

main part of the Delavan marsh habitat. From Dane County A. W. Schorger writes (letter) that the "typical habitat is a marsh without much, if any, standing water. It is not confined to the former, however, as I have frequently found it during the breeding season in fields of timothy and clover." Snyder (1892: 111) reported it at Beaver Dam as "an abundant summer resident in the drier marshes."

In Minnesota Roberts (1890: 213) noted Henslow's Sparrow apparently breeding in a wet marsh near Minneapolis, and in the vicinity of Heron Lake he found a nest on "native grass-grown prairies adjoining tree-claims" (Roberts, 1932, 2: 393).

Jones (1892: 72) stated that migrants at the edge of a woods at Grinnell, Iowa, later moved out to their "prairie homes." Elsewhere in Iowa Anderson (1907: 317) found the bird nesting in fields grown up to hazel and blackberry.

In Missouri Widmann (1907: 178) referred to the bird as a "locally common summer resident in marshes and wet meadows, probably of general distribution throughout the prairie and Ozark border regions." In the vicinity of Kansas City, Harris (1919: 296) stated that it "nests about marshy places and wet meadows. . . ." Scott (1879: 139) found it associated with the Grasshopper Sparrow at Warrensburg.

I once found a small colony of Henslow's Sparrows apparently established for the summer in tall prairie bunch grass on a hillside near Topeka, Kansas. The Reverend P. B. Peabody (letter) found two nests near the crest of a pasture hill covered with rank grass and small sumacs (*Rhus* sp.) in Marshall County, Kansas. This state is almost entirely without such low wet meadows as are frequented by the bird farther east.

At the extreme northwestern corner of the range, in McKenzie County, North Dakota, Larson (1928: 104) reported Henslow's Sparrow from the marshes near sloughs, where it "probably breeds."

A review of the data on distribution and habitat indicates that Henslow's Sparrow is increasing and extending its range in some localities and is retreating from others. In New Jersey, where the salt meadows have always provided a natural habitat, the bird has been a common breeder since the days of Audubon. The same is probably true of the lowlands of Maryland and the Potomac Valley. In Ohio, southern Michigan, and southern Ontario the bird has increased considerably in abundance, a condition made possible only by a widespread clearing of the forests. To judge from statements in the literature the bird has suffered heavily in the prairie regions, where nearly all of its original habitat has been put under the plow. In southern Illinois it was reported by Ridgway (1889: 254-57) to be diminishing with the lessening of its prairie habitat. In Wisconsin the reclama-

tion of the Delavan marshes resulted in a marked decrease of the species (Hollister, 1919: 107). In Ohio, Illinois, and Wisconsin the bird has been found nesting in fields of tame hay—an adaptation that will probably be found elsewhere as time goes on.

It is a matter of some interest to note that a comparison of the summer range of Henslow's Sparrow (Map 1) and the heaviest acreages of hay-raising in the United States (Fifteenth Census, "Types of Farming in the United States," Fig. 9) shows a rough coincidence of the two areas.

THE BREEDING HABITAT IN NORTHWESTERN OHIO

By reason of its proximity to southern Michigan the breeding habitat of Henslow's Sparrow in the "oak openings" of northwestern Ohio is of particular interest for comparative purposes. I am indebted to Louis W. Campbell, of Toledo, for the use of his detailed description of this area. According to Moseley (1928: 82) the openings were formed by sand piled up by northeast storms at the southwest extremity of glacial Lake Warren. Of the four types of habitat recognized here by Campbell (MS), the "wet prairies" are the areas in which Henslow's Sparrow nests. These prairies are grown up to sedge and shrubs and, because of the presence of drainage ditches, are usually dry by the end of June. Among the characteristic plants are *Carex* sp., slender willow (*Salix petiolaris*), purple cinquefoil (*Comarum palustre*), purple loosestrife (*Lythrum alatum*), red osier dogwood (*Cornus stolonifera*), paniced dogwood (*Cornus femina*), purple milkweed (*Asclepias incarnata*), buttonbush (*Cephalanthus occidentalis*), marsh bellflower (*Campanula aparinoides*), boneset (*Eupatorium perfoliatum*), ninebark (*Opulaster opulifolius*), meadowsweet (*Spiraea alba*), steeplebush (*Spiraea tomentosa*), and Canada lily (*Lilium canadense*).

Campbell (MS) considers that Henslow's Sparrows bred in the "wet prairies along the larger ponds of the oak openings" before the advent of the white man. "Today they are still confined to the remnants of the wet prairies, although some have taken over somewhat similar pasture lands" reclaimed from such prairies.

Associated with and nesting in the same areas as Henslow's Sparrow in the oak openings are: the Marsh Hawk (*Circus hudsonius*), Alder Flycatcher (*Empidonax traillii*), Short-billed Marsh Wren (*Cistothorus stellaris*), Yellow Warbler (*Dendroica aestiva*), Northern Yellow-throat (*Geothlypis trichas*), Meadowlark (*Sturnella magna*), Grasshopper Sparrow (*Ammodramus savannarum*), Song Sparrow (*Melospiza melodia*), Swamp Sparrow (*Melospiza georgiana*), and, "in less dense vegetation, the Savannah Sparrow (*Passerculus sandwichensis*). The Bobolink and Dickcissel also nest occasionally" in these areas (Campbell, MS).

Campbell (MS) compares the local distribution of Henslow's Sparrow in the oak openings with that of the Short-billed Marsh Wren and the Swamp Sparrow:

All three frequent the wet prairies of the Oak Openings although the last two prefer heavier cover and wetter situations. Along the shores of Lake Erie within twenty-five miles of the Openings, the Short-billed Marsh Wren is found regularly in suitable places, and the Swamp Sparrow . . . is a common summer resident in the Erie Marsh, Monroe County, Michigan. On the other hand, Henslow's Sparrow, except . . . [upon one occasion], has never even been suspected of breeding there.

Moseley (1928: 91) states that much of the region between the Ohio-Michigan line and Ottawa Lake, in southwestern Monroe County, Michigan, "closely resembles the Oak Openings of Ohio." Campbell (MS) noted Henslow's Sparrows there (in "that portion of the Oak Openings within Michigan") on two occasions during the breeding season.

THE AREAS OF STUDY

Intensive field observations were made on and near the Edwin S. George Reserve, about three miles west of Pinckney, in extreme southern Livingston County, Michigan. The areas of study fall into two groups, separated by a distance of nearly a mile of wooded hills. The larger and more important habitat, which will be called the Anderson habitat, from its proximity to a small village of that name, comprises about one hundred acres of wet, hummocky pasture land, lying between the Grand Trunk Railroad track on the north, and a ridge of small hills on the south (Pl. I, Fig. 2). The north boundary fence of the George Reserve roughly follows this higher ground. The territory is fenced off into a number of fields which considerably simplified such matters as making counts and keeping track of certain individual birds. A small dredged stream, known as Honey Creek, pursues an easterly course from near the northwest corner to the east boundary of the area and ultimately empties into the Huron River. In very dry summers the stream becomes a series of stagnant pools separated by strips of caked mud.

The shallow valley occupied by this habitat extends both east and west from the area of study and contains breeding places contiguous to those where the intensive work was done. Occasional observations were made in these places.

Geographically this area is situated between morainic hills and is an outwash plain or trough, which apparently served as a westbound drainage channel from the Huron-Erie or Saginaw lobes of the ice sheet at a time when the re-entrant angle between these lobes was very near the present site of Pinckney (*cf.* Leverett, 1912: 59, and Pl. I; and Transeau, 1906: Fig. 2, and p. 355). The depressions on the Reserve appear to be more in the nature of glacial lakes, for there is no such well-marked drainage channel as is apparent at Anderson.

The second and less important area of study, to be known as the Reserve habitat, comprises a number of moist depressions separated by larger or smaller hills, lying within the south and east boundaries of the Reserve, nearly a mile south of the Anderson habitat.

The vegetational history of the two habitats after the recession of the glaciers is probably very similar. According to Transeau (1906: 353-55) glacial lakes became sphagnum bogs and later tamarack swamps. More mesophytic swamps, as for example those dominated by cattail or sedge, were derived from the sphagnum-tamarack type by such disturbances of the original vegetation as fire and clearing, in connection with the working up from the southeast of the broad-leaved types of vegetation. Cowles (1901: 149-50) advances the theory that, near Chicago at least, tamarack forests may have developed in the deeper depressions, and open sedge and grass swamps on the shallower ones. Isolated dead tamaracks near the center of the open areas mark both the Anderson and Reserve habitats as having been tamarack swamps within historic times.

At present, cord grass (*Spartina pectinata*) dominates the habitat at Anderson. This coarse moisture-loving grass is known by the farmers as marsh hay, and much of it is cut in the region in late summer. It grows on large hummocks, and it is very difficult to walk through it. Associated with it are a variety of other grasses, herbs, and a few shrubs, of varying importance. Probably second in abundance to *Spartina* is the shrubby cinquefoil (*Potentilla fruticosa*), which usually reaches a height of not more than two feet and remains a part of the landscape aspect throughout the year. Its yellow flowers appear in July and August. This is the only shrubby plant that has been able to maintain itself under the heavy grazing to which the entire Anderson habitat has been subjected, and it is absent where sheep have been pastured extensively.

Spartina and *Potentilla* dominate the habitat entirely except during the late summer and early fall, when such abundant and widely distributed herbs as blue vervain (*Verbena hastata*), goldenrod (*Solidago*, several species), Joe-pye weed (*Eupatorium purpureum*), and spotted boneset (*Eupatorium perfoliatum*) have attained their growth and give a wealth of color to the meadow.

In addition, there are local groups or *sociés* of plants of other species. For example, in the northwest part of Field 6 the banks of Honey Creek are raggedly lined with a row of shrubs (mostly *Cornus stolonifera* and scrubby willow shrubs, *Salix* sp.). A few scattered shrubs also occur in other parts of the habitat. In Field 6 there are two patches of the tall stalks of the evening primrose (*Oenothera muricata*).

The four distinct depressions in the Reserve habitat are separated by intervening areas of varying extent. The largest and most important de-

pression is a sedge marsh near the southeast corner of the Reserve. This will be designated as Area B. The sedge (*Scirpus* sp.) occupies the center of the marsh to the exclusion of almost everything else. Toward the edges of the roughly circular area various grasses, especially *Spartina pectinata* and *Muhlenbergia* sp., are interspersed with it. Stalks of mullein (*Verbascum thapsus*) and of other tall weeds occur where the ground rises toward the east. This zone gives way to thick clumps of bluegrass (*Poa pratensis*) on still higher ground.

Area A is a very small depression nearly a mile west of Area B. At the time of the study it was carpeted chiefly with bluegrass. Other grasses occurred, including some *Spartina pectinata*, and numerous mullein stalks dotted the easy slopes from the bottom of the depression.

The most constant bird associates of Henslow's Sparrow were the Short-billed Marsh Wren (*Cistothorus stellaris*) and the Eastern Savannah Sparrow (*Passerculus sandwichensis savanna*). Red-winged Blackbirds (*Agelaius phoeniceus* subsp.), Bobolinks (*Dolichonyx oryzivorus*), Mississippi Song Sparrows (*Melospiza melodia beata*), Pheasants (*Phasianus torquatus colchicus*), Marsh Hawks (*Circus hudsonius*), Eastern Meadowlarks (*Sturnella m. magna*), and a single pair of Swamp Sparrows (*Melospiza georgiana*) and of Dickcissels (*Spiza americana*) all nested in the general area. A few Greater Prairie Chickens (*Tympanuchus cupido americanus*) occurred and may have nested in Field 6. Barn Swallows (*Hirundo erythrogaster*) skimmed low over the fields throughout the summer.

THE BIRD IN ITS SUMMER HOME

THE MANNER OF FLIGHT

The usual manner of flight of Henslow's Sparrow is well described by Sutton (1928a: 179-82), in a comparison of its flight with that of the Grasshopper Sparrow:

The flight of the two species is quite dissimilar. That of the Henslow's Sparrow is more erratic and undulating, and the tail and rump twist or twirl in a peculiar and very characteristic way, just a second or two after the bird has flushed or left its perch. This twisting motion seems to be accompanied by a temporary change in the beat of the wings, and gives the impression that the propellant power ceases for an instant, while the bird rearranges its body.

VOICE

Faxon (1889: 44-45) described the syllabification of the usual song of Henslow's Sparrow:

Mr. Maynard compares the song to the syllables *see-wick*, but to my ear there was a liquid sound in the first part—*flee-sic*, with a strong accent upon the first syllable. When heard at a very short distance it seemed almost trisyllabic—*f'-lee-sic*.

The spelling "flee-sic" is also used by Bedell (1925: 590) in describing the song. Jouy (1881: 57) stated:

Besides the characteristic note of *tee-wick*, they have quite a song, which may be fairly represented by the syllables *sis-r-r-rit-srit-srit*, with the accent on the first and last parts. This song is often uttered while the bird takes a short flight upward; it then drops down again into the tangled weeds and grasses where it is almost impossible to follow it.

Concerning this rendition by Jouy, Sutton (1928a: 179-82) remarked:

I never once heard the birds utter this song . . . ; but I did often hear the Grasshopper Sparrow give such a song, the spirit and tonal quality of which are very well represented by the above syllables. I had unusual opportunity to compare these two species. . . .

Many ornithologists will recognize in the above a description of one of the songs of the Grasshopper Sparrow. Is it possible that Jouy heard Grasshopper Sparrows singing among Henslow's Sparrows, and confused the songs?

The manner of delivery of the song is so well described by C. M. Jones (1881-82: 17-18) that it seems worth while to quote the passage in full:

The musical performance of this bird has very little to commend it; though considering the poor success he meets with, his performance is certainly praiseworthy. When the muse inspires his breast he mounts to the top of a weed or some other object that raises him just above the grass. There he sits demurely until the spirit moves, when he suddenly throws up his head and with an appearance of much effort, jerks out his monosyllabic "tsip," apparently with great satisfaction. Then, having relieved himself he drops his head and waits patiently for his little cup to fill again. Somehow I cannot watch him while thus engaged, without a feeling of pity for a creature so constituted that he can be satisfied with such a performance, and content with his surroundings.

The birds are in song when they arrive on their breeding grounds. The vigor and frequency of song increase until about the middle of May and continue at a high level until sometime in August. In 1934 the first marked subsidence of song was noted August 11, which was a clear cool day that would have elicited energetic singing earlier in the summer.

Although the song is usually given from a weed or bush just above the level of the surrounding vegetation, or even from concealment below that level, a male sang from the top of a small willow twelve or more feet in height on the Reserve, July 11, 1934. This was immediately after he was seen chasing another individual, presumably a female, in long grass.

Table I shows that there is a tendency toward a slowing down of the song rate with the coming of evening and with the advance of the season.

Forbush (1929: 61) records a singing frequency of "eight to the minute," or once every seven and one-half seconds.

As with most birds the daily period of song begins at dawn or before. On August 1, 1934, the apparent sunset was at 7:50 P.M. The last three

TABLE I
FREQUENCY OF SINGING

DATE	BIRD NO.	TIME	AVERAGE INTERVAL (SECONDS)	MINIMUM INTERVAL	MAXIMUM INTERVAL	NUMBER OF REPEATITIONS
June 17, 1934	1934-1	10:02 A.M.	4.19	2.0	6.0	58
June 17, 1934	1934-1	8:30 P.M.	4.47	2.0	10.0	35
July 6, 1933	1933-1	9:40 A.M.	5.7	1.0	10.0	27
August 9, 1934 ...	14	10:25 A.M.	6.3	4.0	10.0	71
August 9, 1934 ...	.....	5:16 P.M.	8.7	5.0	10.0	5

birds which could be heard singing ceased about 8:20 P.M. (Eastern standard time). Individuals have been heard singing on the Pinckney habitat at 10:00 P.M., midnight, and 3:00 A.M. Bedell (1925: 590-91) and others have recorded individuals as singing steadily throughout the night.

In addition to the true song the bird has a call used only at the height of the breeding season. It may be the call Bedell (*ibid.*) described as a low, crescendo, insect-like buzz; it is decidedly not the song described by Jouy, mentioned above. In the Michigan birds it consisted of a series of intense, high-pitched, sibilant whistles diminishing as they descended the scale, graphically represented: ————_—_—. It is uttered by birds of either sex, usually by members of a pair to each other, but sometimes more vigorously by antagonists as a warning or in the heat of battle. For lack of a better term, it is designated the "call of intimacy."

The hunger call of the young is a nasal whistle, "keee," pitched like the monosyllabic "pee" of the Wood Pewee, but less sharp. The usual alarm note is a sharp "tsip," similar to that of the Chipping and Savannah Sparrows. A higher pitched, more penetrating "tsip" is used as a warning when a hawk appears.

F. M. Weston writes (letter) that he has heard no sound of any kind from Henslow's Sparrows on their wintering ground near Pensacola, Florida.

ARRIVAL FROM THE SOUTH

The first Henslow's Sparrow encountered in 1936 was a bird singing from somewhere beneath the top of the dead herbage near the center of the "big bay" of Field 3, on the afternoon of April 15. The sky was overcast, a chill wind was blowing, and the land was cold and soggy. Throughout the habitat there seemed nothing that could have attracted the birds—no green thing that augured spring—only the dead, wet grass and weed stalks and icy water. The singer kept hidden all the time and when approached too closely ceased abruptly and undoubtedly sneaked off under cover in the manner of his kind.

One-half hour later three birds were seen about a small mud puddle in the adjoining field. This was heavily grazed and afforded no cover. The birds were listless and almost motionless even when approached within a few feet. When finally flushed they flew even more feebly than was normal, and but a short distance. It is suspected that the group of birds had just completed a long journey; they seemed to show plainly their fatigue. The region had been thoroughly searched for birds but four days previous, and no sign of a Henslow's Sparrow had been found.

Jones (1892: 72) stated that in Iowa: "The first arrivals . . . are always found in the underbrush skirting native woods. Later they move out to their prairie homes." I have noted them occasionally in hedgerows or copses in spring and fall in Kansas, Illinois, and New Jersey. None were seen, however, in many hedges searched previous to the appearance of the birds on their breeding grounds in 1936.

COURTSHIP

Aside from increasing frequency and volume of song, the first courtship behavior was noted on the afternoon of May 9, 1936. A singing bird that had been changing his perch frequently, dropped to the ground and was joined by another individual as the call of intimacy was uttered. Presently the male was seen with a piece of dry grass in his mouth, hopping among the hummocks. He soon dropped the grass and began singing feebly from the ground. The female remained concealed, except at intervals when one bird closely following another flitted above the grass for an instant and then dropped back, the actions being punctuated with frequent renditions of the call of intimacy. No trace of a nest could be found.

Early the next morning at the same place a singing male with a mouthful of dried grass alighted on a hummock near another bird. Dropping the grass and fluttering his wings continually the male proceeded over and among the hummocks. He appeared to be taking the female on a tour of the area, indicating to her each possible nesting site by violently fluttering into it.

MATING

A male bird was seen copulating with a female perching in open view on a bush, and holding dead grass in her bill, on July 23, 1934. After the second union both birds dropped into the grass. The male appeared again, flying with the rapid vibrations of the wings characteristic of many birds just subsequent to copulation.

A pair of birds were apparently mating under concealment of the grass on July 11, 1934. The male, at first singing, began to chase the other bird, and both disappeared in the vegetation. Whenever they reappeared their wings were fluttering or vibrating characteristically. Finally the female

ate a caterpillar she had been holding all the time, and the male began singing in a subdued voice.

NEST BUILDING

On June 24, 1933, in Area A, a bird, presumably a female, was seen repeatedly carrying grass to a spot which I carefully located but purposely avoided at the time. The bird flew low and directly, just clearing the tops of the vegetation. Three days later the nest was found; it contained two eggs.

On June 27, 1934, Nest 1 was located by the same method. The female seemed to have three favorite spots from which she collected the dead grass, all within fifty feet of the nest. She was watched from 8:45 A.M. (E. S. T.), when first seen, until 9:50 A.M. Between 9:08 and 9:50 nest material was brought eleven times. With the exception of an eleven-minute interval when the bird may have been feeding, the average interval between visits was 3.3 minutes, while the average period spent in arranging the material at the nest was only 0.7 minute. While the female was building, the male sang only very softly or not at all, but became more vociferous when operations ceased. The last trip for the day was made by the female at 8:40 P.M., five minutes before the first call of the Whip-poor-will heralded the night.

On the following day, June 28, building was in progress at 7:35 A.M. The next day the bird was apparently at work about 7:00 A.M., but between 7:30 and 8:30 operations ceased. The nest was now examined for the first time; it appeared to be finished. On the evening of July 2 two eggs had been laid; by 9:00 A.M. the next morning, there was a third egg; on July 4, a fourth; and on July 5, a fifth.

On July 30, 1934, a new nest containing four eggs was found fifty feet north of a nest that had contained young but had been destroyed by cattle July 20 or 21. The new nest was assumed to be another attempt by the same pair of birds. The eggs began to hatch August 9. The allowance of the usual ten to eleven days for incubation and one day for the laying of each egg brings the date of deposition of the first egg to July 26 or 27, leaving only five or six days as the period in which the new site was chosen and the nest completed, after destruction of the earlier nest.

Types of Nests

Henslow's Sparrow nests studied in southern Michigan were located in three different types of situation with respect to the ground and the immediately surrounding vegetation. The architecture of the nest also varied somewhat, usually in response to the type of situation.

The great majority of nests were built at or near the bases of thick clumps of grass, with the base of the deep cup two or three inches above the

ground. Dead grasses at the bases of the clumps formed arched roofs over the nests. The edge of a "roof" usually lacked a fraction of an inch of extending directly over the outer edge of the nest on the exposed side, so that the plane of the opening was oblique rather than vertical. Plate II, Figure 1, illustrates such a nest.

Some nests, however, were situated from six to twenty inches above the ground and were fastened to the vertical stems of growing herbs and grasses. Such nests were necessarily associated with the advanced growth of the herbage of the latter part of the breeding season. They were usually deeply cup-shaped and not arched over.

Of more than thirty nests found, about three were actually depressed into the ground. Nests 4 and 10, 1934, were in depressions and were either arched over by projecting earth (Nest 4), or protected by dense vegetation (Nest 10). In situation these nests resembled those of Savannah Sparrows found near by.

The most radical departure in nest-building was a shallow, perfectly open saucer of grasses laid among young green vegetation, which afforded no concealment whatever. This was Nest 6, 1936 (Pl. II, Fig. 2). While it afforded unusual photographic possibilities, it could hardly have been expected to fulfill its function of producing fledglings—the nest was empty a few days after it was found.

Nesting Dates

Many records of nesting dates show that first clutches are normally completed by May 20 to 30, depending upon the latitude. Unusually early dates are June 3; for young almost ready to fly (McAtee, 1904: 113); May 22, four partly incubated eggs, New Jersey (Burns, 1895: 189); May 28, slightly incubated eggs, St. Clair County, Michigan (J. C. Wood, 1905: 416); May 26 to July 16, nine nests from New Jersey and Pennsylvania (Harlow, 1918: 138). The occurrence of many July and August nests indicates that many pairs may be two-brooded. At the Anderson habitat Nest 18 held four eggs laid between August 12 and 16, 1934. L. H. Walkinshaw, in Kalamazoo County, Michigan, watched a nest from which the young departed August 19, 1937 (J. Van Tyne, letter). Kumlien and Hollister (1903: 96) report nestlings in September in Wisconsin. August was found to be a regular breeding month for Baird's Sparrow (Cartwright, Shortt, and Harris, 1937: 157).

INCUBATION PERIOD

The length of the period of incubation was accurately determined in Nest 1, 1933, in which the fourth and last egg was laid on June 29 before 10:15 A.M. The first two young hatched July 9 between 9:50 A.M. and 4:40

P.M., after an incubation period of ten or ten and one-fourth days. The last two young hatched July 10; this brought their incubation period to about eleven days.

At Nest 18, 1934, incubation began August 15 or 16. Three eggs had hatched by 4:00 P.M. August 26, an interval of ten or eleven days.

BEHAVIOR OF THE INCUBATING FEMALE

When Nest 14 was discovered on July 30, 1934, the female, which was eight or ten feet east of the nest, flew up. The following day she was flushed about six feet north of the nest. These were probably the first two days of incubation, as calculated from the date of hatching. During most of the incubation period at Nest 1, 1933, the female flew directly out from the nest whenever disturbed; however, on July 8, the day previous to the hatching of the eggs, she sneaked from the nest through the grass for about two feet before flying.

On the last day of incubation the female of Nest 14, 1934, gave the call of intimacy from the nest or from very near it, in response to the singing of the male.

On July 6, 1933, the incubating female was known to be absent from the nest only from 2:21 to 2:38 P.M., during the period from 8:41 A.M. to 1:10 P.M., from 2:00 to 4:45 P.M., and from 5:45 to 7:20. Between 2:21 and 2:38 P.M. this female was near her mate, who sang from 2:20 until 2:29 and then dropped into the grass. The male apparently remained at the place after the female returned to the nest.

The possible copulation of this female with a bird not her mate during the incubation period is probably exceptional.

BEHAVIOR OF THE MALE DURING THE INCUBATION PERIOD

The actions of the male of Nest 1, 1933, were observed and mapped on July 6, between 8:15 A.M. and 7:20 P.M. This was three days before the hatching of the eggs. Details of the bird's activities while under observation are given below. Perches I, II, IV, and V were tall, dead stalks of mullein (*Verbascum thapsus*); Perch III was an elder bush (*Sambucus*); and Perch VI was a shrub not named in the field notes. Perch numbers are indicated by Roman numerals in the following.

8:41-8:42 A.M., sang from I; 8:42-8:43, silent on I; 8:43-9:40, could not be located; 9:40-9:43, sang from I; 9:43-10:03, could not be located; 10:03-10:05, sang from II; 10:05-10:16, on ground, probably feeding; 10:16-10:24, sang from III; 10:24-10:27, in grass at east edge of habitat—(Male No. 2 was here 10:17-10:24); 10:27-10:32, sang from IV; 10:32-10:42, on ground, possibly feeding; 10:42-10:47, sang from IV; 10:47-11:02, silently perched on IV; 11:02-11:05, sang from IV;

11:05-11:07, sang from I; 11:07-11:22, on ground near center of habitat — (Male No. 2 was here at 11:07); 11:22-11:31, sang from I; 11:31 A.M.-12:04 P.M., sang twice from ground south of II; 12:04-12:06, sang from II; 12:06-12:20, on ground near II; 12:20, sang from a little-used perch; 12:20-12:22, remained silent on the same perch; 12:22-12:27, sang from this perch; 12:27-12:48, on ground; 12:48-12:50, silent on little-used perch; 12:50-12:53, sang from IV; 12:53-1:06, in vicinity of IV; 1:10-2:00, observations suspended.

2:13-2:20 P.M., sang twice from a little-used perch; 2:20-2:29, sang from V; accompanied by female, 2:21-2:38; 2:29, flew to II, and thence to ground near by; 2:29-3:38, on ground south of II, where the bird sang three times; 3:38-3:43, sang from VI; 3:43-4:45, disappeared in northwest part of habitat, possibly feeding; 4:45-5:45, observations suspended. 5:45-6:40, in vicinity of I, where it sang twice; 6:40-7:00, sang from VI; at 7:20 it sang once from V.

The data may be summarized as follows:

Length of observations	529 minutes (8 hours, 49 minutes).
Length of time bird could be traced	309 minutes (5 hours, 9 minutes).
Length of time bird spent on ground	209 minutes (3 hours, 29 minutes).
Length of time bird spent in singing	80 minutes.
Length of time bird spent silently perched	20 minutes.

Number of minutes spent perching:

On VI	25.
On IV	31.
On I	16.
On V	9.
On III	8.
On II	2.
On miscellaneous perches	9.

Number of minutes spent singing:

On VI	25.
On IV	16.
On I	15.
On V	9.
On III	8.
On II	2.
On miscellaneous perches	5.

THE HATCHING PERIOD

Two of the eggs in Nest 1, 1933, hatched July 9, between 9:50 A.M. and 4:40 P.M. During this interval the female was twice seen to leave the nest voluntarily. Instead of leaving with her usual low flight, she mounted to a height of about twelve feet in the air, uttering animated twitterings as she swerved over a clump of shrubbery to the eastward.

The "front door" was an opening in the grass on the northwest side of the nest (Pl. III, Fig. 2). It resembled the entrance to a field-mouse's run. This was the exit used when the bird left the nest voluntarily. A less regular aperture on the opposite side was used when danger approached from the west or north. On returning to the nest the female usually alighted on the ground to the west and crept through the grass to it.

As the female sat on the nest in the afternoon she was heard twittering in response to a song of the male. About 6:30 P.M. the bird left the nest and flew into a weedy field a few rods to the east to feed. At 7:07 P.M. examination of the nest showed that there were still two unhatched eggs, which were not yet pipped.

When the nest was approached at 10:45 A.M. the next day a slight movement in the grass revealed that the female was leaving. The nest contained three young and one egg. The male gave alarm "chips" from weeds a short distance to the west. The female re-entered the nest at 10:56. She left again of her own accord at 11:26 from the northwest exit. Her destination appeared to be the weedy field in which she had been seen feeding the previous evening. She returned to a perch near the nest at 11:31 with food, the exact nature of which could not be determined. She looked anxiously about from two different perches before she finally entered the nest at 11:34, by the lower of two holes which had now been formed in the sheltering clump of grass. The bird left the nest at 11:40 for the same destination and returned at 12:02 P.M. with food. The abdomen of an insect could be seen projecting from the bill. When this bird came in the other adult flew out from the nest or near it. This was the first time both birds had been seen at the nest at once. The bird on the nest had entered unobserved, although the nest had been watched constantly from the blind. At 12:35 P.M. there was another shift of adults as one came in with a light green caterpillar, and the other left the nest.

The same thing occurred again at 1:03 P.M. At 1:30 a light brown cutworm was brought. It was the duty of the incoming bird to brood until the mate returned with food. At 2:00 one of the birds carried in a light tan caterpillar with a lateral black stripe. As the incoming bird entered the nest the other came out; the two paused in the grass at the edge of the nest for a moment, facing in opposite directions. On this occasion, as on several previous ones, the outgoing bird twittered very softly. The destination of this bird was the weedy field to the east, a favorite feeding ground. At 2:10 a bird with food came in from a new route, which included, as a stopping point, a scrubby willow thirty feet north of the nest. The food brought was a small tan larva. At 4:30 P.M. all the eggs had hatched. No evidences of any eggshell were seen at any time after the young had hatched.

Nest 14, 1934, was observed carefully on August 9, the day of the hatching of the eggs. At 8:38 A.M. the female sat much more closely than previ-

ously. One of the four eggs had hatched so recently that the down on the young bird was still wet.

The male began singing just east of the blind, after I entered. He had previously been silent. At 8:49 A.M. a bird, presumably the female, flew up out of the thick vegetation twenty-five feet west of the nest, and, flying like a shot, dropped into a shrub five feet north of the nest. Her actual entrance into the nest was hidden. At 9:00 the male began singing from a concealed perch, after an intermission, and his first song was answered by the call of intimacy from his mate on the nest. The next time the female was flushed from the nest, instead of departing, she remained in a bush, "tsipping" in alarm.

About 9:35 A.M. a food-laden bird presumed to be the male appeared in a shrub, then was lost in the grass, and announced his arrival at the nest only by the slight vibrations of the small yellow flowers of the cinquefoil shrub in which the nest was built. At 10:13 A.M. no more eggs had hatched. As I moved away from the nest for the blind, the male, previously silent for a time, began singing. On other occasions, too, it was noted that singing seemed to be his response to mild disturbances near the nest.

When first flushed from the nest that day the female did not return for eleven minutes; when flushed at 10:15 A.M. she returned to the nest one minute after the observer had entered the blind.

At 11:27 A.M. a second young had hatched; it was noticeably smaller than its three-hour old brother. There was no sign of the empty eggshell. At 5:45 P.M. the female flew off the nest low over the vegetation, twittering as she flew. In spite of vigilance her return to the nest was unobserved. As I approached the nest at 5:54 she again flew off.

The third egg was now in the process of hatching. The posterior half of the bird remained within the small end of the shell, while the head was free. The shell had parted evenly near the equator, and the larger end lay near. To free itself further the little bird nodded its head spasmodically, frequently pausing to gasp for breath. As the wings were freed they were used as levers in attempts to push completely out of the shell. After ten or fifteen minutes I withdrew to allow the female a chance to return and warm the young. When the nest was revisited at 6:25 the baby was free, and no sign of an eggshell remained. It is possible that the female may have assisted the young by eating off the attached portion of the shell. The fact that the bird was not seen to leave the nest in the interval lends support to the belief that she devoured the shell.

Between 6:30 and 6:50 P.M. the young bird was weighed. About 6:58 the male approached with the abdomen of a large katydid, which he partly swallowed before he disappeared into the grass. It could not be determined whether he delivered any of the morsel to the nest.

ACTIVITIES AT THE NEST

Nest 10, 1934, offered the best opportunity for observing activities at the nest, because the vegetation was kept cropped by cattle and a few sheep in Field 5a. The nest was sunk in the ground and surrounded by bracken and grass. A ring of hardware cloth three feet high enclosing an area about fifteen feet in diameter was put up to keep livestock away from the nest. Two of the four eggs hatched July 25, a third the next day, and the fourth did not hatch. The third bird to hatch was a runt. On July 27 the normal birds averaged 4.45 grams in weight, the runt weighed 2.65 grams. On July 30 the average weight of the healthy birds was 8.7 grams, that of the runt was 7.5 grams. After that the latter lost weight daily, weighing 7.3 grams on July 31, and 7.1 on August 1. After a severe storm on August 2 this bird was found dead near the nest.

The blind was set up within the enclosure, and observations were begun July 31, when the two older birds were six days old. On three successive occasions that afternoon one of the parents came with food, flew up on the fence (Pl. III, Fig. 1) which had been put up around the nest, and waited until its mate came with food. The second bird always skulked through the grass and under the fence into the enclosure. Later in the afternoon both birds sneaked in through the grass, instead of flying in with food. They usually left in the same manner, except when they carried away fecal material of the young, at which time they always flew off with a particularly undulating flight. Occasionally a grasshopper or caterpillar was captured within the enclosure, whereupon the captor returned to the nest immediately without getting out of sight.

One of the adults became suspicious of a motion and sounds within the blind and came within three feet of it to investigate. When all was quiet it crept off through the grass, keeping its head and shoulders down as low as its back. When traveling through and over the grass the motion used was a very rapid walk—the legs were used alternately. The walk was observed many times.

On the afternoon of August 1 I entered the blind at 2:50 P.M. At 3:00 one of the adult birds flew up on the fence with a larva in its bill. It remained there looking about suspiciously and "tsipping" for six minutes, whereupon it dropped down into the enclosure. It was another two minutes before it ventured to feed the young. This parent had badly worn feathers on the lower abdomen and was, therefore, thought to be the female.

As a Marsh Hawk sailed low over an adjacent field one of the parent birds gave the usual "hawk alarm" of rapidly repeated sharp "tsips." At this warning the young lay low in the nest with heads drawn in.

Instead of entering the nest every time as both had done the previous day, one of the parents usually put its head down through the bracken

above the rim of the nest and divided the food among the outstretched gapes of the young birds. The other parent continued to bring food to the nest entrance and appeared to feed only one bird at each visit. In fact this adult seemed to be anxious that only one bird should be fed at a time, for the following behavior was observed at 4:10 and again at 4:24 P.M.: the entire morsel of food was deposited in the mouth of a young bird, which was able to swallow only part of it. The adult then reached into the open

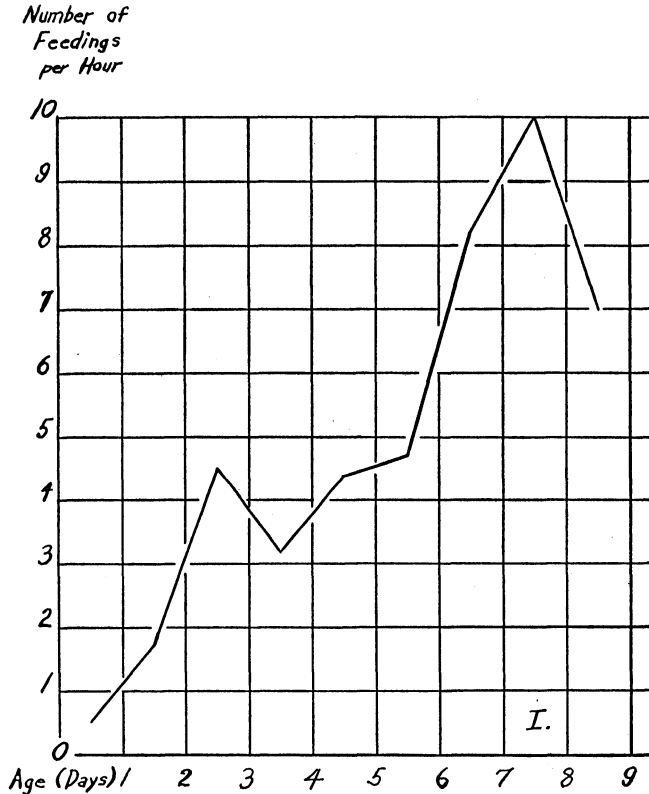


FIG. 1. Hourly frequency of feedings during first nine days of life. There is a rise from one-half feeding an hour at ages of less than one day, to ten feedings an hour at the age of seven to eight days. Data based upon 46 hours' observations at several nests.

mouth of the young, extracted the unswallowed food, and replaced it in the same maw, whereupon it was avidly swallowed. The swallowing reaction appeared to be a response to the "feel" of the thrust of the parent's bill rather than to the presence of food in the mouth.

Twice, immediately after feeding a young bird, the adult remained in the nest and rapidly opened and closed its bill as if eating. In all probability this was not a method of training the young to eat, but it had exactly

that appearance. Frequently morsels protruded from the mouths of the young for well over a minute after they had been fed.

The first food known to be brought to a young bird was delivered by the parent (male?) more than an hour after hatching had occurred. This was an undetermined item brought at 9:35 A.M. to Nest 14, August 9, 1934. At 10:18 the male brought what appeared to be a caterpillar. A second bird had hatched at 11:27. From 2:07 until 4:00 P.M. no food was brought. Increase in the frequency of feedings as the nestlings grew older is shown in Figure 1. Very frequently both parents brought food and fed it almost simultaneously. The nature of the food is discussed on pages 47-49.



FIG. 2. Average daily rhythm of feeding young Henslow's Sparrows in the nest. The principal activity is in the morning and late afternoon. Data for 49 hours of observation.

Nest-cleaning occurred at irregular intervals, sometimes in rapid succession. Plate III, Figure 2, shows an adult emerging from Nest 1, 1933, with a fecal sac in the bill. The sac was usually carried away, but sometimes it was eaten.

SOCIAL ORGANIZATION AND ABUNDANCE

As Henslow's Sparrows would not enter traps, it was impossible to band any adults for identification. The comparatively small number of nests under observation made it seem inadvisable to capture adults at the nest and run the risk of disturbing normal activities. In the small extent of contiguous habitat of Area A, it was possible to keep track of the single pair of birds nesting there and of the second male that sang there occasionally and which on one occasion apparently copulated with the female of the rightful owner of the territory.

In larger areas, where several pairs bred, the social organization seemed to be that of a loose colony. The birds were not uniformly distributed over the habitat as are such birds as the Robin and Song Sparrow, for example. Isolated pairs, as in Area A, were rare. Many comments in the literature attest to the fact that the species usually nests in scattered colonies throughout its range. Observations indicated that territories were established within the colony, and that their boundaries were occasionally violated.

On July 19, 1934, beginning at 5:45 A.M., observations of fighting were made from the blind, which was near Nest 6. During the next hour several feedings of the young occurred. Shortly before seven o'clock two birds had an altercation several yards east of the nest. Field notes written at the time state:

The fighting was apparently not vicious; one bird flew at the other. Then they both disappeared in the grass; shortly thereafter both birds separated and began singing—one fifty feet south of blind, the other from a tall weed not more than twenty feet east of it.

Shortly afterward two adult birds approached the nest with food. Before they reached the nest a third bird came within two feet of the nest and watched them. It acted as if it might be trying to "flirt" with the bird provisionally identified as the female of the nest. When it flew over near the other parent it was chased to a point about one hundred feet to the southwest, where it perched and began to sing. Since Nest 15 was later found about fifty feet southwest of Nest 6, it is possible that this bird was the owner of that nest, but it seems more probable that it was an unmated bird.

About ten minutes later, while one of the parents was brooding the young, the other came to the nest with food. Immediately one of the adults flew a short distance to the east, where it was approached by the rival male from the south. The two started fighting, bowing to each other beak to beak, like fighting roosters. After a few moments, one bird, presumably the intruder, retired to the south and began singing again.

Shortly after eight o'clock the male parent brought food to the brooding female. After delivery of the food the male flew a short distance to the east and began to sing. Presently he joined two other birds about one hundred feet south of the nest, and the three flew across the meadow together, while the female of Nest 6 was brooding.

At 9:40 A.M. an incident happened which throws some light upon the significance of the "call of intimacy." As one of the adults came toward Nest 6 with food, it uttered the call, and immediately, the "rival" male, which had been singing some distance to the south, approached, but it was driven back by the male (?) of the nest. Apparently the call of intimacy had some significance that aroused the interest or jealousy of the rival.

Peace reigned until 12:50 P.M., when both parents came to the nest with food. The male from the south approached one of them, and the two birds lowered their heads at each other, as the two males had done previously. The parent uttered excited squeaks, all the time holding the katydid, which was delivered to the young after the intruder had finally been driven away.

Beginning at about 2:20 P.M. a bird, presumably the same rival male, sang from concealment in the grass about thirty feet from the nest. When the male of the nest came with food for his young the singing stopped but recommenced as soon as he left. At 2:30 the rival ventured to sing from a low bush over the grass where he had been hidden, but he soon flew to a perch about thirty feet distant.

On two or three occasions during the afternoon the bird brooding on the nest, probably the female, flew off and disappeared in the grass near where the "rival" male was singing. Although her actions could not be observed, circumstances made it appear that this bird was not always true to her mate.

It is not strange, perhaps, that such instances should occasionally arise in the most densely populated portion of the habitat. However, observations at Nest 1, 1933, which was a lone nest in an isolated patch of low meadow, show that such occurrences are not limited to crowded fields.

Two males frequently sang in the small area in which the nest was located. By long-continued observation at close range the male which appeared to be the rightful head of the nesting family was identified by the distribution of spots on the breast and certain other individual markings. The two males frequently sang within the area simultaneously. Some of the perches of each bird were less than twenty-five feet apart, but the birds seldom used these at the same time.

On July 4, a female was observed in copulation with the second male—not the male of the nest. This female could not be proved definitely to be the one incubating on Nest 1. However, no second nest was ever located in this area, after very careful search, and no more than three birds were ever seen there at once. Furthermore, the adults of the nest ranged throughout the area unchallenged. It is possible that the second male had a mate with a nest in some near-by habitat, and that the pair was observed copulating near Nest 1, but this seems unlikely.

While such irregularities arise more readily in a community than they do under conditions of isolated nesting sites, the advantages of the semi-colonial mores must outweigh the disadvantages or they would be abandoned. Howard (1920: 202) stated: "A community . . . in the true sense of the word, is a collection of individuals brought together, not primarily as a result of shortage of breeding ground, but in consequence of advantages

of communal ownership over individual ownership." Such communal advantages may well accrue to the colonies of Henslow's Sparrows, and the custom of dwelling in such groups helps to account for the nonuse of certain apparently suitable habitats.

The main advantage which is evident in the colonial system of Henslow's Sparrow is that of protection from predatory enemies. The Marsh Hawk (*Circus hudsonius*) was the most regular predator observed at the Anderson habitat. Whenever one approached the breeding grounds the first sparrow to see it gave a warning note that differed from the alarm note given, for example, when I invaded the colony. Upon the utterance of this warning every bird immediately dropped into the cover of the thick grass. Thus, even in a loosely-knit colony, a single sentinel protects not only its own family but the whole community.

In fields inhabited by colonies of Henslow's Sparrows the numbers of birds an acre may run rather high, but over any extensive area, taken as a whole, the population will be low because of the large amount of uninhabited land. In one nine-acre field (Field 3) at Anderson four pairs nested in 1934. In 1936 it was estimated that seven males had their territories in this field, in which four nests (one deserted) were found before June 10. In Field 6 there were about forty acres of habitable territory, which held about thirty to forty singing males in 1934. A similar density is reported from Mahoning County, Ohio, by Vickers (1908: 150-52), who found from nine to twelve males in a fourteen-acre field. Hennessey (1916: 115) found from forty to sixty birds (he does not say pairs) in an area of about 160 acres in southern Michigan, near Albion. A record for density is reported from Iowa by Anderson (1907: 317) on the authority of G. H. Berry, who reported ten pairs breeding in a field of hazel and blackberry of about one-half acre in extent.

ACTIVITIES AFTER THE BREEDING SEASON

A decrease in the vigor and frequency of singing may occur as early as July 7, though this is succeeded by an increase. This first drop may be accounted for by the fact that most of the males are busy feeding young. It was found by observation that males sang very little while they had young in the nest, since they devoted nearly all of their waking hours to supplying food. The second period of singing dropped off rather suddenly about the middle of August in both 1933 and 1934. Near Olivet, Michigan, birds were in fairly vigorous song on August 15, 1933. Four days later the birds on the Reserve were silent. In 1934 a diminution of song was noted at Anderson on August 11. On August 21 only one bird was heard to sing two or three times during six hours spent in various parts of the Anderson habitat.

This second and final dropping off of song is definitely correlated with physiological changes in the birds themselves, for in two adults collected near Anderson on August 23, 1934, the first evidences of molt were apparent. Some of the specimens taken in September showed no new feathers nor other evidences of molting, and one taken October 5, 1935, had only commenced the process. Molting occurred much earlier in the Savannah and Song Sparrows collected and observed in the same habitat.

In August, also, there seems to be a tendency for the birds, at least the immature ones, to venture into new territory. Upon two occasions immature birds were flushed from weeds along the railroad right of way. Although this ran between two areas inhabited by the birds, no adults were flushed from the strip.

From late August on, the birds have a tendency to make longer flights when disturbed. If flushed several times in succession they frequently fly to the edge of a thicket or into a low tree. Such behavior presages the reactions of the birds during the migration period. Nearly all of the definitely migrating birds seen by me in Kansas, Illinois, and New Jersey were along hedgerows or at the edges of similar shrubby places.

FOOD

Of the seventeen stomachs of Henslow's Sparrows collected by me and examined by the U. S. Bureau of Biological Survey, twelve were those of adults, and five were from young birds well able to fly. Fifteen of them were taken in southern Michigan, and one of an adult and one from a young bird were from St. Lawrence County, New York. The birds were collected in the following months: April, two; May, one; August, ten (including four of the juveniles); September, two; October, two. Animal matter constituted 82 per cent of the food (by bulk), vegetable matter, 18 per cent. From April to September the percentage of animal matter ranged from 85 to 100 (except for one juvenile stomach containing only 10 per cent of animal food); the two stomachs of birds collected in October contained only 9 and 15 per cent of animal matter, respectively. In the following discussion, figures given are percentages of total food, unless otherwise stated.

Orthopterans, comprising 36.47 per cent, made up more than one-half of the August and September food. The cricket *Nemobius* sp., which was the largest single item, composed 17 per cent of the total food. Crickets of this genus were found by Hendrickson (1928: 133) to be characteristic of an Iowa prairie in late summer and fall, and by Shelford (1913: 297-98) to be common on the compass-plant and sedge prairies near Chicago. Short-horned grasshoppers (Acrididae) composed 8.18 per cent of the diet; Tettigidae were also represented.

Coleoptera composed 19.3 per cent and occurred in all but one of the stomachs. Weevils constituted 6.47 per cent. The genus *Hyperodes*, which occurs upon semiaquatic vegetation (Blatchley and Leng, 1916: 164) was found in seven stomachs from April to October. The clover root curculio or leaf weevil (*Sitona hispidula*) constituted 3.2 per cent; it was found in six stomachs. Other weevils were Ceutorhynchini, including *Listronotus appendiculatus*.

Chrysomelids, occurring from April to September, composed 5.4 per cent. *Oedionychis* sp. was present in three stomachs secured in August; two birds taken in August had eaten *Microrhopala vittata* Fabr., whose larvae mine in the leaves of goldenrod (Blatchley, 1910: 1225). One bird had eaten *Gallerucella americana*, a species noted as occurring chiefly in low moist places (Blatchley, 1910: 1166), and, in Iowa, feeding upon *Helianthus* (Hendrickson, 1928: 136). Another bird had eaten *Graphops pubescens* Melsh., an insect found on evening primrose, *Oenothera* (Blatchley, 1910: 1144). Other chrysomelids which had been eaten were *Chaetocnema cribrifrons*, in one stomach, *Anoplitis* (= *Odontota*) *inaequalis*, in two stomachs, and *Phyllotreta vittata*, in one stomach. Other Coleoptera present were *Ludius* sp., which constituted 86 per cent of an April meal, *Harpalus pennsylvanicus*, in one stomach, unidentified carabids in two stomachs, *Cytilus alternatus* in two stomachs, *Aphodius* sp. in one April stomach, an unidentified scarabaeid in one stomach, and a histerid in one stomach.

Heteroptera were found in ten stomachs, May to October; they made up 12.2 per cent. Six stomachs contained remains of lygaeids, forms usually common among herbage. These included *Ligyrocoris diffusus* Uhl., *Cymus angustus*, *Phlegyas abbreviatus*, *P. abdominalis*, *Pamera* (= *Orthaea*) *basalis*, and two unidentified plant bugs. *L. diffusus* is characteristic of wet meadows (Blatchley, 1926: 397) and prairies (Hendrickson, 1928: 134). *Pamera basalis* is noted by Blatchley (1926: 104) as occurring "in bases of tufts of grass"—exactly where one would expect to find Henslow's Sparrows feeding.

Pentatomids occurred in three stomachs, and unidentified Heteroptera in three. *Alydus eurinus* Say composed 46 per cent of the contents of the stomach of an adult taken in September. This species is recorded by Hendrickson (1928: 134) from the Iowa prairies. Other Hemiptera represented were *Jalysus spinosus*, *Corigus* sp., and Emesidae. Fragments or eggs of Homoptera were present in seven stomachs.

Although Lepidoptera constituted but 3.3 per cent of the food contents, observations indicate that caterpillars probably compose at least half of the food brought young nestlings. The caterpillars of cutworms (Noctuidae) are prominent; they composed 10 per cent of the food of an April adult. Remains or eggs of Diptera occurred in only four stomachs.

Larvae of *Sargus* sp. constituted half of the stomach contents of a bird collected on April 15.

Hymenoptera constituted but 1.8 per cent of the food. The genus *Halictus* was represented in one stomach. Three species of these small mining andrenids are listed by Hendrickson (1928: 138) as characteristic of the Iowa prairie. C. C. Adams (1915: 196) recorded three species from such typical prairie plants as *Silphium* and *Solidago* on an Illinois prairie. Ants, ichneumonids, tenthredinids, and chalcids were also sparsely represented.

Additional items of animal matter and the number of stomachs in which each occurred are: unidentified insect eggs, two; spiders, two (composed 55 per cent of an August meal in northern New York); unidentified arachnids, two; Neuroptera, one; myriapods, one; gastropods, one.

Vegetable matter amounted to 18 per cent of the contents of the stomachs examined. It is nearly certain that if fall, winter, and early spring specimens had been examined in proportion to those collected in summer, the percentage of vegetable matter would have been much higher. Ten of the seventeen stomachs contained at least 1 per cent of plant material, and two more had a trace. Seeds of grasses occurred in six stomachs, and amounted to 6.2 per cent, about one-third of the vegetable matter. Seeds of a ragweed, *Ambrosia elatior*, found in two birds taken in October, constituted 75 and 85 per cent, respectively, of their stomach contents. These figures represent 9.4 per cent of the entire content of the seventeen stomachs. Six birds had eaten seeds of various Polygonaceae, mostly of the genus *Polygonum*; this amounted to 1.6 per cent of the total food for all specimens. Seeds of sedges (*Carex*, *Scirpus*, and *Rhynchospora*), eaten by four birds, constituted slightly less than 0.5 per cent of the diet.

Table II lists the vegetable food found in the stomachs examined.

Food of Nestlings

The principal food brought day-old birds in Nest 1, 1933, was smooth caterpillars, chiefly cutworms (noctuids). These and the soft abdomens of katydids, tree crickets, and grasshoppers were the chief items fed young up to three days of age. After that the necessity for quantity rather than quality seemed to rule, and a greater variety of food was brought, though Orthoptera and caterpillars still predominated.

In addition to the forms mentioned above, many others were observed as they were brought to the young. Observations on feeding were made principally at Nest 1, 1933, and Nests 6, 10, and 14, 1934. In 1934 adults frequently fed to nestlings four or more days old large black, yellow, and orange insects which were probably the willow sawfly (*Cimbex americana*). On one occasion a larva resembling that of *Cimbex* was brought in. The

TABLE II
VEGETABLE FOOD OF HENSLOW'S SPARROW

DATE AND PLACE OF COLLECTION	PER CENT												
	Aug. 19—Mich.	Sept. 7—Mich.	Aug. 15—Mich. Juvenile	Aug. 19—Mich.	Aug. 11—Mich. Juvenile	Aug. 15—Mich. Juvenile	Apr. 15—Mich.	Apr. 25—Mich.	May 2—Mich.	Oct. 12—Mich.	Oct. 18—Mich.	Aug. 11—N. Y. Juvenile	Averages from 17 stomachs
Grass Seeds .....	..	2	90	..	..	Tr.	7	..	..	5	..	1	6.2
<i>Panicum</i> sp. ....	..	1	..	..	..	..	7	..	..	..	..	..	..
<i>Panicum huachucae</i> (?) ..	..	..	..	..	..	..	..	..	..	..	..	1	..
<i>Chaetochloa glauca</i> .....	..	1	80	..	..	..	..	..	..	..	..	..	..
<i>Chaetochloa viridis</i> .....	..	..	10	..	..	..	..	..	..	..	..	..	..
<i>Leersia</i> .....	..	..	..	..	..	..	..	..	..	5	..	..	..
<i>Syntherisma</i> (<i>Digitaris</i>) .....	..	..	Tr.	..	..	..	..	..	..	..	..	..	..
<i>Zea mays</i> .....	..	..	..	..	..	Tr.	..	..	..	..	..	..	..
Sedges	1	..	..	1	..	..	5	..	..	..	..	1	0.5
<i>Carex</i> sp.	1	..	..	1	..	..	..	..	..	..	..	1	..
<i>Carex vulpinoidea</i> .....	..	..	..	1	..	..	..	..	..	..	..	..	..
<i>Scirpus</i> .....	..	..	..	..	..	..	5	..	..	..	..	..	..
<i>Rhynchospora</i> .....	..	..	..	..	..	..	..	..	..	..	..	Tr.	..
Polygonaceae	1	3	..	..	15	..	..	1	..	5	3	..	1.6
<i>Polygonum</i> sp.	1	..	..	..	..	..	..	1	..	5	3	..	..
<i>Polygonum punctatum</i> .....	..	..	..	..	15	..	..	..	..	..	..	..	..
<i>Rumex acetosella</i> .....	..	3	..	..	..	..	..	..	..	..	..	..	..
Compositae .....	..	..	..	..	..	..	..	..	..	75	85	..	9.4
<i>Ambrosia elatior</i> .....	..	..	..	..	..	..	..	..	..	75	85	..	9.4
Violaceae .....	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Viola</i> sp. ....	..	..	..	..	..	..	..	..	..	..	..	1	..
Indeterminable .....	..	..	..	1	Tr.	..	..	..	Tr.	..	3	..	..
Total	2	5	90	2	15	Tr.	12	1	Tr.	85	91	3	17.7

NOTE: Five of the seventeen stomachs examined contained no vegetable matter and are therefore omitted from the table, except in the last column on the right.

young were often fed spiders, one of which was identified as the large garden spider (*Argiope*). What appeared to be a firefly (lampyrid) was also brought. Other items partially identified were a black cricket, and a grasshopper of the genus *Melanoplus*. Often it was impossible to obtain more than a vague notion of the items; the victims were mangled and the head of the bird carrying them was in almost continuous motion. It is safe to say that 80 per cent of the food brought to the nest consisted of Orthoptera and many varieties of lepidopterous larvae. This diet seems to conform to that

of other nestling sparrows that have been studied (Judd, 1901: Fig. 52, and Pl. 51, Fig. 1) especially the Grasshopper Sparrow (*Ammodramus sava-narum australis*) and the Dickcissel (*Spiza americana*).

ENEMIES

Snakes are probably among the worst enemies of Henslow's Sparrow. The blue racer (*Coluber constrictor flaviventris*) was common in the Anderson habitat. In Pennsylvania, birds and their eggs constituted 12 per cent of the diet of specimens examined (Ruthven, Thompson, and Gaige, 1928: 88). Once an adult and a young blue racer came very close to Nest 1, 1933, and would probably have destroyed the contents had I not frightened them away. At three or four other nests from which eggs or young were taken, evidence pointed to snakes as the culprits.

The Marsh Hawk (*Circus hudsonius*) is common in the habitat of Henslow's Sparrow and undoubtedly captures individuals at times. Stoddard (1931: 209-10) recorded the remains of a Henslow's Sparrow in one of 1098 pellets of the Marsh Hawk collected at a winter roost in Leon County, Florida. The three-day old young in Nest 2, 1934, disappeared under circumstances which threw suspicion upon a pair of Marsh Hawks that had a nest about one hundred and fifty yards away. These hawks were bringing in many birds to their young, but no Henslow's Sparrows were identified. Later in the season, when many young were out of the nests there was great consternation among the Henslow's Sparrows when a Marsh Hawk swooped down in their midst and made off with some small object that could not be identified. There were two Marsh Hawks' nests within a mile and a half of each other, with the result that the entire Anderson habitat was patrolled several times a day by these birds.

During the nesting season, when a Marsh Hawk appears, singing immediately stops and gives place to the "hawk alarm" ("tsip"), which is more penetrating and longer than the ordinary alarm note. Most of the sparrows disappear, but one or two may remain on their perches until the last minute, when they take shelter in the tangle of grasses, where they are so adept at hiding that they are probably seldom captured.

Sutton (1928b: 86-87) recorded the remains of a Henslow's Sparrow in the stomach of a Sharp-shinned Hawk (*Accipiter velox*) taken in October.

Henslow's Sparrow is apparently unusually free from imposition by the Cowbird (*Molothrus ater*). A review of the data of Friedmann (1929: 219; 1931: 62; 1934: 111; 1938: 49) indicates that only E. J. Court, in southern Maryland, has found a significant percentage of parasitism. Walkinshaw (letter) found a nest, June 15, 1930, in Calhoun County, Michigan, that contained three eggs of the Henslow's Sparrow and one of the Cowbird. No eggs of this parasite were found in any of the nests examined by me, although

the Cowbird was abundant in the region. It seems probable that the skillful concealment of most of the nests is sufficient to divert the attention of the Cowbirds to nests more easily found.

Nest 18, 1934, was located within fifty feet of the burrow of a mink (*Mustela vison* subsp.). The eggs hatched and the three young remained unmolested by the mink but died as a result of cool weather and a heavy infestation of nest mites.

Selko (1937: 73-74) found that birds composed 6.37 per cent of the fall diet of the striped skunk (*Mephitis mesomelas avia* [= *M. mephitis*]) in an Iowa locality. The Eastern Tree Sparrow (*Spizella arborea arborea*), among others, had been victimized.

At least one or two dens of the red fox (*Vulpes fulva*) were located on the Reserve. It is entirely possible that this predator may take Henslow's Sparrows when the opportunity offers. That it does eat grass-inhabiting birds is attested to by Errington (1935: 193): "Among the items found about 113 red fox dens in Iowa during spring and early summer, 1933, were the remains of ten meadowlarks, one short-billed marsh wren, and many other birds."

Skunks, weasels, and raccoons occurred at the Anderson habitat. These animals are known to take young birds and eggs at times. Once a mother raccoon led her five little ones within a very few feet of me as I stood in plain sight in broad daylight. She took them from the woods down into the meadow along Honey Creek, where the Henslow's Sparrows bred.

In 1934 the birds were much more abundant in fields which were lightly pastured than they were in ungrazed meadows. A possible causal relation is that cattle tend to drive out snakes. These reptiles were seen much more frequently in the ungrazed fields in the Reserve than they were at the Anderson habitat, where cattle grazed regularly. The densest sparrow population was in Field 3, where only two cows were kept. The only known case where a nest was trampled upon by stock occurred in this field. Nest 6, 1934, met with this untimely end, after the young had hatched. The location of the blind near the nest may have aroused the cow's curiosity and thus may have been indirectly responsible. One morning fresh tracks of a sheep were within about four inches of Nest 10, 1934, in Field 5a. Within the Reserve, deer frequented the *Spartina* and sedge meadows at night, and consequently they, too, may have occasionally trodden upon nests.

ECTOPARASITES

Red mites or "chiggers" are frequently found on the skin of the ear, about the anus, and sometimes on other parts of summer specimens of Henslow's Sparrow. Specimens of mites from three birds collected at Anderson in August, 1934, were determined by H. E. Ewing, of the U. S. Bureau of

Entomology, as *Trombicula bisignata* Ewing. He writes (letter) that this is a bird- and mammal-infesting chigger of northern North America, which does not attack man.

Mallophaga were found on a bird taken by me in St. Lawrence County, New York, in August, 1936, but were unfortunately lost. No species of Mallophaga has been described from this bird, which seems to be relatively free from lice. Similar conditions are reported for Baird's Sparrow (*Ammodramus bairdi*), a species of strikingly similar habits (Cartwright, Shortt, and Harris, 1937: 182).

PLUMAGE

Adult Male, Fall and Winter

The following description is based on a specimen (U.M.M.Z. No. 50627) taken October 23, 1906, in Wayne County, Michigan, and four Florida specimens (Carnegie Mus. Nos. 11705, 11728, 11811, and 12247) taken in December and January. Color names are after Ridgway (1912).

Line through center of crown ochraceous buff to old gold; sides of crown black, the feathers finely bordered with pale olive green; spot before eye old gold to wax yellow, sometimes undifferentiated from the buff loreal area; line over and behind eye citrine, spreading out to unite with the hind neck of the same color; the latter with small black streaks centrally, mostly unstreaked laterally; an irregular black line along side of head behind eye, usually widest posteriorly. Cheeks and auriculars from orange-buff to yellowish brown; a narrow black line borders this area ventrally and approaches or connects with the postocular black line, thus more or less completely bordering the auricular area; a wide ochraceous-buff line down lower side of neck from mandible, bordered below by a narrow black line down side of throat. Throat white to cream-buff, sometimes very lightly streaked with dusky at the sides; a wide band of warm buff across the breast, the color extending along the sides; the breast and sides narrowly streaked with black; flanks ochraceous-buff with heavy black streaks. Crissum buff-pink laterally, ochraceous-buff mesially; middle of belly white.

Feathers of the back each with a black shaft-streak widening into a rounded area near the tip; shaft-streaks bordered laterally by cinnamon-rufous, except distally where the cinnamon-rufous changes abruptly to chestnut or mahogany red; the end of each feather margined with pale cream-buff, giving the back a scaled appearance; wing coverts similar but with less reddish and with wider buff or ashy margins; tertials black or fuscous, outer vane hazel except at tip, where black from inner vane encroaches; tips margined with buffy or ashy; primaries and secondaries fuscous edged with clay color externally, internally with ashy. Rump clay color with some black shaft-streaks; upper tail coverts sudan brown with narrow black shaft-

streaks. Central pair of rectrices dark cinnamon-rufous with black shaft-streak running entire length; other rectrices fuscous edged with pale grayish brown. Mandible brownish yellow; maxilla brownish. Bend of wing pale yellow. Under wing coverts whitish. Pattern of the upperparts is shown in Plate IV, Figure 2.

Male in Spring and Summer

As the season progresses the colors become faded, especially in late summer. This is particularly true of the citrine head and nape, which fade to light yellowish olive, the buff or gold spot in front of the eye, and the buff of the cheeks, auriculars, and underparts. The feathers of the back and scapulars lose their creamy or ashy tips through wear.

Differences Between the Sexes

In some twenty or thirty Michigan specimens examined, adult females in breeding plumage have, on the average, more black in the crown and back than do the males. It is owing to the greater width of the black streaks of the individual feathers. The black crown stripes of the female are inclined to lack the symmetry of those of the male; the boundaries are more irregular. The same differences were noted between a male and female from North Carolina. This female, however, had fewer black streaks on the side of the nape. The same tendencies are noted in six breeding birds (three of each sex) from Douglas County, Kansas (females, Alexander Wetmore collection, No. 2759; and Kansas Univ. Mus. Nos. 600-601; males, Kansas Univ. Mus. Nos. 598, 1283, and Wetmore collection, No. 2758); and in two immature birds in fall plumage (male, Wetmore collection, No. 3144, and female, Wetmore collection, No. 3143). In four birds from Virginia the female (U.M.M.Z. No. 55795) is practically indistinguishable from the *darkest* of the three males.

Exactly the opposite tendency is to be seen in a series of breeding birds from northwestern Pennsylvania (females, Carnegie Mus. Nos. 85034, 116037; males, Carnegie Mus. Nos. 85030-33, 116003). Here the males have a larger amount of black on crown and back.

Sutton (1935: 24) stated that at the early age of eight or nine days males could be distinguished from females by "the darker appearance of the crown, back, and scapulars, this dark appearance resulting from the greater width of the dark median streak in each feather and the correspondingly narrow buffy or olive edgings." An examination of the small number of young birds available reveals at least one exception to this statement (if the bird is correctly sexed). If it is a general rule that young males have more black than their sisters, the situation is the reverse of that which obtains in their parents, at least in southeastern Michigan.

Development of the Juvenal Plumage

Neossoptiles: The distribution of neossoptiles, or "down" in a Henslow's Sparrow about four hours old (in Nest 6, July 15, 1934) was as follows: A superciliary patch of about two tufts on each side; a patch on the back of the head; one on the middle of the back; one lateral to the femur; a humero-scapular tract of two tufts; and a patch on the posterior margin of the ulna.

On the upper parts the distribution is essentially the same as Gross (1921: 170) found on the nestling Dickcissel (*Spiza americana*). Gross states that the ventral aspect is entirely without down in the latter species. Henslow's Sparrow may differ in having the lateral tracts further ventrad than they are in the Dickcissel. Comparison of specimens or accurate diagrams would determine this. At four days of age down was still prominent. At six days the superciliary and alar tracts retained conspicuous tufts.

Dwight (1900: 189) calls the natal down of this species "smoke-gray." In a four-day old bird (July 14, 1934) the down was pale buffy gray.

Contour feathers and penna: At the age of about twenty-nine hours the sheaths of the primaries appeared as short sharp serrations in Nestling 2, Nest 6, July 16, 1934. The second from the tip was the longest, possibly one-half millimeter in length. The three outermost sheaths were longer than the proximal ones. The sheaths showed more development on the right than on the left side.

The following description of the further development of the juvenal plumage is based upon daily observations of Nestling 3, Nest 5, 1934: At the age of four days (July 14) unsheathing was most advanced on humeral, scapular, and lower back regions; it was just beginning on the upper back and on the ventral tract. The exposed tips of the feathers of the ventral tract were pale lemon yellow. At four days the feathers of the humero-scapular tract had black centers and light brown tips.

At four days the sheaths of the feathers appeared as follows: Head dark lead gray (plumbeous); back deep magenta; wings deep blue-gray, lighter near ends of remiges; tail like back; rump darker; chin and throat pinkish buff; ventral and lateral tracts pale lemon yellow, except that the dorsal part of the lateral tract is a continuation of color of throat.

At the age of five days the same bird is described: Dorsal part of lateral tract still pinkish buff, or even more so than the day before, in contrast to yellow of the rest of the tract and of the ventral tract. Feathers in the pink-buff area at dorsal sides anteriorly show small dark center streaks. Back black, tipped with deep ochraceous-buff anteriorly; posteriorly the buff tips much longer, black centers reduced.

At six days (July 16) the growth of the plumage of this bird over that of the preceding day was amazing. The feathers were almost completely unsheathed, except on the forehead, the crown, and underneath the eye.

Down was still fairly prominent, attached to the tips of the feathers of the sides of the crown and those of the alar tract.

The following description of the bird at the age of six days may be taken as typical of the juvenal plumage: Sides of crown black, center of crown and nape all around light olive-brown, contrasting with the pale rufous back feathers, which have black centers; edge of wing sulphur yellow; remiges fuscous, the primaries very narrowly margined along outer edges and tips with pale light brown, the secondaries similarly margined with a slightly deeper brown; tertials black, broadly margined with pale cinnamon; scapulars and wing coverts fuscous margined with pale rufous. Underparts sulphur yellow, sides strongly washed with vinaceous. The feathers of the anterior part of the sides of the breast have narrow fuscous streaks. This streaking is found on nearly all young examined. Therefore the statement of Brewster (1878: 118-19) that there are no spots or markings of any kind on the underparts is not quite true, if the "sides" are included in the underparts.

The "fused barring" of black along the mid-line of the brown rectrices, and the shortness of these feathers are commented on by Sutton (1935: 25-26). These characteristics hold for all juvenal plumages examined by me, although the fused barring is occasionally found on birds with full-length rectrices and otherwise mature in appearance (cf. Sutton, 1935: 25-26).

Sutton (1935: 23-25) stated:

The plumage or plumage-stage that is worn by this species at the time the first winter plumage begins to appear is different enough from the loose nestling plumage or plumage-stage to suggest the existence of a definite but incomplete *postjuvenal plumage* that involves especially the region of the scapulars and back.

Molting of the fluffy nestling feathers begins when the individual is about two weeks old, apparently; but the molt into the first winter plumage, which for want of a clearer understanding of the situation we must for the present call the *postjuvenal molt*, is not consummated until late September or October.

.....

In a young male specimen, presumably about nine days old (George Reserve, July 19, U.M.M.Z. No. 74992), in which the tail is about an inch long, the back and scapulars are wholly in the juvenal plumage, each feather being dark olive-brown with a narrow olive-buffy edging or margin. In a young female with fully developed juvenal rectrices (George Reserve, August 11, U.M.M.Z. No. 74994), on the other hand, most of the scapulars and many of the back feathers are distinctly not of the juvenal plumage. They are not fluffy enough for juvenal feathers. They have a comparatively narrow, dark central streak, with broad buffy or russet margins and narrow buffy edgings at the tips. That they are not part of the first winter plumage is perfectly apparent from an inspection of the brightly colored, strongly black, white, and chestnut, and still principally sheathed feathers that are appearing in the middle of the back.

... We are forced to the conclusion that they are either a rather definite "post-nestling" stage of the juvenal plumage, or a separate but incomplete *post juvenal plumage* [italics Sutton's] ...

Close scrutiny of six juvenile birds indicates that the region of the back and scapulars is one of precocious development of the adult plumage. Of these six specimens one is the female examined and described by Sutton in the above passage. Two others are of approximately the same apparent age (Royal Ontario Mus. Zool. No. 28361, taken September 11, 1937; Mailliard collection, No. x1167, taken September 2, 1898, a male); two more are slightly older birds in the collection of Lawrence E. Hicks; and the sixth is a young male taken by me at Anderson, Michigan, October 5, 1935 (No. 103 in my collection). This is a definitely older bird, but still in principally juvenal plumage. All six show, in the scapular region, feathers which differ from the typically juvenal ones in surrounding areas, and their number is roughly in proportion to the age of the birds. It is of these that Sutton speaks. They resemble in every detail the less bright interscapulars of the typical adult winter plumage. In the full winter plumage, whether it be that of the first or of subsequent winters, these less brilliant, more buffy feathers are outnumbered and usually overlaid by the black-centered chestnut feathers that so conspicuously characterize that plumage.

Ticehurst (1936: 227-28) independently expressed the possibility that the disputed feathers were those of the winter plumage. In a letter to me (February 20, 1939) Sutton himself definitely states that these feathers "may even be of the first winter plumage"—a reversal of his published statement, quoted above.

Immature birds taken late in fall are very similar to adults, but the buff of the underparts is deeper, in some instances becoming an orange-buff. In two Kansas specimens the lower and upper back have a decided burnt orange tinge.

Stone (1896: 142) stated that the molts of the Henslow's Sparrow are the same as those of the Grasshopper Sparrow (*Ammodramus savannarum australis*), that is, that there is no prenuptial molt. "W. P." (William Palmer, 1896: 242) reported taking two Henslow's Sparrows that were growing new central rectrices, May 6. Wayne (1910: 119) noted that the birds arrive near Charleston, South Carolina "in full autumn plumage, but toward the last of November they begin to moult the feathers about the head and throat." None of the November specimens examined by me, including two of Wayne's own, upholds this statement. The feathers of the areas mentioned are normally renewed at the regular postnuptial molt in August, September, or early October.

It is interesting to note that in the Eastern Savannah Sparrow (*Passerculus sandwichensis savanna*) there is a prenuptial molt (Stone, 1896: 142).

Regional Variation in Plumage

An adult male from Lawrence, Kansas (Kans. Univ. Mus. No. 598), April 14, 1906, is everywhere paler than spring males examined from Virginia.

This is especially noticeable on the primaries. In the Virginia specimens these feathers are nearly fuscous, the inner ones edged with hazel, the outer with cinnamon basally, whereas in the Kansas bird they are hair brown edged with pinkish cinnamon. In the Virginia birds the scapulars, wing coverts, back, rump, and tail are much redder; the black of the tertials is more intense; and the citrine of the head and neck is, on the average, richer.

The Kansas specimen is noticeably paler even than a specimen from Hamilton, Illinois, taken April 26, 1896 (Carnegie Mus. No. 14581). In turn, the latter is slightly paler than the average spring male from Michigan. A series from northwestern Pennsylvania can hardly be distinguished from Michigan birds. The Virginia specimens are brighter than those from any of the regions west of the Alleghany Mountains.

WEIGHT

Thirteen adult Henslow's Sparrows from Michigan, weighed by Mr. Thomas Hinshaw and me, nine from Ohio, weighed by Dr. L. E. Hicks, one recorded by Stewart (1937: 326), and one from Ontario, taken by M. Berry, averaged 13.07 grams. The weight of twelve males averaged 12.88 grams and ranged from 11.4 to 14.9 grams. Six females averaged 13.13 grams in weight and ranged from 11.1 to 14.8 grams.

An analysis of the weights by months, although based upon insufficient data for drawing definite conclusions, shows a trend toward increasing weight as the fall advances. Average weights by months are given below, in grams, with the number of individuals for each month given in parentheses:

April (1), 13.4; May (2), 11.75; June (7), 12.73; July (2), 12.25; August (5), 13.30; October (5), 14.10. Two immature males taken at Anderson, Michigan, October 5 and 18, 1935, weighed 14.61 and 14.77 grams, respectively.

Comparison of these figures with Figure 3 shows that nestling Henslow's Sparrows attain approximately 75 per cent of their adult weight of 13.07 grams before leaving the nest.

SUMMARY AND CONCLUSIONS

From its discovery in 1820 by Audubon to its first reported appearance in West Virginia in 1935 Henslow's Sparrow has winged an erratic course through the pages of ornithological history. The slowness with which our knowledge of the general range of Henslow's Sparrow accumulated is indicative of the ease with which the species is overlooked by even fairly experienced ornithologists.

The clearing of forests has enabled the bird to increase in southern Michigan, Ontario, and northern Ohio. It is definitely pushing its range eastward across southern Ontario. The bird is recorded evidently for the first time from the shores of the St. Lawrence, in northern New York.

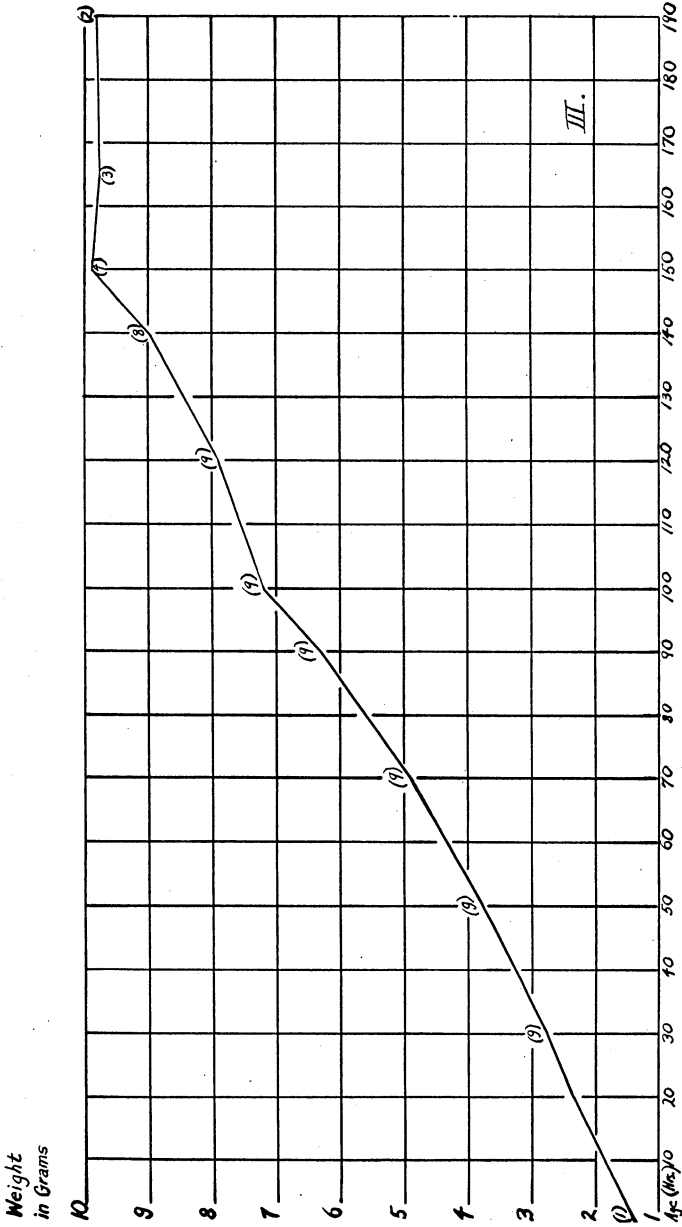


Fig. 3. Growth in weight of nestling Henslow's Sparrows. Figures in parentheses refer to the numbers of individuals weighed at various ages. Note the flattening of the right end of the curve. Studies on other species show that there is a decided retardation in growth rate at the time of the most rapid unsheathing of the feathers. In Henslow's Sparrow this occurs at the age of five to six days (120 to 144 hours).

Apparently because of changes brought about by intensive cultivation, drainage, and perhaps other causes, the bird has disappeared as a breeder from parts of Iowa, from the Delavan marshes in Wisconsin, and from other localities. In the East the center of abundance seems to be the landward edge of the coastal marshes of New Jersey and Maryland. Breeding colonies in northwestern North Dakota and at Chapel Hill, North Carolina, are hundreds of miles from the next nearest known breeding areas. No evidence could be found for including Texas within the breeding range.

The winter range extends from South Carolina to central Florida, and west to eastern Texas. Migration occurs during March and April, and again in late September, October, November, and early December.

Evidence from many sources indicates that one of the characteristics of the bird is instability in abundance, even in suitable habitat. The bird nests in "clans" or scattered colonies in favored spots, although adjacent apparently equally suitable habitats are unoccupied.

The majority of the species breeds in grassy meadows, usually bush-dotted. In southern Michigan the dominant plant of the habitat is *Spartina pectinata*. A minority chooses grassy shrub-sprinkled uplands on which to breed. The favorite winter habitat is in grassy openings in the southern pine woods.

The breeding behavior of the birds studied in Livingston County, Michigan, is described in detail. The semicolonial mores of the species probably has a survival value, as members of the colony warn one another of danger. Monogamy, with some exceptions, seems to be the marital rule.

Feeding and courtship activities, aside from singing, are conducted chiefly under cover of the dense grass of the birds' habitat. In addition to the song, the sexes communicate with each other by means of a call of intimacy.

The female builds the nest unaided. Three different types of nests are built in the habitat studied.

The incubation period is ten to eleven days in length; the young leave the nest the ninth or tenth day after hatching. The empty eggshells are probably eaten by the parent. Very young nestlings are fed almost exclusively on caterpillars and the abdomens of Orthoptera; older ones eat a variety of insects and spiders. Both parents feed the young. The food of adults in the summer is four-fifths animal matter.

The principal enemies of nesting Henslow's Sparrows are probably snakes and Marsh Hawks. The birds of the Anderson habitat are relatively free from Mallophaga, but a high percentage are infested with red mites (*Trombicula*).

Probability of a "postjuvenal" plumage, proposed by Sutton, is discounted.

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PLATE I

FIG. 1. A pine flat near Pensacola, Florida, typical of the winter habitat of Henslow's Sparrow. Photograph by Francis M. Weston.

FIG. 2. Hummocks of dry *Spartina pectinata*, which formed the principal nesting habitat for Henslow's Sparrow at Anderson, Michigan. New shoots may be seen in this early spring (late April) aspect. 1936.



FIG. 1



FIG. 2

PLATE II

FIG. 1. This nest of Henslow's Sparrow at Anderson, Michigan, was in a typical location in the base of a clump of *Spartina pectinata*, whose dried blades formed a protective roof. New growth surrounds the old. Nest 2, 1936—May 28.

FIG. 2. Nest 6, 1936, entirely open and unprotected from above, represented an exceptional type of nest for Henslow's Sparrow. The young disappeared shortly after hatching. June 2, 1936.



FIG. 1



FIG. 2

PLATE III

FIG. 1. An adult of Nest 3, 1933, perched on a fence put up for the protection of the nest. The black postocular, two submalar streaks, and unbroken maxillo-cranial contour are helpful field marks to one first making the bird's acquaintance. August, 1933.

FIG. 2. An adult emerging from Nest 1, 1933, with fecal sac of young. The nest is behind the bird in the base of a clump of bluegrass (*Poa pratensis*).

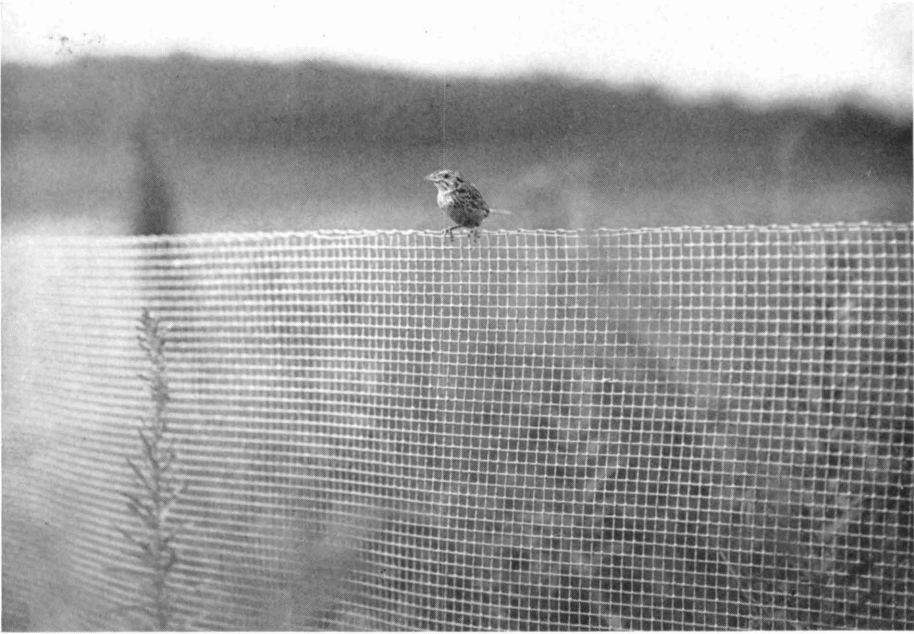


FIG. 1



FIG. 2

A. SIDNEY HYDE

PLATE IV

FIG. 1. Adult about to feed young just out of Nest 10, 1934. Anderson, Michigan.
August 2, 1934.

FIG. 2. Adult Henslow's Sparrow at entrance to nest. The pattern of the upperparts
is well shown. Anderson, Michigan. Nest 1, 1936.



FIG. 1



FIG. 2

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