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SUMMER LIFE OF THE SORA RAIL

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Plate 3

ONE summer day when I, as a boy of fourteen, was wading through a small marshy area, I suddenly splashed into a deep muskrat run; simultaneously a bird slid off a nest and nine spotted buffy eggs very close to my bare feet and disappeared into the dense surrounding vegetation. Four days later, with an older boy, I visited the nest late in the evening and found one of the parent birds brooding several downy young. To our surprise we easily picked the bird off the nest. After we had examined its black face, brown plumage and yellowish legs for a few minutes, it suddenly gave a start and escaped, but our close examination had been enough to identify it as a Sora (*Porzana carolina*). Thus I met a species, which for many years has proved one of the most interesting of any that I have ever studied. The observations here recounted were made in many parts of Michigan and in Alberta and North Dakota.

DISTRIBUTION

The 1931 A. O. U. 'Check-list of North American Birds' gives the breeding range of the Sora as "central British Columbia, southern Mackenzie, Saskatchewan, Manitoba, the lower St. Lawrence River, New Brunswick, and Nova Scotia south to northern Lower California, Utah, Colorado, Kansas, southern Illinois, northern Missouri, southern Ohio, Pennsylvania, and Maryland." In addition, it "winters from California, Arizona, Texas, and Florida through the West Indies and Central America to Venezuela and Peru. Occasional in Labrador and Newfoundland; accidental in Bermuda, Greenland, England, Wales, and Scotland."

Most of my studies were made in Michigan and unless otherwise noted, all records refer to that State. In the Lower Peninsula of



NEST OF SORA RAIL. CALHOUN CO., MICHIGAN



SORA RAIL ON NEST. UPPER SOURIS, NORTH DAKOTA

Michigan, the Sora is the most common rail. During the months of April and May from 1934 through 1937, when a dog was used, I observed 441 rails of which 225 or 51.02% were Soras. Similarly in the Upper Peninsula during part of May 1937 and June 1934 and 1935, 136 rails were observed, of which only 24 or 17.6% were Soras.

MIGRATIONS

The earliest date on which I ever have observed the Sora in Michigan was April 9, 1929. Mr. and Mrs. N. T. Peterson observed one at Duck Lake, Calhoun County, along a cat-tail bordered shore, on March 28, 1936. I find no earlier date. Bent (1926, p. 314) summarized the spring early dates for Michigan as: Ganges, April 5, 1893; Vicksburg, April 11, 1904; Ann Arbor, April 13, 1908; Greenville, April 16, 1896; Hillsdale, April 17, 1894; Albion, April 17, 1896; and Battle Creek, April 20, 1888. The majority of Soras arrive in Michigan during the latter part of April and the very early part of May. Following is a chart of Sora Rail migrations or early and late dates on which I have observed it:

CALHOON COUNTY

<i>Year</i>	<i>First</i>	<i>Common</i>	<i>Last</i>
1919	May 18		
1920	May 10		
1922	April 16		
1923	April 28		
1924	April 27		
1925	April 19		
1929	April 9	April 9	Sept. 22
1930	May 11	May 18	Sept. 1
1931	May 16	May 16	
1932	May 1	May 8	
1933	April 30	May 11	

CENTRAL SOUTHERN MICHIGAN (FIRST AND LAST DATES)

<i>Year</i>	<i>Barry County</i>	<i>Calhoun County</i>	<i>Clinton County</i>	<i>Eaton County</i>	<i>Jackson County</i>	<i>Kalamazoo County</i>
1934		April 22				
	Sept. 30	Oct. 7				
1935		April 18	May 5	May 8	April 28	May 12
	Sept. 29				Oct. 6	
1936		May 3	April 30	April 30	May 3	
		Sept. 17			Sept. 24	
1937		April 18	April 22		May 2	April 20
	Sept. 25	Sept. 30				Oct. 17
1938	May 9	April 14	April 24		April 24	
	Oct. 2	Oct. 2				Sept. 15

On May 6, 1937, the Sora was observed at Seney, Schoolcraft County, in the Upper Peninsula.

The latest dates of observation summarized by Bent (1926, p. 315) were as follows: "Michigan, Palmer, October 6, 1894; Detroit, October 18, 1907; Neebish Island, November 9, 1893; and Vicksburg, November 17, 1902." Wood and Tinker (1934, p. 17) gave as the latest date at Ann Arbor, Washtenaw County, October 15, 1908. Rapp (1931, p. 7) gave as his latest date at Vicksburg, Kalamazoo County, November 1, 1914.

The majority of Soras leave Michigan during the latter part of September or the very early part of October depending upon the severity of the weather. Autumns with early heavy frosts show an effect on the Soras. Where they have been common on certain areas previous to these frosts, few can be found afterward.

NESTING

During the twenty-one years, 1918–1938 inclusive, I have found or observed 51 nests of the Sora, 48 of which were in Michigan, one in North Dakota and two in central Alberta. In Michigan the earliest date was May 2, 1937, in Jackson County, a nest containing the first egg on that date. Another nest on May 10, 1934, contained seven eggs, the first of which must have been laid on or before May 3; this was in Calhoun County. My latest date was for one found June 22, 1924, when it contained ten eggs which hatched about July 9 or 10. By far the majority of nesting dates fall during the latter part of May. In thirty-eight nests found in southern Michigan, the dates of which were known, or estimated from the date of hatching, the first egg was laid as follows: in 16 during the first ten days in May; in 16 during the second ten days; in five between May 21 and May 31; in one between June 11 and June 20. There were no later dates. In the Upper Peninsula three nests had the first eggs laid between May 21 and May 31. In McHenry County, North Dakota, one nest had the first egg laid May 24.

The average measurements of eight nests in southern Michigan were: exterior diameter, 145 mm.; interior diameter, 115 mm.; depth of nest to water level at laying time, 147 mm.; nest proper, depth, 62 mm. The water depth around the nest at laying time averaged 18 cm. This depth varied during incubation with the amount of rainfall. One nest found May 16, 1935, was completely arched over and very difficult to see. There were 10 cm. of standing water about it and the base was about 11 cm. above the water. On May 28 there was a

3.68-inch rainfall with the result that the marshes became flooded. When I visited the region on May 30, the arched part was completely gone and the nest had been raised several cm., leaving the eggs without the least protection from above. During higher water nests might easily become flooded.

On May 12, 1935, a nest containing one egg was only barely started. On May 16, with five eggs, this nest was complete, having in addition the completed runway, a customary approach for the bird from the water level. Usually the nest, as in this case, is completed after the bird starts laying.

Nests are made of surrounding plants, usually coarser on the exterior with a finer lining of grasses or finer sedges (*Carex*). These usually are woven in with the immediately surrounding sedges, rushes or grasses. Unlike the Virginia Rail (*Rallus limicola limicola*) which may use rushes (*Scirpus validus*) entirely where that plant predominates, I never have noted a Sora's nest without a finer lining except when it was located in a region of coarse sedges, where a few nests had the same coarse sedges when complete. Occasionally cat-tails (*Typha latifolia*) were used in the foundation. In a small cat-tail marsh in Calhoun County, the Sora nests abundantly each summer. The entire central portion of the marsh consists of cat-tails while at the extreme border are sedges. Out of thirteen nests found on the area only one was located in the cat-tails; the rest were at the uniting border of sedges, built in the sedges themselves. Usually, as in other small marshes, the sedges were not thickly grouped but in clumps, containing at nesting time both old sedges and the new green stalks. Often the nests were detected at a short distance away on account of a canopy built down from the surrounding vegetation. Whereas I have seen nests in large areas of *Scirpus validus*, I never have found any among lily-pads in such situations as the King Rail (*Rallus elegans elegans*) and the Virginia Rail at times nest. Sometimes during high water the rails build in very open situations without much cover, but usually they select a marsh where the water is of a favorable depth, about six to eight inches, and sedges are the predominating plant. Many small marshes and lake borders, very favorable to the Sora, can be located each spring by driving through the country and inspecting them from the road. Sometimes a marsh may have Soras in it one year but none the following, due to a difference in water level alone.

The usual species of birds nesting near the Sora are the Virginia Rail, occasionally the King Rail, Swamp Sparrow (*Melospiza georgiana*), Red-wing (*Agelaius phoeniceus phoeniceus*), and Prairie Marsh

Wren (*Telmatodytes palustris dissaëptus*). Farther west, the Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*) and the Wilson's Phalarope (*Steganopus tricolor*) were found nesting in close proximity.

A list of nests found from 1918 through 1938 is summarized below:

NESTING DATES OF SORA RAIL

Nest No.	Date found	No. of eggs	Date last egg was laid	Date eggs hatched	No. of eggs in set	Locality
1	June 9, 1918	9		June 13-14 K	9	Convis Twp., Calhoun Co.
2	May 16, 1919	2	Destroyed		x	Convis Twp., Calhoun Co.
3	May 31, 1919	2	Destroyed		x	Convis Twp., Calhoun Co.
4	June 8, 1919	8		June 17-21	8	Convis Twp., Calhoun Co.
5	May 10, 1920	4	May 15 K	May 29-31 K	9	Bellevue, Eaton Co.
6	May 27, 1920	10		June 10-13 K	10	Bellevue, Eaton Co.
7	May 30, 1920	12		June 13-15	12	Convis Twp., Calhoun Co.
8	May 30, 1920	10	Destroyed		10	Convis Twp., Calhoun Co.
9	May 30, 1920	9	Destroyed		9	Convis Twp., Calhoun Co.
10	May 21, 1922	12	Unknown		12	Convis Twp., Calhoun Co.
11	May 28, 1922	5	Destroyed		x	Convis Twp., Calhoun Co.
12	June 3, 1923	7		June 12-15 K	7	Convis Twp., Calhoun Co.
13	June 10, 1923	8		June 15-19 K	8	Convis Twp., Calhoun Co.
14	June 17, 1923	6		June 20-21 K	6	Convis Twp., Calhoun Co.
15	June 22, 1924	10		July 9-10	10	Convis Twp., Calhoun Co.
16	May 11, 1930	4	May 17 K	June 1-3 K	10	Convis Twp., Calhoun Co.
17	May 18, 1930	10		June 3-4 K	10	Convis Twp., Calhoun Co.
18	May 21, 1933	11		June 3-4 K	11	Convis Twp., Calhoun Co.
19	June 4, 1933	5b		June x-4 K	x	Convis Twp., Calhoun Co.
20	May 10, 1934	7	May 12 K	May 27-x K	9	Convis Twp., Calhoun Co.
21	May 10, 1934	2	May 18 K	June x-4 E	10	Convis Twp., Calhoun Co.
22	June 11, 1934	shells		Undoubtedly had hatched	x	Munuscong Bay, Chippewa Co.
23	June 14, 1934	5	Destroyed		x	Munuscong Bay, Chippewa Co.
24	May 12, 1935	1	May 19 K		8	Convis Twp., Calhoun Co.
25	May 15, 1935	6	May 20 K		11	Convis Twp., Calhoun Co.
26	May 16, 1935	5	May 21 K		8	Convis Twp., Calhoun Co.
27	May 16, 1935	6	May 18 K		8	Convis Twp., Calhoun Co.
28	May 16, 1935	4	May 23 K	Deserted	11	Convis Twp., Calhoun Co.
29	May 16, 1935	3	May 21 E	Unknown	8	Convis Twp., Calhoun Co.
30	May 18, 1935	3	May 22 K	Destroyed	x	Ross Twp., Kalamazoo Co.
31	May 19, 1935	10	May 20 K	Deserted	11	Convis Twp., Calhoun Co.
32	May 19, 1935	3	Destroyed		x	Convis Twp., Calhoun Co.
33	May 19, 1935	2	Destroyed		x	Convis Twp., Calhoun Co.
34	May 22, 1935	7	May 25 K	June 8-9 K	10	Ross Twp., Kalamazoo Co.
35	May 22, 1935	7	May 26 K	Destroyed	11	Ross Twp., Kalamazoo Co.
36	May 26, 1935	8	May 26 I	Unknown	8	Convis Twp., Calhoun Co.
37	May 26, 1935	8	May 26 I	Unknown	8	Convis Twp., Calhoun Co.
38	May 30, 1935	8	May 30 I	Unknown	8	Convis Twp., Calhoun Co.
39	June 1, 1935	8	June 1 I	Unknown	8	Bath Twp., Clinton Co.
40	June 7, 1935	9	June 7 I	Unknown	9	Manistique Twp., Schoolcraft Co.
41	June 7, 1935	11	June 7 I	Unknown	11	Manistique Twp., Schoolcraft Co.
42	May 10, 1936	2	Deserted		x	Convis Twp., Calhoun Co.
43	June 1, 1936	8	June 6 K	Destroyed	13	Lower Souris Refuge, McHenry Co., No. Dakota
44	June 19, 1936	0	Unknown		x	Bashaw, central Alberta
45	June 19, 1936	0	Unknown		x	Bashaw, central Alberta
46	May 23, 1937	8	Unknown		8	Convis Twp., Calhoun Co.
47	May 23, 1937	8		May 27-x	8	Convis Twp., Calhoun Co.
48	May 15, 1938	8	May 17 K	June 1-5 K	10	Convis Twp., Calhoun Co.
49	May 15, 1938	9	May 15 I	May 28-June 1	9	Convis Twp., Calhoun Co.
50	May 15, 1938	7	May 15 I	Unknown	7	Convis Twp., Calhoun Co.
51	May 22, 1938	7	May 22 K	June 8-12 K	12	Convis Twp., Calhoun Co.

K, known; E, estimated; I, incubating; b, broken; x, unknown.
All nests in Michigan unless otherwise stated.

Nest no. 5.—The ninth and last egg was laid in this nest on May 15. The eggs hatched May 29-31, giving the incubation period for the last egg sixteen days.

Nest no. 16.—This was found on May 11 when it contained four eggs and the female was flushed from the nest even though it was during the middle of the afternoon. This set was complete on May 17 when it contained ten eggs, and these hatched from June 1–3. The period of incubation for the last egg was seventeen days.

Nest no. 20.—When this nest was found on May 10, it contained seven eggs and one of the parents was incubating. The last egg was laid on May 12. When visited on May 27 at 10 a. m., it contained five downy young, two of which were still wet, and four eggs. Assuming that the remaining eggs hatched on May 28, at least by May 29, the incubation period of the last egg would have been either sixteen or seventeen days. Assuming that egg no. 5 was laid May 8 and hatched May 27, its incubation period would have been nineteen days.

Nest no. 28.—This was built directly underneath the nest of a Red-wing. Both nests were used for some time but later the Sora deserted its nest for some reason.

Nest no. 32.—The three eggs in this nest were punctured. The openings were only a few mm. across and in one the bill which apparently had caused the puncture had pierced the opposite side. The size of the opening and the length of the bill indicated that possibly a Virginia Rail might have done it.

Nest no. 34.—When this nest was found the female was incubating seven eggs. The tenth and last egg was laid May 25, three days later. Durward L. Allen examined the nest at the close of incubation and his notes state that the eggs were present June 7. June 8, three eggs hatched. June 9, six eggs hatched. June 10, all but one egg had hatched; that one was deserted. The mark on this egg was obliterated, consequently the incubation period would be about sixteen days.

Nest no. 43.—This nest, in the Lower Souris Refuge of the U. S. Biological Survey, was built on an area flooded that spring where there had been no standing water for a number of years. It was built of stalks of *Iva xanthifolia*, a tall rank growth on the area, and was lined with finer grasses. It was in the open without protection. Something destroyed the eggs late during the incubation period.

Nests no. 44 and 45.—A Sora was flushed from each of these completed yet empty nests, the day they were found but I did not revisit them.

Nest no. 48.—The female was incubating eight eggs on May 15 when this nest was found. The tenth and last egg was laid on May 17. On June 1 at 6 a. m., it contained six young and four eggs; on June 2, seven young; on June 3, all eggs were hatched by 6 a. m. but nos. 9 and 10;

on June 4, egg no. 9 hatched. Egg no. 10 hatched June 5, late during the day. On June 6, the female was brooding several young early in the morning and on June 7 had evidently just left the nest when I arrived at 6 a. m. She was scolding a bittern in that vicinity but the nest was warm and dry even though there were no young in it by the time I reached it. The incubation period for both eggs nos. 9 and 10 was nineteen days. Even egg no. 6 had an incubation period of nineteen days. The weights of several young and of the eggs from which they hatched were taken at this nest and are as follows:

<i>No. of egg</i>	<i>Wt. of eggs May 16-18</i>	<i>Wt. of eggs June 1-3</i>	<i>Wt. of young the day of hatching</i>
7	8.7 grams	7.7 grams	6.3 grams
8	8.5 grams	7.8 grams	6.3 grams
9	8.6 grams	7.8 grams	6.4 grams
10	7.9 grams	7.4 grams	6.0 grams

Nest no. 49.—The last egg hatched in this nest seventeen days after it was found, when it contained a full complement of eggs. Egg no. 1 weighed on May 26 when pipped, 8.6 grams. On May 28 at 5 a. m., the young from it weighed 6.6 grams. Similarly eggs nos. 4 and 5 weighed 8.9 grams and the young 7.5 and 7.3 grams respectively. Egg no. 8 weighed 8.8 grams, from which a young hatched weighing at hatching 7.1 grams.

Nest no. 51.—Mr. N. T. Peterson found this nest while we were visiting the same small marsh containing nests nos. 48 and 49. It contained seven eggs, cold. On May 23, it contained eight eggs at 5.30 a. m.; May 24, the same; May 25, nine eggs; May 26, ten eggs; May 27, eleven and May 28, twelve eggs. Incubation started May 23. June 8 the nest contained five pipped eggs; June 9, at 5.30 a. m., five newly hatched young and seven eggs, embryo dead in another egg; June 10, six young hatched; June 11, at 5.30 a. m., seven young; June 12, no additional young; June 13, nest and eggs deserted, one embryo nearly out, dead, and three other unhatched eggs, nos. 10, 11 and 12. Incubation period of first five eggs seventeen days; sixth egg eighteen days; eighth egg, marked when laid, nineteen days. The weights of eggs and young are summarized as follows:

<i>No. of egg</i>	<i>Wt. of egg May 23</i>	<i>Wt. of egg June 8-10</i>	<i>Wt. of young June 9-11</i>
1	7.3 grams	6.8 grams	5.8 grams
2	7.3 grams	6.7 grams	5.8 grams
3	7.6 grams	6.9 grams	5.8 grams
5	7.5 grams	6.7 grams	5.3 grams
6	6.5 grams	5.5 grams	5.0 grams
7	6.9 grams	5.8 grams	5.0 grams
8	7.1 grams	6.6 grams	5.8 grams

THE EGGS

The eggs of the Sora are darker buff and the spots are usually larger with more even outlines than those of the Virginia Rail. Bent (1926, p. 305) says of the color: "The ground color is a rich buff, varying from 'chamois' or 'cinnamon buff' to 'cream buff,' 'ivory yellow,' or even 'pale olive buff.' They are irregularly spotted with browns and drabs, 'auburn,' 'chestnut brown,' 'russet,' 'snuff brown' and shades of 'cinnamon-drab' and 'ecru drab'."

Out of 39 nests containing full complements of eggs, the number varied from six to thirteen, with an average of 9.35 eggs per set. The complete list is as follows:

No. of eggs per set	6	7	8	9	10	11	12	13
No. of sets	1	2	12	6	8	6	3	1

All of these except the thirteen-egg set, which was in North Dakota, were in Michigan.

The 128 eggs in sixteen nests were weighed when newly laid; they averaged per set: 8.99, 7.21, 9.56, 8.96, 9.66, 8.5, 8.2, 7.86, 8.4, 8.09, 9.1, 8.2, 8.8, 9.15, 8.39 and 7.28 grams respectively. The average of the 128 eggs was 8.36 grams. The lightest egg weighed 6.5 grams and belonged to a set of twelve eggs averaging 7.28 grams. Another egg weighed only 6.9 grams and belonged to a set of eleven eggs averaging 7.21 grams. The heaviest egg weighed when fresh 10.25 grams. Measurements of 129 eggs averaged 31.503 x 22.8 mm. The largest egg measured 36 x 25 mm., the smallest 28.5 x 20.9 mm., and another 29 x 20 mm.

One egg was laid each day during the very early hours of daylight except on rare occasions where a day was skipped. Incubation usually began several days before the last egg was laid with the result that the eggs hatched over a period of several days.

THE YOUNG

The incubation periods at the six nests as recorded above were 16 days, 17 days, 16 possibly some to 19 days, 15 or 16 days, 19 days and 17 to 19 days respectively. The eggs always hatched over a period of days, from two or three to four, five, and possibly more. Three of these periods have been previously published (Walkinshaw, 1935, pp. 79-80). Bent states (1926, p. 305), that "the period of incubation is said to be 14 days," and 14 days was the period given by Mousley (1937, p. 81) at one nest. Of the six nests I would state the incubation period of the Sora was from 16 to 19 days in Michigan.

The eggs are pipped from 24 to 48 hours before hatching. The young after emerging, are covered with black glossy down varying from 5 to 15 mm. in length, longer on the back of the neck. At the base of the lower mandible are a number of orange 'bristles' and at the base of the maxilla is a little red protuberance about 1 mm. in diameter. The bill is bluish gray, tipped with a tinge of yellow and has the prominently white egg-tooth near its tip. The legs and feet are very light gray with a bluish undertone. About 8 mm. from the tip of the second digit of the wing is a short claw about 1 mm. long.

The downy young of the Sora are able to leave the nest as soon as the down is dry, sometimes sooner if danger threatens. Usually when a nest was approached during hatching time, all of the hatched young were underneath the incubating parent and clambered over the edge into the water when the bird left. At other times from a blind, I have watched the young congregate about one of the parents a short distance from the nest while the other parent incubated the remaining eggs. Twice I have watched the adult brood newly hatched young right in the water, which in both cases was about six inches deep. The feathers of the breast were all fluffed down to the water's surface as the young clambered underneath. Both parents have been noted incubating the eggs, for I have watched them change places at the nest.

A number of downy young have been weighed and measured. Following is a summary of these, showing the increase in weight of the older young, which often remained at the nest with the incubating parent:

<i>Age</i>	<i>Wt. in grams</i>	<i>Wing in mm.</i>	<i>Tarsus in mm.</i>	<i>Culmen including red protuberance in mm.</i>	<i>No. of young</i>
hatched	6.35	12.37	12.1	7.0	21
1 day	7.91	13.0	12.66	7.0	8
2 days	10.53	14.66	12.66	7.6	3

The variation in weight among the twenty-one young at hatching was 5.0 to 7.5 grams; at one day of age, from 5.8 to 8.8 grams; at two days, 9.9 to 11.1 grams. The wing was measured with a straight-edge ruler.

At some nests I have found a parent brooding the young during the early morning a day or two after they had hatched; at other nests I have found no signs of parents or young even the day following that on which the last young hatched. Evidently the parent broods them wherever they find it most suitable, but if night finds them near the nest, they return to it. I have never observed the families of young on high land areas near the hatching marsh as I have in the case of the Virginia Rail. During the summer of 1938, at one small marsh three broods of young Soras hatched late in May and early in June. I had erected a V-shaped chicken-wire approach to a funnel trap at one end of the marsh. On July 17, nine of us made a drive, without success. One young Virginia Rail a month old was captured, but no Soras, even after a second drive using a dog. Evidently the young Soras, five or six weeks old, had left the marsh overland to some other area. This has proved to be the case in most of these small marshes examined a few weeks after the breeding season.

During August and September, and often during the earlier part of October, many Soras can be found on boggy areas where wild rice (*Zizania*) is the predominating plant. Birds flock here by the dozens, and the marshes ring with their voices when one throws a stone into the water. Stomachs examined, of birds from these areas, show that they feed mostly on the seeds of the rice. A number of Soras have been observed along sedge-bordered lakes during late summer, where the actual water borders were boggy, with loosestrife (*Decodon verticillatus*) forming a shady dense shore-line.

Summarizing: Soras during early spring and the nesting period spend the time in small grass- and sedge-grown swales, ponds, and lake borders, retiring to the lake shore-lines, and rice-covered marshes in late summer where they feed until migration time.

VOICE

During the days of spring, when the ponds ring with the voices of frogs, often from the same location the 'whinny' of the Sora can be heard, *whee-hee-hee-hee-hee-hee*, increasing in rapidity as it is given. Again, at this season, a note is heard which also has been traced to this same species, a plaintive *ter-ee*. Although I have heard the whinny

at times in late September, spring is the only season during which I have heard this latter call.

Often when disturbed at the nest the birds gave a sharp *quink-quink-quink-quink*. Sometimes a sharp *kuk-kuk* is given. Later in the summer when a stone was thrown into the water where the Soras were congregated, a piping *queep* was the resulting cry, or often a three-syllabled note described by W. Leon Dawson (1923, p. 1542): "Often and often have I flung a stone or a stick of wood into a wayside clump of tules to be rewarded instantly with a shouted 'crick creek croo,' satisfying evidence that the Sora is on the job."

The downy young often gave a low *queea* changing to a much shriller *queee* when they were in trouble or danger.

WEIGHTS

The weights of the downy young taken at four different nests are given above. The young of each definite brood weighed about the same at the same age, but often those of another nest varied as much as 2 grams. The lightest weight recorded for newly hatched young was 5.0 grams.

At one day of age the weight of eight individuals varied from 5.8 to 8.8 grams and on the second day three individuals ranged from 9.9 to 11.1 grams.

Esten (1931, p. 573) recorded some weights of Soras taken by Wm. Van Gorder without any sex differentiation, as follows: "April 24, 1911, two, 76 and 106 grams. April 9, 1915, 51 grams (very poor). May 3, 1911, two, 61.5 and 83.5 grams. April 27, 1916, two, 125.7 and 111.7 grams."

A number of specimens collected in southern Michigan have been weighed. Most of these are in the University of Michigan Museum of Zoology, with the kind permission of which the following weights are given:

ADULT MALES				
<i>Museum number</i>	<i>Where collected</i>	<i>By whom collected</i>	<i>Date taken</i>	<i>Weight</i>
95930	Washtenaw Co.	J. Van Tyne	May 3, 1938	91.5 grams
66001	Mackinac Co.	J. Van Tyne	Sept. 4, 1930	83.0 grams
83652	Jackson Co.	P. Brodkorb	Sept. 13, 1936	71.7 grams
	Barry Co.	J. Kendrick	Oct. 2, 1938	105.6 grams
Average of 4 adult males				87.95 grams

IMMATURE MALES				
96399	Washtenaw Co.	L. D. Case	July 31, 1938	73.5 grams
72285	Jackson Co.	J. Wood	Aug. 4, 1933	89.5 grams
91544	Jackson Co.	A. Staebler	Aug. 29, 1937	84.0 grams
	Barry Co.	H. Bradley	Oct. 2, 1938	73.4 grams
Average of 4 immature males				80.1 grams
Average of 8 males				84.0 grams
ADULT FEMALES				
C. J. H. 23	Clinton Co.	C. J. Henry	May 5, 1935	78.2 grams
91952	Calhoun Co.	L. H. W.	Aug. 12, 1934	65.0 grams
69175	Washtenaw Co.	J. Van Tyne	Aug. 13, 1932	72.5 grams
Average of 3 adult females				71.9 grams
IMMATURE FEMALE				
86413	Jackson Co.	R. E. Olsen	Sept. 8, 1935	75.2 grams
Average of 4 females				72.72 grams

The average of the nineteen birds recorded above is 83.0 grams. One notes that although there is some overlapping in the weights of the sexes, the males average considerably higher than the females. This also is the case in both the Virginia and the Yellow Rails (*Coturnicops noveboracensis*) as recorded by the author (1937, 1939).

SURVIVAL

If one considers that no marked increase or decrease from year to year is noted among the average species of birds, he realizes that there must be some ratio between the survival of hatched young, the number of eggs hatching, the number of broods raised and the average length of life of individuals of that species. Soras probably raise only one brood annually but the size of broods at hatching time is large, six to thirteen, yet there is no appreciable change from year to year in their numbers so that the majority of hatched young probably never become breeding birds.

Out of 36 nests, the outcome of which was known, 22 brought off young, a percentage of 61.11. In these 36 nests, 266 eggs were laid of which 177 hatched, giving a percentage of 66.54, somewhat higher than the usual average for passerine birds, where the young remain in the nest for a period of days (Nice, 1937, pp. 143, 180-189). The number of young, 177, considering them as all hatching in one year, plus their parents, 72 birds, would become 72, plus or minus, by the following spring. In other words around 177 young and adults would be killed from the original 249 birds.

Probably the elements, rain producing flooded conditions, drouth, extreme cold and heat, produce a large percentage of the casualties. Again, the water of the marsh prevents many predators from troubling the rails but I have seen raccoons (*Procyon lotor lotor*) on these rail marshes even during the daytime. When the young feed near the shore they are certain to be captured at times by some of the dry-land predatory mammals. The downy young although good swimmers and hiders, are slow and easily caught. However, they always try to get away from the danger, then hide deep within some clump of grass or sedge, and do not reappear until their parent calls them out.

At several different places I have found the remains of Soras on posts in these marshes where some hawk or owl had fed on them. Marsh Hawks (*Circus hudsonius*) and Short-eared Owls (*Asio flammeus flammeus*) have been observed coursing repeatedly over rail-inhabited areas, and I have found Yellow Rail feathers in Short-eared Owl pellets. Since the Marsh Hawk is the most abundant and I have found both Yellow and Sora Rail remains where there were no Short-eared Owls at that time, it is my belief that these hawks capture a few rails.

BEHAVIOR

The Sora, like other rails, is very hard to flush from the reeds which it inhabits, yet I believe it will fly more readily than either the Virginia or the Yellow Rails. When flushed, it usually flies farther and faster than those species. With the exception of the bird caught when I was a boy, I have never caught a Sora, even with the help of a dog. They always depend on their wings and legs for escape rather than hiding. If they did hide, when the dog approached, they immediately flew, giving him no chance to capture them. At all seasons, even during winter in central Florida, I have found the Sora a lover of areas covered with a shallow depth of six to eight inches of water, usually where a food supply was abundant.

If one wishes to observe the behavior of Soras in their native habitat the best way is to remain motionless either in a blind or resting on some solid object in or near their habitat. One is certain to observe them working back and forth feeding from the surface of the water. Yet, if one makes a single movement they will quickly disappear. They are very curious though and will return to investigate the cause of the movement.

I have spent ten to twelve hours in blinds at Soras' nests. There is always a marked difference in the behavior of individual birds but the Sora is a wilder bird at the blind than the Virginia Rail. Some birds will spend hours away from the nest before returning while others will return almost immediately. At one nest, on May 27, 1934, where I was attempting to photograph the adults, I had captured and placed in my hat within the blind, five downy young, hoping that the parent might return quicker to the eggs. After waiting two hours without success, although both parents were walking through the sedges very close to the blind and the young were occasionally peeping from inside, I released them, one at a time, with the result that one parent assembled them a short distance from me while the other returned to the edge of the nest, but would not incubate the eggs while I was there; so I finally left. A similar observation was made at a nest on May 27, 1937, but both adults incubated the eggs during the period of two hours which I spent there and when the young were finally released one parent brooded them a few feet from the nest right in the water while the mate incubated the remaining eggs. When I left the blind, both birds quickly left the area, skulking amongst the neighboring vegetation while the young scattered to the nearest clumps of sedges to hide.

The birds, in nearly all cases, even if afraid of the blind, entered their nests by the built-up slanting runways. Sometimes if their fear was too much they would squeeze through the sedges at the back of the nest rather than approach to the runway at the front.

SUMMARY

The Sora Rail is a summer resident over the entire State of Michigan, much more common in the Lower Peninsula than in the Upper. The first birds of the year have been observed as early as March 28, often early in April, but usually the main migration appears in late April or very early in May. Nesting starts during the early part of May, the earliest date for southern Michigan being May 2. Thirty-seven out of thirty-eight nests had the first egg laid in May and thirty-two of these during the first twenty days of that month. In north-central North Dakota, one nest had the first egg laid May 24. The nests were built in sedges or rushes over about 18 cm. of standing water; often the first eggs were laid before the nest was completed. The young hatched during late May or early June.

From six to thirteen eggs are laid, averaging for 39 nests, 9.35 eggs

per set. The average weight of 128 eggs was 8.36 grams when fresh. The extremes were 6.5 grams and 10.25 grams. The average measurements of 129 eggs are 31.503 x 22.8 mm., varying from 29 x 20 mm. to 36 x 25 mm. The color was buffy with fairly large brownish spots. These eggs were deposited during the very early hours of morning, usually one each day until the set was complete.

The incubation periods at six nests varied from sixteen to nineteen days. The young were covered with glossy, black down and had orange bristles at the chin and a red protuberance at the base of the maxilla. They averaged in weight (21 individuals) 6.35 grams at hatching time, then 7.91 grams (eight individuals) the next day, and 10.53 grams (three individuals) the second day after hatching. They often left the nest immediately but occasionally remained at least the two days after hatching.

The so-called 'whinny' is the outstanding call of the Sora.

The average weight of twelve individuals was 81.9 grams, that of four adult males 87.95 grams; of four immature males, 80.1 grams (the eight males averaged 84.0 grams). The average weight of three adult females was 71.9 grams and of one immature, 75.2 grams and for the four females 72.72 grams.

Out of 36 nests, in which 266 eggs were laid, 177 young were brought off from 22 nests, giving a success percentage for nests of 61.11 and for eggs of 66.54.

In late summer the Sora retreats to areas where food is more plentiful. Wild-rice beds have been found to be favorite feeding areas until the rails depart for the south late in September or early in October.

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